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INOVUES, LLC
TEST REPORT

SCOPE OF WORK
ASTM E283, E331, MODIFIED E330 AND AAMA 501.1 R&D TESTING ON A CW AND CW+GS100LF, CURTAIN WALLS

REPORT NUMBER
I6575.01-109-44

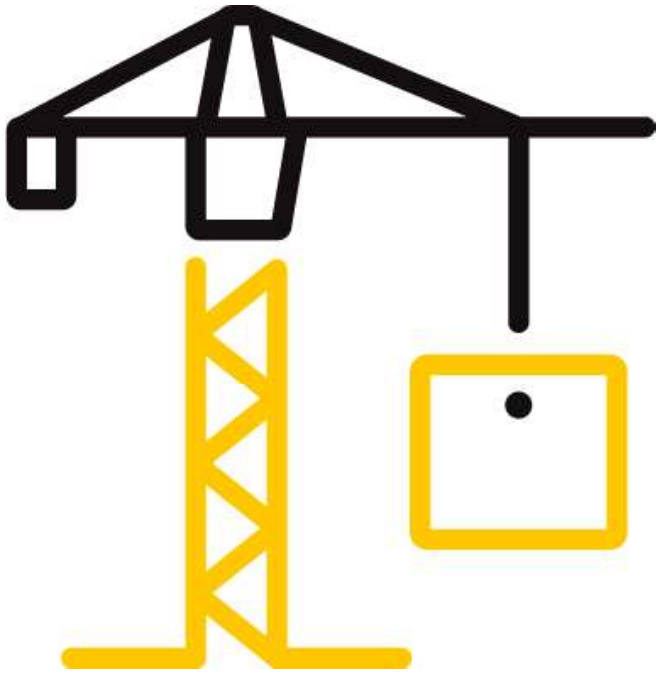
TEST DATE(S)
07/18/18 - 07/20/18

ISSUE DATE
08/14/18

RECORD RETENTION END DATE
07/20/22

PAGES
17

DOCUMENT CONTROL NUMBER
ATI 00479 (07/24/17)
RT-R-AMER-Test-2805



130 Derry Court
York, Pennsylvania 17406

Telephone: 717-764-7700
Facsimile: 717-764-4129
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TEST REPORT FOR INOVUES, LLC
Report No.: I6575.01-109-44
Date: 08/14/18

REPORT ISSUED TO
INOVUES, LLC
2323 McCue Road
Houston, Texas 77056

SECTION 1
SCOPE

Intertek Building & Construction (B&C) was contracted by Inovues, LLC to perform R&D testing in accordance with AAMA 501.1, ASTM E283, modified ASTM E330, ASTM E331, on their CW and CW+GS100LF, Curtain Walls. Results obtained are tested values and were secured by using the designated test method(s). Testing was conducted at Intertek B&C test facility in York, Pennsylvania.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

For INTERTEK B&C:

COMPLETED BY:	Ken R. Stough	**REVIEWED BY:**	Timothy J. McGill
TITLE:	Lead Technician – Product Testing	**TITLE:**	Manager – Product Testing
SIGNATURE:	Digitally Signed for: Ken R. Stough by Vicki L. McElwain	**SIGNATURE:**	Digitally Signed by: Timothy J. McGill
DATE:	08/14/18	**DATE:**	08/14/18

KRS:wnl

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SECTION 2
SUMMARY OF TEST RESULTS

Test Specimen #1: CW

TITLE	RESULTS
Design Pressure	±2394 Pa (±50.00 psf)
Air Infiltration	<0.1 L/s/m^2 (<0.01 cfm/ft^2)
Water Penetration Resistance Test Pressure	540 Pa (12.11 psf)
Dynamic Water Penetration Resistance Test Pressure	1436 Pa (30.0 psf)
Uniform Load Structural Test Pressure	±3591 Pa (±75.00 psf)

