AIA Document G810™ – 2001

Transmittal Letter

PROJECT: Dean Senator Judith Zaffirini Justice Center Building Envelope and Site Rehab
1110 Victoria Street
Laredo, TX 78040

TO: Michael D. Hovar
Raba Kistner, Inc.
1600 N Jackson Road, Suite No. 3
Pharr, TX 78577

FROM: Stoddard Enterprise LLC - Troy Robertson
461 Rodeo Drive
Spring Branch, TX 78070

WE TRANSMIT:	[ ] Attached	[ ] Under separate cover			
VIA:	[ ] Overnight Delivery	[ ] Mail	[X] E-mail		
	[ ] Courier	[ ] Fax	[ ] Other		
FOR:	[X] Approval/Actions	[ ] Information	[ ] Use as requested		
	[ ] Comment	[ ] Distribution	[ ] Other		
THE FOLLOWING:	[ ] Drawings	[ ] Specifications	[ ] Digital Files		
	[X] Submittals	[ ] Other			

NO. OF COPIES	DATE	FORMAT	DESCRIPTION
1	7/29/2025	PDF	Product Data: Alternate Skyligt
			Section: 086200
			Drawings: A7.11
			Buildings Exterior

REMARKS:

Supplier: H&H Skylight Fabricators
13401 Murphy Road, Suite A
Stafford, Tx 77477

Installer: H&H Skylight Fabricators

BY: Troy Robertson

COPIES TO: Raba Kistner, Inc

Reviewed for General Compliance with Contract Documents

STODDARD
General Contractors

h.burge
07/29/2025 11:40:48 AM

SECTION 01 6100

SUBSTITUTION REQUEST FORM

TO: **RABA KISTNER, INC.** DATE: 7.29.2025

PROJECT: **JUSTICE CENTER - BUILDING ENVELOPE AND SITE REHABILITATION PROJECT**

This Proposed Substitution is hereby submitted for consideration for the Specified Product listed below.

Section	Paragraph	Specified Product	
08 6200	2.1 A.	Subject to compliance with Requirements: Pinnacle HU 600: by Wasco	Not Compliant

Proposed Substitution: Apollo Industries HELIOS SERIES: H&H Skylight Fabricators — Compliant

Provide complete technical information on Proposed Substitution, including laboratory tests, if applicable. Include complete information on changes to the Work required for proper installation of proposed Product, including revisions to Contract Documents; effect on other Sections or other Trades. Provide specific information on manufacturer, model, accessories, options, etc.

☒ Information Attached ☒ No Changes Required

Does proposed substitution affect dimensions shown on Contract Drawings in any way?

No

Primary effect(s) on other Trades?

None

Primary difference(s) between Proposed Substitution and Specified Product (if none, state none):

Reference attached Exhibit A - Annotated Specification Section: Detailed Comparison

Location and source for service and parts for Proposed Substitution:

Stafford, TX: H & H Skylight Fabricators

Contract Time will be:

☐ Increased ☐ Decreased ☒ Unchanged

By: _____ Days

Contract Sum will be:

☐ Increased ☒ Decreased ☐ Unchanged

By: $ Change Order 001 dated 7.28.2025 Credit of ($70,738.48) (Amount)

Reason for substitution:

For Cause: Lead Times, Availability, Schedule Impact, Extended Warranties, Specification Requirements

The undersigned Contractor (Design/Builder) has reviewed fully this Proposed Substitution, including its impact on the Work, and certifies it matches or exceeds the performance, durability, appearance, size and other characteristics of the Specified Product. The Contractor (Design/Builder) further agrees to execute all work required to properly install the Proposed Substitution in accordance with the Contract Documents.

SUBMITTED:	APPROVED:	ACCEPTED:
Stoddard General Contractors	**Raba Kistner, Inc.**	**Webb County, Texas**
CONTRACTOR	Architect	OWNER
461 Rodeo Drive	1600 N. Jackson Rd, Suite 3	1110 Victoria Street,
Spring Branch, TX 78070	Pharr, TX 78577	Webb Co., Laredo, Texas, 78040
ADDRESS	ADDRESS	ADDRESS
Lee Herbst	Humberto Rodriguez	
SIGNATURE	SIGNATURE:	SIGNATURE
Lee Herbst - Operations Manager	Humberto Rodriguez, Architect	
PRINTED NAME AND TITLE	PRINTED NAME AND TITLE	PRINTED NAME AND TITLE
7.29.2025	07/30/2025	
DATE	DATE	DATE

EXHIBIT A: SKYLIGHT COMPARISON

Spec Section 08 6200 Requirements	Velux Commercial	Apollo Industries
1.2A - Metal Framed Skylight	Included	Included
1.3B:1 - Deflection at 1/160 of Clear Span	1/175 of Clear Span	1/175 of Clear Span
1.3C - Roof Loads	Customizable Per Project	Customizable Per Project
1.3D - Blast Design (ASTM F 2248)	ASTM E 330	ASTM E 330
1.3E - Blast Mitigation (DoD Standard UFC-4-010-01)	Protocol TAS-201-94	Customizable Per Project
1.3F - Thermal Movement Temp Range (130 deg F)	100 deg F	170 deg F
	Does not meet Specification Requirements	**Exceeds Specification Requirements**
1.3G - Air Infiltration (Minimum Static-Air-Pressure Differential of 6.24lb/Sq. Ft.)	Included	Included
1.3H - Water Penetration (Minimum Differential Static Pressure of 12 lbs./Sq. Ft.)	Included	Included
1.4A-B - Product Data and Shop Drawings	Included	Included
1.4C - Delegated Structural Design	Yes	Yes
1.4D-G	Included	Included
1.5A-C	Included	Included
1.6A - Field Measurements	Included	Included
1.7 - Structural and Water Leakage (5 Years from Date of Substantial Completion)	5 Years from Date of **Shipment**	10 Years from Date of Substantial Completion
	Does not meet Specification Requirements	**Exceeds Specification Requirements**
1.7:1 - Paint Warranty (20 Years from Date of Substantial Completion)	20 Years from Date of **Shipment**	20 Years from Date of Substantial Completion
	Does not meet Specification Requirements	
1.7A - Glass Warranty (5 Years from Date of Substantial Completion)	5 Years from Date of Substantial Completion	10 Years from Date of Substantial Completion
2.1A - Manufacturer Subject to compliance with requirements provide (Pinnacle HU - Velux Group)	Velux Commercial	Apollo Industries
	Non compliant with specification requirem	**Exceeds Specification Requirements**
2.2A-G - Framing Materials	Included	Included
2.3A - Insulating Glass (1-1/16", 5/16" Heat Strengthened, and .030 PVB Interlayer)	1-5/16", 9/16" Heat Strengthened, and .090 SGP Interlayer	1-5/16", 9/16" Heat Strengthened, and .060 Inter
2.3B - Laminated Glass (5/16" Heat Strengthened and .030 PVB Interlayer)	9/16" Heat Strengthened and .090 SGP Inter	9/16" Heat Strengthened and .060 Interlayer
2.3G:3 - Color to be Selected by Owner	Black	Dow 795 Standard Colors
2.4 - Fabrication	Included	Included
2.5 - Aluminum Finish Options	2605 Powder Coat - Color: TBD	Customizable Per Project

DURATIONS

Shop drawings: 4-6 weeks	Shop drawings: 2-3 weeks
Blast Calculations: 4 weeks	Blast Calculations: 3 weeks
Production: 13-15 weeks	Production: 8-10 weeks
Transit: 3-5 days	Transit: 1 Day
Total Duration: 26 weeks	Total Duration: 16 weeks
Kyle Wilson	Jason M. Humble, J.D.
kyle.wilson@texfeninc.com	jhumble@hhskylights.com
310.766.3002	832.672.3919

Per Specification Section 08 6200 Paragraph 2..1A Subject to compliance with requirements, Pinnacle HU 600 by Wasco

1) Pinnacle HU 600 does not meet specified Thermal Movement Temperature Range.
HELIOS Series exceeds specified Thermal Moisture Temperature Range.

2) Pinnacle HU does not meet specified Warrany Requirements.
HELIOS Series exceeds specified Warranty Requirements.

3) Pinnacle HU lead times does not meet schedule requirements.
HELIOS Series does meet schedule requirements.

SUBMITTALS

SECTION 08 62 00
METAL FRAMED SKYLIGHTS

PROJECT:
Webb County Justice Center
Rehabilitation Project

H&H
SKYLIGHT FABRICATORS

Architect:
Raba Kistner Inc.

Purchaser:
Webb County

Location:
1110 Victoria St Laredo, TX 78040

TABLE OF CONTENTS:

COMPANY INFORMATION

CONTACTS

Jason M. Humble, J.D.

Founder and CEO

Cell: 281-386-9454

jhumble@hhskylights.com

Garry Humble

Founder and President

Cell: 832-672-3919

ghumble@hhskylights.com

Geoff Blanchard

Commercial Sales

Cell: 832-672-3919

gblanchard@hhskylights.com

Business Information

EIN: 81-1495299

DUNS: 07-146-5755

Year Established : 1982

NAICS CODES: 238160

Business Certifications:

HUB – State of Texas

SBE/MBE – City of Houston

Major Clients:

Simon Properties

Turner Construction

Ridgemont

Tellepson

Hill and Wilkinson

Marton Roofing Industries

Houston Baptist University

Fort Bend ISD

Jones Lang LaSalle

Boxer Properties

Tarantino Properties

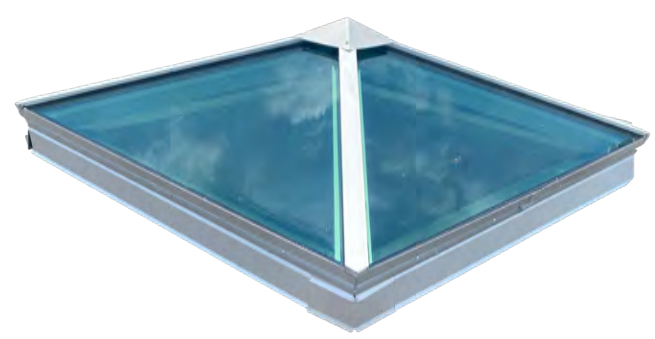
CAPABILITIES STATEMENT

BACKGROUND & CAPABILITIES

H & H Skylight Fabricators, LLC is growing company with decades of experience in skylights and glazing structures. Our management team of Jason Humble and Garry Humble combine for over 50 years of experience in the industry. We manufacture, design, repair, and install skylights across Texas and the surrounding region.

We handle all aspects of the project from start to finish. By not subcontracting our work out, we are able to ensure a higher level of quality while keeping our prices competitive. We are a local company, headquartered in Stafford, Texas.

Our clients' projects have included everything from large general contractors, K-12, Higher Education, Property Management companies, roofing contractors, roof consultants, architects, and individual building owners.

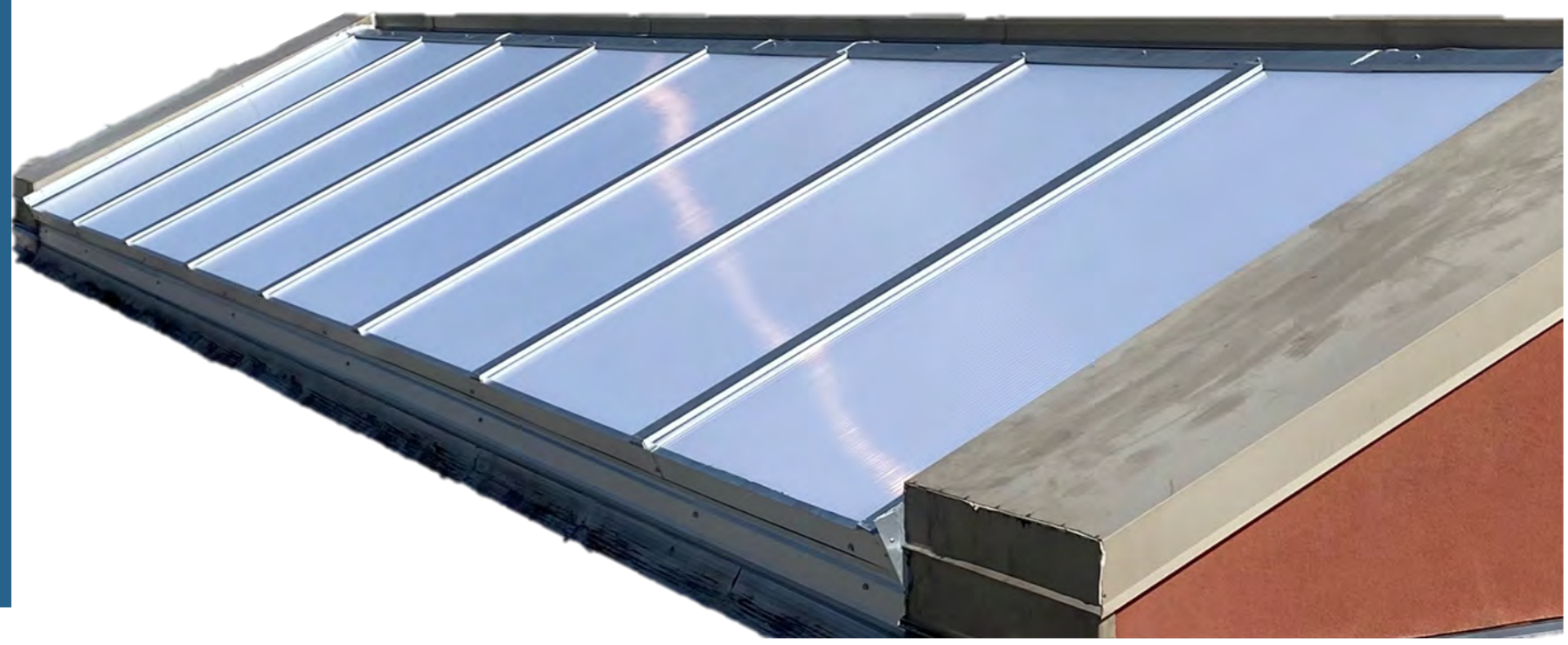


GLAZING SYSTEMS

- UNIT SKYLIGHTS
- METAL FRAMED SKYLIGHTS
- HURRICANE RATED SYSTEMS
- CANOPIES AND AWNINGS

GLAZING MATERIALS

- INSULATING LAMINATE GLASS
- STRUCTURAL ACRYLIC
- POLYCARBONATE MULTIWALL
- FIBERGLASS SANDWICH PANELS



13401 Murphy Road, Suite A Stafford, Texas 77477

Office: 832-672-3919 www.hhskylights.com

08 62 00

METAL FRAMED SKYLIGHTS

- **AIR, WATER, STRUCTURAL (501.1) TEST REPORTS, SHOPS**

CONSTRUCTION CONSULTING LABORATORY

Testing Methods and Standards AAMA 501-15 Test Report

Product/Type: Aluminum Curb Mounted Glass Glazed Skylight
Series Model: Apollo Industries Helios Skylight

Report: CCL 22-087

Test Completion: May 16, 2022

Apollo Industries Series Helios Metal Framed Skylight was shop constructed and glazed by Apollo Industries and installed by Lab staff at Construction Consulting laboratory (**CCL**) in Carrollton, Texas. The specimen was tested in accordance with the AAMA 501-15 'Methods of Test for Exterior Walls and achieved the results noted in the table below.

Product Type	Aluminum Helios Skylight/ Sloped Glazed Unit, **Product Drawings, Appendix A**		
Series Model	Helios Metal Framed Skylight	**Design**: +/-85.0 Psf	**Ft²**
Mock Up Size	Overall Width: 12'-8 ¼" (152.25")	**Length:** 8'-3 ¼" (99.25")	104.94
Configuration	3-bays wide		
Glazing	1/4" x 0.90" PVB x 1/4" Laminated Glass		
Glass DLO	3'-9 ½" (45.50") x 7'-10 ½" (94.50")	**DLO Ft²**	29.86
Tested Slope	3/12		

Test	Test Type	Pressure / Load / Dimension	Results
1	ASTM E 330: Preload / Uniform Load	+42.5 Psf 50% Test	No Damage
2	ASTM E 283: Air Infiltration / Static Pressure	6.24 Psf – Pos	< 0.06 Cfm/Ft²
3	ASTM E 331: Water Resistance / Static Pressure	15.0 Psf	No Water
4	ASTM E 330: Uniform Deflection/Uniform Load	+/-42.5 & +/-85.0 Psf [30 seconds]	No Damage
5	Repeat Air Infiltration Static Pressure	6.24 Psf – Pos	< 0.06 Cfm/Ft²
6	Repeat Water Resistance / Static Pressure	15.0 Psf	No Water
7	Structural Proof Load / Structural Uniform Load	+/- 127.5 Psf [30 seconds]	No Damage

The test specimen passed all tests listed above with no glass breakage or permanent deformation to the vertical or horizontal framing members.

TABLE OF CONTENTS

APPENDIXES

This report is not complete unless these drawings are stamped by **CCL** as illustrated below:

Sheet	Detail	Sheet	Stamped as Illustrated
1	Plan / Elevation	1	Construction Consulting Laboratory 1601 Luna Road Carrollton, Texas 75006 (972) 242-0556
2	Horizontal Vertical Section	2	
3	Pressure Plate	3	
4	Frame Member	4	
5	Exterior gasket	5	
6	Interior Knife Gasket	6	

1. PROJECT DATA

1.1. REPORT ISSUED

Apollo Industries	Stafford, Texas	832 672 3919

1.2. TEST LABORATORY AND LOCATION

Construction Consulting Laboratory (CCL)	Carrollton, Texas	972-242-0556

2. PROJECT SUMMARY

2.1. **Project:** AAMA 501 Laboratory Mock-Up Performance Testing

2.2. **Product Type:** Aluminum Skylight

2.3. **Series/Model:** Helios Metal Framed Glass Skylight

2.4. **Compliance Statement:** Results obtained are tested values and were secured by using the designated test methods in accordance with the requirements and methods noted in AAMA 501-15.

2.5. **Test Completion:** May 16, 2022

2.6. **Test Sample Source:** The specimen was installed by **CCL**. Reports, drawings, and project photographs will be retained by **CCL** for a minimum period of four (4) years from the test completion date.

2.7. **Drawing Reference:** The appended specimen drawings have been reviewed by **CCL** and are representative of the tested specimen.

2.8. **Observers:**

Witnessed By	Representative (All or Partial Viewing)		
Apollo Industries	Garry Humble		
CCL	Edsson Alarcon	Juvenal Azua	Wesley Wilson

3. TEST SPECIFICATIONS / METHODS

- **AAMA 501-15** "Methods of test for Exterior Walls"
  - **ASTM E 283-12 Air Infiltration:** "Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen".
  - **ASTM E 331-16 Static Water Penetration Resistance:** "Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference".
  - **ASTM E 330-14 Uniform Load Deflection and Proof Loading:** "Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference".

4. TEST EQUIPMENT

4.1. Test chamber consisted of 4" x 4" and 2" x 4" stud reinforced 3/4" thick plywood at the floors and walls and a double nominal 2" x 10" rim to provide support and sealing of the System curb. The chamber can be adjusted to meet clients request for slope and is accessible through a single bulkhead door.

4.2. Pressure differentials created with reversible pumps for positive/negative loading.

4.3. Chamber pressure differentials measured with manometers.

4.4. Air infiltration measured with a Meriam laminar flow element and inclined and digital manometers.

4.5. Water applied to the specimen from a spray rack equipped with swirl-type nozzles spaced two feet on center in vertical and horizontal directions, which under controlled pressure delivered a minimum of five gallons per square foot per hour on the specimen.

4.6. Structural deflections and permanent set values measured with Celesco string potentiometers.

5. TEST PROCEDURES / TEST ALLOWABLE

5.1. **Uniform Load Pre-Load per ASTM E 330:** Per project specs, there shall be no system failure and deflection of aluminum members at 50% of the Positive and Negative design load.

Procedure: Preload the at 42.5 Psf and maintain load for 30 seconds.

5.2. **Air Infiltration per ASTM E 283:** The total amount of air infiltration shall not exceed .06 Cfm/ Ft^2 based on the specimen overall size. 12'-8 ¼" wide by 8'-3 ¼" long = 104.94 Ft^2 x 0.06 CFM = 6.29 CFM - Allowed

Infiltration Procedure: The specimen shall be covered with 2-mil plastic sheet material and sealed with spray adhesive and duct tape to the chamber perimeter, thus allowing no movement of air through the specimen. The specimen shall be subjected to a positive pressure differential of 6.24 Psf to obtain a leakage rate for the test chamber. The plastic bag shall be removed, and the chamber pressurized to a positive 6.24 Psf to measure total air infiltration. The chamber infiltration shall be subtracted from the total air infiltration resulting in the infiltration rate of the test specimen, **Photo 1**.

5.3. **Static Water Penetration per ASTM E 331:** There shall be no water penetration during or at the conclusion of this test.

Procedure: Water shall be applied to the specimen at a minimum rate of 5 Gph/Ft^2, in such a way as to completely cover the exterior face of the specimen. Simultaneously, a specified positive static pressure of 15.0 Psf shall be applied for a minimum period of fifteen (15) minutes, **Photo 2.**

5.4. **Design Load Deflections per ASTM E 330:** Per project specs, there shall be no system failure and deflection of aluminum members at 100% of design load and shall not exceed the following:

Procedure: Preload the specimen 50% of the positive or negative DP. Once set, the indicators shall be set to zero. Positive and or negative loading, a pressure equal to 50% and then 100% of the DP shall be applied and maintained for 10 seconds per load. Between loads deflection shall be recorded.

