

Fences, Railings, & Traffic Barriers

8

TECHNICAL BULLETIN

This Technical Bulletin is the eighth in a series of informational papers that provide specific application ideas and installation tips for VERSA-LOK® Retaining Wall Systems. Additional information is available in our *Design & Installation Guidelines*.

The information, including technical and engineering data, figures, tables, designs, drawings, details, suggested procedures and suggested specifications, presented in this publication is for general information only. While every effort has been made to ensure its accuracy, this information should not be used or relied upon for any application without verification of accuracy, suitability and applicability for the use contemplated, which is the sole responsibility of the user. A final, project-specific design should be prepared by a qualified, licensed, professional engineer based on actual site conditions. VERSA-LOK Retaining Wall Systems disclaims any and all express or implied warranties of merchantability fitness for any general or particular purpose, trademark or copyright in regard to information or products contained or referred to herein.



Often fences, stair rails, guide rails or concrete traffic barriers are needed behind a VERSA-LOK® wall. With proper design and installation, a variety of structural and aesthetic features can be placed at the top of a VERSA-LOK wall.

This bulletin provides general information on the design and installation of fences, railings and traffic barriers. Site conditions and loads vary with each project, and these guidelines are not intended as construction drawings for a specific project. The owner or contractor is responsible for complying with all applicable building codes and obtaining a final, project-specific design prepared by a qualified, licensed professional engineer (P.E.) for a wall and any appurtenant structures.

FENCE POST BEHIND WALL

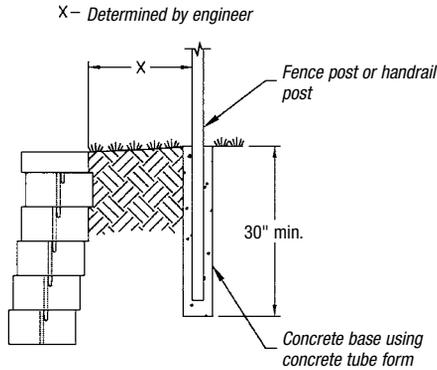
When there is sufficient space, it is cost effective to place a fence several feet behind the wall face (Figure 1). With sufficient post depth and setback, the surrounding soil provides a stable foundation. Setting fence posts back and apart from the wall allows for differential movement between the fence and the wall.

While a minimum fence post depth of 30 inches is suggested, the embedment, post diameter and distance needed behind a wall will vary. This depends on site and soil conditions, loading on the fence, fence type and fence-post spacing.



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FIGURE 1 Post Detail — Typical Section
Handrail or Fence Post (Set back from wall)



It is preferable to create post holes during wall construction. This is done by placing tube forms at planned post locations and then backfilling around these forms (and placing geogrid, if required). After the wall system installation is completed, the concrete and fence posts are placed in the tube forms.

SLEEVE-IT™ FENCE POST ANCHORING SYSTEM

The Sleeve-It system allows fence or railing posts to be securely placed directly behind a VERSA-LOK wall. The Sleeve-It system uses an open-tube form with a horizontal base (Figures 2 and 3).

The Sleeve-It system is installed during wall construction. After the wall system installation is completed, the fence posts are placed into the fence sleeves and surrounded with concrete.

FIGURE 2 Railing Detail — Standard Unit with Sleeve-It System

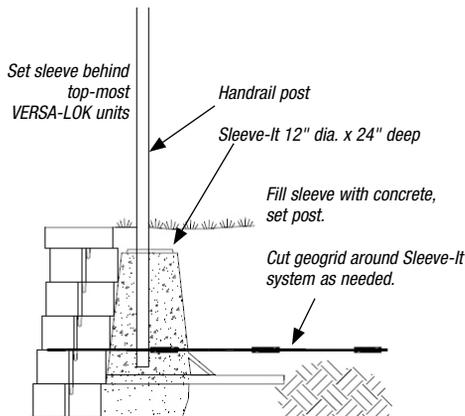


FIGURE 3 Sleeve-It System



For common pedestrian railing fence types, Sleeve-It product SD1 can often meet code requirements for fall protection loading. However, Sleeve-It may not be appropriate for fences that catch significant wind loads, such as solid-board privacy fences or wind screens. Contact Strata (<https://www.geogrid.com>) for more information on the Sleeve-It System.

POST-IN-WALL

Railing posts can be installed closer to the wall face, near the face of the top wall units, if a larger post foundation is provided beneath the surface, behind the wall (Figures 4 and 5).

