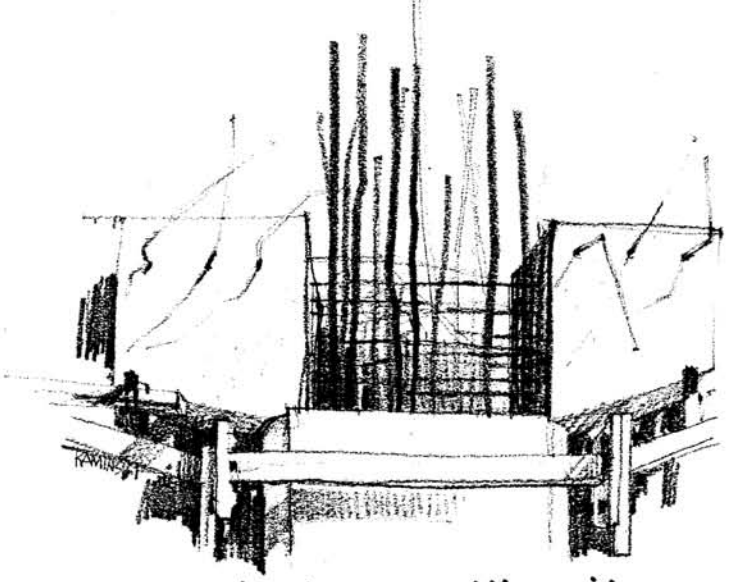
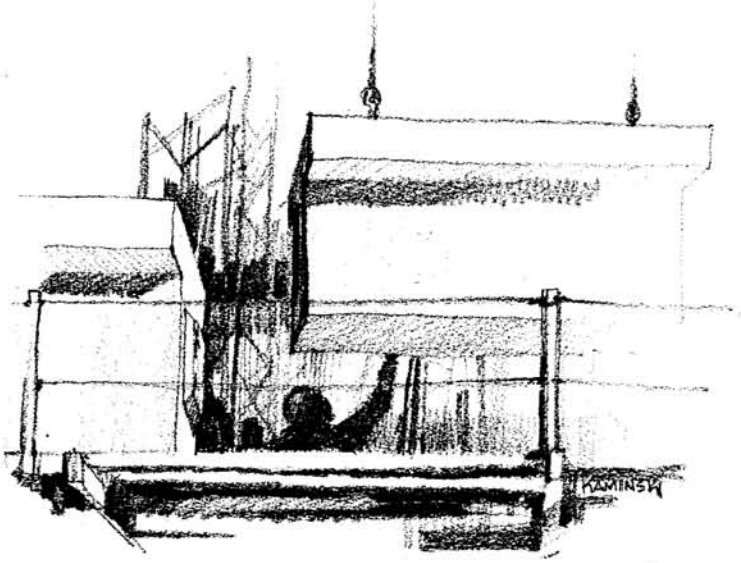
f the Gulf Life Tower to take advantage of the structural system and use as part of elegant design.

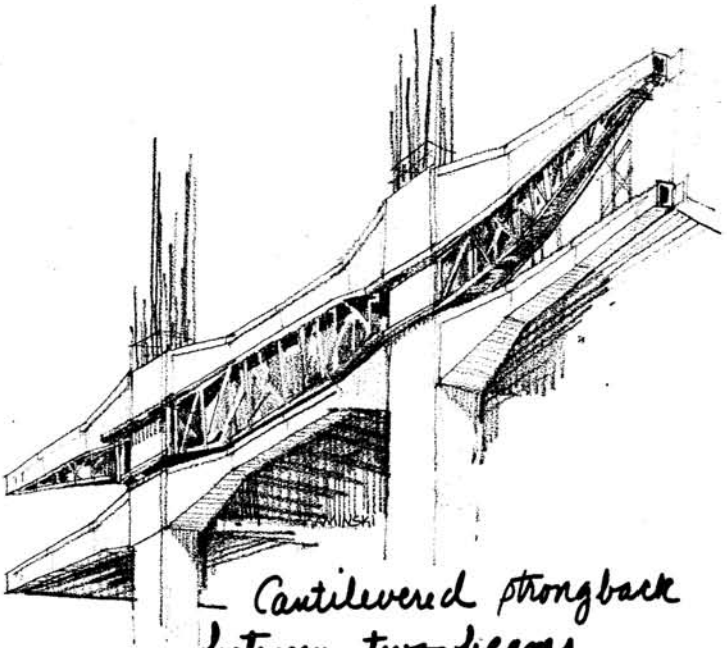
Jacksonville's New Tower: Two Disciplines Unified



Segments in place on either side of a column.



Lowering a segment into position.



