

Post-Tensioned Podium Slabs Make Their Way to the Northeast

By Michael A. Russillo, P. E.

Podium slabs are a special type of floor system that transfers the loads from wood-frame or steel superstructures above the slab to columns and walls below. They have been in use on the West Coast for years, and now are proving to be an efficient solution in the Northeast for 3 and 4 story residential projects with covered parking below grade. Zoning requirements for open space and fire protection, as well as the cost of land and the move toward green building techniques, have encouraged the popularity of this type of structural frame for low-rise, multi-unit residential projects.

The use of post-tensioned (PT) cast-in-place construction for these transfer slabs achieves several benefits. The solid concrete separation between parking and living space provides inherent fire and sound protection. The use of PT two-way slabs allows for the reduction of the overall depth of the frame, which in turn reduces the amount of excavation required since the parking is below grade. This reduction of volume over a beam and slab approach, along with the reduced requirement of concrete and steel, plays a part in achieving a “greener” project. The flat soffit, with sufficient cover for the PT and rebar, requires no additional fire protection and allows for the most efficient lighting, electrical and HVAC distribution. As soon as the stressing of the PT tendons takes place (2-3 days after the pour), the forms and shores may be removed and used for another pour. The slab is ready to carry the framing loads for the upper floors. Concrete by nature is never watertight, but the PT does provide a tight slab with significant crack



The photo above shows the sequence of construction from right to left beginning with the column spacing for parking, the post-tensioning being placed, a poured slab and finally the wood framing being erected. Courtesy of Plumb House Inc.

control. The P/A induced into the slab is a minimum of 125 psi and generally averages 200 psi. This proves especially beneficial in the plaza and open areas where planters, soil and grass plots, public spaces and truck loading may be located.

Due to the high superimposed loading delivered thru the bearing walls and posts of the 3 or 4 floors of superstructure above onto the larger support spacing required for the parking below, the slab needs to be thicker than the normal span/depth ratio of 45 for PT slabs. 12- to 14-inch post-tensioned slabs are used to accommodate the 28- to 30-foot spans for parking, with 3 to 4 story structures above. The post-tensioning is designed to balance the podium slab's dead load, thereby providing “zero” deflection on the first floor from which to erect the balance of the structure. The slab will generally have a mat of bottom rebar, as well as the top steel at columns, sufficient to satisfy strength requirements. The tendon layout has a narrow band of tendons in one direction along column lines and uniformly distributed tendons in the orthogonal direction. This allows ease of placement of the tendons and rebar, and provides much flexibility in locating required penetrations. Encapsulated tendons are recommended throughout and epoxy coated rebar is used in the areas exposed to salts and earth. These projects generally have large footprints, with slab areas greater than 200,000 square feet common. The large post-tensioned slabs sitting on perimeter walls need to

be constructed such that they are not restrained from the volume reduction that wants to take place. This is accommodated by providing a smooth finish at the top of the wall and a detail for dowel bar sleeves that allows slab movement before the rebar locks the slab and wall together. Another common detail used with these large slabs is pour strips of 4-foot width to accommodate the stressing, and when left open for 30-60 days allows for the majority of the shrinkage, shortening and creep to take place. Differences of 12 inches or so in the elevations of various parts of the slab from interior enclosed spaces to outer areas are handled by having the lower slab poured first then, with a separating material used between the slabs, the upper slab is poured overlapping the lower one.

The Post-Tensioning Institute, PTI, has provided design examples and useful details to assist in the efficient design and construction of this type of frame in its publication, *Post-Tensioning Manual*, 6th Edition. ■

Michael A. Russillo, P. E. is the Senior Manager of the Special Products Group at Barker Steel, LLC. His focus since joining Barker Steel in 2003 has been on the development of the mono-strand post-tensioning business in the Northeast as well as Barker's other concrete reinforcement related products. Mr. Russillo is a licensed Professional Engineer and is a member of the Post-Tensioning Institute and the American Concrete Institute. He can be reached via email at mrussillo@barker.com.

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