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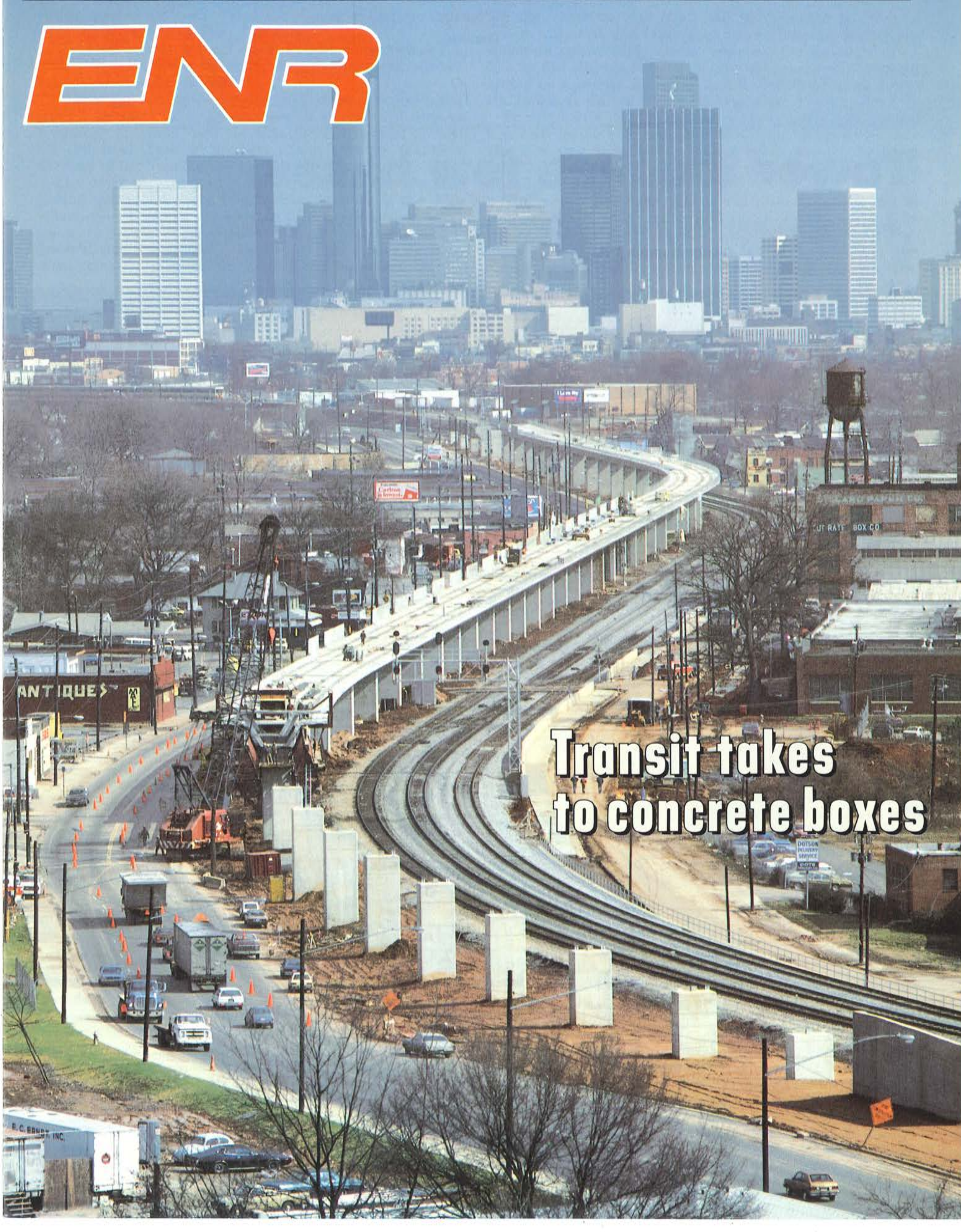


Transit takes to concrete boxes

Tower touches few bases

Only 16 columns, 20 ft in from edge, support Dallas office building

The cost-efficiency of concrete in supporting gravity loads and the ease of erection of steel have teamed up to create a structural solution in a Dallas building that just didn't work in pure concrete or pure steel. By supporting the entire weight of the slender, 72-story building on a mere 16 exterior columns and hanging the rest of the building from them on a rigid steel frame, the building's structural engineers found a compromise between speed of construction and material cost.

