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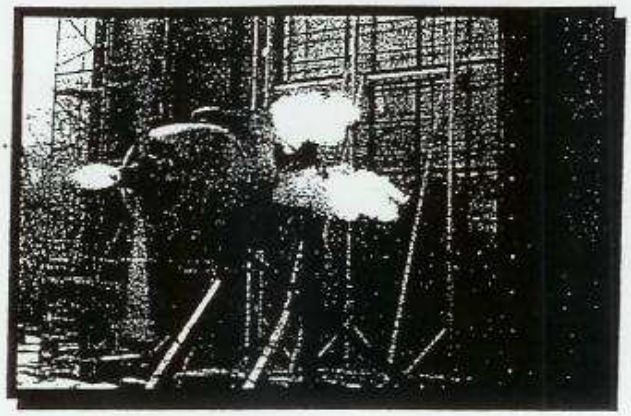

TEST REPORT:

UNITED STATES ALUMINUM PRODUCT TESTING CURTAINWALL SERIES 3150 AND 3250

Prepared for:

U.S. ALUMINUM CORPORATION
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Waxahachie, Texas 75165-5094

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Date:	October 27, 1997
Project:	U.S. Aluminum Curtainwall System Product Testing Curtainwall Series 3250 and 3150
Testing Completion:	June 10, 1997
Tested For:	U.S. Aluminum Corporation 200 Singleton Drive Waxahachie, TX 75165-5094

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MOCK- UP DESCRIPTION:

The combined specimens tested were approximately 29'-1" (8.86 m) wide x 31'-8 ½" (9.66 m) high. They were United States Aluminum Corporation's Series 3250 and 3150 Curtain Wall Systems. The two systems were installed as a continuous mock-up utilizing the use of two chambers to function while tested as one large assembly. This mock-up was assembled to the US Aluminum Mock-Up Drawings, titled "Mock-Up 3150/3250 Curtainwall Field Conditions as Tested", Drawing Number 95-005, dated 10/30/95, Sheets 1 thru 5 of 5, "No revisions noted". **Appendix C**.

System #1 - United States Aluminum Series 3250

4-sided captured, exterior glazed curtain wall system - 3 lites wide x 7 lites high. Glass was ¼" clear tempered at the spandrel areas, and 1" overall insulated glass utilizing ¼" clear tempered, ½" air space and ¼" clear tempered.

The system utilizes extruded aluminum tubular vertical mullions with open back horizontals. The fillers were not installed on the mock-up horizontals for observation purposes. The horizontals are attached to the vertical mullions using a die cast shear block with 2 - #12 x 2" pph fasteners. The horizontal is secured to the shear block with 2 - #8 x ¾" ss fasteners thru the glazing channel into the die cast shear block. Head and sill anchorage of the vertical mullions is accomplished with extruded aluminum "T" anchors which slide fit into the verticals and are secured to the structure with 3/8" diameter bolts, one on each side of the mullion. Mullion splices utilize extruded aluminum splice sleeves, 6" long, that slide into the upper and lower mullions. The system utilizes injection molded nylon joint plugs at the vertical and horizontal intersections at the mullion tongues to create a zone dam. These were set into Dow Corning Silicone 795 Sealant. Injection molded nylon mullion end caps allow the perimeter seal to run uninterrupted across the vertical mullion intersection. The jamb perimeter seals use an extruded silicone sheet bonded to the face cap to allow for free movement during inter-story differential seismic evaluation. Transition glazing of ¼" is accomplished using aluminum snap in ¼" adapter extrusions, sealed to the vertical mullions and horizontals. These were set into Dow Corning Silicone 795 Sealant. The glass is secured using extruded aluminum pressure plates with a ¼ - 20 x 1" hex washer head machine screw, 9" on center, torqued to 50 inch/pounds. The extruded aluminum pressure plates have an integral thermal isolator separating the exterior metal from the interior metal. The pressure plate is covered by a snap on extruded aluminum face cap. Gaskets in the system are a dense E.P.D.M. on the exterior, and a sponge E.P.D.M. on the interior. The gaskets, both interior and exterior, were installed in linear lengths. The horizontals butt into the vertical. The butt joints were set into Dow Corning 795 Silicone Sealant.

