Design Tip: Bumper-Crash Walls and Cables

Perimeter design options for vehicle and user safety.

There are several design choices to consider at the cast-in-place garage's perimeter to increase user safety. Below are their pros and cons.

Perimeter barrier cables are best for constructability and natural ventilation. They are less likely to obstruct sightlines and natural lighting. While surface-mounted barrier cables are preferred, they reduce the depth of parking. And while they minimize the space conflict with column reinforcing steel, they do require embeds. A good alternative is to pass the barrier cables through the columns, provided the column reinforcing steel allows for the space needed. Note: ½-inch cables require a ¾-inch inside diameter sleeve for each cable to be inserted in the column prior to concrete placement; 1 ¼ -inch rebar clearance is needed for each cable to achieve the sleeve placement. (See ***Detail A***.)

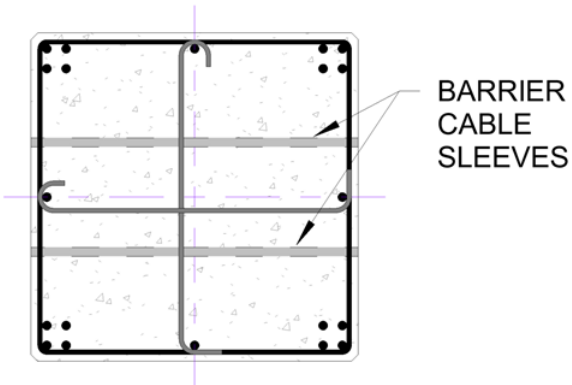
An exterior precast spandrel provides maximum architectural uniformity and will cover the post-tensioned (PT) deck and beam tensioning pocket patches. This solution requires deck and column embeds and welded connections, which can lead to future maintenance. It also reduces natural lighting and adds width to the garage that may not be available.

A masonry-reinforced and grouted bumper wall installed after the concrete formwork has been removed is a possible solution. Do not extend the masonry horizontal reinforcing into the columns, as that reduces constructability.

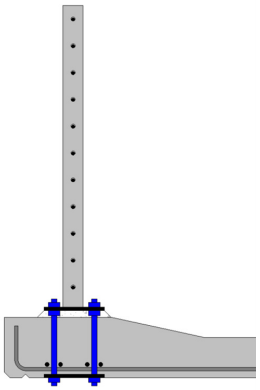
If space is limited, consider a **cast-in-place bumper wall** with exterior-side horizontal reveal strips to create visual interest (see ***Detail C***). When designed, leave a 2-inch separation gap at the columns since the bumper wall will be poured after the columns. The bumper wall should be poured after the slab has been tensioned to minimize shrinkage cracking.

ADDITIONAL CONSIDERATIONS:

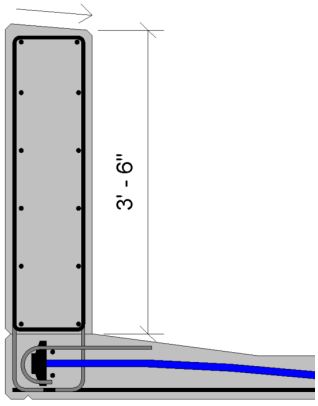
- If using barrier cables through sleeves, the reinforcing clearance challenge in the columns becomes greater when vertical reinforcement bar laps are located in this zone. At shared ramp columns, beam PT anchors also may conflict with the barrier cable sleeves, as the ramp elevation varies through this zone.
- If barrier cables are used on wide bays, intermediate galvanized tube cable supports are a good solution when needed. (***Detail B.***)
- Bumper walls are not recommended at internal slab edges of ramps. Barrier cables are the better choice. If bumper walls are necessary and the walls are back-to-back, separate the two walls by 1 foot to improve constructability.
- If reinforcing and cable sleeve congestion occurs, a combination of a lower partial bumper wall with barrier cables above may be the answer.



Detail A



Detail B



Detail C