Intertek | Architectural Testing

MIAMI-DADE COUNTY PERFORMANCE TEST REPORT

Report No.: E0653.01-201-18

Rendered to:

3M COMPANY
St. Paul, Minnesota 55144

PRODUCT TYPE: Safety and Security Window Film
SERIES/MODEL: 3M™ Scotchshield™ Safety and Security Film Ultra S600 with 3M™ Impact Protection Adhesive Film Attachment System

This report contains in its entirety:

Cover Page: 1 page
Report Body: 9 pages
Drawings: 6 pages

Test Start Date: 8/6/2014
Test End Date: 8/20/2014
Report Date: 10/14/2014
Test Record Retention End Date: 8/20/2024
Miami-Dade County Notification No.: ATI MN14012

1.0 Client Identification:

1.1 Report Issued To: 3M Company
Renewable Energy Division
St. Paul, Minnesota 55114

1.2 Contact Person: Paul Neumann

2.0 Laboratory Identification:

2.1 Test Laboratory: Architectural Testing, Inc.
849 Western Avenue North
St. Paul, Minnesota 55117

2.2 Laboratory Phone Number: 651-636-3835

3.0 Project Summary:

3.1 Introduction: Architectural Testing, Inc. was contracted by 3M Company to conduct TAS 201, TAS 202, and TAS 203; ASTM E330 and ASTM E1886/E1996 testing on their 3M™ Scotchshield™ Safety and Security Film Ultra S600 with 3M™ Impact Protection Adhesive Film Attachment System, Safety and Security Window Film in accordance with Florida Building Code for High Velocity Hurricane Zone and Miami-Dade County requirements. The specimens tested met the performance requirements set forth in the protocols. The results are summarized in Table 1.

Table 1: Summary of Test Results

Specimen #	Test Protocol	Design Pressure
1	TAS 202 / ASTM E330	+100.0 / -100.0 psf
2	TAS 201 / 203 ASTM E1886/E1996 (Small Missile)	+80.0 / -80.0 psf
3	TAS 201 / 203 ASTM E1886/E1996 (Small Missile)	+80.0 / -80.0 psf
4	TAS 201 / 203 ASTM E1886/E1996 (Small Missile)	+80.0 / -80.0 psf

3.2 Product Type: Safety and Security Window Film

3.3 Series/Model: 3M™ Scotchshield™ Safety and Security Film Ultra S600 with 3M™ Impact Protection Adhesive Film Attachment System

3.4 Miami-Dade County Notification No.: ATI MN14012

3.5 Test Dates: 8/6/2014 - 8/20/2014

3.6 Test Record Retention End Date: 8/20/2024

3.7 Test Location: Architectural Testing, Inc. test facility in St. Paul, Minnesota.

3.0 Project Summary: (Continued)

3.8 Test Specimen Source: The test specimens were provided by the client. Representative samples of the test specimens will be retained by Architectural Testing for a minimum of ten years from the report completion date.

3.9 Drawing Reference: The test specimen drawings have been reviewed by Architectural Testing and are representative of the test specimens reported herein. Test specimen construction was verified by Architectural Testing per the drawings located in Appendix B. Any deviations are documented herein and on the drawings.

3.10 List of Official Observers:

Name	Company
Paul Neumann	3M Company
Tony D. Gavin	Architectural Testing, Inc.
Karl A. Lips-Eakins	Architectural Testing, Inc.
Eric J. Schoenthaler	Architectural Testing, Inc.

4.0 Test Protocols:

TAS 201-94, *Impact Test Procedures*

TAS 202-94, *Criteria for Testing Impact & Non Impact Resistant Building Envelope Components Using Uniform Static Air Pressure*

TAS 203-94, *Criteria for Testing Products Subject to Cyclic Wind Pressure Loading*

ASTM E 330-97, *Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference*

ASTM E 1886-05, *Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials*

ASTM E 1996-09, *Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes*

5.0 Test Specimen Description:

5.1 Product Sizes: Table 2 provides product sizes for the overall test specimens and operable components.

Table 2: Overall Specimen and Operable Component Sizes

Overall Area: 35.7 ft^2	**Width (in.)**	**Height (in.)**
Overall size	51-5/8	99-5/8

5.2 Frame Construction: The frame was fabricated utilizing the members listed in Table 3.

Table 3: Frame Member Details

Frame Member	**Part #**	**Material**	**Description**
All		Aluminum	Hollow extruded aluminum tube

5.2.1 Frame Corner Construction: The frame corners were constructed as described in Table 4.

Table 4: Frame Corner Construction Details

Location	**Joinery Type**	**Details**
All corners	Butt	Secured with a corner key and screws.

