IT'S NO 'GARDEN' OF EDEN

The New Boston Garden, Shawmut Center or perhaps Fleet Center: Beantown's sequel to its beloved but hopelessly antiquated arena has already been called various names and it's not even open yet. That's no surprise to those familiar with the $160-million development. The effort is quintessentially Boston—chock full of politics, emotions and fits and starts.

The many vagaries have stretched a four-year process to seven-plus, says Thomas Beckenbaugh, vice president of project architect Ellerbe Becket, Kansas City, Mo.

But the arena is getting done. Come September, Boston Garden's 19,600-seat replacement will be home to basketball's Boston Celtics, ice hockey's Boston Bruins, the circus and more. Some fans may miss the old Garden's intimate setting, despite 1,000 seats with obstructed views and stifling temperatures during post-season play. But they'll probably grow fond of the larger space, with air conditioning and no obstructed views.

The 10-level, 755,000-sq-ft center is a private air rights development of the local New Boston Garden Corp., a Delaware North Co. Delaware North owns the old Garden and the Bruins.

The steel-framed building is burdened by many things, including a compact footprint. Though nearly 100 ft wider than the Garden, it is still 50 ft too narrow for a modern arena.

"We shoehorned a 468 x 300-ft building into a 500 x 309-ft site," says Beckenbaugh. "This is the smallest professional sports building we've done."

Boston arena site has no elbow room. Old Garden is along the south (bottom, right), trains are to the north, a building is along the east and more.

Ideally, an arena should measure 465 x 350 ft, he says. And access is difficult as the site is bounded by buildings, city streets and an elevated highway, adds Kevin J. Collins, senior project manager for the Boston office of general contractor Morse Diesel International.

Beckenbaugh says that though the seating bowl configuration was set early on, the overall arena was designed, redesigned and then, at the request of the Boston Redevelopment Authority, the envelope was modified on paper from a classic to a contemporary look. Also, there was value engineering.

Share. That's not all. Construction could not interfere with operation of the adjacent Garden, to be razed soon after the new arena opens. And work had to interface with a Massachusetts Bay Transportation Authority project—a 12-platform commuter train "superstation" under the air rights. The station, the heart of the $400-million North Station Improvement Project, and the arena share the ground level.

The arena team also could not interfere with trains bringing 15,000 daily commuters into and out of the existing North Station under the Garden. Though MBTA stopped the tracks just short of the site and built temporary platforms, commuters still had to walk across the site to the old station. For this, the state agency built an enclosed, grade-level walkway through the site, which it had to move several times to keep it out of harm's way.

Those constraints would have been enough, but NBGC urged MBTA to concurrently construct a five-level, 1,150-space parking garage beneath the new train shed. The garage will replace parking lost when the elevated Central Artery highway nearby is depressed. NBGC will also lease many spaces.

The garage-station-arena triple-decker meant that despite three different column grids, the buildings would share foundations. "Normally, the builder of the superstructure owns the basement and foundations," says Joseph L. Clougherty, MBTA senior project manager, Boston. But here, "everything from the ground up is theirs and from the ground down is ours," adds Richard F. O'Brien, project manager for the local joint venture that designed the MBTA work, Parsons Brinckerhoff Quade and Douglas Inc./Seelye Stevenson Value and Knecht Inc.

All things considered, the arena is no slam dunk. Ideally, the event floor should be about 20 ft below grade, not 35 ft above it. The elevation makes it more difficult to move patrons in and out. The result is four larger stairwells—as large as 40 x 60 ft—that eat up floor space. Also, there is no room for upper-concourse concession stands along the sides—so they had to be squeezed in at the ends, as did restrooms. Ditto for the upper mechanical level, where four corner air handling units feed the main bowl of the arena, instead of a single mechanical room. "The mechanical rooms are bookends," says Norman D. Kurtz, principal of project consulting engineer Flack + Kurtz, New York City.