Test Specimen #2: CW+GS100LF

TITLE	RESULTS
Design Pressure	±2394 Pa (±50.00 psf)
Air Infiltration	0.1 L/s/m^2 (0.01 cfm/ft^2)
Water Penetration Resistance Test Pressure	540 Pa (12.11 psf)
Dynamic Water Penetration Resistance Test Pressure	1436 Pa (30.0 psf)
Uniform Load Structural Test Pressure	±3591 Pa (±75.00 psf)

SECTION 3
TEST METHOD(S)

The specimens were evaluated in accordance with the following:

AAMA 501.1-17, *Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors using Dynamic Pressure*

ASTM E283-04(2012), *Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen*

Modified ASTM E330/E330M-14, *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*

ASTM E331-00(2016), *Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference*

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SECTION 4
MATERIAL SOURCE/INSTALLATION

Test specimen(s) were provided by the client. Representative samples of the test specimen(s) will be retained by Intertek B&C for a minimum of two years from the test completion date.

The specimen was installed into a Spruce-Pine-Fir wood buck. The rough opening allowed for a no shim space. The exterior perimeter of the window was sealed with silicone. Installation of the tested product was performed by the client.

LOCATION	ANCHOR DESCRIPTION	ANCHOR LOCATION
Head, sill and jambs	#14 x 3" hex head self-tapping screw	Located 4" from each end and midspan through the buck into the window frame

SECTION 5
EQUIPMENT

Control Panel: 003921, 005406
Weather Station: 63316
Spray Rack: 003956 C&D
Wolf: INT00003

SECTION 6
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Anas Al Kassas	Inovues, LLC
Andrew P. Mehalick	Intertek B&C
Timothy J. McGill	Intertek B&C
Ken R. Stough	Intertek B&C

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Report No.: I6575.01-109-44
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SECTION 7
TEST SPECIMEN DESCRIPTION

Product Type: Curtain Wall and Curtain Wall with Inovues Glazing Shield
Series/Model: CW and CW+GS100LF

Product Size(s):

Test Specimens #1 and #2: CW and CW+GS100LF

OVERALL AREA:	**WIDTH**		**HEIGHT**	
2.6 m^2 (28.3 ft^2)	**millimeters**	**inches**	**millimeters**	**inches**
Overall size	1346	53	1956	77

The following descriptions apply to all specimens.

Frame Construction:

MEMBER	**MATERIAL**	**DESCRIPTION**
Head, sill, and jambs	Aluminium	Extruded
Pressure plate	Aluminium	Extruded
Shear block	Aluminum	Extruded
Adaptor	Aluminum	Extruded
Cover cap	Aluminum	Extruded

	JOINERY TYPE	**DETAIL**
All corners	Square-cut, butted, and sealed	Sealed with butyl and secured with an extruded aluminum shear block. The shear block was secured to the jamb with two #12 x 2" pan head screws through the shear block into the jamb. The head and sill were secured to the shear block with two #12 x 7/8" flat head screws through the head / sill into the shear block.
Pressure plate	Square-cut and butted	Secured to the frame with #14 x 2" hex head self-drilling screws located 2" from each end and spaced 9 - 12" on center
Adaptor	Square-cut and butted	Snap-fit into the head, sill, and jambs
Cover cap	Square-cut and butted	Snap-fit onto the pressure plate

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TEST REPORT FOR INOVUES, LLC
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Reinforcement: No reinforcement was utilized.

Weatherstripping: No weatherstripping was utilized.

