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CASE STUDY: BELMONT TRIO, KITCHENER, ON

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1. Introduction

Until the introduction of two total precast concrete plants in southern Ontario, in 2012 and 2014, total precast building construction was not a viable option in the southwestern Ontario market. Precast concrete had been used successfully for years in precast cladding, hollow-core floors, and for parking garages. It was the opening of these production facilities that heralded in the common use of precast concrete in the construction of total precast residential buildings. Project teams now utilize structural precast concrete wall panels and precast hollow-core floors for these types of developments. This project is a positive example of the adoption of this newly introduced product, and demonstrates why this method was chosen and how the process was used through the design.

2. Project Overview

The Belmont Trio Project is located on Belmont Avenue West in Kitchener, Ontario and consists of three residential towers and a central parking structure. The towers are 14, 12 and eight storeys tall and the parking structure has four levels. In total, the project has 412 residential units and 492 parking spaces. The project owner was HIP Developments and was designed by ABA Architects. MTE Consultants served as the project Structural Engineer of Record. The project was built by Melloul-Blamey Construction with the building precast concrete was supplied by Coreslab Structures and the garage precast concrete was supplied by Armtec.

It was the owner's objective to build the structures in a quick, predictable manner. Precast concrete met these needs as it allowed the fabrication of the structural elements to occur off site and be quickly assembled on site. In addition, erection of the structures could continue through most weather conditions, in particular, throughout the Ontario winter months. This provided predictability of the project schedule. Since the structural elements were also the building cladding, the enclosure of the buildings was achieved earlier in the schedule, allowing finishing trades to access the units earlier. The owner was also persuaded by the cleanness and uniformity of the concrete finishes that provided long-term durability to the façade of the building.

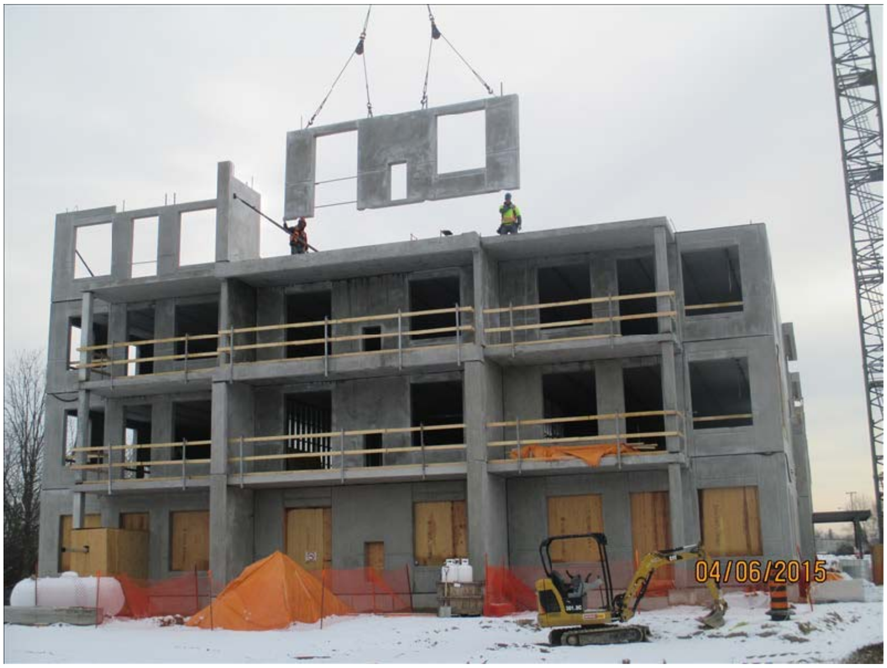

Figure 1: Erection of a Typical Wall Panel (Winter Construction)

The three residential buildings were similar in their structural systems; they were built using hollow-core floor slabs supported by precast concrete-bearing and shear walls. These wall panels also formed the exterior cladding for the building. Due to a high water table in the area, basements were not considered economical for the project, and the precast was founded on raft slabs of uniform thickness. The lack of basements for below-grade parking necessitated the construction of an above-grade parking structure and precast concrete was found to be the most economical option. The garage was built using precast concrete double tee floors supported by precast spandrel beams and walls. Both the residential buildings and garage were stained in related manners to provide continuity between the structures.

