



AAMA/WDMA/CSA 101/I.S.2/A440-17
Performance Test Report

Rendered To:
FreMarq Innovations, Inc.

Report No.:
QCT19-5237.02

Product/Series:
Zero-Sightline Vent Mockup

Test Date(s):
January 29, 2019 through February 22, 2019

Report Date:
May 24, 2019

MANUFACTURER: FreMarq Innovations, Inc.
8300 Highland Drive
Wausau, WI 54401

SERIES/MODEL: Zero-Sightline Vent Mockup
PRODUCT TYPE: Awning Window

Summary of Results	
Test Procedure/Standard	Details
AAMA/WDMA/CSA 101/I.S.2/A440-17	Class AW - PG90: Size Tested 1661 x 1051 mm (~65 x 41 in) - Type AP
Operating Force (ASTM E2068-00)	See Results, PASS
Air Infiltration Resistance (ASTM E283-04)	0.03 L/s/m ² (0.006 cfm/ft ²) @ 300 Pa (6.27 psf), PASS
Air Exfiltration Resistance (ASTM E283-04)	0.03 L/s/m ² (0.006 cfm/ft ²) @ 75 Pa (1.57 psf), PASS
Water Penetration Resistance (ASTM E547-00)	No Penetration @ 720 Pa (15.03 psf), PASS
Water Penetration Resistance (ASTM E331-00)	No Penetration @ 720 Pa (15.03 psf), PASS
Hardware Cycling	2000 Cycles, PASS
Vent Cycling	2000 Cycles, PASS
Misuse Testing: Balance Arm Load Test	No Damage, PASS
Misuse Testing: Vent Lateral Racking Test	No Damage, PASS
Hardware Cycling	2000 Cycles, PASS
Vent Cycling	2000 Cycles, PASS
Operating Force (ASTM E2068-00)	See Results, PASS
Thermal Cycling (AAMA 501.5-07, AAMA 910-16)	0 - 180°F, 6 Cycles, PASS
Uniform Load Deflection (ASTM E330M-14)	+4320 Pa (90.2 psf) / -4320 Pa (90.2 psf), PASS
Air Infiltration Resistance (ASTM E283-04)	0.00 L/s/m ² (0.000 cfm/ft ²) @ 300 Pa (6.27 psf), PASS
Air Exfiltration Resistance (ASTM E283-04)	0.00 L/s/m ² (0.000 cfm/ft ²) @ 75 Pa (1.57 psf), PASS
Water Penetration Resistance (ASTM E547-00)	No Penetration @ 720 Pa (15.03 psf), PASS
Water Penetration Resistance (ASTM E331-00)	No Penetration @ 720 Pa (15.03 psf), PASS
Uniform Load Structural (ASTM E330M-14)	+6480 Pa (135.3 psf) / -6480 Pa (135.3 psf), PASS
Forced Entry Resistance (ASTM F588-17)	Grade 10, Assembly Type B, PASS
Sash/Leaf Torsion (NAFS 7.3.4.2)	See Results, PASS
Concentrated Load on Latch Rail (NAFS 9.3.6.4.3)	See Results, PASS

Reference must be made to Report No. QCT19-5237.02, dated 05/24/2019 for complete specimen description and data.



Project Summary:

Quast Consulting and Testing, Inc. was contracted by FreMarq Innovations, Inc. to perform AAMA/WDMA/CSA 101/I.S.2/A440-17 testing on a Zero-Sightline Vent Mockup. The specimen was supplied by FreMarq Innovations, Inc. and was tested at Quast Consulting and Testing laboratory located in Mosinee, WI. The specimen met the performance requirements set forth in the referenced test procedures. Test specimen description and results are reported herein.

Test Procedure:

Testing was conducted in accordance with:

AAMA/WDMA/CSA 101/I.S.2/A440-17	<i>North American Fenestration Standard/Specification for Windows, Doors and Skylights</i>
ASTM E283-04 (2012)	<i>Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen</i>
ASTM E330M-14	<i>Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference</i>
ASTM E331-00 (2009)	<i>Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference</i>
ASTM E547-00 (2009)	<i>Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference</i>
ASTM F588-17	<i>Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact</i>
ASTM E2068-00 (2008)	<i>Test Method for Determination of Operating Force of Sliding Windows and Doors</i>
AAMA 501.5-07	<i>Test Method for Thermal Cycling of Exterior Walls</i>
AAMA 910-16	<i>Voluntary 'Life Cycle' Specification and Test Methods for AW Class Architectural Windows and Doors</i>

NAFS Primary Designator:

AAMA/WDMA/CSA 101/I.S.2/A440-17

Class AW - PG90: Size Tested 1661 x 1051 mm
 (~65 x 41 in) - Type AP

Test Specimen Description:

Series/Model:	Zero-Sightline Vent Mockup
Product Type:	Awning Window
Overall Size:	1661 mm (65.38 in) wide x 1051 mm (41.38 in) high
Overall Area:	1.74 m ² (18.78 ft ²)
Curtainwall Frame:	1661 mm (65.38 in) wide x 1051 mm (41.38 in) high
Awning Frame:	1524 mm (60.00 in) wide x 914 mm (36.00 in) high
Awning Sash:	1499 mm (59.00 in) wide x 889 mm (35.00 in) high

Curtainwall Frame Construction:

The curtainwall frame members were composed of extruded aluminum and fiberglass attached using #14 x 3/4" HWH SMS spaced 16" on center. The fastener heads were sealed with silicone. The aluminum was attached using square cut corner joinery and #14 x 2" HWH TEX framing fasteners. A PVC caulk backer was snapped on at the outside perimeter.

Awning Frame Construction:

The awning frame members were composed of extruded aluminum and fiberglass snap-fit together. The aluminum was attached using mitered corner joinery and aluminum corner keys. The fiberglass was attached using square-cut corner joinery and one #8 x 1-1/2" PH PAN HD SMS per corner. The fasteners and inside corners were sealed with silicone. An aluminum cap was snapped on at the exterior of the frame. The awning frame was set into the curtainwall frame from the exterior against 60 Durometer EPDM gasket and secured using a pressure plate with 60 Durometer EPDM gasket and #14 x 1" HWH SMS Type A fasteners spaced 9" on center. The interior of the jambs were attached to the curtainwall using #10 x 1-3/4" PH PAN HD SMS spaced 18" on center.

Awning Sash Construction:

The awning frame was composed of extruded aluminum and fiberglass snap-fit together. The aluminum and fiberglass were attached using mitered corner joinery and aluminum corner keys. An aluminum weatherstrip receiver was snapped on at the exterior of the frame.