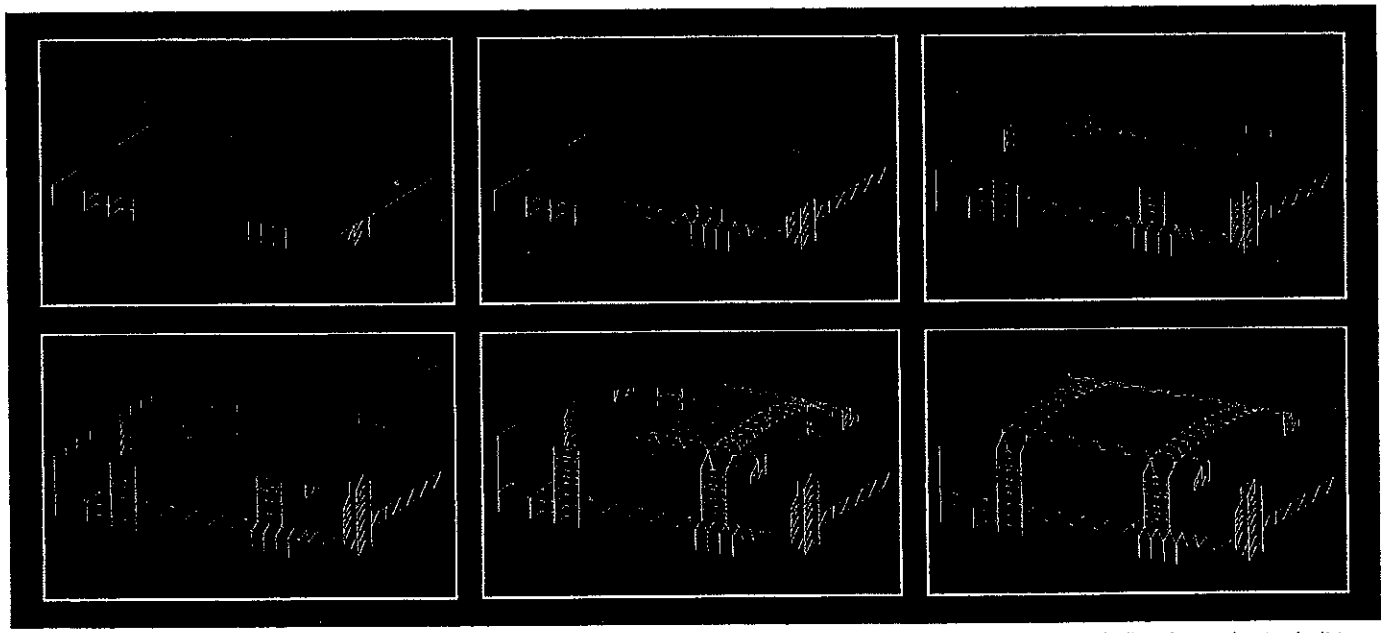
The 8-ft-dia ducts feeding the arena bowl from the 'bookends' had to be threaded through roof trusses during erection, adds Dennis L. Sacco, vice president of mechanical subcontractor, Limbach Co., Woburn, Mass. But the decentralized approach reduced the amount of ductwork.

Balance. The projects were formalized in 1988, when the state legislature transferred ownership of the city land to the MBTA. The city, which had kept the air rights, then designated NBGC as arena developer in a complex tax agreement. By early 1989, NBGC and MBTA also had an agreement, but no money would be exchanged. "Everything is quid pro quo," says Clougherty. "In the final analysis, things should balance out."

Each item was assigned a value: extra cost of garage foundation capacity and column size for arena loads; garage exhaust vents through the arena; and so on. Joint decisions still are being made, even over signage.

The arena team also had to contend with the scheduled razing of the neighboring 150 Causeway Building, which contains all the services and storage for the old Garden, to make way for the depressed Central Artery. That meant providing equivalent temporary space in an under-construction arena.

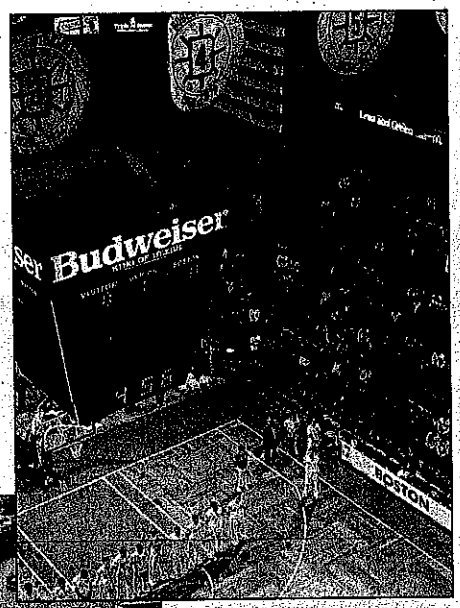
As if things weren't difficult enough, the arena side started to unravel in 1990 when the real estate bust delayed financing. The arena team went on hiatus for two years. However, garage work, using a top-down method for the 60-ft-deep, three-acre excavation, went ahead in 1990. The garage designer had to detail foundations—concrete slurry walls and caissons—and con-