System #2 - United States Aluminum Series 3150

This system utilized all parts as noted in System #1, but is a 2-sided captured system using vertical structural Dow Corning 795 Silicone Joints to retain the glass. The specimen was 3 lites wide by 7 lites high. A 3/8" wide Dow Corning 795 Silicone Weather Seal was applied between the glass lites vertically on the exterior. The ¼" glass adapters on the verticals are secured with #10 x 1 ½" pfh Fasteners at 24" on center. The gaskets, both interior and exterior, were installed in linear lengths. The horizontals butt into the vertical. The vertical butt joints were set into Dow Corning 795 Silicone Sealant.

TEST EQUIPMENT:

1. Test chamber consisted of structural steel beams, columns and bulkheads and was accessible through a bulkhead door.
2. Water was applied to the specimen from a spray rack equipped with swirl-type nozzles spaced two feet on center, both vertically and horizontally, which, under controlled pressure, delivered a minimum of five gallons per square foot per hour on the specimen frontal.
3. Dynamic wind pressures were created by using a Curtis-Wright 3350 Radial Aircraft engine equipped with a four-blade, 13'-6" (4.11 m) propeller, placed approximately 20'-0" (6.10 m) in front of the test specimen.
4. Pressure differentials were created with reversible pumps for positive/negative loading.
5. Pressure differentials between the specimen interior and the atmosphere were measured with manometers.
6. Air infiltration was measured with a Meriam laminar flow element and manometer, and a Dwyer incline manometer.
7. Structural deflections and residual movements were measured with dial indicator gauges with maximum move "Stay-Set" follow up hands (maximum movement under load) and "Live Free Movement" active hands for the residual reading, (failure to return).

TESTING SEQUENCE & PROCEDURES:

TEST	TEST STANDARD
Preload @ 12.5 psf (.60 kPa)	ASTM E330-96
Air Infiltration Test @ 6.24 psf (.30 kPa)	ASTM E283-91
Static Water Test @ 15.0 psf (.72 kPa)	ASTM E331-93
Dynamic Water Penetration Test @ 15.0 psf (.72 kPa)	AAMA 501.1-94
Uniform Structural Test @ 50% & 100% of Design Load	ASTM E330-96
Air Infiltration Test @ 6.24 psf (.30 kPa)	ASTM E283-91
Static Water Test @ 15.0 psf (.72 kPa)	ASTM E331-93
Dynamic Water Penetration Test @ 15.0 psf (.72 kPa)	AAMA 501.1-94
Inter-story Differential Movement - Phase I	.005 x Span
Air Infiltration Test @ 6.24 psf (.30 kPa)	ASTM E283-91
Static Water Test @ 15.0 psf (.72 kPa)	ASTM E331-93
Dynamic Water Penetration Test @ 15.0 psf (.72 kPa)	AAMA 501.1-94
Structural Proof Loading Test @ 150% of Design Load	ASTM E330-96
Inter-story Differential Movement - Phase II	.010 x Span

Test Loads:

Design Load: 25.0 psf (1.20 kPa) positive **(Inward)** 25.0 psf 1.20 kPa) negative **(Outward)**
Proof Load: 37.5 psf (1.80 kPa) positive **(Inward)** 37.5 psf 1.80 kPa) negative **(Outward)**

TESTING PERFORMED AS FOLLOWS:

Applied Pressures:

All positive pressures applied to the test specimen are considered to be **inward** acting and all negative pressures are considered to be **outward** acting. All location references or comments are as viewing the test specimen from the interior (room side) of the test chamber.

1. **Preload:** Per ASTM E330-96 @ 50% Design Load Positive Pressures.

   Subject the test specimen to a static pressure differential of **12.5 psf (.60 kPa)**, 50% of full design load, in a positive pressure. This load was maintained for ten (10) seconds and released. An inspection was made to determine if any failure occurred.

   Allowables:
   No visible deformation in specimen nor loose or disengaged specimen materials after the applied load is released.

   Results: No visible differences observed within the Specimen or test chamber, all materials intact.

