Intertek | Architectural Testing

ASTM E 1886 and ASTM E 1996
TEST REPORT

Rendered to:

FLEETWOOD WINDOWS & DOORS

SERIES/MODEL: Kona 3800 Vertical TDL
PRODUCT TYPE: Curtain Wall

Report No.:	**94550.01-301-44**
Test Dates:	**11/10/09**
Through:	**06/10/10**
Report Date:	**01/07/10**
Revision 2 Date:	**09/25/15**
Record Retention Date:	**06/10/14**

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ASTM E 1886 and ASTM E 1996 TEST REPORT

Rendered to:

FLEETWOOD WINDOWS AND DOORS
395 Smitty Way
Corona, California 92879

Report No.:	94550.01-301-44
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Project Summary: Architectural Testing, Inc. was contracted by Fleetwood Windows and Doors to perform testing on four Series/Model Kona 3800 Vertical TDL, curtain wall lites. The samples tested met the performance requirements set forth in the referenced test procedures for a ±2394 Pa (±50 psf) Design Pressure with missile impacts corresponding to Missile Level D and Wind Zone 4. Test specimen description and results are reported herein. The samples were provided by the client.

Test Procedures: The test specimens were evaluated in accordance with the following:

ASTM E 1886-05, *Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.*

ASTM E 1996-09, *Standard Specification for Performance of Exterior Windows, Glazed Curtain Walls, Doors and Storm Shutters Impacted by Wind Borne Debris in Hurricanes.*

Test Specimen Description:

Series/Model: Kona 3800 Vertical TDL

Product Type: Curtain Wall

Overall Size: 3048 mm (120") wide by 3048 mm (120") high

Daylight Opening Size: 1454 mm (57-1/4") wide by 2972 mm (117") high

Test Specimen Description: (Continued)

Screen Size: NA

Finish: Anodized Aluminum

Glazing Details: The specimen utilized 1-1/4" thick laminated glass units fabricated from two 3/16" thick heat strengthened sheets, a 0.090" thick Sentry Glas Plus interlayer, a 5/8" thick airspace and one 3/16" heat strengthened sheet to the exterior. The glass was set from the exterior against a vinyl bulb gasket and Tremco silicone at the interior. An aluminum glazing stop and a vinyl bulb gasket was applied from the exterior. The glass bite was 1/2".

Weatherstripping: NA

Frame Construction: The vertical frame members corners were routed to fit the horizontal framing members and fully sealed with silicone. The frame corners were attached using three (3) #10 1" long stainless steel Phillips head screws. The vertical frame member dividing each lite was attached with two (2) #10 1" long stainless steel Phillips head screws. All frame members were thermally broken.

Screen Construction: NA

Hardware: NA

Drainage:

Description	Quantity	Location
1/2" by 1/4" weep slots	4	6" from all corners in the sill face
2" by 1/2" weep slots	4	6" from all sill corners in the glazing stop leg
1" weep notch	4	6" from corners in center leg of sill

Reinforcement: NA

Installation: The test specimen was installed into a two nominal 2 x 8 Douglas Fir test bucks. Thirty-two (32) #10 x 2" wood screws were located in all perimeter frame members located 6" from each corner and 16" on center.

Test Results: The following results have been recorded:

ASTM E 1886, *Large Missile Impact*

Conditioning Temperature: 18.3°C (65°F)
Missile Weight: 4082 g (9 lbs)
Missile Length: 2.4 m (8' 0")
Muzzle Distance from Test Specimen: 5.2 m (17 ft.)

Test Unit #1

Impact #1: Missile Velocity: 15.2 m/s (49.8 fps); orientation within ±5° of horizontal

Impact Area: Center of lite
Observations: Missile hit target area
Results: Pass

Impact #2: Missile Velocity: 15.3 m/s (50.1 fps); orientation within ±5° of horizontal

Impact Area: Top right hand corner of lite
Observations: Missile hit target area
Results: Pass

Impact #3: Missile Velocity: 15.1 m/s (49.6 fps); orientation within ±5° of horizontal

Impact Area: Bottom left hand corner of lite
Observations: Missile hit target area
Results: Pass

Impact #4: Missile Velocity: 15.1 m/s (49.7 fps); orientation within ±5° of horizontal

Impact Area: Center of lite
Observations: Missile hit target area
Results: Pass

***Note**: See Architectural Testing Sketch #1 for impact locations.*

Test Results: (Continued)

ASTM E 1886, *Large*

Conditioning Temperature: 18.3°C (65°F)
Missile Weight: 4082 g (9 lbs)
Missile Length: 2.4 m (8' 0")
Muzzle Distance from Test Specimen: 5.2 m (17 ft.)

