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CIP Concrete Right Choice For University of Minnesota-Fairview Amplatz Children's Hospital

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The new $127,000,000 University of Minnesota Amplatz Children's Hospital, an addition to the University of Minnesota Fairview Hospital on the Riverside Campus, was topped off on March 25, 2009. The primary structure—foundations, three levels of below-grade parking, and eight structural levels from grade to penthouse floor—required 31 major pours of structural flatwork. Throughout the eight-month schedule for pouring the primary structure, established at the outset of construction, both the general contractor, Kraus Anderson, and concrete sub-contractor, Gresser, worked tirelessly to maintain the aggressive program. Had two days of inclement weather not halted their efforts during the final days leading up to the last pour, all structural flatwork would have been completed with a day to spare. Since then, the major construction effort has transitioned to enclosing the building.

Early in the process, the design team selected a cast-in-place concrete structure for several reasons. They had agreed to a fast-track delivery model with multiple bid packages for delivery of the construction documents. Additionally, the long lead times required for a steel framed building were incompatible with construction that would start while the design team still worked on the core and shell package. Another advantage to using concrete was that it would allow a thinner overall structural depth, which lowers the required floor-to-floor height and saves project costs for the enclosure. Fairview's concern about vibration control on the floors of the structure also made concrete a good choice, because concrete would provide added mass and stiffness. In the end, the necessity of meeting the aggressive schedule was the deciding factor for both owner and general contractor in giving the design team the go-ahead to proceed with designing a cast-in-place structure.

The building foundations are conventional spread footings. The structural levels of the below grade parking are structured as an 8" thick two-way post-tensioned flat slab, with drop caps at each of the columns. There are 7 pour strips and delayed connections to the foundation walls to allow for shortening and shrinkage of the post-tensioned slab. With an 8 story hospital bed tower above the parking, durability of the below grade parking structure and corrosion protection for the slab were major design considerations. The post-tensioning is a fully encapsulated system that provides an average concrete pre-compression of 200 psi. All mild reinforcing steel in the below grade parking is epoxy coated reinforcing steel with 2" of

top cover. Also as part of this project, a traffic bearing membrane will be placed on the entire below-grade structured parking deck.

The tower structure is wide-module pan-and-joists construction with 14" deep pans and a 5" thick slab—in total, a 19" total depth structural system. Typical joists are 12" wide and spaced at 6½ feet on center. Typical concrete girders are 42" x 19". Post-tensioning is incorporated in concrete girder designs at longer spans and some cantilevers. Pan-and-joist concrete construction without dropped beams provides a flat bottom surface of structure that makes it easier to perform clash detection and coordinate the mechanical, electrical, and architectural requirements between the ceiling and bottom of structure. The lateral system for the building is concrete moment frames. Typical columns in the moment frames are 32" x 20". Floor-to-floor and overall building drifts are limited in the design to L/600.

Tying into and building around several adjacent buildings significantly complicated the design of this addition to the Fairview campus. The existing structures are of 11 different vintages and for most of them the original construction documents were not available. Here again, cast-in-place concrete proved to be advantageous over other structural systems, because it can adjust to field verified existing conditions both in elevation and in plan through minor adjustments in in-place formwork, based on observed in-place dimensions and elevations.

When completed, the overall project will provide 360,000 gross square feet of newly constructed floor space for Fairview. In total, building the new bed tower, which comprises five 29,000 square foot floors each with 24 patient care rooms per floor, required the placement of 19,600 yards of concrete over 3 million pounds of mild reinforcing steel.

Concrete mix designs for the three below grade parking levels and the project slabs-on-grade incorporated cement replacement with fly ash, slag, and silica fume, reducing Portland cement content by 40%. Additionally, all mix designs were specified and prepared with a maximum cementitious content and a well graded aggregate, which minimizes the paste in the mix and produces not only a "greener" mix, but a mix that has better shrinkage and creep characteristics. Striving to make concrete mixes more "green" not only helps the project achieve its Leadership in Energy and Environmental Design (LEED) certification, it is also the right thing to do in a construction industry that has become increasingly more environmentally conscious.

The collaborative decision made by the design team, owner, and general contractor to choose a cast-in-place structure has allowed the design team and contractor, to stay on schedule, deliver a high quality structure, and meet the owner's expectations, including the completion date of the facility.