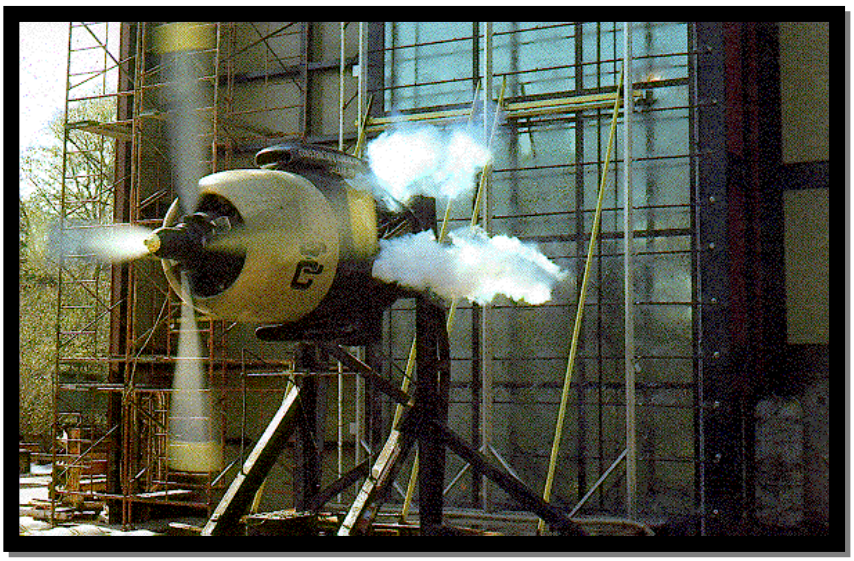
CONSTRUCTION CONSULTING LABORATORY



AAMA 501-15 Performance Test Report

Product/Type: Thermally Broken Aluminum Storefront
Series Model: Atlas Series 2000T Thermal

Report: CCL 20-101

Test Completion: May 28, 2020

Prepared for

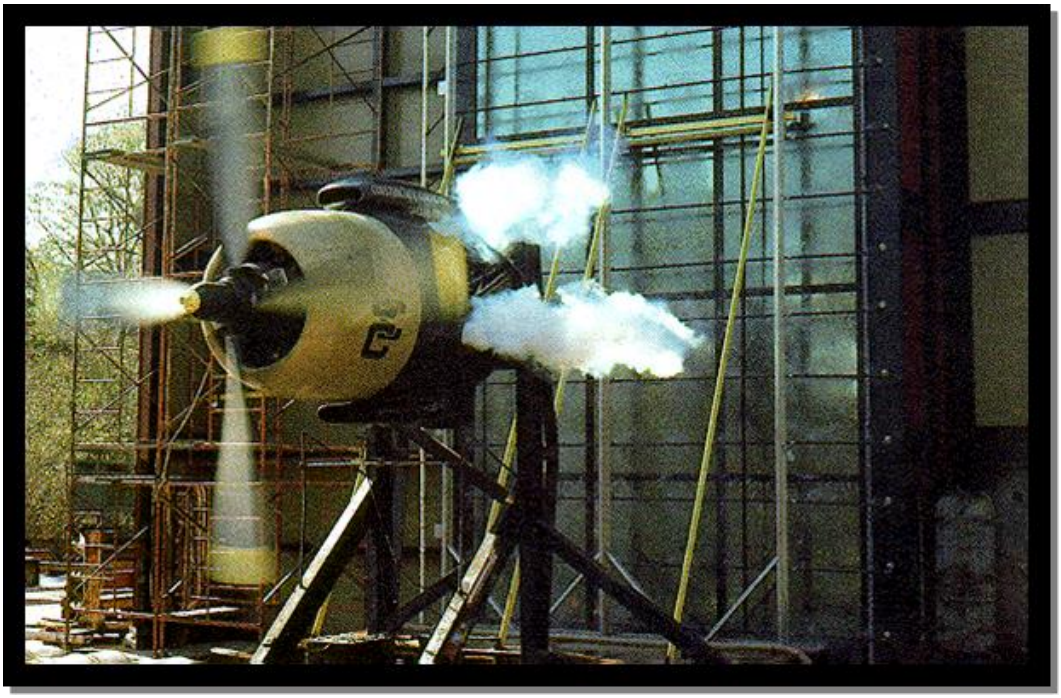
ATLAS ARCHITECTURAL METALS, INC.