Test Unit #2

Impact #1: Missile Velocity: 15.3 m/s (50.3 fps); orientation within ±5° of horizontal

Impact Area: Lower left corner of left lite
Observations: Missile hit target area,
Results: Pass

Impact #2: Missile Velocity: 15.5 m/s (50.9 fps); orientation within ±5° of horizontal

Impact Area: Center of left lite
Observations: Missile hit target area,
Results: Pass

***Note**: See Architectural Testing Sketch #2 for impact locations.*

Test Unit #3

Impact #1: Missile Velocity: 15.1 m/s (49.7 fps); orientation within ±5° of horizontal

Impact Area: Top right corner of left lite
Observations: Missile hit target area
Results: Pass

Impact #2: Missile Velocity: 15.1 m/s (49.6 fps); orientation within ±5° of horizontal

Impact Area: Center of vertical mullion
Observations: Missile hit target area
Results: Pass

***Note**: See Architectural Testing Sketch #3 for impact locations.*

Test Results: (Continued)

ASTM E 1886, *Air Pressure Cycling*

Test Unit #1

Design Pressure: ±2394 Pa (±50 psf)

POSITIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Observations
479 to 1197 (10 to 25)	3500	1.97	-
0 to 1436 (0 to 30)	300	4.02	-
1197 to 1915 (25 to 40)	600	2.86	-
718 to 2394 (15 to 50)	100	5.00	-

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Observations
718 to 2394 (15 to 50)	50	4.90	-
1197 to 1915 (25 to 40)	1050	2.66	-
0 to 1436 (0 to 30)	50	5.00	-
479 to 1197 (10 to 25)	3350	2.72	*No additional damage or deglazing was observed.*

Result: Pass

Test Results: (Continued)

ASTM E 1886, *Air Pressure Cycling*

Test Unit #2

Design Pressure: ±2394 Pa (±50 psf)

POSITIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Observations
479 to 1197 (10 to 25)	3500	2.89	-
0 to 1436 (0 to 30)	300	4.62	-
1197 to 1915 (25 to 40)	600	3.14	-
718 to 2394 (15 to 50)	100	4.04	-

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Observations
718 to 2394 (15 to 50)	50	4.21	-
1197 to 1915 (25 to 40)	1050	2.98	-
0 to 1436 (0 to 30)	50	3.87	-
479 to 1197 (10 to 25)	3350	3.11	*No additional damage or deglazing was observed.*

Result: Pass

Test Results: (Continued)

ASTM E 1886, *Air Pressure Cycling*

Test Unit #3

Design Pressure: ±2394 Pa (±50 psf)

POSITIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Observations
479 to 1197 (10 to 25)	3500	1.97	-
0 to 1436 (0 to 30)	300	4.02	-
1197 to 1915 (25 to 40)	600	2.86	-
718 to 2394 (15 to 50)	100	5.00	-

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Observations
718 to 2394 (15 to 50)	50	4.90	-
1197 to 1915 (25 to 40)	1050	2.66	-
0 to 1436 (0 to 30)	50	5.00	-
479 to 1197 (10 to 25)	3350	2.72	*No additional damage or deglazing was observed.*

Result: Pass

***General Note**: Upon completion of testing, the specimens met the requirements of Section 7 of ASTM E 1996.*

Test Equipment: (See Appendix A)

Cannon: Constructed from steel piping utilizing compressed air to propel the missile

Missile: 2 x 4 Southern Pine

Timing Device: Electronic Beam Type

Cycling Mechanism: Computer controlled centrifugal blower with electronic pressure measuring device

Tape and film were not used to seal against air leakage during structural testing.

Drawing Reference: The test specimen drawings have been reviewed by Architectural Testing, Inc. and are representative of the test specimen reported herein.