The building, called InterFirst Plaza, is part of the $300-million first phase of a $1-billion, four-block complex, Dallas Main Center. Also in that first phase will be 42,000 sq ft of a 100,000-sq-ft underground retail esplanade, pedestrian tunnels connecting with the city's underground walkway system and phase one of a 16-story garage. To follow are a 600 to 1,000-room luxury hotel and a twin 72-story office tower.

Construction recently got under way on InterFirst Plaza. According to Thomas F. Galvin, president of Bramalea Texas, Inc., the Dallas-based lead developer, construction is scheduled to be uninterrupted, with work on the hotel beginning as the first tower is completed in 1984. The second tower will follow the hotel.

Slim structure. The ratio of height to structural width in the unusually slender 921-ft-high building is a large 7.24 to 1. The World Trade Center towers, in comparison, have height to width ratios of 6.49 to 1. That meant that an unusually efficient structure was needed to give the slim building the necessary stiffness.

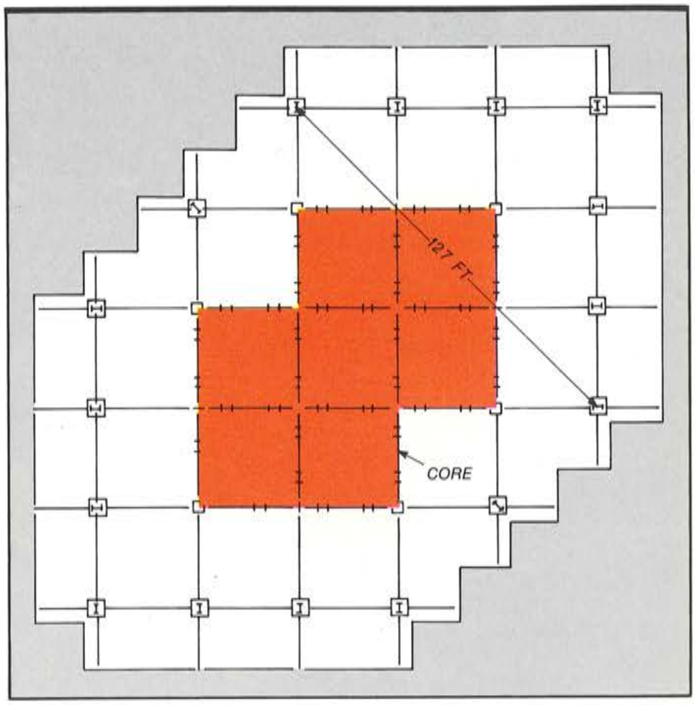
"The first thing we came up with was the old reliable—some form of tube," says William J. LeMessurier, chairman of the board of SCI, part of a joint-venture structural engineer made up of LeMessurier Associates/SCI, Cambridge, Mass., and Brockette Davis Drake, Inc., Dallas.

The architect wanted to preserve the all-glass exterior of the building, however. "The owner wanted a building totally uninterrupted by perimeter columns, which ruled out a tube, and also did not want X-bracing," says Bill D. Smith, president of project architect JPJ Architects, Inc., Dallas. JPJ and the engineers met this requirement with the 16 columns set 20 ft back from the silver reflective-glass curtain wall. The 20-ft setback was large enough that the architect could put an entire row of offices between the curtain wall and the column line. The building has a serrated floor plan and the core parallels the exterior.

LeMessurier first came up with an all-concrete, "fairly conventional, shear-wall structure." Although the frame was rigid and efficient, the contractor claimed that the concrete work would add seven months to the construction schedule.

The next attempt was an all-steel building, but the steel weights came out to be a heavy and expensive 40 psf.

Combination solution. The solution was a combination of the two. With such a slender building, the object was to bear all gravity loads at the exterior. That was done most inexpensively with concrete columns. The interior of the building, on



Set-back columns leave room for offices around the perimeter.

the other hand, required a moment-resisting frame that would transfer all moments to the exterior. That was done in the most quickly constructed way with steel. Steel columns embedded in the concrete columns of the exterior provide the means for connecting the interior steel with the exterior columns.

In order to get all of the gravity load of the building into the exterior, even the core of the building doesn't pass all the way to the foundation. Instead, it hangs from the interior steel frame and transfers the last of its wind shear to the exterior columns through grade and concourse-level floors. Ironically, with tall structures in which lateral stability is the dominating design factor, a building is commonly more efficient without columns in the interior than with additional columns to the foundation, LeMessurier notes.