Glazing: *No conclusions of any kind regarding the adequacy or inadequacy of the glass in any glazed test specimen(s) can be made.*

Test Specimen #1: CW

GLASS TYPE	GLAZING	GLAZING METHOD
Monolithic	1/4" annealed	Exterior glazed against an EPDM gasket and secured with a pressure plate with a EPDM gasket against the glass

Test Specimen #2: CW+GS100LF

GLASS TYPE	SPACER TYPE	INTERIOR LITE	EXTERIOR LITE	GLAZING METHOD
1-1/8" IG	Hybrid – aluminum profiles / extrusions between adhesives / sealants	1/4" annealed	1/8" annealed 0.060" PBV interlayer 1/8" annealed	Exterior glazed against an EPDM gasket and secured with a pressure plate with an EPDM gasket against the glass

Test Specimens #1 and #2: CW and CW+GS100LF

LOCATION	QUANTITY	DAYLIGHT OPENING		GLASS BITE
		millimeters	inches	
Fixed daylight opening	1	1219 x 1829	48 x 72	1/2"

Drainage:

DRAINAGE METHOD	SIZE	QUANTITY	LOCATION
Weephole	5/16" diameter	2	Located 2" from each end of the bottom rail under the cover cap through the pressure plate

Hardware: No hardware was utilized.

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Report No.: I6575.01-109-44
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SECTION 8
TEST RESULTS

The temperature range during testing was 26°C (79°F) to 29°C (85°F). The results are tabulated as follows:

Test Specimen #1: CW

TITLE OF TEST	RESULTS	ALLOWED	NOTE
Air Leakage, Infiltration per ASTM E283 at 75 Pa (1.57 psf)	<0.1 L/s/m^2 (<0.01 cfm/ft^2)	Report only	1
Air Leakage, Infiltration per ASTM E283 at 300 Pa (6.27 psf)	<0.1 L/s/m^2 (<0.01 cfm/ft^2)	Report only	1
Air Leakage, Exfiltration per ASTM E283 at 75 Pa (1.57 psf)	<0.1 L/s/m^2 (<0.01 cfm/ft^2)	Report only	1
Air Leakage, Exfiltration per ASTM E283 at 300 Pa (6.27 psf)	<0.1 L/s/m^2 (<0.01 cfm/ft^2)	Report only	1
Water Penetration, per ASTM E331 at 580 Pa (12.11 psf)	Pass	No leakage	
Dynamic Water Penetration per AAMA 501.1 at 1436 Pa (30.0 psf)	Visible water on sill	No leakage	5
Dynamic Water Penetration, Modified at 2107 Pa (44.0 psf)	Visible water on sill	No leakage	6
Dynamic Water Penetration, Modified at 2346 Pa (49.0 psf)	Visible water on sill	No leakage	7
Dynamic Water Penetration, Modified at 2490 Pa (52.0 psf)	Visible water on sill	No leakage	8
Uniform Load, per ASTM E330 +2394 Pa (+50.00 psf) -2394 Pa (-50.00 psf)	No damage	No damage	9, 10, 11
Air Leakage, Infiltration per ASTM E283 at 75 Pa (1.57 psf)	<0.1 L/s/m^2 (<0.01 cfm/ft^2)	Report only	2

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TEST REPORT FOR INOVUES, LLC
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Date: 08/14/18

Test Specimen #1: CW

TITLE OF TEST	RESULTS	ALLOWED	NOTE
Air Leakage, Infiltration per ASTM E283 at 300 Pa (6.27 psf)	<0.1 L/s/m^2 (<0.01 cfm/ft^2)	Report only	2
Air Leakage, Exfiltration per ASTM E283 at 75 Pa (1.57 psf)	<0.1 L/s/m^2 (<0.01 cfm/ft^2)	Report only	2
Air Leakage, Exfiltration per ASTM E283 at 300 Pa (6.27 psf)	<0.1 L/s/m^2 (<0.01 cfm/ft^2)	Report only	2
Water Penetration, per ASTM E331 at 580 Pa (12.11 psf)	Pass	No leakage	
Uniform Load Structural, per ASTM E330 +3591 Pa (+75.00 psf) -3591 Pa (-75.00 psf)	No damage	No damage	9, 10