TEST SPECIMEN DESIGN CRITERIA: +/- 85.0 Psf / 30- second load duration	
Rafter Span (L/175): 96.0" /175:	Allowable = 0.548" (inches)

5.5. **Repeat Air Infiltration** per ASTM E 283 at a Positive 6.24 Psf static test pressure

5.6. **Repeat Static Water Penetration** per ASTM E 331 at the specified pressure for a minimum duration of 15 minutes.

5.7. **Proof Load Residual** per ASTM E 330, there shall be no permanent deformation of the aluminum members that exceed 0.02% of span at 150% of design load.

Procedure: The specimen shall be preloaded to 50% of the positive or negative DP. Once set, the indicators shall be set to zero. Positive and or Negative loading, a pressure equal to 150% of the DP shall be applied and maintained for 10 seconds, pressure released, and permanent sets recorded.

TEST SPECIMEN PROOF LOAD / +/-127.5 Psf	
Rafter Span (L)/500: 96" / 500	Allowable = 0.192 (inches)

6. MOCK-UP DESCRIPTION

Product Type	Aluminum Helios Skylight, **Product Drawings, Appendix A**		
Series Model	Helios Metal Framed Skylight	**Design**: +/-85.0 Psf	**Ft²**
Test Method	AAMA 501-15 "Methods of Test for Exterior Walls"		
Mock Up Size	Overall Width: 12'-8 ¼" (152.25")	**Length:** 8'-3 ¼" (99.25")	104.94
Configuration	3-bays wide		
Glazing	1 3/8" Sealed Laminated Insulating Glass		
Glass DLO	3'-9 ½" (45.50") x 7'-10 ½" (94.50")	**DLO Ft²**	29.86
Tested Slope	12/3		

WEEP ARRANGEMENT: Internal condensate gutters at head, jambs and rafters control water into the sill gutter which weeps to the exterior through a 316" weep hole in-line to rafter.

GLASS: 1/4" x 0.90" PVB x 1/4" Laminated Glass.

GLASS GLAZING: Glass lites are exterior set and capture glazed using aluminum pressure plates and EPDM gaskets, preset glazing at interior and preset retainer at exterior pressure plates. Pressure plate secured to the framing members with #14 x 1 ½" hex washer head, rubber gasketed screws spaced on 6" centers at the jambs, head (up slope) and rafters. Glass is sealed to the frame at sill (down slope) with a heal bed of GE SilPruf SCS-2000 structural silicone. Once glazed, the pressure plates are covered with an aluminum face cap and wet sealed with GE SilPruf SCS-2000 to glass and frame members

PERIMETER SEALANT: Aluminum coping sealed to frame perimeter and curb with GE SilPruf SCS-2000 silicone. Coping is anchored to curb full perimeter with 5/16 x 1" hex head screws spaced approximately 2" from each end and on 24" centers.

INTERNAL SEALANT: Frame set into a bed of GE SilPruf SCS-2000 silicone applied to the jamb and rafter structural tubing. Cross section of condensate gutters sealed with GE SilPruf SCS-2000 silicone.

REINFORCEMENT: Aluminum Tube 2" x 2" x 0.125" thick at frame jambs and head (up slope). Aluminum Tube 2" x 6" x 0.188" thick at rafters. Aluminum channel 2" x 3" x 0.125" thick below frame sill (down slope) attached to curb with 5/16 x 1" hex head Tek screws. Rafters attached to curb using 2" x 3" x 0.125" thick aluminum angle set at each side and secured to curb and rafter with four (4) 5/16 x 1" hex head Tek screws per angle, two (2) per substrate.

ANCHORAGE: Frame members attached to curb and rafter support tubes with #14 x 1 ½" hex washer head, rubber gasketed screws set in pairs and spaced 6" from each end and on 12" centers.

7. TEST RESULTS

METHOD	TITLE OF TEST	TEST PRESSURE	MEASURED	ALLOWED
ASTM E 330	Uniform Pre-Load	Positive 42.50 Psf	No Damage	No Damage
ASTM E 283	Air Infiltration	Positive 6.24 Psf	0.02 Cfm/ft²	0.06 Cfm/ft²
ASTM E 331	Water Resistance [N1]	Positive 15.0 Psf	No Leakage	No Leakage
ASTM E 330	Uniform Load Deflection [N2]	Pos/Neg 85.0 Psf	No Damage	No Damage

50% and 100% Positive / Negative 85.0 Psf DP (30-Second Duration All Loads)

	+42.5 Psf			+85.0 Psf			-42.5 Psf			-85.0 Psf			Allowed
Ind.	Total	Set	Net	Total	Set	Net	Total	Set	Net	Total	Set	Net	
1	0.06	0.01		0.17	0.05		0.10	0.05		0.18	0.06		
2	0.32	0.01	.245	0.67	0.03	.500	0.35	0.04	.265	0.68	0.04	.520	.548
3	0.09	0.00		0.17	0.00		0.07	0.01		0.14	0.01		

ASTM E 283	Air Infiltration	Positive 6.24 Psf	0.02 Cfm/ft²	0.06 Cfm/ft²
ASTM E 331	Water Resistance [N1]	Positive 15.0 Psf	No Leakage	No Leakage
ASTM E 330	Uniform Proof Load [N2]	Pos/Neg 127.5 Psf	No Damage	No Damage

150% Positive / Negative 127.50 Psf DP (30-Second Duration All Loads)

	+85.0 Psf			+127.50 Psf			-85.0 Psf			-127.50 Psf			Allowed
Ind.	Total	Set	Net	Total	Set	Net	Total	Set	Net	Total	Set	Net	
1	0.17	0.05		0.25	0.05		0.18	0.06		0.22	0.05		
2	0.67	0.03	.01	0.95	0.08	.045	0.68	0.04	.01	0.90	0.08	.035	.192
3	0.17	0.00		0.20	0.02		0.14	0.01		0.20	0.04		

Note 1: *Water resistance testing was performed with the specimen set to a 3 on 12 slope.*
Note 2: Plastic sheeting was not used to achieve the noted uniform test loads.

8. DISCLAIMER

The performance results were achieved by using the designated test methods. This report does not constitute certification of this product or product line.

Respectfully submitted,

CONSTRUCTION CONSULTING LABORATORY

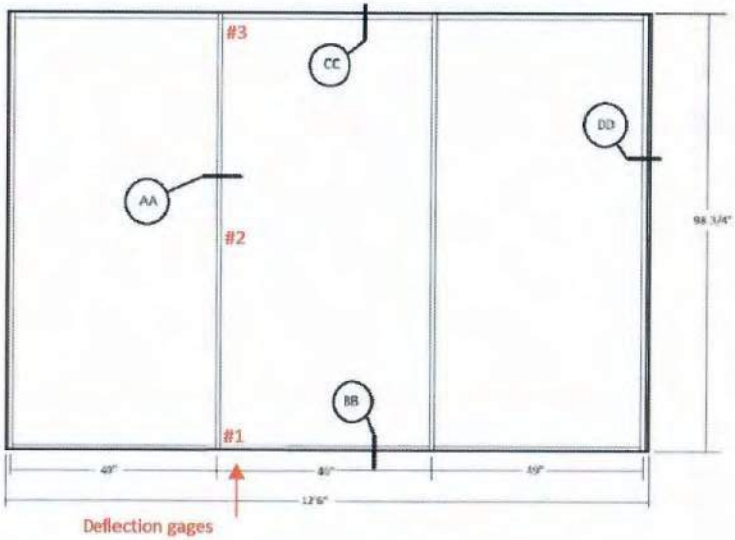
EDSSON ALARCON
TESTING MANAGER
Signed Electronically

WESLEY WILSON
LABORATORY MANAGER
Signed Electronically

APPENDIX A

Sheet	Detail	Sheet	Stamped as Illustrated
1	Plan / Elevation	1	Construction Consulting Laboratory 1601 Luna Road Carrollton, Texas 75006 (972) 242-0556
2	Horizontal Vertical Section	2	
3	Pressure Plate	3	
4	Frame Member	4	
5	Exterior gasket	5	
6	Interior Knife Gasket	6	

Construction Consulting Laboratory
1601 Luna Road
Carrollton, Texas 75006
(972) 242-0556



SPECIFICATIONS:

ALUMINUM: TO BE 6063 T6 EXTRUDED ALUMINUM.
GLAZING FRAME TO BE MIN. 0.078 WALLS
STRUCTURAL TUBES TO HAVE MIN. 1/8" WALLS
FORMED FLASHINGS TO BE 0.040

GLAZING: TO BE LAMINATED GLASS PANELS
1/4" OVER 1/4" HEAT STRENTHENED WITH
0.090 PVB INNER LAYER

FINISH:

GASKETES: TO BE EPDM EXTRUDED GASKETS, TYPICAL
CONTINUOUS, BLACK IN COLOR

SEALANTS: TO BE "G.E. SILPRUF".

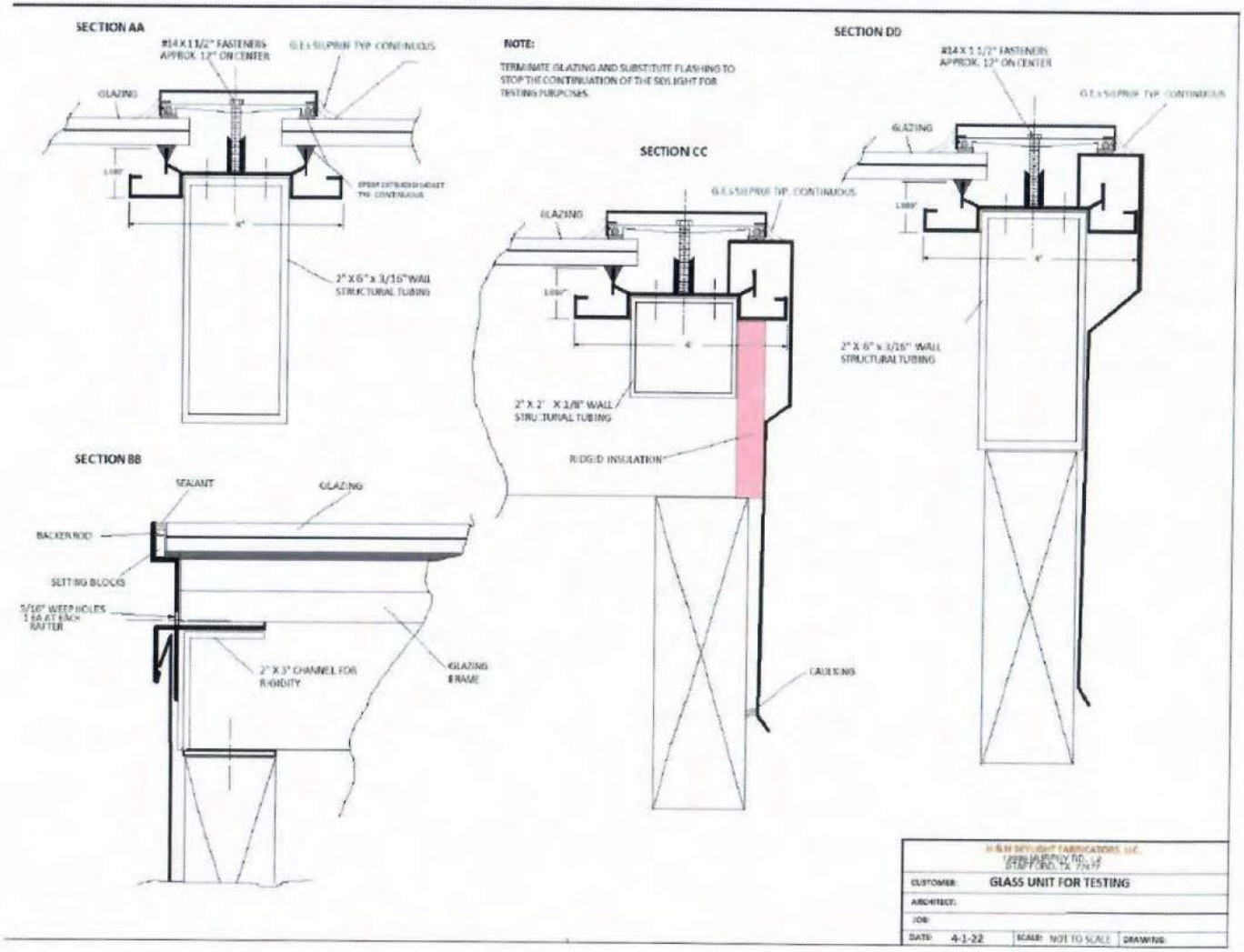
FASTENERS: TO BE STAINLESS STEEL FASTENERS
WITH BONDED NEOPRENE WASHERS.
STRUCTUAL FASTENERS TO BE CADMIUM
COATED SCREWS.

DESIGN LOADS :

H & H SKYLIGHT FABRICATORS, LLC
13401-A MURPHY RD.
STAFFORD, TX. 77477

CUSTOMER:	GLASS SKYLIGHT TESTING
ARCHITECT:	
JOB:	
DATE:	SCALE: NOT TO SCALE DRAWING:

Construction Consulting Laboratory
1601 Luna Road
Carrollton, Texas 75006
(972) 242-0556



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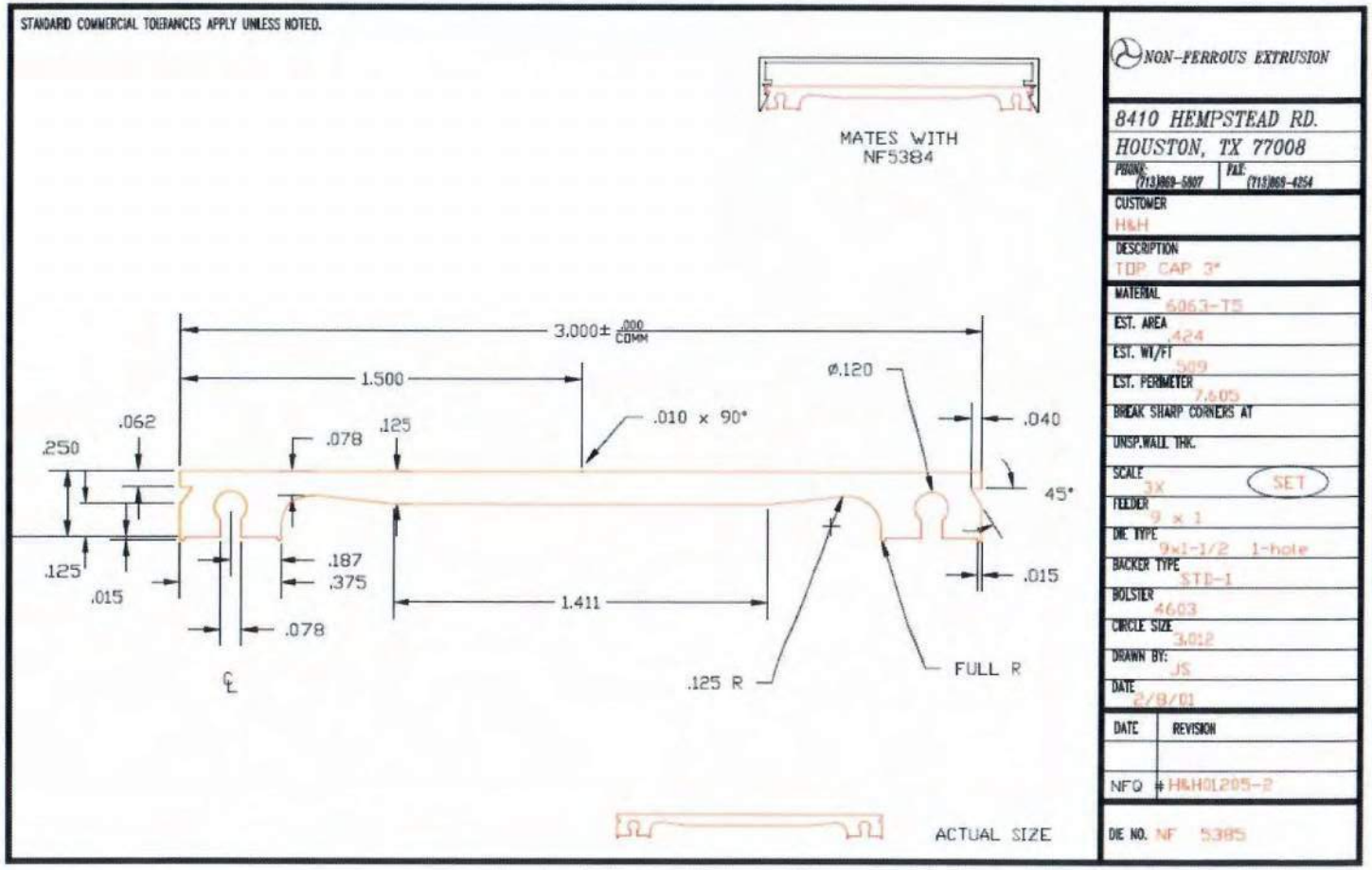

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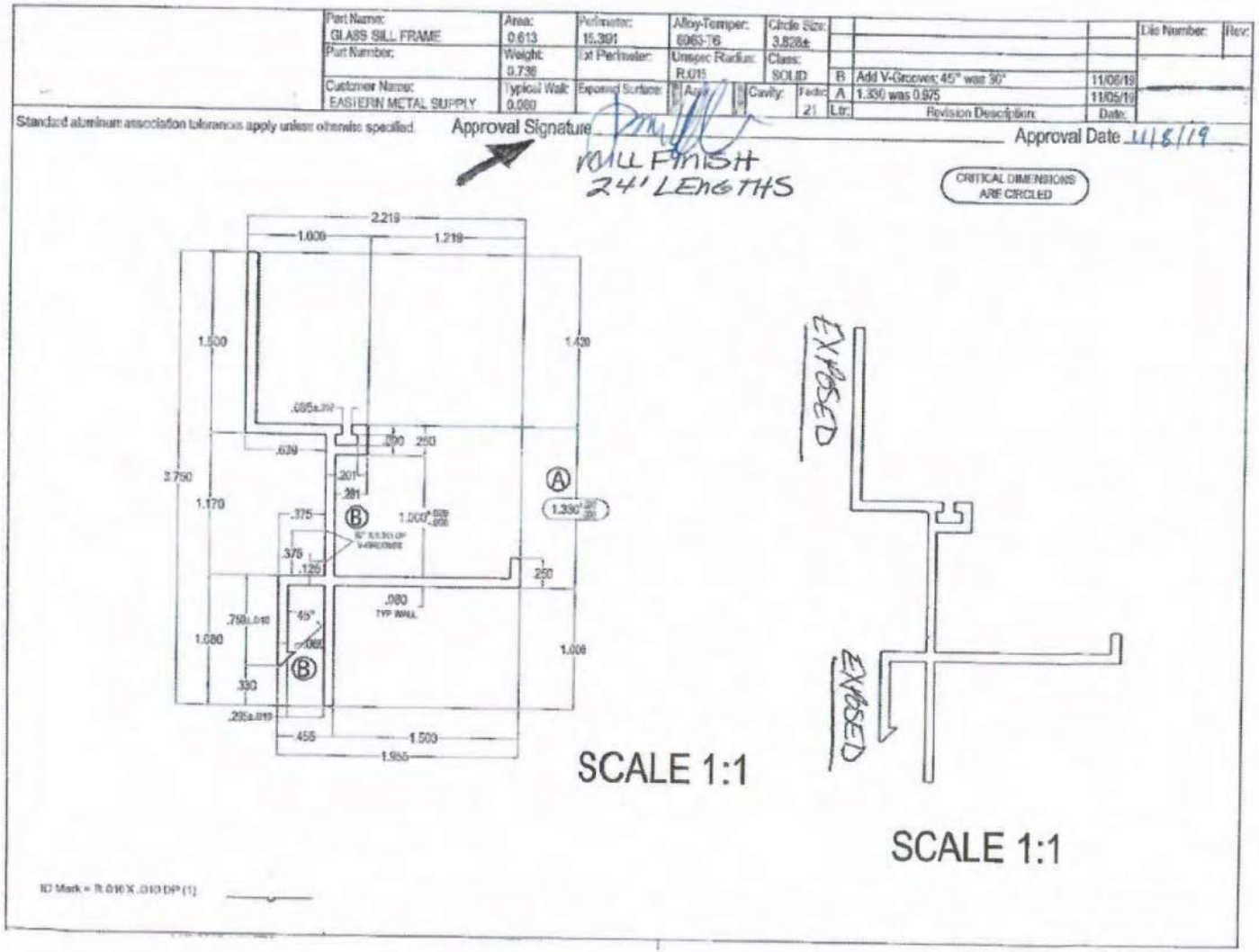