FIGURE 4 Post Detail — Section

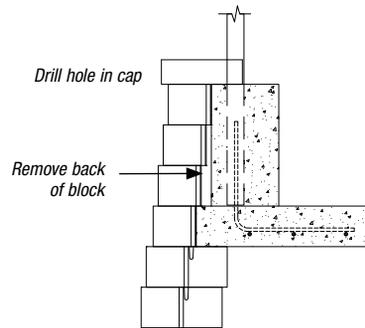
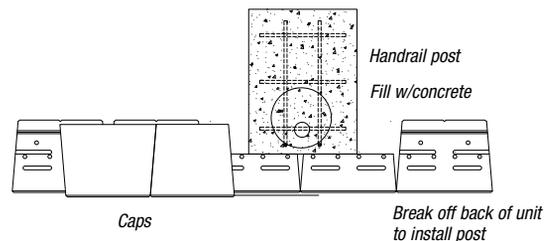


FIGURE 5 Post Detail — Plan View Handrail (no setback)



Railings should NOT be attached to just a cap unit or top unit because they do not provide sufficient foundation stability for a railing.

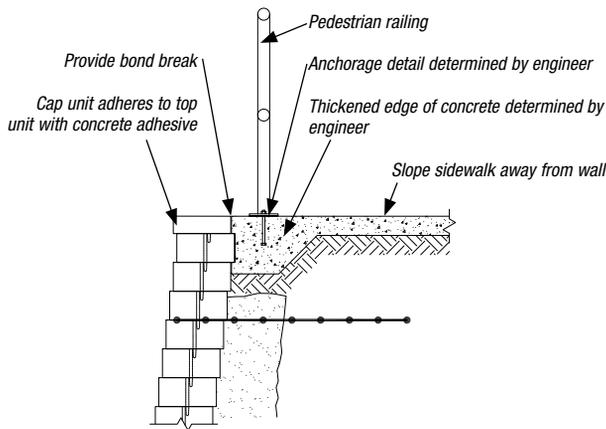
A steel-reinforced, cantilevered foundation system can be designed by a qualified, professional engineer. Before the top of wall is completed, the horizontal base of the foundation can be cast-in-place, with reinforcing steel placed in the horizontal base and extended vertically.

The back of the top VERSA-LOK units can be split away to allow the post to be closer to the wall face. An open tube form is placed over the vertical rebar. When wall installation is completed, the concrete and railing post are placed in the tube form. To create a finished look at top, caps can be cut or drilled to fit tightly around the post.

INTEGRATED RAILING AND SIDEWALK

If a sidewalk or other concrete slab is being installed behind the wall units, a thickened section of the concrete right behind the wall can be used to support the railing foundation (Figure 6).

FIGURE 6 Sidewalk at Top of Wall



When space allows, fences and railings should be placed several feet behind VERSA-LOK walls.

POSTS PENETRATING GEOGRID

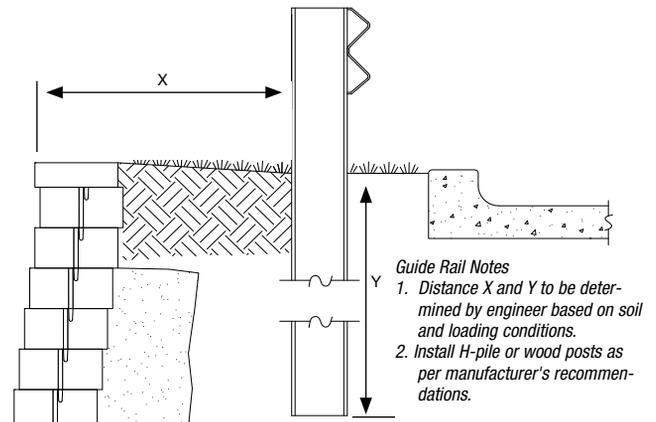
For walls requiring geogrid soil reinforcement, railing posts can extend down below the top layers of geogrid. The top layers of geogrid usually can accommodate some intrusions while still maintaining needed strength. Typically, during wall construction, the geogrid is cut to fit around the planned post locations.

The wall design engineer must evaluate any planned post intrusions into the geogrid. Augering, or driving through backfilled geogrid after wall construction, may excessively disturb the geogrid or pull it away from the soil or the wall units. Instead, it is preferable to place tube forms or Sleeve-Its at planned post locations during wall construction and before geogrid is placed and backfilling is completed.

