wyle laboratories
Huntsville, Alabama 35807
FAX (256) 721-0144, Phone (256) 837-4411

CERTIFICATION TEST REPORT

Flotation Systems, Inc.
2700 Alabama Highway 69 South
Cullman, AL 35057

REPORT NO.	51469-02
CUSTOMER P.O. NO.	09162004
CONTRACT NO.	N/A
NUMBER OF PAGES	15
DATE	December 2, 2004

1.0 SPECIMEN: Two-Inch and Three-Inch Rail L Section, Guardrail System

2.0 PART NUMBER: N/A

3.0 SERIAL NUMBERS: N/A

4.0 REFERENCES:

- Flotation Systems, Inc. Purchase Order No. 09162004
- Wyle Laboratories Quotation No. 542/027120-R1/DB
- Wyle Laboratories' Quality Assurance Program Manual, Revision 2
- ICC Evaluation Service, Inc., AC174, "Acceptance Criteria for Deck Board Span Ratings and Guardrail Systems (Guards and Handrails), dated April 2002
- ANSI/NCSL Z540-1, "Calibration Laboratories and Measuring and Test Equipment, General Requirements"
- ISO 10012-1, "Quality Assurance Requirements for Measuring Equipment"
- MIL-STD-45662A, "Calibration System Requirements"

STATE OF ALABAMA
COUNTY OF MADISON

Robert L. Porter, Department Manager, being duly sworn, deposes and says: The information contained in the report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

Robert L. Porter

SUBSCRIBED and sworn to before me this 3rd day of Dec, 2004

Patricia Phillips
Notary Public in and for the State of Alabama at large

My Commission expires Jan. 16, 2005

SEAL

Wyle shall have no liability for damages of any kind to person or property, including special or consequential damages, resulting from Wyle's providing the services covered by this report.

TEST BY: Steven R. Rooks 12-2-04
Steven R. Rooks, Project Engineer Date

APPROVED BY: Rick Moldenhauer 12/2/04
for David R. Bailey, Eng. Supervisor Date

WYLE Q.A.: T R Hamilton 12/3/04
T. R. Hamilton, QA Manager Date

(pap)

ACCREDITED
Cert No. 845.02

5.0 PROCEDURES AND RESULTS

5.1 In-Fill Load Test

The Guardrail Systems shall be tested and shall be capable of satisfactorily resisting a load of 125 pounds applied over a one square-foot area normal to the in-fill.

Both the two-inch and three-inch Guardrail Systems were successfully subjected to In-fill Testing in accordance with the references listed above.

Loads were applied over a one square-foot area in the center of the glassed section, centered between the center rail and end rail on the wired side, and also near the center rail on the wired side.

Upon completion of the In-Fill Load Test, the Guardrail Systems were visually inspected for any signs of damage and/or degradation resulting from the imposed test environment. No anomalies were noted.

Photographs of test specimens and test setup are presented in Attachment A. The Instrumentation Equipment Sheet for the test setup is presented in Attachment B.

Flotation Systems provided a List of Materials used in the manufacturing of the Guardrail Systems. This List of Materials is presented in Attachment C.

The test results contained herein apply only to the test specimens identified in this report.

5.2 Uniform Load Test

The top rail of the Guardrail System (Guard and Handrail) shall be subjected to two separate tests, where a maximum uniform load of 125 pounds per linear foot is applied vertically and horizontally.

Both the two-inch and three-inch Guardrail Systems were successfully subjected to Uniform Load Testing in accordance with the references listed above.

A vertical load of 125 pounds per linear foot was applied using a measured amount of sand and/or lead. The horizontal load was achieved using a Wyle-fabricated beam, a load cell, and a chain hoist pulling device. The load applied to the two-inch Guardrail System was 750 pounds. The load applied to the three-inch Guardrail System was 698 pounds.

Upon completion of the Uniform Load Test, the Guardrail Systems were visually inspected for any signs of damage and/or degradation resulting from the imposed test environment. No anomalies were noted.

5.0 PROCEDURES AND RESULTS (Continued)

5.2 Uniform Load Test (Continued)

Photographs of test specimens and test setup are presented in Attachment A. The Instrumentation Equipment Sheet for the test setup is presented in Attachment B.