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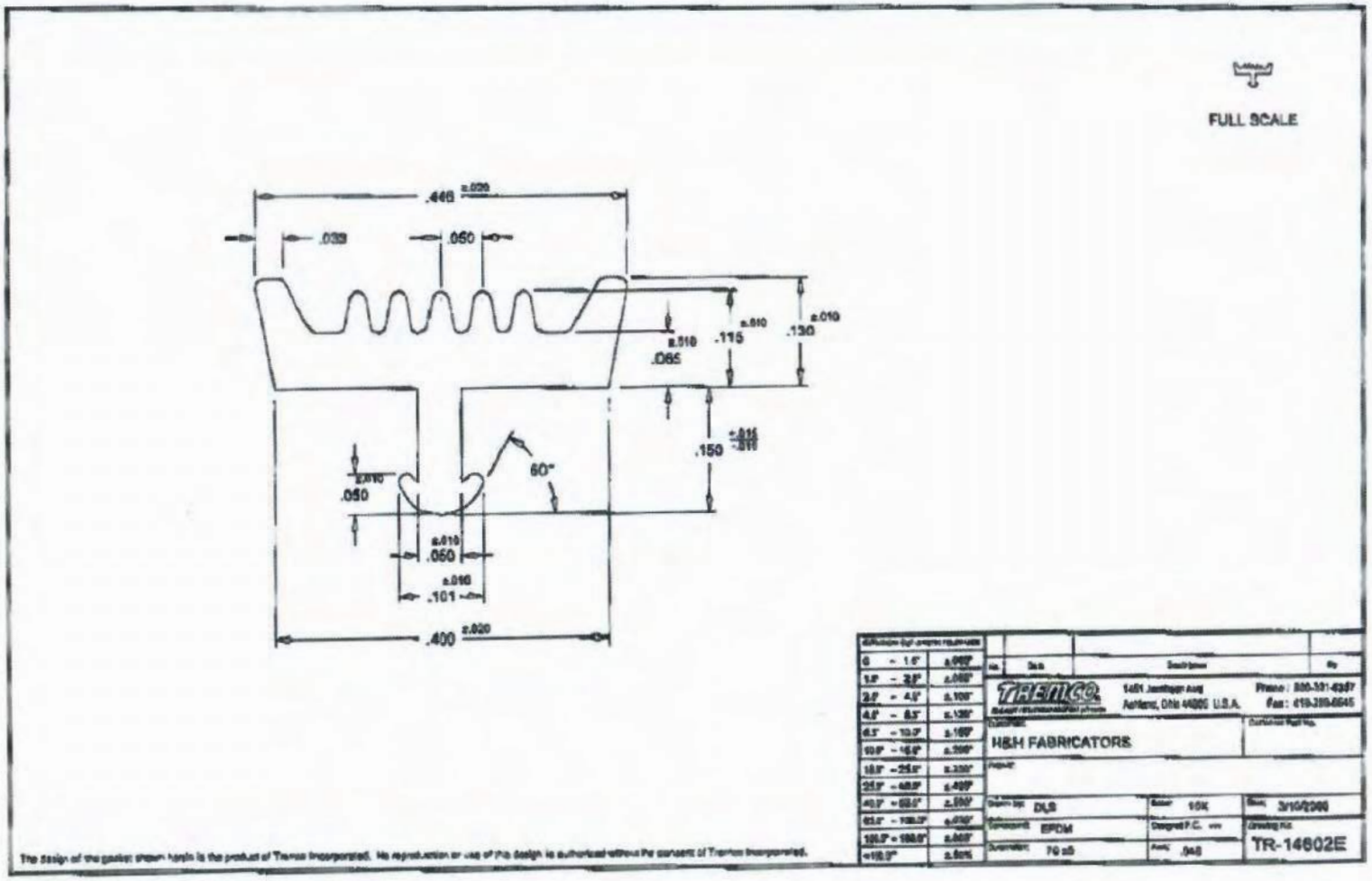
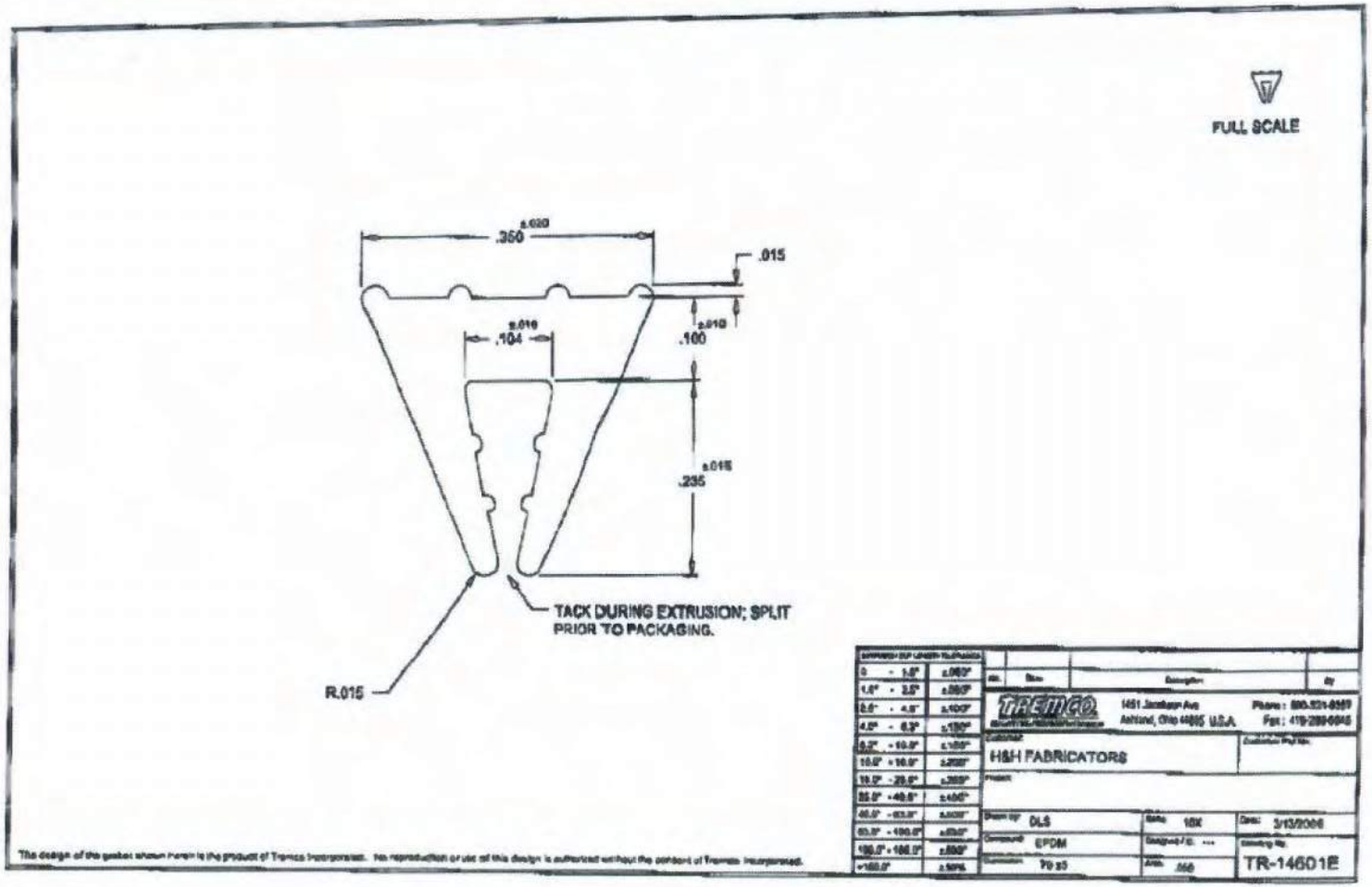
Carrollton, Texas 75006
(972) 242-0556



Construction Consulting Laboratory
1601 Luna Road
Carrollton, Texas 75006
(972) 242-0556



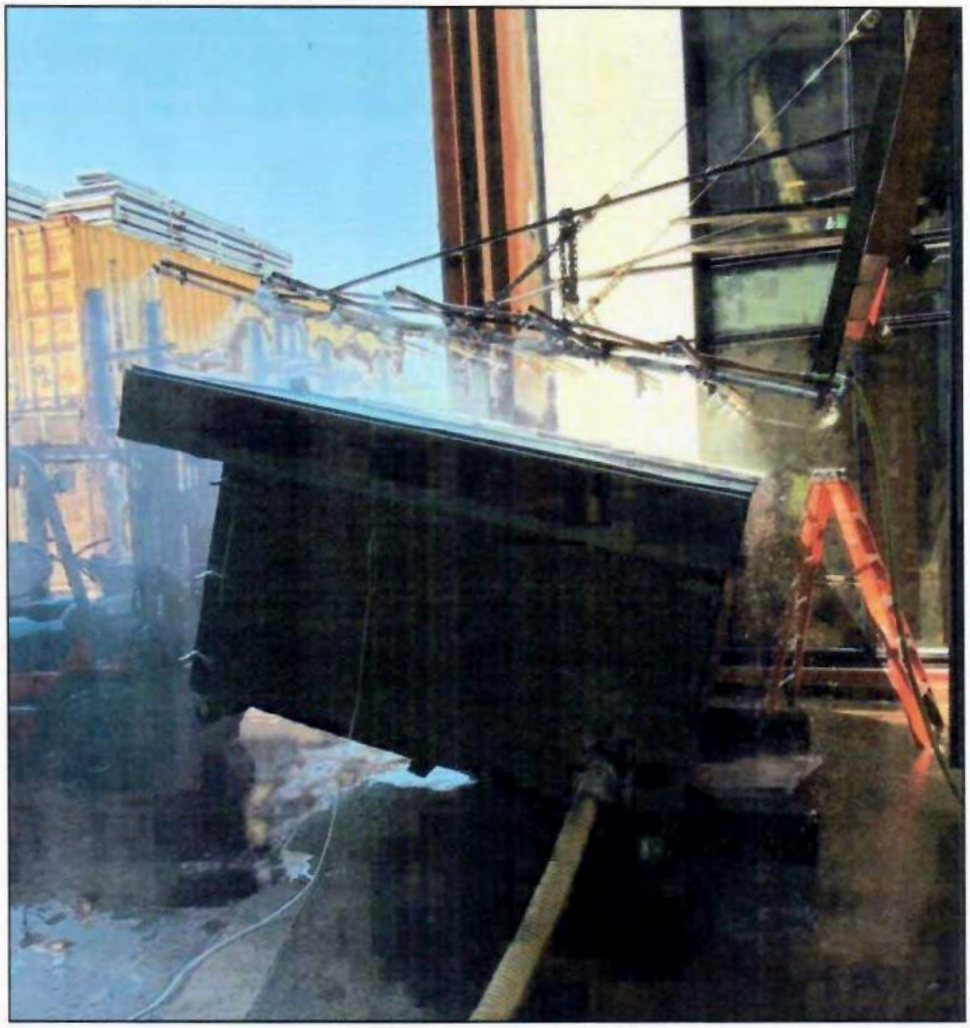
APPENDIX B

PHOTOGRAPHS

Photograph 1

Air Infiltration per ASTM E 283: The total amount of air infiltration shall not exceed .06 Cfm/ Ft² based on the specimen overall size. 12'-8 ¼" wide by 8'-3 ¼" long = 104.94 Ft² x 0.06 CFM = 6.29 CFM - Allowed

Infiltration Procedure: The specimen shall be covered with 2-mil plastic sheet material and sealed with spray adhesive and duct tape to the chamber perimeter, thus allowing no movement of air through the specimen. The specimen shall be subjected to a positive pressure differential of 6.24 Psf to obtain a leakage rate for the test chamber. The plastic bag shall be removed, and the chamber pressurized to a positive 6.24 Psf to measure total air infiltration. The chamber infiltration shall be subtracted from the total air infiltration resulting in the infiltration rate of the test specimen.



Photograph 2

Static Water Penetration per ASTM E 331: There shall be no water penetration during or at the conclusion of this test.

Procedure: Water shall be applied to the specimen at a minimum rate of 5 Gph/Ft², in such a way as to completely cover the exterior face of the specimen. Simultaneously, a specified positive static pressure of 15.0 Psf shall be applied for a minimum period of fifteen (15) minutes

-END OF REPORT-

08 62 00

METAL FRAMED SKYLIGHTS

- **GUIDE SPECS**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including general and supplementary conditions and Division 1 specification sections, apply to this section.

1.2 SUMMARY

A. This section includes the following:

1. Aluminum-framed skylights to include the following geometries:

   a) single pitch skylights with vertical or no gable ends.

   b) pyramid skylights.

   c) double pitch skylight with hipped, vertical, or no gable ends.

   d) sawtooth skylight with vertical or no gable ends.

   e) curved barrel vault skylight with vertical or no gable ends.

   f) segmented barrel vault skylight with vertical or no gable ends.

   g) lean-to skylight with vertical or no gable ends.

   h) polygon skylight.

   i) custom skylight enclosures and entries.

   j) canopy skylights.

2. Structural design, engineering, fabrication, and installation of the entire skylight system to include extruded aluminum framing, integral closures, trim, and perimeter flashing.

3. Fasteners, anchors and related reinforcement of the framing system as required to resist design loads.

4. Glass and glazing materials including gaskets, sealants, setting blocks, backer rods, and related materials.

5. Installation of the entire metal-framed skylight system.

6. Single subcontract responsibility: Retain a single firm or company, hereinafter referred to as "Skylight contractor" for design, fabrication, and installation of work of this section and related sections to establish undivided responsibility for entire system.

   (customize below per project specific requirements)

7. *Optional design: Blast-rated skylights. (all above geometries apply; please consult factory for engineering and design assistance for specific project applications)*

8. *Optional design: Hurricane-rated skylights. (all above geometries apply; please consult factory for engineering and design assistance for specific project applications) - (EXCEPT CURVED BARREL VAULT SKYLIGHT)*

9. *`Optional design: Limited thrusting design. (all above geometries apply; please consult factory for engineering and design assistance for specific project applications)*

B. Related Work *(customize below per project specific requirements)*

1. Section 05120: Structural steel for metal framing.
2. Section 05500: Metal fabrications.
3. Section 07210: Building insulation: Rigid insulation at skylight perimeter.
4. Section 07600: Flashing and sheet metal.
5. Section 07900: Joint sealers: Perimeter joint sealant and backer rod.
6. Section 08800: Glazing.
7. Section 08900: Glazed curtain walls.

1.3 REFERENCES *(customize below per project specific requirements)*

A. Aluminum Association (AA): Specifications for Aluminum Structures SAS-30

B. American Architectural Manufacturers Association (AAMA)

C. American Society for Testing and Materials (ASTM)

D. American Institute of Steel Construction (AISC)

E. American National Standards Institute (ANSI)

1.4 PERFORMANCE REQUIREMENTS

A. Framing system including glazing material shall be designed to support design loads as prescribed by the governing building code, and/or specified herein:

Negative wind load…….(__)psf
Positive wind load……(__)psf
Snow load……..(__)psf
Concentrated load……(__)lbs.

B. Thermal load of +/- 60 degrees F from ambient temperature without causing buckling, stresses on glass, failure of seals, undue stress on structural elements, reduction of performance or other detrimental effects.

C. Compression flanges of flexural members may be assumed to receive effective lateral bracing only from anchors to the building structure, and horizontal glazing bars or interior trim, which are in contact with 50% of the member's total depth.

D. Thermal breaks shall be assumed to have no ability to transfer shear stress for composite action of flexural members. Elements joined by a thermal break shall be assumed to act separately.

E. The maximum allowable deflection of any framing member normal to the plane of the glass shall not exceed L/175. For spans 20'-0" or greater the maximum allowable deflection shall not exceed L/240.

F. The maximum allowable deflection of any framing member parallel to the plane of the glass shall not exceed 1/8".

G. Structural-Test Performance: Metal Framed Skylights tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified deflection limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

H. Allowable air infiltration shall not exceed 0.03 cfm/sqft. of the total glazed surface area when tested in accordance with ASTM E283 at static pressure of 6.24 psf.

I. No uncontrolled water leakage shall occur when the system is tested in accordance with ASTM E331 at a static pressure of 12 psf.

J. Skylight framing is designed to be self-supporting between the support construction. The skylight(s) will impose reactions to the support construction. All adjacent and support construction must support the transfer of all loads including horizontal and vertical, exerted by the skylight(s). Design or structural engineering services for the supporting structure or building components not included in the skylight scope and are not included under this section.

K. Condensation Resistance Factor: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (crf) of not less than 62 when tested according to AAMA 1503-09.

(customize below per project specific requirements)

L. *Optional blast rated design: Skylight framing will be designed, engineered and manufactured to resist blast loads per specific project requirements. Blast loads will be proven via 3D model analysis and structural calculations. Please consult factory for system capabilities and project assistance.*

M. *Optional hurricane rated design: Skylight framing will be designed, engineered and manufactured to resist impact loads from wind-borne debris. Manufacturer will offer tested system for either Miami Dade County (large and small missile (laminated glass) or Florida-approved system (large missile insulated glass). Please consult factory for system capabilities and project assistance.*

N. *Optional limited thrusting design: The skylight framing is to be designed to exert no horizontal reactions under vertical gravity loads, (dead, snow, live). Unbalanced live loads, (wind, seismic, etc.), acting upon the skylight will produce horizontal reactions that cannot be controlled by the skylights but must be resisted by the support structure. Please consult factory for system capabilities and project assistance.*

1.5 SUBMITTALS

A. Product data: Includes construction details, material descriptions, dimensions and profiles of components, and finishes for metal-framed skylights.

B. Shop drawings: For metal-framed skylights includes plans, elevations, sections, details, and attachments/interfaces to other work. Must be drawn in the domestic USA by the manufacturer of the system.

C. Includes air, water, and structural test data.

D. Signed and sealed professional engineering calculations by a qualified professional engineer responsible for their preparation licensed in the state the project is located.

E. Samples for initial selection: Manufacturer's color charts showing the full range of colors available for factory-finished aluminum.

F. Samples for verification: Finish samples, if required, are to be provided on pieces of 2"x3" aluminum sheet.

G. Installer certificates: If required, signed by manufacturer certifying that installers comply with requirements – reference installer program.

H. Product test reports: From a qualified testing agency indicating skylights comply with requirements, based on comprehensive testing of current products.

I. Sealant compatibility and adhesion test reports: From sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with sealants; includes sealant manufacturer's interpretation of test results for sealant performance and recommendations for primers and substrate preparation needed for adhesion.

J. Field test reports: If required.

1.6 QUALITY ASSURANCE

A. Installer qualifications: An experienced installer who has specialized in installing metal-framed skylights similar to those indicated for this project and who is acceptable to manufacturer; also licensed within the state the project is located.

B. Professional engineer qualifications: A professional engineer who is experienced in providing engineering services of the kind indicated. Engineer must be licensed in the state the project is located.

C. Testing agency qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

D. Manufacturer must use an extruded aluminum system comprised of domestically produced aluminum and is fabricated/assembled in the USA.

E. Manufacturer must have accredited quality assurance program monitored by a third party certified agency.

F. Pre-construction testing: If required.

G. Pre-construction sealant compatibility and adhesion testing: If required.

H. Welding: All welding shall comply with standards set forth by the American Welding Society.

I. Pre-installation conference: When required, conduct conference at project site to comply with requirements in Division 1, Section "Project Meetings." Review methods and procedures related to metal-framed skylights including, but not limited to, the following:

1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
2. Review structural load limitations.
3. Review skylight curb structural requirements.
4. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.

5. Review required testing procedures.
6. Review weather and forecasted weather conditions and procedures for unfavorable conditions.
7. Review protection of adjacent roof areas.
8. Review preparation and other requirements for installing structural silicone sealant.

1.7 PROJECT CONDITIONS

A. Field measurements: Where skylights are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

B. Established dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating skylights without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 WARRANTY

A. Skylight manufacturer shall warrant that the framing system will be free of defects in materials and workmanship for a period of ten (10) years from date of substantial completion.

B. Anodized Finishes: All anodized finishes shall be warranted for color and film integrity for a period of five (5) years from date of application.

C. Painted finishes: All painted finishes shall be warranted for a period of ten (10) years from date of application.

D. Glazing materials shall be warranted against defective materials, seal failure, and defects in manufacture per the glazing manufacturer's standard warranties, but not less than ten (10) years; only ten (10) years delamination warranty is available and breakage is not included.

E. Skylight manufacturer/installer shall guarantee that the installation will remain weather tight for a period of one (10) years from date of substantial completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by APOLLO INDUSTRIES. / 13401 Murphy Road, Suite A / Stafford, TX 77477 PH: 832-672-3920 Email: info@apolloskylights.com

B. Substitutions: Manufacturers shall not be considered without prior approval in writing no later than ten (10) calendar days prior to bid. Substitute manufacturers must have been in the custom skylight business for not less than a period of ten (10) years and must submit to the architect the following:

1. List of similar projects successfully completed within the last five years.
2. Proof of financial capability.
3. Complete details of proposed skylight.

4. Complete specifications for architect's review.
5. Structural calculations for the specific project stamped by a professional engineer licensed in the state in which the project is located.

2.2 FRAMING SYSTEM

A. Extruded aluminum framing members to be 6063-T5, 6063-T6, or 6061-T6 alloy and temper. Other alloys and tempers may be used if they prove they do not void the warranties required in paragraph 1.8. Any substituted alloys and tempers must be clearly indicated on the shop drawings and in the structural calculations.

B. Thickness of structural framing members shall depend on the design loading, cross sectional configuration, and fabrication requirements.

C. Rafter bars shall have condensation gutters as a portion of the extrusion. Horizontal cross bar gutters sit on top of and drain into rafter gutters. Skylight systems with in line gutters, or guttering systems that require sealant, or systems using horizontal attachment with shear blocks that require sealants are unacceptable skylight systems.

D. All formed aluminum flashing and closures to be a minimum of .063 inches in thickness.

E. Snap-on covers and miscellaneous non-structural trim shall be the minimum thickness recommended by manufacturer.

F. Glazing band: Glazing sits above the function water control band.

G. Function band: allows moisture or condensation to move through the system without coming in contact with the glazing.

H. Provide tubular shapes and profiles of manufacturer's standard construction for members of the skylight systems. Web, Flange and/or "I" Beam Systems are unacceptable.

