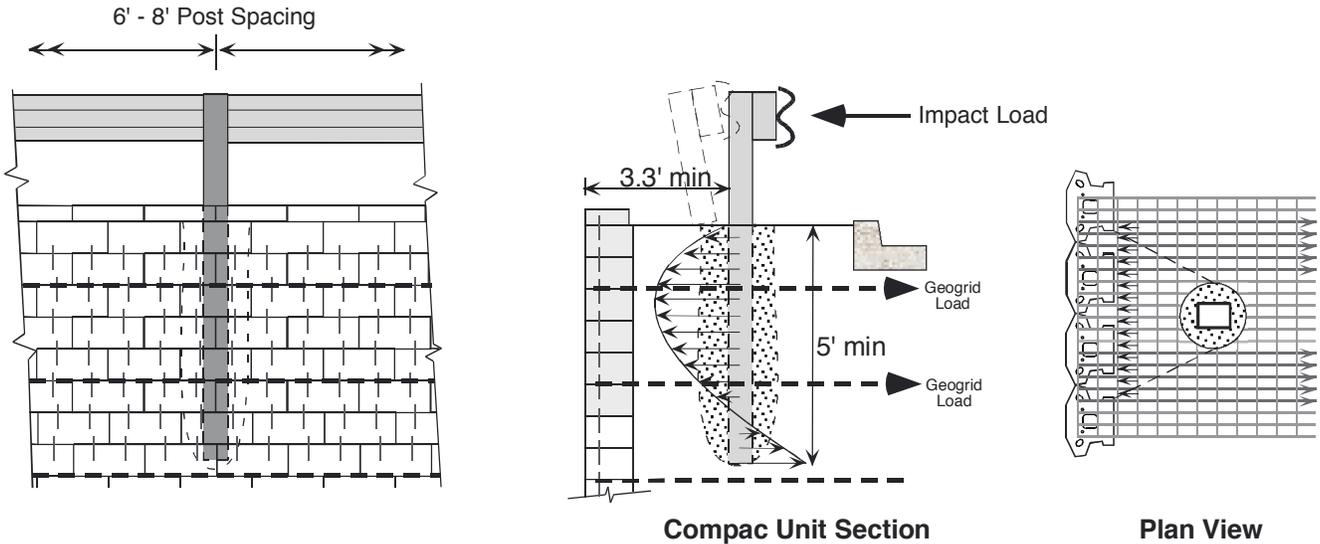




Typical Guardrail Detail



Typical Guardrail Elevation

Typical Guardrail Section

Introduction

Guardrails or flexible post and beam barriers are not "designed" in the conventional sense as a guardrail is not expected to resist traffic impact loadings and remain serviceable like other barriers. The guardrail is designed to be sacrificed during impact and the energy absorbed through resistance and displacement that redirects or halts the vehicle after yielding and failure of the system. Typically, progressive resistance is developed as the first post fails and load is transferred to the adjacent posts through tension on the rail.

There have been numerous guardrail configurations developed over the years by regional transportation agencies and engineers in an attempt to balance cost and performance. They are all similar with varying degrees of stiffness and displacement characteristics exhibited upon impact. The design criteria is relatively simple and only requires that a flexible barrier system be provided sufficient lateral space to displace under impact loading. This space requirement is typically 1m (3.3') minimum (can be up to 1.5m (5') with more flexible rail systems) which can be a problem when not properly accounted for on project site design plans.

Guardrail Analysis

The analysis of a Keystone wall structure with a guardrail placed as shown is problematic in that the guardrail is designed to fail under impact, therefore, there may or may not be some localized displacement of the soil and upper wall units as a result of a major impact. The AASHTO design criteria appears to be a reasonable consideration:

AASHTO '97

Flexible post and beam barriers, when used, shall be placed a minimum distance of 1.0 m (3.3') from the wall face, driven 1.5 m (5') below grade and spaced to miss the reinforcements.... The upper two rows of reinforcement shall be designed for an additional horizontal load of 4.4 kN per lineal meter of wall (300 plf).

Design Note

Two levels of reinforcement are required in the upper four feet of wall to provide resistance against the loads suggested by AASHTO. Posts holes are either augered through the geogrid reinforcement or the posts placed in tubes previously installed during wall construction unless a drive point is used to cut through the reinforcement.