

**TEST REPORT**

Rendered to:

**LMT - MERCER GROUP INC.**

For:

**Galvanized Steel Tower Post Mount**

**Report No: 69429.02-119-19**  
**Report Date: 04/10/07**

## TEST REPORT

69429.02-119-19  
April 10, 2007

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## **TEST REPORT**

Rendered to:

LMT - MERCER GROUP INC.  
690 Puritan Avenue  
Lawrenceville, New Jersey 08648

Report No: 69429.02-119-19  
Test Date: 11/21/06  
Report Date: 04/10/07

### **1.0 General Information**

#### **1.1 Product**

Galvanized Steel Tower Post Mount

#### **1.2 Project Description**

Architectural Testing, Inc. (ATI) was contracted by LMT - Mercer Group Inc. to perform structural performance testing on a galvanized steel tower post mount. The purpose of the testing is code compliance evaluation in accordance with Section 5.1 of the following criteria:

ICC-ES™ AC174 (effective July 1, 2006), *Acceptance Criteria for Deck Board Span Ratings and Guardrail Systems (Guards and Handrails)*.

The scope of testing performed and reported herein was for preliminary evaluation purposes to evaluate the post mount for supporting a 6 ft by 42" railing system. Testing was limited to satisfying the structural load testing requirements of Section 5.1, *Guardrail System Test Requirements*, which are equal to 2.5 times the design loads of the referenced building codes. Further testing would be required to determine actual adjustment factors for the tested material.

#### **1.3 Product Sampling**

Tested components were not independently sampled as required by AC174 but were supplied by LMT - Mercer Group Inc. as testing was for internal R&D purposes only.

#### **1.4 Conditions of Testing**

Unless otherwise indicated, the conditions of testing were laboratory ambient conditions with temperature in the range of  $68 \pm 4^{\circ}\text{F}$ . All test specimen materials were stored in the laboratory conditions indicated for no less than 40 hours prior to testing.

## 2.0 Reference Standards

ASTM D 7032-04, *Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails)*

## 3.0 Structural Performance Testing of Assembled Railing Systems

Re: AC174 - Section 5.1

### 3.1 General

Railing assemblies were tested in a self-contained structural frame designed to accommodate anchorage of a rail 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" using electronic linear displacement transducers.

### 3.2 Railing Assembly Description

A PVC guardrail system consisting of extruded top and bottom rails with spaced balusters inserted in the rail members providing approximately 3-1/2" clear space between balusters was used in the evaluation of the galvanized steel tower post mount. Top and bottom rails were hollow profiles with no reinforcing inserts. The railing system had an overall top rail length (inside of post to inside of post) of 72" with an overall rail height of 42" (deck surface to top of top rail). Top and bottom rails were attached to 4" by 4" PVC-sleeved galvanized steel tower post mounts via external metal brackets. Each external metal bracket was secured to a post section with four (4) #10 by 3/4" pan head, self-starting, stainless steel screws. The top rail section was secured to the bracket with six (6) #10 by 3/4" pan-head, self-starting, stainless steel screws (three on each side). The bottom rail section was secured to the bracket with four (4) #10 by 3/4" pan-head, self-starting, stainless steel screws (two on each side). The rail system utilized a PVC support block located at the midspan of the bottom rail. See drawings in Appendix A and photographs in Appendix B for additional details.

### 3.3 Series/Model

The scope of testing performed and reported herein was intended to evaluate the galvanized steel tower post mount for supporting a 6 ft long railing system. The railing system used in testing consisted of the following components (see Appendix A for drawings):

Top Rail - 3-1/4" wide by 3-3/4" high PVC "T" rail

Bottom Rail - 2" wide by 3-1/2" high rectangular PVC profile

Rail Bracket - external metal bracket

Baluster - 1-1/2" square PVC picket

Post Sleeve - 4" by 4" PVC post sleeve

Post Mount - 2" square galvanized steel tube tower measuring 0.109" (12 gauge) thick, welded to 3-1/2" square galvanized steel leveling plate (3/8" thick) attached with four (4) 5/16" Grade 5 bolts\* to 5-1/2" square galvanized steel base plate (3/8" thick)

*\* Bolts must be Grade 5 or better.*

Post Mount Spacer - 3-1/2" square aluminum insert

### 3.4 Test Setup

All railing assemblies were installed and tested as a single railing section by directly securing the post mount into the surface of a rigid steel channel to simulate anchorage into concrete. Evaluation of the base mounting hardware was not included in the scope of testing. Transducers mounted to an independent reference frame are located to record movement of reference points on the railing system components (ends and mid-point) to determine net component deflections. See photographs in Appendix B for individual test set-ups.