Atlas Architectural Metals
9210 Emmott Rd
Houston, TX 77040
Phone: 713-869-9551

S- UNITED, INC.
A Quality Control Company

CONSTRUCTION CONSULTING LABORATORY
AAMA 501-15 (AWS) PERFORMANCE TESTING
CLIENT: ATLAS ARCHITECTURAL METALS
SERIES: 2000T (THERMALLY BROKEN)

REPORT #: CCL 20-101
DATE: 6-17-20
PROJECT: PERFORMANCE MOCK-UP



Atlas Glass and Metal Series 2000T Storefront window system is a thermally broken stick-built exterior glazed window wall system designed by Atlas Glass and Metal and installed by an Atlas Glass sub-contractor at Construction Consulting Laboratory (CCL) in Carrollton, Texas. The mock-up was constructed with an overall width and height of 15'-1/4" wide by 10'-7 3/8" tall. The specimen was tested in accordance with the AAMA 501-15 "Methods of Test for Exterior Walls" and per the ASTM methods listed below and achieved the results noted in the table below.

Atlas Series 2000T Thermally Broken Storefront			
Test	**Test Type**	**Pressure / Load / Dimension**	**Results**
1	ASTM E 330: Preload / Uniform Load	10 Psf 50% Pos Design	No Damage
2	ASTM E 283: Air Infiltration / Static Pressure	6.24 Psf – Pos	< 0.06Cfm / Ft²
3	ASTM E 283: Air Exfiltration / Static Pressure	6.24 Psf – Neg	< 0.06Cfm / Ft²
4	ASTM E 331: Water Resistance / Static Pressure	12 Psf	No Leak Noted
5	ASTM E 330: Uniform Deflection / Uniform Load	Pos/Neg 20 Psf	No Damage
6	Repeat Air Infiltration Static Pressure	6.24 Psf – Pos	< 0.06Cfm / Ft²
7	Repeat Air Exfiltration Static Pressure	6.24 Psf – Neg	< 0.06Cfm / Ft²
8	Repeat Water Resistance / Static Pressure	12 Psf	No Leak Noted
9	Structural Proof Load / Structural Uniform Load	Pos/Neg 30 Psf	No Damage
The test specimen passed all tests listed above with no glass breakage or permanent deformation to the vertical or horizontal framing members.			

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APPENDIXES

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

Sheet	Detail	Date	Stamped as Illustrated
1	Elevation / Plan / Section	Not Dated	Construction Consulting Laboratory1601 Luna Road Carrollton, Texas 75006 (972) 242-0556

1. PROJECT DATA

1.1. **REPORT ISSUED**

Atlas Architectural Metals	Houston, Texas	713-869-9551

1.2. **TEST LABORATORY and LOCATION**

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

2. PROJECT SUMMARY

2.1. **Project:** AAMA 501-15 Laboratory Mock-Up Performance Testing

2.2. **Product Type:** Thermally Broken Aluminum Storefront

2.3. **Series/Model:** 2000T (Thermally Broken)

2.4. **Compliance Statement:** Results obtained are tested values and were secured by using the designated test methods. The mock-up was tested per AAMA 501-15 "Methods of Tests for Exterior Walls".

2.5. **Test Completion:** May 28, 2020

2.6. **Test Sample Source:** The test specimen was built and installed at **CCL** using lineal and parts provided by Atlas Architectural Metals. 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 installation photographs and installation of the tested specimen.

2.8. **Observers:**

Witnessed By	**Representative (All or Partial Viewing)**		
CCL	Edsson Alarcon	Dakota Poole	Juvenal Azua

3. TEST SPECIFICATIONS / METHODS

- **AAMA 501-15** "Methods of Tests for Exterior Walls and Project specifications"
  - **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 steel reinforced wood walls, floor and roof and was 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 with 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 variations measured with Celesco String Potentiometers located throughout the test specimen.

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 design load.

Procedure: Preload the specimen 50% of the positive DP and maintain load for 10 seconds.

5.2. **Air Infiltration per ASTM E 283:** The total amount of air infiltration shall not exceed .06 Cfm/ ft² of the curtain wall. Mock-up overall test size 15'-¼" wide by 10'-7 3/8" high = 159.44 Ft² x 0.06 CFM = 9.56 CFM – Allowed.

