SPECIALIZED TESTING
10600 Pioneer Boulevard, Suite G • Santa Fe Springs, California 90670 • (562) 903-0032 • Fax (562) 903-3534
ACCREDITED

WANESSA-SUE, INC.
AIRLIGHT BUILDING PANELS
RACKING SHEAR TEST PROGRAM

FULLY REVERSED (CYCLIC) RACKING SHEAR TESTS PURSUANT TO ASTM E 2126

TEST REPORT NO. – STQA50483B

TEST DATES: 7/16/2013 and 7/17/2013
FINAL REPORT DATE: 8/15/2013

TEST SPONSOR
WANESSA-SUE, INC.
5456 INEZ RD
KINGMAN, AZ 86409

TESTED BY

SPECIALIZED TESTING
10600 PIONEER BLVD.
SANTA FE SPRINGS, CA 90670

REGISTERED PROFESSIONAL ENGINEER
TIM FOSTER
NO. C 056556
Exp 12/2014
CIVIL
STATE OF CALIFORNIA

REPORT REVIEWED BY:

MARTIN MEJIA
PROJECT MANAGER

REPORT PREPARED BY:

TIM FOSTER, P.E.

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I. OBJECTIVE

The objective of the test program was to determine the lateral capacity and behavior of Airlight Building Panels when subjected to fully reversed (cyclic) racking shear tests. The test data shall be evaluated by the IAPMO Uniform Evaluation Service.

II. TEST STANDARDS

The test program was performed in compliance with ASTM E 2126-11 – *Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings.*

III. SCOPE OF TESTING

Three racking shear tests were performed as follows:

- Three racking shear tests of 5-1/2-in. thick x 96-in. long x 10-ft. high assemblies (two 48-in. long panels with one vertical joint)

A monotonic test was performed to establish the cyclic displacement, delta value, as required by Method A of ASTM E 2126.

IV. TEST SPONSOR

The test program was sponsored by Wanessa-Sue, Inc. through a contractual agreement with Specialized Testing, Inc. dba Specialized Testing.

V. AIRLIGHT BUILDING PANEL DESCRIPTION AND TEST ASSEMBLY DIMENSIONS

The Airlight Panel is a composite structure constructed of modified expanded polystyrene (EPS), bonded to galvanized light-gauge cold formed steel (CFS) framing members. The framing members (24-ga) are rolled and assembled by Wanessa-Sue, Inc. Adhesive is applied to interior sides of the webs and flanges of the CFS. The assembled framing members are positioned in a thermal press at the interior and exterior face of the panel. EPS beads are injected into the press. The heat and pressure of the press expands the EPS such that the CFS framing members and the foam form a composite structure incorporating a thermal break at the mid-depth of the panel. **Section 4** of the **Appendix** presents a drawing of the Airlight Building Panel and component material identification reports.

Following are the nominal dimensions for the panel assemblies tested in this racking shear test program:

- Two 48-in. long by 10-ft. tall x 5-1/2-in. thick panels joined to form a 96-in. long x 10-ft. high x 5-1/2-in. thick assembly (dimensions are nominal).

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VI. TEST SPECIMEN SAMPLING

The production of the Airlight Building Panel test specimens was performed on June 27, 2013. The test specimen production was witnessed by Tim Foster of Specialized Testing, at the Wanessa Sue, Inc. manufacturing facility located at 5456 Inez Road – Kingman, AZ 86409. The witnessed panels were identified, quarantined and shipped to Specialized Testing's laboratory located in Santa Fe Springs, CA. Three Airlight Building Panels were received by Specialized Testing on June 28, 2013 and were assigned the following log number: 647. Twelve Airlight Building Panels were received by Specialized Testing on July 16, 2013 and were assigned the following log number: 656. **Section 2** of the **Appendix** presents the Specialized Testing sampling report.

Figures 1 and **2** present photographs of the sampled Airlight Building Panel.

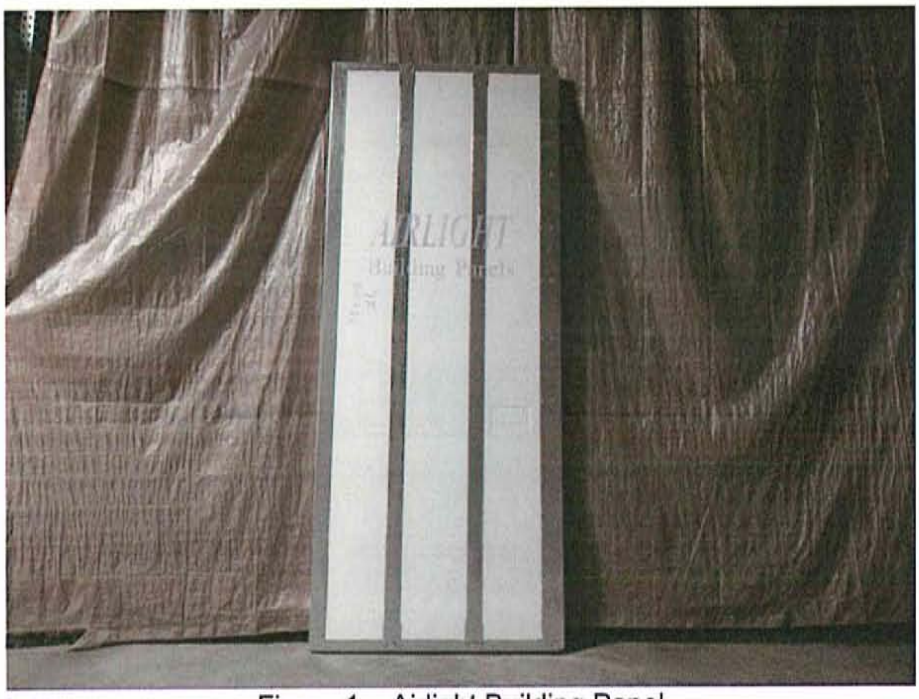

Figure 1 – Airlight Building Panel
Single 48-in. long x 10-ft.-4-in. high x 5-1/2-in. thick panel

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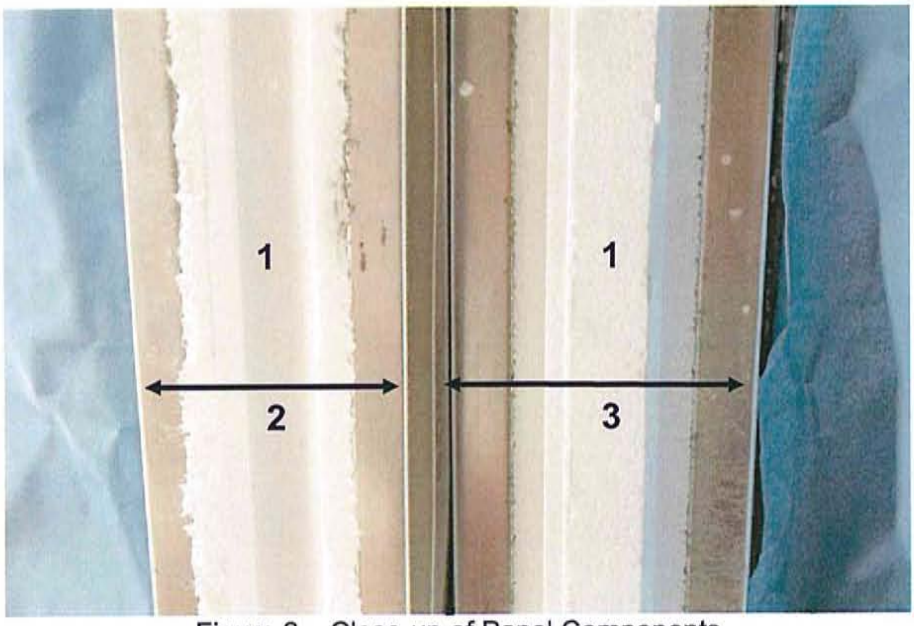

Figure 2 – Close-up of Panel Components
(1) EPS Foam Core, (2) Airlight Building Panel Foam Female Edge "Groove"
(3) Airlight Building Panel Foam Male Edge "Tongue"

VII. LABORATORY OF RECORD

Specialized Testing, Inc. dba Specialized Testing (IAS TL228) was the laboratory of record. All Racking Shear tests were performed at Specialized Testing's laboratory facilities in Santa Fe Springs, CA.

VIII. TEST EQUIPMENT

The test equipment consisted of a structural steel test frame assembly, test apparatus, test instruments, and a data acquisition system. The test frame consisted of a rigid structural steel base, a load beam, a mechanical lever arm, guide tracks, and miscellaneous fixtures.

The test apparatus consisted of a hydraulic actuator, hydraulic accumulators, in-plane guides, and an aluminum load beam. The test instruments consisted of a 10,000-lb. Sensotec compression-tension load cell, Bei-Duncan deflection LVDTs, and an Ametek linear motion transducer. An IBM compatible computer system, utilizing LabView software by National Instruments, was used for data acquisition. The data acquisition rate was 50-hz. A Mediamation control system was used to deliver the displacement protocol.

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IX. TEST SETUP

The test was set-up in conformance with Sections 7 and 8.5 of ASTM E 2126 with the following exception:

- Displacement of the holdown relative to the end post was not possible as the test specimens do not utilize a traditional holdown connector. The overturning force is resisted via the two STHD10 Hold-downs on the north and south ends of the panel; both hold-downs were located on the west face of the panel.

The test panel assembly was positioned in the test frame and attached as follows:

At the Rigid Test Frame Base:

A 16-ga. thick C-Channel was fastened to the rigid base of the test frame with five 5/8-in. diameter bolts. The test panel assembly was fastened to the C-Channel with Grabber Lox No. 10 x 3-1/4-in. self drilling screws 16-in. on center. The bottom of the STHD10 hold-downs were welded to the rigid base of the test frame. Both hold-downs were located on the west side of the test frame. The test panel assembly was fastened to the hold-downs using Hilti Hex Head No. 10-16 x 1-1/4-in. self drilling screws.

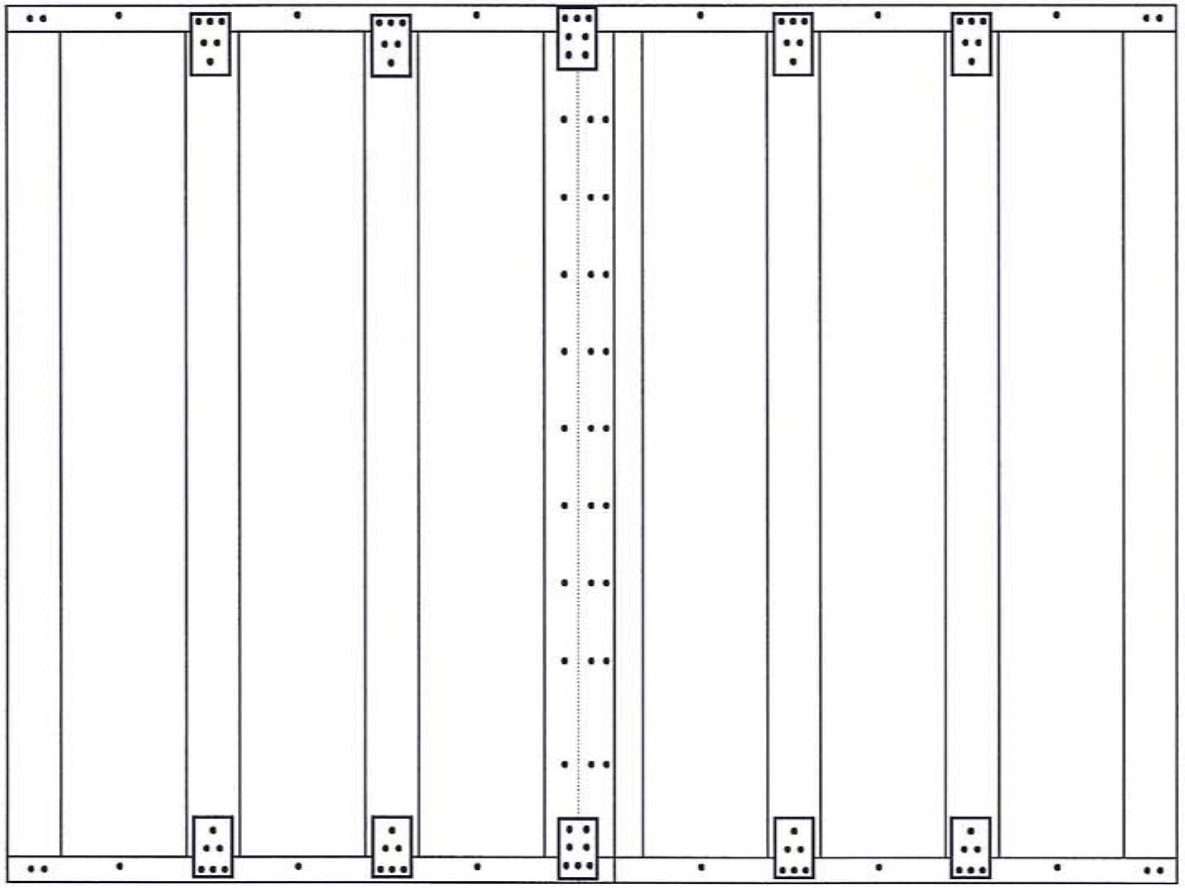
At the Top of the Test Frame:

The test panel assembly was fastened to a 16-ga. thick C-Channel with Grabber Lox No. 10 x 3-1/4-in. self drilling screws. The C-Channel was fastened to the load cap of the test station with twenty-five 1/4-in. diameter self drilling screws.