Glazing:

The specimen was glazed with a 1-1/8" insulated glass unit comprising 1/4" clear tempered, 5/8" aluminum spacer, 1/4" clear tempered. The glass was structurally glazed with a continuous Dow 983 silicone joint. The glass was set on 5/16" x 1-1/8" x 4" 85-durometer silicone setting blocks with a 7/8" glass bite.

Reinforcement: None

Weatherstripping:

<u>Type</u>	<u>Quantity</u>	<u>Location</u>
70-Durometer EPDM Bulb Gasket	Perim	Interior sash perimeter
70-Durometer EPDM Bulb Gasket	Perim	Mid-depth frame perimeter
70-Durometer EPDM Sweep Gasket	Perim	Exterior sash perimeter

Hardware:

<u>Type</u>	<u>Quantity</u>	<u>Location</u>
Gea Handle	1	Sash, center of bottom rail
Melron Locking Lug	6	Sash bottom rail, 16" from jambs. Sash stiles, 6-1/2" and 19" from sill
Melron Anti-Theft Keeper	2	Sill, 16" from jambs
Melron Keeper	4	Sash stiles, 6-1/2" and 19" from sill
Melron Corner Drive	2	Bottom sash corner
24" 4-Bar Hinge	2	Top of sash stiles
Snubbers	2	Top rail/frame head, 19" from jambs

Drainage: None

Installation:

The specimen was installed into a 2" x 8" x 1/4" HSS with a 7/8" perimeter joint. The specimen was anchored using 5" wide 6063 T6 aluminum installation anchors captured by the frame and attached to the buck using 1/4-20 self drilling hex head screws. The anchors were located at head and sill, 5" from curtainwall frame ends.



Test Results:

<u>NAFS §</u>	<u>Title of Test</u>	<u>Results</u>	<u>Allowed</u>
9.3.1	Operational Force Test Per ASTM E2068-00 (2008)		
	Awning	PASS	
	Breakaway Force	81 N (18.2 lbf)	155 N (34.85 lbf)
	Open Operating Force	46 N (10.3 lbf)	135 N (30.35 lbf)
	Closing Operating Force	61 N (13.7 lbf)	135 N (30.35 lbf)
	Handle	PASS	
	Open Operating Force	37 N (8.3 lbf)	Reported
	Closing Operating Force	72 N (16.1 lbf)	Reported
9.3.2.1	Air Infiltration/Exfiltration per ASTM E283-04 (2012)		
	Infiltration	PASS	
	300 Pa	0.03 L/s/m ²	0.51 L/s/m ²
	(6.27 psf)	0.006 cfm/ft ²	0.100 cfm/ft ²
	Exfiltration	PASS	
	75 Pa	0.03 L/s/m ²	0.51 L/s/m ²
	(1.57 psf)	0.006 cfm/ft ²	0.100 cfm/ft ²
9.3.3	Water Penetration Resistance per ASTM E547-00 (2009)		
	Water applied at a rate not less than 5 gallons per square foot per hour		
	Temperature: 58.1 °F (14.5 °C)		
	Specimen #1	PASS	
	720 Pa (15.03 psf)	No Penetration	No Penetration
9.3.3	Water Penetration Resistance per ASTM E331-00 (2009)		
	Water applied at a rate not less than 5 gallons per square foot per hour		
	Temperature: 58.1 °F (14.5 °C)		
	Specimen #1	PASS	
	720 Pa (15.03 psf)	No Penetration	No Penetration



5.3.6.9 Life Cycle Testing per AAMA 910-16

2.1.4 Vent Cycling **PASS**
 2000 Cycles Lubrication applied every 500 cycles
 See Appendix B

2.1.5 Locking Hardware Cycling **PASS**
 2000 Cycles Lubrication applied every 500 cycles
 See Appendix B

2.1.7 Misuse Testing **PASS**
 Balance Arm Load Test No damage No damage
 Vent Lateral Racking Test No damage No damage

2.1.8 Vent Cycling **PASS**
 2000 Cycles Lubrication applied every 500 cycles
 See Appendix B

2.1.9 Locking Hardware Cycling **PASS**
 2000 Cycles Lubrication applied every 500 cycles
 See Appendix B

9.3.1 Operational Force Test Per ASTM E2068-00

Awning **PASS**
 Breakaway Force 72 N (16.1 lbf) 155 N (34.85 lbf)
 Open Operating Force 23 N (5.1 lbf) 135 N (30.35 lbf)
 Closing Operating Force 75 N (16.9 lbf) 135 N (30.35 lbf)

Handle **FAIL**
 Open Operating Force 32 N (7.2 lbf) 22 N (5 lbf)
 Closing Operating Force 61 N (13.8 lbf) 22 N (5 lbf)

2.1.10.1 Thermal Cycling per AAMA 501.5-07, AAMA 910-16

Specimen #1 **PASS**
 0°F - 180°F Exterior Air Temp No Observable No Observable
 6 Cycles Damage Damage



9.3.4.2 Uniform Load Deflection per ASTM E330M-14

Temperature: 58 °F (14.4 °C)

2-mil plastic film was used to prevent air leakage during testing. It is the opinion of the test technician that this film did not influence the results of the test

Specimen #1

Positive Load: 4320 Pa (90.2 psf)

Negative Load: 4320 Pa (90.2 psf)

Sash Rail, Between Locks

PASS

Span (L):	711 mm (28 in)	L/175
Positive Deflection:	0.5 mm (0.02 in)	4.1 mm (0.16 in)
Negative Deflection:	0.5 mm (0.02 in)	4.1 mm (0.16 in)

9.3.2.1 Air Infiltration/Exfiltration per ASTM E283-04 (2012)

Infiltration

PASS

300 Pa	0.00 L/s/m ²	0.51 L/s/m ²
(6.27 psf)	0.000 cfm/ft ²	0.100 cfm/ft ²

Exfiltration

PASS

75 Pa	0.00 L/s/m ²	0.51 L/s/m ²
(1.57 psf)	0.000 cfm/ft ²	0.100 cfm/ft ²

The tested specimen meets or exceeds the performance levels specified in AAMA/WDMA/CSA 101/I.S.2/A440 for air leakage resistance

9.3.3 Water Penetration Resistance per ASTM E547-00 (2009)

Water applied at a rate not less than 5 gallons per square foot per hour

Temperature: 59 °F (15 °C)

Specimen #1

PASS

720 Pa (15.03 psf)	No Penetration	No Penetration
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9.3.3 Water Penetration Resistance per ASTM E331-00 (2009)

Water applied at a rate not less than 5 gallons per square foot per hour

Temperature: 59 °F (15 °C)