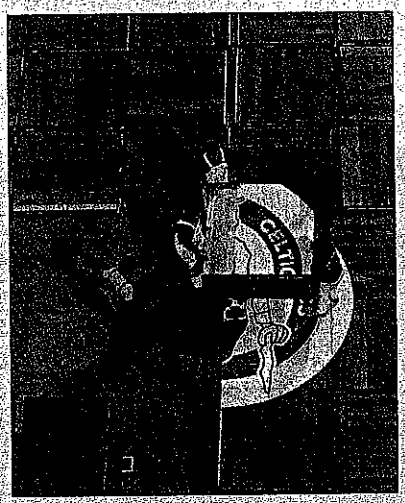


Framing strategy: First erect the giant steel table above the train shed. Then, continue building above the tabletop including the perimeter belt truss (yellow), the saddle truss (yellow) and framing for concourses and seating bowl (red). Finally, erect roof trusses (red).

crete-encased steel garage columns before the arena design was complete. Consequently, in some locations, there are larger columns than necessary. O'Brien says that the arena delay caused "dozens of little things like that." He adds, however, that starting the projects at the same time would also have been "a mess."

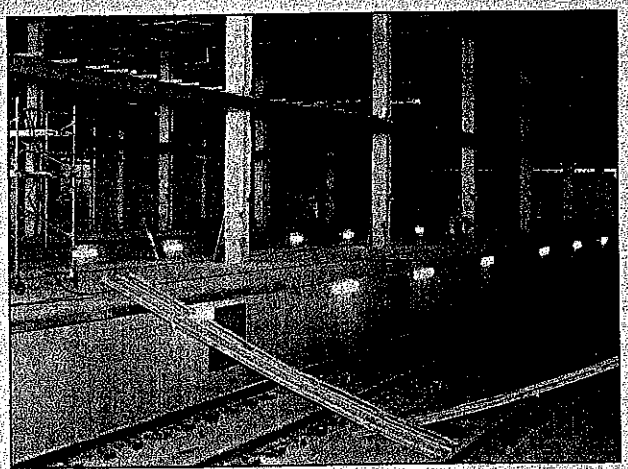
It turned out that 150 Causeway's razing was put off. That nixed the Garden's temporary need for service space, but it left little room—between an active subway tunnel and 150 Causeway foundations—for a line of arena caissons outside the garage footprint. It also meant building the arena snug up against 150 Causeway as well as the old Garden, only 9 in. away. Close proximity is delaying some exterior finish work until both old buildings are razed.





Old Garden, open since 1928, is way past its prime. It has no air conditioning and 1,000 seats with obstructed views. After tenants, championship banners and Celtics' famous playing floor relocate, old Garden will be razed.

In December 1992, NBGC switched from preconstruction manager Gilbane Building Co. to Morse Diesel, which agreed to take a risk position. But then NBGC nearly called everything off. When getting ready to close the $120-million bank loan, it found out that the elevation for the top of the train shed, as defined by the 1988 state legislation, was 9 in. off. "Technically, part of the arena was intruding into MBTA space," says Budge Upton, NBGC director of development and construction. It took lots of political wrangling, several months and 30 pages of legislation to correct the simple error. "We closed on the loan in April," says Upton, six months later than expected. In May 1993, with the garage already 80% complete but still set to open with the arena, NBGC work finally started.



Enclosed walkway allows commuters to pass safely through site.

The strategy was to frame a giant structural steel table, its legs connecting into perimeter garage columns, and then continue on up. The level-three tabletop, which coincides with the event floor, is 35 ft above the train station slab. It contains plate girders that transfer loads from the arena's radial column grid to the garage's orthogonal grid. There are 100-plus, 6-ft-deep plate girders, 10 to 40 ft long, and "nothing is repetitive," says Peter J. Cheever, vice president of arena structural engineer LeMessurier Consultants, Cambridge, Mass. It's such a maze that workers had to cut 1,100 penetrations for ductwork and ice-level piping coming up from mechanical rooms below.