Figures 3 and **4** present sketches of the test panel assembly. **Figure 5** presents a sketch of the test instrument set-up. **Figures 6** and **7** present photographs of the test specimens positioned in the test frame.

CYCLIC (REVERSED) LOAD TESTS OF AIRLIGHT BUILDING PANELS
PER ASTM E 2126 METHOD A
TWO 5-1/2-IN. THICK x 48-IN. WIDE x 10-FT. TALL PANELS
(Specialized Testing Project No. STQA50483B)

FIGURE 3
TEST PANEL ASSEMBLY SKETCH - EAST ELEVATION



• = Grabber Lox No. 10 x 3/4" Self Drilling Screw

▭ = 20-Ga 3-1/2" x 5"
Panel to Panel / Panel to Track Plates

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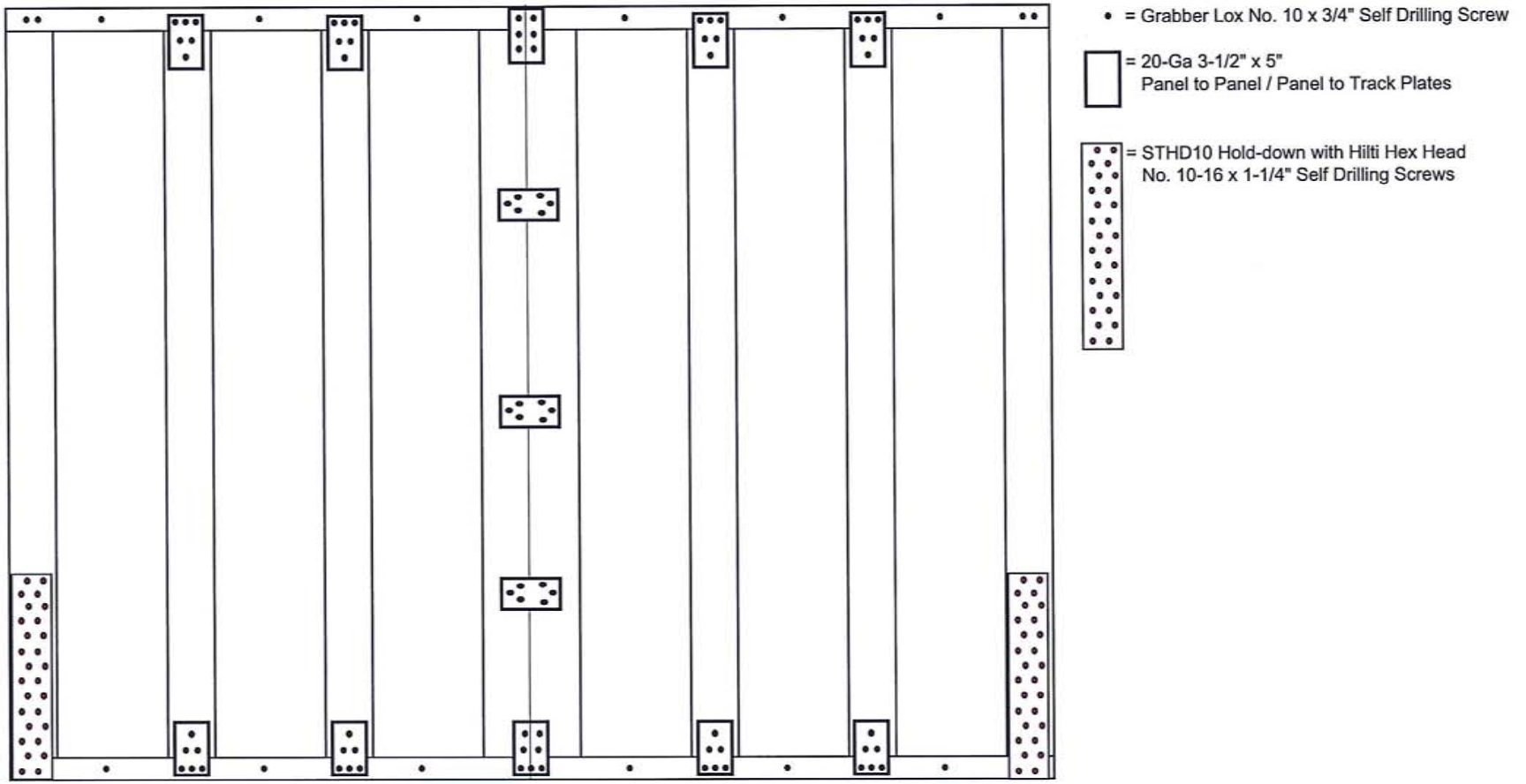
FIGURE 4
TEST PANEL ASSEMBLY SKETCH - WEST SIDE



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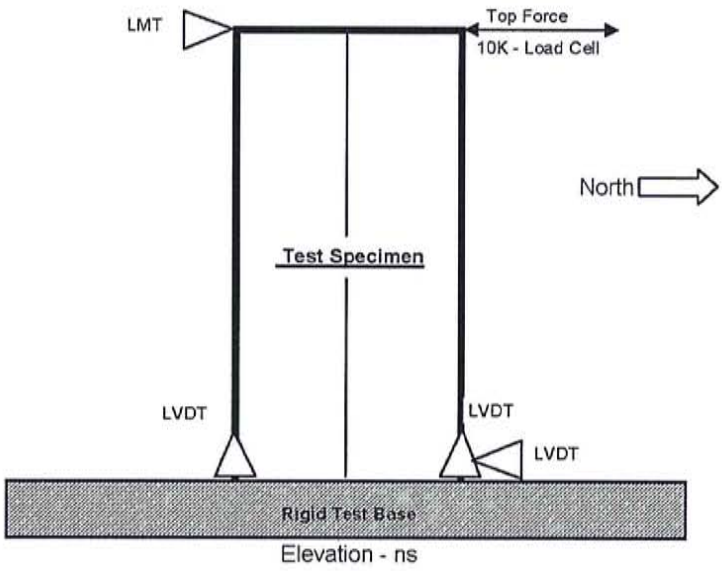

Elevation - ns

LEGEND

10K Load Cell - Sensotech 10,000-lb. Tension / Compression load cell - measures force at the top of the panel assembly.

LMT = Ametek String Potentiometer - measures displacement at the top of the panel assembly.

LVDTs - Bei Duncan LVDTs - measure horizontal and vertical displacement at the base of the test assembly relative to the rigid base of the test frame.

Figure 5 – Test Instrument Setup

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Figure 6 – Test Specimen Positioned in Test Frame
(1) Load Cell, (2) Load Cap, (3) String Potentiometer, (4) Base LVDTs
Two Panel – 96-in. long x 10-ft. tall x 5-1/2-in. thick assembly shown

Figure 7 – Test Specimen Positioned in Test Frame – Close-up
Horizontal and Vertical Deflection LVDTs

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X. TEST PROCEDURE

The test program specified the use of the Sequential Phased Displacement (SPD) loading protocol pursuant to Section 8.3 of ASTM E 2126 (Method A). A single monotonic "programming test" was performed to determine the displacement control value (Delta) for the Method A tests. Three additional test specimens were tested pursuant to Method A of ASTM E 2126.

Cyclic displacement was delivered to the test specimen from the hydraulic actuator via the lever arm and load beam. Force was measured with the compression-tension load cell. The following displacement measurements were recorded:

- Horizontal displacement at the top of the test assembly specimen - measured with a linear motion transducer.
- Vertical displacement at both ends of the test assembly (uplift and compression) relative to the rigid base of the test frame - measured with LVDTs.
- Horizontal displacement at the base of the test assembly relative to the rigid base of the test frame with an LVDT.

The panel assemblies were tested in accordance with the Method A protocol. The cyclic tests were performed with an initial frequency of 0.5-hz. The frequency was reduced to 0.3-hz., and 0.2-hz. at the later stages of each test to compensate for inertial effects. All specimens were tested until failure was observed. Note that in some cases instruments were removed prior to completion of the test. This step was required to prevent damage to the test instrument. A note has been made on the plotted record when test instruments were removed during the test.

XI. TEST EQUIPMENT CALIBRATION

The load cell and displacement transducers used in the test program were independently calibrated by United Calibration (United). United is an ISO/IEC 17025 accredited calibration laboratory. Calibration certificates for the test equipment used in the program are on file at Specialized Testing. The calibration instruments used are traceable to NIST.

XII. FAILURE MODE

The failure mode for the test panel assemblies was fracture of the stud at the north-west side of the panel, directly above the hold-down.

Figure 8 presents a photograph of the failure mode.

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Figure 8 – Failure Mode (Observed in All Tests)
Stud Fracture at the North-West Side of the Panel, Directly Above the Hold-Down

XIII. TEST RESULTS

A summary of the top force and displacement at the strength limit state is presented in **Table 1**. Plotted records of all cyclic tests are presented in **Section 1** of the **Appendix**.

XIV. SPEC TESTING PERSONNEL

Martin Mejia – Test Report Author and Project Manager
Tim Foster, P.E. – Assistant Project Manager
Dennis Morales – Senior Test Technician
Ricardo Flores – Senior Test Technician

WANESSA-SUE, INC. AIRLIGHT BUILDING PANELS RACKING SHEAR TEST PROGRAM

TABLE 1 - TEST DATA SUMMARY

SPECIALIZED TESTING PROJECT NO. STQA50483B

TEST NUMBER	DATE OF TEST	TEST ASSEMBLY DESCRIPTION	SPD DELTA IN. (1)	PEAK FORCE (SLS) (2)	DISPL. AT PEAK FORCE (SLS) (2)	PRIMARY FAILURE MODE	MEAN PEAK FORCE LBS.	MEAN DISPL. AT PEAK FORCE IN.	VARIATION FROM MEAN PERCENT
1	7/16/2013	Two 48-in. long by 10-ft. tall x 5-1/2-in. thick panels joined to form a 96-in. long x 10-ft. high x 5-1/2-in. thick assembly (dimensions are nominal). See Figures 3 and 4 for sketches of the test panel assembly.	0.5	5,424	1.486	Stud fracture at the north-west side of the panel, directly above the hold-down	5,470	1.697	-0.8
2	7/17/2013			5,318	1.688	Stud fracture at the north-west side of the panel, directly above the hold-down			-2.8
3	7/17/2013			5,668	1.918	Stud fracture at the north-west side of the panel, directly above the hold-down			3.6

(1) A monotonic test was performed to develop the cyclic displacement, delta value, as required by Method A of ASTM E 2126.

(2) Mean absolute value of load and displacement values at the strength limit state (SLS).

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APPENDIX

WANESSA-SUE, INC.

