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CERTIFICATION TEST REPORT

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

REPORT NO.	50431-01
CUSTOMER P.O. NO.	120503
CONTRACT NO.	N/A
NUMBER OF PAGES	10
DATE	December 30, 2003

1.0 TEST SPECIMEN: Two-Inch Continuous Rail Section

2.0 PART NUMBER: N/A

3.0 SERIAL NO: N/A

4.0 REFERENCES:

- Flotation Systems, Inc. Purchase Order No. 120503
- Wyle Laboratories' Quotation No. 542/023550/DB
- Wyle Laboratories' Quality Assurance Program Manual, Revision 2
- International Code Council, 2003 International Building Code
- 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 30th day of Dec., 2003

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

My Commission expires Jan. 16, 2005

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.

PREPARED BY DW Bennett 12/30/03
Don Bennett, Project Engineer Date

APPROVED BY David R Bailey 12/30/03
David R. Bailey, Engineering Supervisor Date

WYLE Q. A. Brenda Mabry 12/30/03
FOR T. R. Hamilton, Q. A. Manager Date

(pap)

ACCREDITED
Cert No. 845.02

4.0 REQUIREMENTS

Load Testing shall be conducted on an aluminum 2-inch Continuous Rail Section. The testing shall be as specified by the ICC 2003 International Building Code, Chapter 16, Sections 1607.7.1, Handrails and Guards.

- 1607.7.1 Handrail Assemblies and Guards shall be designed to resist a load of 50 plf applied in any direction at the top, and to transfer this load through the supports to the structure.
- 1607.7.1.1 Handrail Assemblies and Guards shall be able to resist a single concentrated load of 200 pounds applied in any direction at any point along the top, and have attachment devices and support structures to transfer this loading to appropriate structural elements of the building. This load need not be assumed to act concurrently with the loads specified in the preceding paragraph.
- 607.7.1.2 Intermediate Rails (all those except the Handrails), Balusters and Panel Fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to one square foot, including openings and spaces between rails. Reactions due to this loading are not required to be super-imposed with those of Section 1607.7.1 or 1607.1.2.

5.0 PROCEDURES AND RESULTS

The two-inch continuous rail section was made up of two rail sections mounted to aluminum decking and a wood foundation. The handrails were 74-1/2 and 68-1/2 inches, respectively, and shared a common center post. The loading was provided using dead weights and tension pulls. The dead weights were verified by pre-weighing and the tension pulls were measured using a digital force gage. Deflections were measured using dial indicators. The loads were maintained sufficiently long to obtain deflection readings.

5.1 Results

5.1.1 Handrail Assemblies and Guards shall be designed to resist a load of 50 plf applied in any direction at the top and to transfer this load through the supports to the structure.

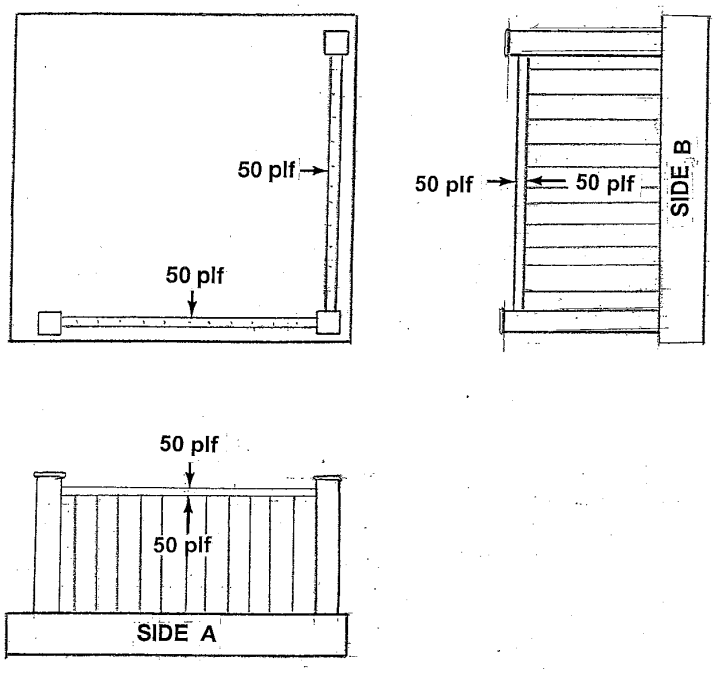
The deflection data, as shown in Table I on Page 3, is measured from loads applied at the locations described in Figure 1 on Page 3. As shown in the data tables, the handrail exhibited some displacement under loading. On removal of loading, the handrail assembly was visually examined and no damage or set was observed.