Specimen #1	PASS	
720 Pa (15.03 psf)	No Penetration	No Penetration

9.3.4.3 Uniform Load Structural per ASTM E330M-14

Temperature: 72 °F (22.2 °C)

2-mil plastic film was used to prevent air leakage during testing. It is the opinion of the test technician that this film did not influence the results of the test

Specimen #1	
Positive Load:	6480 Pa (135.3 psf)
Negative Load:	6480 Pa (135.3 psf)

Sash Rail, Between Locks	PASS	
Span (L):	711 mm (28 in)	.2%*L
Positive Permanent Set:	0.0 mm (0.00 in)	1.5 mm (0.06 in)
Negative Permanent Set:	0.3 mm (0.01 in)	1.5 mm (0.06 in)

9.3.2.1 Forced Entry Resistance Per ASTM F588-17

Specimen #1	PASS	
Grade: 10 Assembly Type: B		
T1 = 5 min, L1 = 667 N (150 lbf)		
L2 = 333 N (75 lbf), L3 = 111 N (25 lbf)		

Disassembly Test	No Entry	No Entry
Concentrated Load Tests	No Entry/Damage	No Entry/Damage
Lock/Hardware Manipulation	No Entry	No Entry
Sash Manipulation	No Entry	No Entry



7.3.4.2 Sash Leaf Torsion Test

Specimen #1	PASS	
Test Load	70 N (15.74 lbf)	
Specimen Area: A (B)	1.3 m ² (14.34 ft ²)	33.3*A mm (0.12*B in)
Deflection	11.2 mm (0.44 in)	43.3 mm (1.70 in)

9.3.6.4.3 Sash Concentrated Load Test on Latch Rail

Specimen #1	PASS	
Normal-to-Sash Test Load	135 N (30.35 lbf)	
Deflection Toward Exterior	1.0 mm (0.04 in)	1.5 mm (0.06 in)
Deflection Toward Interior	1.0 mm (0.04 in)	1.5 mm (0.06 in)
In-plane Test Load	135 N (30.35 lbf)	
Deflection Toward Sash	0.0 mm (0.00 in)	1.5 mm (0.06 in)
Deflection Away from Sash	0.0 mm (0.00 in)	1.5 mm (0.06 in)



Drawing Reference: The test specimen drawings have been reviewed by Quast Consulting and Testing, Inc. for general compliance with the test specimen reported herein.

List of Official Observers:

Name:

Brian Sasman
Arlen Fisher
Kelly Marlow
Jeff Beyer
Ben Knospe

Company:

Quast Consulting and Testing, Inc.
Quast Consulting and Testing, Inc.
Quast Consulting and Testing, Inc.
FreMarq Innovations, Inc.
FreMarq Innovations, Inc.

Detailed drawings, data sheets, representative samples of test specimens, a copy of this report, or other pertinent project documentation will be retained by Quast Consulting and Testing, Inc. for a period of four years from the original test date. At the end of this retention period, such material shall be discarded without notice and the service life of this report will expire.

Results obtained are tested values and were secured by using the designated test methods. No conclusions of any kind regarding the adequacy or inadequacy of the glass in the test specimen can be made. 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 Quast Consulting and Testing, Inc.

QUAST CONSULTING & TESTING, INC.

QUAST CONSULTING & TESTING, INC.

Arlen Fisher
Project Manager

Brian M. Sasman, PE
Reviewer

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

Appendix A: As-Built Drawings (4 Pages)