AIRLIGHT BUILDING PANELS

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SECTION 1 – PLOTTED RECORD OF RACKING SHEAR TESTS

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PER ASTM E 2126 METHOD A
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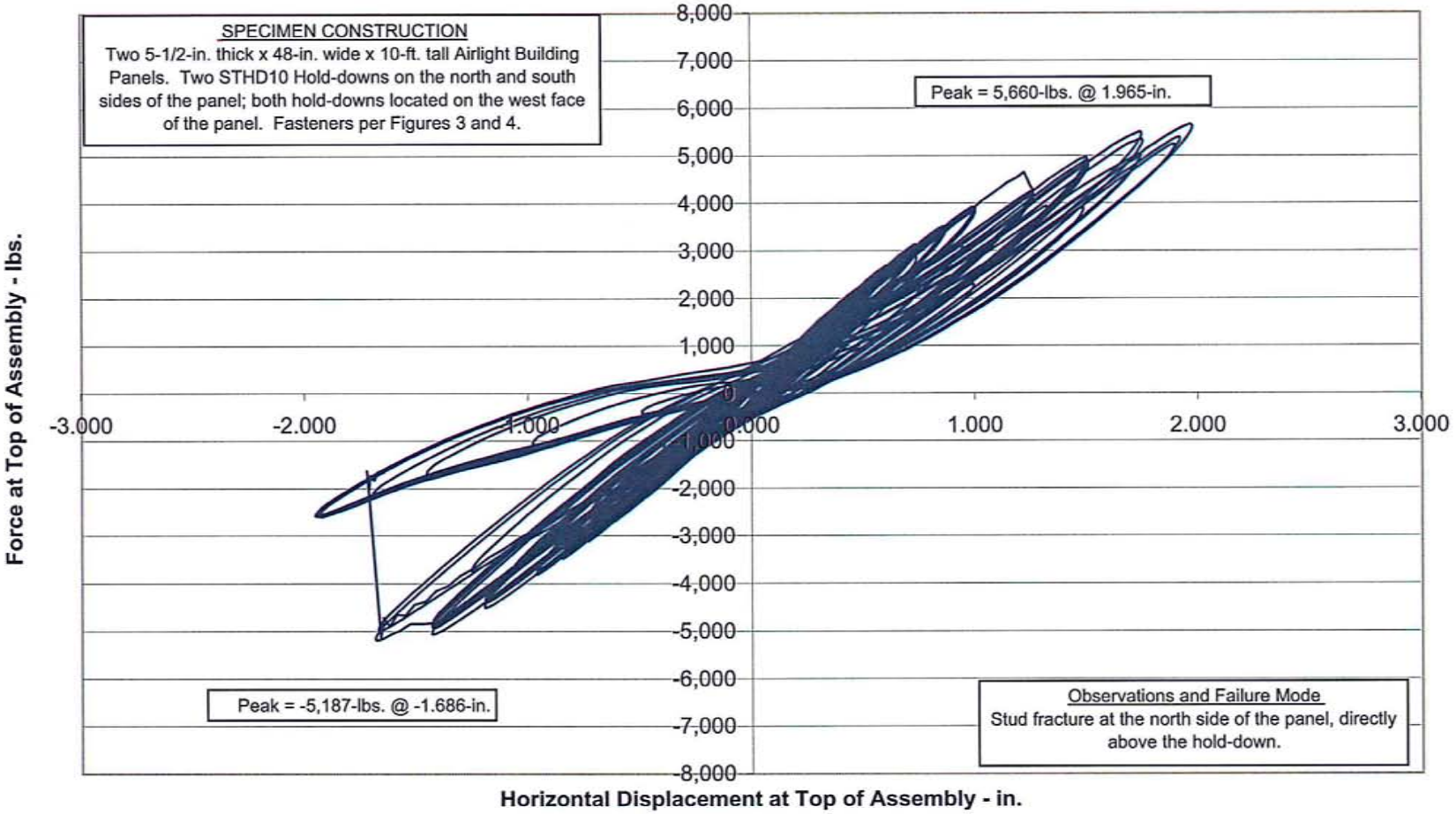
Test No. 1 - 7/16/2013 (Specialized Testing Project No. STQA50483B)



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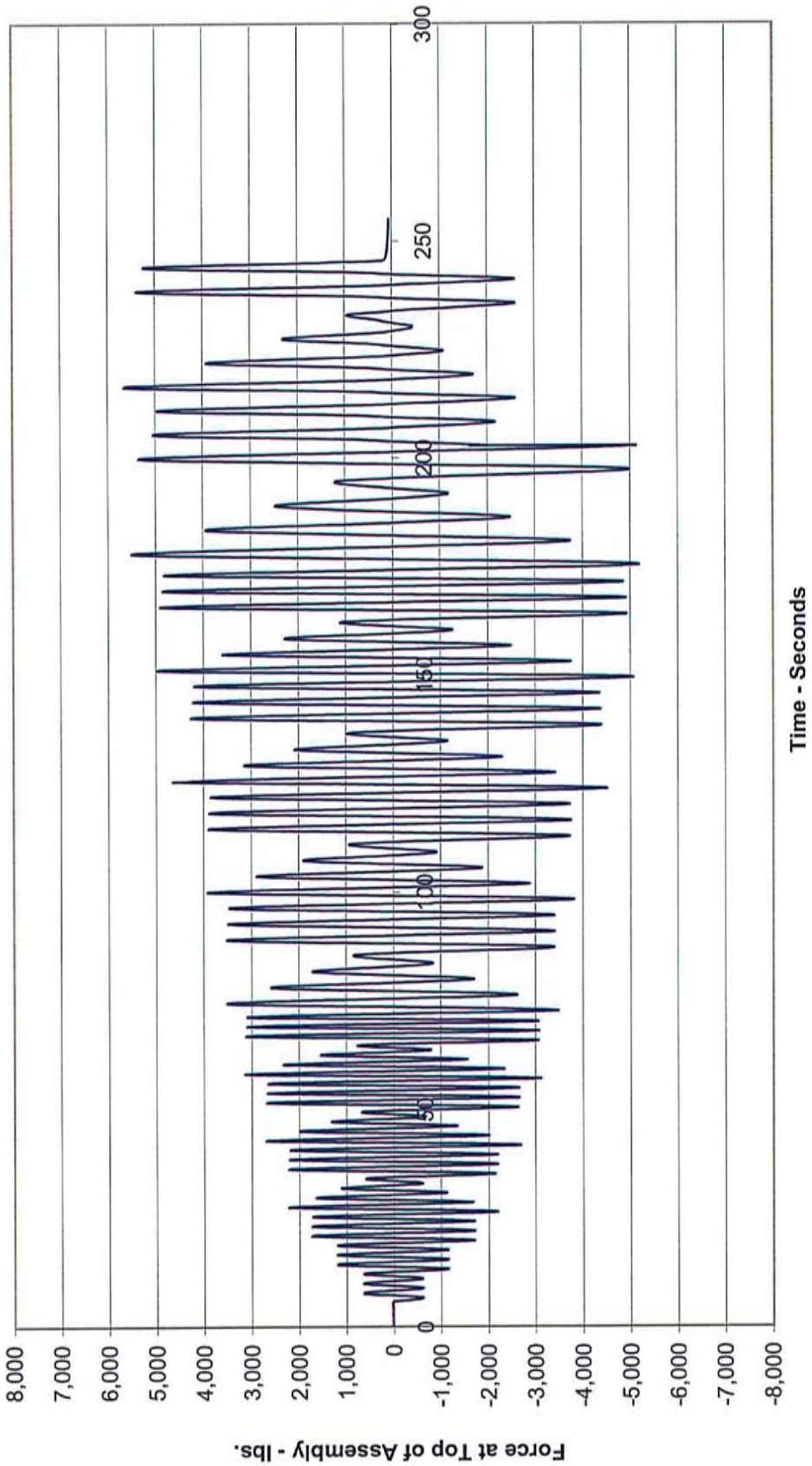

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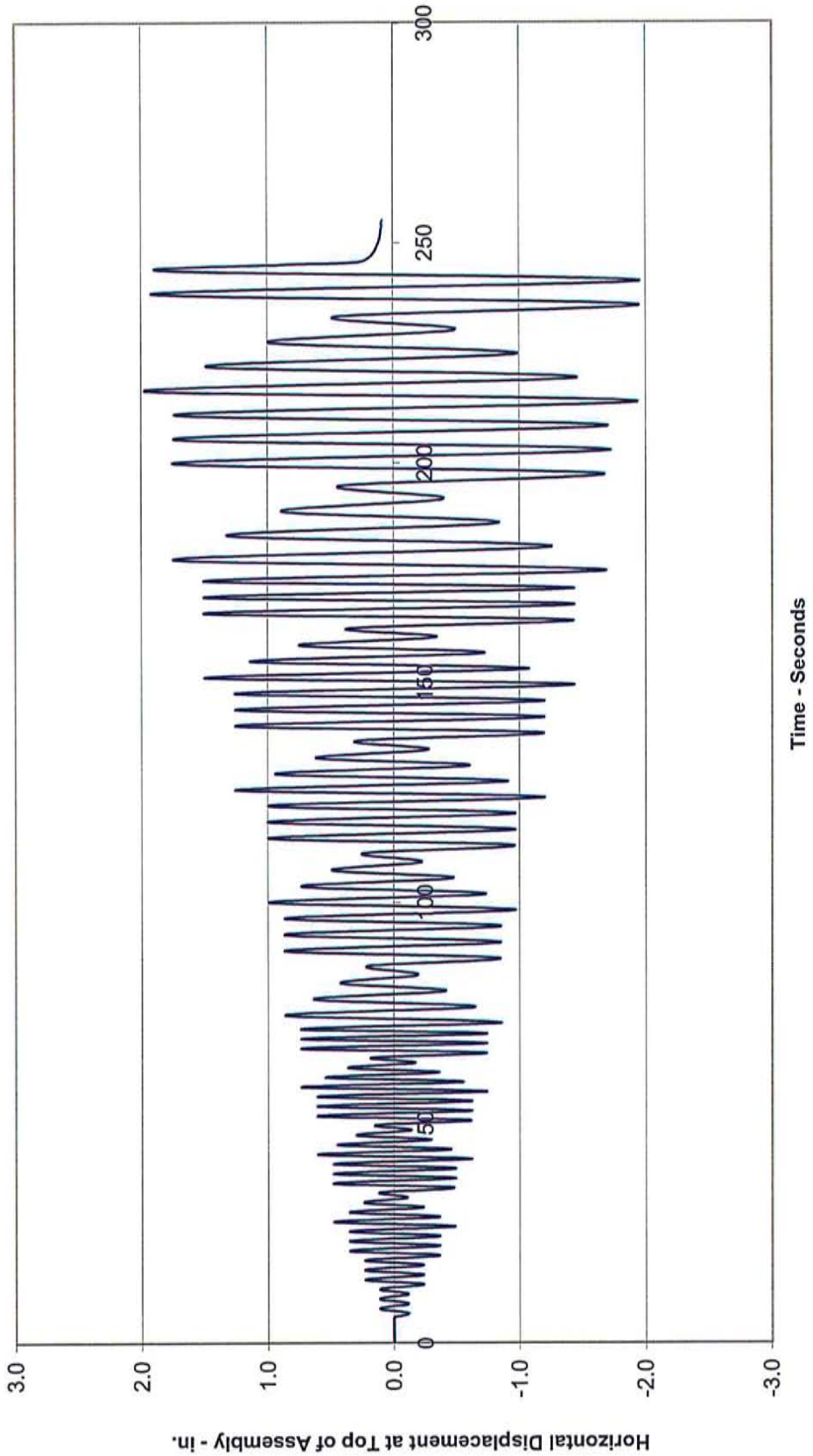

