PERFORMANCE TEST REPORT

CCLW JOB #08-5152-1

OCTOBER 7, 2008

DATES OF FORMAL TESTING

SEPTEMBER 19 & 23, 2008

TEST LOCATION

CONSTRUCTION CONSULTING LABORATORY WEST
4751 WEST STATE STREET, SUITE B
ONTARIO, CA 91762

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MOCK UP DEESCRIPTION

The scope of the mock-up specimen for testing was one (1), shop glazed unitized wall system consisting of three (3) modules in width by two (2) modules in height of a custom curtain wall system with 1 3/16" glazing. The mock up measured overall 12'-6" wide by 22' high.

For a complete description and framing details, see drawings, sheets 1-41, at end of this report.

The report is not complete unless drawings marked and stamped by the laboratory are included.

All references to positive pressures are considered inward acting and negative is outward.

The mock up was tested in accordance with each applicable AAMA and ASTM standard.

TEST EQUIPMENT

The specimen was installed into a test chamber constructed of structural angles, beams, and columns covered with steel and plywood bulkheads, accessible through a bulkhead door.

Air infiltration was measured with a Meriam laminar flow element and a Dwyer electronic manometer.

Water was applied from a vertical spray rack mounted 22" to 24" from the specimen. The rack was equipped with swirl-type nozzles spaced two (2) feet on center, vertically and horizontally, which delivered five (5) gallons of water per hour per square foot of wall frontal area.

Dynamic winds were generated by a Curtis Wright 3350 radial aircraft engine with a three (3) bladed propeller, 14'-5" diameter, which formulates typical and atypical wind conditions.

Pressure differentials were measured with a Dwyer electronic manometer (DM-2).

The pressure differential between the exterior and interior of the chamber was created by a positive and negative blower system.

WITNESSED BY (all or partial)

Katherine Miller	EHDD Architecture
Anurag Jain	Weidlinger Associates, Inc.
Ryan Burke	Webcor Builders
Michael Hathhorn	Webcor Builders
Scott Acevedo	Webcor Builders
Eric Thatcher	Webcor Builders
Eric Schroter	Simpson, Gumpertz & Heger, Inc.
David Mirelez	Guarantee Glass, Inc.
Cassie Harker	Guarantee Glass, Inc.
Nancy Bjurstrom	Advanced Glazing Systems, LLC
Glenn Allen	Advanced Glazing Systems, LLC
Subir Ghosh	Advanced Glazing Systems, LLC
Jack W. Jackson	Construction Consulting Laboratory West
Chad C. Jackson	Construction Consulting Laboratory West

FORMAL TEST SEQUENCE **SEPTEMBER 19, 2008**

The weather conditions at 9:30 AM were 72° F, 44% RH, calm winds and a clear sky.

PRELOAD

To set the specimen for testing, a positive pressure differential of **15.0 psf**, 50% of design load, was applied to the specimen while exhausting air for the air infiltration test. It was held for ten seconds and then reduced to **6.24 psf** to complete the air test. There was no indication of failure.

AIR INFILTRATION TEST per ASTM E283-04

The exterior of the wall area was sealed with a visqueen material and tape. The exterior face of the specimen was then subjected to a positive static pressure differential of **6.24 psf**. This infiltration reading represented the amount of air infiltration through the chamber (tare). The visqueen was removed and another reading was recorded at **6.24 psf** pressure differential representing the amount of air infiltration through the wall specimen and the chamber (gross). Subtracting the first reading from the last yields the net air infiltration through the specimen.

ALLOWABLE

Air infiltration shall not exceed **0.06 cfm** per square foot of wall area. Net allowable based on measurements was **20.4 cfm** total. (12.5' x 22' = 274 s/f x 0.06 = **16.4 cfm** total.

RESULTS:

Specimen passed. The Titon trickle vents were taped over and not included in the air infiltration readings.

Net air infiltration was measured at **6.2 cfm** total.

STATIC WATER PENETRATION TEST per ASTM E331-00

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 frontal area, in such a way as to completely cover the exterior face of the specimen. At the same time, a positive differential static pressure of **15.0 psf** was applied to the face of the specimen. The application of pressure and water was maintained for a period of fifteen (15) minutes, with observers viewing the interior of the specimen.