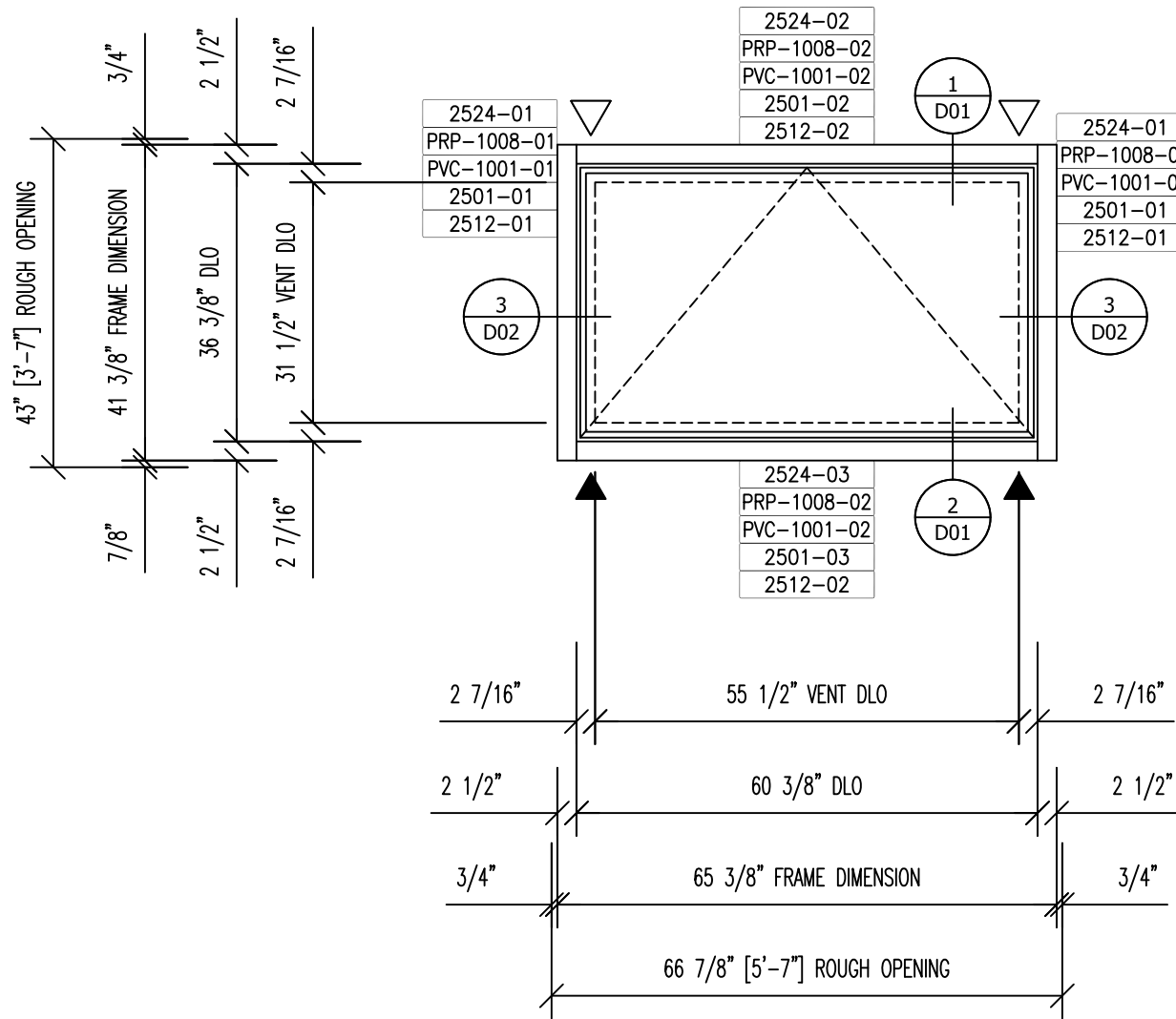
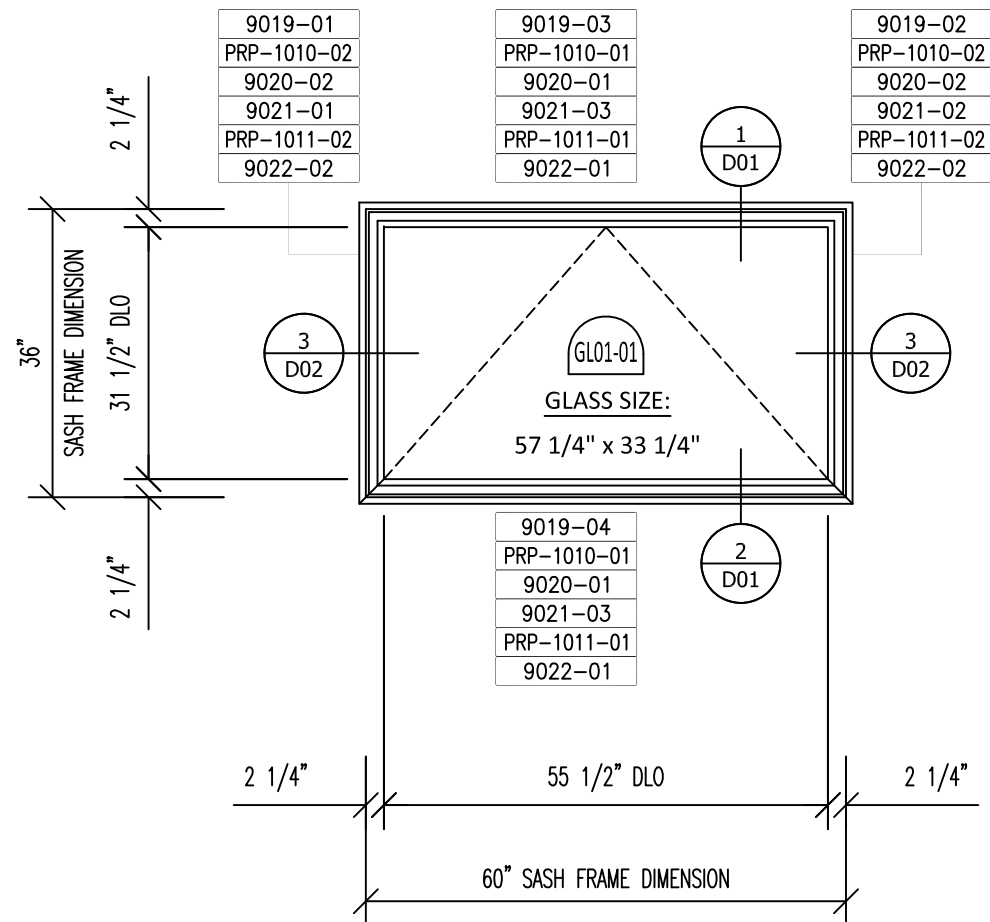
Appendix B: Maintenance Manual (2 Pages)

PERFORMANCE REQUIREMENT

VT-1 **1 REQUIRED**
 PERFORMANCE MOCK-UP
 FINISH: ANY FINISH

WATER: 15#
AIR: 6.24
STRUCTURAL: 50 PSF

1 **1 REQUIRED**
 PERFORMANCE MOCK-UP
 FINISH: ANY FINISH



GLASS DESCRIPTION	
MARK	DESCRIPTION
GL01-01	1 1/8" OA IG UNIT 1/4" CLEAR TEMPERED GLASS 5/8" ALUMINUM AIR SPACER 1/4" CLEAR TEMPERED GLASS GLASS AND GLAZING SUPPLIED BY FERMARQ INNOVATIONS, INC.



Drawings reviewed for general compliance with tested specimen

Project #: **QCT19-5237**
 Date: **02/12/2019**
 Reviewer: **Arlen Fisher**

SHOP NOTE:
 FRAMING TOLERANCES ARE AS FOLLOWS:
 - DLO's = +/- .030" (1/32")
 - FRAME SQUARE = +/- 1/16"

ADJUST FRAME MEMBERS IF NEEDED TO BRING FRAMES WITHIN TOLERANCE. FRAME ARE NOT ALLOWED TO BE TRANSFERRED TO NEXT STAGE UNTIL ALL DIMENSIONS HAVE BEEN VERIFIED AND SIGNED OFF ON.

PROJECT NAME:
 LOCATION:
 ARCHITECT:
 CUSTOMER:
 REPRESENTATIVE:

PHONE (715) 848-0848
 800 Highland Drive
 WAUSAU, WI 54981

General Notes:
 1. Contractor to verify all dimensions in the field. All framing will be manufactured to the dimensions indicated unless otherwise noted.
 2. Drawings marked "approved" or "approved as noted" shall be interpreted as an accurate condition of job requirements and such approval shall release to fabrication.
 3. Framing shall not be responsible for any errors and/or work that occurs from the use of these drawings by other trades.