List of Official Observers:

Name	Company
Nathan Baker	Fleetwood Window and Doors
Dennis Janzen	Architectural Testing, Inc.
Mason Kelly	Architectural Testing, Inc.
Leaton Kirk	Architectural Testing, Inc.
Tyler Westerling, P.E.	Architectural Testing, Inc.

Detailed drawings, data sheets, representative samples of test specimens, a copy of this report, or other pertinent project documentation will be retained by Architectural Testing, Inc. for a period of four years from the original test date. At the end of this retention period, such materials shall be discarded without notice and the service life of this report will expire.

Results obtained are tested values and were secured by using the designated test methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimen(s) tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.

Digitally Signed by: Tyler Westerling

Tyler Westerling, P.E.
Project Engineer

Digitally Signed by:Kenny C. White

Kenny C. White
Laboratory Manager

TW:he/ms

Attachments (pages): This report is complete only when all attachments listed are included.
- Appendix-A: Test Equipment (1)
- Appendix-B: Sketches (2)
- Appendix-C: Drawings (3)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	01/07/10	N/A	Original report issue
1	06/23/10	3-7	Added Test Specimens due to retest
2	09/25/15	Cover, 1	Revised "Expiration Date" with "Record Retention Date"

This report produced from controlled document template ATI 00165, revised 11/09/09.

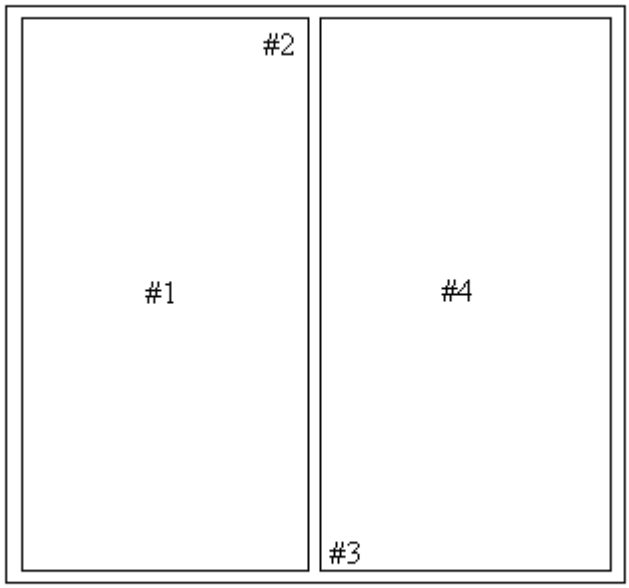
Appendix A

Test Equipment

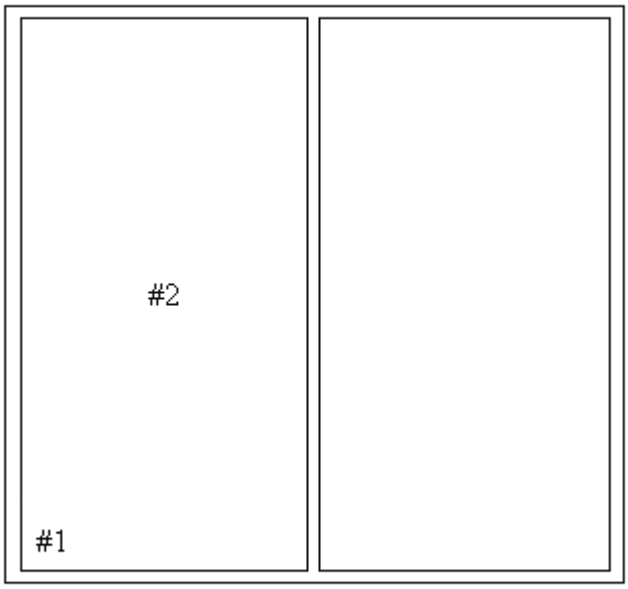
Instrument	Manufacturer	Asset #
Control Panel	ATI	005062
2 x 4 Cannon	ATI	003575