I. Locate weep holes to positively drain condensation to exterior of skylight as required.

2.3 FABRICATION

A. Framing components are as follows:

1. Factory fit and assembled, where practical.
2. All fabrication shall be done at the manufacturing location and not on site.
3. Install gaskets and tapes at factory.
4. Fabricate components that, when assembled, will have accurately fitted joints with ends coped; or mitered to produce hairline joints free of burrs and distortion.
5. Fabricate components to drain water passing joints and to drain condensation and moisture occurring or migrating within skylight system to the exterior.
6. Fabricate components to accommodate expansion, contraction, and field adjustment, and to provide for minimum clearance and shimming at skylight perimeter.
7. Fabricate components to ensure that glazing is thermally and physically isolated from framing members;
8. Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.

9. Fit and assemble components to greatest extent practicable before finishing.
10. Reinforce members as required to retain fastener threads.
11. Attach retainer bars with gasketed stainless steel fasteners spaced at a maximum of 8 inches on center.
12. Before shipping, shop assemble, mark, and disassemble components that cannot be permanently shop assembled.

B. Provide continuous aluminum skylight sill pan / closure flashing with weatherproof joints sealed and fully welded corners. Locate weep holes in the assembly as required. Structural curb to support skylight is by others.

C. Prepare framing to receive anchor and connection devices and fasteners.

D. Field/factory glazing: Locate and size setting blocks and spacers in accordance with the glazing manufacturer's recommendations. At no point shall the glazing come in contact with the skylight frame or fasteners.

2.4 ALUMINUM FINISH

A. Applicator Qualifications: Certified by AAMA and listed on AAMA Verified Components List.

B. Verify accuracy of components, quantities, and sizes prior to application of finishes.

C. Applicator - PVDF-Based Finishes:
1. Use regenerative thermal oxidizer to destroy VOC's.
2. Utilize chrome-based five-stage pretreatment system applied in accordance with AAMA and ASTM standards.
3. Possess in-house blending capabilities, allowing for only specific amount of paint needed for each project.
4. Utilize automated rotary atomization spray bell application providing uniform coverage with manual spray reinforcement for coverage in areas unreachable by automation.
5. Employ skilled professional field service division to repair warranty or application issues arising at Project site.
6. Utilize documented quality control protocol in accordance with AAMA 2605 test procedures.
    a. Color uniformity: 8.1.1.
    b. Performance: 8.1.2.
    c. Specular gloss: 8.2.
    d. Dry film hardness: 8.3.
    e. Dry adhesion: 8.4.1.1.
    f. Wet adhesion: 8.4.1.2.
    g. Boiling water adhesion: 8.4.1.3.
    h. Direct impact: 8.5.
    i. Abrasion resistance: 8.6.
    j. Muriatic acid resistance 8.7.1.
    k. Mortar resistance:8.7.2.
    l. Nitric acid resistance: 8.7.3.
    m. Detergent resistance: 8.7.4.
    n. 24-hour window cleaner resistance: 8.7.5.
    o. Online Quality Assurance Inspection:
        i. Proper paint coverage: 5.0.
        ii. Visual/appearance: 5.2.
        iii. Dry-film thickness: 5.3.
        iv. Color 2ÄE per ASTM D2244, Section 3.
        v. Gloss: +/- 5 units of manufacturers specification.

p. Apply AAMA 2605 compatible water-based air-dry system.

ii. Applicator - Anodize Finishes:
1. Offer both caustic (traditional) and eco-friendly (acid) etching technologies.
2. Utilize fully automated, computer-controlled process lines for consistency throughout Project.
3. Utilize documented quality control protocol in accordance with AAMA 611 test procedures :
   a. Color uniformity: 8.3.
   b. Gloss uniformity: 8.4.
   c. Oxide coating thickness: 9.1.
   d. Oxide coating weight/density: 9.2.
   e. Seal test: 9.8.
   f. Online quality assurance inspection:
      i. Random sample check for color uniformity: Maximum difference of 5ÄE.
      ii. Random coating thickness testing: Minimum oxide coating of 18 microns (0.7 mil) for Class I clear and color anodize coatings and 10 microns (0.4 mils) for Class II clear anodize.

(customize below per project specific requirements)

D. *Optional: Class I, color anodic finish: AA-M10C22A42/A44 (mechanical finish, as fabricated; chemical finish: etched, medium matte; anodic coating: Architectural class I, integrally colored or electrolytically deposited color coating 0.7 mil or thicker) complying with AAMA 606.1 or AAMA 608.1.*

E. *Optional: Anodize Finish: AAMA 611, Architectural Class I anodized to 0.0007 inch minimum thickness, [champagne] [light bronze] [medium bronze] [dark bronze] [extra dark bronze] [black] [copper] [____] color.*

F. *Optional: PVDF-Based Coating: AAMA 2605, fluoropolymer finish containing minimum 70 percent kynar resins, [two] [three] [four] coat system, [custom] [____] color [to be selected from manufacturer's full color range.*

2.5 GLAZING MATERIALS

A. Skylight system can accommodate ¼" single glazed – 2" insulated glazing (other glazing thickness can be accommodated per job specific requirements).
1. Typical insulating glass: 1-5/16 inch consisting of 1/4 inch tinted, tempered exterior lite with soft coat low "e" on # 2 surface, 1/2 inch sealed air space, and 9/16 inch clear laminated safety glass with a .060 interlayer interior lite. (*other as required-specified) *Glass must meet the requirements of AAMA for the project. For impact tested system, consult factory for approved glazing.

B. Glazing Gaskets:
1. Continuous extruded black silicone gasket to meet or exceed the following for systems not reliant on compression sealed gasket design:

i.	Hardness (shore A)	60+/- durometer
ii.	Tensile strength	974 psi or greater
iii.	Elongation	273%

C. Silicone setting blocks: Manufacturer's standard permanent non-migrating and hardness to comply with requirements.

D. Glazing weatherseal sealant: Neutral-curing silicone sealant recommended by skylight and sealant manufacturers for this use.

1. Sealant is capable of withstanding 50 percent movement in both extension and compression (total of 100 percent movement) when tested for adhesion and cohesion under maximum cyclic movement according to ASTM C 719.
2. Sealant complies with ASTM C 920 for Type S, Grade NS, Class 50, uses NT, G, A, and O, as applicable to substrates including other sealants with which it comes in contact.
3. Color: Dow 795 standard colors.

E. Flashing Sealant: Single-component, non-sag, high-performance, non-priming, gun-grade elastomeric polyurethane furnished by skylight manufacturer.

1. Sealant complies with ASTM C920, Type S, Grade NS, Class 50, Use NT, A, G, and O. Canadian Specification CAN2-19.13-M82
2. Color: Dow 795 standard colors.

2.6 ANCHORS AND FASTENERS

A. Provide all anchors and fasteners required for complete installation.

B. All fasteners in potential wet areas to be stainless steel.

C. All lag screws, sleeve, stud, and through bolt-structural connections shall be zinc plated or stainless steel.

D. Conceal fasteners where possible.

2.7 SEALANTS

A. Skylight manufacturer shall be responsible for the selection of all sealants.

B. All surfaces shall be cleaned and primed in accordance with the sealant manufacturer's guidelines.

C. All exterior seals shall be black in color. (Or standard color sealants, as available and selected by the client)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting skylight performance.

1. Skylight installer shall notify the general contractor of obvious deficiencies or dimensional errors in the support system and/or adjacent construction. No installation work shall be performed until the deficiencies are corrected or written authorization is given to proceed with the as-built construction.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Material Protection is as follows:

1. Where aluminum will contact dissimilar materials protect against galvanic action and corrosion.
2. All materials shall be delivered, stored, and covered to protect factory finishes from weather damage and construction dirt until installed.
3. Glazing materials shall be packaged to prevent breakage.
4. Skylight materials shall be installed in strict accordance with manufacturer's erection drawings and installation manual.

3.3 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing skylight components.

1. Fit frame joints to produce hairline joints free of burrs and distortion.
2. Rigidly secure non-movement joints.
3. Accommodate thermal and mechanical movements.
4. Install framing components to drain water passing joints and to drain condensation and moisture occurring or migrating within skylight system to the exterior.
5. Coordinate installation of curb flashings at skylight perimeters to maintain continuity of water barriers. Set continuous curbs and flashings in a full sealant bed, unless otherwise indicated; comply with requirements in Division 7 Section "Joint Sealants".
6. Set skylights plumb, level, and true to line, without warp or rack of frames or panels and anchor securely in place in accordance with approved shop drawings.

B. Erection tolerances: Install skylight components true in plane, accurately aligned, and without warp or rack. Adjust framing to comply with the following tolerances:

1. Variation from plane: Limit variation from plane or location shown to 1/8 inch in 10 feet; 1/4 inch over total length.
2. Alignment: Where surfaces abut in line and at corners and where surfaces are separated by less than 3 inches, limit offset from true alignment to less than 1/32 inch; otherwise, limit offset from true alignment to 1/8 inch.

C. Field glazing: Locate and size extruded silicone setting blocks and spacers in accordance with the glazing manufacturer's recommendations. At no point shall the glazing come in contact with the skylight frame or fasteners.

D. Install weather seals according to sealant manufacturer's written instructions to provide weatherproof joints. Install joint fillers behind sealant as recommended by sealant manufacturer.

3.4 FIELD QUALITY CONTROL

A. Water leakage: Field check in accordance with AAMA 501.2. There shall be no uncontrolled water leakage as defined in AAMA 501.2. Water supply to the skylights, with adequate water pressure, is to be furnished by the General Contractor. Tests are to be conducted upon completion of the installation with no remobilization or down time included to accommodate either water supply availability or witness personnel schedules. Testing is to be performed by the manufacturer's authorized personnel with a maximum of five (5) man-hours for set-up, testing and clean-up. Any retests due to failures of adjacent trades and any surrounding conditions will be performed at additional costs. Independent laboratory testing and reports, if required, are to be ordered and directed by the Owner and/or General Contractor at their expense.

3.5 CLEANING

A. Clean skylights inside and outside, immediately after installation, and after sealants have cured, according to manufacturer's written recommendations.

1. Remove temporary protective coverings and strippable coatings from pre-finished metal surfaces.
2. Remove labels and markings from all components.
3. Remove excess sealants.

B. The general contractor shall perform final cleaning and physical protection of all installed materials.

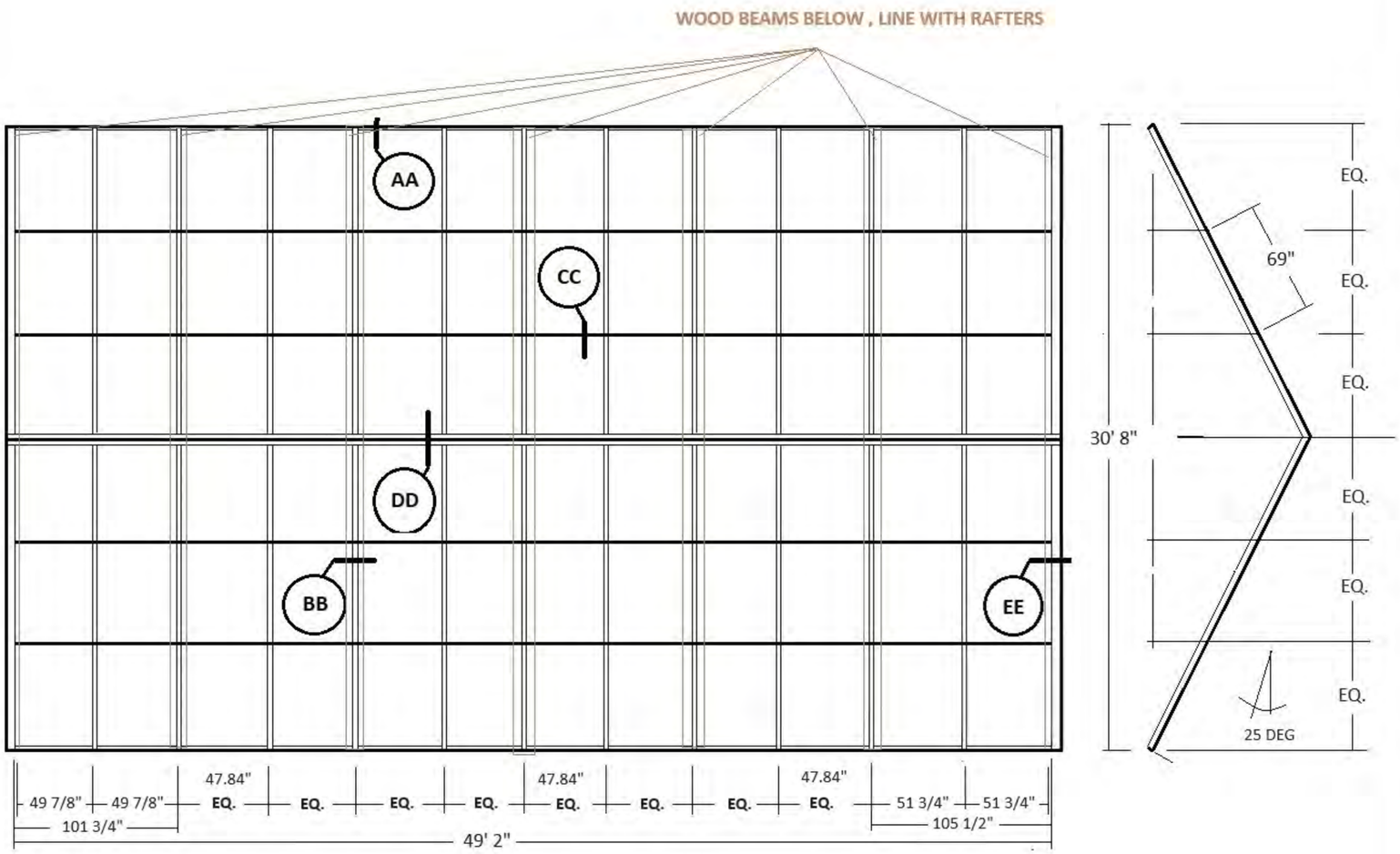
END OF SECTION 086300 – Metal Framed Skylights

SECTION 08 62 00

METAL FRAMED SKYLIGHTS

SAMPLE SHOP DRAWINGS

DOUBLE SLOPED RIDGE SKYLIGHT



SPECIFICATIONS:

ALUMINUM: TO BE 6063-T6 EXTRUDED ALUMIMUM FRAMING.
GLAZING FRAMES TO HAVE MIN .078 WALLS
FLASHING TO BE 0.040 MIN. WALLS, 3000 SERIES ALUM.
STRUCTURAL FRAMES TO BE MIN. 0.125 WALLS

GLAZING: TO BE 1 3/16" INSULATED GLASS
MAKEUP:
1/4" GREY TEMPERED LOW E # 2 SIDE
1/2" AIR SPACE
1/4" CLEAR TEMPERED INNER PANEL

FINISH: TO BE BAKED SHOP PAINTED
BRONZE IN COLOR

GASKETES: TO BE EPDM EXTRUDED GASKETS, TYPICAL
CONTINUOUS. BLACK IN COLOR

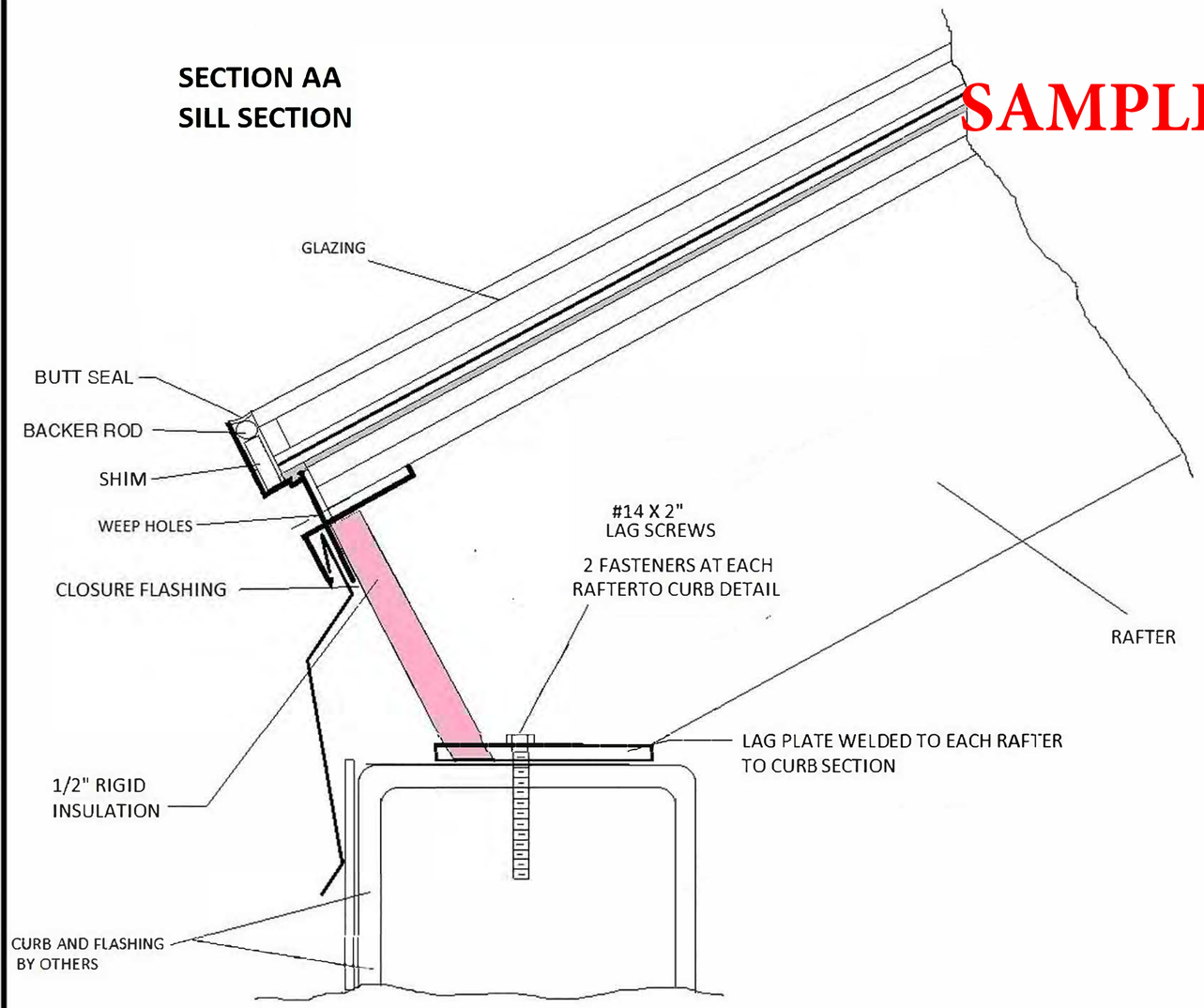
FASTENERS: TO BE STAINLESS STEEL FASTENERS
WITH BONDED NEOPRENE WASHERS.
STRUCTUAL FASTENERS TO BE CADIUM
COATED SCREWS.