Job **VENT MOCK-UP**

CUST. ORDER NO.
 SHEET NAME
SHOP ELEVATION
PERFORMANCE MOCK-UP

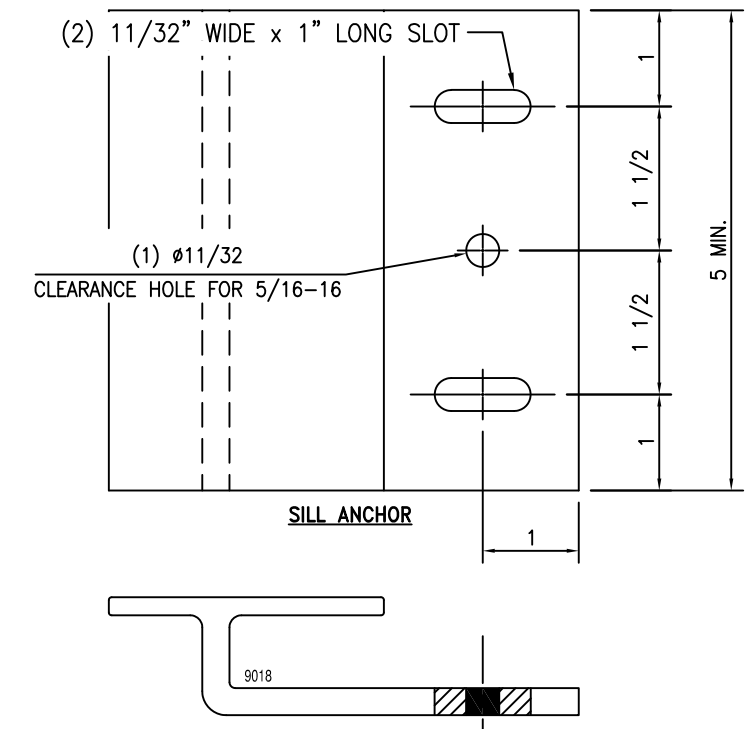
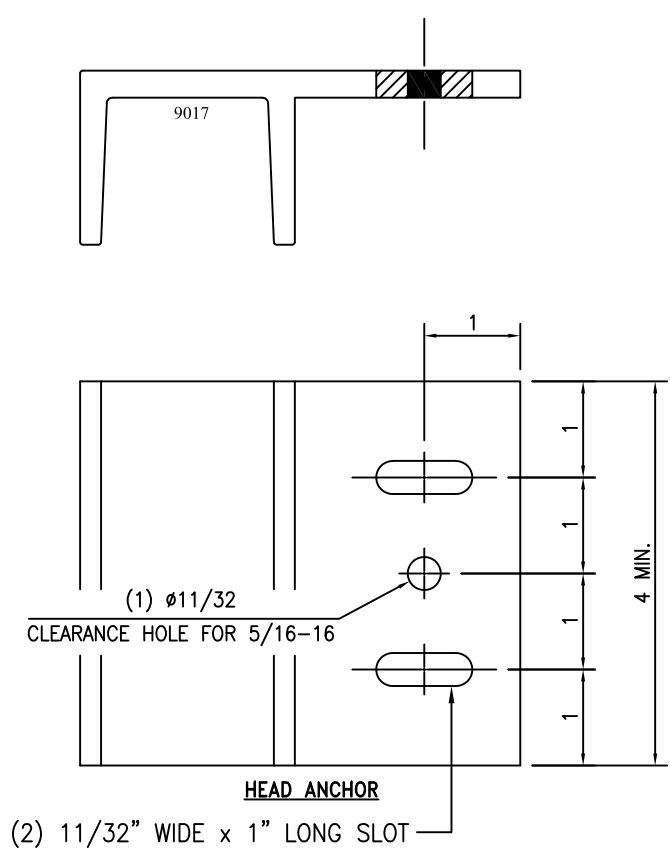
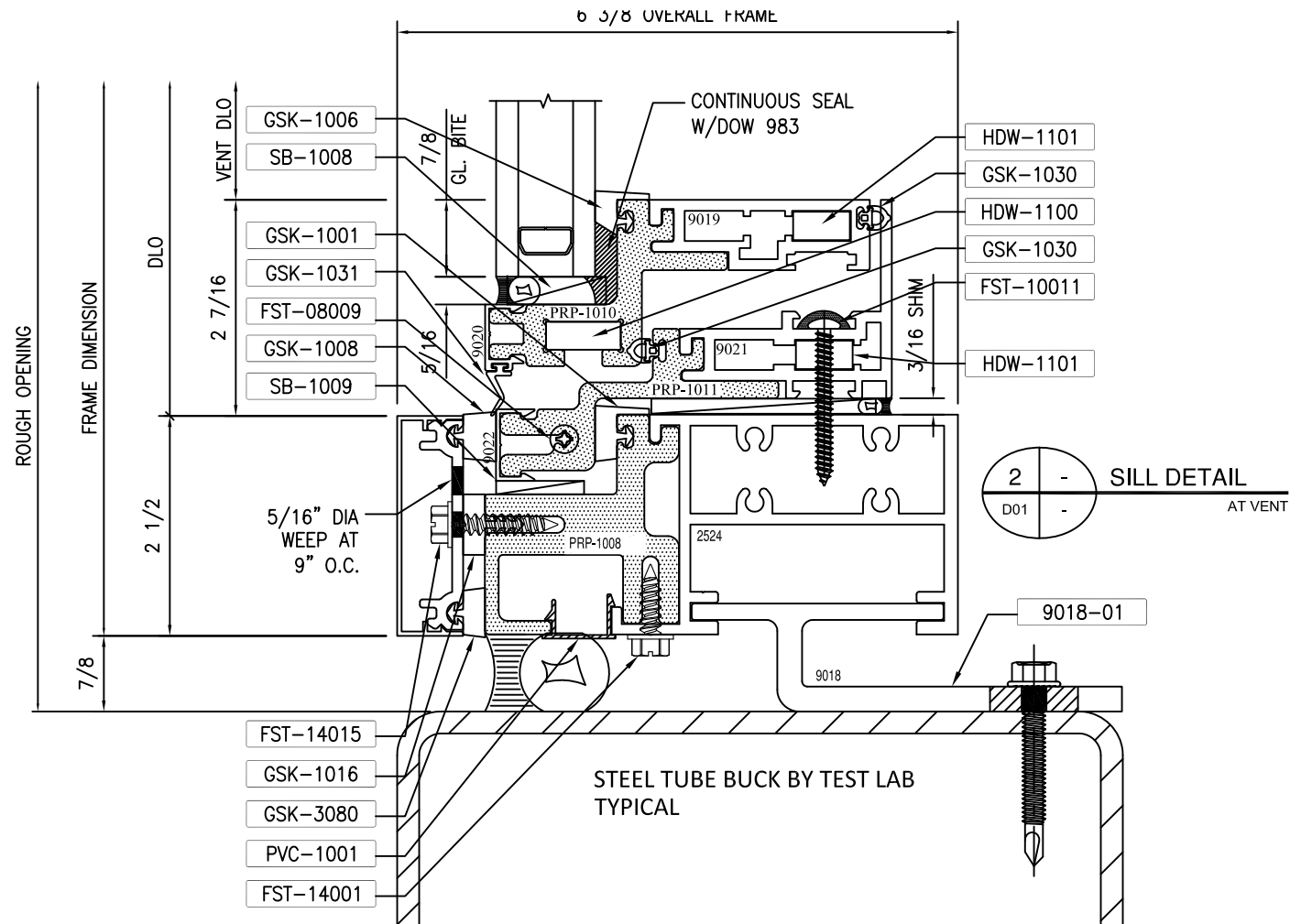
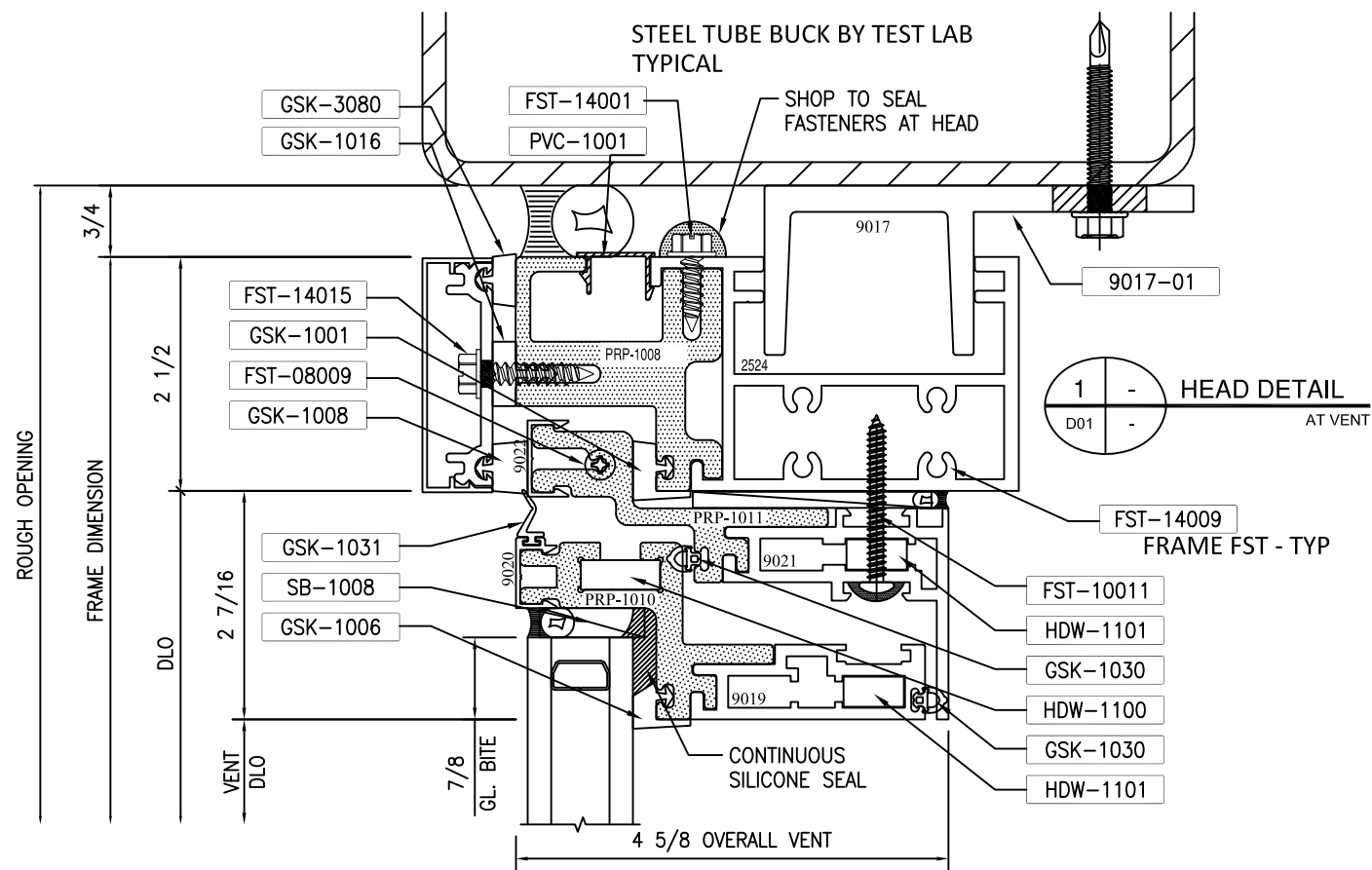
SCALE
 1/2" = 1'-0"

