

*Sports construction***All the arena is a stage***Scheduled events drive \$200-million renovation of Madison Square Garden*

**T**he requirement that “events” must go on—for almost three years—drove the \$200-million renovation of New York City’s Madison Square Garden and gave the project team unlimited food for thought. That holds especially true for the job’s lead construction executive, Frank Ross, who put a homemade cardboard model of the arena’s interior on his dining room table early in the job. Home cooking with the model in view helped Ross concoct an idea for a suspended work platform that made possible the construction of 88 new skyboxes—the project’s most critical element.

“It was a stroke of genius,” says Joseph J. Diesko, of the fruits of Ross’s table. Diesko is senior project manager for project architect, Ellerbe Becket Sports, Kansas City, Mo. Ross is president of field operations for HRH Construction Corp., project construction manager with Herbert Construction Co., both based in Manhattan.

To avoid supports in seating areas, each work platform was suspended at four points from the roof structure. And, the interconnected string of up to 17 platforms could be lowered 6 ft for work on skybox soffits and hoisted before events, to clear sight lines. When a group of skyboxes was completed, each roughly 48 x 27-ft platform—a steel-truss table contoured to follow the arena’s circumference—was lowered to the floor while still assembled and wheeled on a rig to another location. There, it was hoisted for storage up against the ceiling until needed again, like a “giant moth,” says Alan Shalders. Shalders is chief engineer for the scaffold supplier, Universal Builders Supply Inc., Mount Vernon, N.Y., which realized Ross’s concept.

The work platforms epitomize a job



**Interior** has 88 new skyboxes, built using suspended work platforms (left) that could be stored for reuse like giant moths under the ceiling.

that had to be staged around the Garden’s three million visitors annually. “We had to teach our construction workers that the Garden comes first,” says Ross.

A helpful strategy was to break work into smaller jobs. Areas are taken out of commission one at a time, says Jud-

son W. Perkins, president of the facilities development and management group of the arena’s owner-operator, Madison Square Garden Corp., New York City.

And, “on an event day, there is a drop-dead time,” adds Ross. Workers clean up and store materials for a safety check.

That may sound easy, but it isn’t, when combined with programmatic demands and the usual surprises of a renovation. “The renovation was the most difficult one around,” claims Diesko, even though the arena was closed as planned for two summers. That just meant a more frenetic pace to cram work into the “dark” months, he adds.

During the renovation, which began in January, 1989, and is on time for



completion next month, no events were cancelled, says Ross. In fact, only one concert was cancelled in recent history. That was in 1987, during an unrelated asbestos abatement project. (The 1987 abatement work preceded a \$35-million asbestos removal program that dovetailed with the renovation.)

**High scores.** In the renovation, the 88 tiered skyboxes that ring the ceiling, and improve upon 29 demolished originals, get the most points for difficulty. Other high scorers include the two new skybox elevator towers and a new skylobby, both attached outside the original footprint. Gutting and re-

novation's structural engineer Severud Associates, both New York City.