Infiltration Procedure: The specimen shall be covered with 4-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**.**

5.3. **Air Exfiltration per ASTM E 283:** The total amount of air exfiltration shall not exceed 0.06 Cfm/ ft² of the curtain wall area tested 15'-¼" wide by 10'-7 3/8" high = 159.44 Ft² x 0.06 CFM = 9.56 CFM - Allowed

Exfiltration Procedure: The chamber and PMU are pressurized to a negative differential pressure of 6.24 Psf to obtain a total exfiltration rate. The chamber infiltration tare is subtracted from the total exfiltration rate to obtain a calculated exfiltration rate for the PMU.

5.4. **Static Water Penetration per ASTM E 331:** Per project specifications, 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 shall be applied for a minimum period of fifteen (15) minutes.

5.5. **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 / Positive / Negative at Design Pressure	
Vertical mullion span (L/175): 127.375" /175:	Allowable = 0.728**"** (inches)
Horizontal span (L/175): 57.417" / 175:	Allowable = 0.328**"** (inches)

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

5.7. **Repeat Air Exfiltration per ASTM E 283 at a Negative 6.24 Psf static test pressure**.

5.8. **Repeat Static Water Penetration per ASTM E 331:** Per project specifications at the specified pressure for a minimum duration of 15 minutes.

5.9. **Proof Load Residual per ASTM E 330:** Per project specs, 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 / Positive 30 Psf / Negative 30 Psf	
Mullion Span (L)/500: 127.375" / 500	Allowable = 0.255 (inches)
Horizontal Span (L)/500: 57.417" / 500	Allowable = 0.118 (inches)

6. MOCK-UP DESCRIPTION

Product Type:	Aluminum Thermally Broken Storefront, **Product Drawings, Appendix A**		
Series Model:	Atlas 2000T	**Design**: +/-20 Psf	**Square Feet**
Mock Up Size:	Overall Width: 15'-¼" (180.25")	**Height:** 10'-7 3/8" (127.375")	159.44 Ft²
Configuration:	3-bay wide / 3-lites per bay, Elevation, **Sheet 1, Appendix A**		

WEEP ARRANGEMENT: 5/16" weep holes spaced at ¼-points of glass DLO through sill exterior leg.

GLASS: Vision glass manufactured by Oldcastle BuildingEnvelope. All glass is 1" Sealed Insulating Glass ¼" tempered outboard, 1/2" air spacer seals and ¼" tempered in board.

GLASS GLAZING: Glass lites are exterior set and supported on 3" setting blocks (Part # 9104) at 1/4 points of glass DLO. Silicone interior preset and exterior wedge glazing gasket (Part # 9100) used at glass, full perimeter. Interior gasket sealed with Dow Corning DOWSIL 795 (DC-795) silicone applied a minimum of 2" in each direction at the corners and between ends of gaskets. Interior gasket reglet at frame sill sealed continuous of glass DLO and turned up jambs and vertical members 2" prior to setting gasket. Exterior gasket installed after glass is set and retained at bottom edge with aluminum glass stop part# 2004.

PERIMETER SEALANT: Frame perimeter sealed to chamber steel members with backer rod and Dow Corning DC-795 silicone full perimeter. Interior bead not installed for purposes of testing.

INTERNAL SEALANT: See Glazing. Frame starter sill anchor bolts sealed with DC 795 sealant below head and capped over head during starter installation. DC 795 Sealant applied to each end of intermediate horizontal to vertical members, jambs, and intermediates during fabrication. Sealant squeeze out was tooled to aluminum at the exterior face and scraped off at interior side of glazing. exterior face of shear blocks prior to setting horizontal. Starter's aluminum end dams sealed to starter at interior and exterior side prior to setting member. All exposed fasteners are sealed with DC 795 silicone. Aluminum water diverters, deep pocket and shallow pocket, are set in and sealed over with DC 795.

REINFORCEMENT: None

ANCHORAGE: Frame members attach to chamber 3/8" thick tube steel with Drill-Flex ¼-20 x 4" hex washer head fasteners bolts. Anchors at starter are stagger set on 12" centers at the interior and exterior side of the thermal break starting 3" from each end. Frame head anchors are set in pairs spaced 2" and 4" off jambs and each side of the vertical mullion. Frame jambs anchors pairs spaced 3" off head and sill and at each side of the intermediate horizontal.