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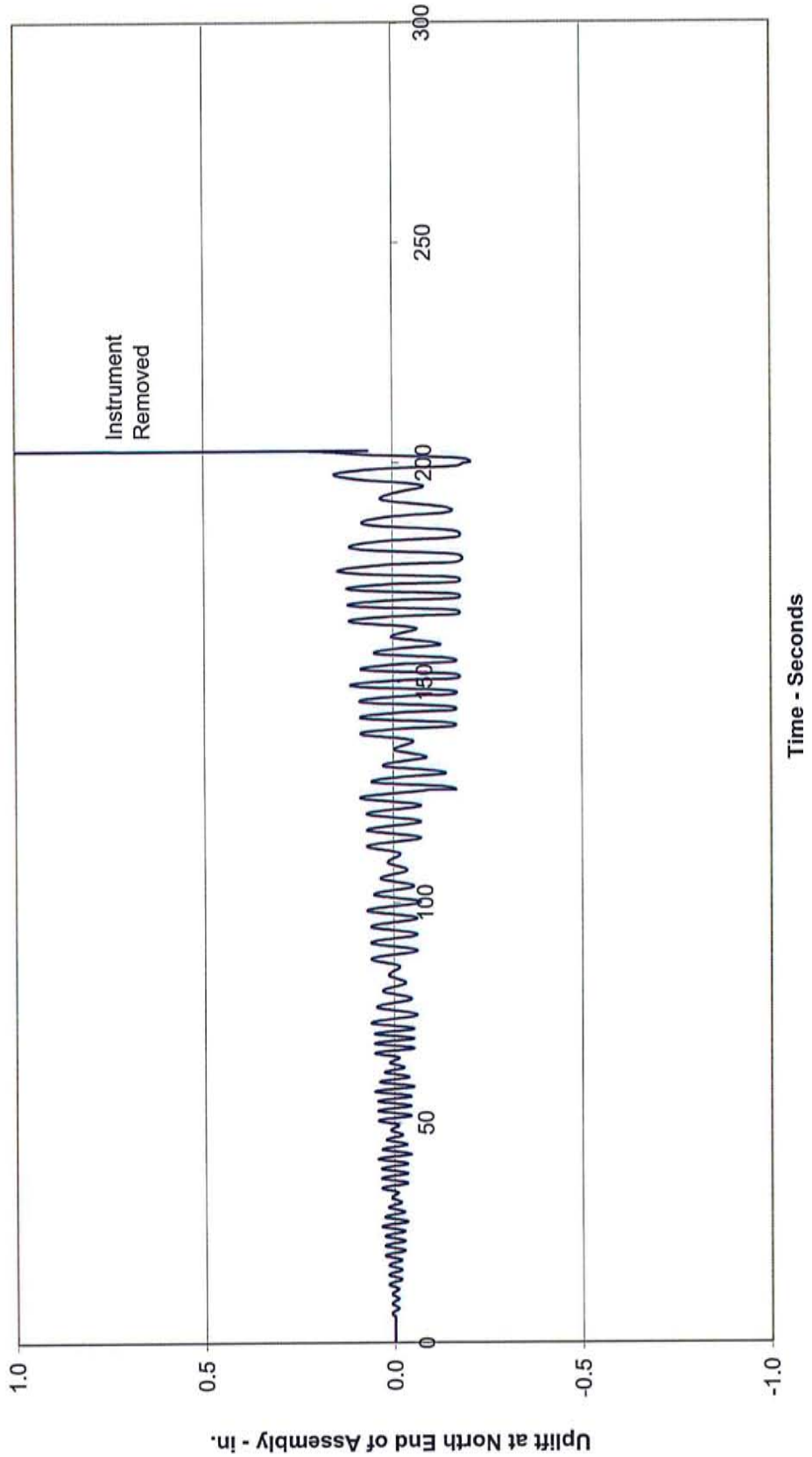

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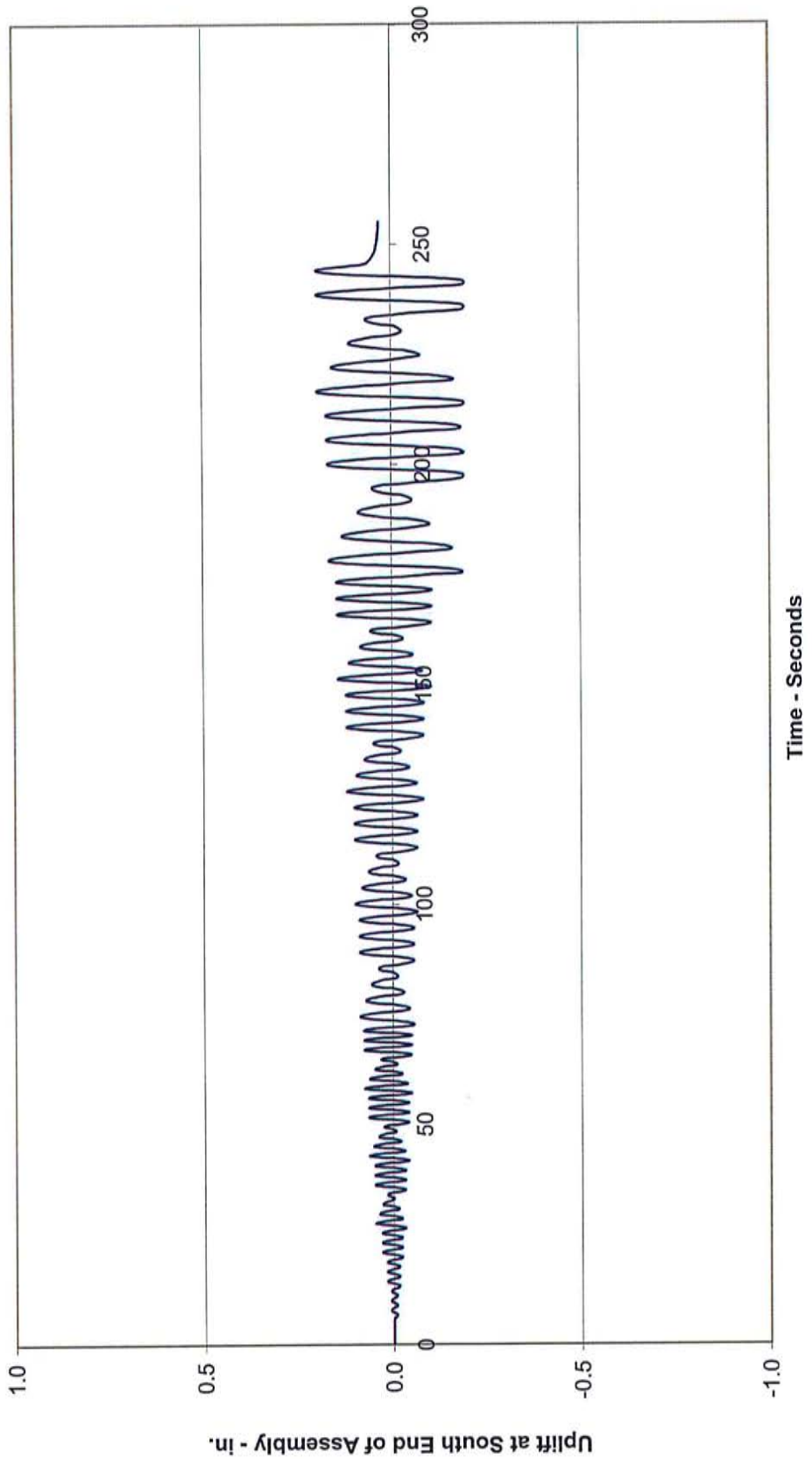

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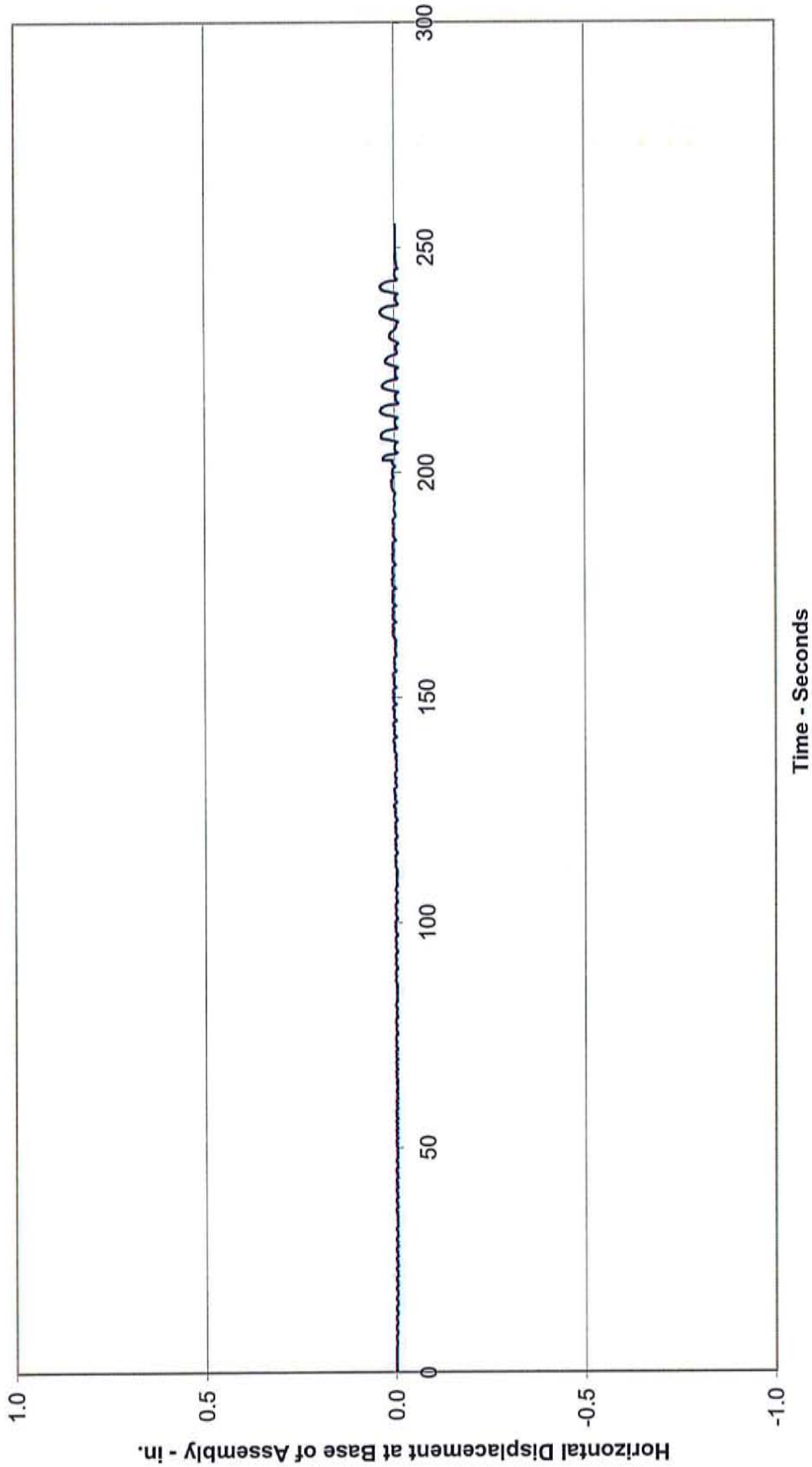
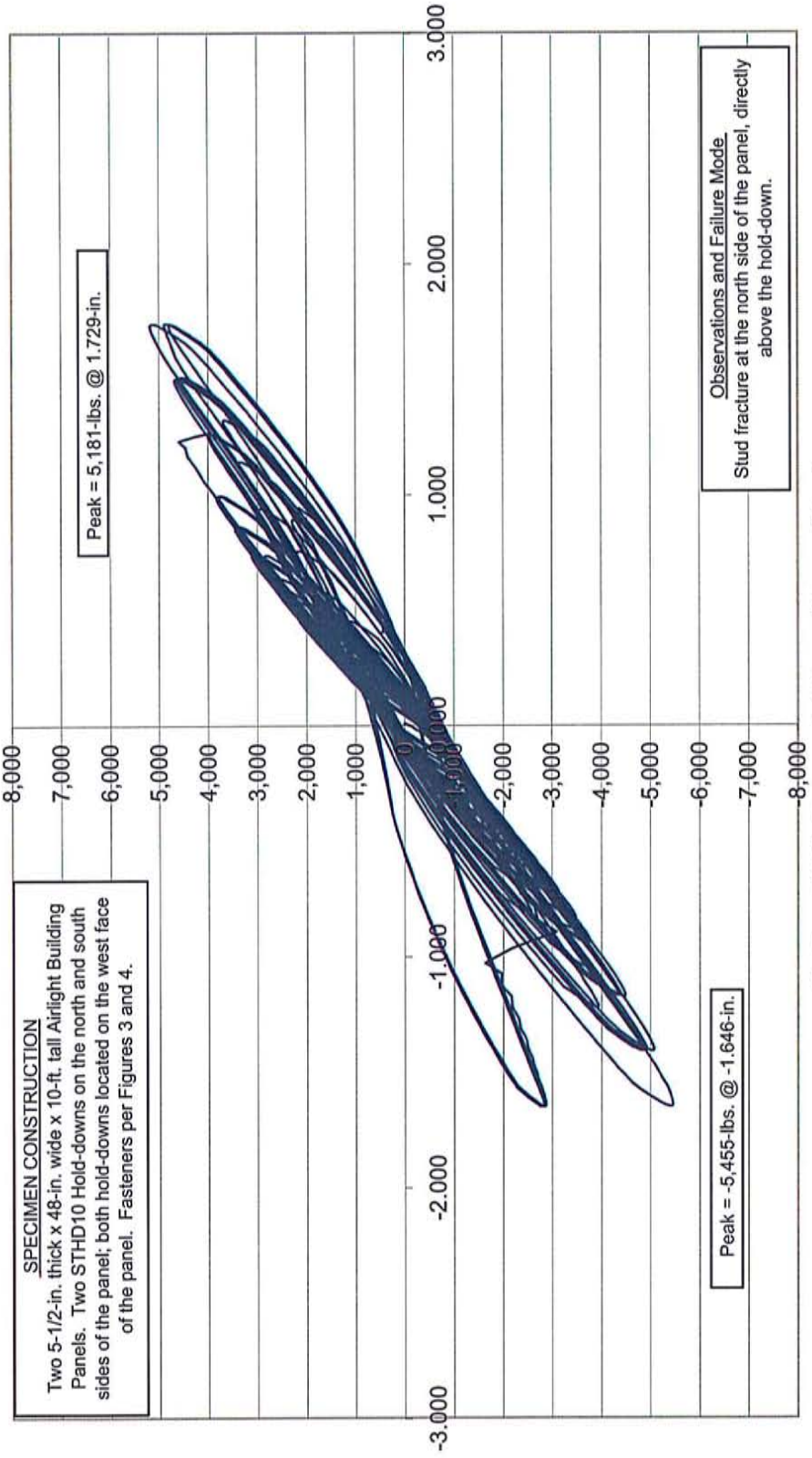


