Typical column-to-beam connection with stiffeners.

STEEL FRAMING

economical solution for mid-rise condo project

Thomas Roszak

(top) Precast plank installed. Note the cut-out flange, lower right, that allows for the insertion of the planks, which are then slid into place. The flange cut-out, upper left in photo, is then welded back into place.
(left) Typical residential floor showing partition and ceiling framing.

The 433 North Wells Street luxury condominium project in Chicago's River North area is a seven-story steel and masonry building. There are 10 condominiums on floors two through seven, a retail office space on the first floor with frontage on Wells Street, and parking for 24 cars on the first and basement levels. The total project is 31,300 sq. ft.

The building's program and requirements were to build a multi-unit condominium structure to include zoning-required first floor retail and enough parking for each condominium. The site is located between vintage buildings on the north and south sides, a narrow alley to the east, and Wells Street, a busy thoroughfare, to the west. Because of this tight construction area with crane access only from Wells Street, building components had to be light and deliverable all from one access point. The marketing requirements needed to satisfy an upper level of larger luxury condominiums. There are three types of floor plans: a 2,400 sq. ft. two-bedroom plus family room, a 2,400 sq. ft. three-bed-

room and a 4,100 sq. ft. three-bedroom plus family room penthouse. Layout flexibility was required, allowing for interior walls to be moved per customer's specifications.

The building is 50′ wide by 110′ long and divided into two condominiums per floor. By obtaining a zoning variance, a central courtyard was created, providing light into the middle rooms of the condominiums. The structural system is a combination of structural steel joist and deck and precast hollow-core concrete planks. Lateral stability is provided by a masonry shear wall in the east/west direction

(top) Large mechanical openings and skylights are framed out in the concrete hollow core planks.
(left) 185-ton crane setup in front of building. Multi-story columns reduce erection costs.

and by moment connections in the north/south direction. Due to the lightness of the steel frame, the building dead loads were small enough to allow for a 2′ to 3′ thick mat foundation system in lieu of caissons at a considerable cost savings.

Typical spans for the main steel beams are 16 to 24′ in the north/south direction, and finished floor-to-floor height is 9′-0″. Ten-inch thick pre-cast concrete hollow core planks are nested into the first and second floor beams, spanning east/west and topped with 2″ of concrete. On floors three through seven, open web steel joists (K-12s) are nested into the steel beams. Exterior masonry serves as an architectural skin to fit the building into its neighborhood of historic loft buildings. Member sizes of the basement columns varied from W12x120 to W12x40. The upper floor columns were two-story high and varied from W12x50 to W12x30. The beam sizes on the lower levels varied from W40x211 to W18x35. The upper level beams varied from W16x26 to W16x36. The metal deck on top of the joists is $^{9}/_{16}$″ thick 26 gauge galvanized. The exterior bal-

View at rear of first floor parking garage.

conies and catwalks were bracketed and cantilevered from the main steel structure. The MC7x19.1 channels of the balconies were hot-dipped galvanized for corrosion resistance and an industrial look. The upper floor of the two-storied penthouse has two double story loft areas with 20′ ceiling heights. This was easily accomplished by allowing the steel column and beam structure to go through and simply eliminating the joist and deck in these locations.

The entire erection sequence was accomplished by placing a 200-ton hydraulic crane in the parking lane of Wells Street (on the west side of the building). Due to the fact that the column, beam and joist components were pre-fabricated, the length of construction time was reduced, therefore saving on crane costs. The total tonnage of structural steel was approximately 272 tons, and the entire structural steel and ornamental iron contract was $700,000. The erection contract was $250,000, including crane costs.

The entire building was sprinklered, decreasing the fire-rating requirement for the floor and walls. The lower fire ratings resulted in a material cost savings—i.e. less gypsum board. CMU block and steel fire protection were necessary.

All interior steel was prime painted, and all exterior steel was galvanized with yellow-painted accents (Sherwin - Williams direct-to-metal system). The joists were fabricated by Gooder-Henrichsen Co., Inc. The entire project was designed on AutoCad 13 and 14.

The structural system allowed for flexibility in design and ease of installation from mechanical and electrical trades. All of the upper floor beams had pre-engineered penetrations. Four 8″ diameter penetrations were cut in at mid-span for sloped plumbing pipes and HVAC ductwork. On each side of these larger holes were three 2″ penetrations, which were used for fire sprinkler and electrical conduit piping. This setup allowed for the complete elimination of soffits and gave the spaces a very clean look. The joist space also afforded the opportunity of installing recessed can lights anywhere and everywhere—a customer priority.

Market preferences in Chicago dictated a drywall-finish ceiling, which was easily attained by securing RC2 channels directly to the joists and the drywall directly to the RC2 channel. Sound attenuation was enhanced with a 2.5″ concrete topping on the metal deck, 6″ sound batt insulation, RC2 channels and fire-rated type X gypsum drywall. Thus, in addition to the benefits of the reduced construction costs and speed of erection, the structural steel system allowed for flexible layouts, elimination of soffits for mechanical trades and provisions for recessed lighting—major selling points in a competitive real estate market.

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