Test Specimen #2: CW+GS100LF

TITLE OF TEST	RESULTS	ALLOWED	NOTE
Air Leakage, Infiltration per ASTM E283 at 75 Pa (1.57 psf)	0.1 L/s/m^2 (0.01 cfm/ft^2)	Report only	3
Air Leakage, Infiltration per ASTM E283 at 300 Pa (6.27 psf)	0.2 L/s/m^2 (0.03 cfm/ft^2)	Report only	3
Air Leakage, Exfiltration per ASTM E283 at 75 Pa (1.57 psf)	<0.1 L/s/m^2 (<0.01 cfm/ft^2)	Report only	3
Air Leakage, Exfiltration per ASTM E283 at 300 Pa (6.27 psf)	0.1 L/s/m^2 (0.01 cfm/ft^2)	Report only	3
Water Penetration, per ASTM E331 at 580 Pa (12.11 psf)	Pass	No leakage	
Water Penetration, per AAMA 501.1 at 1436 Pa (30.0 psf)	No visible water	No leakage	5

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Test Specimen #2: CW+GS100LF

TITLE OF TEST	RESULTS	ALLOWED	NOTE
Water Penetration, per AAMA 501.1 at 2107 Pa (44.0 psf)	No visible water	No leakage	6
Water Penetration, per AAMA 501.1 at 2346 Pa (49.0 psf)	No visible water	No leakage	7
Water Penetration, per AAMA 501.1 at 2490 Pa (52.0 psf)	No visible water	No leakage	8
Uniform Load, per ASTM E330 +2400 Pa (+50.13 psf) -2400 Pa (-50.13 psf)	No damage	No damage	9, 10, 11
Air Leakage, Infiltration per ASTM E283 at 75 Pa (1.57 psf)	0.1 L/s/m^2 (0.01 cfm/ft^2)	Report only	4
Air Leakage, Infiltration per ASTM E283 at 300 Pa (6.27 psf)	0.2 L/s/m^2 (0.03 cfm/ft^2)	Report only	4
Air Leakage, Exfiltration per ASTM E283 at 75 Pa (1.57 psf)	0.1 L/s/m^2 (0.01 cfm/ft^2)	Report only	4
Air Leakage, Exfiltration per ASTM E283 at 300 Pa (6.27 psf)	0.1 L/s/m^2 (0.02 cfm/ft^2)	Report only	4
Water Penetration, per ASTM E331 at 580 Pa (12.11 psf)	Pass	No leakage	
Uniform Load Structural, per ASTM E330 +3591 Pa (+75.00 psf) -3591 Pa (-75.00 psf)	No damage	No damage	9, 10, 11

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York, Pennsylvania 17406

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***General Note**: All testing was performed in accordance with the referenced standard(s).*

Note 1: Test Date 07/18/18 / Time: 3:50 PM

Note 2: Test Date 07/19/18 / Time: 3:00 PM

Note 3: Test Date 07/18/18 / Time: 4:12 PM

Note 4: Test Date 07/19/18 / Time: 4:45 PM

Note 5: Test duration of 15 minutes

Note 6: Test duration of 2 minutes

Note 7: Test duration of 30 seconds

Note 8: Test duration of 5 seconds

Note 9: Loads were held for 10 seconds.

Note 10: Tape and film were not used to seal against air leakage during structural testing.

Note 11: No deflection on permanent set measures taken because of research and development testing.