5.1 Results (Continued)

Table I. Linear Load of 50 plf Applied at the Handrail

Load	Side A (inch)	Side B (inch)
100 plf Load, Downward	0.23	0.10
100 plf Load, Upward	0.18	0.13
100 plf Lateral Load, In	0.93	0.95
100 plf Lateral Load, Out	1.26	0.93

Figure 1. A 50 plf Load Applied in Any Direction at the Top



Photographs 1 and 2, presented on page 7 show the test setup. A listing of the instrumentation used and the calibration data is presented on Page 10 of this report.

5.1.2 Handrail Assemblies and Guards shall be able to resist a single concentrated load of 200 pounds applied in any direction at any point along the top, and have attachment devices and support structures to transfer this loading to appropriate structural elements of the building. This load need not be assumed to act concurrently with the loads specified in the preceding paragraph.

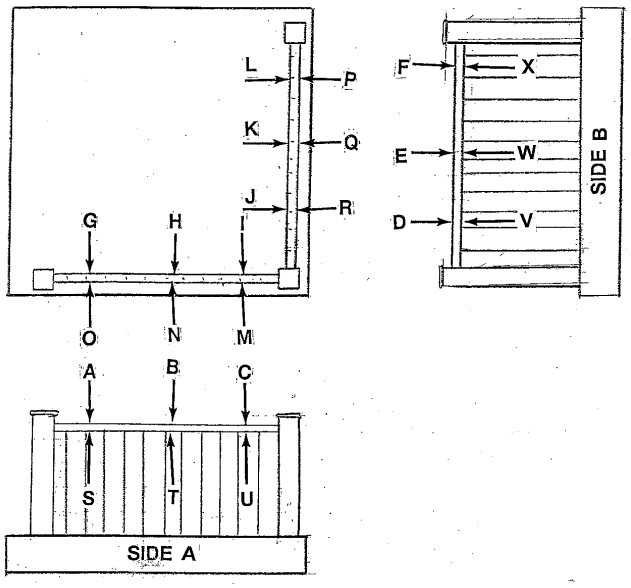
The deflection data, as shown in Table II on Page 4, is measured from loads applied at the locations described in Figure 2 on Page 4. As shown in the data tables, the handrail exhibited some displacement under loading. On removal of loading, the handrail assembly was visually examined and no damage or set was observed.

5.1 Results (Continued)

Table II. Concentrated Load Applied to Handrails

Load (lbs.)	Location	Deflection (inch)
200	A	0.03
200	B	0.38
200	C	0.04
200	D	0.02
200	E	0.05
200	F	0.04
200	G	0.92
200	H	0.79
200	I	0.62
200	J	0.49
200	K	0.75
200	L	1.14
200	M	0.63
200	N	1.04
200	O	2.01
200	P	1.24
200	Q	0.64
200	R	0.55
200	S	0.04
200	T	0.30
200	U	0.05
200	V	0.05
200	W	0.27
200	X	0.03

Figure 2. Concentrated Load of 200 lbs. Applied at the Top of the Guardrail



5.1 Results (Continued)

5.1.2 (Continued)

Photographs 3 and 4, presented on page 8, show the test setup. A listing of the instrumentation used and the calibration data is presented on Page10 of this report.

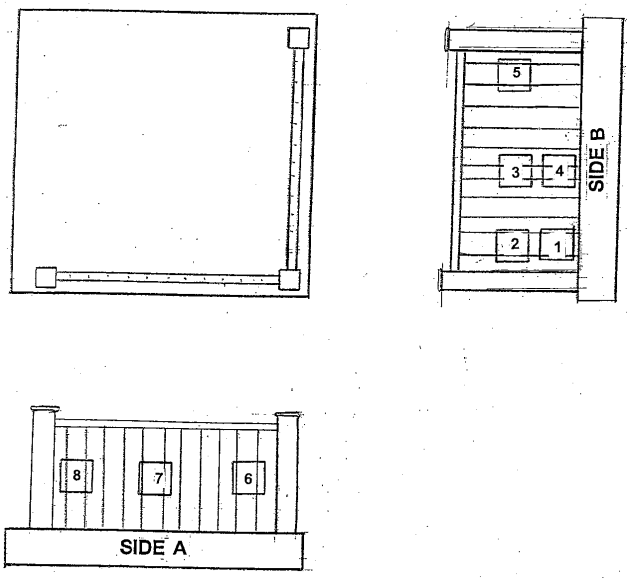
5.1.3 Intermediate Rails (all those except the Handrails), Balusters and Panel Fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to one square foot, including openings and spaces between rails.

