PERFORMANCE TEST REPORT

PRL ALUMINUM
PLDSHRB
"DRY SET" GLASS HANDRAIL

CCLW JOB #10-5395

MARCH 31, 2010

DATE OF TESTING

MARCH 30, 2010

TESTED FOR

PRL ALUMINUM
14760 DON JULIAN ROAD
CITY OF INDUSTRY, CA 91746

TESTED BY

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

PH: 909-591-1789

FAX: 909-627-9020

INTRODUCTION

The following is a test report outlining test procedures, test specimens and test results utilized and obtained during performance testing of a glass hand rail for PRL Aluminum at Construction Consulting Laboratory West, Ontario, California, on March 30, 2010. Testing was conducted in accordance with industry standards and in accordance with the current issue of the test standards.

TEST SPECIMEN

The test specimen submitted for testing was one (1) glass handrail systems consisting of one (1) piece of 1/2 inch clear tempered glass mounted into a 2 1/2" x 4 1/8" aluminum base shoe and capped with a 2 inch round extruded aluminum rail. The glazing at the aluminum base shoe was DRY SET in accordance with the attached drawing (sheet 1 of 1).

For a complete description including anchorage, glass and framing details, see drawing at the conclusion of this report. Drawing furnished by PRL Aluminum.

WITNESSED BY (all or partial testing)

Ruben Gallegos	PRL Aluminum
Jack W. Jackson	Construction Consulting Laboratory West
Chad Jackson	Construction Consulting Laboratory West
Richard Rist	Construction Consulting Laboratory West

TEST STANDARDS

ASTM E 935: **Standard test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.**

TEST LOADS

Uniform load: **50.0 pound/force per linear foot**

Concentrated load: **200.0 pound/force**

TESTING AS FOLLOWS **March 30, 2010**

The single specimen tested was 4' long by standard handrail height.

The handrail shoe was attached to a structural steel channel base with 1/2" diameter machine bolts spaced 12" o/c.

The 1/2" thick tempered glass lite was DRY SET glazed per manufacturer's drawing with the set screws torqued at 20 lbf.

The test loads were applied horizontally in a lateral direction at the center and directly to the round extruded aluminum top rail and held for twenty (20) seconds.

A standard tape measure was used to determine the deflection and permanent residual movement at the top of the hand rail, measured to an accuracy of 1/8 of an inch. (See photo #1)

Dial gages measuring to an accuracy of 0.01" were used at the top of the shoe and at one inch (1") above the shoe on the face of glass. (See photo #1)

RESULTS

Specimen passed.

The performance of this single specimen indicates that it meets model design and code requirements with the following safety factors:

Uniform load: 50.0 pound / force per linear foot.

775 lb-f / 50 lb/ft x 4.0 ft = safety factor of **3.87**.

Concentrated load: 200.0 pound/force.

775 lb-f / 200 lb = safety factor of **3.87**.

The specimen was destroyed during testing with the ultimate load recorded.

Method of failure was glass breakage.

LOAD	#1 - SHOE	#2 - GLASS	#3 - TOP
200	.00	.07	1 1/2"
225	.00	.09	1 3/4"
250	.01	.10	2"
275	.01	.11	2 1/4"
300	.01	.13	2 1/2"
325	.01	.14	2 3/4"
350	.01	.15	3"
375	.01	.17	3 1/4"
400	.01	.18	3 1/2"
425	.01	.20	3 3/4"
450	.01	.27	4 1/8"
475	.01	.27	4 3/8"
500	.01	.25	4 1/2"
525	.01	.26	4 3/4"
550	.02	.27	5"
575	.02	.29	5 3/8"
600	.02	.30	5 1/2"
650	—	—	6"
675	—	—	6 1/4"
700	—	—	6 1/2"
775	—	Glass Breakage	—

SUMMARY

The performance of this single specimen indicates that it meets model design and code requirements.

TESTING COMPLETED

This completes the performance testing of glass handrail for PRL Aluminum at Construction Consulting Laboratory West, Ontario, California on March 30, 2010.