OTHER FEATURES: Vertical members connect to horizontal screws splines with two (2) #10-1" Phillips pan head screws per connection. Frame members are poured and de-bridged thermally broken with polyurethane.

DESCRIPTION DISCLAIMER: The written description is based on the appended drawings and install photographs taken during installation. Field assembly or installation deviations from that reported is the responsibility of the manufacturer.

7. PERFORMANCE RESULTS

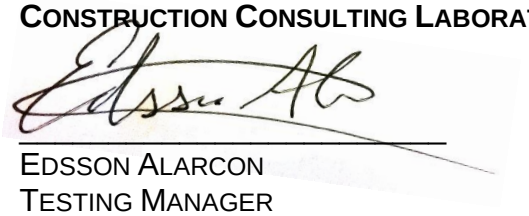
Method	Title of Test	Test Pressure	Measured	Allowed
ASTM E 330	Uniform Pre-Load	Positive 20 Psf	No damage	No Damage
ASTM E 283	Air Infiltration	Positive 6.24 Psf	0.03 Cfm/ft^2	0.06 Cfm/ft^2
ASTM E 283	Air Exfiltration	Negative 6.24 Psf	0.02 Cfm/ft^2	0.06 Cfm/ft^2
ASTM E 331	Water Resistance	Positive 12 Psf	No Leakage	No Leakage
ASTM E 330	Deflections @ Typical Vertical Mullion			
		Positive 20 Psf	0.720"	0.728"
		Negative 20 Psf	0.715"	0.728"
ASTM E 330	Deflections @ Intermediate Horizontal			
		Positive 20 Psf	0.025"	0.328"
		Negative 20 Psf	0.030"	0.328
ASTM E 283	Air Infiltration	Positive 6.24 Psf	0.03 Cfm/ft^2	0.06 Cfm/ft^2
ASTM E 283	Air Exfiltration	Negative 6.24 Psf	0.03 Cfm/ft^2	0.06 Cfm/ft^2
ASTM E 331	Water Resistance	Positive 12 Psf	No Leakage	No Leakage
ASTM E 330	Uniform Load @ Typical Mullion			
	Permanent Set	Positive 30 Psf	0.10"	0.255"
	Permanent Set	Negative 30 Psf	0.12"	0.255"

8. DISCLAIMER

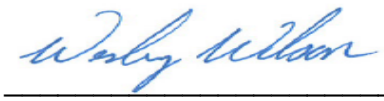
The tested specimen performed within the specified criteria.