### 3.5 Test Procedure

Testing and evaluation was performed in accordance with Section 5.1 of AC174. 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 2.5 times design load in no less than ten seconds.
3. Held 2.5 times design load for no less than one minute.

### 3.6 Test Results

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. There were no adjustment factors applied to the test loads.

#### 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.

#### 72" by 42" PVC Guardrail Attached to Galvanized Steel Tower Post Mounts Installed in Rigid Surface

Test No. 1 - 11/21/06 Design Load: 50 lb / 1 Square ft of In-Fill at Center of Two Balusters			
Load Level	Test Load (lb)	E.T. (min:sec)	Sustained load equal to or greater than 125 lb for minimum of one minute
125 lb (2.5x D.L.)	125 - 133	00:20 - 01:31	

Test No. 2 - 11/21/06 Design Load: 50 lb / 1 Square ft of In-Fill at Bottom of Two Balusters			
Load Level	Test Load (lb)	E.T. (min:sec)	Sustained load equal to or greater than 125 lb for minimum of one minute
125 lb (2.5x D.L.)	126 - 132	00:21 - 01:28	

Test No. 3 - 11/21/06 Design Load: 50 plf Horizontal Uniform Load on Top Rail <sup>1</sup>			
Load Level	Test Load (lb)	E.T. (min:sec)	Sustained load equal to or greater than 750 lb for minimum of one minute
750 lb (2.5x D.L.)	750 - 757	01:09 - 02:18	

<sup>1</sup> Uniform load was simulated with 1/4-pt loading.

### 3.6 Test Results: (Continued)

Test No. 4 - 11/21/06 Design Load: 50 plf Vertical Uniform Load on Top Rail <sup>1</sup>			
Load Level	Test Load (lb)	E.T. (min:sec)	Sustained load equal to or greater than 750 lb for minimum of one minute
750 lb (2.5x D.L.)	754 - 785	00:58 - 02:09	

<sup>1</sup> Uniform load was simulated with four equal load points.

Test No. 5 - 11/21/06						
Design Load: 200 lb Concentrated Load at Midspan of Top Rail						
Load Level	Test Load (lb)	E.T. (min:sec)	Displacement (inches)			
			End	Mid	End	Net <sup>1</sup>
200 lb (D.L.)	203	00:15	0.43	1.89	0.35	1.50
500 lb (2.5x D.L.)	500 - 511	00:42 - 02:05	Sustained load equal to or greater than 500 lb for minimum of one minute			
<u>Deflection Evaluation:</u> Maximum rail deflection at 203 lb = 1.50" on a 6 ft rail (72"). Limits per AC174 <sup>2</sup> : $\left(\frac{h}{24} + \frac{l}{96}\right) = \left(\frac{36}{24} + \frac{72}{96}\right) = 2.25" > 1.50" \therefore ok$ and $\frac{h}{12} = \frac{36}{12} = 3.00" > 1.50" \therefore ok$						

<sup>1</sup> Each end displacement was measured at the center of the 4" by 4" support. Net displacement was the rail displacement relative to the supports.

<sup>2</sup> Calculations were conservatively based on a 36" railing height to satisfy the minimum rail height required for One- and Two-Family Dwellings.

Test No. 6 - 11/21/06 Design Load: 200 lb Concentrated Load at End of Top Rail (Bracket)			
Load Level	Test Load (lb)	E.T. (min:sec)	Displacement (inches)
500 lb (2.5x D.L.)	500 - 510	00:24 - 01:30	Sustained load equal to or greater than 500 lb for minimum of one minute

### 3.6 Test Results: (Continued)

<b>Test No. 7 - 11/21/06</b> <b>Design Load: 300 lb Concentrated Load on Top of a Single Post (50 plf x 6 ft.)</b> Limited to support for rail lengths up to 6-ft (50 plf x 6 ft. = 300 lb)			
Load Level	Test Load (lb)	E.T. (min:sec)	Displacement (inches)
300 lb (D.L.)	303	00:20	1.19"
750 lb (2.5x D.L.)	751 - 758	00:54 - 02:02	Sustained load equal to or greater than 750 lb for minimum of one minute
<b>Deflection Evaluation:</b> Maximum post deflection at 300 lb = 1.19" For Rail Length = 6 ft. (72"), Limit per AC174 <sup>1</sup> : $\left(\frac{h}{24} + \frac{l}{96}\right) = \left(\frac{36}{24} + \frac{72}{96}\right) = 2.25" > 1.19" \therefore ok.$ and $\frac{h}{12} = \frac{36}{12} = 3.0" > 1.19" \therefore ok$			

<sup>1</sup> Calculations based on a 36" railing height (worse case).