Appendix B

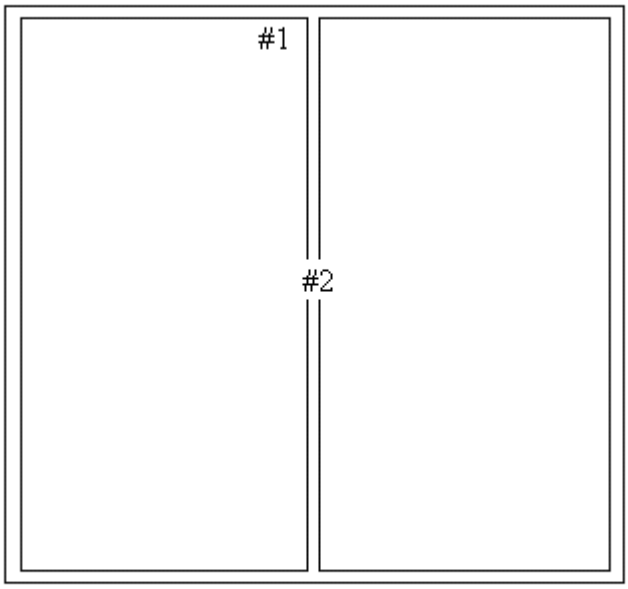
Sketches



Sketch #1 Specimen #1 Impact Locations



Sketch #2 Specimen #2 Impact Locations



Sketch #3 Specimen #3 Impact Locations

Appendix C

Drawings

TABLE OF CONTENTS

GENERAL NOTES

1. THESE SYSTEMS HAVE BEEN TESTED, ANALYZED AND APPROVED FOR DESIGN PRESSURES NOT TO EXCEED THOSE SHOWN IN THE "ALLOWABLE DESIGN LOAD" TABLE.

2. BUCKING OPENINGS & BUCKING FASTENERS MUST BE PROPERLY DESIGNED & INSTALLED TO TRANSFER LOADS TO THE STRUCTURE AND TO BE REVIEWED BY BUILDING OFFICIAL.

3. ALL HARDWARE & FASTENERS SHALL BE IN ACCORDANCE WITH THESE DRAWINGS & MAY NOT VARY UNLESS SPECIFICALLY MENTIONED ON THE DRAWINGS.

4. THE DETAILS & SPECIFICATIONS SHOWN HEREIN REPRESENT THE PRODUCTS TESTED & PROPOSED FOR WATER, AIR, IMPACT, CYCLIC & UNIFORM STATIC AIR PRESSURE TESTING IN CONFORMANCE WITH AAMA AND FBC PROTOCOLS TAS 201, 202 & 203 FOR LARGE MISSILE IMPACT AND ASTM 1886/1996.

5. THESE SYSTEMS HAVE BEEN DESIGNED IN ACCORDANCE WITH THE FLORIDA BUILDING CODE (FBC) INCLUDING HIGH VELOCITY HURRICANE ZONES (HVHZ).

6. ALL ANCHORS SHALL BE INSTALLED AS SPECIFIED ON THESE DRAWINGS. SPECIFIED EMBEDMENT TO BASE MATERIAL SHALL BE BEYOND WALL FINISH OR STUCCO.

7. MATERIALS, INCLUDING BUT NOT LIMITED TO STEEL SCREWS, THAT COME INTO CONTACT WITH OTHER DISSIMILAR MATERIALS SHALL MEET THE REQUIREMENTS OF AAMA AND FLORIDA BUILDING CODE.

GLAZING TYPES

	ASTM 1886/1996 TAS 201, 202,203 LARGE MISSILE IMPACT AND CYCLIC WIND LOADING
OA: 1": (5MM–ANNEALED, 0.625 AIR, 5MM–ANNEALED.	NO
OA: 1–1/4" INSULATING LAMINATED GLASS COMPRISED OF: 6MM TEMPERED– 5/8" AIRSPACE – 5MM HEAT STRENGTHENED – 90 MIL SENTRY GLASS®– 5MM HEAT STRENGTHENED	YES

ALLOWABLE DESIGN LOAD

MAXIMUM DESIGN PRESSURE:		+50 PSF	-50 PSF
MAXIMUM FRAME SIZE WITH TDL BARS:	120" X 120"		
MAXIMUM FRAME SIZE WITHOUT TDL BARS:	120" X 60"		
MAXIMUM TDL BAR LENGTH:	120"		
		GLAZING DAYLIGHT OPENING	
MAXIMUM GLAZING SIZE		120" X 60"	
WITH NON–INTERSECTIONG TDL BARS		120" X 60"	
WITH INTERSECTIONG TDL BARS		60" X 60"	