130 Derry Court
York, Pennsylvania 17406

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Facsimile: 717-764-4129
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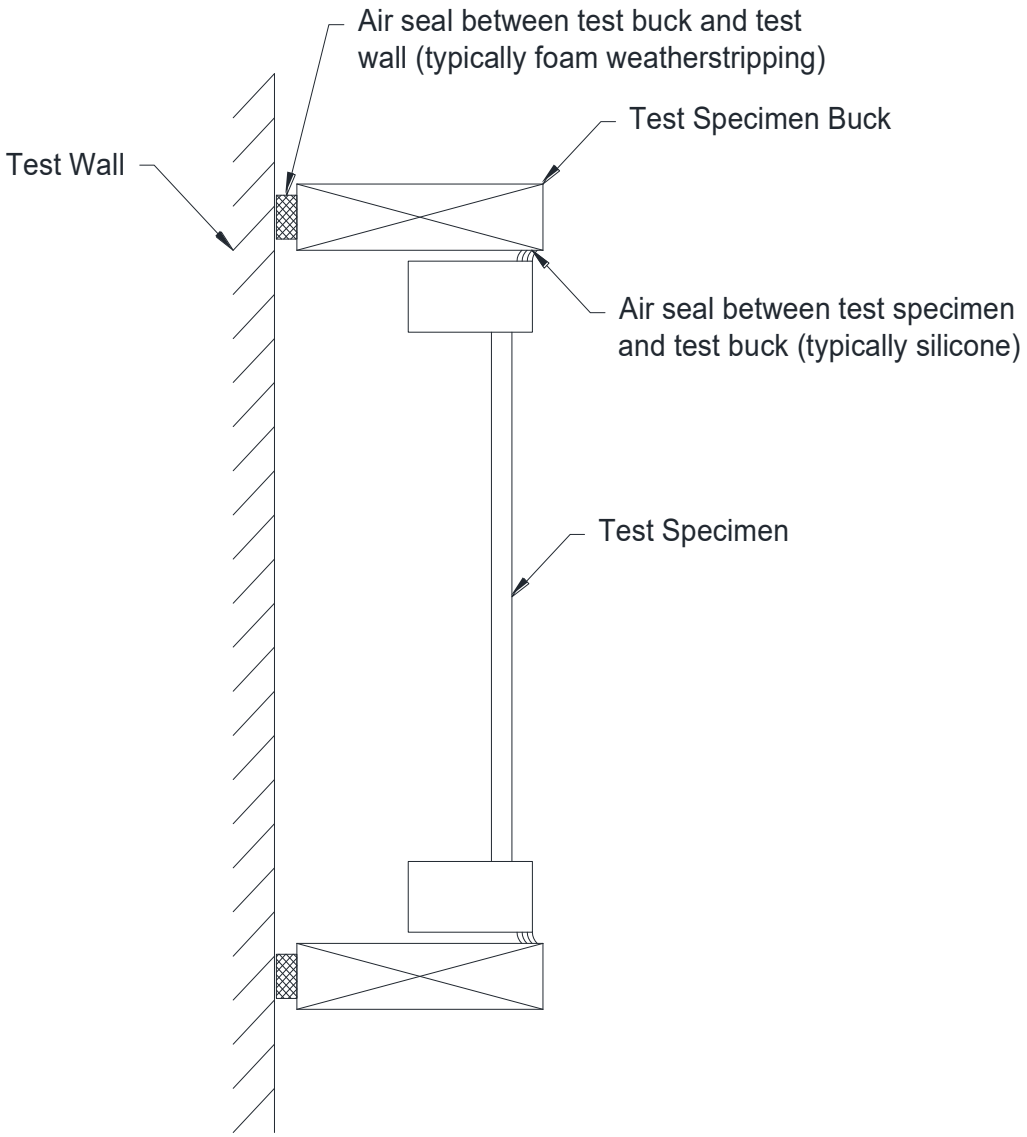
SECTION 9
LOCATION OF AIR SEAL

The air seal between the test specimen and the test wall is detailed below. The seal is made of foam weatherstripping and is attached to the edge of the test specimen buck. The test specimen buck is placed against the test wall and clamped in place, compressing the weatherstripping and creating a seal.



