

LMT-MERCER GROUP, INC. TEST REPORT

SCOPE OF WORK

ICC-ES AC273 TESTING ON 1-1/2 IN DIAMETER ALUMINUM HANDRAIL

REPORT NUMBER

H3133.01-119-19 R0

TEST DATE

07/20/17

ISSUE DATE

09/05/17

RECORD RETENTION END DATE

07/20/21

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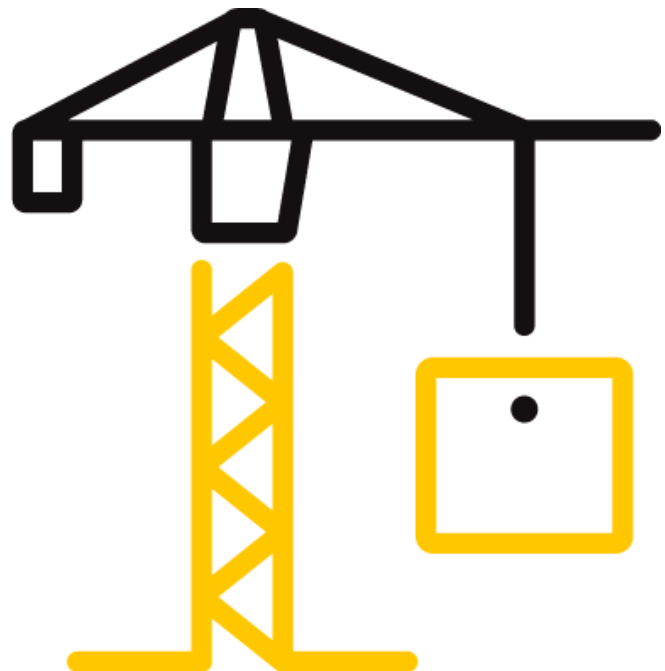
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TEST REPORT FOR LMT-MERCER GROUP, INC.

Report No.: H3133.01-119-19 R0

Date: 09/05/17

REPORT ISSUED TO

LMT-MERCER GROUP, INC.

322 Lake Avenue

P.O. Box 1147

Hartville, OH 44632

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by LMT-Mercer Group, Inc. to perform structural testing in accordance with ICC-ES™ AC273 on their 1-1/2 in diameter aluminum handrail. Results obtained are tested values and were secured by using the designated test method(s). Testing was conducted at Intertek test facility in York, PA.

Intertek B&C in York, Pennsylvania has demonstrated compliance with ISO/IEC International Standard 17025 and is consequently accredited as a Testing Laboratory (TL-144) by International Accreditation Service, Inc. (IAS). Intertek B&C is accredited to perform all testing reported herein.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

For INTERTEK B&C:

COMPLETED BY:	Adam J. Schrum	REVIEWED BY:	V. Thomas Mickley, Jr., P.E.
TITLE:	Lead Technician	TITLE:	Senior Staff Engineer
SIGNATURE:		SIGNATURE:	
DATE:	09/05/17	DATE:	09/05/17

AJS:vtm/aaa

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SECTION 2

TEST METHOD(S)

The specimen was evaluated in accordance with the following:

ICC-ES™ AC273 (March 1, 2008 - editorially revised March 2016), *Acceptance Criteria for Handrails and Guards*

ICC-ES™ AC273 was developed by the ICC Evaluation Service, Inc. (ICC-ES™) as acceptance criteria to evaluate compliance with the following building codes:

2015 *International Building Code*®, International Code Council

2015 *International Residential Code*®, International Code Council

SECTION 3

LIMITATIONS

All tests performed were to evaluate structural performance of the handrail to carry and transfer imposed loads to the supports (posts). The test specimen evaluated included the handrail, brackets and attachment of the brackets to the support posts. Anchorage of support posts to the supporting structure is not included in the scope of this testing and would need to be evaluated separately.

SECTION 4

MATERIAL SOURCE

Test samples were provided by the client.

Representative samples of the test specimen(s) will be retained by Intertek B&C for a minimum of four years from the test completion date.

SECTION 5

EQUIPMENT

Railing assembly tests were performed per ICC-ES™ AC273, Section 4.2.1 in a self-contained structural frame designed to accommodate anchorage of a handrail assembly and application of the required test loads. The specimen was loaded using an electric winch mounted to a rigid steel test frame. High strength steel cables, nylon straps, and load distribution beams were used to impose test loads on the specimen. Applied load was measured using an electronic load cell located in-line with the loading system. Deflections were measured to the nearest 0.01 in using electronic linear displacement transducers.