FIELD VERIFY ALL DIMENSIONS

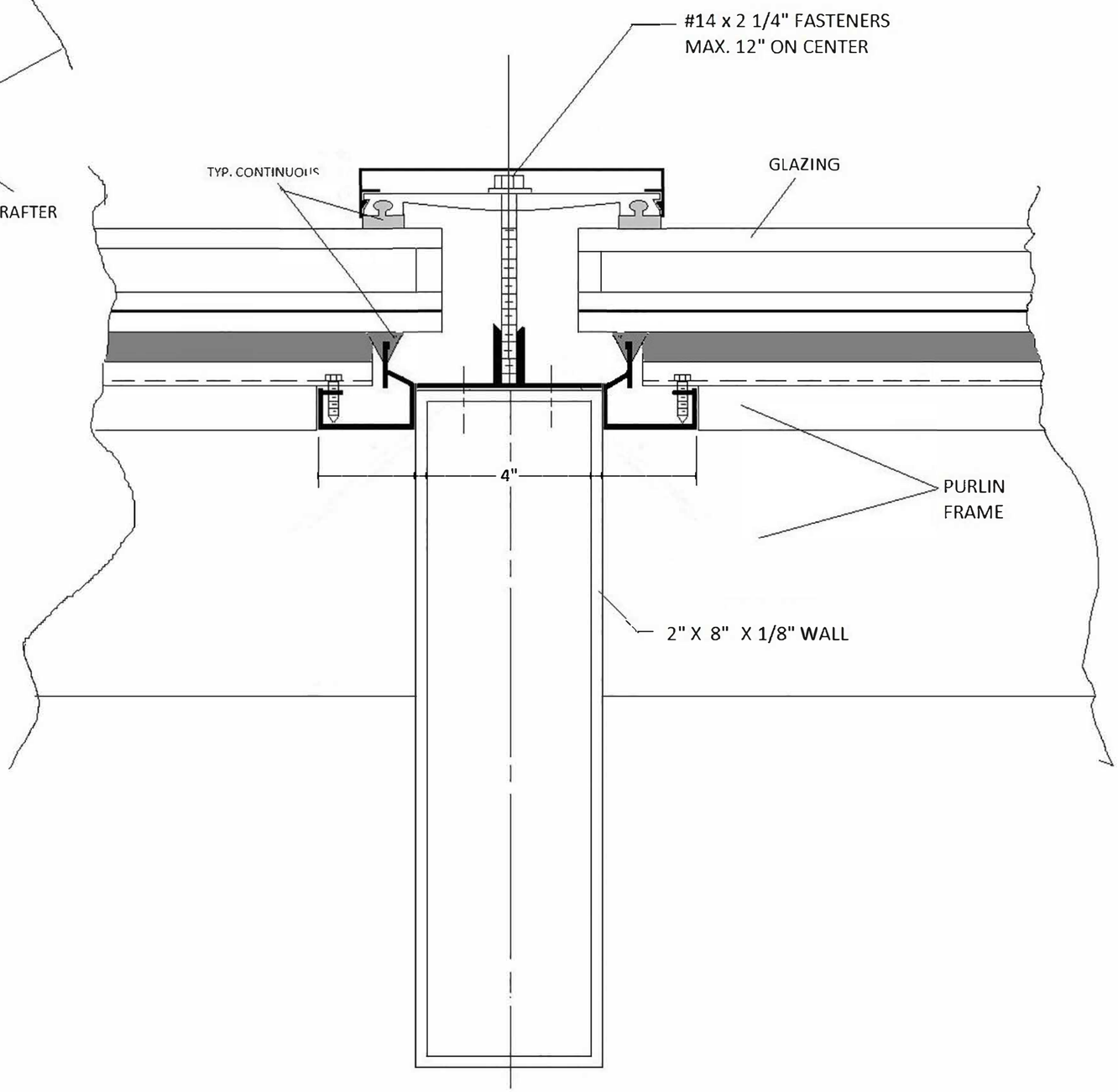
H & H SKYLIGHT FABRICATORS, LLC.
13401-A MURPHY RD.
STAFFORD, TX. 77477

CUSTOMER:	ESR DEVELOPMENT INC.		
ARCHITECT:			
JOB:	COLLEGE STATION HILTON		
DATE:	2-7-24	**SCALE:** NOT TO SCALE	**DRAWING:** 6768 1of3

SECTION AA
SILL SECTION



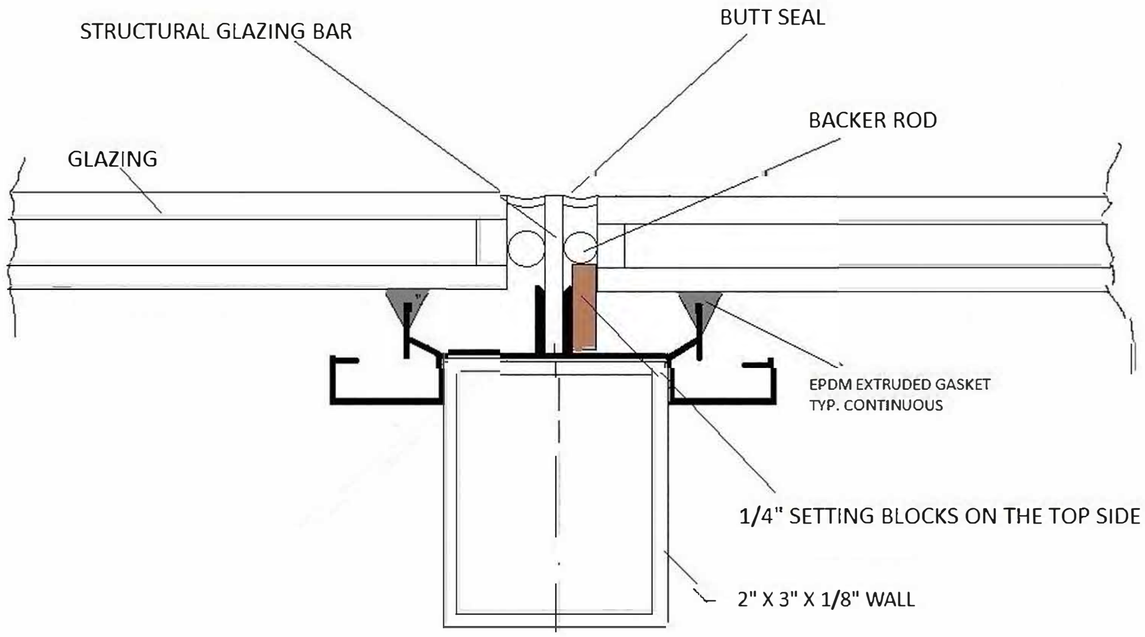
SECTION BB
RAFTER SECTION



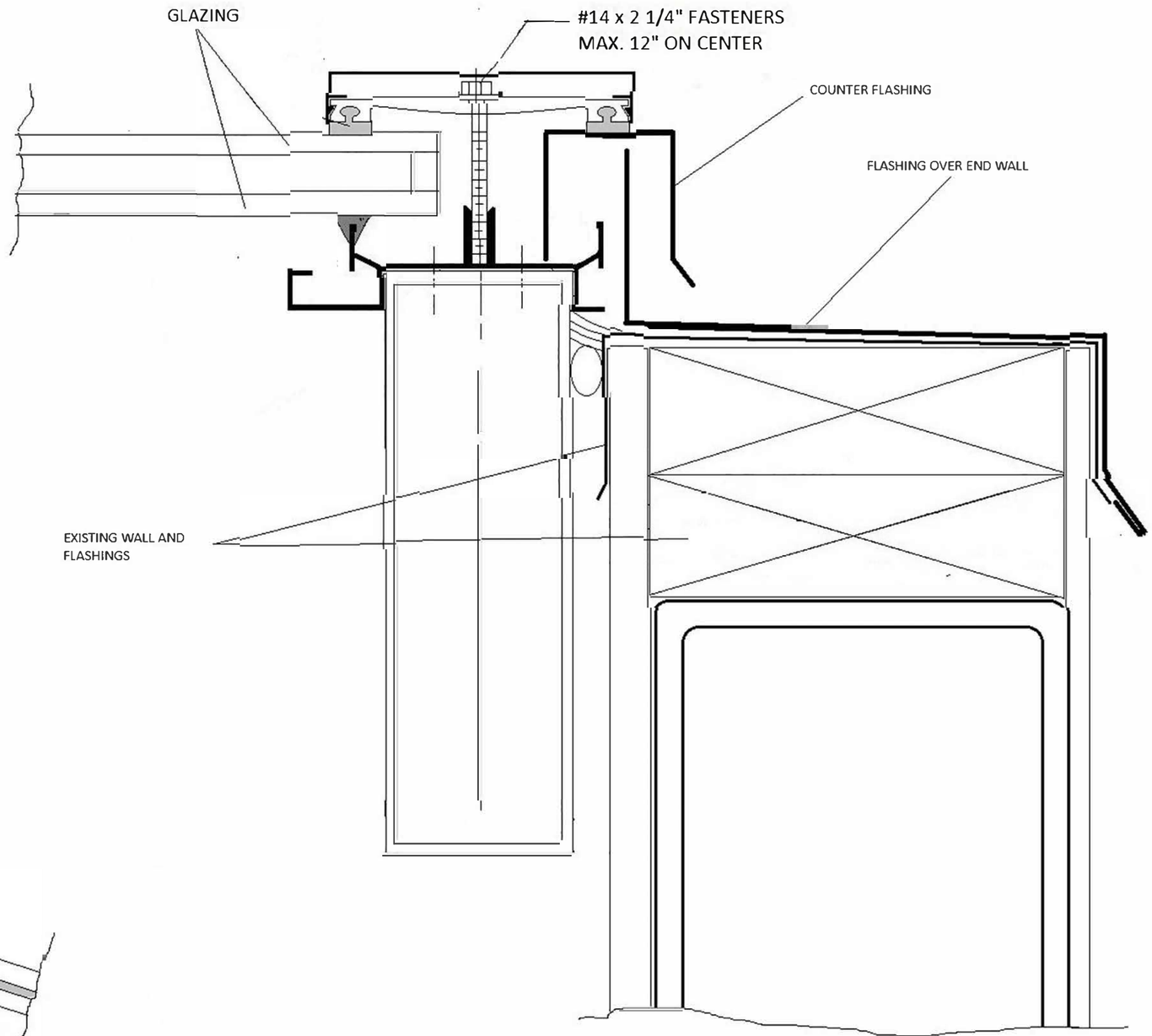
H & H SKYLIGHT FABRICATORS, LLC. 13401-A MURPHY RD. STAFFORD, TX. 77477			
CUSTOMER:	ESR DEVELOPMENT INC.		
ARCHITECT:			
JOB:	COLLEGE STATION HILTON		
DATE:	2-7-24	**SCALE:** NOT TO SCALE	**DRAWING:** 6768 2of3

SAMPLE FOR REFERENCE ONLY

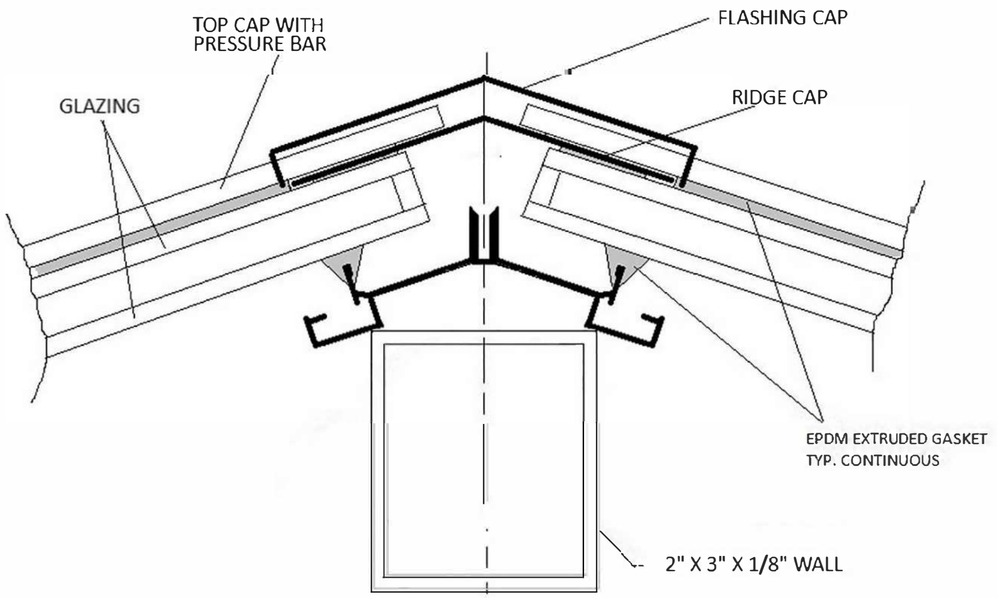
SECTION CC
PURLIN SECTION



SECTION EE
END RAFTER SECTION



SECTION DD
RIDGE SECTION



H & H SKYLIGHT FABRICATORS, LLC. 13401-A MURPHY RD. STAFFORD, TX. 77477			
CUSTOMER:	ESR DEVELOPMENT INC.		
ARCHITECT:			
JOB:	COLLEGE STATION HILTON		
DATE:	2-7-24	**SCALE:** NOT TO SCALE	**DRAWING:** 6768 3of3

HILTON COLLEGE STATION

COLLEGE STATION, TEXAS

08 62 00

METAL FRAMED SKYLIGHTS

- **H&H Skylights recent/current projects**

NOTABLE RECENT PROJECTS						
PROJECT	**Location**	**General Contractor**	**Architect**	**Scope**	**Year**	**Value**
703 McKinney	Dallas, TX	Hill & Wilkinson	Gruen Associates	3 @ 16'x'16' Glass Pyramids	2020	$ 120,000.00
Corpus Christ Art Museum	Corpus Christi, TX	STBP	HANSON	Glass Skylights	2022	$ 130,000.00
McAllen Airport	McAllen, Texas	Argio Roofing	ARMKO	34' x 40' Glass Ridge	2023	$ 160,000.00
Prien Lake Mall		Simon Properties	n/a	Glass Ridges and Pyramids	2021	$ 505,000.00
Porsche S Austin	Austin, TX	Ridgemont	Gensler	Glass Single Slope	2021	$ 167,000.00
CyFair ISD	Houston, Texas	D1 Constrruction	Huckabee	Ridge Skylights	2023	$ 130,000.00
TAMU Aggie Park	College Station, TX	Tellepsen	Lake Flato	Glass Single Slope	2022	$ 30,000.00
McFarlin Church	Norman, OK	CMR Roofing	McKinney Partnership	8 @ 14' x 14' Glass Pyramids	2022	$ 360,000.00
Collin Springs	McKinney, TX	Kelley Construction	Guide Architectur	8 glass pyramids	2023	$ 55,000.00
Fred Haas Toyota	Woodlands, TX	SPD Construction	Goree	Glass Ridges	2023	$ 220,000.00
Forney ISD - High School	Forney, TX	Gallagher	Huckabee	2 @ 33'x76' Glass Ridge	2023	$ 440,000.00
NOTABLY CURRENT PROJECTS						
Grapevine Mills Mall	Grapevine, TX	SIMON PROPERTIES	N/A	Glass Ridge	2023	$ 660,000.00
Ellis Island	New York, NY	Pullman	Army Corp Eng	Multiple Glass Skylights	2024	$2,300,000.00

08 62 00

METAL FRAMED SKYLIGHTS

- **Apollo Industries Brochure**

APOLLO
INDUSTRIES

COMMERCIAL GLAZING SOLUTIONS

BRINGING NATURAL LIGHT IN TO YOUR LIFE

www.apolloskylights.com

ABOUT APOLLO INDUSTRIES

Apollo Industries combines decades of experience in the skylight industry to design one of the nation's best sloped glazing systems. We started from humble beginnings repairing the skylights of some of the largest manufactures around. Through this experience, we learned the strengths and weaknesses of various skylight designs and used that knowledge since designing our first system over 30 years ago.

We constantly strive to approve ourselves in every aspect and the proof is in the thousands of skylights we have manufactured across the country. The decades of experience and hard work culminate in our HELIOS Metal Framed Skylights, our SKYTEK Unit Skylights, our LUNA Series Walkways and Canopies, and our Titan Series Fiberglass Sandwich panel system for skylights and wall systems.

While many manufactures focus on limited styles or glazing options, the Apollo Industries Glazing Systems are designed to use the widest selection of options on the market to allow our clients the greatest flexibility, without sacrificing creativity or quality.

GLAZING SYSTEMS

SkyTek Series
Unit Skylights

Helios Series
Metal Framed Skylights

Titan Series
Fiberglass Sandwich Panels

Luna Series
Glazed Canopies and Walkways

GLAZING OPTIONS

Monolithic Acrylic

Monolithic Polycarbonate

Multi-wall Acrylic

Multi-wall Polycarbonate

Fiberglass Sandwich Panels

Insulating Laminated Glass

FINISH OPTIONS

Standard Mill

Production Paint

Anodized

Powder Coat

Fluoropolymer Paint

VISIT OUR WEBSITE : For design information, details, specifications, and additional project information

North Forney

High School, Forney, Texas

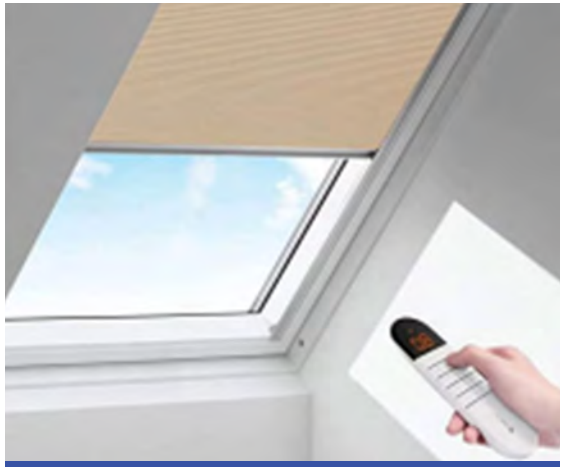
GLAZING COMPARISON CHART

GLAZING MATERIAL	ACRYLIC MONOLITHIC (DOUBLE GLAZED)		POLYCARBONATE 3 WALL		POLYCARBONATE DOUBLE GLAZED		FIBERGLASS SANDWICH PANELS	STRUCTURAL ACRYLIC		IMPACT RATED STRUCTURAL ACRYLIC ASSEMBLY	INSULATED GLASS LOW E	
SIZE	1/8”-3/16”		16mm-25mm		25mm over 16mm		2 ¾”	16mm		1 ¼”	1 3/16”	
COLOR	WHITE	BRONZE	OPAL	BRONZE	OPAL	BRONZE	WHITE	COOL BLUE	BRONZE	COOL BLUE	CLEAR	GREY
LIGHT TRANSMIT-TANCE (VLT)	52%	27%	35% - 52%	35% - 37%	26%		15% - 20%	28%	53%	26%	42%-70%	21%-30%
U-VALUE (SUMMER)	.5		.34 - .40		16%		.29 -.53	.49		.27	.29	
Solar Heat Gain Coefficient (SHGC)	.35	.75	.57	.63	.40		.23–.38	.20	.75	.19	.23 – .39	.17 – .30

SKYTEK SERIES

UNIT SKYLIGHTS

THERMAL FORMED

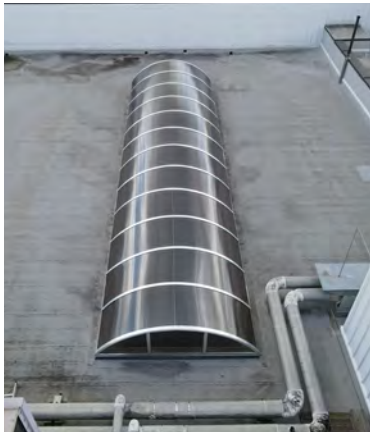


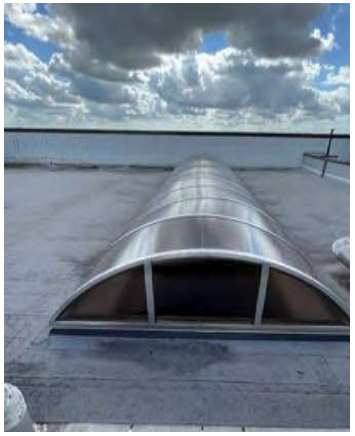
BLINDS

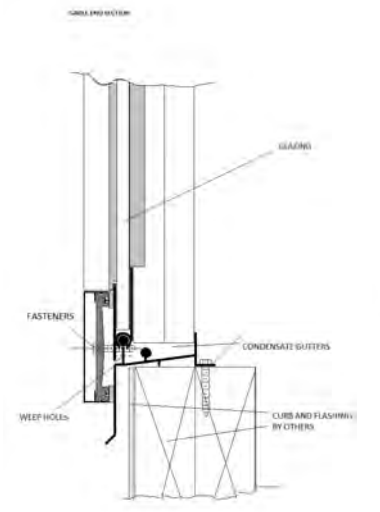
OPERABLE

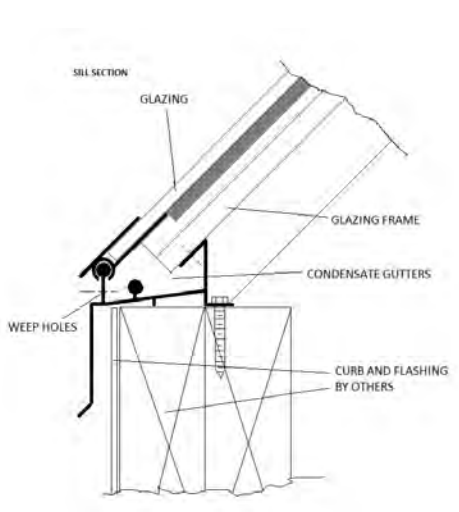
FALL PROTECTION

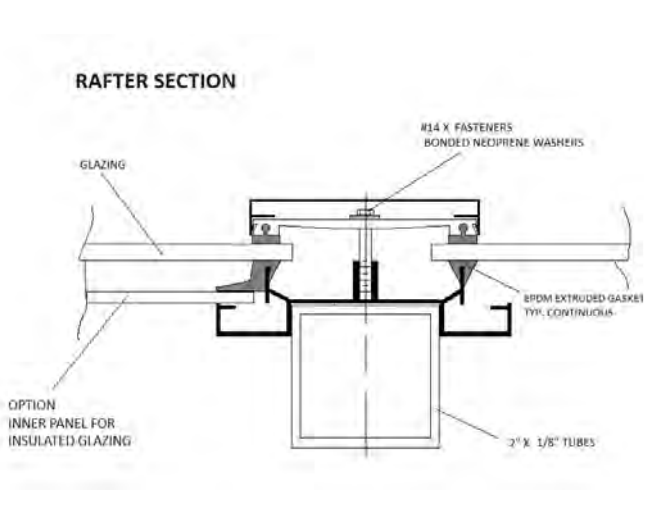
CLUSTER SYSTEMS





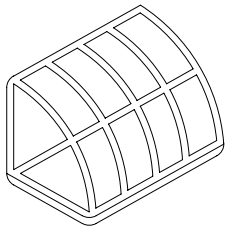


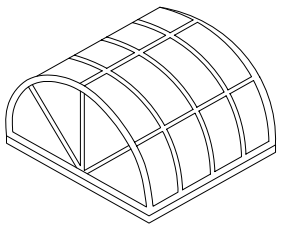


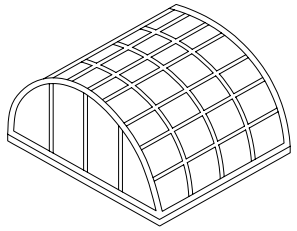


HELIOS SERIES

BARREL VAULT SKYLIGHTS







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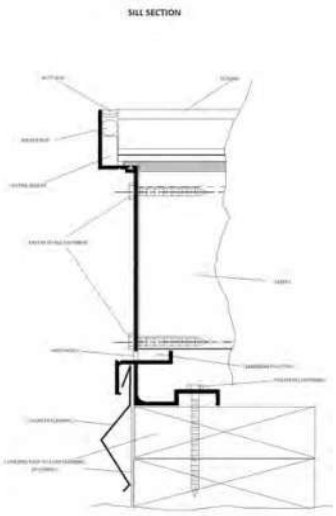
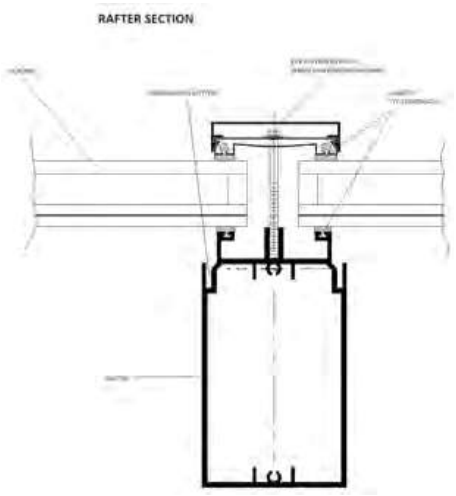
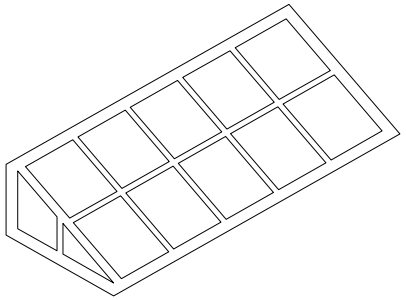
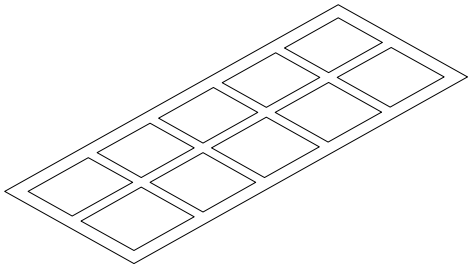