CYCLIC (REVERSED) LOAD TESTS OF AIRLIGHT BUILDING PANELS PER ASTM E 2126 METHOD A

TWO 5-1/2-IN. THICK x 48-IN. WIDE x 10-FT. TALL PANELS

Test No. 2 - 7/17/2013 (Specialized Testing Project No. STQA50483B)



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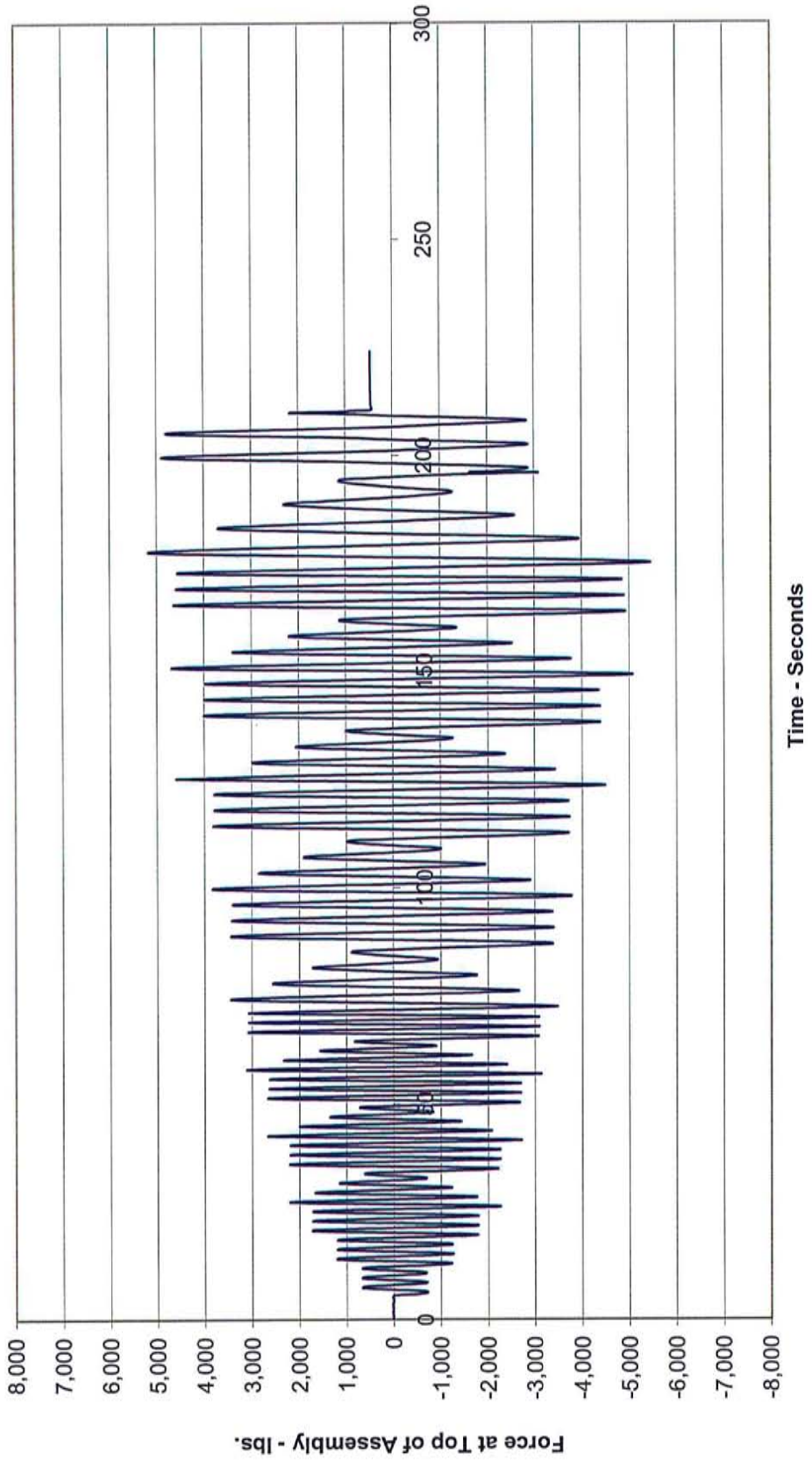

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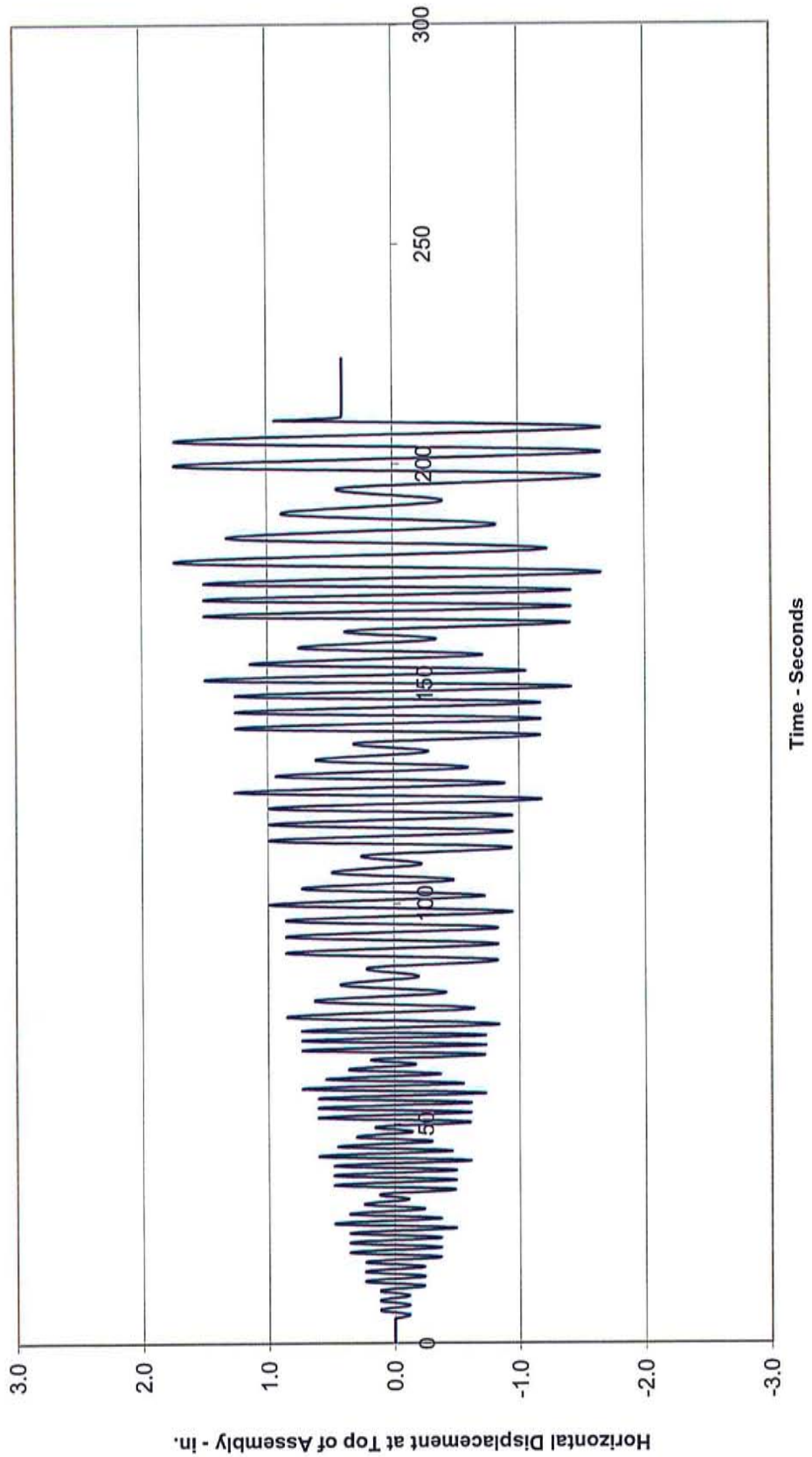

