FENESTRATION TESTING LABORATORY, INC.

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SUMMARY SHEET
OF
AAMA 1503.1-88

THERMAL TEST RESULTS

FOR

U.S. ALUMINUM CORP.

SERIES 4500 Aluminum Curtain Wall

U-VALUE = 0.32 Btu/Hr * Ft^2 * °F

U-CLASS = U40

74 = CRF Class = C 65

SEE F.T.L. REPORT NO. **T98W-052**

FOR

COMPLETE DESCRIPTION OF THE

PRODUCT TESTED

FENESTRATION
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TESTED FOR

U.S. ALUMINUM CORP.
200 Singleton Drive
Waxahachie, TX 75165

1.0 PURPOSE

The purpose of this report is to present the testing methods employed and test results obtained during the performance testing of one (1) **Aluminum Curtain Wall** described in paragraph 4.0 of this report.

2.0 TEST REFERENCES

2.1 TEST STANDARD

AAMA 1504-88 Voluntary Standard for Thermal Performance of Windows, Doors, and Glazed Wall Sections.

2.2 TEST METHOD

AAMA 1503.1-88 Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections.

3.0 SUMMARY

Test results indicate that the product achieved **U-Class rating of U 40**

4.0 DESCRIPTION

SERIES & TYPE:	**4500 Curtain Wall**
FRAME MATERIAL & FINISH:	Aluminum - Clear Anodized
CONFIGURATION:	Two Bays Wide
FRAME SIZE:	95.75" x 95.75"
OPERABLE PANEL/ VENT SIZES:	N/A
STATIONARY PANEL/ FIXED LITE SIZES:	44.50" x 91.25" Daylight Opening

GLASS:

FIXED PANEL:

Overall Size:	0.979"
Outside Lite:	0.222" Clear
Center Lite:	0.003" HM88 Low-e on surface#3
Inside Lite:	0.227" Cardinal Low-e on surface#5
Space Between Lites:	0.186" (Space #1), 0.35" (Space #2)

GLASS (CONTINUED): Spacer type and Gas: Both spacers were steel desiccant filled and sealed with polysulfide and wrapped with "perimeter barrier tape". (See drawing) "Warm edge" spacer in space #2. The glazing cavities contained krypton.

GLAZING: Both panels were outside glazed with sponge gasket on the frame perimeter and sponge gasket on the snap-in aluminum stops applied full perimeter from the exterior. The stops were supported by plastic clips that slid into a pocket in the frame extrusions. Each panel sat on EPDM setting blocks at 1/4 points.

WEEPAGE: The snap-in aluminum stops at the head and sill contained a 5/16" diameter weep, one (1) per bay.

CONSTRUCTION: The horizontal frame members were mechanically joined to the verticals with screws and aluminum shear block.

CAULKING: Refer to the attached drawings.

Note: For a full description of the system refer to the attached drawing, which has been verified for accuracy and forms a part of this report. Without this drawing, this report becomes null and void.

INSTALLATION: As per AAMA 1503.1-88.

5.0 TEST RESULTS

The following results and data are a compilation of the average values of five data recordings for all points taken in a two-hour period under steady state conditions in accordance with the stated standard.

t_c	=	18.00 °F	q_t	=	340.02 watts
t_h	=	68.00 °F	q_c	=	38.37 watts
A	=	64.00 Ft^2	q_p	=	301.65 watts

Where:

t_c	=	Temperature of air on cold side in degrees Fahrenheit
t_h	=	Temperature of air on hot side in degrees Fahrenheit
q_t	=	Total heat flux in watts
q_c	=	Chamber tare heat flux in watts
q_p	=	Heat flux through the product in watts
A	=	Area of product in square feet
U	=	Overall Thermal Transmittance Heat Transfer Co-efficient U-factor in Btu/hr-ft^2-F

$$U = \frac{Q_p * 3.413}{A\,(t_h - t_c)} = 0.32\ \text{BTU/hr - ft}^2\text{ - F}$$

Based on the above data, U-Value = 0.32 Btu/hr - ft^2 - F and falls under:
U-Class = U40

5.1 Condensation Resistance Factor (CRF)

FT_p	=	55.02	T_c	=	18.00	T_h	= 68.00
FT_r	=	52.77	W	=	0.03		
FT	=	54.95	GT	=	56.17		
CRF_f	=	74	CRFg	=	76		

CRF_{report} = 74

CRF_{class} = C65

$$W = \frac{FT_p - FT_r}{FT_p - (T_c + 10)} \times 0.40$$

Where:
- t_c = temperature of air cold side
- 10 = arbitrary temperature adjustment
- 0.40 = arbitrary weighing factor

The weighted frame temperature, FT, is calculated as follows:

$$FT = FT_p\ (1 - W) + (W * FT_r)$$

The average of 6 predetermined thermocouple glazing temperatures (GT) and the weighted frame temperature (FT) are used in calculating the CRF for the glass and frame as follows:

$$CRF_g = \frac{GT - t_c}{t_h - t_c} \times 100$$

$$CRF_g = \frac{FT - t_c}{t_h - t_c} \times 100$$

Where : 100 = A multiplier to make CRF a whole number.

CRF numbers shall be whole numbers only. Any number 0.5 and greater shall be rounded to the next whole number. One number, the lower of CRF_g or CRF_f shall be reported as the product CRF. At the manufacturer's option the second number, CRF_g or CRF_f, may be reported with its proper subscript and clearly indicating its alternate significance.

CRF_g	=	Condensation Resistance Factor for the glass
CRF_f	=	Condensation Resistance Factor for the frame
FT	=	Weighted frame temperature
FT_p	=	Average temperature of 14 predetermined thermocouple locations on frame and sash members
FT_r	=	Average temperature of 4 roving thermocouple locations on the 4 coldest locations of frame and sash members
W	=	A weighing factor to ration FT_p and FT
GT	=	Average temperature of 6 predetermined thermocouple locations on the glazing

5.2 AIR INFILTRATION TEST	MEASURED	ALLOWED
At 0.57 PSF	0.00 CFM/Ft^2	N/A
At 1.57 PSF	0.02 CFM/Ft^2	0.06 CFM/Ft^2

All cross sections were cut and their profiles were visually verified with the cross section profile drawing. Only dimensions circled were verified by this laboratory.

The profile that does not match due to extrusion deformities, as in case of vinyl extrusions, etc. are not this laboratory's responsibility.

The laboratory stamp on the extrusion drawing need not necessarily mean that all dimensions are checked on the tested cross sections.

This report may not be duplicated in part or in whole without the written approval of this test laboratory and the manufacturer for who this test was conducted for.

All of the tests were conducted in accordance with the referenced standards in paragraph 2.0.

Testing Completed : July 16, 1998
Report Completed : July 24, 1998
Tested By : Anis Jan / Jim Cruz

Pete Cruz
Test Engineer

Anis Jan
Test Engineer

Jim Cruz
Test Technician

Disclaimer:

For complete description and details refer to the attached cross section drawings which are part of this report. Without the attached drawings this report becomes null and void. Drawings have been marked, stamped and verified by this laboratory.