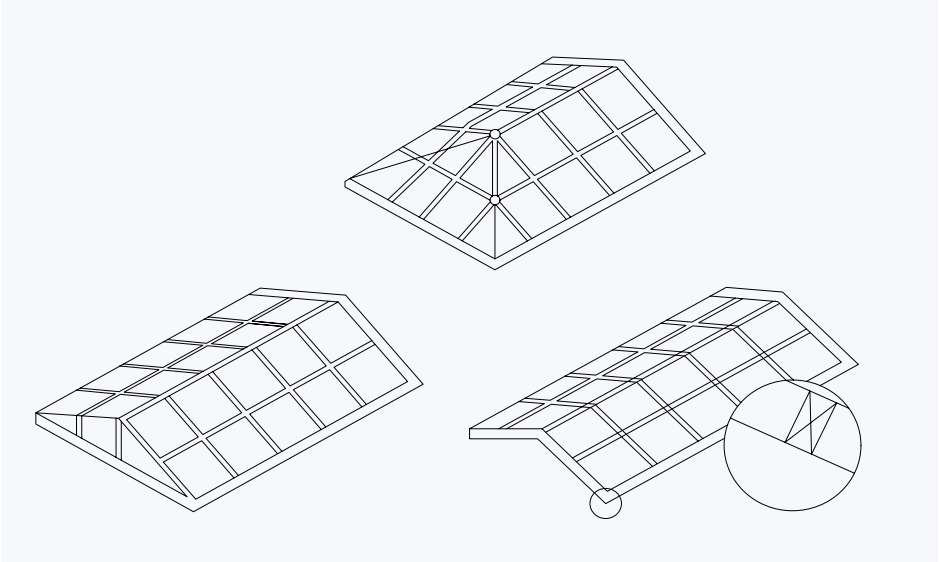


SINGLE SLOPE





RIDGE SKYLIGHTS



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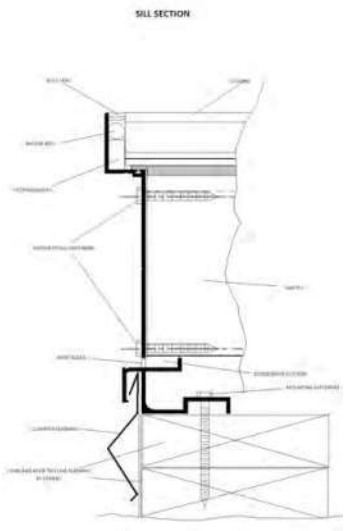

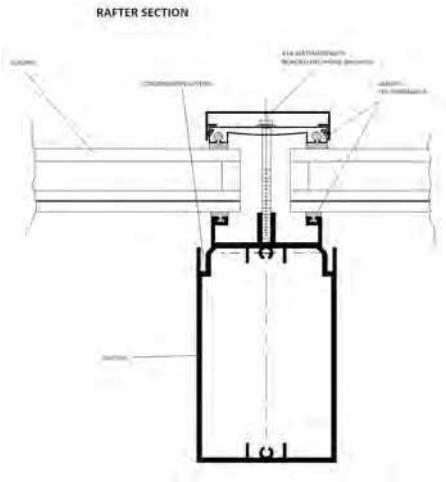

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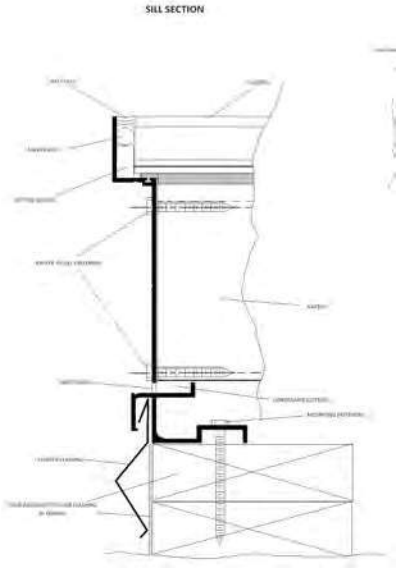
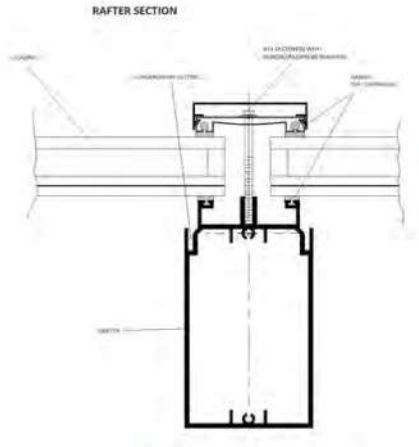
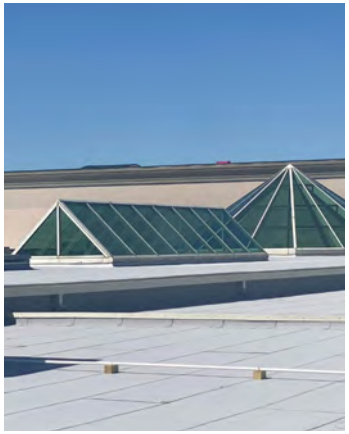
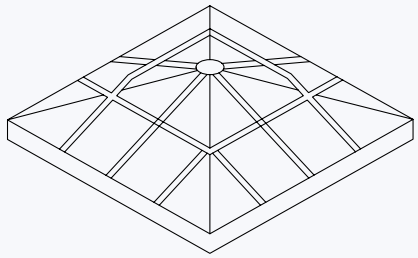
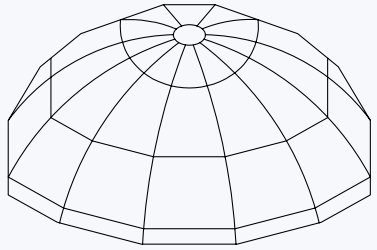


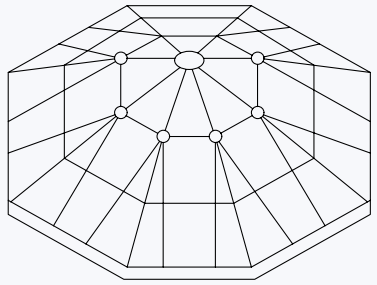




POLYGONAL SKYLIGHTS





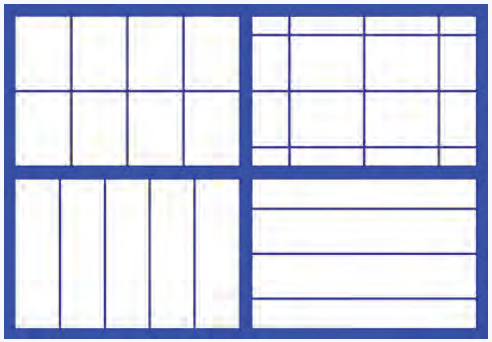


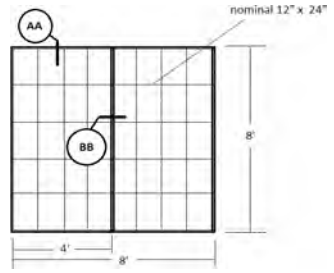
TITAN SERIES

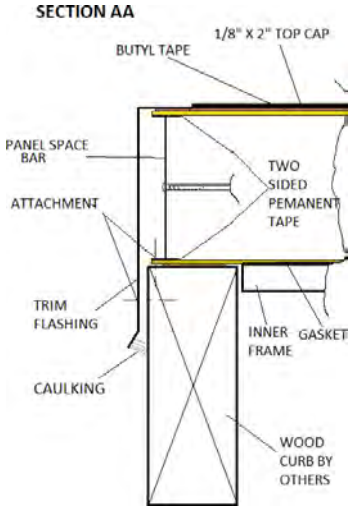
FIBERGLASS SANDWICH PANEL SYSTEMS

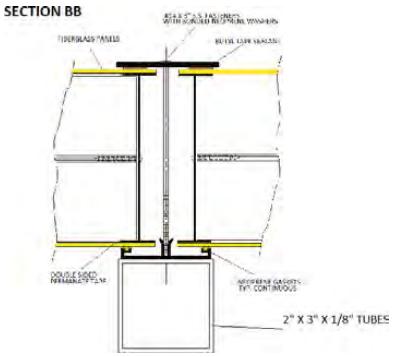
Our Titan Series is built for strength, quality, and versatility. This systems is glazed with 2 ¾ inch fiberglass sandwich panels and incorporate with a structural grid core that can be customized in different sizes and spacing. The Titan Series systems are highly efficient and designed to be utilized either as a sloped glazing system overhead, or as an efficient ver tical wall system.

GRID CORE PATTERNS









LUNA SERIES

GLAZED CANOPIES AND WALKWAYS

Our Luna Series features our latest design capabilities for glazed walkways, awnings and canopies. The system is highly customizable and can a accomodate a wide arrange of glazing materials to meet the design needs of the project. Whether it is a fully enclosed system, or a point supported system, we can make the vision come to life. Talk to our design team for more information.

APOLLO
INDUSTRIES

Apollo Industries Headquarters
13401 Murphy Road Suite B Stafford, Texas 7747

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F: 281-476-6446

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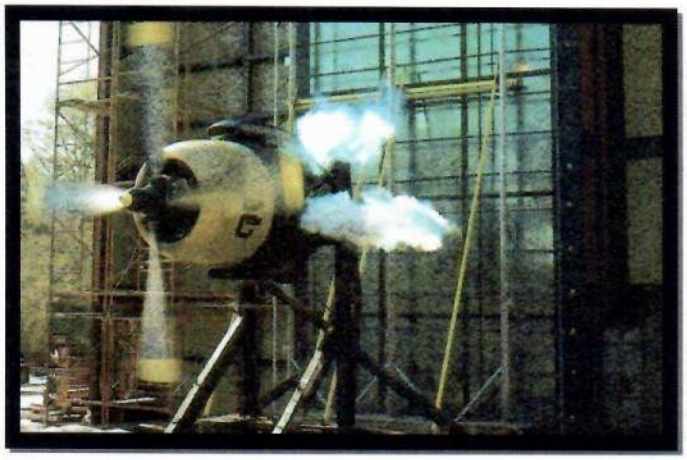
www.apolloskylights.com

CONSTRUCTION CONSULTING LABORATORY



Testing Methods and Standards AAMA 501-15 Test Report

Product/Type: Aluminum Curb Mounted Glass Glazed Skylight
Series Model: Apollo Industries Helios Skylight

Report: CCL 22-087

Test Completion: May 16, 2022

Apollo Industries Series Helios Metal Framed Skylight was shop constructed and glazed by Apollo Industries and installed by Lab staff at Construction Consulting laboratory (**CCL**) in Carrollton, Texas. The specimen was tested in accordance with the AAMA 501-15 'Methods of Test for Exterior Walls and achieved the results noted in the table below.

Product Type	Aluminum Helios Skylight/ Sloped Glazed Unit, **Product Drawings, Appendix A**		
Series Model	Helios Metal Framed Skylight	**Design**: +/-85.0 Psf	**Ft²**
Mock Up Size	Overall Width: 12'-8 ¼" (152.25")	**Length:** 8'-3 ¼" (99.25")	104.94
Configuration	3-bays wide		
Glazing	1/4" x 0.90" PVB x 1/4" Laminated Glass		
Glass DLO	3'-9 ½" (45.50") x 7'-10 ½" (94.50")	**DLO Ft²**	29.86
Tested Slope	3/12		

Test	Test Type	Pressure / Load / Dimension	Results
1	ASTM E 330: Preload / Uniform Load	+42.5 Psf 50% Test	No Damage
2	ASTM E 283: Air Infiltration / Static Pressure	6.24 Psf – Pos	< 0.06 Cfm/Ft²
3	ASTM E 331: Water Resistance / Static Pressure	15.0 Psf	No Water
4	ASTM E 330: Uniform Deflection/Uniform Load	+/-42.5 & +/-85.0 Psf [30 seconds]	No Damage
5	Repeat Air Infiltration Static Pressure	6.24 Psf – Pos	< 0.06 Cfm/Ft²
6	Repeat Water Resistance / Static Pressure	15.0 Psf	No Water
7	Structural Proof Load / Structural Uniform Load	+/- 127.5 Psf [30 seconds]	No Damage

The test specimen passed all tests listed above with no glass breakage or permanent deformation to the vertical or horizontal framing members.

TABLE OF CONTENTS

APPENDIXES

This report is not complete unless these drawings are stamped by **CCL** as illustrated below:

Sheet	Detail	Sheet	Stamped as Illustrated
1	Plan / Elevation	1	**Construction Consulting Laboratory** 1601 Luna Road Carrollton, Texas 75006 (972) 242-0556
2	Horizontal Vertical Section	2	
3	Pressure Plate	3	
4	Frame Member	4	
5	Exterior gasket	5	
6	Interior Knife Gasket	6	

1. PROJECT DATA

1.1. REPORT ISSUED

Apollo Industries	Stafford, Texas	832 672 3919

1.2. TEST LABORATORY AND LOCATION

Construction Consulting Laboratory (CCL)	Carrollton, Texas	972-242-0556

2. PROJECT SUMMARY

2.1. **Project:** AAMA 501 Laboratory Mock-Up Performance Testing

2.2. **Product Type:** Aluminum Skylight

2.3. **Series/Model:** Helios Metal Framed Glass Skylight

2.4. **Compliance Statement:** Results obtained are tested values and were secured by using the designated test methods in accordance with the requirements and methods noted in AAMA 501-15.

2.5. **Test Completion:** May 16, 2022

2.6. **Test Sample Source:** The specimen was installed by **CCL**. Reports, drawings, and project photographs will be retained by **CCL** for a minimum period of four (4) years from the test completion date.

2.7. **Drawing Reference:** The appended specimen drawings have been reviewed by **CCL** and are representative of the tested specimen.

2.8. **Observers:**

Witnessed By	**Representative (All or Partial Viewing)**		
Apollo Industries	Garry Humble		
CCL	Edsson Alarcon	Juvenal Azua	Wesley Wilson

3. TEST SPECIFICATIONS / METHODS

- **AAMA 501-15** "Methods of test for Exterior Walls"
  - **ASTM E 283-12 Air Infiltration:** "Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen".
  - **ASTM E 331-16 Static Water Penetration Resistance:** "Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference".
  - **ASTM E 330-14 Uniform Load Deflection and Proof Loading:** "Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference".

4. TEST EQUIPMENT

4.1. Test chamber consisted of 4" x 4" and 2" x 4" stud reinforced 3/4" thick plywood at the floors and walls and a double nominal 2" x 10" rim to provide support and sealing of the System curb. The chamber can be adjusted to meet clients request for slope and is accessible through a single bulkhead door.

4.2. Pressure differentials created with reversible pumps for positive/negative loading.

4.3. Chamber pressure differentials measured with manometers.

4.4. Air infiltration measured with a Meriam laminar flow element and inclined and digital manometers.

4.5. Water applied to the specimen from a spray rack equipped with swirl-type nozzles spaced two feet on center in vertical and horizontal directions, which under controlled pressure delivered a minimum of five gallons per square foot per hour on the specimen.

4.6. Structural deflections and permanent set values measured with Celesco string potentiometers.

5. TEST PROCEDURES / TEST ALLOWABLE

5.1. **Uniform Load Pre-Load per ASTM E 330:** Per project specs, there shall be no system failure and deflection of aluminum members at 50% of the Positive and Negative design load.

Procedure: Preload the at 42.5 Psf and maintain load for 30 seconds.

5.2. **Air Infiltration per ASTM E 283:** The total amount of air infiltration shall not exceed .06 Cfm/ Ft^2 based on the specimen overall size. 12'-8 ¼" wide by 8'-3 ¼" long = 104.94 Ft^2 x 0.06 CFM = 6.29 CFM - Allowed

Infiltration Procedure: The specimen shall be covered with 2-mil plastic sheet material and sealed with spray adhesive and duct tape to the chamber perimeter, thus allowing no movement of air through the specimen. The specimen shall be subjected to a positive pressure differential of 6.24 Psf to obtain a leakage rate for the test chamber. The plastic bag shall be removed, and the chamber pressurized to a positive 6.24 Psf to measure total air infiltration. The chamber infiltration shall be subtracted from the total air infiltration resulting in the infiltration rate of the test specimen, **Photo 1**.

5.3. **Static Water Penetration per ASTM E 331:** There shall be no water penetration during or at the conclusion of this test.

Procedure: Water shall be applied to the specimen at a minimum rate of 5 Gph/Ft^2, in such a way as to completely cover the exterior face of the specimen. Simultaneously, a specified positive static pressure of 15.0 Psf shall be applied for a minimum period of fifteen (15) minutes, **Photo 2.**

5.4. **Design Load Deflections per ASTM E 330:** Per project specs, there shall be no system failure and deflection of aluminum members at 100% of design load and shall not exceed the following:

Procedure: Preload the specimen 50% of the positive or negative DP. Once set, the indicators shall be set to zero. Positive and or negative loading, a pressure equal to 50% and then 100% of the DP shall be applied and maintained for 10 seconds per load. Between loads deflection shall be recorded.

TEST SPECIMEN DESIGN CRITERIA: +/- 85.0 Psf / 30- second load duration	
Rafter Span (L/175): 96.0" /175:	Allowable = 0.548" (inches)

5.5. **Repeat Air Infiltration** per ASTM E 283 at a Positive 6.24 Psf static test pressure

5.6. **Repeat Static Water Penetration** per ASTM E 331 at the specified pressure for a minimum duration of 15 minutes.

5.7. **Proof Load Residual** per ASTM E 330, there shall be no permanent deformation of the aluminum members that exceed 0.02% of span at 150% of design load.

Procedure: The specimen shall be preloaded to 50% of the positive or negative DP. Once set, the indicators shall be set to zero. Positive and or Negative loading, a pressure equal to 150% of the DP shall be applied and maintained for 10 seconds, pressure released, and permanent sets recorded.

TEST SPECIMEN PROOF LOAD / +/-127.5 Psf	
Rafter Span (L)/500: 96" / 500	Allowable = 0.192 (inches)

6. MOCK-UP DESCRIPTION

Product Type	Aluminum Helios Skylight, **Product Drawings, Appendix A**		
Series Model	Helios Metal Framed Skylight	**Design**: +/-85.0 Psf	**Ft²**
Test Method	AAMA 501-15 "Methods of Test for Exterior Walls"		
Mock Up Size	Overall Width: 12'-8 ¼" (152.25")	**Length:** 8'-3 ¼" (99.25")	104.94
Configuration	3-bays wide		
Glazing	1 3/8" Sealed Laminated Insulating Glass		
Glass DLO	3'-9 ½" (45.50") x 7'-10 ½" (94.50")	**DLO Ft²**	29.86
Tested Slope	12/3		

WEEP ARRANGEMENT: Internal condensate gutters at head, jambs and rafters control water into the sill gutter which weeps to the exterior through a 316" weep hole in-line to rafter.

GLASS: 1/4" x 0.90" PVB x 1/4" Laminated Glass.

GLASS GLAZING: Glass lites are exterior set and capture glazed using aluminum pressure plates and EPDM gaskets, preset glazing at interior and preset retainer at exterior pressure plates. Pressure plate secured to the framing members with #14 x 1 ½" hex washer head, rubber gasketed screws spaced on 6" centers at the jambs, head (up slope) and rafters. Glass is sealed to the frame at sill (down slope) with a heal bed of GE SilPruf SCS-2000 structural silicone. Once glazed, the pressure plates are covered with an aluminum face cap and wet sealed with GE SilPruf SCS-2000 to glass and frame members

PERIMETER SEALANT: Aluminum coping sealed to frame perimeter and curb with GE SilPruf SCS-2000 silicone. Coping is anchored to curb full perimeter with 5/16 x 1" hex head screws spaced approximately 2" from each end and on 24" centers.