5.3 Reinforcement: No reinforcement was utilized.

5.4 Weatherstripping: No weatherstripping was utilized.

5.0 Test Specimen Description: (Continued)

5.5 Glazing Details:

5.5.1 Glazing Materials: Table 5 describes the glass utilized for testing.

Table 5: Glazing Details

Glass Type	Overall Thickness	Glass Makeup	Glazing Method
Ultra S600	0.1935"	3/16" tempered glazing laminated with 3M™ Scotchshield™ Ultra S600	Sealed against a vinyl gasket and secured on the interior with a vinyl wedge gasket. The filmed glass was additionally secured to the interior using a continuous bead of 3M™ Impact Protection Adhesive (IPA), a structural sealant wet-glaze style film attachment, with 3/8" nominal overlap on both film and frame surfaces (Reference Drawing Assy_Window_C)

5.5.2 Daylight Opening and Glass Bite: Table 6 provides the daylight opening and glass bite utilized for testing.

Table 6: Daylight Opening Sizes and Glass Bite Details

Glass Type	Location	Quantity	Daylight Opening	Glass Bite
Ultra S600	Frame	1	48" x 96"	1/2"

5.6 Drainage: No drainage was utilized.

5.7 Hardware: No hardware was utilized.

5.8 Installation: Table 7 provides details of the test specimen installation into the Spruce-Pine-Fir wood test buck. The rough opening allowed for a 1/4" shim space. The exterior perimeter of the test specimen was sealed with sealant.

Table 7: Installation Details

Location	Anchor Description	Anchor Location
Frame perimeter	#10 x 3" screws	Through the frame 6" from each corner and spaced 24" on center.

6.0 Test Results: The temperature duringtesting was 77°F. Results are tabulated as follows:

6.1 Protocol TAS 202-94 / ASTM E330, *Static Air Pressure*

Table 8 provides the results for positive and negative uniform static load test.

Table 8: Test Specimen #1 TAS 202 / ASTM E330, Preload and Design Load Test Results

Load (psf)	Indicator Location	Deflection (in.)		Permanent Set (in.)	
		Measured	Allowed	Measured	Allowed
+75.00 50% of Test Pressure	1	0.01	N/A	0.01	N/A
	2	0.02		0.01	
	3	0.03		0.02	
+100.00 Design Pressure	1	0.02		0.02	
	2	0.04		0.02	
	3	0.06		0.03	
-75.00 50% of Test Pressure	1	0.04		0.03	
	2	0.05		0.03	
	3	0.04		0.02	
-100.00 Design Pressure	1	0.06		0.04	
	2	0.08		0.04	
	3	0.07		0.03	
+150.00 Test Pressure	1	0.04		0.02	
	2	0.07		0.03	
	3	0.11		0.04	
-150.00 Test Pressure	1	0.08		0.05	
	2	0.10		0.054	
	3	0.09		0.04	

***Note**: See Architectural Testing Sketch #1 for indicator locations. Deflection/permanent set reported is the overall deflection between three points (longest unsupported span) which accounts for support movement.*

Conclusion: Architectural Testing observed no signs of failure in any area of the test specimen during the TAS 202 / ASTM E330 structural only testing.

6.0 Test Results: The temperature during testing was 78°F. Results are tabulated as follows:

6.2 Protocol TAS 201-94 / ASTM E330, *Static Air Pressure*

Tables 9, 10 and 11 provides the results for the small missile impact test.

Table 9: Test Specimen #1 TAS 201 / ASTM E1886 Small Missile Impact Test Results

Impact #	Missile Weight (grams)	Missile Velocity (ft./sec.)
1	2.0	131.5
2	2.0	131.7
3	2.0	130.9

Table 10: Test Specimen #2 TAS 201 / ASTM E1886 Small Missile Impact Test Results

Impact #	Missile Weight (grams)	Missile Velocity (ft./sec.)
1	2.0	129.2
2	2.0	130.7
3	2.0	131.2

Table 11: Test Specimen #2 TAS 201 / ASTM E1886 Small Missile Impact Test Results

Impact #	Missile Weight (grams)	Missile Velocity (ft./sec.)
1	2.0	130.2
2	2.0	130.0
3	2.0	130.9

***Note**: See Architectural Testing Sketch #2 for impact locations.*

Conclusion: The small missiles impacted each intended target and Architectural Testing carefully inspected each impact location. Architectural Testing observed no signs of penetration, rupture, or opening after the small missile impact test; as such, each test specimen satisfies the small missile requirements of TAS 201 / ASTM E1886.

6.0 Test Results: The temperature during testing was 76°F. Results are tabulated as follows:

6.3 Protocol TAS 203-94 / ASTM E1886, *Cyclic Wind Pressure Loading*

Tables 12, 13 and 14 provide the results for the positive and negative cyclic load test.

Table 12: Test Specimen #1 TAS 203 / ASTM E1886, Cyclic Test Spectrum and Average Cycle Time

Design Pressure	**+80.0 / -80.0 psf**	**Stage**			
		1	**2**	**3**	**4**
Pressure Range (psf)		16.0 – 40.0	0 – 48.0	40.0 – 64.0	24.0 – 80.0
Average Cycle Time (sec.)		2.06	2.98	2.22	2.92
Number of Cycles		3500	300	600	100
		5	**6**	**7**	**8**
Pressure Range (psf)		24.0 – 80.0	40.0 – 64.0	0 – 48.0	16.0 – 40.0
Average Cycle Time (sec.)		2.45	2.09	2.71	2.17
Number of Cycles		50	1050	50	3350

Table 13: Test Specimen #2 TAS 203 / ASTM E1886, Cyclic Test Spectrum and Average Cycle Time