Jack W. Jackson
Construction Consulting Laboratory West
President/Manager of Testing

Photo #1

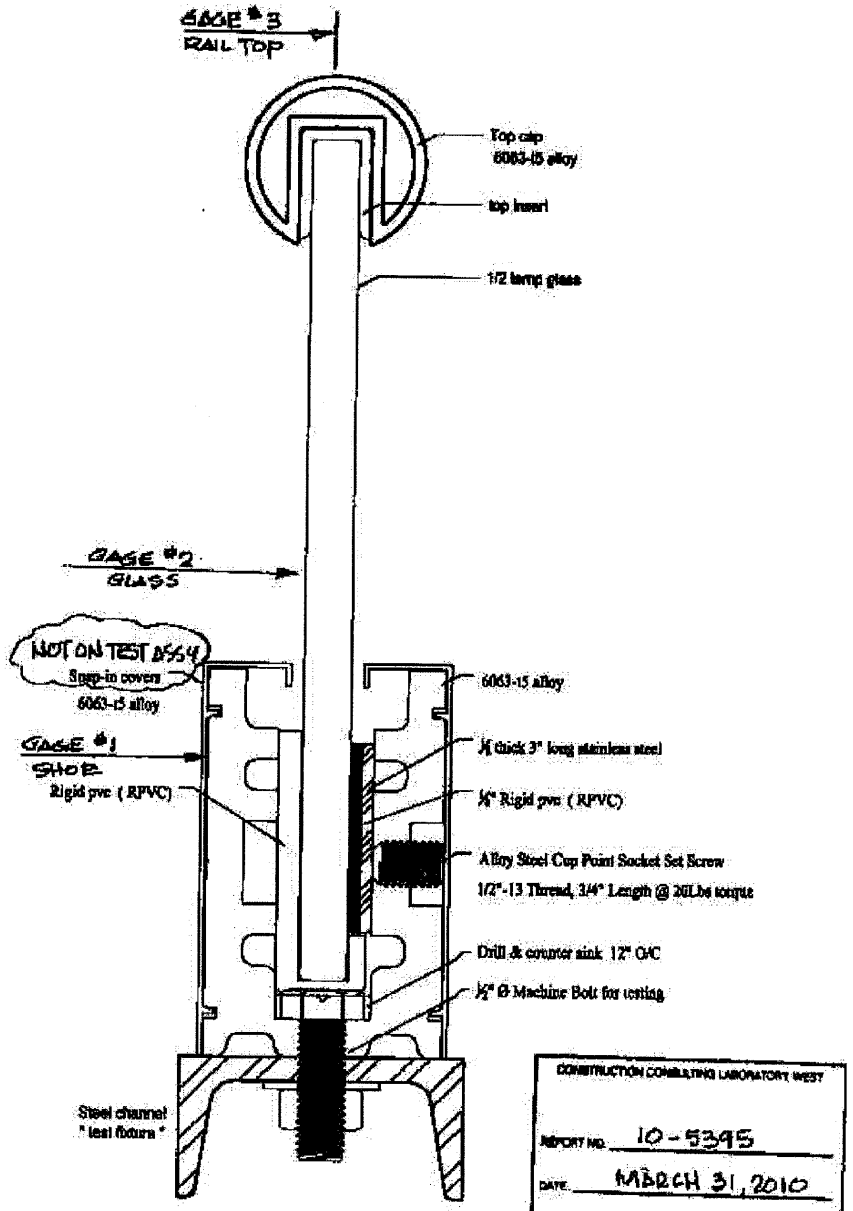
PRL GLASS SYSTEMS INC. Prglass.com

PLDSHRB

"Dry-set" Handrail Base shoe

DWG NO.: PLDSHRB

DATE: 4/02/10



CONSTRUCTION CONSULTING LABORATORY WEST

REPORT NO. 10-5395

DATE MARCH 31, 2010

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PERFORMANCE TEST REPORT

PRL ALUMINUM
HRBDS
"DRY SET" GLASS HANDRAIL

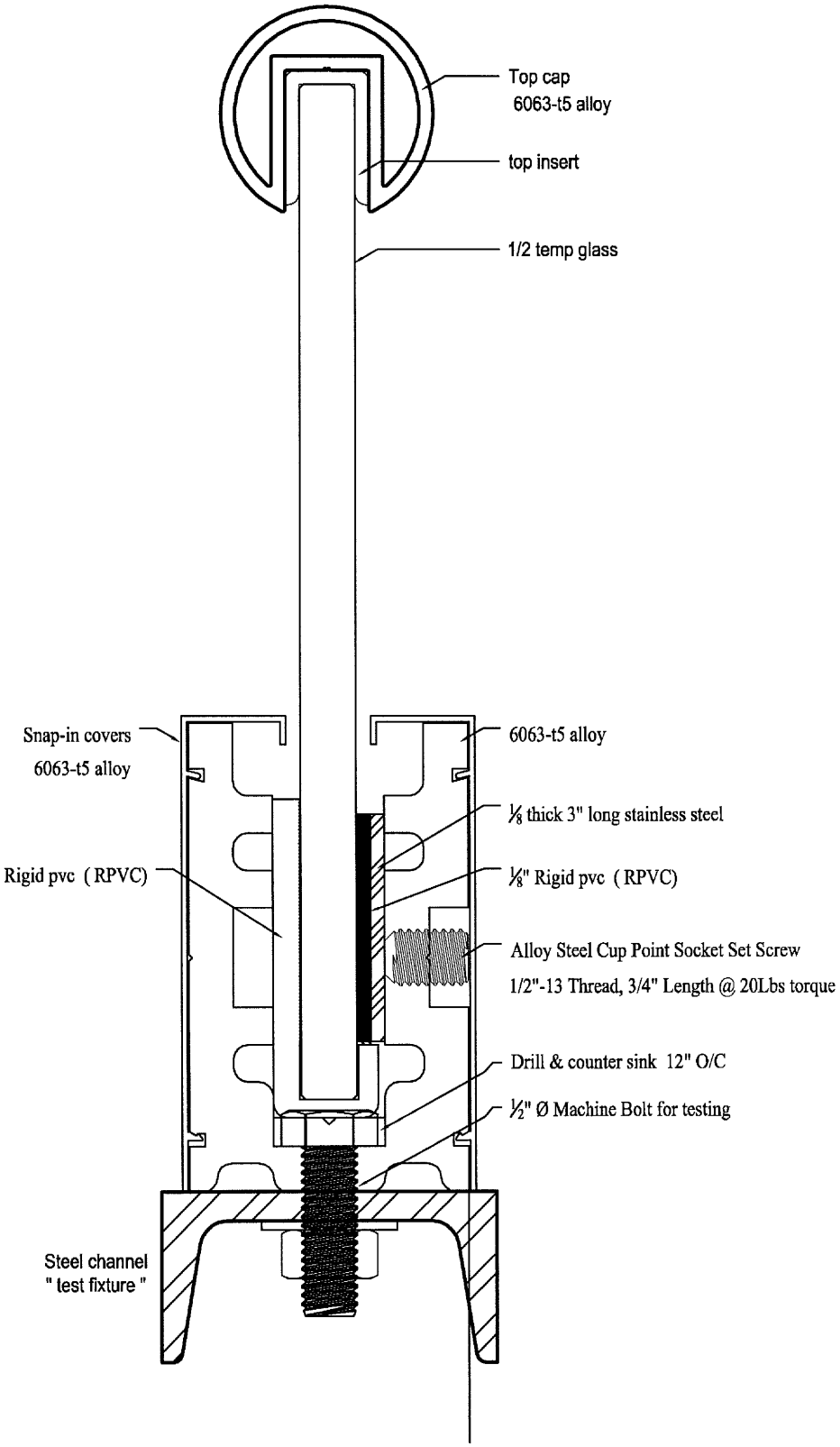
CCLW JOB #10-5395

PRL GLASS SYSTEMS INC. Prlglass.com

PLDSHRB
"Dry-set " Handrail Base shoe

DWG NO.: PLDSHRB

DATE: 4/09/10



PERFORMANCE TEST REPORT

PRL ALUMINUM
PLDSHRB
"DRY SET" GLASS HANDRAIL
SIDE MOUNT

CCLW JOB #10-5395-1

APRIL 5, 2010

DATE OF TESTING

APRIL 1, 2010

TESTED FOR

PRL ALUMINUM
14760 DON JULIAN ROAD
CITY OF INDUSTRY, CA 91746

TESTED BY

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

PH: 909-591-1789 FAX: 909-627-9020

INTRODUCTION

The following is a test report outlining test procedures, test specimens and test results utilized and obtained during performance testing of a side mount glass hand rail for PRL Aluminum at Construction Consulting Laboratory West, Ontario, California, on April 1, 2010. Testing was conducted in accordance with industry standards and in accordance with the current issue of the test standards.