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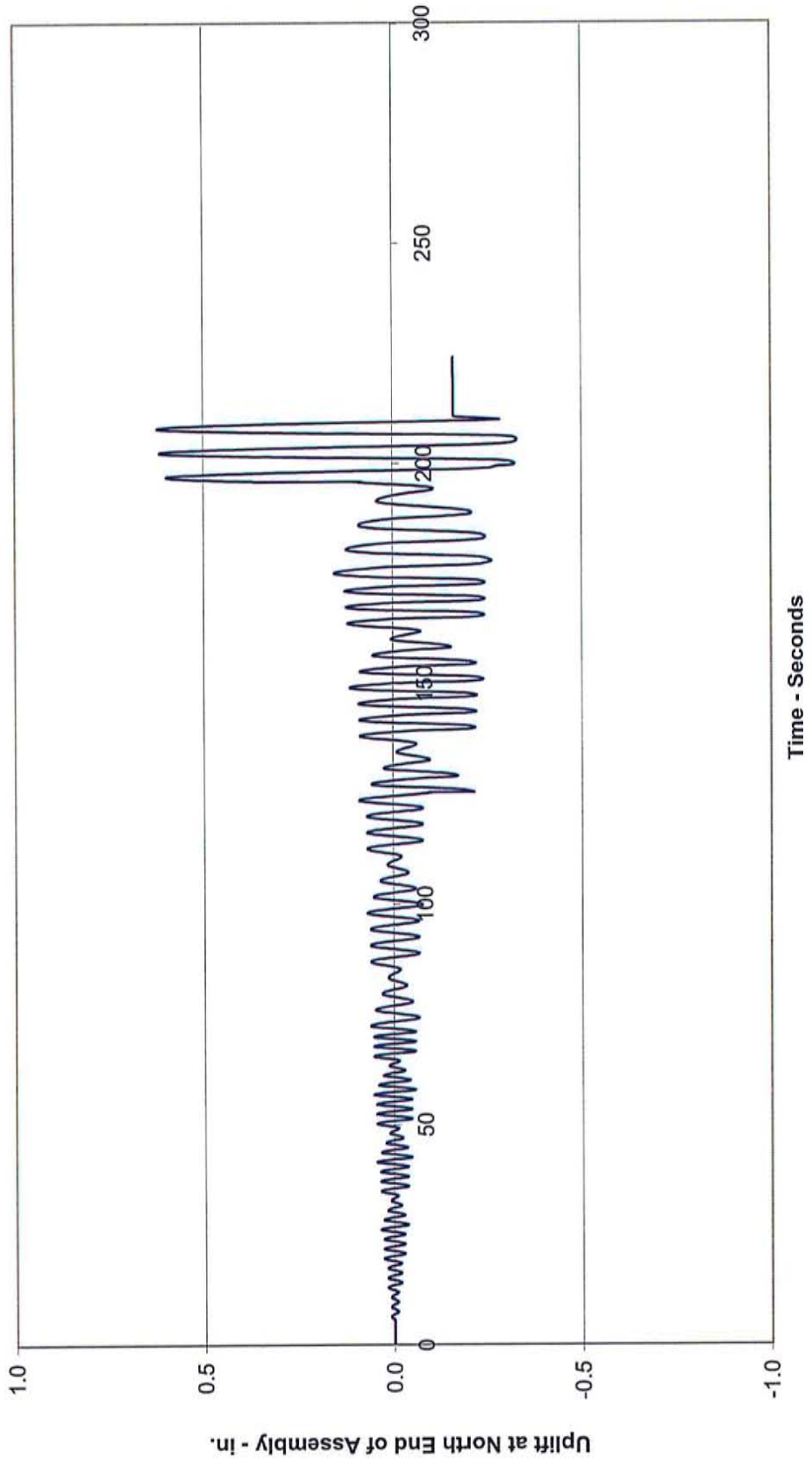

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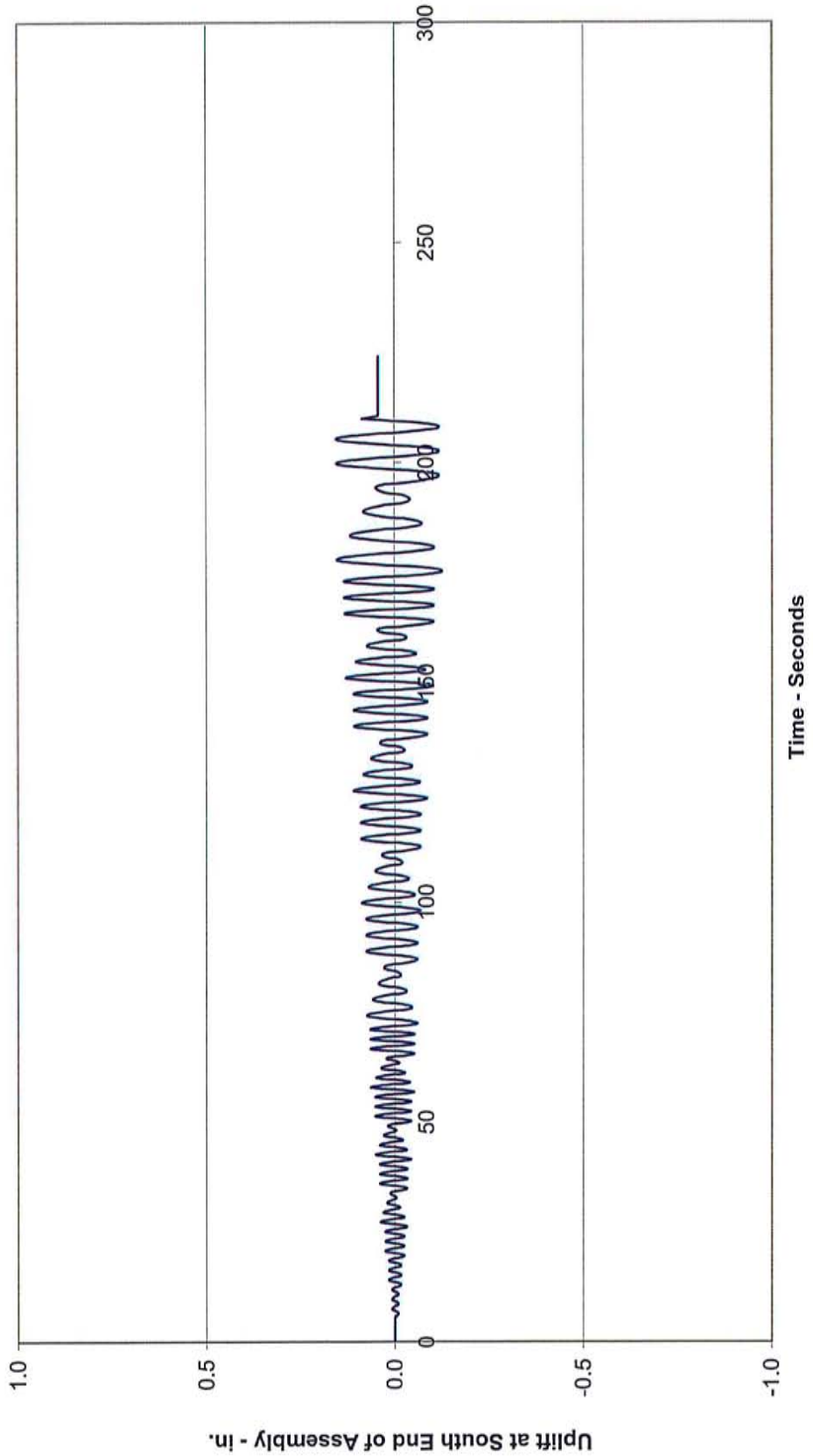

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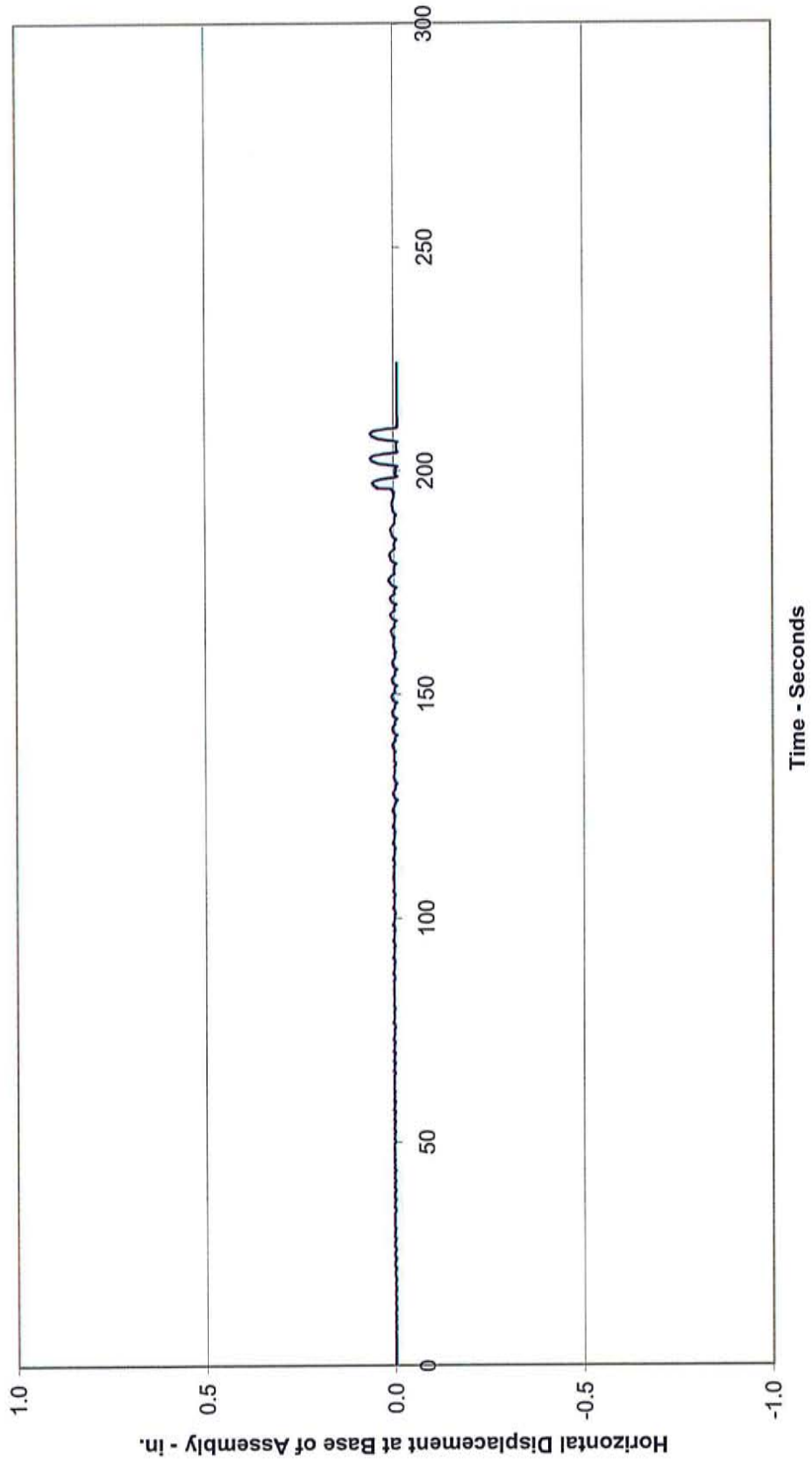

CYCLIC (REVERSED) LOAD TESTS OF AIRLIGHT BUILDING PANELS PER ASTM E 2126 METHOD A

TWO 5-1/2-IN. THICK x 48-IN. WIDE x 10-FT. TALL PANELS

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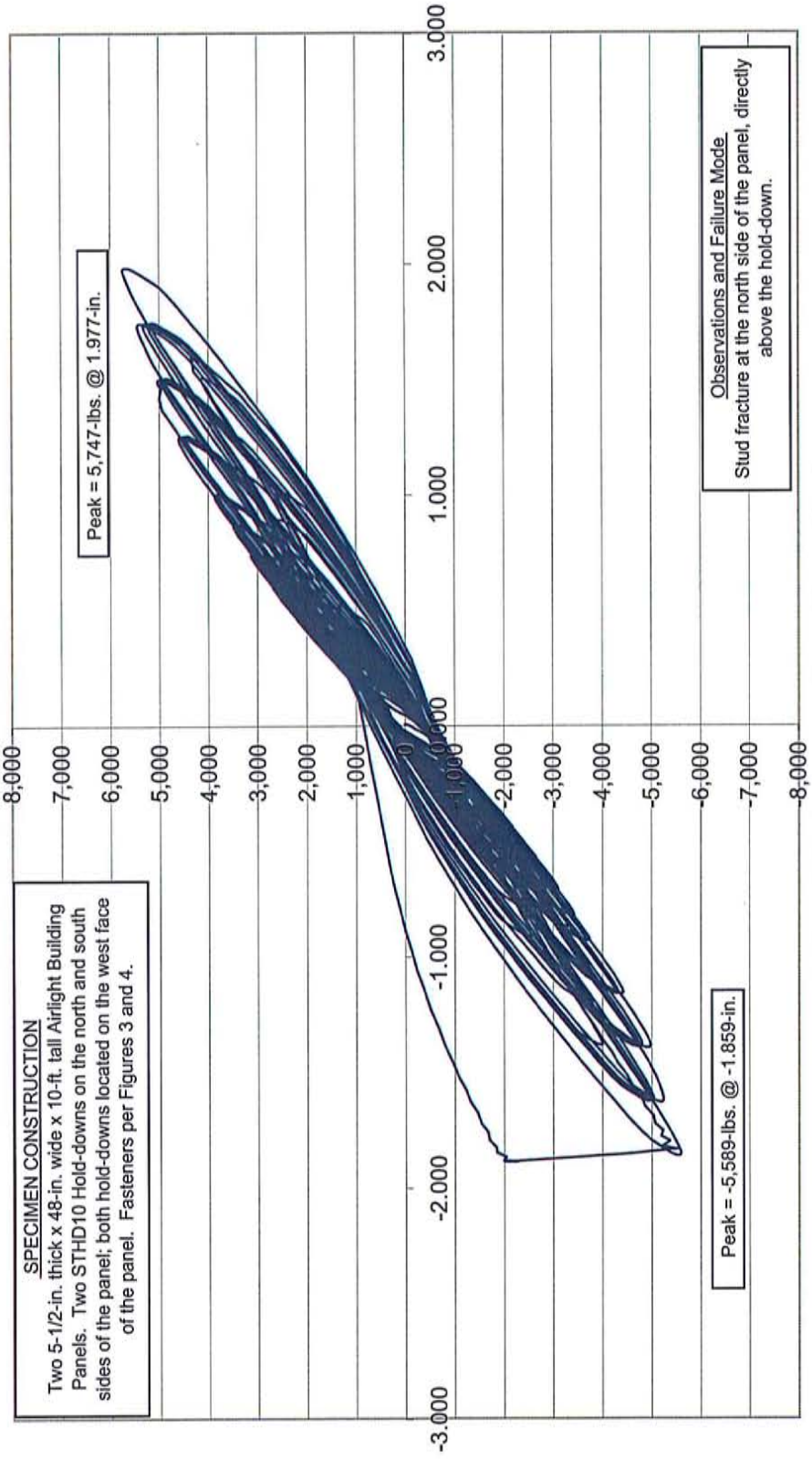