Cantilevered strongback between two beams.

BY WELTON BECKET, FAIA

Form and structure of the Gulf Life Tower are one, the product of architects and engineers who worked as one, pooling innovative concepts.

The precast, segmented, post-tensioned structural framework supports the floor system (leaving the interior column-free), encloses the space and, with its inherent color and texture, provides the finish.

We were aware that on the virtually flat Jacksonville cityscape the 430-foot tower—highest in the area—would emerge strongly on the skyline. Our concepts was to portray honestly the many levels of activity of an office building rather than let it pose as one mass against the horizon.

A horizontal beam system, with the beams themselves the dominating elements, was the solution. Thus the structural concept: two columns on each facade supporting beams at approximately third points, creating sizable cantilevers at beam ends. The window walls are recessed to give full play to the

The author: Mr. Becket is principal of the Los Angeles-based firm of Welton Becket & Associates with offices in San Francisco, New York and Houston.

frame; light and shadow bring it alive as the sun moves across its face.

We determined that a white structure would take maximum advantage of the Florida sunshine. The cement and quartz sand mix required to provide the white cement dictated—for economical reasons—use of the barest amount of structure, yet one with a pleasing form.

The precast segments, shipped from Atlanta by rail and truck, were assembled on site. Each beam consists of 14 precast units strung together on high-strength steel cables. Each weighs no more than 15,000 pounds. The beams were assembled on specially designed boom-like cantilevered strongbacks hoisted from floor to floor as the building went up. Each strongback had a center section, resting on the completed columns below, and two end sections, cantilevering outward from the center section to avoid putting loads on the overhanging ends of completed beams.

With all segments in place, a guidewire was fished through the metal tendon conduits in the beam and was then used to pull a rubber

tube all the way through each conduit. Inflated with air—5 psi—the tubes expanded to bridge the spaces between the segments from within. Grout was now pumped into the spaces through 1-inch diameter holes in the beam tops.

After 24 to 48 hours, the grout achieved a strength of 4,000 psi. Twelve-strand steel tendons were pulled through the conduits and left projecting 30 inches at each end for post-tensioning. Protruding strands at each end were threaded through conical grips and chucked and stretched with hydraulic jacks. The corner detail of the tower allowed for erection tolerances and proper conditions for the jacking equipment. The post-tensioning technique did away with the need for corner columns.

Six feet 9 inches deep at their maximum points, the beams cantilever 42 feet beyond the column center lines to the building corners, where they are 4 feet deep.

The beam intersects the column in the form of a haunch on either side. From there, it tapers upward and inward, first sharply to a point where it becomes prismatic in plan, then gently toward the end.

At the cantilever ends, the beam splays to receive the tendon bearing plates and provide sufficient area for them.

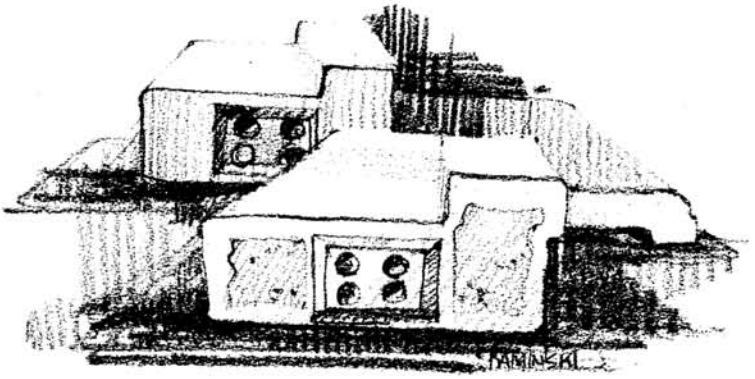
The interior face of columns and beams are in the same plane to allow for an uninterrupted perimeter of the loft space.

While tensioning was underway, the two columns intersecting the beam were cast in place. Forms for this operation were the beam segments abutting the columns and precast interior and exterior facing panels, also cast in Atlanta.

