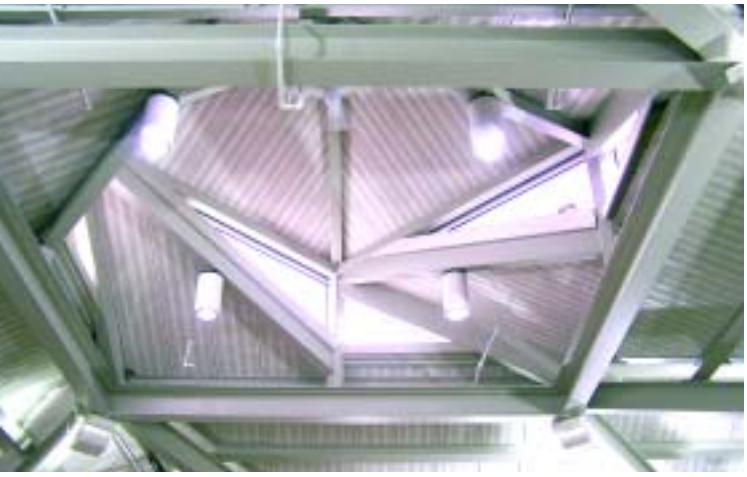
Check It Out!

By Eli Goldstein, AIA and Allan Klein, P.E.

Exposed structural steel helped stretch a $4 million budget to create a thoughtful, user-friendly structure for the Hillsborough Township, NJ public library.



Above: White-painted exposed structural steel is especially dramatic at the central cupola structure.

Below: Exterior view of the nearly completed structure.

After only 10 years in service, rapid population growth resulted in cramped quarters at the single-story, 70,000 sq. ft Hillsborough, NJ municipal building. The public library—the largest function in the building—was most pressed for space. The building program called for an addition of about 20,000 sq. ft to be divided between the library and other municipal functions.

One of the first challenges faced by the architectural and engineering team was to determine where to put the addition and how to distribute the new space. Early studies recommended adding a three-story addition, but after much study, the team concluded that the most appropriate and economical solutions lay in a one-story addition next to the library portion of the existing building. By moving the library into the new space, the old library could be renovated to accommodate expanded municipal offices.

"As I began looking at Hillsborough's program, I saw that the vast majority of the library's space would be dedicated to four programmatic elements of roughly equal size: the fiction book section, the non-fiction book section, the children's book section, and the staff area," explained Eli Goldstein, managing partner for architects Goldstein Partnership. "At the same time, I realized that due to site constraints the addition would have to be square—roughly 150 feet on a side."

Another crucial requirement was that all of the library's reading tables be visible from the reference or circulation desks. Everyone agreed that maximizing access to natural light and views of the outside was a priority as well. The design team arrived at a plan consisting, roughly, of an arrangement of rectangular spaces for each of the four library functions, with each rectangle oriented perpendicular to its neighbors in pinwheel fashion.

The roof over each of the rectangular reading areas is gabled, but the intersection of the four roofs has a special treatment. "We looked at numerous ways of celebrating, in an architectural way, the convergence of these four gables," Goldstein explained. Some were too difficult to build, while others looked like "afterthoughts," he said.

The solution was to build a "lantern" structure at the intersection. The lantern's roof shares surfaces with the roofs of each of the gables, but it has sufficient openings to bring daylight right into the heart of the addition. Locating the reference desk beneath the central lantern structure allows the reading tables in each module to be visible to library staff.

"The extremely tight budget on this project limited us to a very spare architectural vocabulary," noted Goldstein. "In that spirit, we decided to use an exposed steel frame and to develop a somewhat industrial character around it."

The sizing and spacing of lighting, ductwork, piping, and conduit are coordinated with the layout of the superstructure and are left exposed. Over the stacks, the structure consists of W-shape steel girders, open web joists, and metal roof deck. Each stack area is column-free.

Over the reading areas, the gabled roof is framed with parallel-chord HSS trusses, rolled steel purlins (connecting at the panel points of the HSS trusses), and acoustic metal deck. Clerestories occur at the transition between the flat roofs and the gabled roofs. All framing and decking is painted white to help distribute light from indirect light fixtures.

The lantern structure is composed of W-shape steel compression and tension rings. The structure is rotated 45 degrees so that the planes of the intersecting gable roofs are common with the planes of the central pyramid. This arrangement is further complicated by the elimination of columns that would have directly supported the struts and valley beams. In place of columns, the valley beams are supported by cantilevers extending from the flat-roofed, stack-area structures. The hip beams frame to "super columns" that receive loads from the lantern, the gabled roofs, and the flat roofs. These columns also resist rotation of the pyramid induced by the location of the struts.

The original building had high parapets to hide its rooftop equipment, which were not an option on this project due to budget constraints. Instead, heat pump units were suspended under the roof deck and fresh air is supplied through short ducts from louvers in the exterior walls. Air is supplied to the reading areas from registers along the perimeter.

Because the exterior walls would be substantially shorter than those on the original building, the juncture of the two structures was a concern, Goldstein said.

Above: View of one of the reading areas during construction, looking towards the exterior. The exposed structure and clerestory windows provide an airy look.

Inset: Computer rendering of the finished library interior, looking towards the central cupola.

"We decided to create a zone between the two structures with a lower roof so that each would have a more distinct identity," he explained. Support spaces were located under the roof of this "transitional zone."

The lack of finishes resulted in a very simple construction process. Once the shell was complete and the minimal number of interior partitions had been erected, the interior was ready for ductwork, lighting, paint, and carpet.

Completed in November 2004, the addition clearly meets the objectives of the design team, according to Goldstein. "From the moment a person enters from the original municipal building, the entire library—now substantially larger than before—can be seen and understood in a single glance," he said. "The space is filled with daylight, and there are views in every direction." ★

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