### 3.7 Conclusion

The galvanized steel tower post mount met the structural performance requirements of Section 5.1 of AC174 for supporting rail lengths up to and including 72" and rail heights up to and including 42".



Detailed drawings, data sheets, representative samples of test specimens, a copy of this test report will be retained by Architectural Testing, Inc. for a period of four years from the original test date. At the end of this retention period such materials shall be discarded without notice and the service life of this report by Architectural Testing will expire. Results obtained are tested values and were secured using the designated test methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimens tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.:

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Justin M. Mann  
Laboratory Supervisor

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Travis A. Hoover  
Project Engineer

JMM:jmm/nlb

Attachments (pages) This report is complete only when all attachments listed are included

Appendix A - Drawings (6)

Appendix B - Photographs (4)

### Revision Log

<b><u>Rev. #</u></b>	<b><u>Date</u></b>	<b><u>Page(s)</u></b>	<b><u>Revision(s)</u></b>
0	04/10/07	N/A	Original report issue

## **APPENDIX A**

### **Drawings**

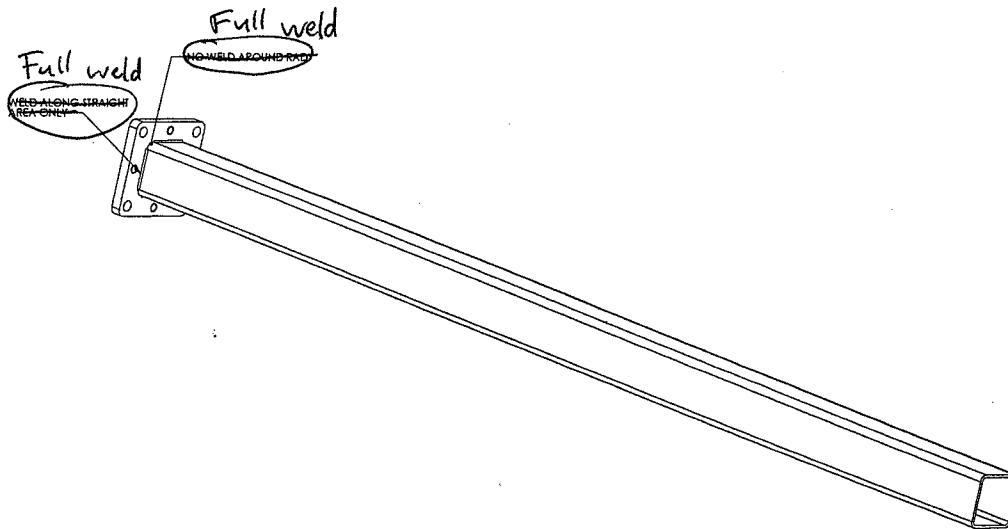
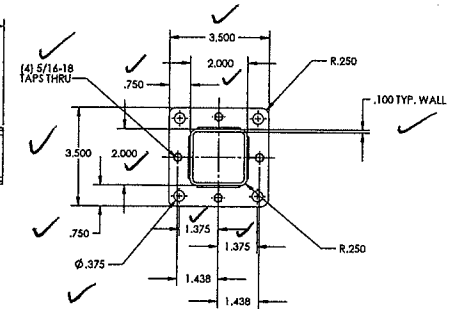
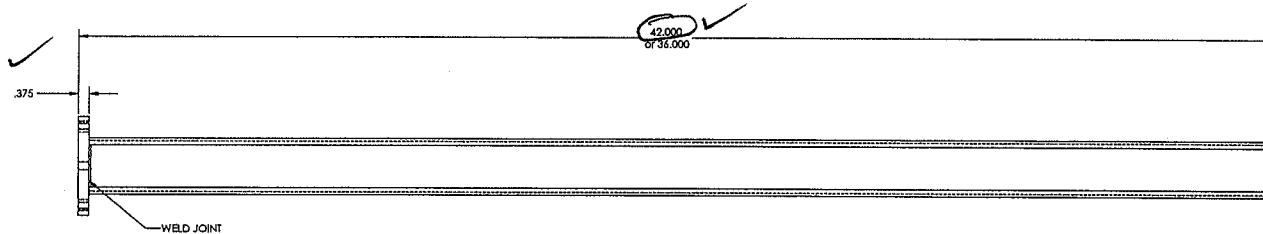


## Architectural Testing

Test sample complies with these details.  
Deviations are noted.