GUIDE RAILS

The setback and embedment depth of the guide rails behind retaining walls will vary with site conditions and loading. For most highways, guide rails are setback 3 feet minimum and placed at an embedment depth of 5 feet (Figure 7).

FIGURE 7 Guide Rail Detail



The guide rail generally needs at least two geogrid layers within its foundation depth. Augering (or driving rail posts) is not generally suggested but may be done if approved by wall design engineer (see Posts Penetrating Geogrid section).

Guide rails can resist some vehicle loads but are often designed to significantly yield to vehicle impacts, to avoid vehicles rebounding into traffic areas. Consequently, guide rails might not provide sufficient structural resistance to prevent a high-speed vehicle from going over a tall wall.

TRAFFIC BARRIERS

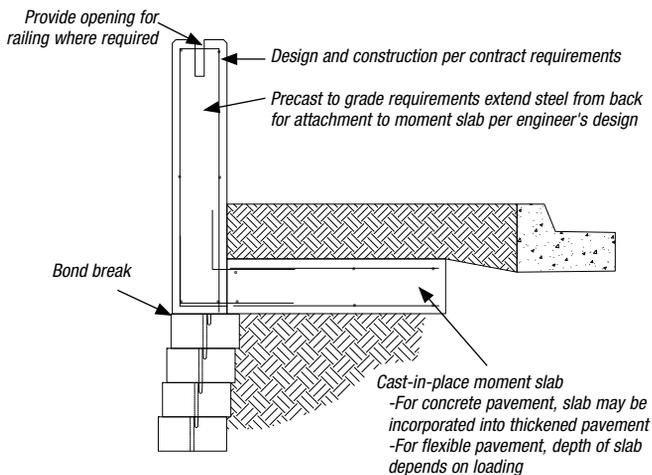
When there is not enough room to set guide rails behind a wall, or if more protection for vehicles is needed, then reinforced-concrete traffic barriers can be placed directly on top of a wall. These can be cast-in-place or precast barriers, or a combination.



When there is no room to set guide rails behind a wall, traffic barriers can be placed directly on top of a wall.

Resistance to lateral movement and impact overturning is provided by the large mass of concrete below grade and by extending the barrier's foundation horizontally behind the wall (Figure 8).

FIGURE 8 Typical Section —
Traffic Barrier Detail



A licensed, qualified engineer (P.E.) must prepare a project-specific, structural design for a concrete traffic barrier. The reinforcing steel, barrier size and wall geometry will vary with site conditions and loading.

Given that a traffic barrier is rigid and a retaining wall is somewhat flexible, a wall with a traffic barrier needs con-

trol joints, expansion joints and bond breaks to address possible differential movement.

BACK-TO-BACK WALLS

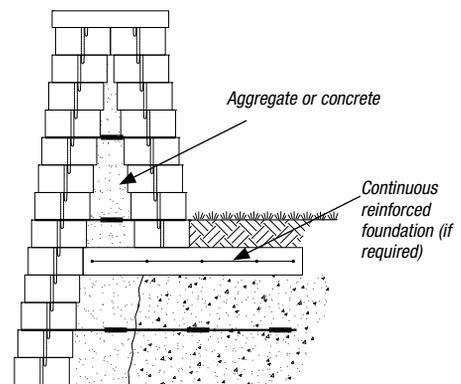
Back-to-back VERSA-LOK walls at the top of a retaining wall can act as attractive parapet screen. With proper design, back-to-back walls can also act as pedestrian fall protection, traffic barriers or be spaced apart to allow room for plantings or fencing.



Back-to-back VERSA-LOK walls can act as pedestrian barriers. This design also provided room for planting.

To reduce differential settlement of the back wall compared to the front wall, precautions should be taken, such as thickening the gravel fill behind the units to extend under the back wall or placing a wider concrete foundation under the back wall (Figure 9).

FIGURE 9 Typical Section —
Back-to-Back Wall



Reinforced, cast-in-place concrete also can be placed between walls to provide a traffic barrier that matches the look of the retaining wall. Structural design of barriers should be provided by a qualified, professional engineer (Figure 9).

FENCING USING VERSA-LOK COLUMNS

VERSA-LOK columns at the top of the wall and with fencing installed between the columns can provide attractive fall protection.



Railings between columns provide attractive fall protection.

