Jewish Community Center

The exterior of the Jewish Community Center on Manhattan's Upper West Side provides no clue at all to what can be found inside. A mere 137-feet tall to the main roof, the building's height does not call attention to itself in the surrounding cityscape. And with a footprint of just 10,000 square feet, the structure is certainly not noted for its bulk. What is remarkable is the interior, with its unexpectedly large open spaces and diversity of facilities.

The building was designed to serve a variety of different functions — educational, social and recreational. As an educational and cultural center, it houses a nursery school for 150 pupils, a religious study area with a library, classrooms and a two-story theater with raked seating. It provides the community with state-of-the-art fitness facilities including two swimming pools, a regulation size gym, aerobics and workout rooms and associated services. There are also offices to serve the administrative needs of the organization.

In its design, Schuman Lichtenstein Claman & Efron and A.J. Diamond, Donald Schmitt & Co., the architects, sought to achieve a sense of outreach to the local community. The building is clad in brick and glass, making some of the activities visible from the street. For the architects and engineers, however, the primary challenge was to fit all the functions into the compact urban site and at the same time comply with building height zoning regulations. In fact, in the early schematic design stage, the building had to be redesigned to reduce its height.

Photo: Fran Solomon

The architectural design called for stacking all the program elements vertically, with the different types of activities organized as units to achieve coherence. Accommodating all the necessary functions resulted in a building that is eight stories above grade and three below, with 15 floors plans. Driving the project was the need to design a structural system that would minimize the required floor-to-floor heights, making it possible to add extra floors without violating the building height restrictions.

Photo: Courtesy of DeSimone Consulting Engineers

Column Free Space

In close collaboration with the architects, DeSimone Consulting Engineers, the structural engineer, devised a structural system that would keep the structural requirements from interfering with the height requirements. The designers made the structure work for them by placing structural elements in such a way as to achieve the required stiffness and at the same time allow full use of the floor space.

Due to the nature of the facilities the community center offers, much of the building had to be free of columns. Despite its small footprint, the design featured several large open areas that required long clear spans.

The most challenging aspect of the project was to provide these column-free spaces at different levels of the building, comments Carlos M. Dobryn, principal for DeSimone. "The solution was a structural system that combined one and two-story structural steel elements. The great thing about steel is that it can make things like this work. We used every chapter of the AISC steel manual for this design."

Below grade, classrooms and the theater were incorporated into three cellar levels. Because the engineers sought to minimize the depth of the excavation while preserving headroom, concrete flat plate construction was used in this area. Elsewhere in the building, steel was the only economically feasible solution, especially for the long-span areas.

Beneath the main lobby on the ground floor, 55-foot. clear-span composite steel beams were used to frame the space over the theater. To reduce their depth and still succeed in supporting the heavy loads of the column-free lobby area, the beams are only 24-inches-deep but are closely spaced. To further maximize ceiling heights, the mechanical ducts for the theatre penetrated through the steel beams.

Photos this page: Courtesy of DeSimone Consulting Engineers

"A powerful element was needed, not just to span but also to accept the load of the pool and two other floors of gym-related facilities," Estevez points out. The most efficient structural solution was two-story-deep diagonal steel trusses between levels 4 and 6 below the pool. This reduced the amount of steel necessary and, with creative architectural design, also permitted the use of the space between the truss diagonals.

Two stories were inserted into the truss system below the pool. The design incorporated the structure into the floor space, and the architects used it to great advantage.

Large Spans Required

Above the 20-foot-high lobby, the design called for more classrooms, and above them, a gymnasium that would require spans of more than 68 feet. To support the gymnasium, the engineers selected two single-story 55-foot-long vierendeel trusses, 28 feet on center, between levels 2 and 3A, where the gym is located. The trusses, which are free of diagonal members, would effectively support the loads of the gym while allowing for the unobstructed space between the truss chords to be used for classrooms.