Design Pressure	**+80.0 / -80.0 psf**	**Stage**			
		1	**2**	**3**	**4**
Pressure Range (psf)		16.0 – 40.0	0 – 48.0	40.0 – 64.0	24.0 – 80.0
Average Cycle Time (sec.)		2.11	2.21	1.96	2.51
Number of Cycles		3500	300	600	100
		5	**6**	**7**	**8**
Pressure Range (psf)		24.0 – 80.0	40.0 – 64.0	0 – 48.0	16.0 – 40.0
Average Cycle Time (sec.)		2.30	2.09	2.76	2.00
Number of Cycles		50	1050	50	3350

Table 14: Test Specimen #2 TAS 203 / ASTM E1886, Cyclic Test Spectrum and Average Cycle Time

Design Pressure	**+80.0 / -80.0 psf**	**Stage**			
		1	**2**	**3**	**4**
Pressure Range (psf)		16.0 – 40.0	0 – 48.0	40.0 – 64.0	24.0 – 80.0
Average Cycle Time (sec.)		2.00	2.83	2.00	2.97
Number of Cycles		3500	300	600	100
		5	**6**	**7**	**8**
Pressure Range (psf)		24.0 – 80.0	40.0 – 64.0	0 – 48.0	16.0 – 40.0
Average Cycle Time (sec.)		2.47	1.90	2.58	1.89
Number of Cycles		50	1050	50	3350

7.0 Test Equipment:

Cannon: Constructed from steel piping utilizing compressed air to propel the missile

Missile: 5/16" diameter ball bearings

Timing Device: Electronic beam type

Cycling Mechanism: Computer controlled centrifugal blower with electronic pressure measuring device

8.0 Laboratory Compliance Statements: The following are provided as required by the protocols for the testing reported herein.

Upon completion of testing, specimens tested for TAS 201-94 met the requirements of Section 1626 of the Florida Building Code, Building.

Upon completion of testing, specimens tested for TAS 202-94 met the requirements of Section 1620 of the Florida Building Code, Building.

Upon completion of testing, specimens tested for TAS 203-94 met the requirements of Section 1626 of the Florida Building Code, Building.

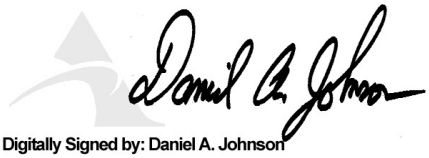
Tape and film were used to seal against air leakage during structural testing. In our opinion, the tape and film did not influence the results of the test.

Architectural Testing will service this report for the entire test record retention period. Test records that are retained such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by Architectural Testing, Inc. for the entire test record retention period.

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 specimens tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, Inc.

Eric J. Schoenthaler
Project Manager



Daniel A. Johnson
Director – Regional Operations

EJS:es

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix A: Sketches (2)
Appendix B: Drawings (7)

