Cavity Shaftwall Systems Contribute to Century Long Growth of High Rise Building Technology

One hundred years ago, in 1886, the nine-story Home Insurance Building in Chicago was completed. Generally accepted as the world’s first skyscraper, the now-demolished structure symbolizes the beginning of a century of progress in tall building construction.

Over 6,000 skyscrapers—as defined by the Council on Tall Buildings and Urban Habitat — have been constructed during the past century. And there are at least two buildings on the drawing boards now which, when completed in the next decade, will rise more than 200 feet higher than Chicago’s Sears Tower, presently the world’s tallest building.

The phenomenal growth in high-rise technology can be attributed, for the most part, to two factors. First is the introduction of lightweight, high-strength materials, such as space-age plastics and new metal alloys. The second factor is the re-application of existing products to solve new problems, such as development of the I-Stud cavity shaftwall system.

Designed to replace heavier, more expensive masonry walls, the I-Stud cavity shaftwall system utilizes gypsum wallboard framed by metal studs and channels to enclose elevator shafts, stairwells and vertical service shafts. The shaftwalls incorporate built-in flex characteristics designed to withstand the positive and negative air pressure forces exerted by high-speed elevators.

Substantial Weight Savings . . .

The I-Stud cavity shaftwall system is a major contributor to the technology of high-rise buildings because it is four to five times lighter, and considerably less expensive than masonry enclosures and weighs approximately 10 pounds per square foot of wall compared to 40 or 50 pounds per square foot for a masonry wall. A weight savings of this magnitude rapidly translates into major dollar savings because buildings which utilize the cavity shaftwall system will require less structural steel and less extensive underground support pilings.

And interestingly, none of the fire-resistive qualities of masonry are lost, because the core of the gypsum panels in the cavity shaftwall system contains approximately 21 percent water by weight, creating a fire barrier with a two-hour rating from either side. When the shaftwall panel is exposed to fire, the water is slowly released as steam to effectively retard heat transmission.

An I-Stud cavity shaftwall system also goes up much, much faster than masonry. It can go up fast and easy during any season of the year. And the system is built from one side, one floor at a time, which eliminates the need for scaffolding.

This speed and ease of installation was demonstrated in the construction of the 1,600-room, 15-story Anaheim (CA) Hilton Hotel. Approximately 215,000 linear feet of I-Stud cavity shaftwall system were installed as the project moved from groundbreaking through completion in less than two years.

The I-Stud cavity wall system is typically installed utilizing inch-thick gypsum shaftliner panels inside a 2½” metal I-stud with integral tabs to hold the panels in place on the shaft side.
As an added benefit, use of the cavity shaftwall system increases the amount of leasable space in a building.

Metal J-track runners are used horizontally on the top and bottom and vertically at partition ends, and also to frame openings. Two layers of half-inch gypsum wallboard are then fastened to the outside of the stud, creating the wall side of the enclosure.

Development of the first gypsum shaftwall system came about just prior to construction of the twin World Trade Center Towers in New York, which in 1972, were the world’s two tallest buildings.

The architects and engineers who were designing the Trade Center asked the major gypsum wallboard manufacturers to develop a gypsum-based alternative to the conventional masonry elevator enclosures.

Since that time, gypsum shaftwall systems have become ‘standard equipment’ in nearly every medium and high-rise building project to come off the drawing boards.

In a recent application, the equivalent of 15 miles of cavity shaftwall was used to enclose the 32 elevators and numerous stairwells in the new Standard Oil Company (SOHIO) headquarters building in Cleveland, OH. The 45-story structure, pictured on the cover of this month’s Construction Dimensions/May 1986.
Dimensions, the city’s tallest, is located in the heart of downtown and serves as the focal point for a major redevelopment plan presently underway there.

Shaftwall systems are engineered to handle the flex created by positive and negative air pressure forces associated with high speed, high-rise elevators. At the SOHIO job site, manufacturer representatives worked closely with the elevator manufacturer, prior to the installation, to measure the amount of pressure the elevators would actually exert on the shaftwall surfaces.

“The architects originally thought the system would need to withstand 15 pounds of pressure,” he revealed, “but our testing confirmed that 10 pounds of pressure was more realistic. This allowed the use of a thinner gauge metal, saving SOHIO thousands of dollars,” according to Tom Dempsey, Gold Bond’s Cleveland district manager.

In Dallas, a cavity shaftwall system has been specified for use in the 60-story Allied Bank Tower now under construction. Designed by renowned architectural firms of I.M. Pei and Harry Weese, the 10-sided structure, enclosed with emerald green glass panels, looks like a modern art sculpture. With sloping sides and a pointed top, no two floors in the building are exactly alike.

More Interior Space . . .

In addition to the apparent construction benefits, developers and building owners will specify the cavity shaftwall system because it can be installed by the interior finishing contractor, eliminating the need for specialized tradesmen. As an added benefit, use of the cavity shaftwall system increases the amount of leasable space in the building.

Typically, a shaftwall system is only three and a half inches thick while the masonry equivalent is an eight-inch-thick block. In a large building, the difference between the two adds up to quite a significant amount of leasable space.

The benefits add up quite rapidly—superior fire resistance, tremendous weight savings, faster installation and an increased amount of leasable space—and they all translate into major savings in the ever-escalating costs of new building construction.