Flotation Systems provided a List of Materials used in the manufacturing of the Guardrail Systems. This List of Materials is presented in Attachment C.

The test results contained herein apply only to the test specimens identified in this report.

5.3 Concentrated Load Test

Two separate tests shall be conducted, where a test load of 500 pounds is applied at the top rail and at the top of a single post. In both cases, the load shall be continuously applied normal to the top rail (top of the guard) at the maximum Guardrail System (guard) height. When the applied load reaches 200 pounds, the deflection at the point of loading shall be recorded. The allowable deflection for the Guardrail System at 200 pounds shall not exceed either one of the following allowable deflection limits.

1. The sum of the rail (guard) height, *h* (in inches), divided by 24 plus the effective rail (guard) length, *l* (in inches), between the vertical supports divided by 96. Where the effective rail (guard) length is the distance between the edges of the posts. The deflection at the midspan of the rail (guard) is measured relative to the center of the two posts.

2. The effective post height (vertical support) divided by 12. Where the effective post (vertical support) height is the difference from top-of-post to first point of the support or first connector of the post to the supporting rim joist (in inches).

Maximum deflections allowable for the 2-inch System on the rail are: 41.25”/24 + 72”/96 = 0.7679”. On the corner post is: 1”/12 = 0.0833”.

Actual 2-inch system deflections are: glass panel rail = 0.07”, wired rail = 0.328”, and the corner post is 0.02”. All measurements of the 2-inch Rail System were within acceptable limits.

Maximum deflections allowable for the 3-inch System on the rail are: 42”/24 + 67”/96 = 0.7161”. On the corner post is: 2.5” / 12 = 0.2083”.

5.0 PROCEDURES AND RESULTS (Continued)

5.3 Concentrated Load Test (Continued)

Actual 3-inch System deflections are: glass panel rail = 0.100", wired rail = 0.420", and the corner post is 0.007". All measurements of the 3-inch Rail System were within acceptable limits.

Photographs of test specimens and test setup are presented in Attachment A. The Instrumentation Equipment Sheet for the test setup is presented in Attachment B.

Flotation Systems provided a List of Materials used in the manufacturing of the Guardrail Systems. This List of Materials is presented in Attachment C.

The test results contained herein apply only to the test specimens identified in this report.

6.0 QUALITY ASSURANCE

All work performed on this program was completed in accordance with Wyle Laboratories' Quality Assurance Program.

The Wyle Laboratories, Huntsville Facility, Quality Management System is registered in compliance with the ISO-9001 International Quality Standard. Registration has been completed by Quality Management Institute (QMI), a Division of Canadian Standards Association (CSA).

Wyle Laboratories is accredited (Certificate No. 845.02) by the American Association for Laboratory Accreditation (A2LA), and the results shown in this test report have been determined in accordance with Wyle's scope of accreditation unless otherwise stated in the report.

7.0 TEST EQUIPMENT AND INSTRUMENTATION

All instrumentation, measuring, and test equipment used in the performance of this test program were calibrated in accordance with Wyle Laboratories' Quality Assurance Program, which complies with the requirements of ANSI/NCSL Z540-1, ISO 10012-1, and Military Specification MIL-STD-45662A. Standards used in performing all calibrations are traceable to the National Institute of Standards and Technology (NIST) by report number and date. When no national standards exist, the standards are traceable to international standards or the basis for calibration is otherwise documented.