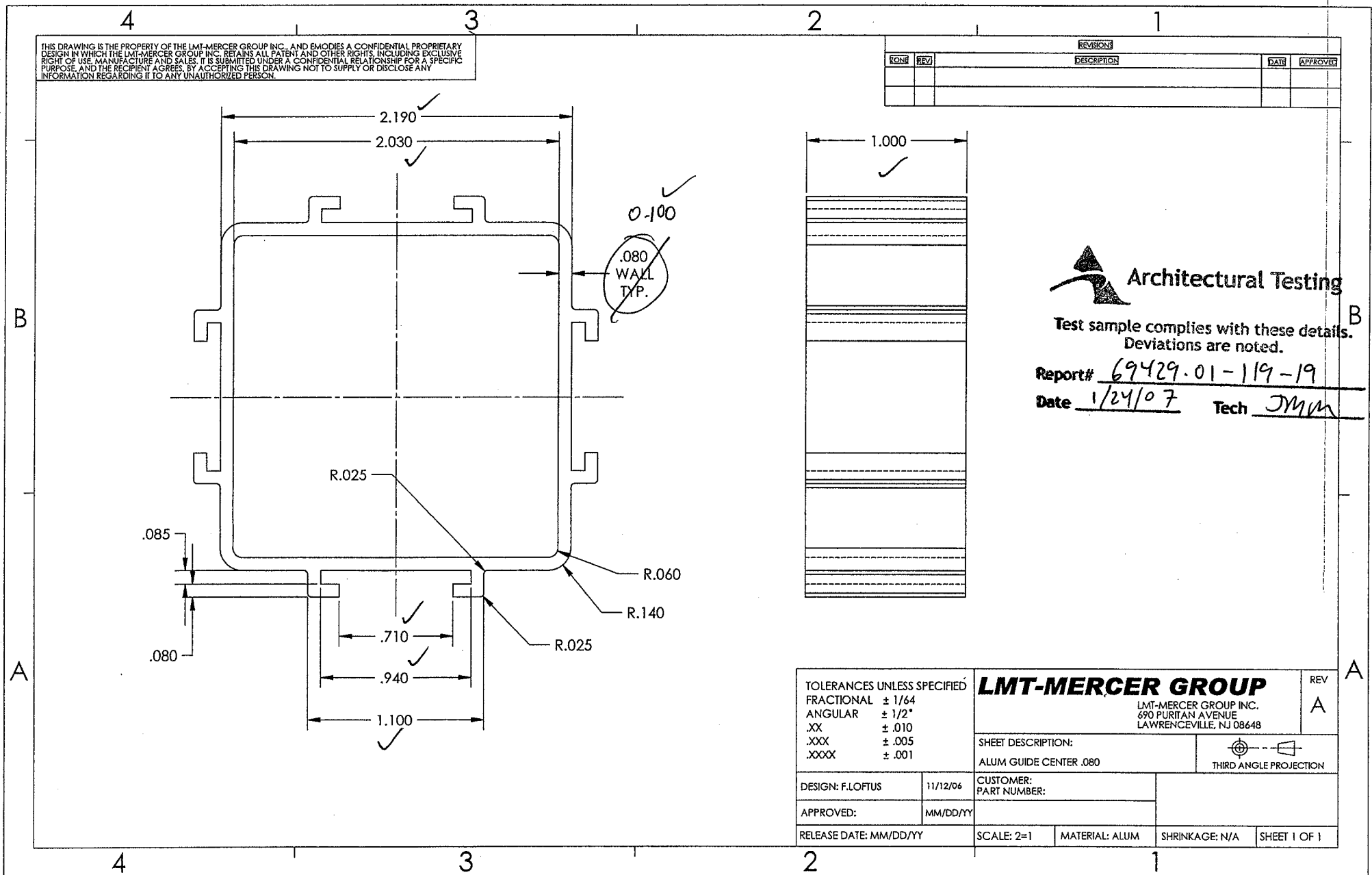
Report# 69429-01-119-19

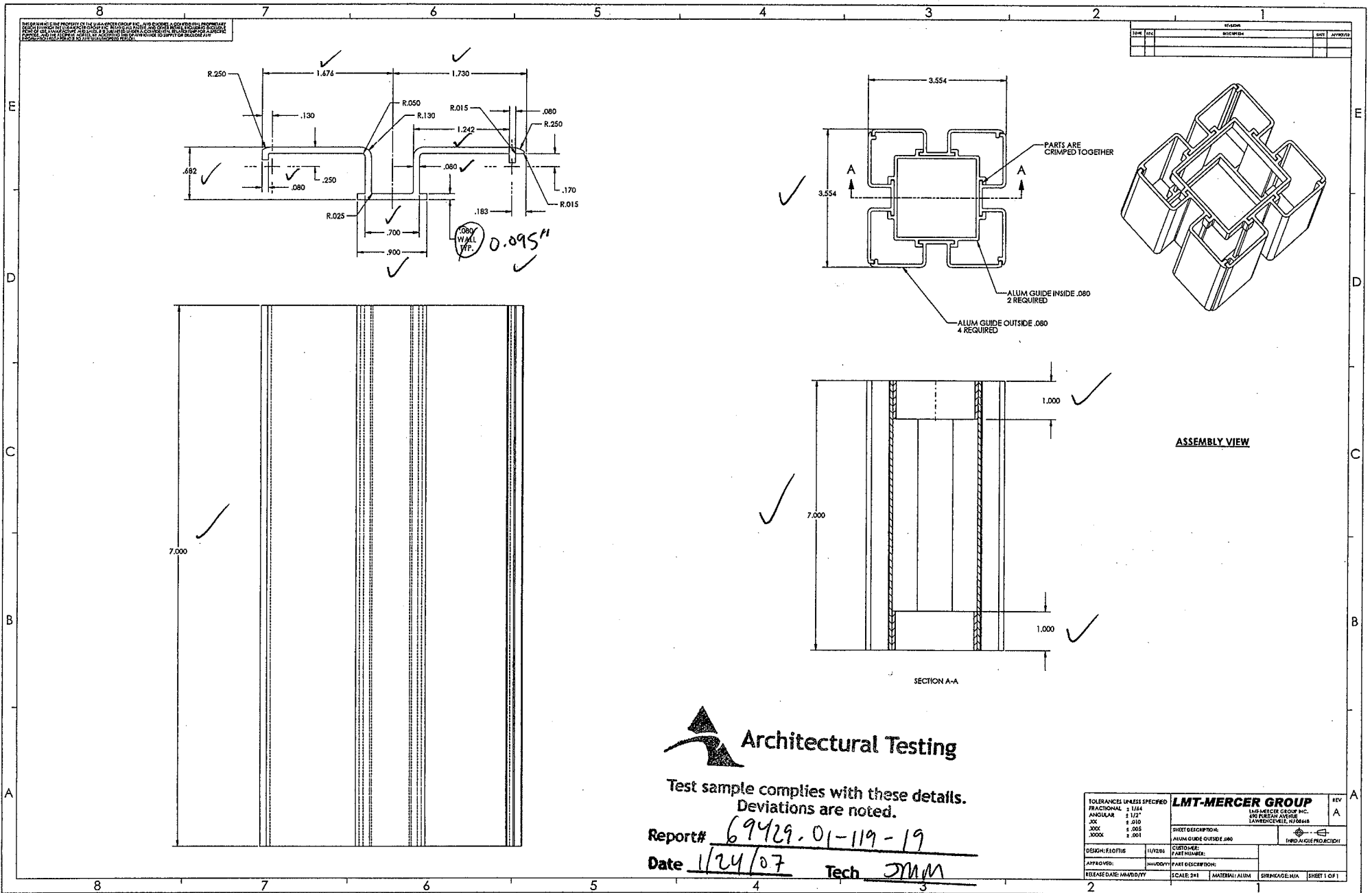
Date 1/24/07 Tech JMA



TOLERANCES UNLESS SPECIFIED		LMT-MERCER GROUP		REV
FRACTIONAL	± 1/64	LMT-MERCER GROUP INC.		A
ANGULAR	± 1/2°	300 FARM ROAD		
XXX	± .030	LAWRENCEVILLE, GA 30046		
300X	± .010			
3000X	± .005			
DESIGN: FLOPUS	AW/DOY	CUSTOMER:	THIRD ANGLE PROJECTION	
APPROVED:	AW/DOY	PART DESCRIPTION:		
RELEASE DATE: 1/24/07		SCALE: 1=1	MAT: GALVANNEED STEEL	SHEET 1 OF 1