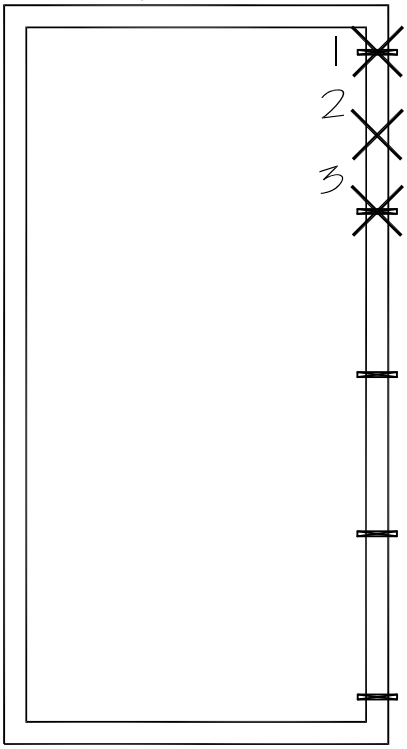
Appendix A

Sketches

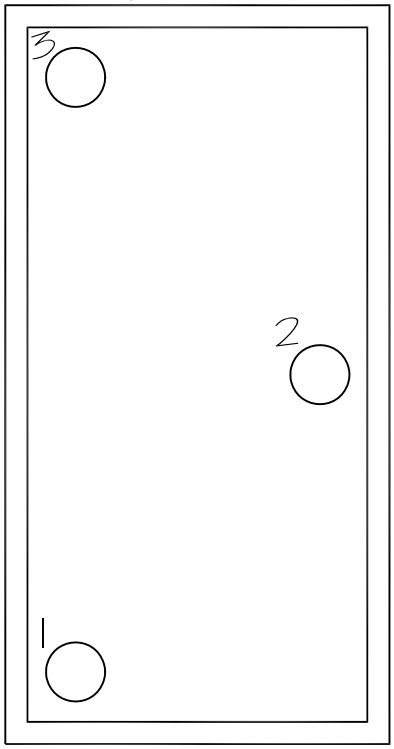
SKETCH #1

Architectural Testing

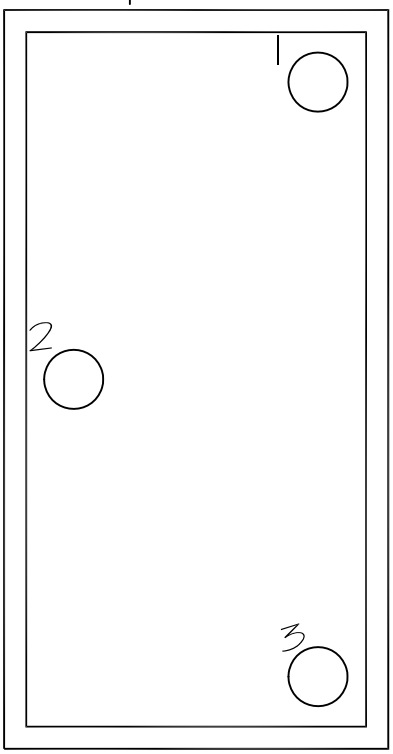
Structural Test Specimen



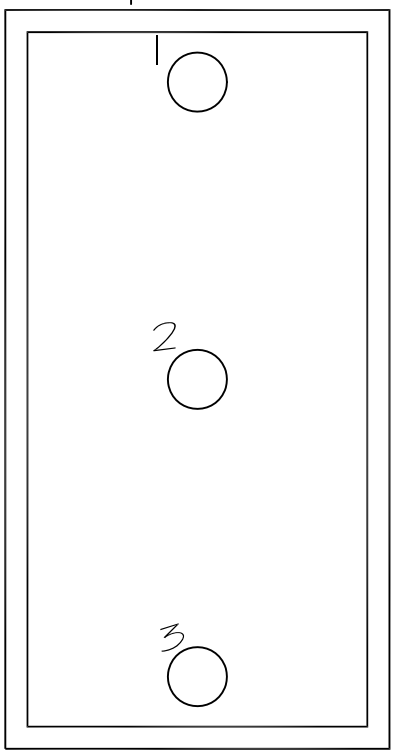
Impact Test Specimen #1



Impact Test Specimen #2



Impact Test Specimen #3

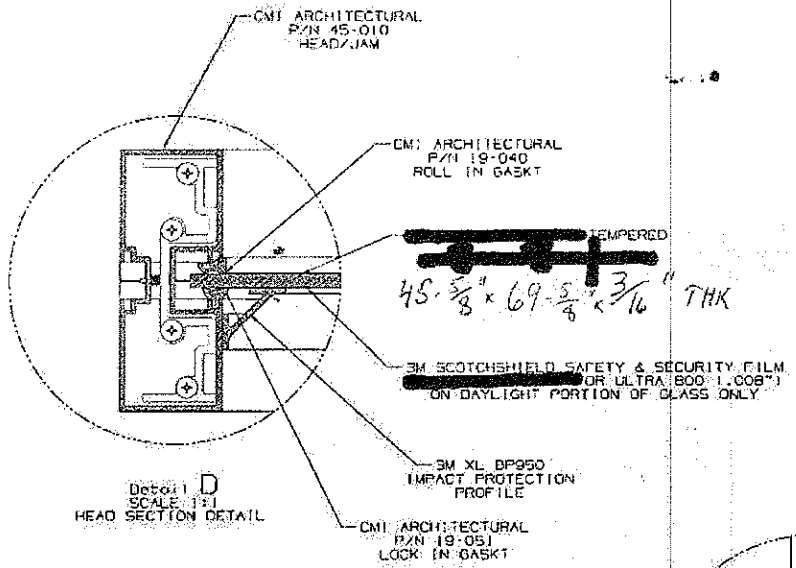


= ANCHOR LOCATIONS = IMPACT LOCATIONS = INDICATOR LOCATIONS

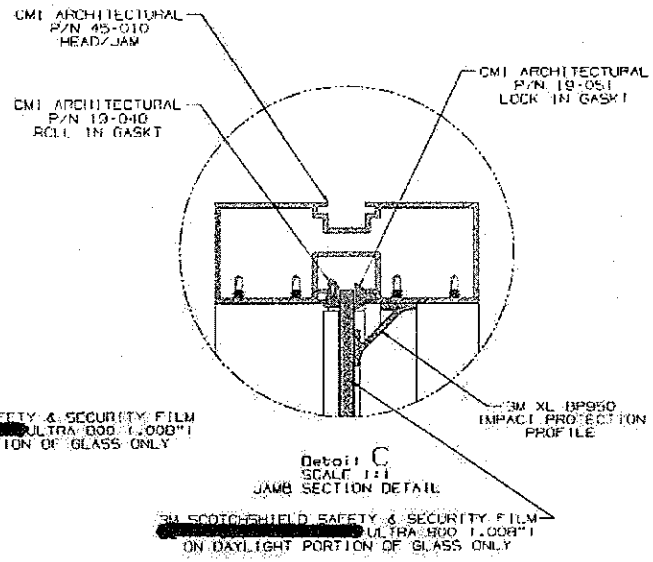
PROJECT NO. E0653.01-201-44	CLIENT: 3M, SCOTCHIELD ULTRA S600 PROJECT NAME: SAFETY AND SECURITY WINDOW FILM	Architectural Testing	DRAWING IMPACT AND INDICATOR LOCATIONS	DWG. BY: ETH DATE: 11/6/14	PAGE 1 OF 1