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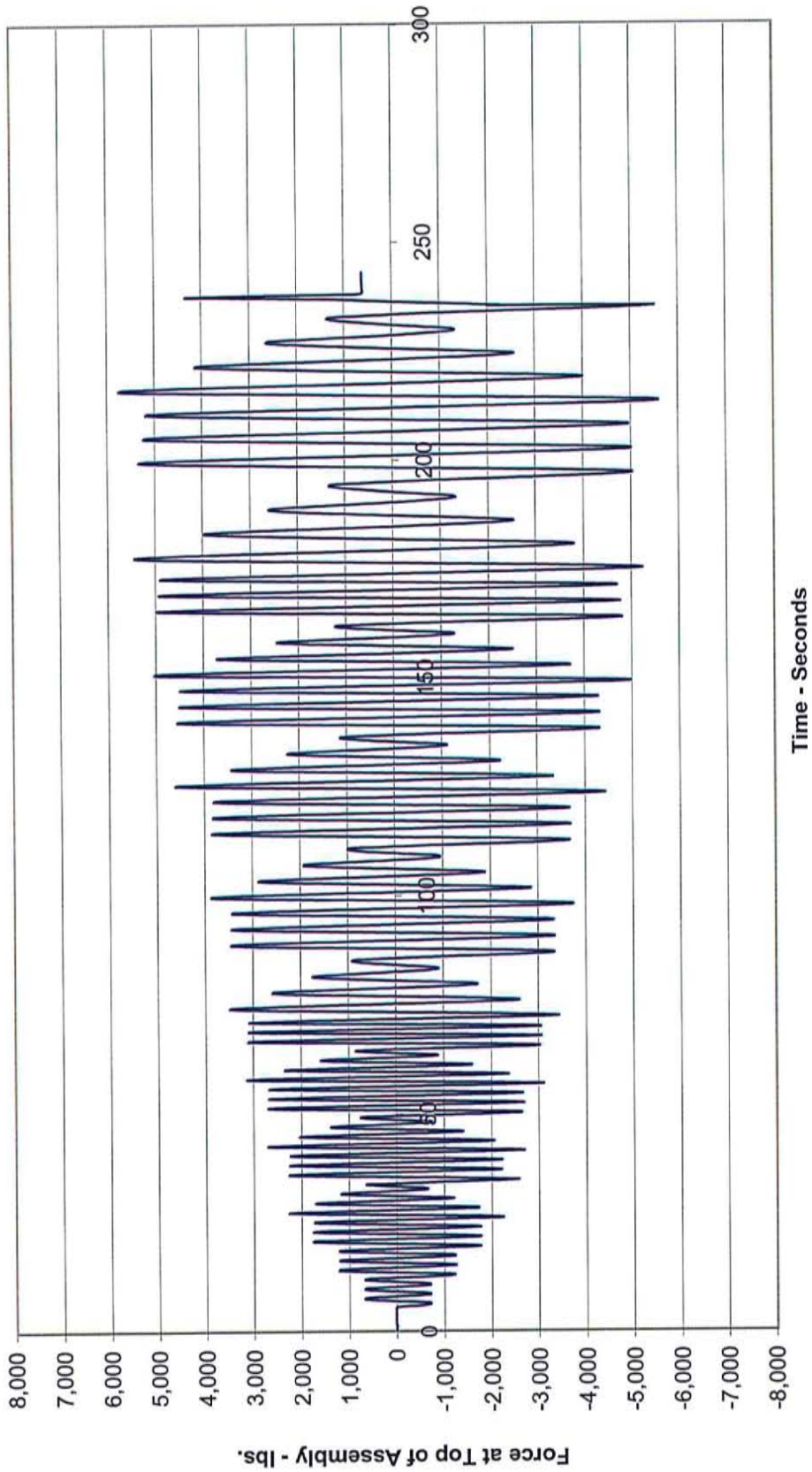

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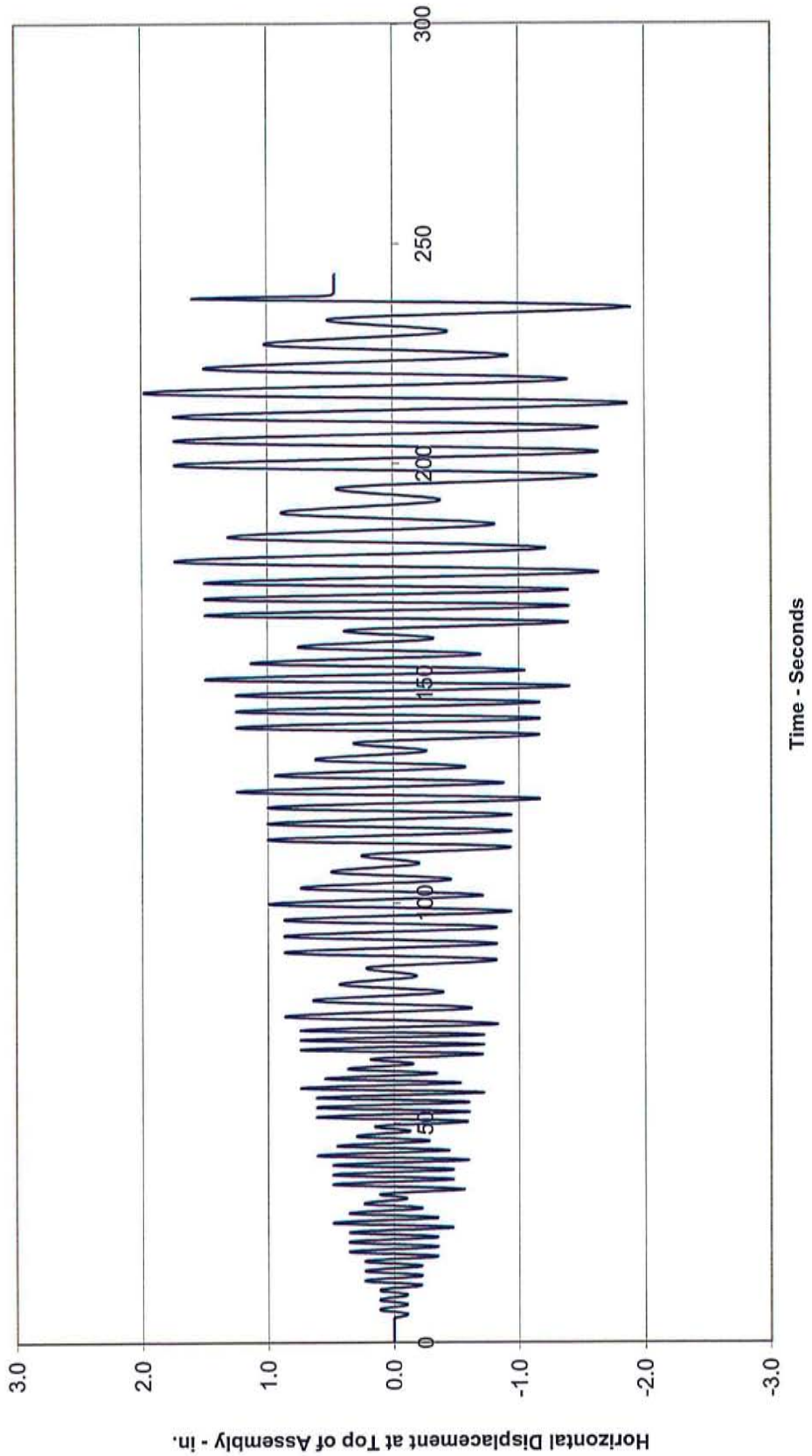

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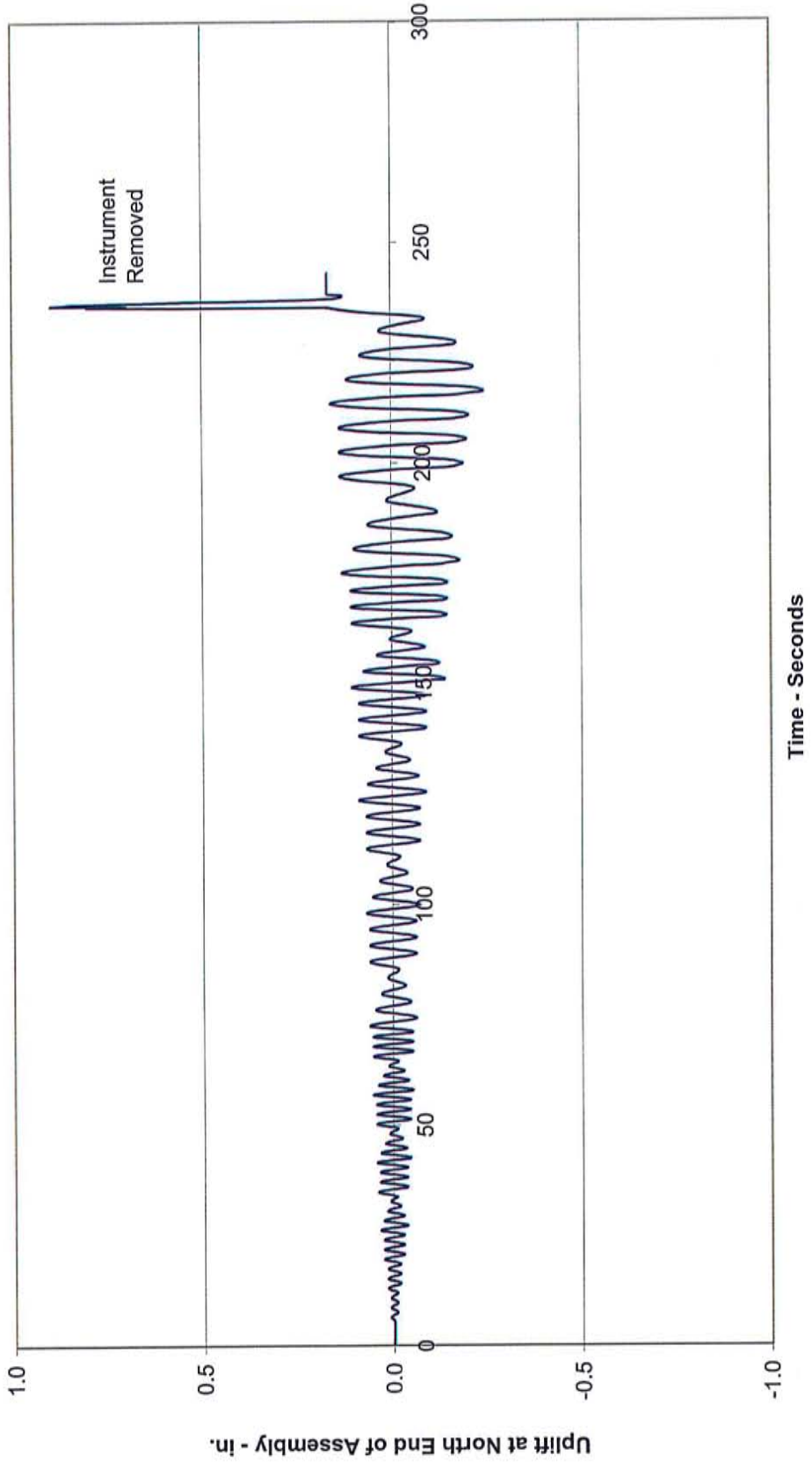