2. **Air Infiltration Test:** Per ASTM E283-91

   The specimen was completely covered with an impervious visqueen material and sealed at the perimeter with tape, thus allowing no movement of air through the specimen.

   The exterior face of the specimen was subjected to a positive pressure differential of **6.24 psf (.30 kPa)** Air infiltration was measured and recorded, thus indicating the amount of infiltration through the chamber.

   Chamber Reading: **98 CFM (.046 m^3/s)**

   The visqueen material covering the specimen was removed and the exterior face of the specimen was subjected to a positive pressure differential of **6.24 psf (.30 kPa)** Air infiltration was measured, thus indicating the amount of infiltration through the chamber and the specimen. Subtracting the previous reading (chamber only) from this reading yields the amount of infiltration through the specimen.

   Chamber and Specimen Reading: **103 CFM (.049 m^3/s)**

   Allowables:
   Total amount of air infiltration shall not exceed **.06 CFM** per square foot of the wall area tested.

MAXIMUM ALLOWABLE **55.33 CFM (.026 m^3/s)** 29'-0" x 31'-8 ½" x .06

Results:

CHAMBER	SPECIMEN & CHAMBER	SPECIMEN ONLY (YIELD)	ALLOWABLE (NOT TO EXCEED)
98.0 CFM (.046 m^3/s)	103.0 CFM (.049 m^3/s)	5.0 CFM (.0024 m^3/s)	55.33 CFM (.026 m^3/s)

3. **Static Water Test @ 15 psf (.72 kPa):** Per ASTM E331-93

Positive pressure differential of **15.0 psf (.72 kPa)**

Water was applied to the exterior face of the specimen at a minimum rate of five gallons per hour per square foot of panel area, in such a way as to completely and continuously cover the face of the specimen. Simultaneously, a positive **inward** differential static pressure of **15.0 psf (.72 kPa)** was applied against the face. The application of pressure and water was maintained for a period of fifteen (15) minutes, with observers inside the chamber checking for water penetration.

Allowables:
There shall be no uncontrolled water penetration during or at the conclusion of this test.

Note:
"Uncontrollable water" is defined as any uncontrolled water that appears on any normally exposed interior surfaces, that is not contained or drained back to the exterior, or that can cause damage to adjacent materials or finishes. Water contained within drained flashings, gutters, and sills is not considered water leakage. The collection of up to one half (1/2) ounce of water (14.8 cc) in a fifteen (15) minute test period on top of any interior stop or stool integral with the wall system shall not be considered water leakage.

Results: No leakage observed.

4. **Dynamic Water Penetration Test:** Similar to AAMA 501.1-94

75 -85 Miles per hour slipstream for 15 minutes @ **15 psf (.72 kPa)**

Water was applied to the exterior face of the specimen at a minimum rate of five (5) gallons per hour per square foot of wall area, in such a way as to completely and continuously cover the face of the specimen.

Simultaneously, the wall was subjected to sufficient air flow from an aircraft engine with a four bladed propeller, approximately 13'-6" (4.11 m) in diameter, approximately 20'-0" (6.10 m) in front of the specimen. The application of air flow and water was maintained for a period of fifteen (15) minutes, with observers inside the chamber checking for water penetration.

Allowable:
There shall be no uncontrolled water penetration during or at the conclusion of this test.

Results: No leakage observed.

5. **Uniform Structural Test @ 50% & 100% of Design Load:** per ASTM E330-96

Dial indicators were installed to measure deflection and residuals at ends and mid spans of the typical framing members.

Test: With the specimen set in a positive mode, all indicators were set on zero. A positive pressure of **12.5 psf (.60 kPa) (inward)** equal to 50% of the design load, was applied and held for ten (10) seconds then released. The indicators were read and the data recorded.

Results: Refer to Structural Reading Charts, Pages 9 & 10.

Test: Pressure was increased to positive **25.0 psf (1.20 kPa) (inward)** equal to 100% of design load, applied and held for ten (10) seconds then released. The indicators were read and the data recorded.

Results: Refer to Structural Reading Charts, Pages 9 & 10.