ALLOWABLE

Water leakage is defined as "uncontrolled" water infiltrating the system or appearing on systems normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.

RESULTS:

Specimen passed. There was no water leakage.

DYNAMIC WATER PENETRATION TEST per AAMA 501.1-05

The specimen was subjected to a dynamic wind load pressure equivalent of **15.0 psf** (76.5 mph wind speed) only, with a water application of five (5) gallons per hour per square foot of wall frontal area for duration of fifteen (15) minutes.

ALLOWABLE

There shall be no uncontrolled water leakage, same as the static water test above.

RESULTS

Specimen passed. The Titon trickle vents were opened during the dynamic water test to demonstrate that the vent is weatherproof during a rain storm. There was no water leakage noted.

UNIFORM STRUCTURAL TEST @ DESIGN – ASTM E-330-02

The test specimen was subjected to a positive load of **15.0 psf**. The pressure was held for ten (10) seconds and released. Indicators were set.

The test specimen was subjected to a positive load of **30.0 psf**, held for ten (10) seconds and released. Indicators were read and data was recorded.

The blower system, along with the measuring equipment, was then reversed. The test specimen was subjected to a negative load of **22.5 psf**. The pressure was held for ten (10) seconds and released. Indicators were set.

The test specimen was subjected to a negative load of **45.0 psf**, held for ten (10) seconds and released. Indicators were read and data was recorded.

ALLOWABLE

At design load, limit deflection of framing members, in a direction normal to wall plane, to **L/175**.

RESULTS

Specimen passed.

All measured structural spans complied with specified criteria. See elevation drawing for dial indicator locations. See Charts **#1** and **#2** on page 6 for deflection and permanent set results (reference bold number – **xx**/xx for **deflection**/permanent set)

REPEAT AIR INFILTRATION TEST per ASTM E283-04

Similar procedure and same criteria as previous air infiltration test. (allowed 16.4 cfm)

Specimen passed.

Gross leakage was measured and compared to the gross leakage obtained at start of testing. With the wall and chamber wet and the windows adjusted, the difference was 4.0 cfm less. This indicates that there was no detrimental change in the air infiltration due to the structural design load tests. The Titon trickle vents remained taped.

REPEAT STATIC WATER PENETRATION TEST per ASTM E331-00

Same procedure and same criteria as previous static water penetration test.

RESULTS

Specimen passed. **15.0 psf**: There was no water leakage noted.

UNIFORM STRUCTURAL PROOF LOAD TEST per ASTM E330-02

The test specimen was subjected to a positive load of **22.5 psf** (75% design load).
The pressure was held for ten (10) seconds and released, with indicators then set to zero.

The test specimen was subjected to a positive load of **45.0 psf** (150% design load), held for ten (10) seconds and released. Indicators were read and all data recorded.

The blower system along with the measuring equipment was reversed. The test specimen was subjected to a negative load of **33.75 psf** (75% design load). The pressure was held for ten (10) seconds and released, with indicators set to zero.

The test specimen was subjected to a negative load of **67.5 psf** (150% design load), held for ten (10) seconds and released. Indicators were read and all data recorded.

ALLOWABLE

No failures or permanent set in excess of **L/1000** is allowed.

RESULTS

Specimen passed.

All measured structural spans complied with specified criteria. See elevation drawing for dial indicator locations. See Charts **#3** and **#4** on page 7 for deflection and permanent set results (reference bold number – xx/**xx** for deflection/**permanent set**).

END OF TESTING

The as built mock-up drawings sheets 1 through 41, reviewed and stamped by the laboratory, should accompany and are a part of this report.

CONSTRUCTION CONSULTING LABORATORY WEST
JACK W. JACKSON
PRESIDENT/MANAGER OF TESTING

FRANCIS PICKELL, SR.
PROFESIONAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
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QU 1224
EXP. 6/30/09
QUALITY
STATE OF CALIFORNIA