Respectfully submitted,

CONSTRUCTION CONSULTING LABORATORY



EDSSON ALARCON
TESTING MANAGER
Signed Electronically

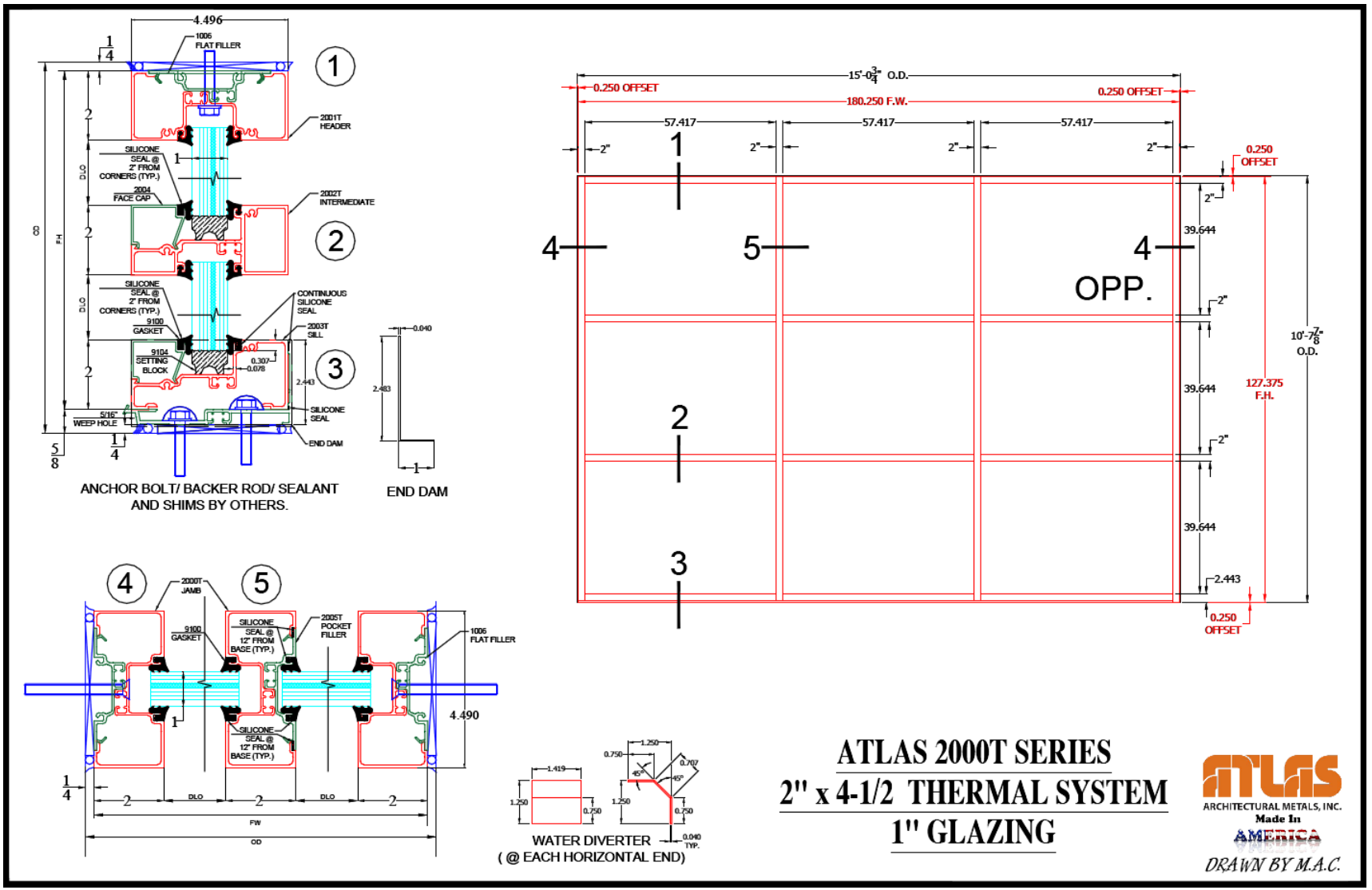


WESLEY WILSON
LABORATORY MANAGER
Signed Electronically

APPENDIX A

Sheet	Detail	Date	Stamped as Illustrated
1	Elevation / Plan / Section	Not Dated	Construction Consulting Laboratory1601 Luna Road Carrollton, Texas 75006 (972) 242-0556

Construction Consulting Laboratory1601 Luna Road Carrollton, Texas 75006 (972) 242-0556