*FRAME ANCHOR REQUIREMENTS TABLE

OPENING TYPE (SUBSTRATE)	FRAME TO OPENING FASTENER TYPE	MINIMUM EMBEDMENT	MINIMUM EDGE DIST.
2X_ WOOD FRAME OR BUCK	(1)NO. 10 SMS SCREW	1 1/2"	3/4"
MIN. 18 GA. 33 KSI STEEL STUD	(1)NO. 10 SMS SCREW	FULL	3/8"
CMU/CONCRETE	(2)3/16" CONCRETE SCREWS	1 1/4"	2 5/8"

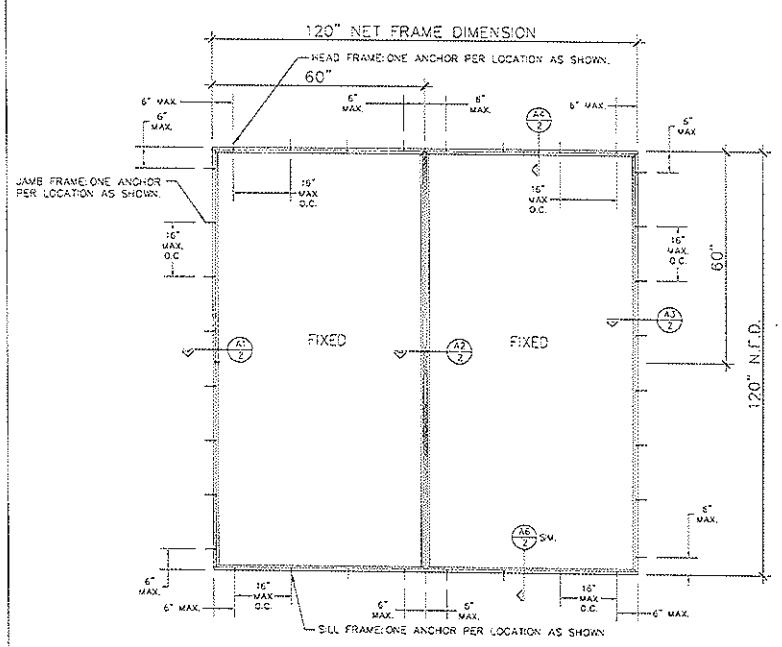
(1) SMS SCREWS GRADE 5
(2) CONCRETE SCREWS SHALL BE 3/16" ITW TAPCON OR EQUIVALENT

Architectural Testing, Inc.
Test sample complies with these details
Deviations are noted

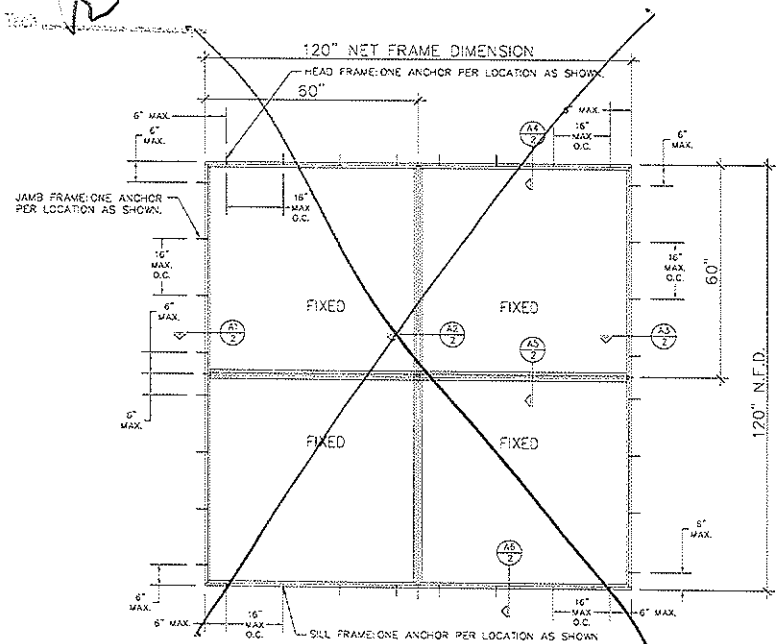
94550 [illegible]