The vacuum/blower pumps were reversed and set to perform in a negative mode. The test specimen was subjected to a negative pressure of **12.5 psf (.60 kPa) (outward)** equal to 50% of design load to set the specimen in a negative mode. The pressure was held for ten (10) seconds and released.

Test: With all indicators set on zero, the test specimen was subjected to a negative pressure of **12.5 psf (.60 kPa)**, **(outward)** equal to 50% of design load. The pressure was held for ten (10) seconds and released. The indicators were read and data recorded.

Results: Refer to Structural Reading Charts, Pages 9 & 10.

Test: Pressure was increased to negative **25.0 psf (25.0 kPa) (outward)** equal to 100% of the design load, held for ten (10) seconds and released. The indicators were read and data recorded.

Results: Refer to Structural Reading Charts, Pages 9 & 10.

Reset wall in a positive mode at **12.5 psf (.60 kPa)** - held for (10) seconds and released.

Allowable:
There shall be no system failure and deflection of aluminum members shall not exceed L/175 or .750" (19.0 mm) maximum, whichever is less.

Vertical Span 156"/175 = 0.891" (22.6 mm)
Vertical Max. Allowable = 0.750" (19.0 mm)

Horizontal Span 56"/175 = 0.320" (8.1 mm)
Horizontal Max. Allowable = 0.320" (8.1 mm)

STRUCTURAL READING CHART

(Deflections in Hundreds of an inch)

Indicator #		Length	Uniform Structural Test						Structural Proof Loading Test	
			50% Design Load		100% Design Load				150% Design Load	
Locator		of Span	12.5 psf	Residual	25 psf	Residual	Net	Allowable	37.5 psf	Residual
#1	*Positive*		+0.00	+0.00	+0.00	+0.00			+0.01	+0.00
	Negative		-0.00	-0.00	-0.00	-0.00			-0.00	-0.00
#2	*Positive*		NR	NR	+0.00	+0.00			+0.00	+0.00
	Negative		-0.00	-0.00	-0.03	-0.02			-0.01	-0.00
#3	*Positive*	156"	+.13	+0.00	+.24	+0.01	.240	.750	+.33	+0.07
	Negative	156"	-.14	-0.00	-.33	-0.05	.330	.750	-.51	-0.05
#4	*Positive*		+0.06	+0.00	+.14	+0.01			+.27	+0.06
	Negative		-.10	-0.00	-.20	-0.01			-.30	-0.01
#5	*Positive*		+0.05	+0.00	+.11	+0.02			+.25	+0.05
	Negative		-0.05	-0.00	-.12	-0.01			-.25	-0.02
#6	*Positive*		+0.00	+0.00	+0.01	+0.00			+0.02	+0.00
	Negative		-0.01	-0.00	-0.02	-0.01			-0.02	-0.00
#7	*Positive*	156"	+.12	+0.00	+.30	+0.02	.300	.750	+.44	+0.03
	Negative	156"	-.13	-0.00	-.33	-0.07	.330	750	-.43	-0.03
#8	*Positive*		+0.00	+0.00	+0.01	+0.00			+0.01	+0.00
	Negative		-0.00	-0.00	-0.02	-0.01			-0.01	-0.00
#9	*Positive*		+0.00	+0.00	+0.00	+0.00			+0.00	+0.00
	Negative		-0.00	-0.00	-0.01	-0.00			-0.00	-0.00
#10	*Positive*		+0.00	+0.00	+0.03	+0.01			+0.04	+0.00
	Negative		-0.00	-0.00	-0.04	-0.02			-0.05	-0.02
#11	*Positive*		+.22	+0.00	+.47	+0.01			+.76	+0.06
	Negative		-.22	-0.00	-.50	-0.04			-.75	-0.04
#12	*Positive*		+0.00	+0.00	+0.00	+0.00			+0.03	+0.02
	Negative		-0.02	-0.00	-0.02	-0.00			-0.01	-0.00
#13	*Positive*		+.22	+0.00	+.46	+0.00			+.60	+0.01
	Negative		-.19	-0.00	-.49	-0.04			-.53	-0.06
#14	*Positive*	56"	+.19	+0.00	+.39	+0.01	.080	.320	+.63	+0.06
	Negative	56"	-.19	-0.00	-.43	-0.05	.090	.320	-.66	-0.07
#15	*Positive*		+.12	+0.00	+.27	+0.01			+.43	+0.06
	Negative		-.12	-0.00	-.31	-0.04			-.54	-0.06
#16	*Positive*		+0.10	+0.00	+0.05	+0.00			+.14	+0.04
	Negative		-0.04	-0.00	-0.09	-0.02			-.13	-0.02
#17	*Positive*	56"	+0.04	+0.00	+0.08	+0.00	.060	.320	+.14	+0.03
	Negative	56"	-0.03	-0.00	-0.09	-0.02	.040	.320	-.13	-0.02
#18	*Positive*		+0.01	+0.00	+0.03	+0.01			+0.08	+0.02
	Negative		-0.00	-0.00	-0.04	-0.03			-0.08	-0.02
#19	*Positive*		+.20	+0.00	+.42	+0.01			+.63	+0.05
	Negative		-.21	-0.00	-.47	-0.07			-.57	-0.04
#20	*Positive*		+.22	+0.00	+.38	+0.00			+.50	+0.02
	Negative		-.22	-0.00	-.38	-0.04			-.52	-0.01