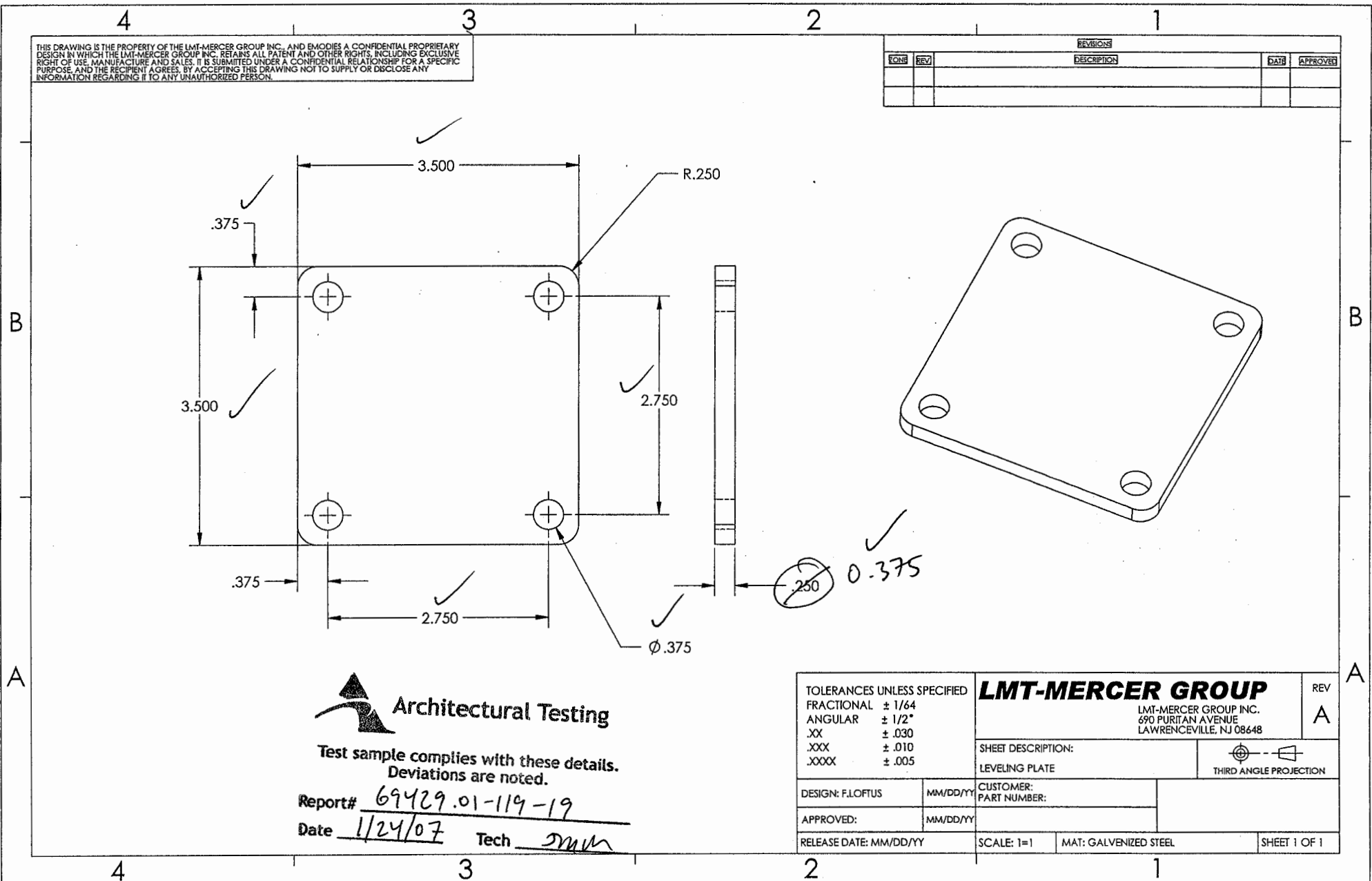






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REV		DESCRIPTION	DATE	APPROVED



**Architectural Testing**

Test sample complies with these details.  
Deviations are noted.