Report# Date

Tech



SPECIMEN 1: VERTICAL TDL



SPECIMEN 2: INTERSECTING TDL

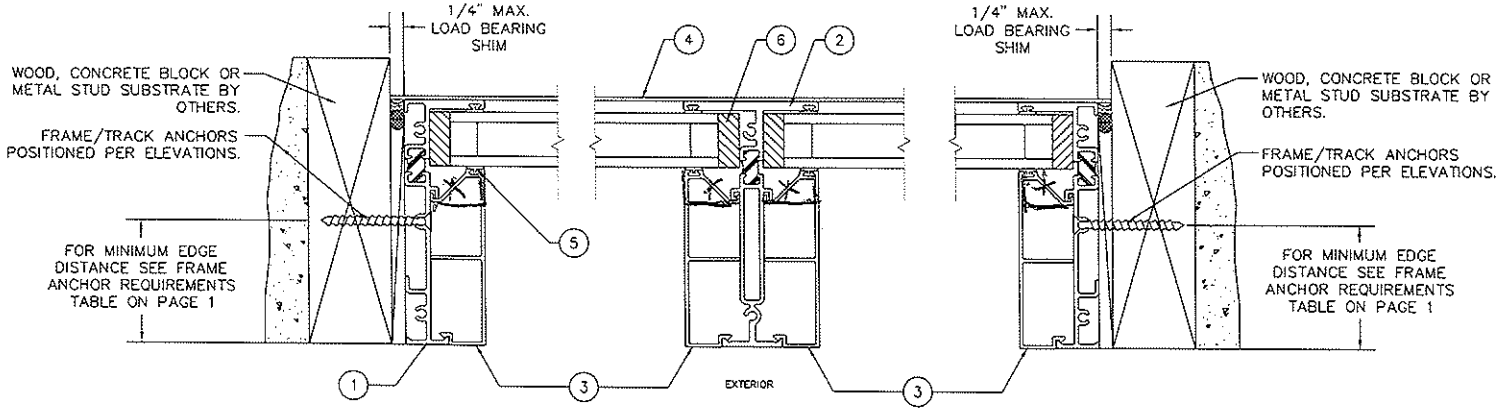
VALIDATOR INITIAL

COMMENTS | DRAWN BY | DATE | REVISIONS | DATE: 08/17/2009 | DRAWN BY: KEVIN | JOB NUMBER: 25385

TITLE: KONA 3600 AAMA, FBC, ASTM 1886/1996 CERTIFICATION
CUSTOMER: FLEET WOOD WINDOWS AND DOORS
POS NAME: KONA 3600 CERTIFICATION

FLEETWOOD WINDOWS AND DOORS
395 SMITH AVE CORONA, CALIFORNIA 92880 - www.fleetwoodusa.com

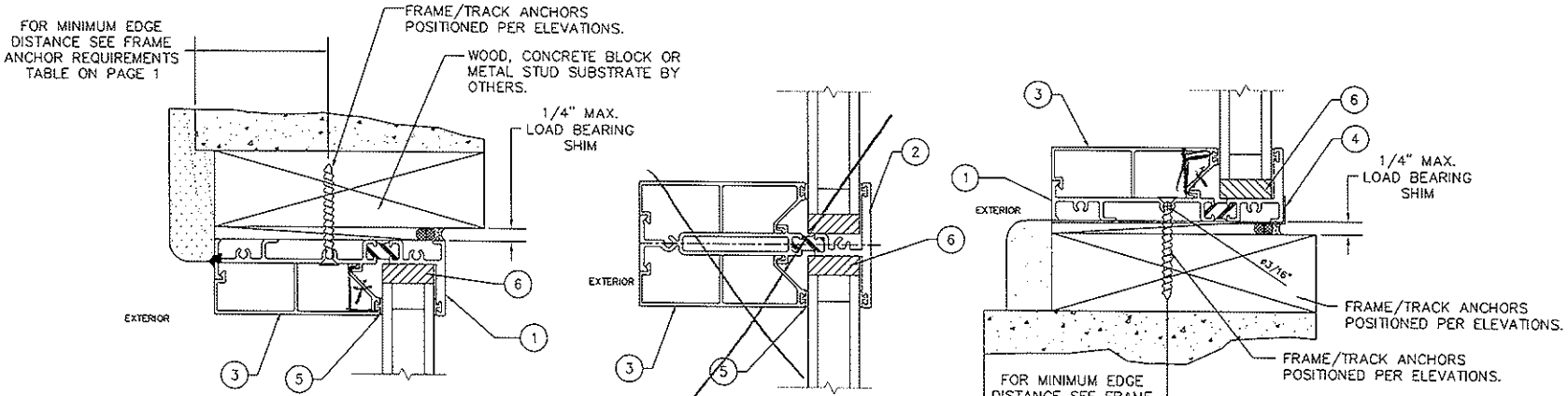
SCALE : 1:16
DRAWING NO. : CERT-3600-09
SHEET : 1 OF 3