Appendix B

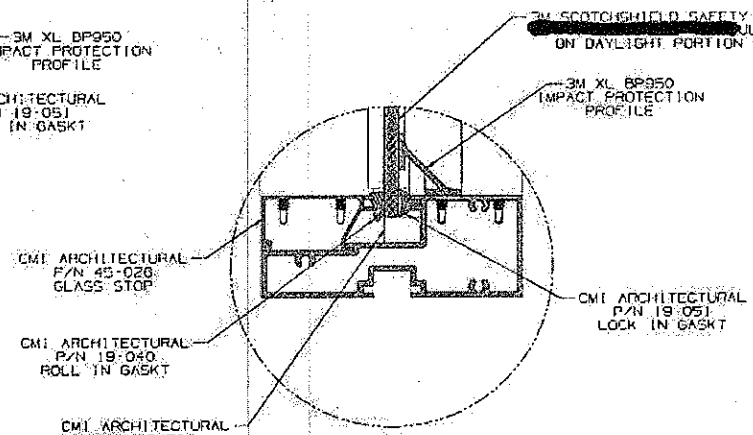
Drawings



Detail D
SCALE 1:1
HEAD SECTION DETAIL



Detail C
SCALE 1:1
JAMB SECTION DETAIL



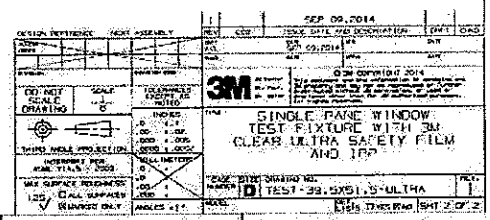
Detail E
SCALE 1:1
SILL SECTION DETAIL

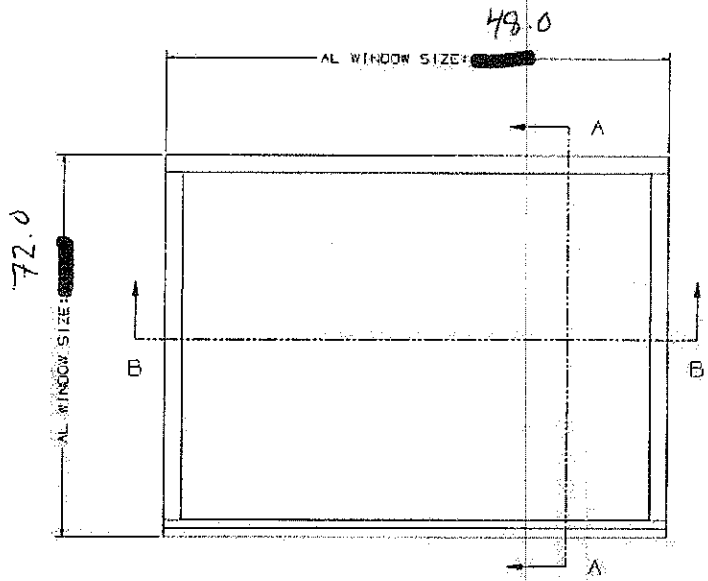
Architectural Testing

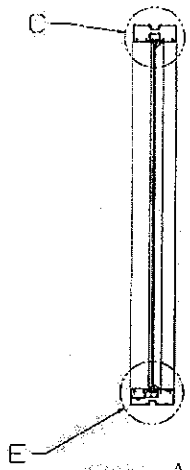
Test sample complies with these details.
Deviations are noted.