Typically the fencing is placed directly next to the columns and supported on its own foundation, separate from the column.

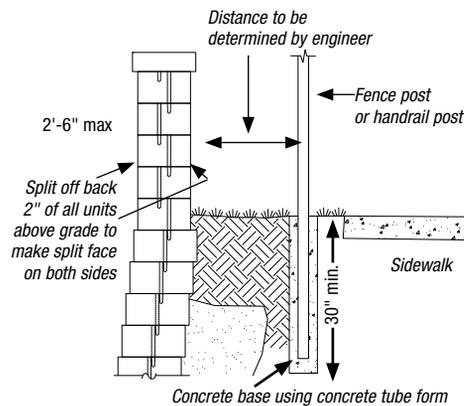
Special reinforced-concrete foundations for the fencing, the columns or both are needed and should be designed by a qualified, professional engineer.

FREESTANDING PARAPETS

For straight walls, VERSA-LOK Standard or VERSA-LOK Cobble units, or combination of both – in what is called the VERSA-LOK Harmony wall system – can be modified to create attractive, vertical free-standing walls at the top of retaining wall.

These 10-inch-wide free-standing parapets should not be relied on to provide fall protection. If pedestrian or vehicle traffic barriers are needed, independent fences or railings behind freestanding parapet should be provided (Figure 10).

FIGURE 10 Freestanding Wall Detail (Straight Walls Only) — Typical Handrail or Fence Post



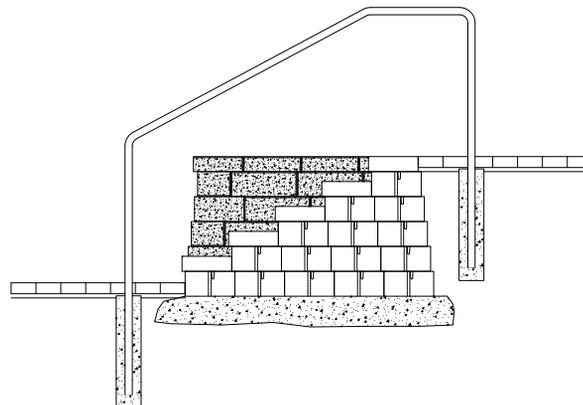
For information on parapets up to 2 1/2 feet high maximum, see VERSA-LOK Technical Bulletin No. 6.

STAIR RAILS

VERSA-LOK projects including stairs can accommodate a variety of railings. Railings can be anchored just above and below steps, into sidewalls above stairs, or, with proper foundations, into step riser assembly (pedestal).

When practical, spanning stair railings from landing to landing and placing post foundations directly into the soil is one of the easiest ways to provide a stable stair railing foundation (Figure 11).

FIGURE 11 Stair Rails — Typical Handrail



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TECHNICAL BULLETIN

For more detailed information regarding design and installation, please contact your local dealer or VERSA-LOK® Retaining Wall Systems.

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U.S. Patent D319,885,
U.S. Patent D321,060,
U.S. Patent D341,215,
U.S. Patent D346,667,
U.S. Patent D435,302,
U.S. Patent D439,678,
U.S. Patent D447,573,
U.S. Patent D452,332,
U.S. Patent D458,387,
U.S. Patent D537,533,
U.S. Patent D552,258,
U.S. Patent D555,810,
U.S. Patent D569,010,
U.S. Patent 6,488,448,
U.S. Patent 6,960,048,
U.S. Patent 7,229,235,
U.S. Patent 7,244,079
and other U.S. patents pending

Canadian Industrial Design
Registration No. 63929,
No. 71472, No. 73910, No. 73911,
No. 73912, No. 91178, No. 115161,
No. 123413, No. 123414 and
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Solid VERSA-LOK units allow the use of several common attachments for concrete, such as grout, mortar, fasteners that embed in polymers, or anchors that mechanically attach to concrete. The appropriate fastener varies depending on the retaining wall unit, loading, wall geometry, and site conditions. Refer to fastener manufacturer's and design engineer's recommendations.

Stair railings should NOT be simply attached to the cap units, treads or on top of unit, because this typically does not provide sufficient stability for the stair railings.



A beautiful variety of columns, stairs, walls, fencing and railings sets off this commercial project.

Stair rails can be fitted within VERSA-LOK stairs and columns.

Metal fencing is surrounded by columns made with VERSA-LOK.

Integral columns within a tiered wall design work well with sections of metal fencing for a creative hardscape design.