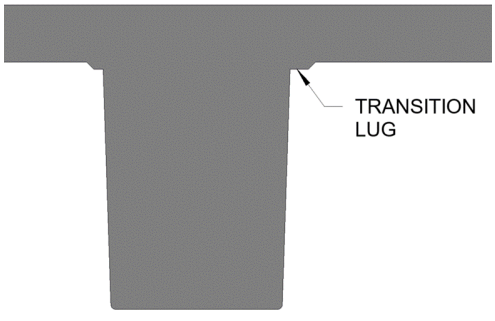
Design Tip: Form Finishes

Understanding concrete formwork finish expectations is essential to achieving constructability's value.

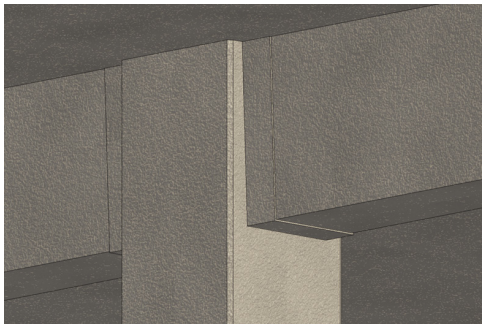
Nearly all the concrete on a garage is exposed to view, so be careful with cast-in-place designs needing high-level architectural concrete or Class A results. It is unlikely that formwork joints between panels will achieve consistent Class A results. A Class B form finish typically provides the best value with a constructability balance. Larger panelized and repetitive garage formwork systems produce excellent results.

Designs should anticipate:

- **Variations in formed surface finishes.** While panelized formwork garage systems are highly productive and provide excellent finishes, they do require adjustment when assembled. At each of these locations, unique finish and/or texture results are expected to occur.
- **Finishes reflecting formwork transitions.** For slab form panel to steel beamform connections, expect use of a beveled slab soffit plywood form. The form provides a transition and a small lug, which varies in size and consistency depending on the warp in the slab required for drainage. Each slab soffit formwork panel is positioned slightly different from end to end as the bay transitions. As a result, the transition lug varies from panel to panel, bay to bay and within any given bay.
- **A ¼-inch offset between steel column collars and steel beamforms.** Expect a slight offset at steel beamform to column connections to accommodate construction tolerances. The beam has a fixed length, while column locations vary due to post-tensioning (PT) stress-induced shrinkage on the floor below as well as standard concrete location tolerances. Hence, a steel column collar throat is fabricated to accept the beamform to rest within it. It provides a few inches of length variability and allows the beamform to be released without being pinched between columns after the PT beam is tensioned.
- **Offsets between large formwork panels.** The design document should anticipate these minor and seldomly noticeable offsets rather than express a need for remediation. Neither the cost nor the results will be acceptable to owners. For example, grinding joint locations smooth addresses the offsets but leaves behind unsightly grinding marks—even when painted later. Instead, consider lighting styles and locations to minimize light being cast in such a way to highlight these tolerance-allowable offsets.
- **Exterior faces with PT cable stressing locations.** Each PT tendon has an inset pocket allowing cable-jacking access to the PT anchor. Once a tendon is tensioned and approved, it is cut and capped. The inset pocket is then filled with grout and struck off with a trowel. Although the resulting offsets are negligible, the process leaves noticeable surface effects in texture and color. Generally, the result is acceptable when painted—or an architectural surface treatment can further enhance appearance. If aesthetics is a concern, apply a precast perimeter, an aluminum architectural ribbon or a coating, such as stucco. Grinding and rubbing the entire concrete exterior is not cost-effective and seldom achieves desired results.
- **Beam shortening.** Long-span beams will shorten once PT compressive forces are applied. On garages with several bay widths, the shortening is cumulative. Engineers should not only predict the shortening, but also allow for it and define it in the design documents. If necessary, the design engineer should provide specific instruction for the concrete contractor to enlarge the formwork and slope the perimeter columns to reflect anticipated shortening. Doing so will improve the constructability of later attached architectural features.



A slab panel to beam panel transition, resulting in a transition lug.



Offset at a beam-to-column connection.