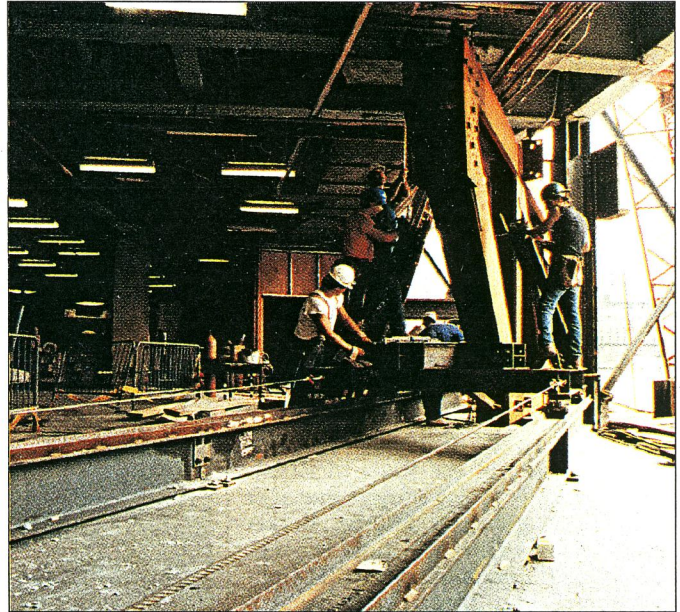
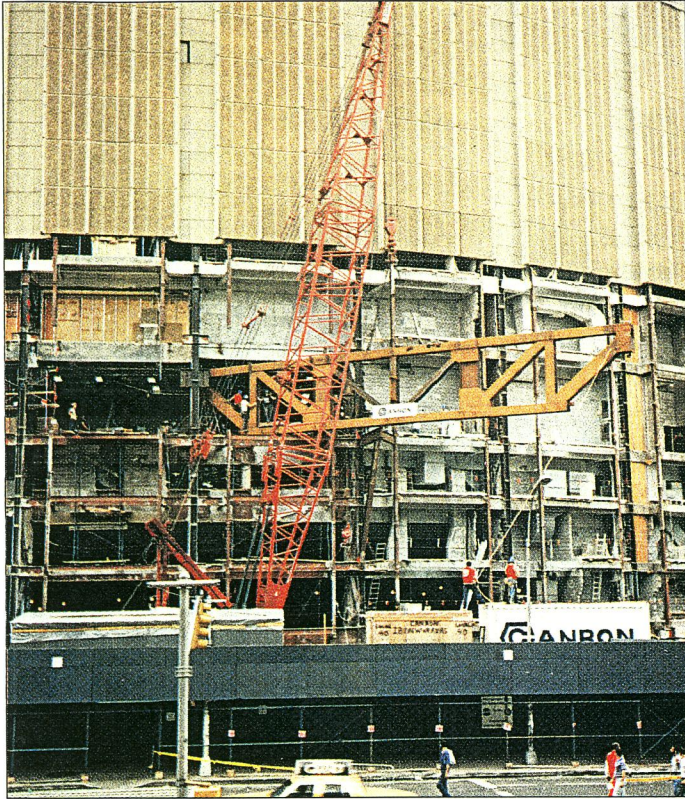
Fortunately, the basic structure, with its 425-ft-dia cable-supported roof, had been overdesigned. Using its extra capacity became a theme. For example, each skybox, which extends about 15 ft along the circumference and projects about 26 ft into the arena, hangs from roof cables and the existing structural beams, says Tibor Vari, a Severud associate partner.

Similarly, the new 150 x 30-ft skylobby is hanging outside the building off new 45° cables that hang from existing perimeter columns. And the new

enough capacity but couldn't be accessed directly, says Vari.

Trains seem omnipresent. The poured-concrete stage of the theater, outside the arena footprint, had to be isolated from vibrations on 1,500 pads because it is directly over a city subway. But that effort paled next to the task of building a new stage house.

The problem was that two of the arena's 48 main perimeter columns, which support roof cables, were in the way of the new 68-ft-wide stage opening. To get around this, Severud designed two new 13.5-ft-deep, 83-ft-long transfer trusses, so that 30-ft



**Truss (left)** being installed to help create a large stage opening in the rebuilt theater was threaded into the existing arena in a single piece using a trolley track (above).

building a 5,600-seat theater, now called the Paramount, was also tough. And, finally, hanging a 300 x 50-ft mezzanine that feeds skybox elevators above an elevated public concourse was tricky. "We [only] picked up a couple hundred seats in the 20,000-seat arena, but we added 100,000 sq ft of space," says Perkins.

The modernization also includes new escalators, power and lighting; better back-of-the-house services, such as central beer pumping; expanded rest rooms; rebuilt seating; a new video scoreboard and other items.

The 22-year-old drum-shaped Garden contains 842,000 sq ft in some 10 levels. It has a steel-frame, reinforced-concrete floors and precast cladding, originally designed by architect Charles Luckman Associates and the

steel-framed mezzanine, like the suspended concourse below it, was hung off the concourse's roof. The roof, which was reinforced, spans and is supported by the arena and a neighboring building. For the mezzanine, which had to be enclosed during the work to protect passersby, materials could only be brought in through the a hole in the roof.

**Obstacle.** Another stumbling block was that the arena sits above three levels of Amtrak's underground Penn Station. "We couldn't interrupt their systems," says Robert Conroy, HRH/Herbert's project manager.

Because of this, the four columns for each elevator tower come down on a 2-ft-deep pile-cap-like structure at grade that spreads the loads over three existing station columns. They had

lengths of each column could be cut out at the stage opening. The trusses now bear on reinforced existing columns at either end.

Even worse, the interfering columns helped support the main arena floor, at level five, well above the street-level theater. The bottom of each truss was located at the main floor. Columns were then cut away below the main floor girders, and column stubs projecting down from the trusses are hangers for the girders.

One Saturday last August, workers opened up the side of the drum, installed a trolley track and threaded the single-piece trusses into position.

The goal at the Garden is to keep the arena competitive and visitors happy. But one group might take exception. Bored backstage between performances, the circus elephants had habitually lifted their trunks to pop out ceiling tiles. No more, says Perkins. Replacement sheetrock should be impervious to trunk abuse. ■

*By Nadine M. Post*