A1 2 JAMB SCALE: FULL

A2 2 V. MULLION SCALE: FULL

A3 2 JAMB SCALE: FULL



A4 2 HEAD SCALE: FULL

A5 2 H. MULLION SCALE: FULL

A6 2 SILL SCALE: FULL

Architectural Testing, Inc.
Test sample complies with these details
Deviations are noted

94550 JAN 05 2010

Remarks Date

Tech

VALIDATOR INITIAL

FLEETWOOD WINDOWS AND DOORS
305 SMITH AVE CORONA, CALIFORNIA 92880 - www.fleetwoodusa.com

TITLE: KONA 3800 - AAMA, NWC, ASTM 1886/ 1996 CERTIFICATION
CUSTOMER: FLEET WOOD WINDOWS AND DOORS
JOB NAME: KONA 3800 CERTIFICATION
DRAWN BY: KEVIN
DATE: 09/17/2009
JOB NUMBER: 253695

REVISIONS | DATE | DRAWN BY | COMMENTS

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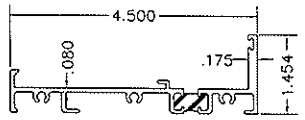
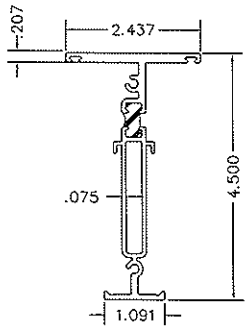
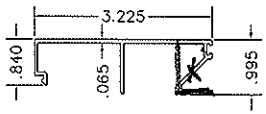
SHEET: 2 OF 3



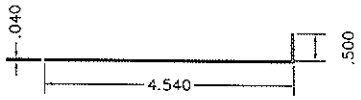
① SILL, HEAD & JAMB



② MULLION

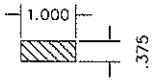


③ GLASS STOP



④ SILL PAN

⑤ SANOPRENE BULB



⑥ EDGE BLOCK

ITEM #	PART	ITEM DESCRIPTION
		EXTRUSIONS
1	3805	SILL, HEAD JAMB
2	3806	MULLION
3	3801	GLASS STOP
4	3822	SILL PAN
5	OVP04	SANOPRENE BULB
6	FW-1006	EDGE BLOCK

Architectural Testing, Inc.
Test sample complies with these details
Deviations are noted

94550 JAN 05 2010

Report# Date

Tech

VALIDATOR INITIAL

FLEETWOOD WINDOWS AND DOORS
395 SMITTY AVE CORONA, CALIFORNIA 92880 www.fleetwoodusa.com

TITLE: KONA 3800 - AAMA, HIC. ASTM 1886/1996 CERTIFICATION
CUSTOMER: FLEETWOOD WINDOWS AND DOORS
JOB NAME: KONA 3800 CERTIFICATION

DRAWN BY: KEVIN
DATE: 05/17/2009
JOB# NUMBER: 243985

REVISIONS | DATE | DRAWN BY | COMMENTS

SCALE: 1:1
DRAWING NO.: CERT 3800-09
SHEET: 3 OF 3