ATTACHMENT A

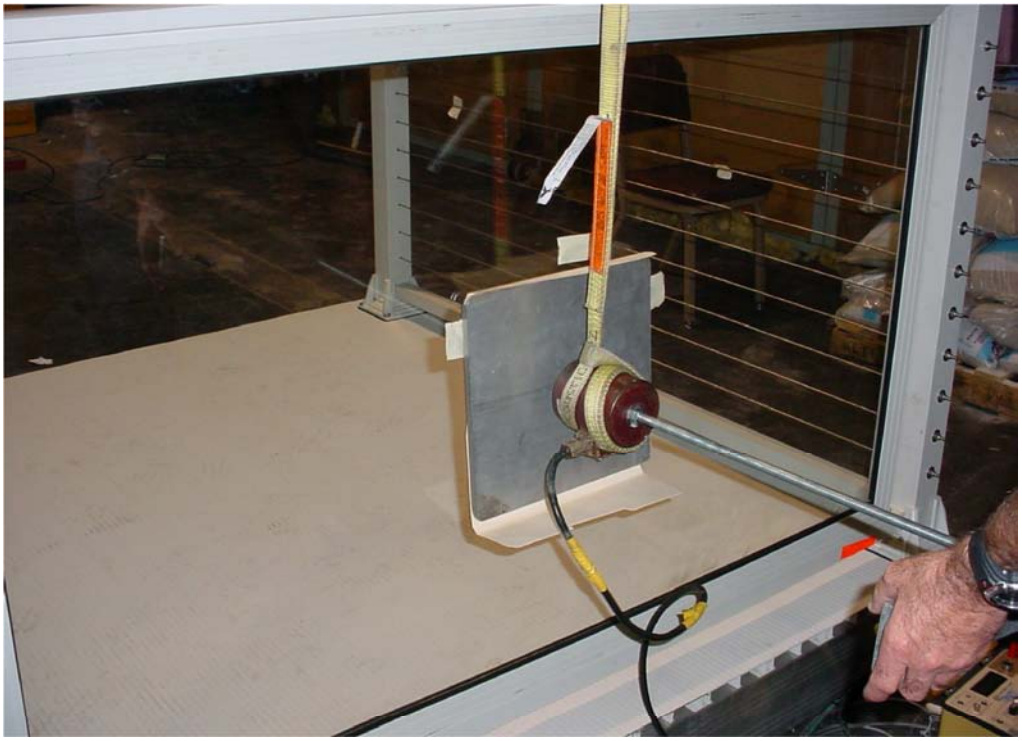
PHOTOGRAPHS



Photograph No. 1
Typical Center Wired Side, In-Fill Load Test



Photograph No. 2
Typical Near Center Post Wired Side, In-Fill Load Test



Photograph No. 3
Typical Center Glass Side, In-Fill Load Test



Photograph No. 4
Typical Vertical Glass Side, Uniform Load Test



Photograph No. 5
Typical Vertical Wired Side, Uniform Load Test



Photograph No. 6
Typical Horizontal Glass Side, Uniform Load Test



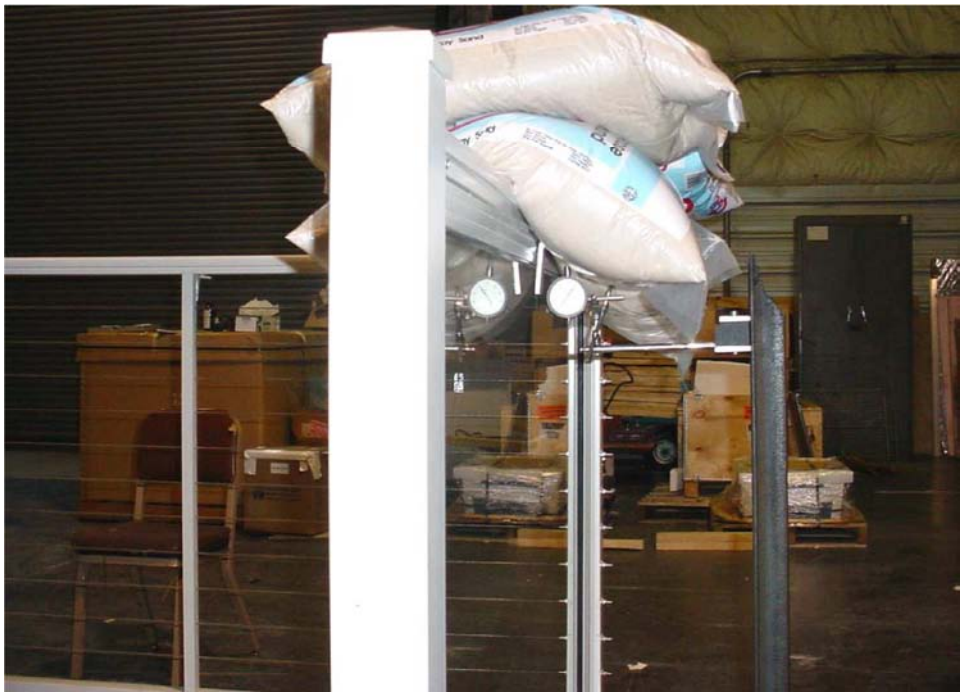
Photograph No. 7
Typical Horizontal Wired Side, Uniform Load Test



