

BATTLING THE SNOWMAN

The use of a steel frame cut construction time for an apartment building built during Buffalo's cold winter



A concrete structural system was originally considered for the Hertel Avenue Apartments in Buffalo. However, a combination of concentrically braced and moment resisting steel frames proved to be both more economical and faster to erect. Shown at top is the traditional exterior of the building, while pictured above is a detail of the structure's steel joist floor system.

WHEN THE PROJECT TEAM FOR THE HERTEL AVENUE APARTMENTS IN BUFFALO

began designing a four-story structure combining ground floor retail and indoor parking with three floors of housing units, they first considered a conventional reinforced building. After all, concrete is the dominant structural material for residential construction.

However, during the design phase, the contractor, Kulback's Construction, Inc., of Buffalo, was asked to consider alternative construction techniques from the viewpoint of reducing both construction costs and construction time. As a result of this analysis, it was decided that a steel-framed building would be more economical and quicker to construct.

According to Anthony F. Kraska, president of operations for Kulback's, the use of a steel frame with steel joists lowered the cost of construction by about 22% as compared with the more traditional pre-cast concrete plank with concrete topping, cast-in-place formed deck or composite concrete systems. The total cost of the structural system, including fireproofing, was \$6 per sq. ft. In addition, steel construction could proceed during Buffalo's frigid winter months, which speeded construction as compared with the problems with concrete construction in cold weather, Kraska added.

The floor system consists of a 3" concrete floor on a $\frac{1}{16}$ " formed metal deck supported by K-Series steel joists spaced about 3' on center. Joist supplier was AISC-member New Columbia Joist, a division of Bouras Industries.

"The use of the joist system

allows for the open commercial space and the parking under the units without bringing the exterior bearing walls down to grade,” explained Joe Siracuse of Siracuse Engineers, the project’s structural engineer. “When we got into it, we found that we also had lighter loads on the foundation. The use of steel joist construction also allowed for a lighter steel frame than would concrete plank floors. The building foundation system is lighter, so we were able to use spread footings for the columns. Some of the other schemes would have required a deep foundation system because of the heavier column loads.”

A total of 1,650 pieces of short span K-Series steel joists, weighing 145 tons, were used throughout the project. The structural steel frame used both ASTM A36 and ASTM A572 Gr. 50 steel. The floors are designed for 40 lb. per sq. ft. live load with a 20 lb. partition allowance.

REDUCED WEIGHT

The designers used eccentric braced frames in the lateral load resisting system. A vertical K-bracing system was used in the stairwells of the short dimension of the building’s wings, while moment resisting steel frames were used on the interior columns in the long dimension.

“It gave us the required stiffness with the least amount of steel,” Siracuse explained.

The steel joist system allowed for clear spans of up to 32’ and a floor-to-floor height of 10’-4”, while allowing for installation of infrastructure pipes and ducts through the joist webs.

Project architect was Frank Ziolkowski of Lauer Manguso in Buffalo. He said the use of steel joists and steel framing, based on the span for the building, allowed for maximum headroom in the apartments. “We were fighting headroom constraints and height constraints, as well,” he explained. “We had to push that envelope to four stories and nearly 50’. So we had to go for a



A major advantage of steel framing was the ability to keep working in cold weather, an important consideration in Buffalo.

variance. Certainly, this system allowed us to keep the building height to a minimum.”

SIMPLE MECHANICAL RUNS

The system also made it easier to install the building’s plumbing and electrical system. “It gives a lot of flexibility to take those penetrations and run those various components through the webs of the joists, where otherwise you wouldn’t be able to with conventional composite construction,” Ziolkowski said.

One of the most important considerations in using steel was the ability to work through the cold Buffalo winter without being hindered by weather considerations. “During wintertime construction, the erection of steel joists and deck is not impacted as drastically by cold temperature as is cast-in-place concrete,” Kraska said. He noted that winter temperatures in Buffalo often make it impossible to pour concrete during those months. Kraska estimated that the use of a steel frame and steel joists cut three months from the construction schedule.