DATE
 12/13/18

DRAWN BY
 Ed Gerl

SHEET NO.
SE01

DATE
 REV. NO.
 SUBMITTAL/REVISION DESCRIPTIONS



TRIM TAGS KEY	
9017-01	HEAD ANCHOR 6063-T6 4" WIDE LOCATION: 1 CLIP PER VERTICAL 1 CLIP AT JAMBS
9018-01	SILL ANCHOR 6063-T6 5" WIDE LOCATION: 1 CLIP PER VERTICAL 1 CLIP AT JAMBS
FST-08009	#8 x 1 1/2" PH PAN HD SMS 4 PER VENT (1 AT EACH CORNER)
FST-10011	#10 x 1 3/4" PH PAN HD SMS AT JAMBS ONLY @ 18" O.C. MAX
FST-14001	#14 x 3/4" HWH SMS AT 16" O.C. MAX
FST-14009	#14 x 2" HWH TEX FRAMING FASTENER
FST-14015	#14 x 1" HWH SMS TYPE A AT 9" O.C. PRESSURE PLATE
GSK-1001	INTERIOR GLAZING SPACER 60 DUROMETER EPDM [LN. FT.]
GSK-1006	70 DUROMETER SILICONE GASKET [LN. FT.]
GSK-1008	EXTERIOR GLAZING GASKET 60 DUROMETER EPDM GASKET
GSK-1016	STEM ISOLATOR 70 DUROMETER EPDM GASKET
GSK-1030	WEATHER STRIP 70 DUROMETER EPDM
GSK-1031	PERIMETER SWEEP GASKET 70 DUROMETER EPDM
GSK-3080	EXTERIOR GLAZING SPACER 60 DUROMETER EPDM GASKET
SB-1008	5/16" x 1 1/8" x 4" 85 DUROMETER BLACK SILICONE SETTING BLOCK (2) PER LITE
SB-1009	1/8" x 1" x 4" BLACK SILICONE SETTING BLOCK (2) PER LITE
PVC-1001	CAULK BACKER
HDW-1101	FRAME CORNER KEY AND SASH CORNER KEY 1
HDW-1100	SASH CORNER KEY 2

