

May 4, 2020

Project B2003678

Standard Iron & Wire Works, Inc.
524 Pine Street
Monticello, MN 55362

Re: Aluminum Guardrail Testing

This report is a summary of load testing performed on a single multi span guardrail.

Test Method

The guardrail was tested in conformance to the concentrated and uniform load test procedures from *ASTM E935 Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings*.

Single Point Loads were applied to the sample using a SPX Power Team 5-ton hydraulic cylinder through spherical bearing pad and measured using a 2,000 lbf capacity load cell. Quarter point loads were applied using a pair of calibrated pneumatic cylinders. In both cases deflections were measured using Linear Variable Differential Transformers (lvdt). Data was monitored and recorded during the test using a DEWESoft DEWE-43 data acquisition system.

A single rail assembly with an assemble length of 146" and height of 43" was provided for testing. A 200 lbf point load was applied to the top rail midspan, centered on a post, and adjacent to a post. A 608 lbf quarter point load (equivalent to 50 lb-ft) was applied as well. These four configurations are shown in figures 1-4 below.

Figure 1: Test Setup - Midspan

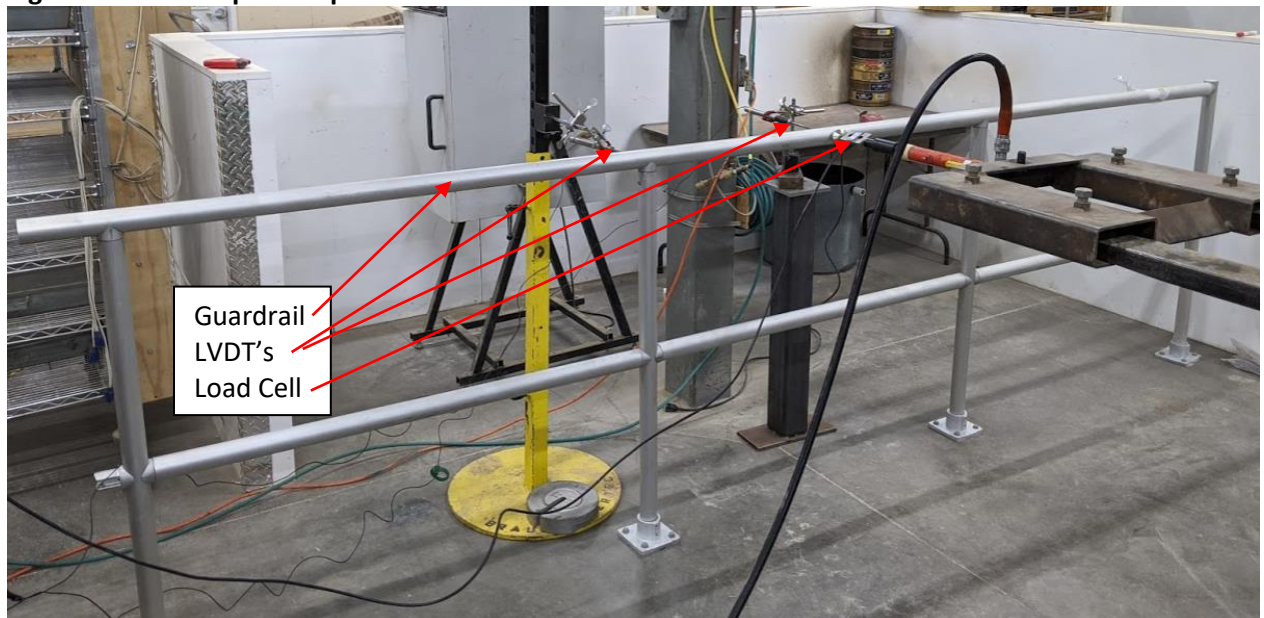


Figure 2: Test Setup – Centered on Post



Figure 3: Test Setup – Adjacent to Post



Figure 4: Test Setup – Quarter Point Load



Test Results

The test results for each load condition is shown in table 1 below.

Table 1: Test Results

Load Type	Test Location	Test Load (lbf)	Rail Deflection (in)	Post Deflection (in)	Permanent Deflection – Rail (in)	Permanent Deflection – Post(in)
Concentrated	Midspan	200	1.198	1.006	0.117	0.107
Concentrated	Centered on Post	200	NA	2.173	NA	0.199

Concentrated	Adjacent to Post	200	0.957	1.095	0.032	0.048
Uniform	¼ Point	608	2.851	2.794	0.354	0.342

There was no visible structural failure to any of the rail components after each test. The only tests that exceeded to the 2" deflection limit provided by Standard Iron was the concentrated load test centered on the end post and the ¼ point test. Photos of each of these tests at full applied load is shown in figures 5-6 below.

Figure 5: End Post at 200 lbf



Figure 6: ¼ point load at 608 lbf



General

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

It has been a pleasure providing these testing services for you. If you have any questions regarding this report, please call Erik Knudson at 952.995.2384.

Sincerely,

BRAUN INTERTEC CORPORATION

Erik J. Knudson
Material Testing Technician