Report# E0653 D9117 E2188

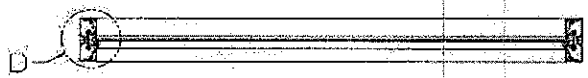
Date 11/6/14 Tech GR







SECTION A - A



SECTION B - B

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# E0653 D9117 E2158

Date 11/6/14 Tech GR

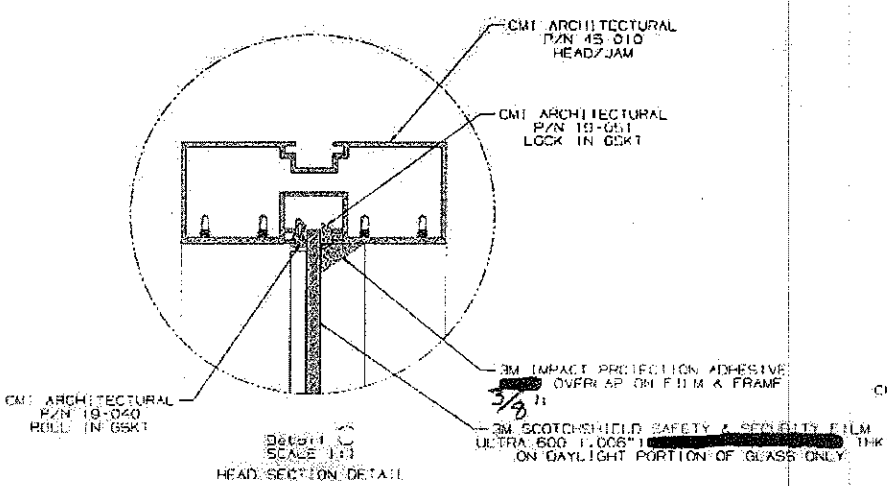
SEP. 09, 2014

3M

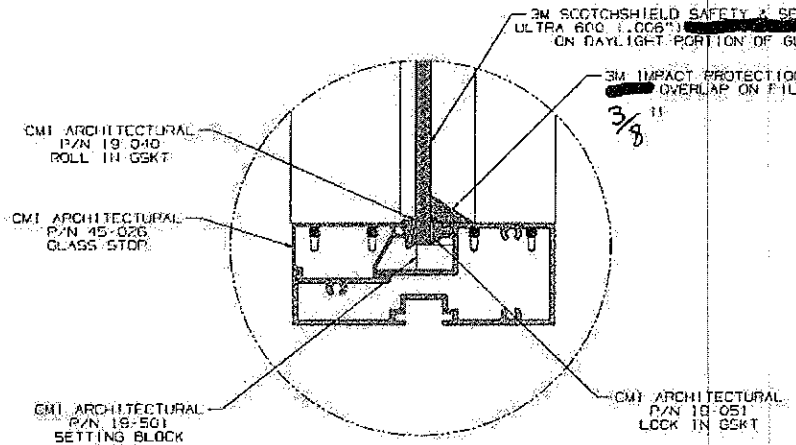
SINGLE PANE WINDOW
TEST FIXTURE WITH 3M
CLEAR ULTRA SAFETY FILM
AND IPA

D ASSY_WINDOW_C

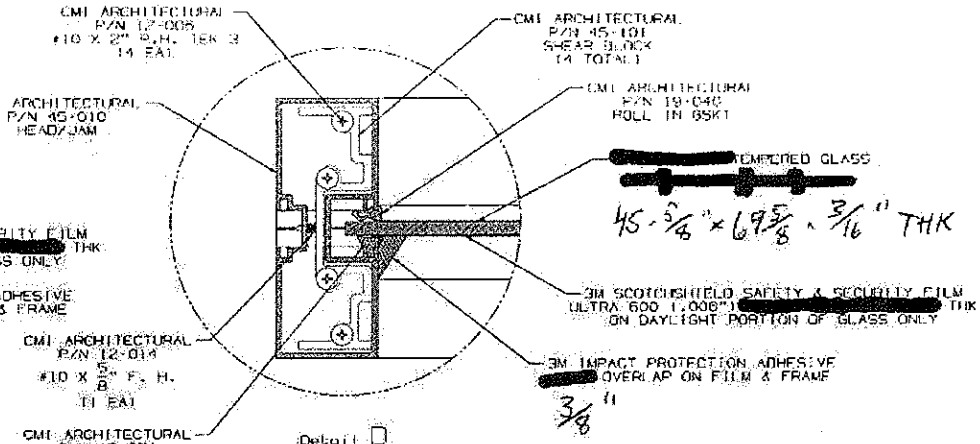
SHT 1 OF 2



Detail C
SCALE 1:1
HEAD SECTION DETAIL



Detail E
SCALE 1:1
SILL SECTION DETAIL



Detail D
SCALE 1:1
JAMB SECTION DETAIL

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# ECS3D917 E2158

Date 11/6/14 Tech GR

DO NOT SCALE DRAWING	SCALE 1:1	TOLERANCES EXCEPT AS NOTED	3M
THIRD ANGLE PROJECTION		FRACTIONS ±1/64 DECIMALS .X ±.02 .XX ±.010 .XXX ±.005 ANGLES ±1°	
INTERPRET PER ASME Y14.5 - 2009		MATERIAL	
MFG SURFACE ROUGHNESS 125 √ ALL SURFACES		BREAK ALL EDGES .005 X 45° MAX	

SEP. 09, 2014

SINGLE PANE WINDOW
TEST FIXTURE WITH 3M
CLEAR ULTRA SAFETY FILM
AND TPA

CODE IDENT NO. D | DRAWING NO. ASSY_WINDOW_C | REV

SCALE: 0.145 | SHEET 2 OF 2

PRINT REVISIONS	DATE

12580
Die Number
45–010
Customer Number

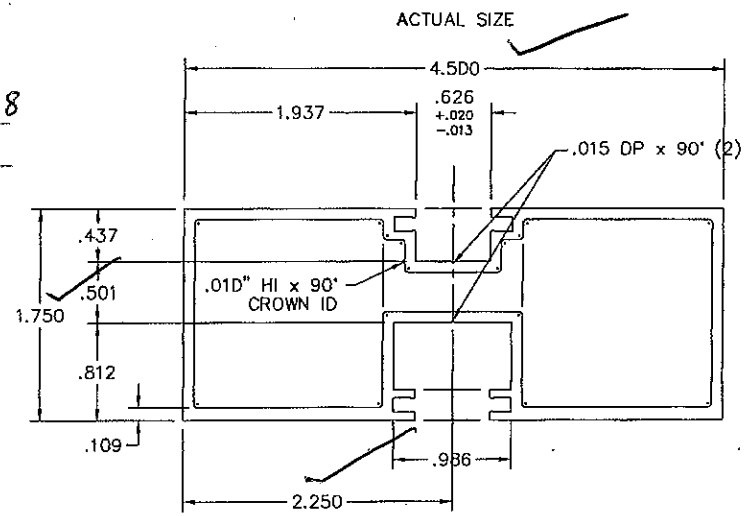
Architectural Testing

Test sample complies with these details.
Deviations are noted.