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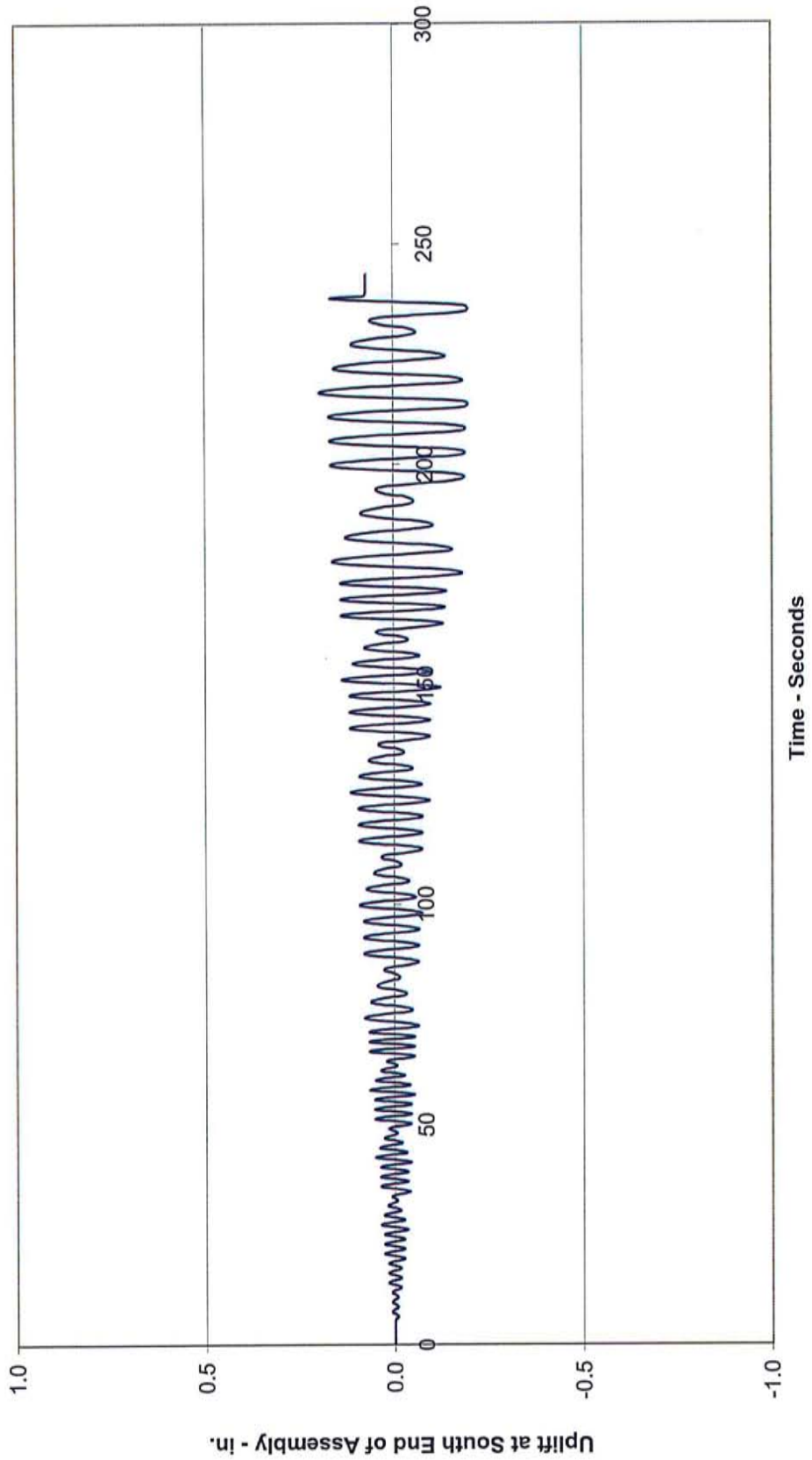
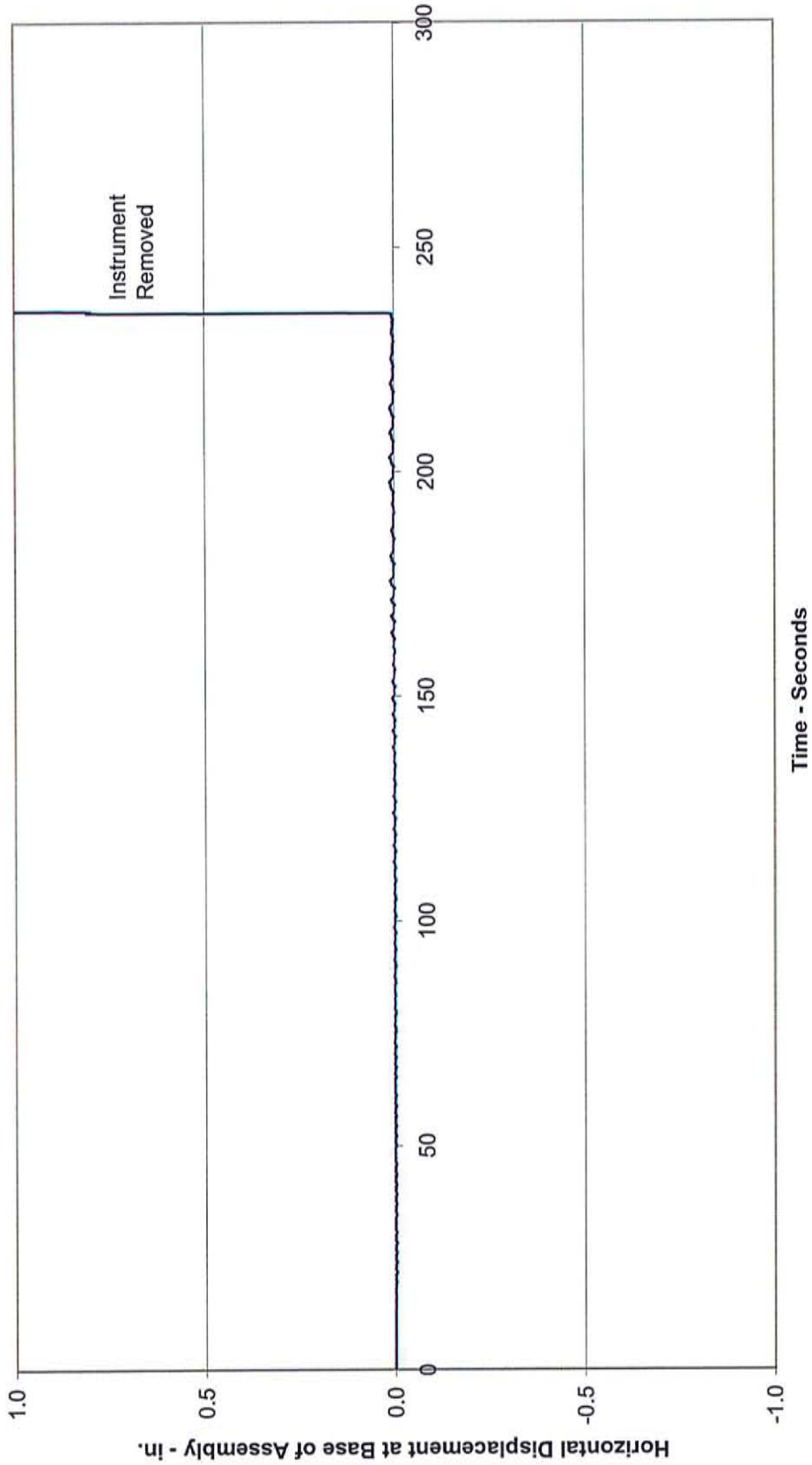


CYCLIC (REVERSED) LOAD TESTS OF AIRLIGHT BUILDING PANELS
PER ASTM E 2126 METHOD A
TWO 5-1/2-IN. THICK x 48-IN. WIDE x 10-FT. TALL PANELS
Test No. 3 - 7/17/2013 (Specialized Testing Project No. STQA50483B)



WANESSA-SUE, INC.
AIRLIGHT BUILDING PANELS
RACKING SHEAR TEST PROGRAM
SPECIALIZED TESTING REPORT NUMBER STQA50483B

SECTION 2 – SAMPLING

DS-PQ-850 - TEST SPECIMEN SAMPLING FORM

Created by: TF - Approved by: MM

DATE AND TIME OF SELECTION / RECEIPT:	6/27/2013
CLIENT NAME	Wanessa-Sue, Inc
CONTACT	Wanessa-Sue Pence
ADDRESS	5056 Inez Road Kingman, Arizona
SAMPLING LOCATION:	Same as address above
PROJECT NAME / STQA NO.	Airlight Building Panels / STQA50483
TEST STANDARD(S):	ASTM E 72 / ASTM E 2126
DESCRIPTION OF SAMPLED SPECIMEN(S)	4' x 10' x 5-1/2" wall panels with two independent "layers" of 24-ga. CFS framing members located at the interior and exterior "face" of the panels such that there is a foam separation between the framing menbers. The foam is StyroChem material (ICC-ES ER 5687) and the CFS members are rolled by Wanessa-Sue, Inc. The heat number of the CFS used in the witnessed panels is 127D6480 (mill certificat provided). Adhesive (Slocum Adhesives Product V-4917) was applied to the interior surfaces of the CFS framing members (prior to the sampling visit). The Slocum Adhesive does not appear to have IAPMO evaluation
NUMBER OF SAMPLES SELECTED FROM	The foam injection process for 14 panels was witnessed
TOTAL INVENTORY OF:	NA - the panels are built to order
LOT / BATCH NUMBERS	Panel identification is noted in the Quality System by the date of manufacturing only. In this case the identification number was 6/27/13. All panels were further identified with the inspector's initials (TF) marked on all panels.
COMMENTS (NOTES, PHOTOGRAPHS, DRAWINGS, TEST REPORTS, ETC.)	Photographic documentation of the sequence of manufacturing is attached. Note that the CFS framing members were rolled and assembled and the Slocum Adhesive was applied prior to the sampling visit.
SAMPLING AGENT / APPROVAL	Tim Foster / Tim Foster
SIGNATURE	*Tim Foster*

WANESSA-SUE, INC.
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SECTION 4 – INSTALLATION INSTRUCTIONS

Wanessa-Sue, Inc.

Recommendations for proper installation of

AIRLIGHT Building Panels

One key to a good install is preparation. Check the foundation slab carefully: Most problems in construction are caused by unleveled and out of square slabs. Fix all holes and lumps, exaggerated humps need to be ground level, exaggerated dips, fill with grout. Check for proper spacing of "J" bolts in beaded in concrete slab. Stem walls are addressed in the same manner.

Establish corners and wall lengths, check for square, set chalk lines and layout openings. YOU must Install Sill foam or 30# felt to isolate the slab from the steel track. You are now ready to set track. There needs to be a minimum three anchor bolts per. 10ft. of track, two bolts if shorter than 10 feet are needed to complete a parameter wall.

Now corners are cut, set, and openings are in place. The truck has just arrived with AIRLIGHT panels. While unloading panels, inspect for any damage and place panels along the labeled wall area where they will be installed.

To start take two panels from opposing walls and build a corner being sure to brace and level both sides, continuing in one direction until all panels are all in place. As you are setting the panels in the track screw the panels to the track and set and screw the top track to stiffen the wall. Bracing will be needed every eight feet. When walls are in place, attach truss clips to top track, set trusses, and remove wall bracing.