TEST SPECIMEN

The test specimen submitted for testing was one (1) side mounted glass handrail systems consisting of one (1) piece of 1/2 inch clear tempered glass mounted into a 2 1/2" x 4 1/8" aluminum base shoe and capped with a 2 inch round extruded aluminum rail. The glazing at the aluminum base shoe was DRY SET in accordance with the attached drawing (sheet 1 of 1).

For a complete description including anchorage, glass and framing details, see drawing at the conclusion of this report. Drawing furnished by PRL Aluminum.

WITNESSED BY (all or partial testing)

Ruben Gallegos	PRL Aluminum
Jack W. Jackson	Construction Consulting Laboratory West
Chad Jackson	Construction Consulting Laboratory West
Richard Rist	Construction Consulting Laboratory West

TEST STANDARDS

ASTM E 935: **Standard test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.**

TEST LOADS

Uniform load: **50.0 pound/force per linear foot**

Concentrated load: **200.0 pound/force**

TESTING AS FOLLOWS **April 1, 2010**

The single specimen tested was 4' long by standard handrail height.

The handrail shoe was attached to a structural steel channel base with 1/2" diameter machine bolts spaced 12" o/c.

The 1/2" thick tempered glass lite was DRY SET glazed per manufacturer's drawing with the set screws torqued at 20 lbf.

The test loads were applied horizontally in a lateral direction at the center and directly to the round extruded aluminum top rail and held for twenty (20) seconds.

A standard tape measure was used to determine the deflection and permanent residual movement at the top of the hand rail, measured to an accuracy of 1/8 of an inch. (See photo #1)

Dial gages measuring to an accuracy of 0.01" were used at the top of the shoe and at one inch (1") above the shoe on the face of glass. (See photo #1)

RESULTS

Specimen passed.

The performance of this single specimen indicates that it meets model design and code requirements with the following safety factors:

Uniform load: 50.0 pound / force per linear foot.

850 lb-f / 50 lb/ft x 4.0 ft = safety factor of **4.25**.

Concentrated load: 200.0 pound/force.

850 lb-f / 200 lb = safety factor of **4.25**.

The specimen was not destroyed during testing with the ultimate load not recorded.

Test loading was stopped when the top cap slipped off of the 1/2" glass at 850 lbf.

LOAD	#1 - SHOE	#2 - GLASS	#3 - TOP
200	.03	.10	1 3/4"
225	.04	.12	2 1/8"
250	.04	.15	2 1/2"
275	.05	.17	2 3/4"
300	.05	.19	3 1/8"
325	.05	.21	3 1/2"
350	.06	.24	3 3/4"
375	.07	.26	4 1/8"
400	.08	.27	4 1/2"
425	.08	.30	4 3/4"
450	.09	.31	5"
475	.10	.33	5 3/8"
500	.10	.34	5 1/2"
525	.10	.36	5 3/4"
550	—	.38	6"
575	—	.40	6 1/4"
600	—	.41	6 5/8"
650	—	—	7"
675	—	—	7 3/8"
700	—	—	7 3/4"
750	—	—	8 1/2"
800	—	—	10"
850	—	Did Not Break	—

SUMMARY

The performance of this single specimen indicates that it meets model design and code requirements.

TESTING COMPLETED

This completes the performance testing of the side mounted glass handrail for PRL Aluminum at Construction Consulting Laboratory West, Ontario, California on April 1, 2010.