Report# 69429.01-119-19  
Date 1/24/07 Tech SMW

TOLERANCES UNLESS SPECIFIED  
FRACTIONAL  $\pm 1/64$   
ANGULAR  $\pm 1/2^\circ$   
.XX  $\pm .030$   
.XXX  $\pm .010$   
XXXX  $\pm .005$

**LMT-MERCER GROUP**

LMT-MERCER GROUP INC.  
690 PURITAN AVENUE  
LAWRENCEVILLE, NJ 08648

REV  
A

SHEET DESCRIPTION:

LEVELING PLATE

THIRD ANGLE PROJECTION

DESIGN: F.LOFUS

MM/DD/YY

CUSTOMER:  
PART NUMBER:

APPROVED:

MM/DD/YY

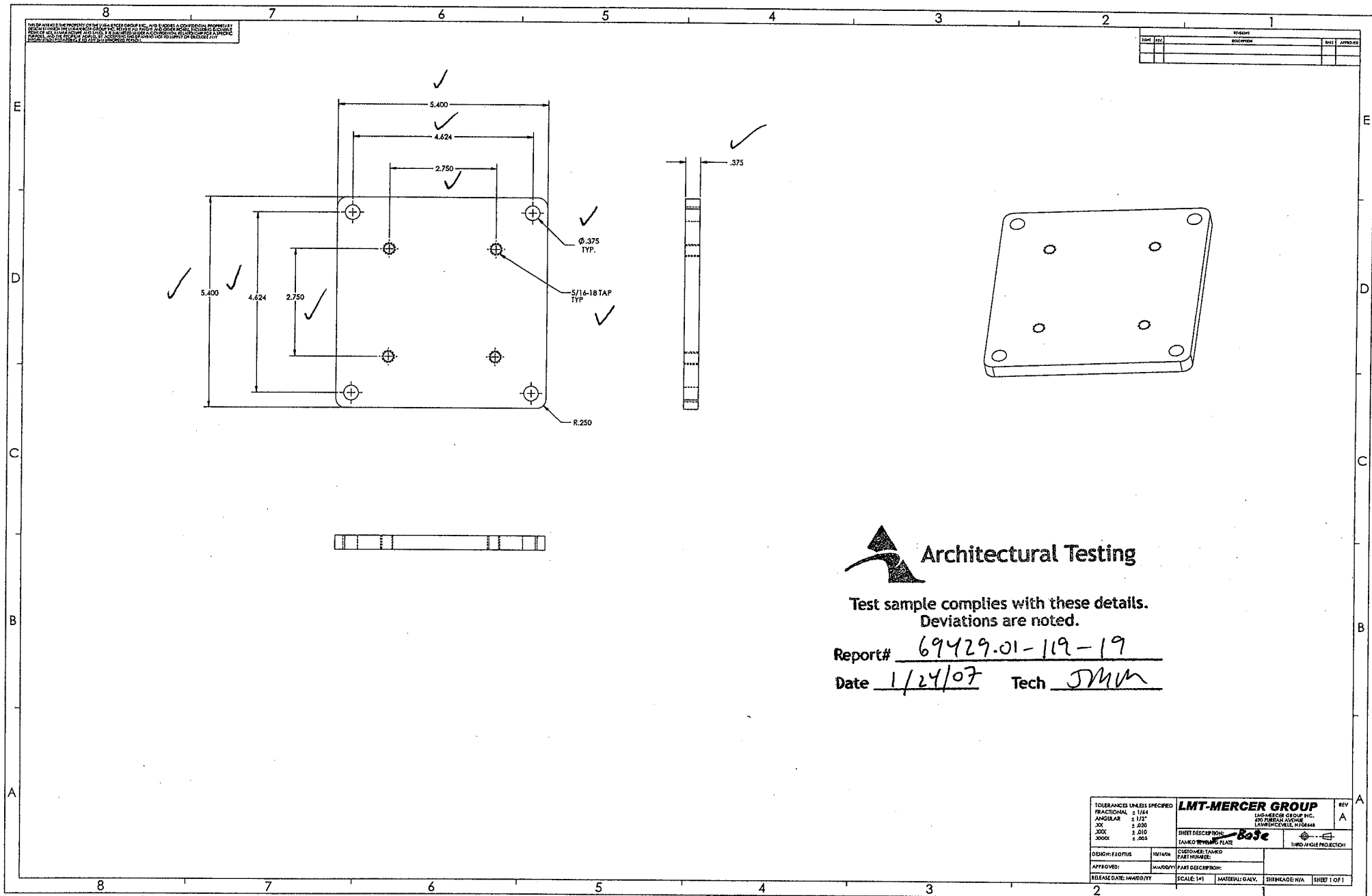
RELEASE DATE: MM/DD/YY

SCALE: 1=1

MAT: GALVENIZED STEEL

SHEET 1 OF 1





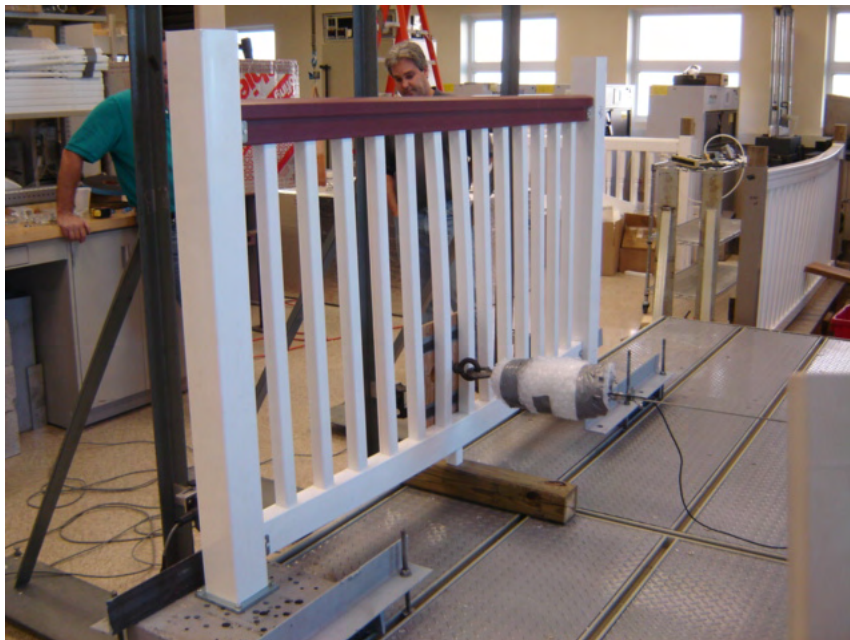