Just above the tabletop, a story-high perimeter belt truss transfers gravity and lateral loads from perimeter columns spaced 20 ft apart above the event floor to columns every 40 ft below it, says Cheever. The broader column spacing minimized the number of perimeter caissons, especially in the limited space between the subway tunnel and 150 Causeway. Saddle trusses, up the long walls and across the roof, also resist lateral loads.

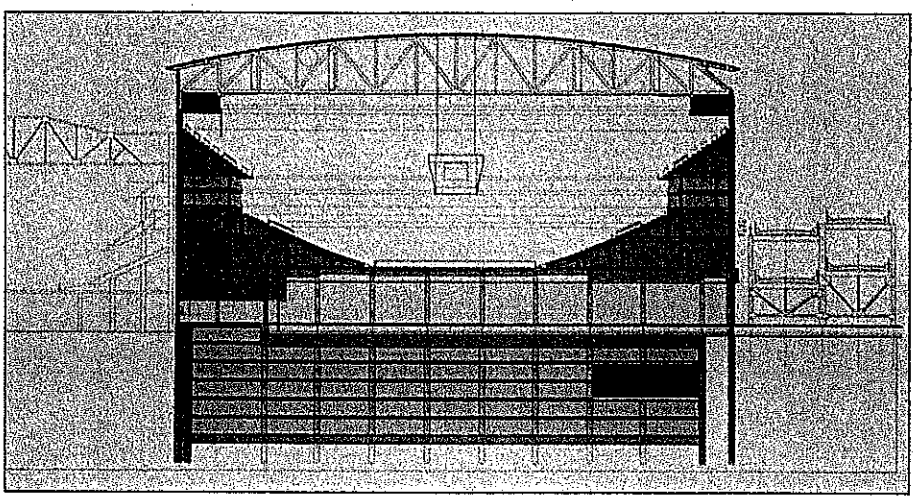
Turf. When arena work began, turf battles flared with the garage team, mostly regarding laydown areas, says Rory D. Neubauer, vice president of Modern Continental/Obayashi, the local garage joint venture. "There was only a half acre of real estate for both teams. We eventually...shared it."

In general, "we met weekly with MBTA reps" to interface, adds Collins. At times, discussion was heated, but everyone had a "can-do" attitude, he adds.

Nevertheless, Neubauer says arena work "compromised the garage's watertight envelope by virtue of construction." Connections into elevator shafts and columns were the most irksome.

"I don't think the water involvement was anything great," answers Gary P. O'Brien, Morse Diesel project superintendent. And he says he doubts the garage was ever 100% watertight.

The arena's close neighbors forced work to proceed from the inside out, with materials and equipment crowded into the event floor. Access inside was limited to a 200-ft-long, 12-ft-wide ramp



Garage (blue), train shed (tan) and arena form Boston triple-decker. Old Garden is on the left.

with a steep, 12% grade. "You have to watch what you bring up the ramp," says Michel E. Letellier, vice president for the steel fabricator, The Canam Manac Group, Boucherville, Quebec. Heavier cranes for roof truss erection couldn't make the grade, so they were stripped and reassembled inside.

Essentially, roof framing consists of 10 transverse trusses, 40 ft on center and up to 30 ft deep, that span 296 ft. Each top chord is segmented to create a barrel vault roofline. Two 29-ft-deep longitudinal trusses brace the transverse trusses and provide rigidity.

Truss erection was 20% more expensive because of logistics, says John R. Snow, project manager for Dorel Steel Erection Corp., Quincy, Mass.

During bidding, Dorel anticipated the difficulties and hired an engineer who determined that more than half of the event floor needed strengthening to develop crane paths.

Logistics eventually dictated that truss erection, which began last May and was done by August, would proceed from east to west until the center and then west to east. Cranes first picked 120-ft-long end sections and landed them on perimeter columns and falsework towers. Then, cranes picked the 50-ft-long center section. The center of the last truss had to be stick-built because of crane limitations.

Work is reportedly on time and on the $92-million budget. But the arena continues to make news. First called the New Boston Garden, it was renamed Shawmut Center by the bank that bought the naming rights for $30 million. But Fleet Financial Group just bought Shawmut and announced plans to change the name. At press time, speculation was rampant. Some were even putting their money on Fleet Feet.

Though the name may change again and again, there is one thing that should remain the same. Fans with soft spots in their hearts for the Celtics' playing floor—with its secret dead spots—need not fret. "The Parquet" will be there come September. ▣

By Nadine M. Post in Boston