NR = No Reading

STRUCTURAL READING CHART

(Deflections in Millimeters)

Indicator #		Length	Uniform Structural Test						Structural Proof Loading Test	
			50% Design Load		100% Design Load				150% Design Load	
Locator		of Span	.60 kPa	Residual	1.20 kPa	Residual	Net	Allowable	1.80 kPa	Residual
#1	*Positive*		+0.0	+0.0	+0.0	+0.0			+0.3	+0.0
	Negative		-0.0	-0.0	-0.0	-0.0			-0.0	-0.0
#2	*Positive*		NR	NR	+0.0	+0.0			+0.0	+0.0
	Negative		-0.0	-0.0	-0.8	-0.5			-0.3	-0.0
#3	*Positive*	3962	+3.3	+0.0	+6.1	+0.3	6.1	19.1	+8.4	+1.8
	Negative	3962	-3.6	-0.0	-8.4	-1.3	8.4	19.1	-13.0	-1.3
#4	*Positive*		+1.5	+0.0	+3.6	+0.3			+6.9	+1.5
	Negative		-2.5	-0.0	-5.1	-0.3			-7.6	-0.3
#5	*Positive*		+1.3	+0.0	+2.8	+0.5			+6.4	+1.3
	Negative		-1.3	-0.0	-3.1	-0.3			-6.4	-0.5
#6	*Positive*		+0.0	+0.0	+0.3	+0.0			+1.3	+0.0
	Negative		-0.3	-0.0	-0.5	-0.3			-1.3	-0.0
#7	*Positive*	3962	+3.0	+0.0	+7.6	+005	7.6	19.1	+11.2	+0.8
	Negative	3962	-3.3	-0.0	-8.4	-1.8	8.4	19.1	-10.9	-0.8
#8	*Positive*		+0.0	+0.0	+0.3	+0.0			+0.3	+0.0
	Negative		-0.0	-0.0	-0.5	-0.3			-0.3	-0.0
#9	*Positive*		+0.0	+0.0	+0.0	+0.0			+0.0	+0.0
	Negative		-0.0	-0.0	-0.3	-0.0			-0.0	-0.0
#10	*Positive*		+0.0	+0.0	+0.8	+0.3			+1.0	+0.0
	Negative		-0.0	-0.0	-1.0	-0.5			-1.3	-0.5
#11	*Positive*		+5.6	+0.0	+11.9	+0.3			+19.3	+1.5
	Negative		-5.6	-0.0	-12.7	-1.0			-19.1	-1.0
#12	*Positive*		+0.0	+0.0	+0.0	+0.0			+0.8	+0.5
	Negative		-0.5	-0.0	-0.5	-0.0			-0.3	-0.0
#13	*Positive*		+5.6	+0.0	+11.7	+0.0			+15.2	+0.3
	Negative		-4.8	-0.0	-12.4	-1.0			-13.5	-1.5
#14	*Positive*	1422	+4.8	+0.0	+9.9	+0.3	2.0	8.1	+16.0	+1.5
	Negative	1422	-4.8	-0.0	-10.9	-1.3	2.3	8.1	-16.8	-1.8
#15	*Positive*		+3.1	+0.0	+6.9	+0.3			+10.9	+1.5
	Negative		-3.1	-0.0	-7.9	-1.0			-13.7	-1.5
#16	*Positive*		+2.5	+0.0	+1.3	+0.0			+3.6	+1.0
	Negative		-1.0	-0.0	-2.3	-0.5			-3.3	-0.5
#17	*Positive*	1422	+0.8	+0.0	+2.0	+0.0	1.5	8.1	+3.6	+1.0
	Negative	1422	-0.8	-0.0	-2.3	-0.0	1.0	8.1	-3.3	-0.5
#18	*Positive*		+0.3	+0.0	+0.8	+0.0			+2.0	+0.5
	Negative		-0.0	-0.0	-1.5	-0.8			-2.0	-0.5
#19	*Positive*		+5.3	+0.0	+10.7	+0.5			+16.0	+1.3
	Negative		-5.6	-0.0	-11.9	-1.8			-14.5	-1.0
#20	*Positive*		+5.6	+0.0	+9.7	+0.0			+12.7	+0.5
	Negative		-5.6	-0.0	-9.7	-0.0			-13.2	-0.3