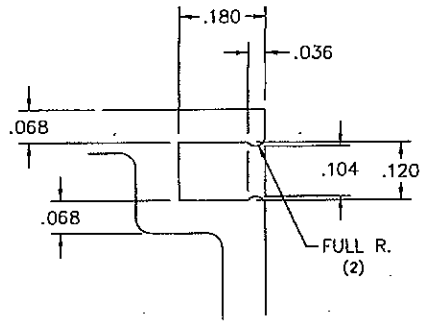
Report# E0653 D9117 E2158

Date 11/6/14 Tech GR

ACTUAL SIZE



ENTIRE OUTSIDE
SURFACE EXPOSED



DETAIL "A"
4 x SIZE

03–24–11 added .625 tolerance

BREAK UNSPECIFIED CORNER: .010 R.

TYPICAL WALL UNLESS OTHERWISE NOTED: .090

ESTIMATED DIE DATA			
ALLOY/TEMPER:	6063–T5		
AREA	1.445	WT/FT	1.733
PERIMETER	31.168	CIRCLE SIZE	4 – 5
OUTSIDE PERIMETER	17.197	FACTOR	18
EXPOSED PERIMETER	17.197	HOLLOW	

DIE REVISIONS	DATE

PRESS SIZE
LEGEND
• = .031 R.
○ = .062 R.
× = .125 R.
⊗ = .250 R.
* =

CROWN EXTRUSIONS

Crown Extrusions, Inc.
122 Columbia Court N.
Chaska, MN 55318
952-448-3533 Fax: 952-448-5328

CUSTOMER [redacted] Architectural
CMI Architectural Products,Inc.
20821 SD Highway 25
DeSmet, SD 57231-5827
605-854-3326 Fax: 605-854-3820

PART NAME: MULLION

DIE #	12580
SCALE	FULL & NOTED
DATE	12–11–08
LAST REVISION	03–24–11
DRAWN	TCG
CUSTOMER NUMBER	45–010

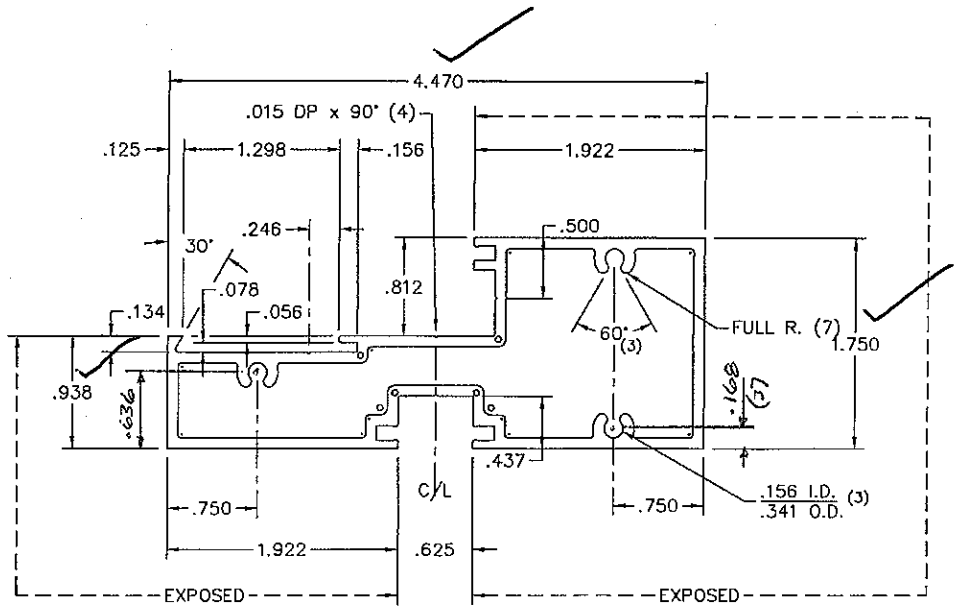
STANDARD TOLERANCES APPLY UNLESS OTHERWISE NOTED

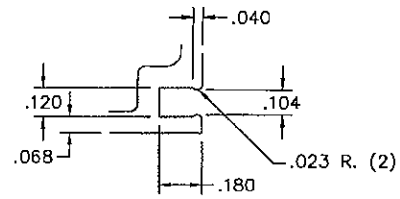
	PRINT REVISIONS		DATE
1	REDRAWN ON CAD	MB	7-30-98

CRM-44

REV.

DELHI	TIFTON	BOTH
☒	☐	☐





DETAIL "A"
2 x SIZE

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# E06530911 7 E2158

Date 11/6/14 Tech GR

BREAK UNSPECIFIED CORNERS .010 R. .090 TYPICAL WALL UNLESS SPECIFIED OTHERWISE.