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Facsimile: 717-764-4129
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SECTION 10
PHOTOGRAPHS

Photo No. 1
Test Specimen #1 CW

Photo No. 2
Test Specimen #2 CW+GS100LF

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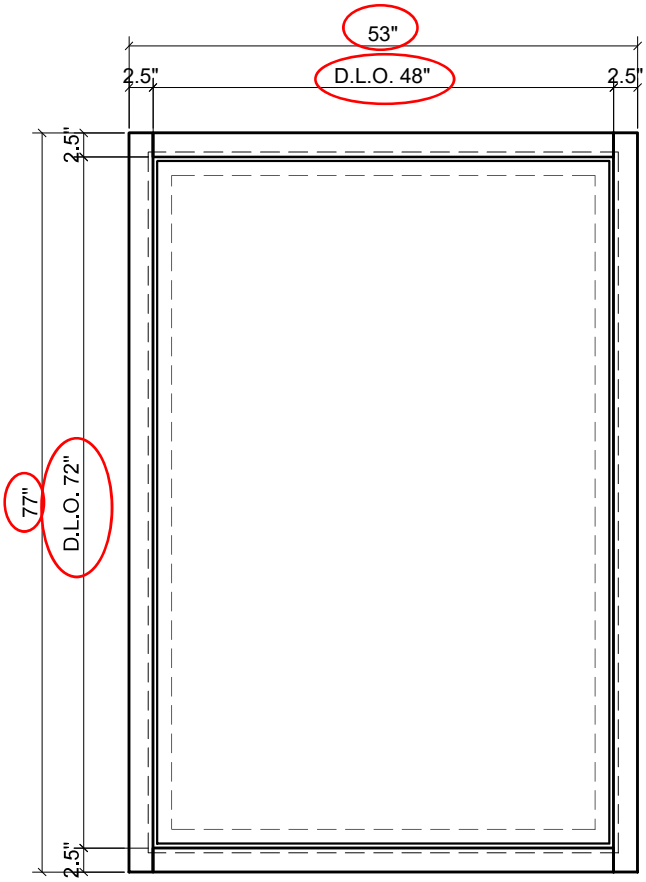
SECTION 11
DRAWINGS

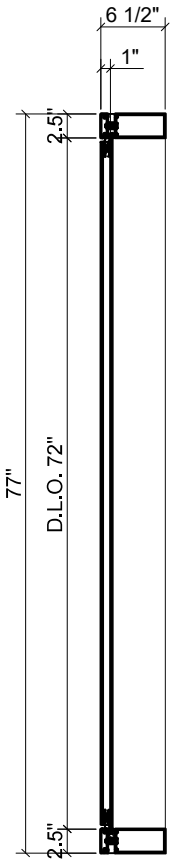
The test specimen drawings have been reviewed by Intertek B&C and are representative of the test specimen(s) reported herein. Test specimen construction was verified by Intertek B&C per the drawings included in this report. Any deviations are documented herein or on the drawings.

INOVUES
ADAPTIVE GLAZING SHIELDS

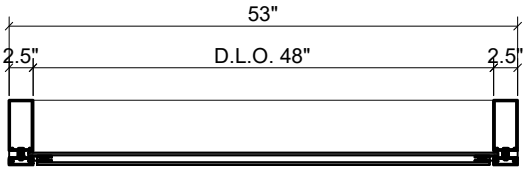
INOVUES, LLC
2323 MCCUE RD, HOUSTON, TX 77056 USA
www.inovues.com | info@inovues.com | +1 (833) 466-8837



ELEVATION



SECTION



PLAN

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Date:	08/02/2018
Verified by:	

NOTES:

PLAN, ELEVATION, AND SECTION ARE FOR SCHEMATIC PURPOSES

DRAWN BY: AA	SCALE 1:20	DIMENSIONS INCHES	SCH. DWG. NO. INO-002-01001	GLAZING SHIELD 1.0_PROTOTYPE 2_EPS
CHECKED BY: .	DATE: 2018-04-24	CUSTOMER/REF.NO. ALLIANCE GLAZING TECHNOLOGIES		REVISION R1

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Telephone: 717-764-7700
Facsimile: 717-764-4129
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SECTION 12
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	08/14/18	N/A	Original Report Issue