Jack W. Jackson
Construction Consulting Laboratory West
President/Manager of Testing

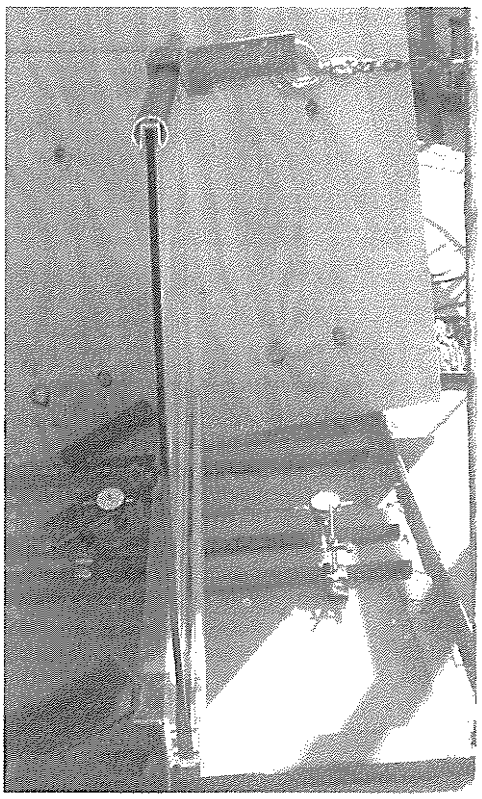


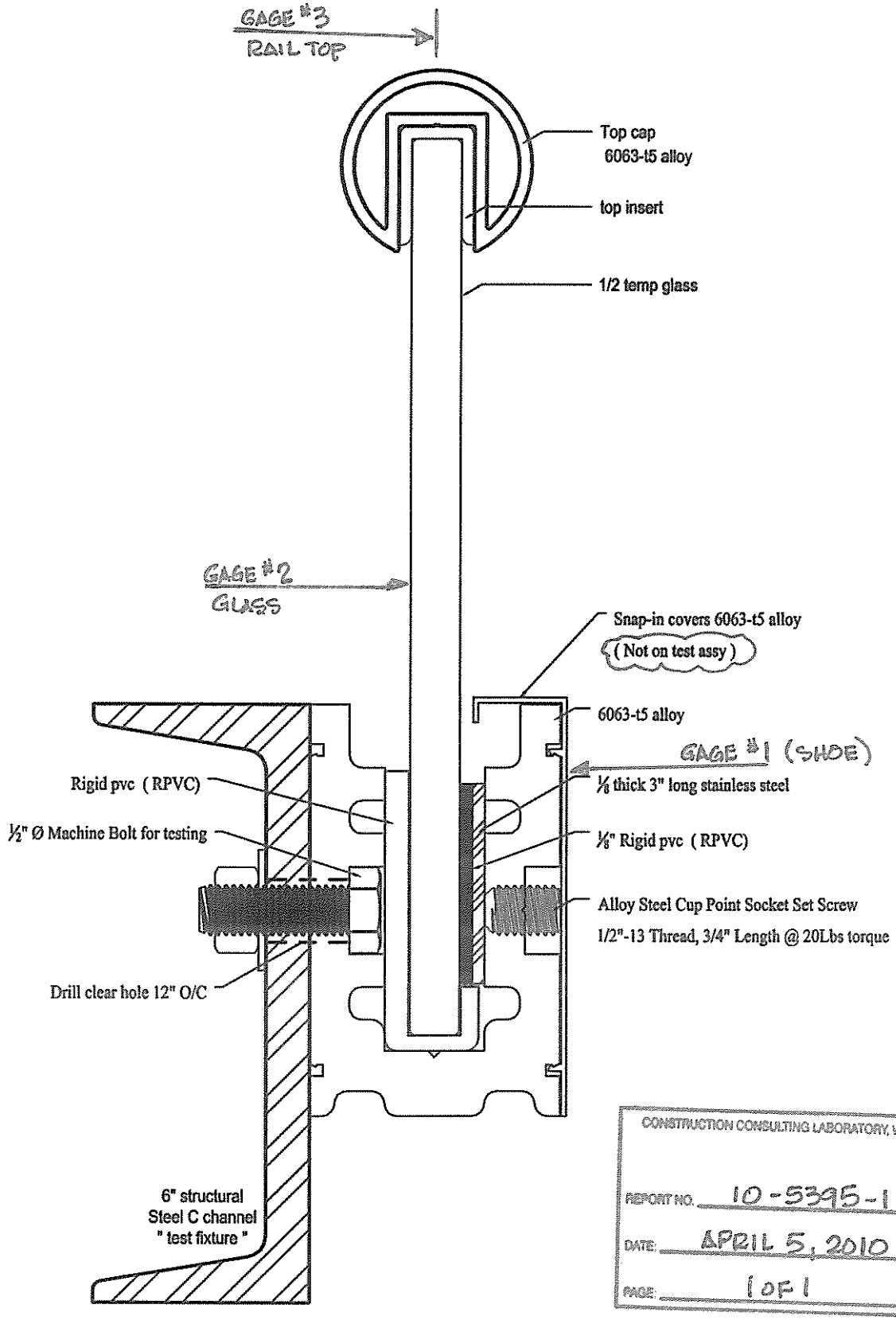
Photo #1

PRL GLASS SYSTEMS INC. Prlglass.com

PLDSHRB
"Dry-set " Handrail Base shoe

DWG NO.: PLDSHRB

DATE: 4/02/10



CONSTRUCTION CONSULTING LABORATORY, WEST

REPORT NO. 10-5395-1

DATE: APRIL 5, 2010

PAGE: 1 OF 1

PERFORMANCE TEST REPORT

PRL ALUMINUM
GLASS HANDRAIL TESTING

CCLW JOB #08-5221

JANUARY 20, 2009

DATE OF TESTING

JANUARY 13, 2009

TESTED FOR AND INSTALLED BY

PRL ALUMINUM
14760 DON JULIAN ROAD
CITY OF INDUSTRY, CA 91746

TESTED BY

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

PH: 909-591-1789

FAX: 909-627-9020

INTRODUCTION

The following is a test report outlining test procedures, test specimens and test results utilized and obtained during performance testing of glass hand rails for PRL Aluminum at Construction Consulting Laboratory West, Ontario, California, on January 13, 2009. Testing was conducted in accordance with industry standards and in accordance with the current issue of the test standards.

TEST SPECIMEN

The test specimens submitted for testing were two (2) glass handrail systems consisting of one (1) piece of 1/2 inch clear tempered glass mounted into a 2 ½" x 4 ½" aluminum base shoe and capped with a 2 inch round extruded aluminum rail and glazed with rockite cement and anchored with four (4) 1/2" bolts *which were tapped into the structural channel.*

Materials tested were assembled by PRL Aluminum.

For a complete description including anchorage, glass and framing details, see drawing at the conclusion of this report. Drawing furnished by PRL Aluminum.