NR = No Reading

DIAL INDICATOR LOCATIONS AND DESCRIPTIONS

LOCATION OF DIAL INDICATORS	DESCRIPTION
1	Bottom of Mullion @ Sill
2	Mullion @ Bottom Anchor
3	Center Span of Bottom Mullion Anchor to Anchor
4	Top of Bottom Mullion 1" Below Splice
5	Bottom of Top Mullion 1" Above Splice
6	Mullion at Mid Span Deadload Anchor
7	Center Span of Top Mullion Anchor to Anchor
8	Mullion @ Top Anchor
9	Top of Mullion at Head
10	Structural Glazed Mullion at Mid-Span Dead Load Anchor
11	Center Span Between Anchors of Bottom Structural Glazed Mullion
12	Structural Glazed Mullion at Bottom Windload Anchor
13	Left End of Horizontal Vision over Span Relative to Steel
14	Center of Horizontal Vision over Span Relative to Steel
15	Right End of Horizontal Vision over Span Relative to Steel
16	Left End of Horizontal Vision over Vision Relative to Mullion
17	Center of Horizontal Vision over Vision Relative to Mullion
18	Right End of Horizontal Vision over Vision Relative to Mullion
19	Center of 1" Vision Glass
20	Center of 1/4" Spandrel Glass

* See Appendix A for a diagram showing specific indicator locations.

6. **Air Infiltration Test:** Per ASTM E283-91 (Following Uniform Structural Loading)

The specimen was completely covered with an impervious visqueen material and sealed at the perimeter with tape, thus allowing no movement of air through the specimen.

The exterior face of the specimen was subjected to a positive pressure differential of **6.24 psf (.30 kPa)** Air infiltration was measured and recorded, thus indicating the amount of infiltration through the chamber.

Chamber Reading: **74 CFM (.035 m^3/s)**

The visqueen material covering the specimen was removed and the exterior face of the specimen was subjected to a positive pressure differential of **6.24 psf (.30 kPa)** Air infiltration was measured, thus indicating the amount of infiltration through the chamber and the specimen. Subtracting the previous reading (chamber only) from this reading yields the amount of infiltration through the specimen.

Chamber & Specimen Reading: **78 CFM (.037 m^3/s)**

Allowable:
Total amount of air infiltration shall not exceed **.06 CFM** per square foot of the wall area tested.