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SECTION 6

LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Brad Lynn	LMT-Mercer Group, Inc.
Adam J. Schrum	Intertek B&C

SECTION 7

TEST PROCEDURE

Structural Performance Testing of Assembled Railing Systems

The railing assembly was installed and tested as a single handrail section by directly securing the SYP 4 x 4's to rigid steel stanchions. The railing was assembled by an Intertek B&C technician. Transducers mounted to an independent reference frame were located to record movement of reference points on the railing system components (ends and mid-point) to determine net component deflections. See photographs in Section 10 for test setups.

The test specimen was inspected prior to testing to verify size and general condition of the materials, assembly, and installation. No potentially compromising defects were observed. One specimen was used for all load tests which were performed in the order reported. Each design load test was performed using the following procedure:

1. Zeroed transducers and load cell at zero load;
2. Increased load to specified test load in no less than ten seconds; and
3. Held test load for no less than one minute.

Unless otherwise noted, all loads and displacement measurements were normal to the rail (horizontal). The test results apply only to the railing assembly between supports and anchorage to the support.

Key to Test Results Tables:

Load Level: Target test load

Test Load: Actual applied load at the designated load level (target). Where more than one value is reported, the test load was the range (min. - max.) that was held during the time indicated in the test.

Elapsed Time (E.T.): The amount of time into the test with zero established at the beginning of the loading procedure. Where more than one value is reported, the time was the range (start-end) that the designated load level was reached and sustained.

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TEST SPECIMEN DESCRIPTION

The aluminum handrail system is comprised of an aluminum handrail with aluminum die cast brackets. Test specimens consisted of one product color: White. Drawings are included in Section 11 to verify the overall dimensions and other pertinent information of the tested product, its components, and any constructed assemblies. Photographs are provided in Section 11.

SERIES/MODEL	Aluminum handrail system
HANDRAIL	1-1/2 in diameter (OD) by 0.17 in. wall by 104 in long (overall) 6105-T5 extruded aluminum
HANDRAIL ATTACHMENT	2 in wide 6063-T5 die cast aluminum brackets spaced 96 in on-center
POST	4 by 4, preservative treated Southern Yellow Pine posts

Fastening Schedule

CONNECTION	FASTENER
Bracket to Post ¹	One 3/8 in by 3 in (0.267 in minor diameter) 7 TPI, stainless steel, hex-head lag bolt
Bracket to Rail ²	Two ¼ in by 1 in (0.183 in minor diameter) 14 TPI, stainless steel, flat-head, Philips drive screws

¹ 15/64 in predrill

² 13/64 in predrill

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SECTION 9

TEST RESULTS

Structural Performance Testing of Assembled Railing Systems

96 in Aluminum Handrail

IBC - All Use Groups / ICC-ES™ AC273

Specimen No. 1 of 3

Test No. 1 - Test Date: 07/20/17

Design Load: 50 lb / ft Uniform Load applied at 45 degrees on Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RESULT
1000 lb (2.50 x D.L.)	1000 - 1008	01:35 - 02:40	Sustained load equal to or greater than 1000 lb for one full minute without failure

Test No. 2 - Test Date: 07/20/17

Design Load: 200 lb Horizontal Concentrated Load at Mid-Span of Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET ¹
200 lb (D.L.)	200	00:37	0.23	1.96	0.22	1.74
500 lb (2.50 x D.L.)	501 - 505	01:06 - 02:09	Result: Withstood load equal to or greater than 500 lb for one full minute without failure			

¹ Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.

Test No. 3 - Test Date: 07/20/17

Design Load: 200 lb Vertical Concentrated Load at Mid-Span of Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET ¹
200 lb (D.L.)	200	00:54	0.08	2.56	0.08	2.48
500 lb (2.50 x D.L.)	501 - 508	01:40 - 02:45	Result: Withstood load equal to or greater than 500 lb for one full minute without failure			

¹ Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.

TEST REPORT FOR LMT-MERCER GROUP, INC.

Report No.: H3133.01-119-19 R0

Date: 09/05/17

Test No. 4 - Test Date: 07/20/17

Design Load: 200 lb Horizontal Concentrated Load at Ends of Rail (Brackets)

LOAD LEVEL ¹	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)
1000 lb (2.50 x D.L.) x 2	1001 - 1010	01:03 - 02:08	Result: Each end withstood load equal to or greater than 500 lb for one full minute without failure

¹A spreader beam was used to impose loads on both ends of the rail, therefore loads were doubled.