WITNESSED BY (all or partial testing)

Jack W. Jackson	Construction Consulting Laboratory West
Chad Jackson	Construction Consulting Laboratory West
James Scales	Construction Consulting Laboratory West
Michael Dubuque	Construction Consulting Laboratory West

TEST STANDARDS

ASTM E 935-00: **Standard test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.**

TEST LOADS

Uniform load: **50.0 pound/force per linear foot**

Concentrated load: **200.0 pound/force**

TESTING AS FOLLOWS **January 13, 2009**

STRUCTURAL LOAD TEST

The test loads were applied horizontally in a lateral direction at the center and directly to the round extruded aluminum top rail and held for twenty (20) seconds.

A standard tape measure was used to determine the deflection and permanent residual movement at the top of the hand rail, measured to an accuracy of 1/16 of an inch. (See photo #1)

A dial gage measuring to an accuracy of 0.01" was used at the top of the shoe and at one inch (1") above the shoe. (See photo #1)

HAND-RAIL #1

Anchor bolts tapped into steel channel without washer and nuts. (See photo #2)

LOAD	SHOE	TOP	GLASS
PL 125	.01	7/16"	.01
0	.00	00"	.00
125	.03	1 1/16"	.03
150	.03	1 5/16"	.04
175	.04	1 5/8"	.05
200	.05	1 15/16"	.06
225	.06	2 1/4"	.07
250	.08	2 5/8"	.09
275	.09	2 15/16"	.10
300	.11	3 3/8"	.12
325	.14	3 3/4"	.15
350	.15	4 3/16"	.17
375	.17	4 11/16"	.20
400	.21	5 3/16"	.24
425	.26	6 1/16"	.32
450	.34	7 3/16"	.43
520 *		12"	No Breakage

***Load was removed and specimen returned to 7 3/8" permanent set.**

RESULTS

Specimen passed.