The steel weight for this combination structure: a respectable 25 psf.

The exterior columns are located on 30-ft centers and vary in size from 6 x 6-ft to 8 x 8-ft. The largest are reinforced with 96 No. 18 bars, and the design strength of the concrete is 10,000 psi.

Rolled in Luxembourg. Joe F. Brockette, president of Brockette Davis Drake, says that 42-in.-deep rolled shapes, fabricated in Luxembourg and not available from U.S. steel makers, will be used in the frame. "With the deeper sections we don't have to use built-up shapes," he says.

The steel erector is the John F. Beasley Construction Co., Dallas. Vice President James W. Neal describes the erection method as "highly unusual."

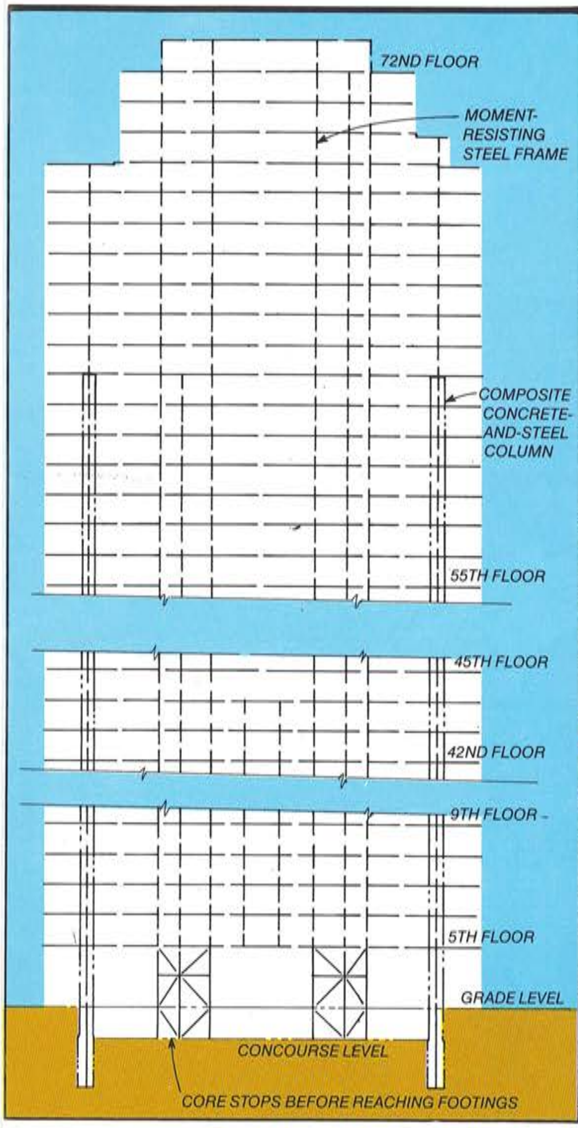
"There are two significant things from an erection standpoint," he says. "We will support all interior columns on temporary falsework until the structure is complete through the 12th level. Then we will remove the falsework, and all of the load of the building will be carried by exterior columns."

The other support system Beasley will have, he says, is a jacking system on every fourth floor, starting at the 12th. When crews complete the welding of a four-floor tier, which has to be supported in a cambered position until welding is finished, they will release it. Beasley will use a laser measurement system to maintain the level of each four-floor tier. No