Test No. 5 - Test Date: 07/20/17

Design Load: 200 lb Vertical Concentrated Load at Ends of Rail (Brackets)

LOAD LEVEL ¹	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)
1000 lb (2.50 x D.L.) x 2	1000 - 1025	01:55 - 02:58	Result: Each end withstood load equal to or greater than 500 lb for one full minute without failure

¹A spreader beam was used to impose loads on both ends of the rail, therefore loads were doubled.

Specimen No. 2 of 3

Test No. 1 - Test Date: 07/20/17

Design Load: 50 lb / ft Uniform Load applied at 45 degrees on Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RESULT
1000 lb (2.50 x D.L.)	1000 - 1009	01:20 - 02:25	Sustained load equal to or greater than 1000 lb for one full minute without failure

Test No. 2 - Test Date: 07/20/17

Design Load: 200 lb Horizontal Concentrated Load at Mid-Span of Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET ¹
200 lb (D.L.)	201	00:31	0.18	2.08	0.22	1.88
500 lb (2.50 x D.L.)	502 - 507	01:03 - 02:07	Result: Withstood load equal to or greater than 500 lb for one full minute without failure			

¹ Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.

TEST REPORT FOR LMT-MERCER GROUP, INC.

Report No.: H3133.01-119-19 R0

Date: 09/05/17

Test No. 3 - Test Date: 07/20/17

Design Load: 200 lb Vertical Concentrated Load at Mid-Span of Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET ¹
200 lb (D.L.)	200	00:34	0.04	2.38	0.06	2.33
500 lb (2.50 x D.L.)	502 - 510	01:28 - 02:29	Result: Withstood load equal to or greater than 500 lb for one full minute without failure			

¹ Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.

Test No. 4 - Test Date: 07/20/17

Design Load: 200 lb Horizontal Concentrated Load at Ends of Rail (Brackets)

LOAD LEVEL ¹	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)
1000 lb (2.50 x D.L.) x 2	1001 - 1013	00:45 - 01:57	Result: Each end withstood load equal to or greater than 500 lb for one full minute without failure

¹A spreader beam was used to impose loads on both ends of the rail, therefore loads were doubled.

Test No. 5 - Test Date: 07/20/17

Design Load: 200 lb Vertical Concentrated Load at Ends of Rail (Brackets)

LOAD LEVEL ¹	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)
1000 lb (2.50 x D.L.) x 2	1001 - 1022	01:09 - 02:16	Result: Each end withstood load equal to or greater than 500 lb for one full minute without failure

¹A spreader beam was used to impose loads on both ends of the rail, therefore loads were doubled.

Specimen No. 3 of 3

Test No. 1 - Test Date: 07/20/17

Design Load: 50 lb / ft Uniform Load applied at 45 degrees on Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	RESULT
1000 lb (2.50 x D.L.)	1000 - 1009	01:06 - 02:09	Sustained load equal to or greater than 1000 lb for one full minute without failure

TEST REPORT FOR LMT-MERCER GROUP, INC.

Report No.: H3133.01-119-19 R0

Date: 09/05/17

Test No. 2 - Test Date: 07/20/17

Design Load: 200 lb Horizontal Concentrated Load at Mid-Span of Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET ¹
200 lb (D.L.)	201	00:28	0.34	1.96	0.48	1.55
500 lb (2.50 x D.L.)	501 - 510	00:58 - 02:01	Result: Withstood load equal to or greater than 500 lb for one full minute without failure			

¹ Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.

Test No. 3 - Test Date: 07/20/17

Design Load: 200 lb Vertical Concentrated Load at Mid-Span of Top Rail

LOAD LEVEL	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)			
			END	MID	END	NET ¹
200 lb (D.L.)	200	00:34	0.03	2.39	0.08	2.34
500 lb (2.50 x D.L.)	501 - 514	01:16 - 02:19	Result: Withstood load equal to or greater than 500 lb for one full minute without failure			

¹ Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.

Test No. 4 - Test Date: 07/20/17

Design Load: 200 lb Horizontal Concentrated Load at Ends of Rail (Brackets)

LOAD LEVEL ¹	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)
1000 lb (2.50 x D.L.) x 2	1001 - 1016	00:50 - 01:54	Result: Each end withstood load equal to or greater than 500 lb for one full minute without failure

¹A spreader beam was used to impose loads on both ends of the rail, therefore loads were doubled.

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Test No. 5 - Test Date: 07/20/17

Design Load: 200 lb Vertical Concentrated Load at Ends of Rail (Brackets)

LOAD LEVEL ¹	TEST LOAD (lb)	E.T. (min:sec)	DISPLACEMENT (in)
1000 lb (2.50 x D.L.) x 2	1001 - 1020	00:32 - 01:37	Result: Each end withstood load equal to or greater than 500 lb for one full minute without failure

¹A spreader beam was used to impose loads on both ends of the rail, therefore loads were doubled.