Photograph No. 8
Typical Wired Rail, Concentrated Load Test



Photograph No. 9
Typical Corner, Post-Concentrated Load Test



Photograph No. 10
Typical Glass Rail, Concentrated Load Test

ATTACHMENT B

INSTRUMENTATION EQUIPMENT SHEETS

wyle laboratories

INSTRUMENTATION EQUIPMENT SHEET

1

DATE: 10/ 1/04 JOB NUMBER: 51469 TEST AREA: DYNAMICS
TECHNICIAN: J REYER CUSTOMER: FLOTATION SYSTEMS TYPE TEST: LOAD TEST

NO.	INSTRUMENT	MANUFACTURER	MODEL #	SERIAL #	WYLE #	RANGE	ACCURACY	CAL DATE	CAL DUE
1	STOP WATCH	HANHART	STRATOS2	N/A	115185	24HR	.5SEC	9/23/04	12/22/04
2	DIAL INDICATOR	STARRETT	1"	NA	106961	1"	.001"	9/28/04	12/27/04

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION Jason Reyer 10/1/04 CHECKED & RECEIVED BY 10-1-04

Q.A. 10/1/04

WH-1029A, REV, APR '99

wyle laboratories

INSTRUMENTATION EQUIPMENT SHEET

1

DATE:	10/ 1/04	JOB NUMBER:	51469	TEST AREA:	DYNAMICS
TECHNICIAN:	J. REYER	CUSTOMER:	FLOATATION SYSTEMS	TYPE TEST:	LOAD TEST

NO.	INSTRUMENT	MANUFACTURER	MODEL #	SERIAL #	WYLE #	RANGE	ACCURACY	CAL DATE	CAL DUE
1	STOP WATCH	HANHART	STRATOS2	N/A	115185	24HR	.5SEC	9/23/04	12/22/04
2	LOAD CELL	BLH ELEC	USG1	44016	098026	1KLBS	.5%	9/30/04	9/30/05
3	COND STRAIN	VISHAY	P-3500	50210	101083	19999uE	.05%	9/30/04	3/29/05
4	FORCE GAGE	TRI-COASTAL IND	264-202	13481	108377	2000LB	.15%FS	3/ 9/04	3/ 9/05

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION Jason Reyer 10/4/04 CHECKED & RECEIVED BY 10-1-04

Q.A. 10/1/04

WH-1029A, REV, APR '99

ATTACHMENT C

LIST OF MATERIALS USED IN MANUFACTURE OF GUARDRAIL SYSTEMS (PROVIDED BY FLOTATION SYSTEMS)

Railing Materials

Aluminum Extrusions:

3" Post
3" x 3" x 0.125"
Alloy 6005-T5
Hydro Aluminum Die # - S-20863

2" Post
2" x 2" x 0.125"
Alloy 6005-T5
Hydro Aluminum Die # - S-20862

1" Picket
1" x 1" x 0.040"
Alloy 6063-T6
Hydro Aluminum Die # - S-20844

Flat Plates
Typical Wall Thickness 0.080"
Alloy 6063-T6
Hydro Aluminum Die # - S-20843

Top Handrail Cap
Typical Wall Thickness 0.075"
Alloy 6063-T6
Hydro Aluminum Die # - S-20845

Bottom Cap
Typical Wall Thickness 0.100"
Alloy 6063-T6
Hydro Aluminum Die # - S-20846

Frame For Glass
Typical Wall Thickness 0.080"
Alloy 6005-T5
Altec Aluminum Technologies Die # - 42061

Glass:
1/4" Tempered Safety Glass
ANSI Z97.1 CRF 1201 CII

Cable Assemblies:
1/8" Diameter
Type 316 Stainless Steel
1x19 Construction
Manufactured By: Feeney Wire Rope & Rigging