INTERNAL SEALANT: Frame set into a bed of GE SilPruf SCS-2000 silicone applied to the jamb and rafter structural tubing. Cross section of condensate gutters sealed with GE SilPruf SCS-2000 silicone.

REINFORCEMENT: Aluminum Tube 2" x 2" x 0.125" thick at frame jambs and head (up slope). Aluminum Tube 2" x 6" x 0.188" thick at rafters. Aluminum channel 2" x 3" x 0.125" thick below frame sill (down slope) attached to curb with 5/16 x 1" hex head Tek screws. Rafters attached to curb using 2" x 3" x 0.125" thick aluminum angle set at each side and secured to curb and rafter with four (4) 5/16 x 1" hex head Tek screws per angle, two (2) per substrate.

ANCHORAGE: Frame members attached to curb and rafter support tubes with #14 x 1 ½" hex washer head, rubber gasketed screws set in pairs and spaced 6" from each end and on 12" centers.

7. TEST RESULTS

METHOD	TITLE OF TEST	TEST PRESSURE	MEASURED	ALLOWED
ASTM E 330	Uniform Pre-Load	Positive 42.50 Psf	No Damage	No Damage
ASTM E 283	Air Infiltration	Positive 6.24 Psf	0.02 Cfm/ft²	0.06 Cfm/ft²
ASTM E 331	Water Resistance [N1]	Positive 15.0 Psf	No Leakage	No Leakage
ASTM E 330	Uniform Load Deflection [N2]	Pos/Neg 85.0 Psf	No Damage	No Damage

50% and 100% Positive / Negative 85.0 Psf DP (30-Second Duration All Loads)

	+42.5 Psf			+85.0 Psf			-42.5 Psf			-85.0 Psf			Allowed
Ind.	Total	Set	Net	Total	Set	Net	Total	Set	Net	Total	Set	Net	
1	0.06	0.01		0.17	0.05		0.10	0.05		0.18	0.06		
2	0.32	0.01	.245	0.67	0.03	.500	0.35	0.04	.265	0.68	0.04	.520	.548
3	0.09	0.00		0.17	0.00		0.07	0.01		0.14	0.01		

ASTM E 283	Air Infiltration	Positive 6.24 Psf	0.02 Cfm/ft²	0.06 Cfm/ft²
ASTM E 331	Water Resistance [N1]	Positive 15.0 Psf	No Leakage	No Leakage
ASTM E 330	Uniform Proof Load [N2]	Pos/Neg 127.5 Psf	No Damage	No Damage

150% Positive / Negative 127.50 Psf DP (30-Second Duration All Loads)

	+85.0 Psf			+127.50 Psf			-85.0 Psf			-127.50 Psf			Allowed
Ind.	Total	Set	Net	Total	Set	Net	Total	Set	Net	Total	Set	Net	
1	0.17	0.05		0.25	0.05		0.18	0.06		0.22	0.05		
2	0.67	0.03	.01	0.95	0.08	.045	0.68	0.04	.01	0.90	0.08	.035	.192
3	0.17	0.00		0.20	0.02		0.14	0.01		0.20	0.04		

Note 1: *Water resistance testing was performed with the specimen set to a 3 on 12 slope.*
Note 2: Plastic sheeting was not used to achieve the noted uniform test loads.

8. DISCLAIMER

The performance results were achieved by using the designated test methods. This report does not constitute certification of this product or product line.

Respectfully submitted,

CONSTRUCTION CONSULTING LABORATORY

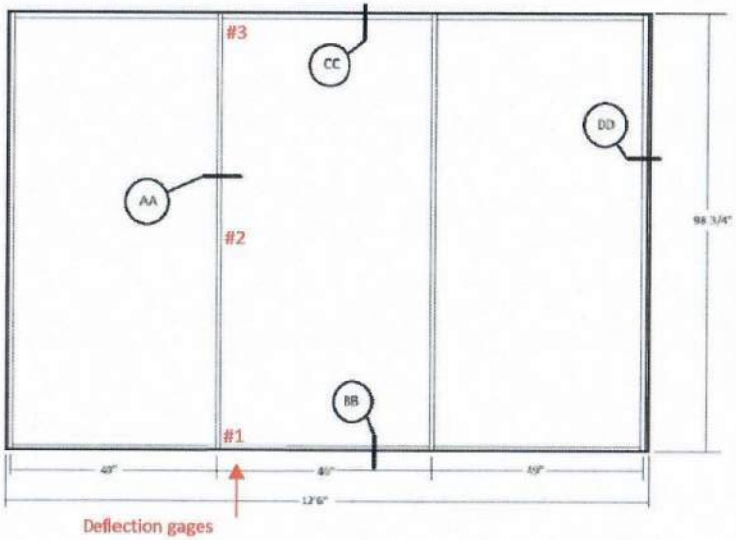
EDSSON ALARCON
TESTING MANAGER
Signed Electronically

WESLEY WILSON
LABORATORY MANAGER
Signed Electronically

APPENDIX A

Sheet	Detail	Sheet	Stamped as Illustrated
1	Plan / Elevation	1	**Construction Consulting Laboratory** 1601 Luna Road Carrollton, Texas 75006 (972) 242-0556
2	Horizontal Vertical Section	2	
3	Pressure Plate	3	
4	Frame Member	4	
5	Exterior gasket	5	
6	Interior Knife Gasket	6	

Construction Consulting Laboratory
1601 Luna Road
Carrollton, Texas 75006
(972) 242-0556



SPECIFICATIONS:

ALUMINUM: TO BE 6063 T6 EXTRUDED ALUMINUM.
GLAZING FRAME TO BE MIN. 0.078 WALLS
STRUCTURAL TUBES TO HAVE MIN. 1/8" WALLS
FORMED FLASHINGS TO BE 0.040

GLAZING: TO BE LAMINATED GLASS PANELS
1/4" OVER 1/4" HEAT STRENTHENED WITH
0.090 PVB INNER LAYER

FINISH:

GASKETES: TO BE EPDM EXTRUDED GASKETS, TYPICAL
CONTINUOUS, BLACK IN COLOR

SEALANTS: TO BE "G.E. SILPRUF".

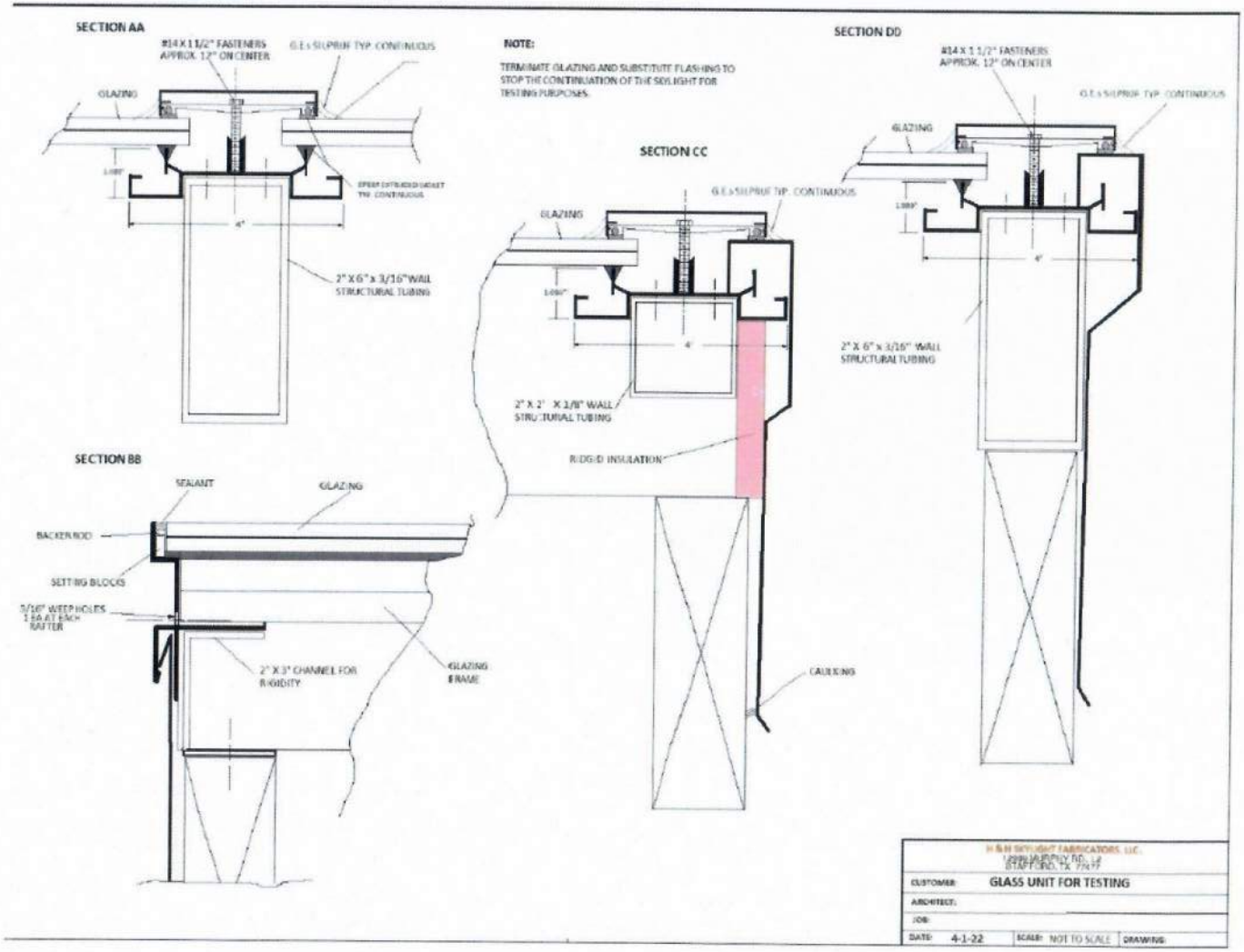
FASTENERS: TO BE STAINLESS STEEL FASTENERS
WITH BONDED NEOPRENE WASHERS.
STRUCTUAL FASTENERS TO BE CADMIUM
COATED SCREWS.

DESIGN LOADS :

H & H SKYLIGHT FABRICATORS, LLC.
13401-A MURPHY RD.
STAFFORD, TX. 77477

CUSTOMER:	GLASS SKYLIGHT TESTING
ARCHITECT:	
JOB:	
DATE:	SCALE: NOT TO SCALE DRAWING:

Construction Consulting Laboratory
1601 Luna Road
Carrollton, Texas 75006
(972) 242-0556



Construction Consulting Laboratory
1601 Luna Road
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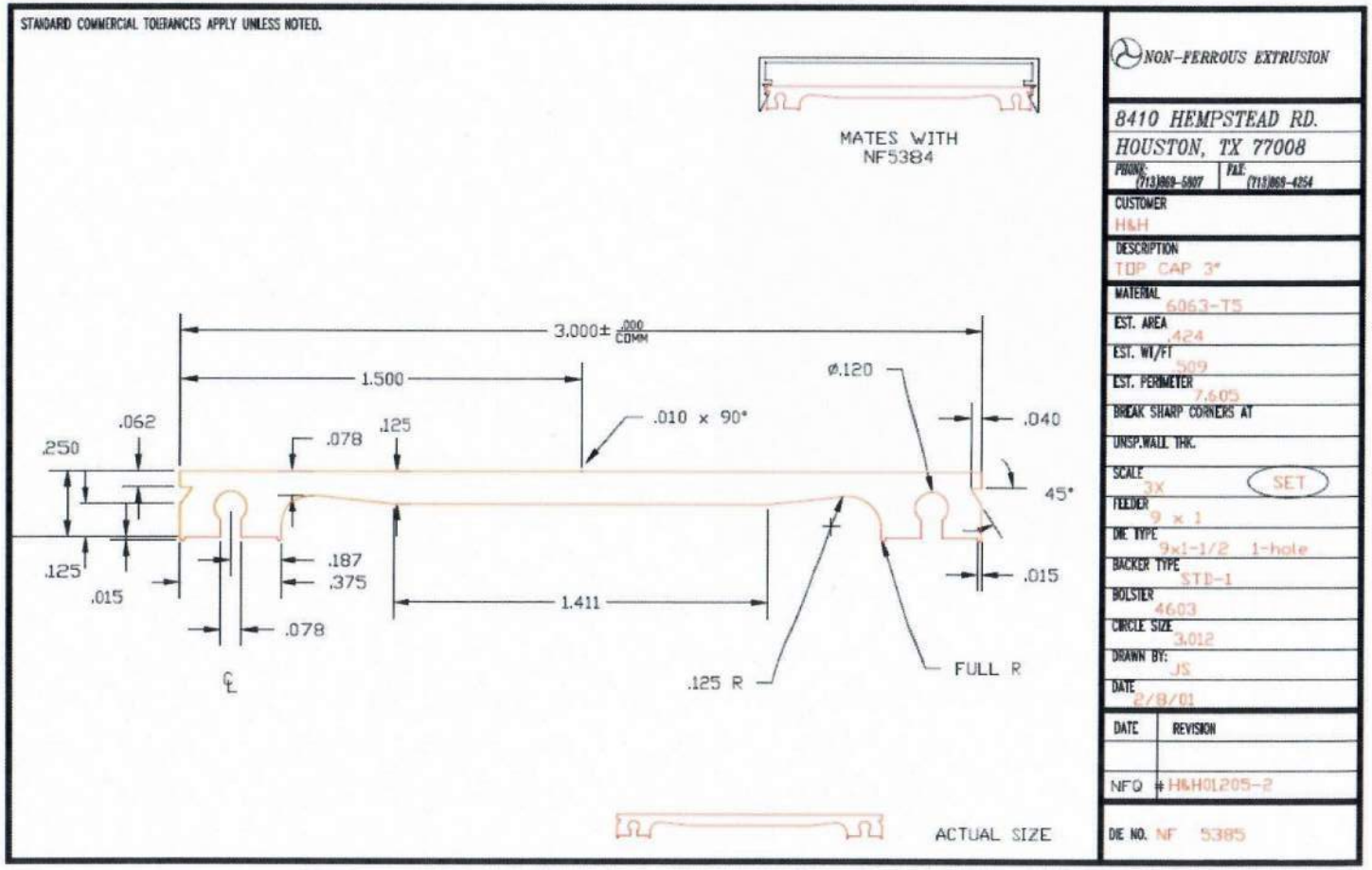
(972) 242-0556



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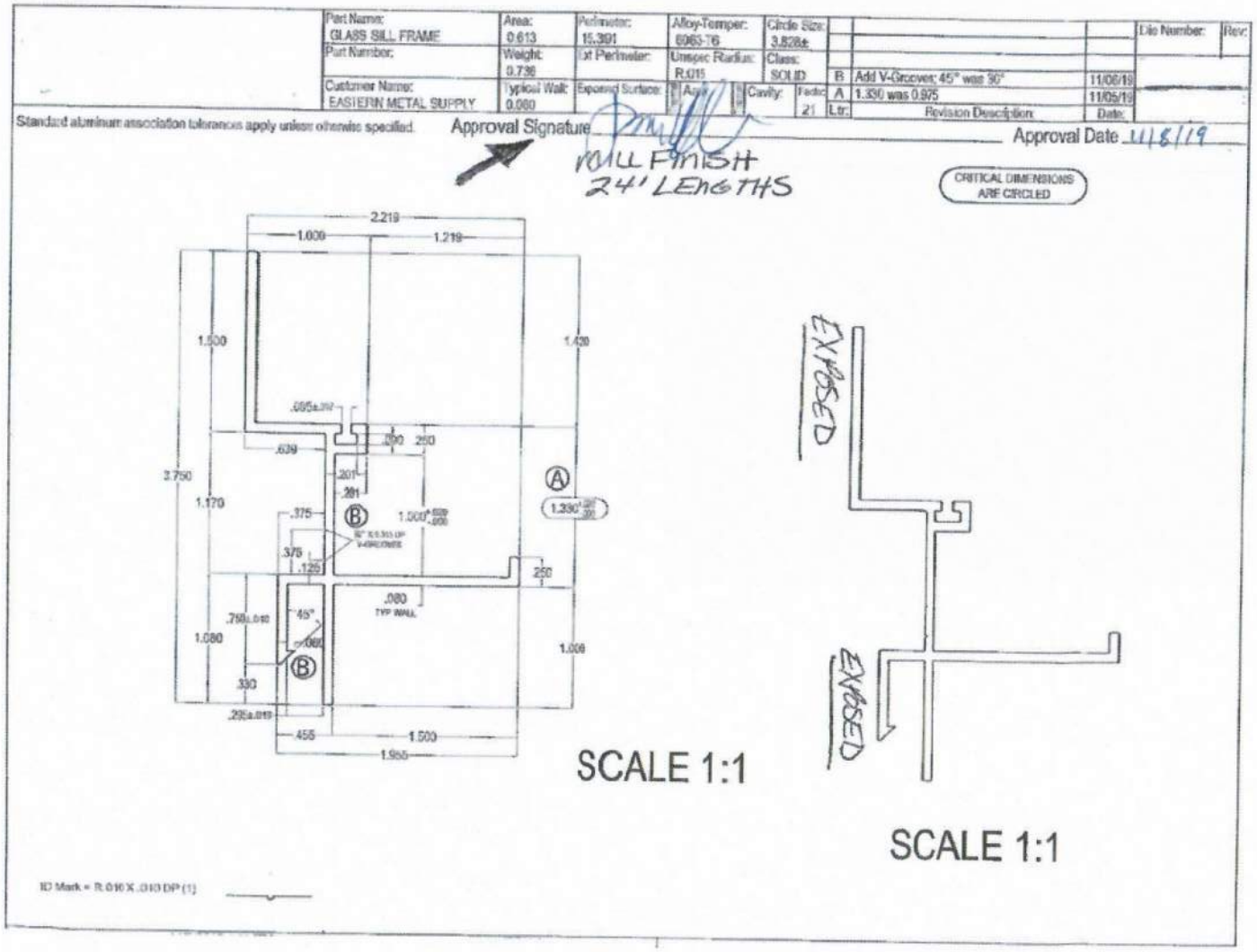

Construction Consulting Laboratory
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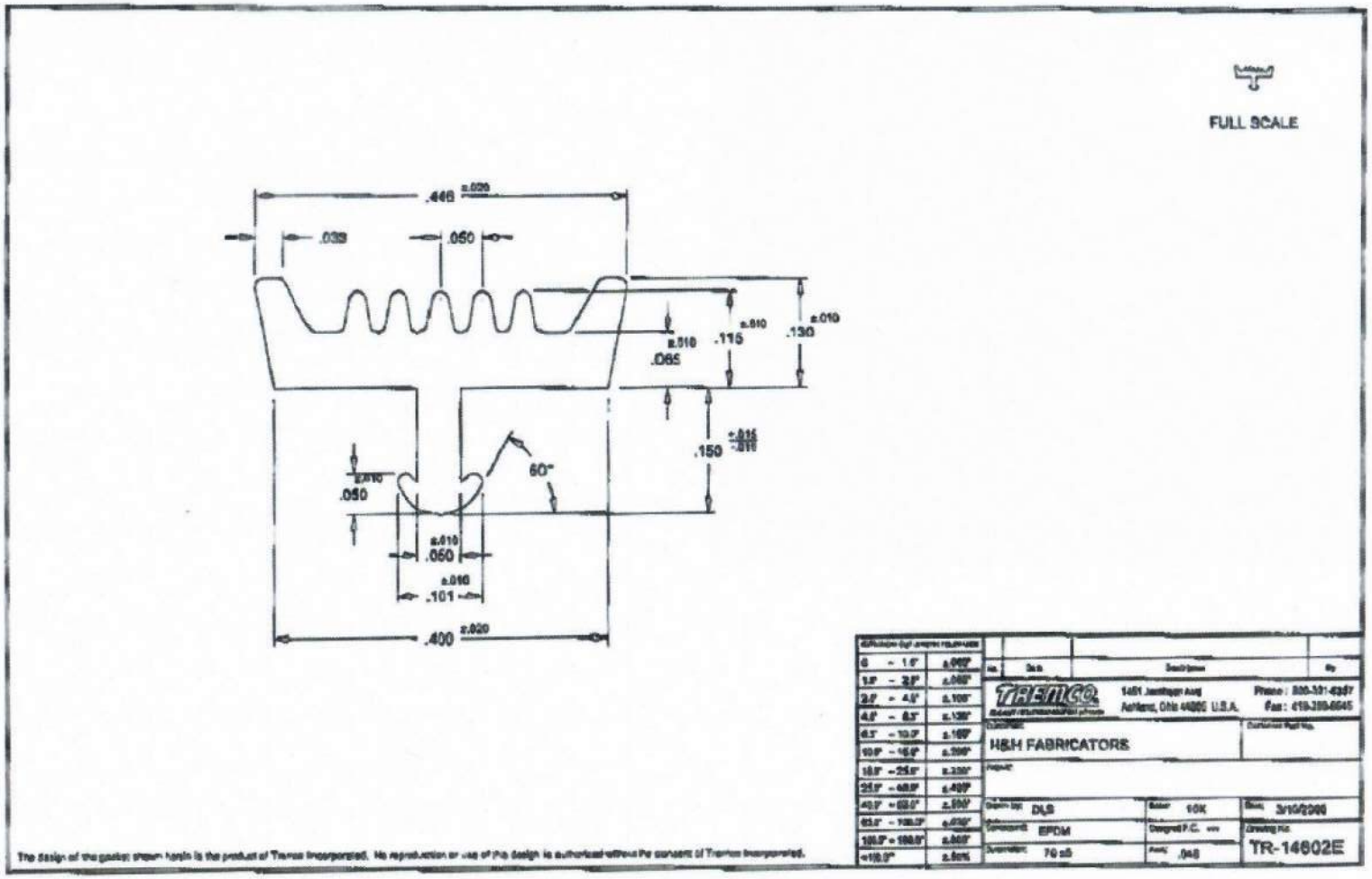