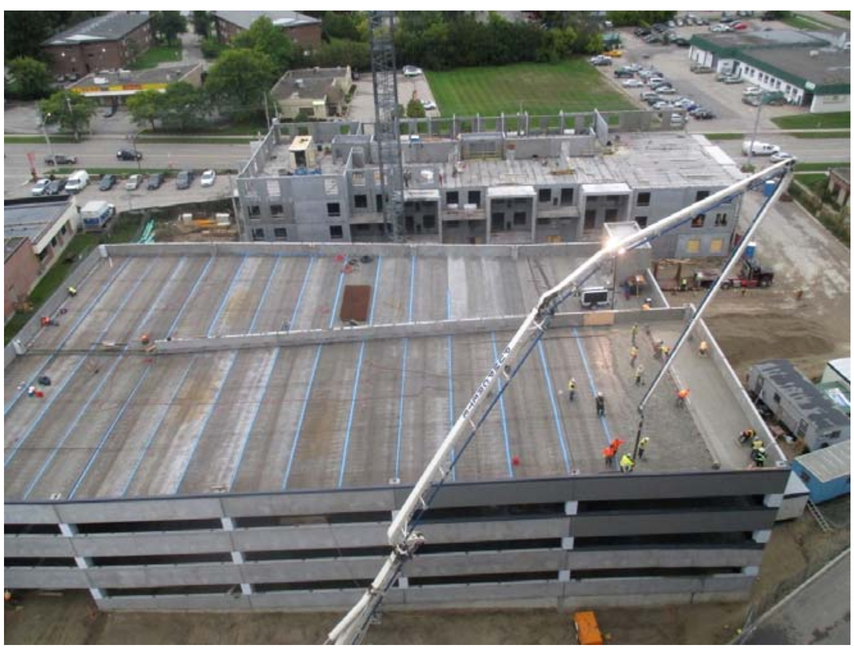

Figure 2: Pouring of Topping Slab at Garage

The three residential buildings utilized over 3,250 pieces of precast concrete in addition to nearly 434,500 square feet of precast hollow-core slabs. The parking structure provided an additional 230 pieces of precast concrete. Typically precast floors were erected in a weekly cycle with the building construction on the 14-storey tower from ground breaking to occupancy being 17 months.

3. Innovation

In order to maximize the efficiency of the precast system, the fabricator was introduced into the design process during the initial phases of the project, utilizing a construction management approach. Regular design coordination meetings were held that included the owner, contractor, architect, engineers and the precast fabricator. This presented several advantages. First it allowed the design to conform to the fabricator's unique fabrication approach and eliminate changes later in the process. Second, it allowed the fabricator to begin their shop drawings earlier and shorten the critical path on that process. Third, it allowed fabrication of the precast pieces to start before final design was completed. If a traditional design-bid-build approach was employed there would have been a considerable gap in time from the completion of the foundations until the fabricator had completed enough pieces to allow them to start erection.

Utilizing the exterior wall precast wall as the main structural bearing element provided a great deal of structural efficiency, but limited the architectural aesthetics of the building. The architect overcame this with a couple of innovations. First, a series of offset, two-storey balconies in contrasting colours was utilized to create a façade that minimized attention to the bearing wall behind. This design received praise from the community. Secondly, the required exterior building penetrations for venting and exhaust were combined in a louver above the glazing which minimized the penetrations through the vertical structural elements. This created a more efficient use of the concrete wall panels.

Figure 3: Completed Building Facade

4. Lessons Learned

The primary lesson learned on this project was how precast concrete total building construction could be effectively used in the efficient construction of residential building towers. The owner was pleased with the speed and predictability of construction as well as with the aesthetics and durability of the buildings. They have continued to use this system on several subsequent projects. One key to the successful use of this system is the alignment of structural elements for the full height of the structure. Structural solutions for discontinuous load paths quickly add cost to the project, and reduce the economic efficiency of the product.

One element for consideration was the coordination and scheduling of trades. It was found that the building structure was enclosed very quickly and that care was needed to ensure that the efficiency that was achieved in the erection of the structure and the enclosure of the building was not lost by a lag in the finishing trades.

5. Conclusion

Although not a new technology, the relatively recent introduction of total precast building construction into the market of southwestern Ontario has been embraced by developers, contractors and engineers for its efficiency, cost effectiveness, durability, and versatility. The more familiar designers become with the product, the more creative their designs become. As the housing market continues to grow, we see this form of construction continuing to gain market share.

Figure 4: Project Overview

Acknowledgements

Canadian Precast Concrete Institute