

Technical Memorandum

Subject: Guardrail Loading

Technical Information:

A common design issue is determining the lateral load to a retaining wall due to collision loading for post and beam guardrail systems installed on a gravity retaining wall. A prescriptive load is provided in some jurisdictions, but more often, the load is not defined and must be interpreted by the designer.

Older versions of the AASHTO specifications provided a prescriptive load for rigid barriers. These are self-supporting systems with moment slabs that cannot deflect to dissipate energy. The high-magnitude lateral forces prescribed by these older specifications are generally not applicable to guardrails.

Unlike rigid barriers, steel guardrails are generally flexible systems that are expected to deflect and dissipate energy. A steel W-beam guardrail will transfer load along its length, further reducing the load magnitude applied to the retaining wall. At the point of impact, posts are expected to shear or deflect to allow deflection of the rail beam. This deflection dissipates energy and transfers load along the length of the guardrail beam.

Traditionally in many jurisdictions, a collision load of 300 pounds per lineal foot is applied at 2.5 feet above pavement level for a steel guardrail system. This value is supported by the provisions of AASHTO 11.10.10.2 (which is directly applicable to MSE configurations). Note that collision loads are applied over a very short duration. Since earth pressures cannot respond as quickly, a reduced earth pressure may be appropriate for stability calculations when applying the 300 psf lateral load in working stress design. Reduced safety factors (75% of the normal safety factors) may also be applied, similar to seismic loading. In limit state design, reduced load factors for gravity loads are typically used for this extreme load case.

Guardrail posts can often be installed within the cells of 24SF and 6SF units. Where moderate to higher speed traffic is expected, the face of the guardrail should be set at least 3 feet from the face of the wall to allow for deflection. In the case of parking bumpers or low-speed applications, this offset may not be necessary.