The performance of this single specimen indicates that it meets model design and code requirements with the following safety factors:

Uniform load: 50.0 pound / force per linear foot.

520 lb-f / 50lb/ft x 4.0 ft = safety factor of **2.6**.

Concentrated load: 200.0 pound/force.

520 lb-f / 200 lb = safety factor of **2.6**.

The specimen was not destroyed during testing and ultimate loads were not determined.

OBSERVATIONS

Fasteners at aluminum shoe were tapped into the structural channel and stripped during testing.

HAND-RAIL #2

Anchor bolts tapped into steel channel without washers and nuts.

LOAD	SHOE	TOP	GLASS
PL 125	.04	1 1/8"	.03
0	.00	1/16"	.00
125	.05	1 3/16"	.03
150	.06	1 1/2"	.04
175	.07	1 13/16"	.05
200	.08	2 1/16"	.055
225	.09	2 3/8"	.07
250	.11	2 13/16"	.10
275	.115	3 1/16"	.105
300	.13	3 7/16"	.12
325	.14	3 15/16"	.14
350	.17	4 1/4"	.15
375	.18	4 5/8"	.18
400	.21	5 3/16"	.22
425	.24	5 3/4"	.26
450	.31	6 7/16"	.32
520 *		10"	No Breakage

***Load was removed and specimen returned to 9 3/4" permanent set.**

RESULTS

Specimen passed.

The performance of this single specimen indicates that it meets model design and code requirements with the following safety factors:

Uniform load: 50.0 pound / force per linear foot.

520 lb-f / 50lb/ft x 4.0 ft = safety factor of **2.6**.

Concentrated load: 200.0 pound/force.

520 lb-f / 200 lb = safety factor of **2.6**.

OBSERVATIONS

Fasteners at aluminum shoe were tapped into the structural channel and stripped during testing.

TESTING COMPLETED

This completes the performance testing of glass handrail for PRL Aluminum at Construction Consulting Laboratory West, Ontario, California on January 13, 2009.

Jack W. Jackson
Construction Consulting Laboratory West
President/Manager of Testing

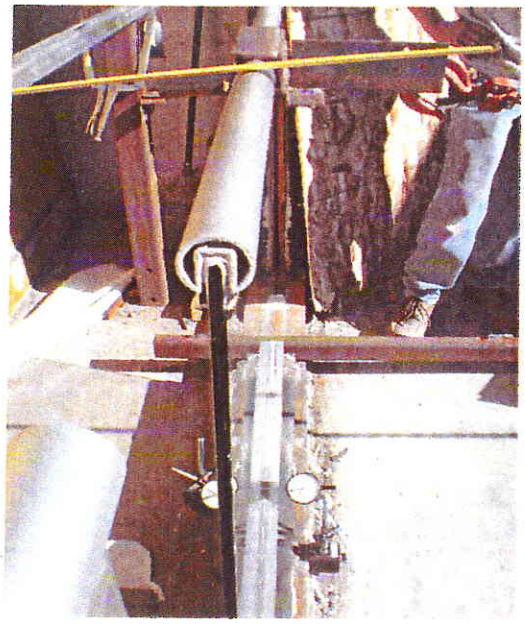


Photo #1

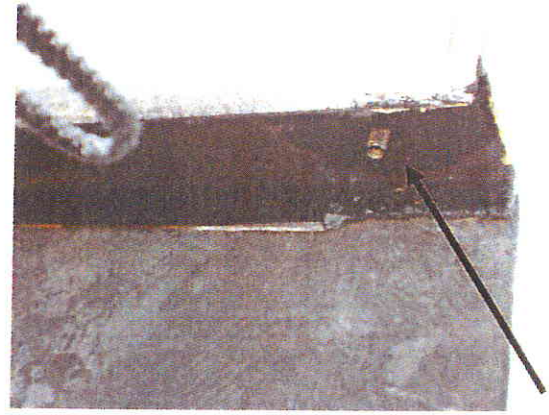


Photo #2