The deflection data as shown in Table III, below, is measured from loads applied at the locations described in Figure 3, below. As shown in the data tables, the handrail exhibited some displacement under loading. On removal of loading, the handrail assembly was visually examined and no damage or set was observed.

Table III. Horizontally Applied Loads on a One-Foot Square Area

Location	Deflection (inch)
1	0.08
2	0.12
3	0.13
4	0.15
5	0.16
6	0.15
7	0.22
8	0.21

Figure 3. 50 psf Load Applied Between any Two Intermediate Rails


5
3
4
SIDE B
2
1
8
7
6
SIDE A

5.1 Results (Continued)

5.1.3 (Continued)

Photograph 5, presented on page 9, shows the test setup. A listing of the instrumentation used and the calibration data is presented on Page 10 of 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.

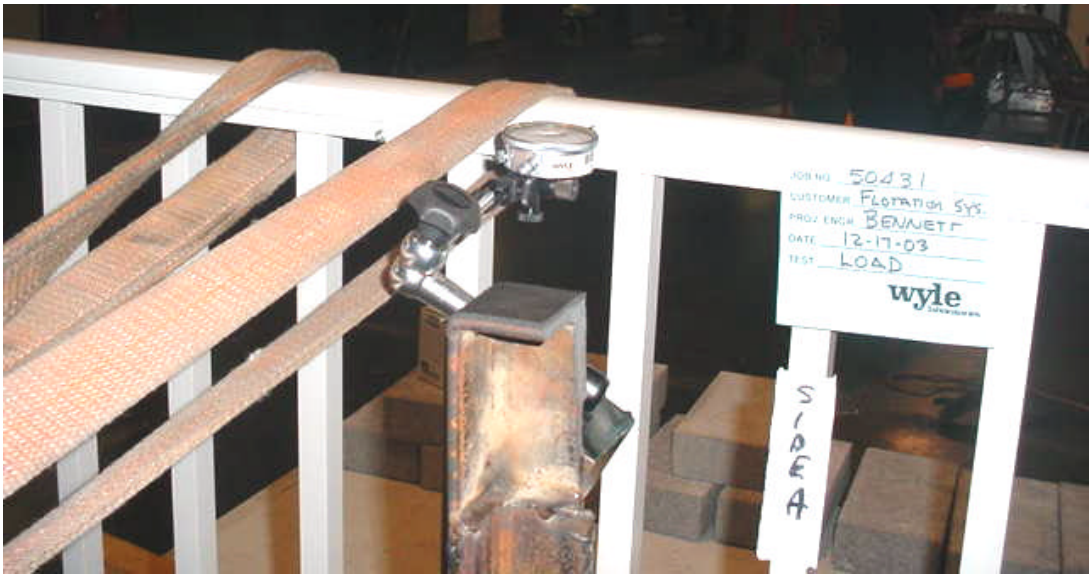
7.0 TEST EQUIPMENT AND INSTRUMENTATION

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.

A listing of the equipment used in the performance of this test program is on file at Wyle Laboratories and is available for inspection upon request.

Photograph No. 1
100 plf Applied in the Lateral Out Direction

Photograph No. 2
100 plf Applied in the Downward Direction



Photograph No. 3
Concentrated Load of 200 Pounds Applied in a Lateral Direction

Photograph No. 4
Concentrated Load of 200 Pounds Applied in a Downward Direction

Photograph No. 5
A Horizontally Applied Load of 50 Pounds on an Area Equal to One Square Foot

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INSTRUMENTATION EQUIPMENT SHEET

1

DATE: 12/16/03 JOB NUMBER: 50431 TEST AREA: DYN LAB
TECHNICIAN: T.HARDMAN CUSTOMER: FLOTATION SYSTEMS TYPE TEST: LOAD

NO.	INSTRUMENT	MANUFACTURER	MODEL #	SERIAL #	WYLE #	RANGE	ACCURACY	CAL DATE	CAL DUE
1	DIAL INDICATOR	TECLOCK	A1-921	N/A	113811	1"	.001"	9/24/03	12/23/03
2	DIAL INDICATOR	BROWN & SHARP	88339	8D2370	116824	MFG	.001"	11/18/03	2/16/04
3	DIAL INDICATOR	FOWLER	1	N/A	092508	1"	.001"	10/16/03	1/14/04
4	FORCE GAGE	TRI-COASTAL IND	264-202	13481	108377	2000LB	.15%FS	2/14/03	2/14/04

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 12/16/03 LEONARD MATHIS CHECKED & RECEIVED BY 12/16/03

Q.A. 12/16/03

WH-1029A, REV, APR '99