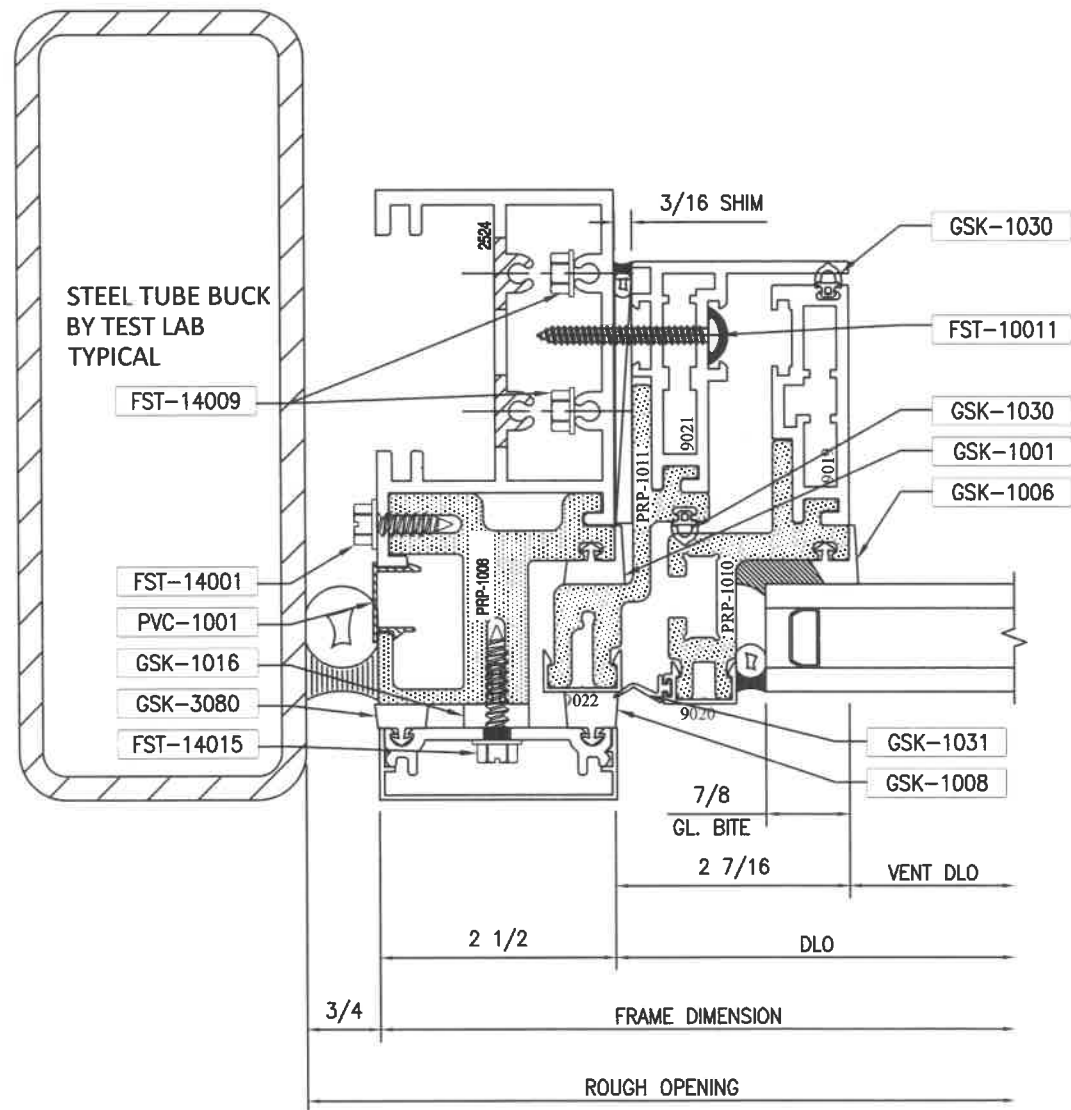


Drawings reviewed for general compliance with tested specimen

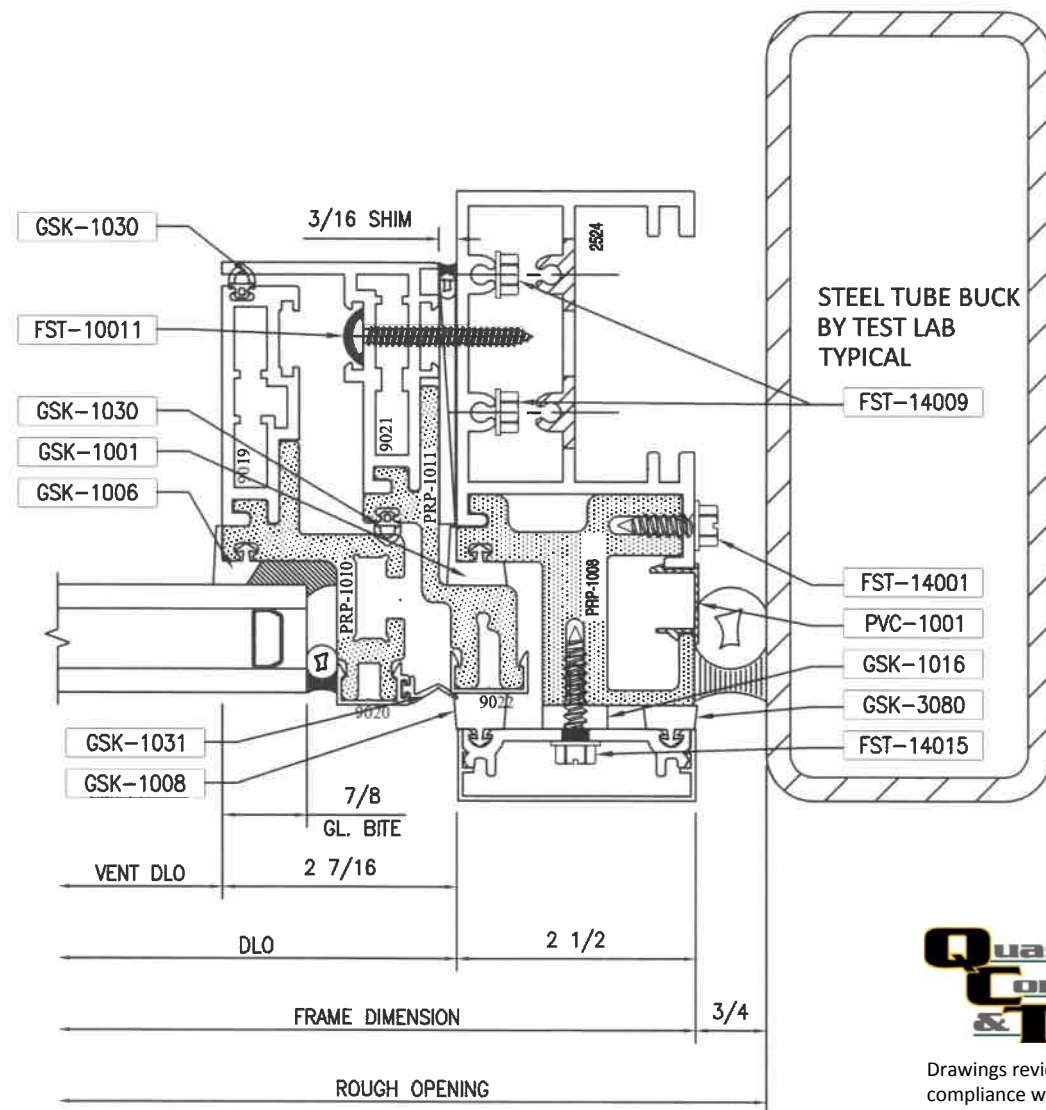
Project #: **QCT19-5237**
Date: **02/12/2019**
Reviewer: **Arlen Fisher**