## **APPENDIX B**

### **Photographs**



**Photo No. 1**  
**Infill Load at Center of Three Balusters**



**Photo No. 2**  
**Infill Load at Bottom of Three Balusters**



**Photo No. 3**  
**Horizontal Uniform Load on Top Rail**



**Photo No. 4**  
**Vertical Uniform Load on Top Rail**





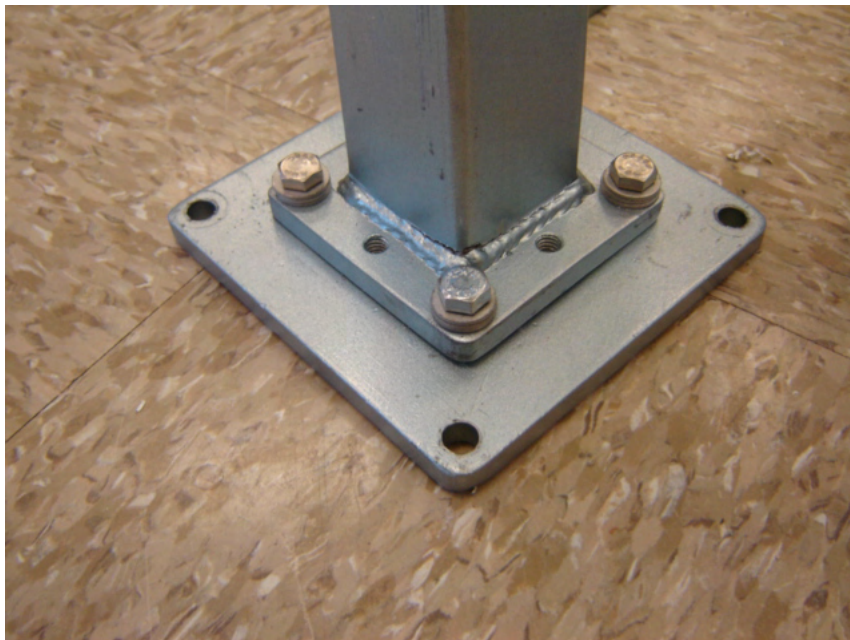
**Photo No. 5**  
**Concentrated Load at Midspan of Top Rail**



**Photo No. 6**  
**Concentrated Load at End of Top Rail (Bracket)**



**Photo No. 7**  
**Concentrated Load at Top of Post**



**Photo No. 8**  
**Base of Galvanized Steel Tower Post Mount**