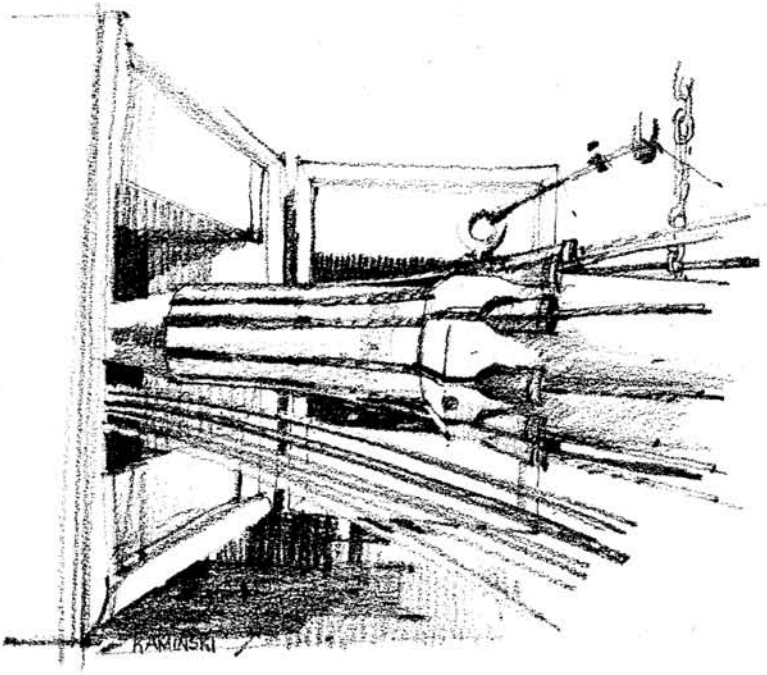
Following post-tensioning, the tendons were pressure grouted and the columns extended upward to the underside of the next beam. Forms for these pours were 6-inch thick precast shells, 6 feet 9 inches high.

To speed the trusses from floor to floor, four strongback units were used, plus one extra center section. When raising the four trusses to the next level, a tower crane positioned the extra section above one of the trusses to be moved. The end sections of the lower truss were unbolted, lifted by crane and then bolted to the extra center section. This freed the center section at the lower level so it could be used as an extra section to raise the next strongback.

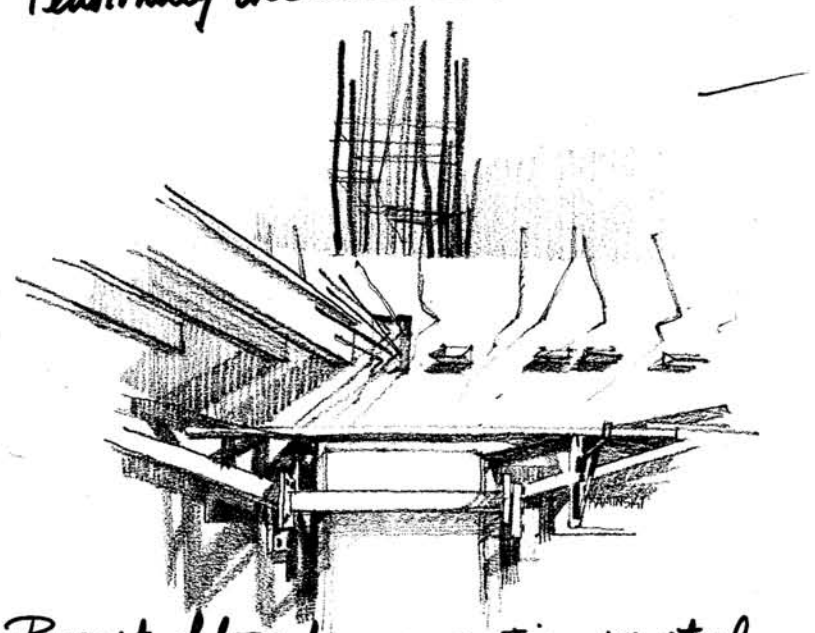
With all four strongbacks raised, the left-over center section was



