MERIT AWARD

$10M OR GREATER,
BUT LESS THAN $25M

New York Presbyterian Church

NEW YORK, NY

JUROR COMMENT:

Exploits the potential of steel to create very interesting geometric forms.

Seeking a new place of worship to accommodate to accomodate their growing congregation, a Korean church in New York decided that renovating a former commercial or industrial building was their most viable option. A two-story, 88,000-sq.-ft., 1930s steel-framed building that had housed the Knickerbocker Laundry factory in Queens was selected for renovation into a new place of worship. This presented the design team with quite a challenge: to respect and exploit what was there while transforming the building to suit a new use and give it a new image. The new church needed to accommodate a 2,500-seat sanctuary, classrooms, cafeteria and wedding chapel, all on a tight budget.

The main challenge was to break out of the constraints imposed by the regular column grid and 10′ ceiling heights of the old factory. In order to provide the 2,500-seat sanctuary, additional space had to be added, but the architects did not want this space to swallow up the existing building. The solution was to place the new sanctuary on top of the existing building. Structural analysis revealed that the existing roof could support the congregants in a new sanctuary if the sanctuary's own roof were independently supported on columns that threaded through the existing building to separate foundations. The load carrying capacity of the existing roof was also strengthened by stripping off the concrete encasement, adding shear studs to the top of the existing beams and then casting a new composite steel-concrete structure. Although this technique is widely used in new buildings, the project shows that it can be effectively applied to renovation projects.

The new sanctuary roof was supported on steel framing separate from the 1930s superstructure that was "dropped through" the existing construction. This secondary framing system included 120′ long trusses to provide a clear span over the auditorium, providing uninterrupted sightlines for the congregation.

The architects also needed to respond to the acoustic requirements of the sanctuary, achieving this by designing a wavy, kinetic ceiling and roof profile and rib-like walls. Instead of varying the beam length to achieve the wavy roof profile, the engineers produced a parametric design for the column bays. Pre-fabricated open-web joists, measuring a constant 22′ long, were used, but set on columns placed at varying distances. The roof beams consequently assumed the sloping an-

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SOFTWARE
Alias Wavefront

PHOTOS
Karen Ludlam/Buro Happold

Building section. The new sanctuary is built on top of the existing building.

gles required for the sanctuary but at low cost.

The architects' design specified that the sanctuary be reached by new wide flights of steps and circulation paths that bore little relation to the existing geometry or structural grid. The architects used 3-D geometric modeling packages to sculpt these complex voids and stairways, and the engineers were then quickly able to assess the structural implications of various design options. To create these new staircases, the existing steel structure had to be cut away. A complex transfer structure is often the structural solution used to create new load paths around the existing columns that have to be removed, but this would have been too expensive in this building. The solution was identified using the 3-D geometric modeling packages as they established where on plan new load-bearing block walls could be used to prop the floor structure. Starting from the basement, the walls were built up to the underside of the existing steel beams and concrete floor and dry-packed to be able to take the load imposed from above. The superfluous original structure could then be cut away to create the new voids.

The other area of complex steel framing is the grand covered outdoor walkway, doubling as an emergency exit, viewing platform and "signboard" for the building. It also continues and makes visible from the outside the rib-like forms of the sanctuary ceiling. The rigid bents that comprise it were described for the fabricators using a 3-D model and an extensive set of workpoints, resulting in remarkably few fabrication errors despite their complexity. The series of bents is stabilized longitudinally with diaphragms constructed from light-gage steel joists and plywood panels, clad outside in metal and inside in redwood. These diaphragms are warped out of plane owing to the bents' geometry. The use of light-gage joists permitted them to be formed economically simply by torquing the joists.

The Presbyterian Church shows that the complex geometry required of many contemporary designs can be achieved economically with the assistance of today's sophisticated computer software, adaptive reuse of materials and close dialogue between the architect and engineers.