ESTIMATED DIE DATA			
INTERNAL USE		6063-T5	
AREA	1.354	WT/FT	1.624
PERIMETER	29.721	CIRCLE SIZE	4 - 5
OUTSIDE PERIMETER	15.421	FACTOR	18
EXPOSED PERIMETER		HOLLOW II	

PRESS SIZE	
LEGEND	
• = .031 R.	
o = .062 R.	
x = .125 R.	
⊗ = .250 R.	
* =	

DIE REVISIONS	DATE

sapa: Sapa Extrusions, Inc.
DELHI, LA 71232

CUSTOMER

CMI ARCHITECTURAL PRODUCTS
2800 FREEWAY BOULEVARD
SUITE 205
MINNEAPOLIS, MN 55430

APPLICATION

F.G. SILL 1/4"

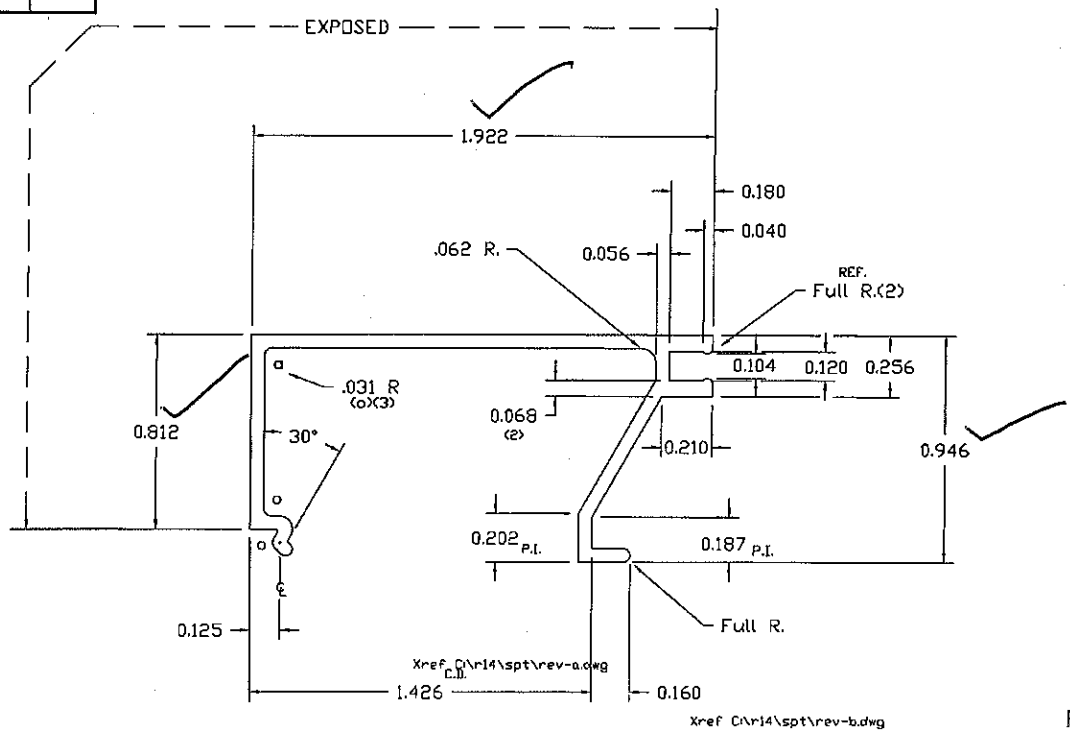
CADD #	CRM-44 350
SCALE	FULL & NOTED
DATE	7-29-98
LAST REVISION	
DRAWN	Michael Bryan
JOB	
CUSTOMER NUMBER	45-018

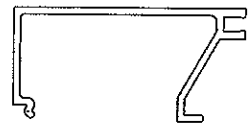
PRINT REVISIONS	DATE

CRM-49 B

REV.

DELHI ☐ TIFTON ☐ BOTH ☐





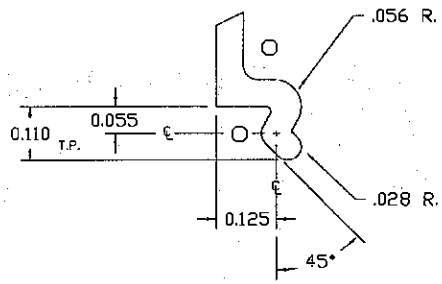
ACTUAL SIZE

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# E0653 D9117 E2158

Date 11/6/14 Tech GR



DETAIL

4 x Size

BREAK UNSPECIFIED CORNERS .010 R. .056 TYPICAL WALL UNLESS SPECIFIED OTHERWISE.

ESTIMATED DIE DATA			
INTERNAL USE	6063-T5		
AREA	.243	WT/FT	.291
PERIMETER	8.478	CIRCLE SIZE	2-3
OUTSIDE PERIMETER		FACTOR	29
EXPOSED PERIMETER	2.734		

PRESS SIZE

LEGEND
• = .031 R.
○ = .062 R.
× = .125 R.
⊗ = .250 R.
* =

DIE REVISIONS		DATE
A	RE-DESIGNED	1-5-88
B	SHORTENED LEG	2-13-89

sapa: Sapa Extrusions, Inc.
DELHI, LA 71232

CUSTOMER
CRONSTROMS
MINNEAPOLIS, MN

APPLICATION
SILL STOP 1/4" TO 1"

CADD #

SCALE 2 x & Noted

DATE 10-31-88

LAST REVISION

DRAWN J. ALBEREZ

JOB

CUSTOMER NUMBER 45-026