MAXIMUM ALLOWABLE **55.33 CFM (.026 m^3/s)**(29'-1" x 31'-8 ½" x .06)

Results:

CHAMBER	SPECIMEN & CHAMBER	SPECIMEN ONLY (YIELD)	ALLOWABLE (NOT TO EXCEED)
74.0 CFM (.035 m^3/s)	78.0 CFM (.037 m^3/s)	4.0 CFM (.002 m^3/s)	55.33 CFM (.026 m^3/s)

7. **Static Water Test @ 15 psf (.72 kPa):** Per ASTM E331-93

Positive pressure differential of **15.0 psf (.72 kPa)**

Water was applied to the exterior face of the specimen at a minimum rate of five gallons per hour per square foot of panel area, in such a way as to completely and continuously cover the face of the specimen. Simultaneously, a positive **inward** differential static pressure of **15.0 psf (.72 kPa)** was applied against the face. The application of pressure and water was maintained for a period of fifteen (15) minutes, with observers inside the chamber checking for water penetration.

Allowables:
There shall be no uncontrolled water penetration during or at the conclusion of this test.

Note:
"Uncontrollable water" is defined as any uncontrolled water that appears on any normally exposed interior surfaces, that is not contained or drained back to the exterior, or that can cause damage to adjacent materials or finishes. Water contained within drained flashings, gutters, and sills is not considered water leakage. The collection of up to one half (1/2) ounce of water (14.8 cc) in a fifteen (15) minute test period on top of any interior stop or stool integral with the wall system shall not be considered water leakage.

Results: No leakage observed.

8. **Dynamic Water Penetration Test:** Similar to AAMA 501.1-94

75-85 Miles per hour slipstream for 15 minutes @ **15 psf (.72 kPa)**

Water was applied to the exterior face of the specimen at a minimum rate of five (5) gallons per hour per square foot of wall area, in such a way as to completely and continuously cover the face of the specimen.

Simultaneously, the wall was subjected to sufficient air flow from an aircraft engine with a four bladed propeller, approximately 13'-6" (4.11 mm) in diameter, approximately 20'-0" (6.10 mm) in front of the specimen. The application of air flow and water was maintained for a period of fifteen (15) minutes, with observers inside the chamber checking for water penetration.

Allowable:
There shall be no uncontrolled water penetration during or at the conclusion of this test.

Results: No leakage observed.

9. **Inter-story Differential Movement Test - Phase I:**

The specimen was subjected to the movement of .005 x span for the following cycle:

Moved Lower Beam to the Left 3/8" (9.53 mm) from center.
Moved Upper Beam to the Right 3/8" (9.53 mm) from center.
Moved Upper Beam to the Left 3/8" (9.53 mm) past center.
Moved Lower Beam to the Right 3/8" (9.53 mm) past center.
Moved Lower Beam to the Left 3/8" (9.53 mm) past center.

Concluded One Cycle - Repeated for two more cycles.

10. **Air Infiltration Test:** Per ASTM E283-91

The specimen was completely covered with an impervious visqueen material and sealed at the perimeter with tape, thus allowing no movement of air through the specimen.

The exterior face of the specimen was subjected to a positive pressure differential of **6.24 psf (.30 kPa)**. Air infiltration was measured and recorded, thus indicating the amount of infiltration through the chamber.

Chamber Reading: **74 CFM (.035 m^3/s)**

The visqueen material covering the specimen was removed and the exterior face of the specimen was subjected to a positive pressure differential of **6.24 psf** Air infiltration was measured, thus indicating the amount of infiltration through the chamber and the specimen. Subtracting the previous reading (chamber only) from this reading yields the amount of infiltration through the specimen.

Chamber and Specimen Reading: **79 CFM (.038 m^3/s)**

Allowable:
Total amount of air infiltration shall not exceed **.06 CFM** per square foot of the wall area tested.

MAXIMUM ALLOWABLE **55.33 CFM (.026 m^3/s)** (29'-0" x 31'-8 ½" x .06)

Results:

CHAMBER	SPECIMEN & CHAMBER	SPECIMEN ONLY (YIELD)	ALLOWABLE (NOT TO EXCEED)
74.0 CFM (.035 m^3/s)	79.0 CFM (.038 m^3/s)	5.0 CFM (.002 m^3/s)	55.33 CFM (.026 m^3/s)

11. **Static Water Test:** Per ASTM E331-93

Positive pressure differential of **15.0 psf (.72 kPa)**

Water was applied to the exterior face of the specimen at a minimum rate of five gallons per hour per square foot of panel area, in such a way as to completely and continuously cover the face of the specimen. Simultaneously, a positive **inward** differential static pressure of **15.0 psf (.72 kPa)** was applied against the face. The application of pressure and water was maintained for a period of fifteen (15) minutes, with observers inside the chamber checking for water penetration.