SECTION 10

CONCLUSION

Structural Performance Testing of Assembled Railing Systems

When installed between adequate supports, the handrail assembly reported herein meets the structural performance requirements of Section 4.2.1 of ICC-ES™ AC273 for use in Commercial Applications (IBC).

Anchorage of support posts to the supporting structure is not included in the scope of this testing and would need to be evaluated separately.

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SECTION 11 PHOTOGRAPHS



Photo No. 1
Uniform Load Test Applied at 45 degrees



Photo No. 2
Horizontal Concentrated Load Test at Mid-Span of Handrail

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Photo No. 3

Vertical Concentrated Load Test at Mid-Span of Handrail



Photo No. 4

Horizontal Concentrated Load Test at Ends of Handrail (Brackets)

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Date: 09/05/17



Photo No. 5

Vertical Concentrated Load Test at Ends of Handrail (Brackets)



Photo No. 6

Handrail Bracket Connection



Total Quality. Assured.

130 Derry Court
York, Pennsylvania 17406

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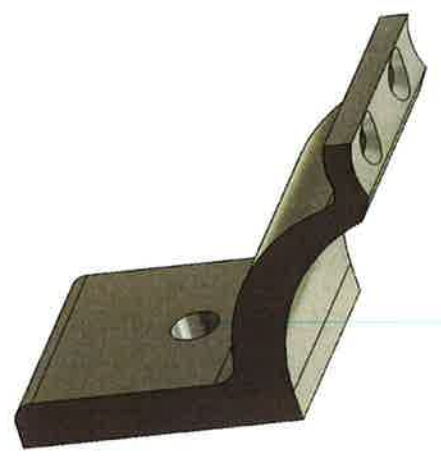
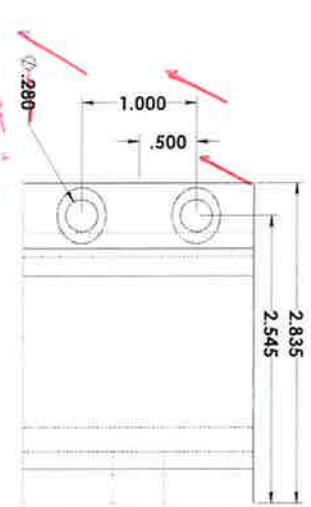
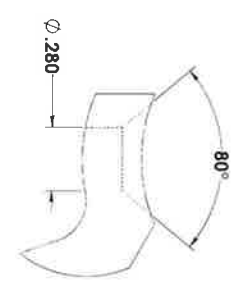
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Report No.: H3133.01-119-19 R0

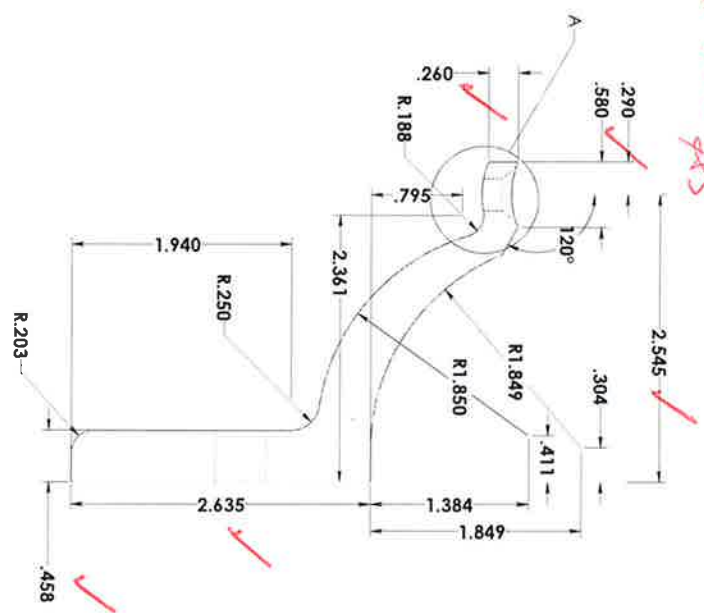
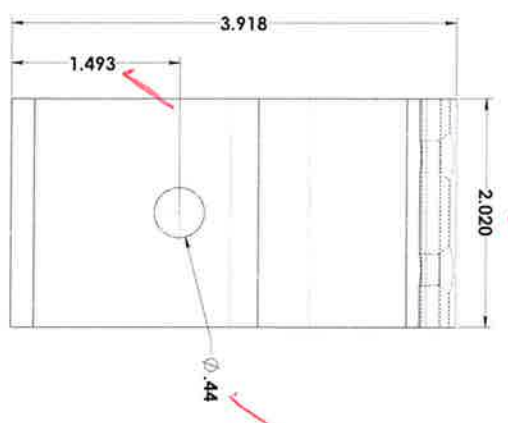
Date: 09/05/17

SECTION 12 DRAWINGS

The "As-Built" drawings for the 1-1/2 in aluminum handrail, which follow, have been reviewed by Intertek B&C and are representative of the project reported herein. Project construction was verified by Intertek B&C per the drawings included in this report. Any deviations are documented herein or on the drawings.