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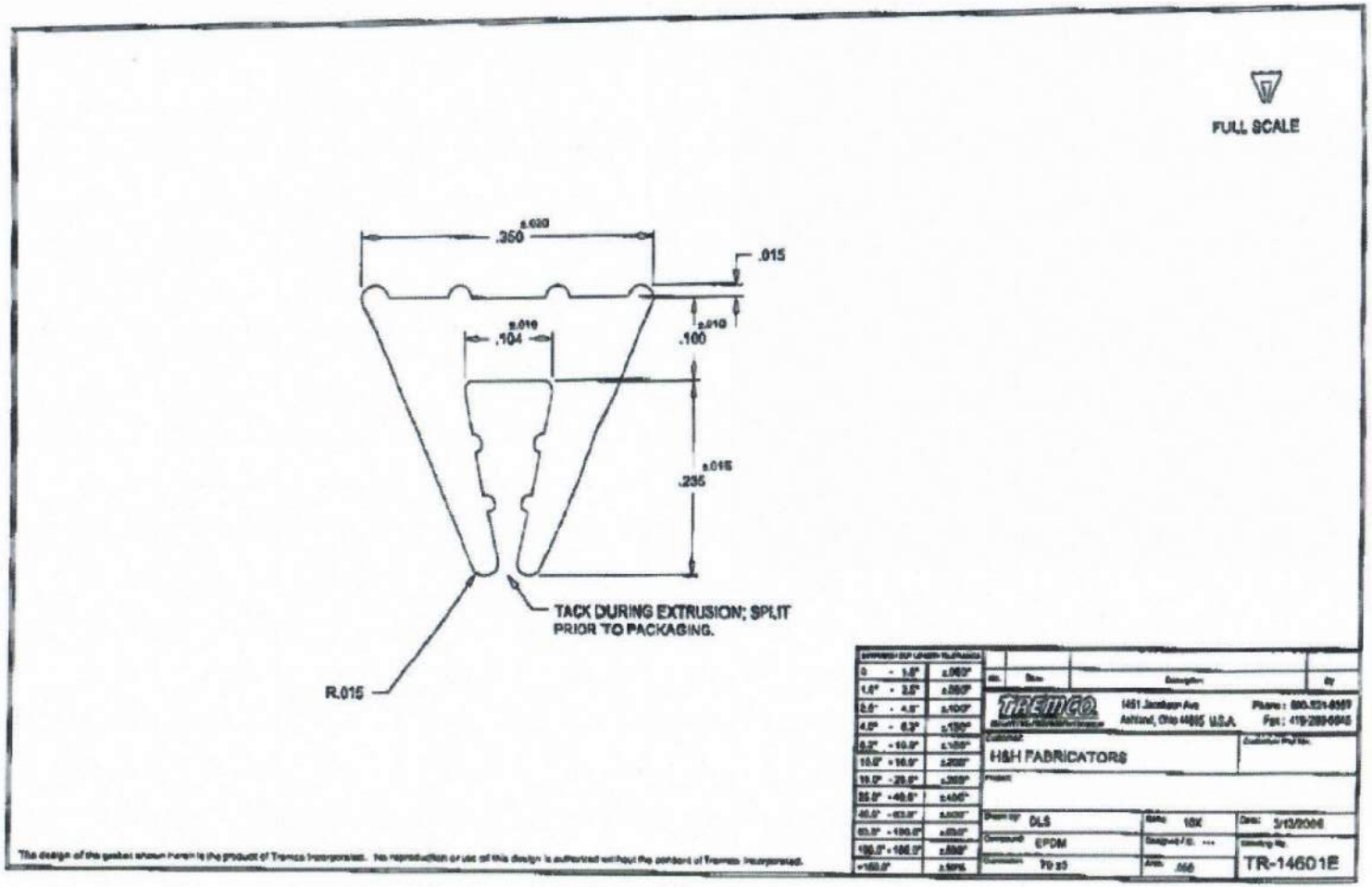


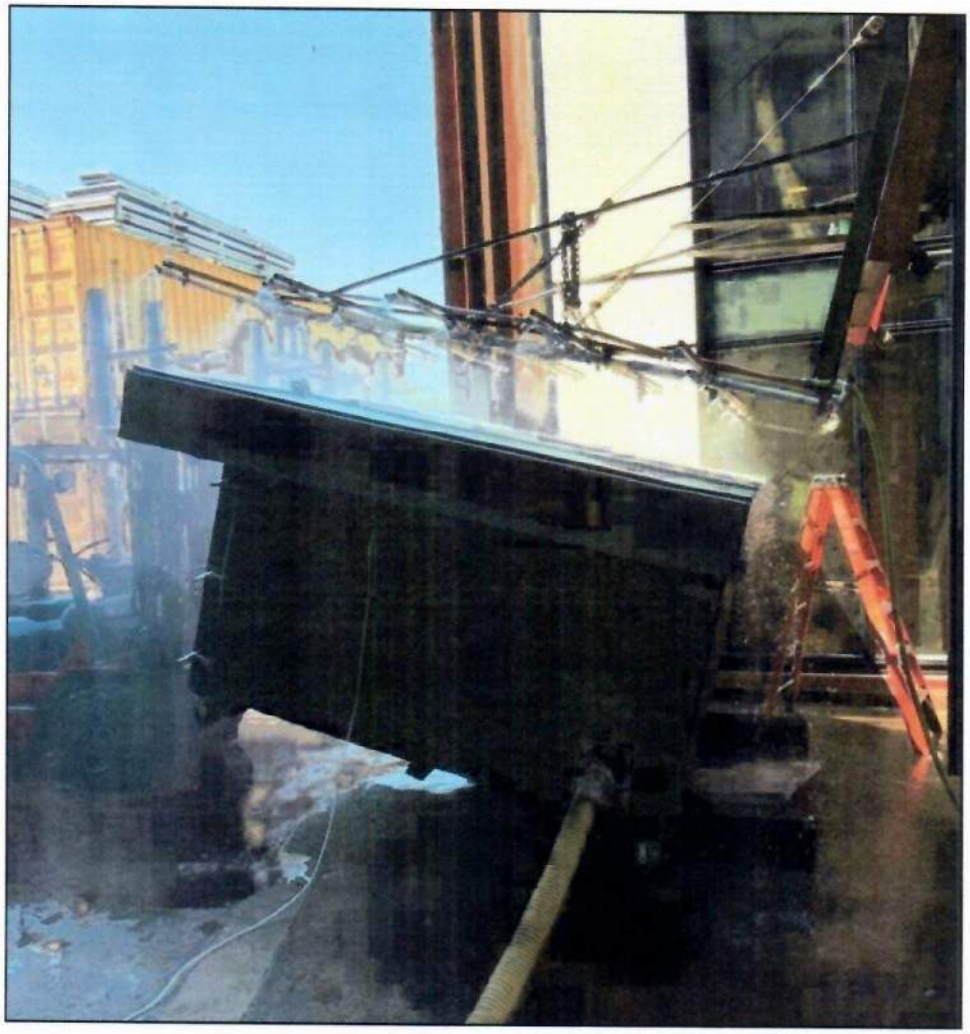
APPENDIX B

PHOTOGRAPHS

Photograph 1

Air Infiltration per ASTM E 283: The total amount of air infiltration shall not exceed .06 Cfm/ Ft² based on the specimen overall size. 12'-8 ¼" wide by 8'-3 ¼" long = 104.94 Ft² x 0.06 CFM = 6.29 CFM - Allowed

Infiltration Procedure: The specimen shall be covered with 2-mil plastic sheet material and sealed with spray adhesive and duct tape to the chamber perimeter, thus allowing no movement of air through the specimen. The specimen shall be subjected to a positive pressure differential of 6.24 Psf to obtain a leakage rate for the test chamber. The plastic bag shall be removed, and the chamber pressurized to a positive 6.24 Psf to measure total air infiltration. The chamber infiltration shall be subtracted from the total air infiltration resulting in the infiltration rate of the test specimen.



Photograph 2

Static Water Penetration per ASTM E 331: There shall be no water penetration during or at the conclusion of this test.

Procedure: Water shall be applied to the specimen at a minimum rate of 5 Gph/Ft², in such a way as to completely cover the exterior face of the specimen. Simultaneously, a specified positive static pressure of 15.0 Psf shall be applied for a minimum period of fifteen (15) minutes

-END OF REPORT-

Impact and Static Load Testing on Skylight

For

Apollo Industries

Aluminum Frame Glazed Skylight

FINAL REPORT
8.20.2020

Zero/Six Consulting, LLC.
1027 Tremont St. Galveston, TX 77550
z6consulting.com

PROJECT DATA

Testing Agency:	Zero/Six Consulting, LLC
Project:	Aluminum Frame Glazed Skylight
Project Location:	Z6 Shop 1027 Tremont St. Galveston, TX 77550
Client/Requester:	Apollo Industries
Client Contact:	Jason Humble 832.672.3919
Date(s) of Testing:	8.19.2020
Tests Performed:	Impact Load Test Static Load Test
Date of Report:	8.20.2020
Report Author(s):	Jeffrey T. Bishop, PE

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Zero/Six Consulting, LLC (ZSC), was commissioned by Apollo Industries to perform load testing on their aluminum framed glazed skylight.

The test load was dictated by previous experience, and a structural engineer of record working with Apollo on upcoming projects. For the skylight to be used as a cover to protect from falling through the hole, it must meet requirements from OSHA 1910.29(e)(1) – *Is capable of supporting without failure, at least twice the maximum intended load that may be imposed on the cover at any one time.* The structural engineer of record suggested 600 lb., since the IBC (International Building Code) concentrated live load requirement for roofs is 300 lb. Due to the potential nature of a fall onto the skylight, impact testing was also performed beginning at 3' height with a 200 lb. sand bag.

The skylight passed the initial impact test from 3' height with 200 lb. (600 ft.-lb.) with no visible damage. Then the skylight was loaded to 600 lb. static load for 60 seconds without any visible damage, when the load was removed the lite and frame did not appear to have any visible permanent deformation. Additional impact tests were performed on the same specimen from 4', 5', 6', 7', and 8' height, the 200 lb. bag did not penetrate through the glazed skylight opening. Although at these heights some visible permanent deflection was observed on the framing members, the glazing did not have any visible damage.

F-18971

8.20.2020

TEST SPECIFICS

Test Dates: 8.19.2020

Test Methods: Impact Load, Static Load

Specimen

Specimen Dimensions: Attachment A

4’ width between glazing mullions

8’ length, with one end standard base connection and the other end left open

9/16” glazing (tempered, laminated glass, 1/4” clear, 0.060 inner layer, 1/4: clear)

Manufacturer: Apollo Industrial

Model: 2X3 aluminum tube frame with standard pressure plates

Environmental Conditions

8.19.2020

Temperature: 89°F

Humidity: 57%

Wind: (indoor) none
(outdoor) 8 mph

Conditions: None

TEST SUMMARY

Test #	Load (lb.)	Height (ft.)	Energy (ft.-lb.)	Type	Result
1	200	3	600	Impact	No damage
2	600			Static	No damage
3	200	4	800	Impact	Slight deflection in members
4	200	5	1000	Impact	Additional deflection in members
5	200	6	1200	Impact	Additional deflection in members
6	200	7	1400	Impact	Additional deflection in members
7	200	8	1600	Impact	Additional deflection in members

All tests were performed on the same skylight specimen. The 200 lb. sand bag did not penetrate through the skylight at any test, nor was there any visible damage to the glazing. The final deflection of the tube members was measured at approximately 2-1/4” at the center.

PHOTOGRAPHS

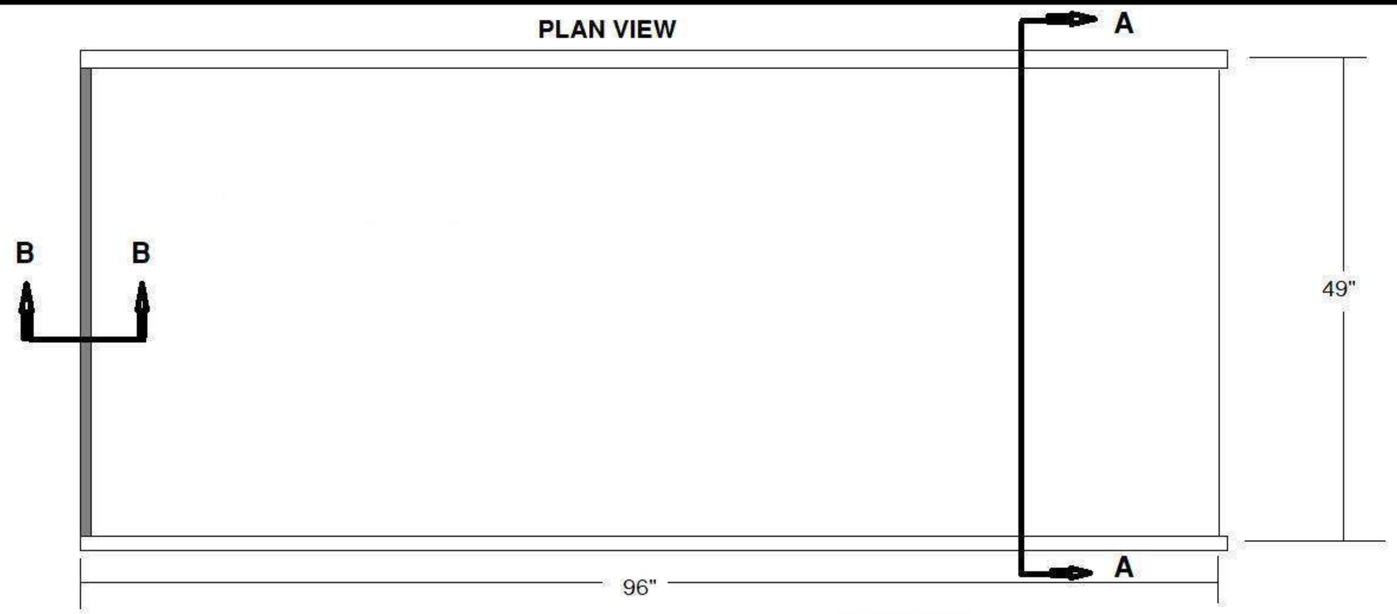
200 lb. sand bag dropped from 3' at moment of impact on the center of the glazed skylight.		
1	**Test 1 8.19.2020**	
Static load testing with 600 lb. applied for 60 seconds.		
2	**Test 2 8.19.2020**	

After final test, 200 lb. bag dropped from 8’ height. Deflection in members was observed, and was permanent. Bag did not penetrate specimen, nor was there any visible damage to glazing.		
3	**Test 7 8.19.2020**	

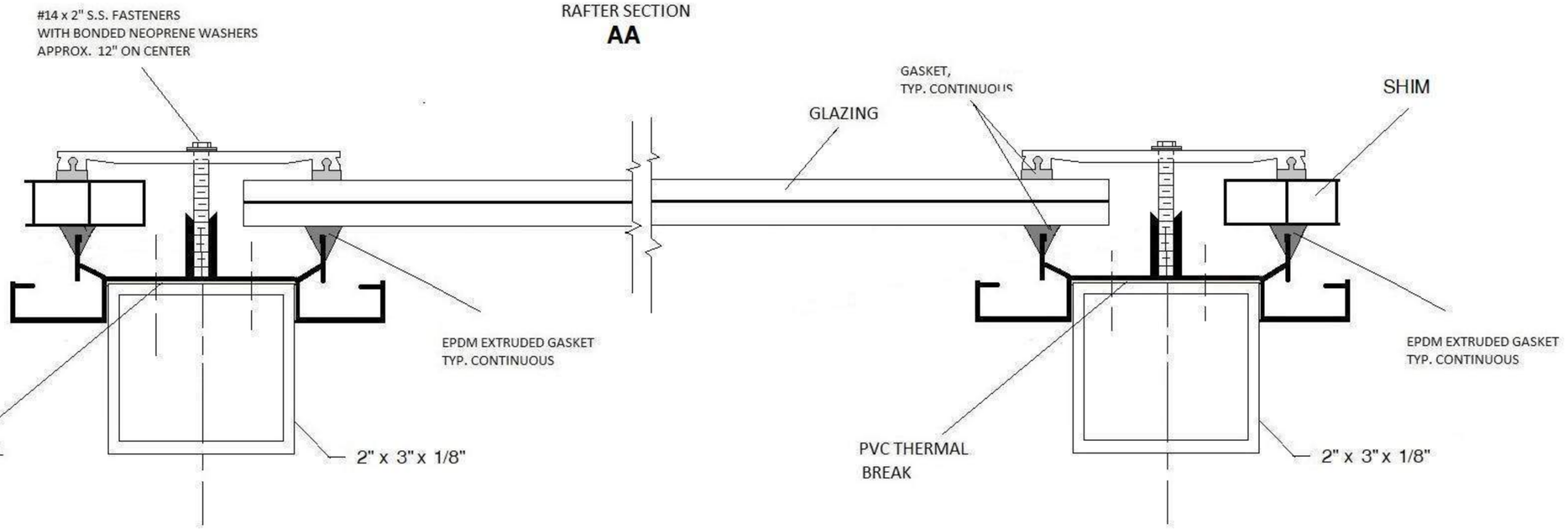
Attachment A

8.20.2020

PLAN VIEW



RAFTER SECTION
AA



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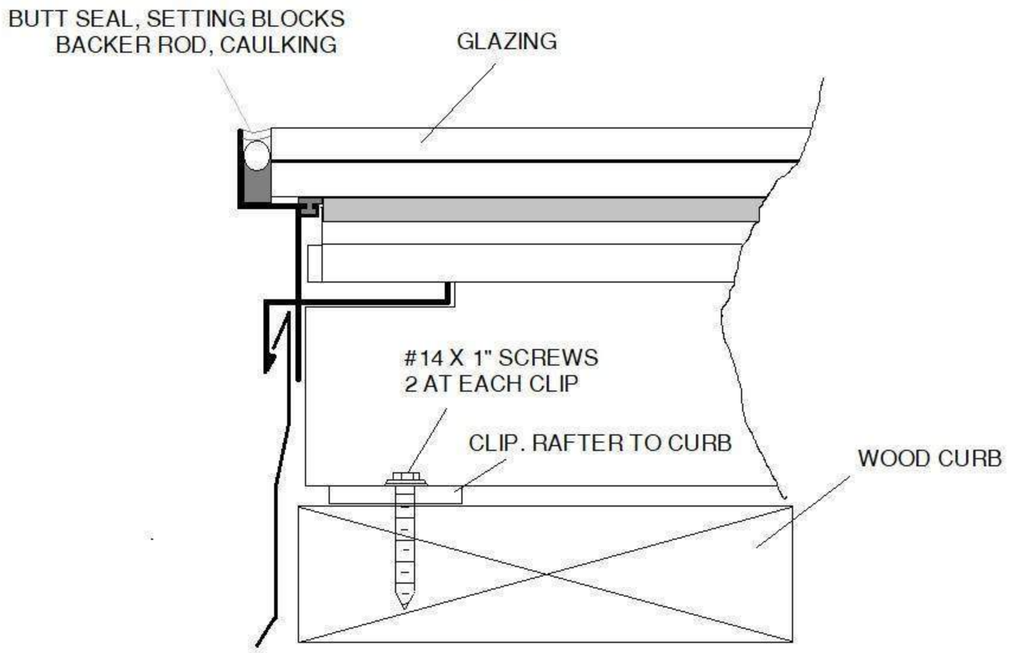


NOTES:

ALUMINUM: TO BE 6063 T6 EXTRUDED ALUMINUM FRAME.
FLASHING TO BE 5000 SERIES FORMED ALUM.

GLAZING: TO BE TEMPERED, LAMINATED GLASS
1/4" CLEAR TEMPERED, 0.060 INNER LAYER, 1/4" CLEAR TEMPERED. 9/16" OVERALL

H & H SKYLIGHT FABRICATORS, LLC.
12999 MURPHY RD. L2
STAFFORD, TX. 77477

CUSTOMER:

ARCHITECT:

JOB:

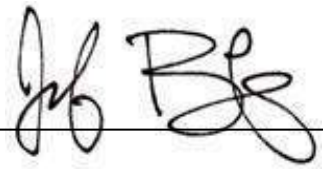
DATE:

END OF REPORT

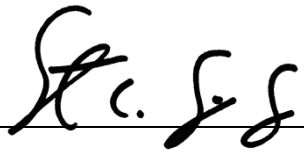
Electronic Copy

Or

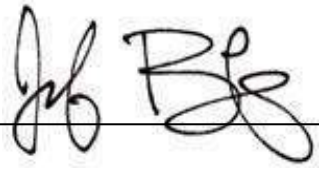
Hard Copy #_____

Written By: 

Jeffrey Bishop, PE

Reviewed By: 

Steven C. Singleton

Approved By: 

Jeffrey Bishop, PE