

Precast Concrete Guardwall Artificial Stone Facing Design and Construction Notes for Aesthetic Barriers

Precast Concrete Guardwall (May 15, 2002)

1. The precast concrete guardwall has been approved for use as an NCHRP 350 Test Level 3 barrier due to the similarities to the Stone Masonry Guardwall that was crash tested and meets the requirements of NCHRP Report 350. This artificial stone system is approved for design speed of 100 km/h or less.
2. Based on the crash tests for the stone masonry guardwall the precast concrete guardwall may use specifications that define the maximum projections up to 38 mm beyond the neat line, 50 mm deep raked joints, and beds 50-75 mm thick. Based on aesthetics, specifications for the guardwall may be revised to specify any smoother artificial stone face. Artificial stone faces with critical dimensions greater than those listed above are not considered crashworthy.
3. Numerous designs for the precast concrete guardwall and terminal sections have been reviewed and tested during the development of this system. Federal Lands Highway Standard Drawings for berms, turn-down terminals, and back-slope anchored terminals reflect the best compromise of safety, aesthetics, and ease of construction. Due to the possible effect on the crashworthiness of the guardwall, any modifications to Federal Lands Highway Standards for the stone masonry guardwall must be approved by the Federal Lands Highway Office.
4. The grading in front of the guardwall and terminals must be at a slope of 1:10 or flatter for the guardwall to be effective.
5. The maximum dynamic deflection of the stone masonry guardwall is 0 m for design speeds of 100 km/h or less.
6. During construction, care should be taken to avoid large rock projections oriented toward oncoming traffic. Such projections have a tendency to snag a vehicle resulting in greater vehicle and occupant injury. The recommended orientation for the projections is away from oncoming traffic, so that the vehicle can ride over the projections.
7. The precast concrete guardwall was previously crash tested (NCHRP 230 tests) 3.66 m behind a 88.9 mm mountable curb. Since the 3.66 m is considered to be the critical offset distance, the guardwall is approved for use with any 90 mm mountable curb at any offset.
8. The precast concrete guardwall can be used as a median barrier as long as both sides of the guardwall have a vertical face.
9. The Federal Highway Administration has approved the back-slope anchored terminal based on other terminal tests. The Federal Lands Highway Office has standard drawings designed specifically for the precast concrete guardwall and my use drawings designed for the stone masonry guardwall for a berm Buried terminal (BT).

- a back-slope anchored terminal (BAT), and a stand alone terminal (SAT) (turn-down), and may be used:
- a. The precast concrete guardwall terminal sections were designed specifically for use with an earth berm in a median. The steep 1:4.5 tapers on these terminal sections necessitate the use of a 600 mm earth berm. The sideslopes on the earth berm should be 1:4 or flatter and the approach slope should be 1:20 or flatter. The approach slope for opposing traffic may be steepened to a maximum of 1:6 if there is inadequate room for the 1:20 slope. However, in no case should the 1:20 approach slope be steepened. The preferred design is to place the approach end of this configuration outside the clear zone.
 - b. Where there is a back-slope to tie to, the preferred terminal is the back-slope anchored terminal (BAT). Special consideration will be needed to maintain drainage, because this terminal will not accommodate a drainage ditch.
 - c. For roadside applications where there is adequate room, and no back-slope to tie to, the preferred terminal is the buried terminal (BT) with an earth berm. Due to the steep 1:4.5 top tapers, the earth berm must have a 600 mm earth berm specified instead of the standard 450 mm berm. The terminal section should be located outside the clear zone, but if this is impractical it should be flared as far from the roadway as possible. The earth berm should be oriented approximately parallel to the roadway. It is intended that each berm will be stacked to fit its particular location. For safety, aesthetics, and maintenance considerations, it is desirable to flatten the slopes of the berm as much as possible. A 1:3 sideslope on the berm facing the roadway is considered minimally acceptable. It is also desirable to increase the height of the berm, but the 1:20 approach slope must be maintained..
 - d. Where it is not possible to construct an earth berm or tie to a backslope, the guardwall may be terminated using the SAT (turned-down) without an earth berm. Crash tests on similar turn-down designs have demonstrated the potential for this type terminal to launch a vehicle or produce a rollover. However, this terminal is superior to leaving the exposed guardrail end that could snag or even penetrate a vehicle. The widened shoulder area and guardrail flare aids in providing stability for a vehicle riding up on the terminal. Precast concrete terminals may only be used without an earth berm if they are located outside the clear zone.
10. The nature of the precast concrete guardwall provides that, typically, no transition is required to bridge rails. Care should be exercised not to create possible snagging points where the barrier connects to the bridge rail, even on trailing bridge rail ends.