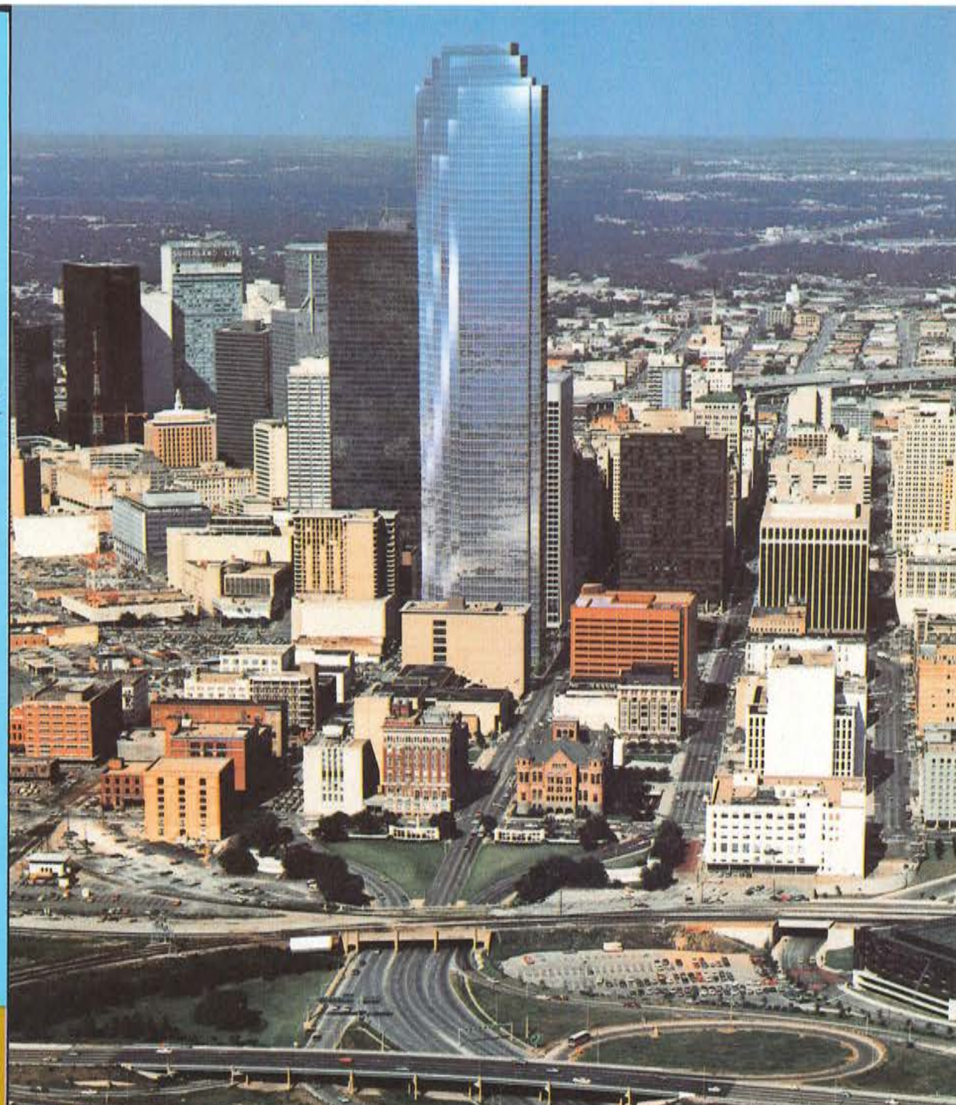
the site. Since the full block will be excavated to 30 ft, a system was needed to retain the earth and the live loads from traffic on surrounding streets. Following an investigation of four or five alternative methods, the designers and contractor settled on a precast slurry-wall system. Bencor Corp. of America, Dallas, is the contractor for this work.

Brockette says that the system—possibly being used for the first time in the U.S.—had the advantages of speed of construction, cost and smooth interior finish. Ramsey estimates that the system will save 30 days over more conventional retention systems.

The precast 10-ft-wide, 12-in.-thick concrete panels vary in length from 22 to 35 ft and will penetrate the rock 4 ft or more. They are placed in a 2-ft-wide trench, displacing bentonite slurry, at a rate of about 60 lin ft per day. The remaining 12 in. of the trench is filled with lean concrete. The



Steel frame takes load to composite columns.



InterFirst Plaza, to be tallest in Dallas, is outside height-restricted area.

more than nine floors below the steel frame erection crews, crews will be casting concrete around the steel for the 16 composite columns. Neal estimates that it will take Beasley one year to complete the steel erection.

Precast slurry wall. Another unusual feature of the project is the retention system. According to E. Ralph Ramsey, senior project manager for the construction manager, Austin Commercial, Inc., Dallas, rock is found about 23 ft below grade at

contractor is also incorporating prestressed tiebacks into the panels at about 10-ft centers.

At 72 stories, InterFirst Plaza and its future twin will be the tallest buildings in Dallas. This is possible because the site lies at the edge of the central business district area, where the Federal Aviation Administration has imposed height restrictions because of flight patterns from Dallas Love Field. The highest building to date in the city is 52 stories tall. ■