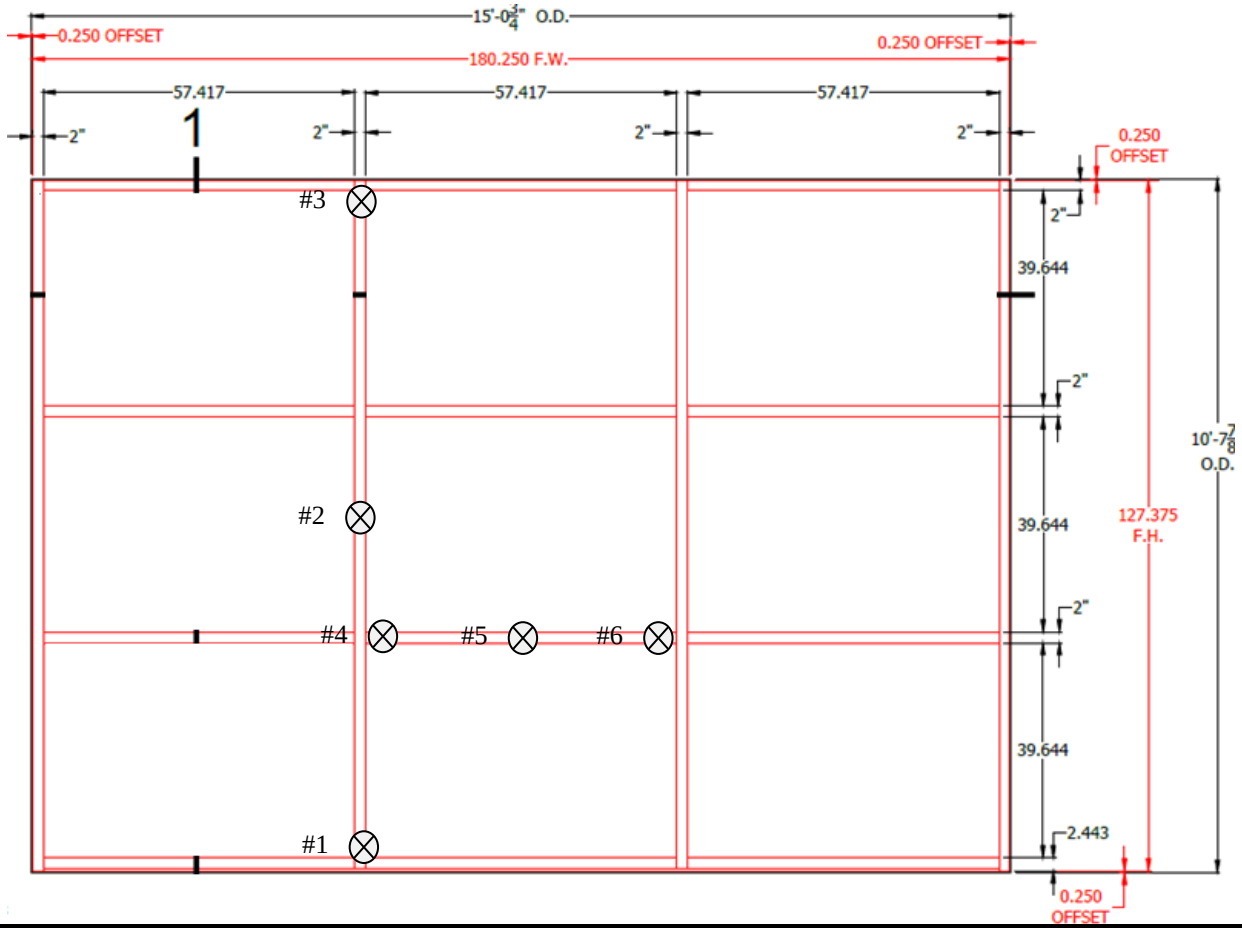


APPENDIX B

INDICATOR LOCATION DIAGRAM
&
DEFLECTIONS AT LOAD

CONSTRUCTION CONSULTING LABORATORY
AAMA 501-15 (AWS) PERFORMANCE TESTING
CLIENT: ATLAS ARCHITECTURAL METALS
SERIES: 2000T (THERMALLY BROKEN)

REPORT #: CCL 20-101
DATE: JUNE 17, 2020
PROJECT: PERFORMANCE MOCK-UP



TEST SPECIMEN DESIGN CRITERIA / Positive 20 Psf / Negative 20 Psf												
Vertical mullion span (L/175): 127.375"/175: Allowable = 0.728" (inches)												
Horizontal span (L/175): 57.417"/175: Allowable = 0.328" (inches)												
50% & 100% DESIGN STRUCTURAL DEFLECTION TABLE											**Allowable: Vertical Span: .925" - Horizontal span: 0.326"**	
	+20 Psf			**+30 Psf**		**-20 Psf**			**-30 Psf**		**Deflection Allowable**	**Permanent Set Allowable**
Ind.	Total	Set	Net	Set	S-Net	Total	Set	Net	Set	S-Net		
1	0.06	0.01		0.02		0.06	0.00		0.02			
2	0.79	0.05	.720	0.15	.100	0.78	0.05	.715	0.17	.120	.728	.255
3	0.08	0.01		0.03		0.07	0.01		0.09			
4	0.01	0.01		0.03		0.00	0.00		0.01			
5	0.04	0.01	.025	0.02	.00	0.03	0.00	.03	0.01	.00	.328	.118
6	0.02	0.01		0.02		0.00	0.00		0.00			
Net	For net deflection, average the end points and subtract from the midspan dimension.											
S-Net	For permanent set, average of the end points and subtract from the midspan dimension.											

-END OF REPORT-

1601 Luna Road
Carrollton, TX 75006

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A Quality Control Company

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