



Tunnel Forms Speed Denver Project

Denver apartment tower first in region to employ French tunnel form system

■ *Courtesy Putzmeister America*

Construction of this 25-story luxury apartment complex in Denver's Cherry Creek district is the first project in the region to employ the unique "tunnel form" system developed in France.

Construction of a luxury 25-story apartment tower at 4550 Cherry Creek Drive South is the first project in the Denver area to employ a new "tunnel form" system developed in France.

The tunnel form system is a special construction method utilized for medium- to high-rise buildings. It utilizes specially designed steel forms in a molded tunnel or upside down "U" shape that maintains a certain size. The advantage is that both the load-bearing wall and floor slab are constructed at the same time, making it an extremely fast process.

According to projections from tunnel form suppliers, this method reduces both construction time and costs by up to 20 percent. This cost efficiency is gained by optimizing labor, using less concrete and minimizing the finishing work.

The Hanover Co., Houston-based owner of the apartments, was looking for a speedy yet economical way to construct the building. It discovered High-Rise Concrete Systems of Del Ray, Fla., a firm experienced in the tunnel form system. Throughout the project, High-Rise maintained a tight schedule to keep moving on a fast-track schedule. By employing a tower crane, a placing boom and 12 full tunnel form sections, 120 to 150 yards of concrete per pour could create 6,000 square feet of wall and floor structure in a single day.

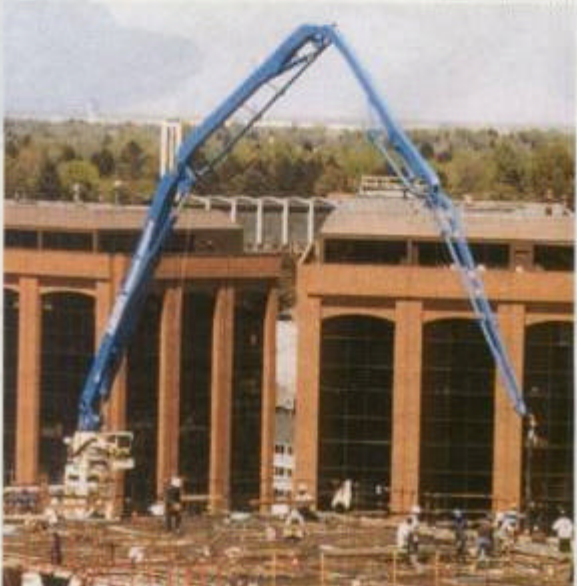
On this particular job, the repetitious daily process included hooking each 6-foot-wide by 25-foot-long form piece to a bracket and

positioning about 30 of them side-by-side on a floor. They were locked in place, jacked up and filled with rebar between the sides to create the walls and over the top for the floor above.

Then, virtually every day, at 2 p.m., concrete was placed. A heater inside each tunnel section plus accelerators in the concrete resulted in quick setting and strong 7,000-psi ratings. Therefore, the next day the forms could be rolled out on wheels, lifted by the crane to the next floor, and the process repeated. When the crew remained on the scheduled five pours

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a week, one finished floor plus one extra pour was accomplished.

Lucht's Concrete Pumping of Denver was called upon for its pumping expertise and equipment. Because the tunnel form system is so unusual to the industry, several concrete placing approaches were discussed, with the final details ironed out by Steve Lucht, Tim Swindle and Dave Kauffman of Lucht's, working with Bill Carbeau of Putzmeister.

Experienced operators Jim Hall and Ian Bond of Lucht's then implemented the approach. For the lower floors, a variety of Putzmeister pumps from Lucht's fleet were used, including 28-, 32-, 36-, 46-, 52-, and 58-meter boom pumps. From the eighth floor to the top, they utilized a 36-meter placing boom and two TG 10 towers, one at each end of the building. To power the boom, a diesel power pack was used, avoiding the cost of running electrical power to the job site.

Putzmeister equipment was especially chosen for this particular job because of the modular placing boom and tower system's versatility. According to Lucht's Tim Swindle, "The added convenience of the 'square' TG 10 towers coupled to a totally self-contained pedestal kept up the fast pace. We could move the placing boom from tower to tower in under four minutes. This is almost 10 times faster than the typical 30-minute move time



The detachable placing boom atop the structure quickly placed the concrete with pinpoint accuracy while the truck-mounted portion remained on the ground using a high-rise trailer kit with a diversion valve to pump the needed output up to the boom.

required with other systems. This advantage, along with a proportional radio remote control, made it the sure candidate for the project."

Because of intense Colorado summer heat and the accelerator chemicals used in the concrete, no margin for error was available. And because of the fast set times, pours had to be completed in a two-hour time span.

As a result, concrete had to be placed at a rate of 80 to 100 yards per hour. The detachable 36-meter Putzmeister boom atop the structure quickly placed the concrete with pinpoint accuracy while the truck-mounted portion remained on the ground, using a high-rise trailer kit with a diversion valve to pump the needed

output. Ready Mix Concrete of Denver provided the special concrete mix.

Dave Kauffman of Lucht's noted that, "To give an idea of how fast this tunnel form system worked in comparison to conventional methods, we were topping off the 25th floor when the four-story parking garage next to us was just starting the third floor. And we had both started construction at about the same time."

The completed complex will house 288 apartments renting from \$1,200 to \$4,500 a month, depending on size. Started in July 2001, the project is scheduled for completion in February 2003. A total of 15,000 yards of concrete will have been placed in constructing the \$46-million apartment complex. □