STRUCTURAL READINGS
100% DESIGN LOAD

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9-19-08

CHART 1 OF 4
TEST PRESSURE = 30.0 PSF POSITIVE

DIAL IND.	MEMBER/D'TL REF.	POSITION	GROSS READ	NET READ	ALLOW L/175	SPAN
1	VERT. MULL 02/PMU_4.02	BOTTOM	**10**/01	-	-	ANCH-
2	VERT. MULL 02/PMU_4.02 (3)	STK JT – BOT	**10**/01	**07**	-	-
3	VERT. MULL 02/PMU_4.02 (2)	STK JT – TOP	**17**/03	**07**	-	-
4	VERT. MULL 02/PMU_4.02 (1&5)	MID SPAN	**33**/00	**25**/00	**75**	132"
5	VERT. MULL 02/PMU_4.02	TOP	**07**/00	**-**	**-**	ANCH-
6	HORZ. MULL 18/PMU_3.06	MID SPAN	**03**/01	**03**/01	**37**	64.75"
7	VISION GLASS – 1 3/16" INSUL	CENTER	**21**/01	**21**/01	**-**	64.75"

CHART 2 OF 4
TEST PRESSURE = 45.0 PSF NEGATIVE

DIAL IND.	MEMBER/D'TL REF.	POSITION	GROSS READ	NET READ	ALLOW L/175	SPAN
1	VERT. MULL 02/PMU_4.02	BOTTOM	**04**/00	-	-	ANCH-
2	VERT. MULL 02/PMU_4.02 (3)	STK JT – BOT	**03**/00	**07**	-	-
3	VERT. MULL 02/PMU_4.02 (2)	STK JT – TOP	**06**/01	**07**	-	-
4	VERT. MULL 02/PMU_4.02 (1&5)	MID SPAN	**27**/01	**21**/01	**75**	132"
5	VERT. MULL 02/PMU_4.02	TOP	**08**/01	**-**	**-**	ANCH
6	HORZ. MULL 18/PMU_3.06	MID SPAN	**04**/01	**04**/01	**37**	64.75"
7	VISION GLASS – 1 3/16" INSUL	CENTER	**34**/00	**34**/00	**-**	64.75"

READINGS ARE IN HUNDRETHS OF INCH DEFL. LIMIT = L/175
READINGS ARE **DEFLECTION**/PERMANENT SET

STRUCTURAL READINGS
150% PROOF LOAD

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CHART 3 OF 4
TEST PRESSURE = 45.0 PSF POSITIVE

DIAL IND.	MEMBER/D'TL REF.	POSITION	GROSS READ	NET READ	ALLOW L/175	SPAN
1	VERT. MULL 02/PMU_4.02	BOTTOM	14/**01**	-	-	ANCH-
2	VERT. MULL 02/PMU_4.02 (3)	STK JT – BOT	17/**01**	**02**	-	-
3	VERT. MULL 02/PMU_4.02 (2)	STK JT – TOP	36/**03**	**02**	-	-
4	VERT. MULL 02/PMU_4.02 (1&5)	MID SPAN	57/**02**	44/**01**	**13**	132"
5	VERT. MULL 02/PMU_4.02	TOP	12/**02**	**-**	**-**	ANCH
6	HORZ. MULL 18/PMU_3.06	MID SPAN	04/**01**	04/**01**	**06**	64.75"
7	VISION GLASS – 1 3/16" INSUL	CENTER	28/**01**	28/**01**	**-**	64.75"

CHART 4 OF 4
TEST PRESSURE = 67.5 PSF NEGATIVE

DIAL IND.	MEMBER/D'TL REF.	POSITION	GROSS READ	NET READ	ALLOW L/175	SPAN
1	VERT. MULL 02/PMU_4.02	BOTTOM	05/**02**	-	-	ANCH-
2	VERT. MULL 02/PMU_4.02 (3)	STK JT – BOT	04/**00**	**00**	-	-
3	VERT. MULL 02/PMU_4.02 (2)	STK JT – TOP	07/**00**	**00**	-	-
4	VERT. MULL 02/PMU_4.02 (1&5)	MID SPAN	52/**02**	40/**01**	**13**	132"
5	VERT. MULL 02/PMU_4.02	TOP	20/**01**	**-**	**-**	ANCH
6	HORZ. MULL 18/PMU_3.06	MID SPAN	05/**01**	05/**01**	**06**	64.75"
7	VISION GLASS – 1 3/16" INSUL	CENTER	49/**01**	49/**01**	**-**	64.75"

READINGS ARE IN HUNDRETHS OF INCH PERM. SET LIMIT = L/1000
READINGS ARE DEFLECTION/**PERMANENT** SET