"An advantage of the trusses was that they could be prefabricated off site, with the major welds performed in the shop, delivered to the site in single pieces, and bolted in place in the field," comments Juan Estévez, project manager for DeSimone,

At levels 6A and 6B, above the gym, the engineers had to devise a method to support the 82-foot-long swimming pool across a 68 foot, 4 inch span. Using plate girders to support this load would have meant adding height or eliminating one floor of needed space to meet the building height restrictions.

Extending the diagonals through the two floors provided enough room to walk through the truss, enabling the architects to design locker rooms and fitness facilities around them.

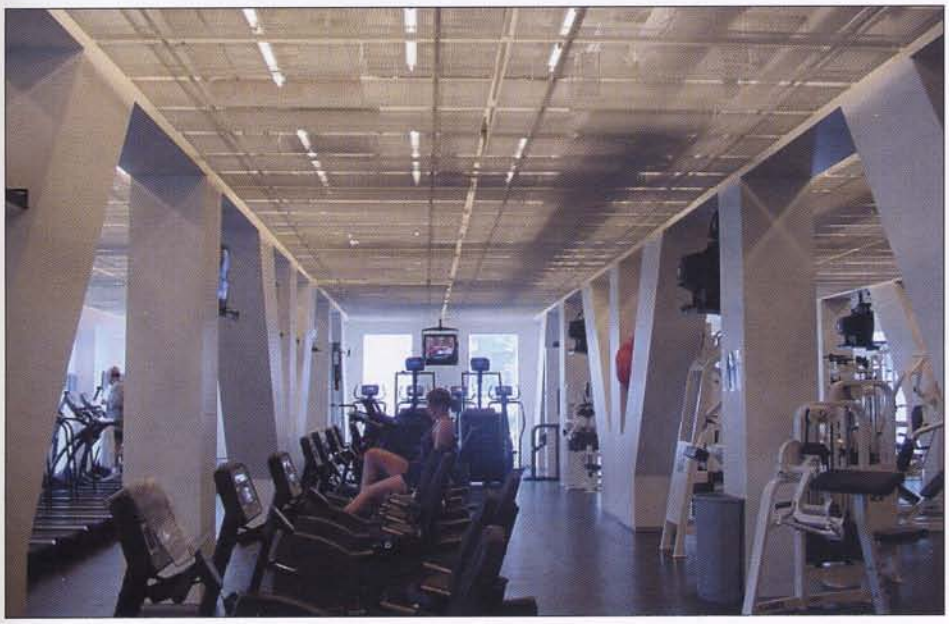
Nonetheless, headroom was still at a premium, so the depth of the chords had to be minimized. "The compression and tension capabilities of the steel allowed us to use very shallow elements — only 16-inches-deep," Estévez notes. The upper truss chords are oriented for strong axis bending to support the heavy floor loads."

Brute Force Needed

On level 7, above the pool, the engineers "resorted to brute force," using six lines of 60-inch-deep plate girders 14 feet on center to transfer the loads of the column-free, 20-foot-high pool area. These built-up members span 68 feet, 4 inches and receive all the weight of the stories above. They were sufficiently strong to take the lighter loads of the three upper stories, where the library, more classrooms, offices and the mechanical penthouses are located.

To resist wind and earthquake forces, the building's lateral system consists of moment frames and braced frames. Connected spandrel beams are on the north and east facades. Braced frames are on the south and west sides where there is no need for windows because the structure abuts the buildings nearby.

The Jewish Community Center, completed at a cost of $57 million, illustrates how close collaboration between architects and engineers can overcome the constraints of a complex project, and how the versatility of steel can make its construction possible.



Photos these pages: Courtesy of DeSimone Consulting Engineers

JEWISH COMMUNITY CENTER

Owner: Jewish Community Center, New York, NY

Architect:
Schuman Lichtenstein Claman & Efron, New York, NY and
A.J. Diamond, Donald Schmitt & Co., Toronto, Ontario, Canada

Structural Engineer:
DeSimone Consulting Engineers, New York, NY

Construction Manager:
AMEC Construction Management, Inc., New York, NY

Structural Steel Erector:
Falcon Steel Co., Inc., Wilmington, DE

Steel Deck Erector:
A.C. Associates, Lyndhurst, NJ