Allowables:
There shall be no uncontrolled water penetration during or at the conclusion of this test.

Note:
"Uncontrollable water" is defined as any uncontrolled water that appears on any normally exposed interior surfaces, that is not contained or drained back to the exterior, or that can cause damage to adjacent materials or finishes. Water contained within drained flashings, gutters, and sills is not considered water leakage. The collection of up to one half (1/2) ounce of water (14.8 cc) in a fifteen (15) minute test period on top of any interior stop or stool integral with the wall system shall not be considered water leakage.

Results: (1) droplet of water appeared at the lower right corner of Lite #2.
(2) droplets of water appeared at the lower left corner of Lite #3.

12. **Dynamic Water Penetration Test:** Similar to AAMA 501.1-94

75-85 Miles per hour slipstream for 15 minutes @ **15 psf (.72 kPa)**

Water was applied to the exterior face of the specimen at a minimum rate of five (5) gallons per hour per square foot of wall area, in such a way as to completely and continuously cover the face of the specimen.

Simultaneously, the wall was subjected to sufficient air flow from an aircraft engine with a four bladed propeller, approximately 13'-6" (4.11 mm) in diameter, approximately 20'-0" (6.10 mm) in front of the specimen. The application of air flow and water was maintained for a period of fifteen (15) minutes, with observers inside the chamber checking for water penetration.

Allowable:
There shall be no uncontrolled water penetration during or at the conclusion of this test.

Results: No water observed on the interior of the specimen.

Note:
"Uncontrollable water" is defined as any uncontrolled water that appears on any normally exposed interior surfaces, that is not contained or drained back to the exterior, or that can cause damage to adjacent materials or finishes. Water contained within drained flashings, gutters, and sills is not considered water leakage. The collection of up to one half (1/2) ounce of water (14.8 cc) in a fifteen (15) minute test period on top of any interior stop or stool integral with the wall system shall not be considered water leakage.

13. **Uniform Structural Proof Load @ 150% of design load:** Per ASTM E330-96

150% of design load = **37.5 psf (1.80 kPa)** positive **37.5 psf (1.80 kPa)** negative

The test specimen was set in a positive testing mode by applying a positive load of **18.75 psf (.90 kPa)**, which equals 75% of design load.

Test: With all indicators set on zero, a positive pressure of **37.5 psf (1.80 kPa)**, 150% design load was applied and held for ten (10) seconds, then released, all dial indicators were read and recorded.

Results: Refer to Structural Reading Charts, Pages 9 & 10.

The specimen was then set in a negative testing mode by applying a negative load of **18.75 psf (.90 kPa)**, which equals 75% of design load.

Test: With all indicators set on zero, a negative pressure of **37.5 psf (1.80 kPa)**, 150% of design load, was applied and held for ten (10) seconds, then released. All indicators were read and data recorded.

Results: Refer to Structural Reading Charts, Pages 9 & 10.

Allowable:
No system failure or permanent set of framing members greater than .2% of clear span.

Vertical Span = 156" x .2% = 0.312" (7.9 mm)
Vertical Maximum Allowable = 0.312" (7.9 mm)

Horizontal Span = 56" x .2% = 0.112" (2.8 mm)
Horizontal Maximum Allowable = 0.112" (2.8 mm)

14. **Inter-story Differential Movement Test - Phase II:**

The specimen is subjected to the movement of .010 x span for the following cycle:

Moved Lower Beam to the Left 3/4" (19.0 mm) from center.
Moved Upper Beam to the Right 3/4" (19.0 mm) from center.
Moved Upper Beam to the Left 3/4" (19.0 mm) past center.
Moved Lower Beam to the Right 3/4" (19.0 mm) past center.
Moved Lower Beam to the Left 3/4" (19.0 mm) past center.

Results: All of the specimen stayed intact, no glass breakage or metal disengagement observed.

CONCLUSION

Testing completed - The tested specimen performed within the specified criteria.

Respectfully submitted,

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