DETAIL A
SCALE 4:1



Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # H3133-01-119-19

Date 8/17/17 Tech ASJ

PROJECT: **LMT-MERCER GROUP**
 DRAWING NO: **17-01-119-19**
 DATE: **8/17/17**
 SCALE: **AS SHOWN**
 DRAWN BY: **ASJ**
 CHECKED BY: **ASJ**
 APPROVED BY: **ASJ**
 PROJECT LOCATION: **17-01-119-19**
 CLIENT: **LMT-MERCER GROUP**
 ARCHITECT: **LMT-MERCER GROUP**
 ENGINEER: **LMT-MERCER GROUP**
 TESTER: **ASJ**

A

B

C

D

E

8

7

6

5

4

3

2

1

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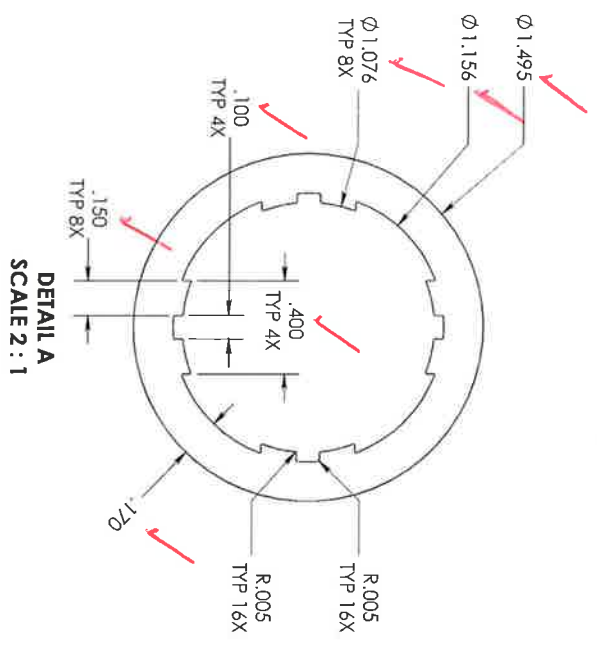
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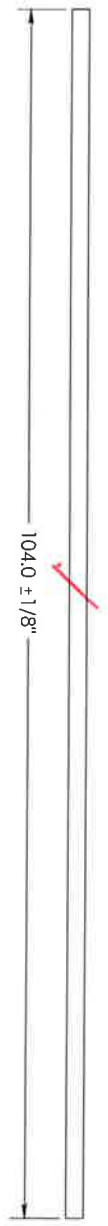
Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # H3133.01-119-19
Date 8/17/17 Tech ATS



DETAIL A
SCALE 2 : 1



SCALE: 1:10

TOLERANCES UNLESS SPECIFIED
 FRACTIONAL ± 1/64
 ANGULAR ± 1/2°
 .XX ± .010
 .XXX ± .005
 .XXXX ± .0005

LMT-MERCER GROUP
 LMT-MERCER GROUP INC.
 690 PURITAN AVENUE
 LAWRENCEVILLE, NJ 09848

ALUMINIUM ADA RAIL
 0.170 WALL X 104" LONG

DESIGN: JIM F
 07/07/2017
 APPROVED: BRAD LYNN
 07/10/2017
 RELEASE DATE: 07/10/2017

CUSTOMER: LMT
 PART NUMBER: 18D
 MATERIAL: 6105-T5 ALLOY
 SCALE: NOTED

1500 DIA ALUM TUBE X 104
 X 170 WALL SHIPT
 SHRINKAGE: N/A
 SHEET 1 OF 1

VOLUME: 0.170 WALL - 9.085 CU.IN./FOOT

4

3

2

1

A

B

A

B



Total Quality. Assured.

130 Derry Court
York, Pennsylvania 17406

Telephone: 717-764-7700
Facsimile: 717-764-4129
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SECTION 13

REVISION LOG

REVISION #	DATE	PAGES	REVISION
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