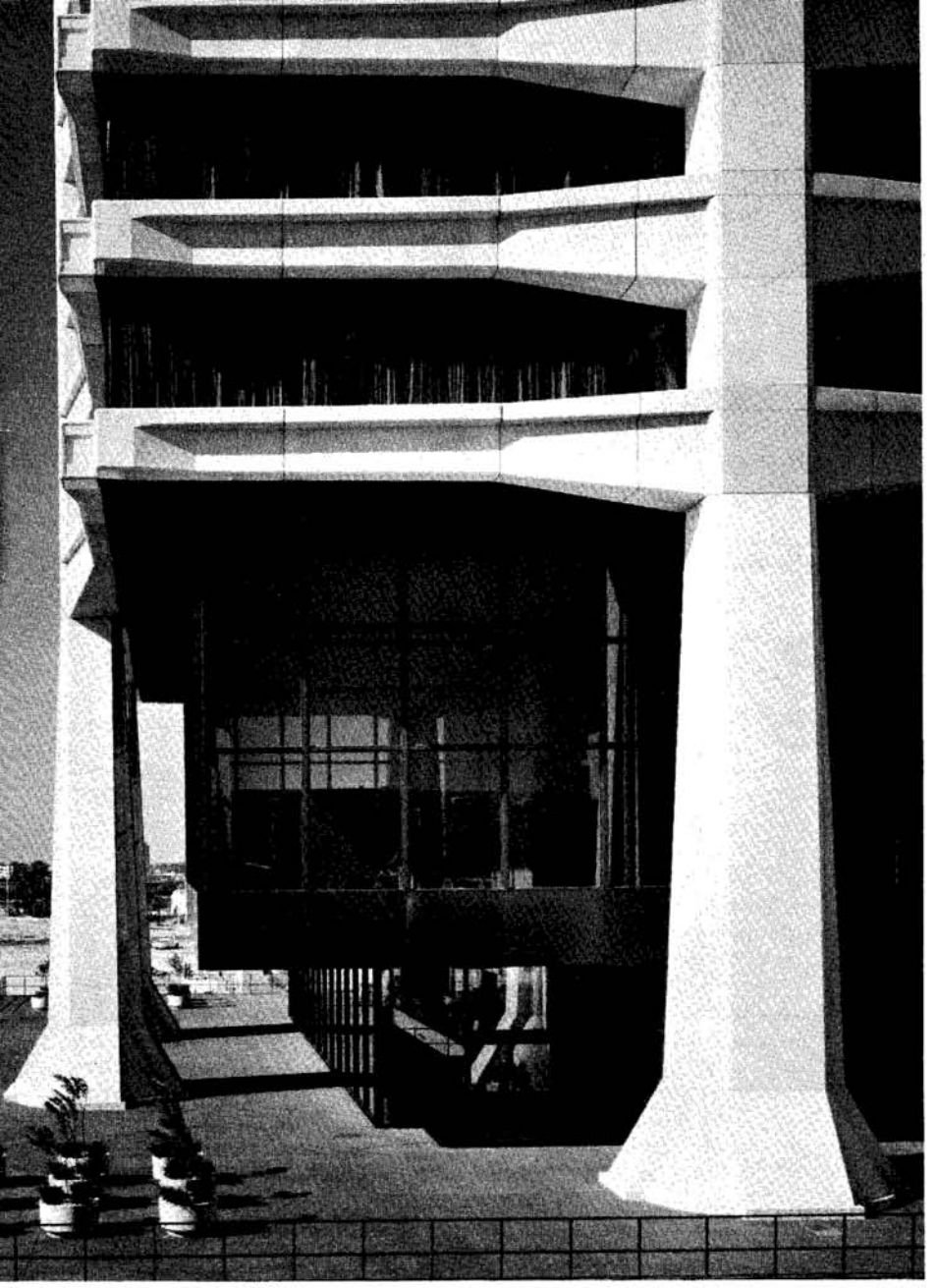
Cut of beam with conduits.



Tensioning the tendons at beam's end.



Precast floor beams resting on steel supports in exterior beams.



The Gulf Life Tower, Jacksonville, Florida, by Welton Becket & Associates. Kemp, Bunch & Jackson, associate architects; Richard R. Bradshaw, Inc., structural engineers.

Home office of the Gulf Life Insurance Company, the $17-million tower, on a dark green terrazzo podium, is focal point of the $25-million Gulf Life Center on St. Johns River. The center, on 12 landscaped acres, includes a 320-room hotel and a parking facility housing a central mechanical plant. A bridge links garage and tower at podium level, doubles as covered access to stores and cafeteria at concourse level. The glass-enclosed lobby at podium level has escalators and elevators to a bank on the 2nd and 3rd floors; Gulf occupies the 4th through the 15th floors, rents the rest. A private club is on the top floor. Solar grey glass gives glare protection and contrasts boldly with the white concrete for maximum emphasis on the structural system.

lowered to the ground until needed for the next lift.

Oak blocking, faced with heavy cotton padding to keep the finished precast segments off the steel of the strongbacks, provided the clearance needed to move the strongbacks after each use. Tensioning took load off the blocks so they could be removed easily.

With core walls, beams and columns in place, the precast prestressed floor tees were installed, north-south and east-west on alternate floors to spread the load evenly. The tees bear on metal angle brackets welded to inserts in the beams, on the core walls and on precast girders spanning between these.

Where the vertical stems of the double tees rest atop previously cast-in-place core walls, the outside forms for the next core wall lift start at the top of the double tee slabs. Gaps between the stems on the underside of the slab were closed from below before the concrete topping was poured.

The podium and concourse levels of the building, larger in area than the tower, are framed of precast, prestressed single tees with a 7-foot width. The basement has its slab 10 feet below the waterline, resisting hydrostatic pressures.

The Gulf Tower stands as a model of interplay between architectural design, structural engineering and the very latest construction techniques. □