PROJECT NAME:		DRAWN:	
LOCATION:		DATE:	
ARCHITECT:		SUBMITAL/REVISION DESCRIPTIONS:	
CUSTOMER:		REV. NO.:	
REPRESENTATIVE:		DATE:	
<p>FreMarq Innovations, Inc 3500 Highland Drive WAUSAU, WI 54981 PHONE (715) 845-0843</p>			
<p>General Notes: 1. Contractor to verify all dimensions in the field. All framing will be manufactured to the dimensions indicated unless otherwise noted. Contractor to contact documents and if required provide correct details and/or dimensions to ensure proper coordination. 2. Drawings marked "approved" or "approved as noted" shall be interpreted as an accurate condition of job requirements and such approved shall authorize release to fabrication. 3. Fabricator shall not be responsible for any errors and/or work that occurs from the use of these drawings by other trades.</p>			
JOB		CUST. ORDER NO.	
CUST. ORDER NO.		SHEET NAME	
PERFORMANCE MOCK-UP		DETAILS	
SCALE	HALF	DATE	2/13/18
DRAWN BY	Ed Gerl	SHEET NO.	D01

TRIM TAGS KEY		
9017-01	HEAD ANCHOR 6063-T6 4" WIDE LOCATION: 1 CLIP PER VERTICAL 1 CLIP AT JAMBS	
9018-01	SILL ANCHOR 6063-T6 5" WIDE LOCATION: 1 CLIP PER VERTICAL 1 CLIP AT JAMBS	
UIF FST-08009	#8 x 1 1/2" PH PAN HD SMS 4 PER VENT (1 AT EACH CORNER)	UIF GSK-1001
UIF FST-10011	#10 x 1 3/4" PH PAN HD SMS AT JAMBS ONLY @ 18" O.C. MAX	UIF GSK-1006
UIF FST-14001	#14 x 3/4" HWH SMS AT 16" O.C. MAX	UIF GSK-1008
UIF FST-14009	#14 x 2" HWH TEX FRAMING FASTENER	UIF GSK-1016
UIF FST-14015	#14 x 1" HWH SMS TYPE A AT 9" O.C. PRESSURE PLATE	UIF GSK-1030
		UIF GSK-1031
		UIF GSK-3080
		UIF SB-1008
		UIF SB-1009
		UIF PVC-1001
		UIF HDW-1101
		UIF HDW-1100



3 - LEFT JAMB DETAIL
D02 - AT VENT



4 - RIGHT JAMB DETAIL
D02 - AT VENT



Drawings reviewed for general compliance with tested specimen

Project #: QCT19-5237
Date: 02/12/2019
Reviewer: Arlen Fisher

PROJECT NAME:	PHOENIX (718) 848-0848
LOCATION:	
ARCHITECT:	
CUSTOMER:	
REPRESENTATIVE:	
JOB:	MOCK-UP
CUST. ORDER NO.	
SHEET NAME:	PERFORMANCE MOCK-UP DETAILS
SCALE:	HALF
DATE:	2/19/18
DRAWN BY:	Ed Gerl
SHEET NO.:	D02

Cleaning & Maintenance

Due to the wide range of environments our hardware is used in, some cleaning may be required. Wind-blown dust and dirt can cause the windows to be more difficult to operate, as well as cause the hardware to wear or corrode faster. Routine maintenance and inspection of hardware is even more critical in coastal areas and some industrial areas, as these harsh environments can have detrimental effects on window hardware.

We recommend the hardware be inspected once a year (more if necessary) and cleared of dirt and grime build up. Particular attention should be given to cleaning dirt from slides in window hinges and from the track hardware bars slide.

Clean water should be used when possible to flush the hardware clean. A mild (hand wash) dish soap and water mixture can be used to loosen stubborn dirt. Always rinse the hardware with clean water. Allow the hardware to dry completely before lubricating.

Cleaners to Avoid

DO NOT USE THE FOLLOWING:

- Vinegar Based Cleaners
- Citrus Based Cleaners (Lemon, etc.)
- Chlorine Based Cleaners
- Industrial Strength Cleaners
- Abrasive Cleaners

These types of cleaners will not only remove the lubricants from the hardware, they can also remove the corrosion resistant coatings and harm aluminum finishes.

Warning: Glass cleaners and brick/siding washes, with the above ingredients, must not come in contact with the hardware window finishes for the reasons listed above.

Lubrication

After the hardware is clean and dried it must be lubricated to restore the smooth operation, and in some cases corrosion resistance. There are several commercially available products that can be used. It is recommended that the replacement lubricant be similar to what was removed. (If the gears were coated with grease before you cleaned them, re-lubricate only with grease, not a spray such as WD40, etc.) The following list of products will help you know where each should be used.

Lithium Grease: Use on all gear drives; such as operators and locks. Best choice due to waterproofness.

WD40 or CD2: Use on all sliding or rotating joints; such as rollers, pivots, brackets, hinges and chains. Attaching a tube to the nozzle will help concentrate the spray and direct it to the appropriate spot. These lubricants won't last as long as oil.

Automotive Grease or Petroleum Jelly: Will work in same areas as White Grease. It is not as waterproof, and it will attract dust. Be careful when applying grease since it will stain any wood it contacts.



Light Oil such as 3 in 1 Oil: Can be used on sliding or rotating joints. Care must be used when applying due to possible staining of wood parts.

Graphite: Can be used on sliding and rotating joints. Also works well on cam locks and hinges.

Warning: Avoid the use of silicone-based sprays or lubricants. Silicone can cause some plastic parts to become brittle.

There are many other products which can be used which will give equal results. Care must be used when applying any lubricant to avoid staining and/or damage to window. Since lubricants only work if present, periodic checks should be done to ensure the function of the hardware.