



Engineering Consulting  
Failure Analysis  
Laboratory Services  
NDT

December 21, 2007

Tek-Rail  
Mr. Chuck Nelson  
320 Temple Avenue  
Newnan GA 30269

Re: MME Project # 15258

Mr. Nelson,

Metals and Materials Engineers, LLC (MME) was retained by Tek-Rail, located in Newnan, Georgia to perform load testing on the various styles of Tek-Rail's PolyVinyl Chloride (PVC) Guardrail Systems. This testing was performed to verify the loading capacity and maximum deflection of the rail systems. Testing of each guardrail type was performed in accordance with:

- Building Officials Code Administration (BOCA),
- International Building Code (IBC),
- American Society of Civil Engineers (ASCE),
- Southern Building Code Congress International (SBCCI) standards.

Details of rail testing specifications are in accordance with IBC section 1607.7.1, BOCA section 1606.4, ASCE 7-95 Section 4.4, and SBCCI 1608.2.2. All specified loads were increased by a factor of 2.5 times to correspond with criteria from the ASCE: "The construction shall sustain without structural failure or excessive deflection, a superimposed load equal to two and a half times the live load." All load tests were conducted using a force application device in line with a digital load cell. At the predetermined maximum force, the load was held for one, the maximum deflection was recorded, and the guardrail system and attachments were inspected for visible evidence of failure or separation of material from attachment points. When the load was released, the guardrails were allowed to return to their original configuration and the permanent deformation was recorded.

The first test was performed according to ASCE criteria, which states: "Guardrail systems shall be designed and constructed for a concentrated load of 200 pounds (890N) applied at any

point and in any direction at the top of the guardrail." This test is identical to the version present in IBC 2003/2006. The specified test load was increased by a factor of 2.5 times to correspond with aforementioned criteria from ASCE 7-95.

The second test was performed according to IBC 2003/2006 criteria, which states: "Handrail assemblies and guards shall be designed to resist a load of 50 plf (0.73kN/m) applied in any direction." This test is superseded by the more strenuous test defined in SBCCI Section 1608.2.2.2 which states: "Guardrail systems located other than within dwelling units shall be designed and constructed for a load of 50 pounds/foot (730N/M) applied horizontally at the required guardrail height and a simultaneous load of 100 pounds/foot (1459 N/M) applied vertically downward at the top of the guardrail." The specified test load was increased by a factor of 2.5 times to correspond with aforementioned criteria from ASCE 7-95.

The third test was performed according to IBC 2003/2006 criteria, which states: "Components. Intermediate rails, balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds (0.22 kN) on an area equal to 1 square foot (0.093m<sup>2</sup>), including openings and space between rails." The specified test load was increased by a factor of 2.5 times to correspond with aforementioned criteria from ASCE 7-95.

Rail Identification	Rail Length*	First Test	Second Test	Third Test	Deflection Peak			Permanent Deformation		
					Test 1	Test 2	Test 3	Test 1	Test 2	Test 3
Style "S" – One stiffener	8'	Acceptable	Acceptable	Acceptable	9 <sup>1</sup> / <sub>2</sub> "	5"	N/A	2"	<sup>3</sup> / <sub>4</sub> "	N/A
Style "C" – One stiffener	8'	Acceptable	Acceptable	Acceptable	5"	1 <sup>5</sup> / <sub>8</sub> "	N/A	1 <sup>1</sup> / <sub>4</sub> "	<sup>1</sup> / <sub>4</sub> "	N/A
Style "R" – No stiffener	7'	Acceptable	Acceptable	Acceptable	4 <sup>3</sup> / <sub>8</sub> "	2 <sup>1</sup> / <sub>2</sub> "	N/A	2 <sup>5</sup> / <sub>8</sub> "	<sup>3</sup> / <sub>4</sub> "	N/A
Style "R" – One stiffener	10'	Acceptable	Acceptable	Acceptable	6 <sup>5</sup> / <sub>8</sub> "	4"	N/A	3 <sup>7</sup> / <sub>8</sub> "	1"	N/A

Rail Identification	Rail Length*	First Test	Second Test	Third Test	Deflection Peak			Permanent Deformation		
					Test 1	Test 2	Test 3	Test 1	Test 2	Test 3
Style "B" – No stiffener	8'	Acceptable	Acceptable	Acceptable	8 <sup>1</sup> / <sub>2</sub> "	4 <sup>3</sup> / <sub>4</sub> "	N/A	3 <sup>3</sup> / <sub>4</sub> "	1"	N/A
Style "B" – One stiffener	10'	Acceptable	Acceptable	Acceptable	7 <sup>3</sup> / <sub>4</sub> "	2 <sup>7</sup> / <sub>8</sub> "	N/A	2 <sup>3</sup> / <sub>8</sub> "	<sup>3</sup> / <sub>8</sub> "	N/A

\*Rail length is defined as the distance between wall substrates and/or vertical posts

In conclusion, the rail systems defined herein meet the loading criteria defined IBC 2003/2006 section 1607.7.1, BOCA 1999 section 1606.4, ASCE 7-95 Section 4.4, and SBCCI 2000 1608.2.2 without any indication of failure and no indication of excessive permanent deformation or cracking at the anchorage points.

As always, please do not hesitate to contact us if you have any further questions or concerns regarding this matter.

Respectfully,

Scott Lowrie, PE  
 Senior Engineer



Georgia PE#026708