n 1854, Elisha Graves Otis demonstrated his “safety hoister” at the Crystal Palace Exposition in New York City. Ascending in his elevator in an open shaftway, he ordered the rope cut. The crowd gasped. The platform held fast. And the passenger elevator industry was born.

In the decades that followed, innovations in speed, power, and control enabled vertical transportation to advance with the growing urban skyline. Today, sophisticated, high-tech elevators successfully integrate thousands of parts and state-of-the-art electrical, mechanical and hydraulic sub-systems to move passengers at speeds up to 2,000 feet per minute in skyscrapers well over 1,400 feet high.

And there are high-rise structures now on the drawing boards which will rise more than 200 feet above today’s tallest buildings.

Much like high-rise technology, the art of elevatoring has not yet attained its ultimate form. This contention is reflected in the development of a $15-million research tower currently under construction by industry leader Otis Elevator Company. According to Otis, when the 29-story, Bristol, CT facility is completed this month, it will be the tallest, most ambitious one of its kind in North America.

The point at which elevatoring and high-rise technology intersect is, of course, the elevator shaft. Innovation in shaftwall construction, however, is a fairly recent occurrence. The Otis facility illustrates this well, a shaft enclosure system that offers tremendous weight savings, faster installation and superior fire resistance.

During groundbreaking ceremonies, With little need for floor space, the structure is little more than a metal-clad, 383-foot elevator core.
Oct. 17, 1985, George David, president of Otis, described the research tower as a “strategic investment” for Otis. “It is the most important one in terms of brick and mortar that we have made for some time.”

Experimenting...

Otis wanted the slender test tower to accommodate a wide range of elevator experiments under simulated operating conditions, but had little need for additional floor space. For this reason, the structure in final form is uniquely little more than a metal-clad, 383-foot elevator core.

The tower includes 11 hoistways, 10 for testing high-rise, mid-rise and low-rise elevators, plus an 11th elevator for servicing the tower’s test areas. A design using reinforced concrete was the simplest way to engineer the building, but Otis discounted concrete in order to expedite construction and enable optimum flexibility in partition arrangement.

For this reason, an all-steel design was specified, featuring an inner network of structural steel to handle local floor loads and an outer network of corner columns and diagonal bracing for general tower stability.

Architects Hellmuth, Obata & Kassabaum, Washington, D.C., initially envisioned an exterior skin of reflective glass, but ultimately opted for the industrial image of flint gray metal sheathing. For the building’s interior, the Gold Bond I-Stud Cavity Shaftwall System was elected to enclose the structure’s hoistways.

Featuring gypsum wallboard framed by metal studs and channels, the I-Stud System was designed by Gold Bond Building Products, Charlotte, NC, to replace heavier, more expensive masonry walls. It is four to five times lighter than masonry enclosures, and like new metal alloys and space age plastics, ranks as a contributor to the phenomenal growth of high-rise technology.

Contractor for installation of the I-Stud System was Partitions Inc., Newington, CT. According to Richard C. Christofer, president, the Otis tower utilized over 100,000 square feet of 1-inch gypsum shaftliner inside 4-inch metal I-studs with integral tabs to hold the 2 x 8-foot panels in place on the shaft side. Metal J-track runners are used horizontally on the top and bottom and vertically at partition ends, and also to frame openings. Completing the Gold Bond System, two layers of ½-inch Fire-Shield G gypsum board face panels, totaling 200,000 square feet, are fastened to the outside of the stud, creating the wall side of the enclosure.

Weight Savings...

Shaftwalls erected with the I-Stud System at the Bristol facility weighed only 10 pounds per square foot compared to 40 or 50 pounds per square foot for typical masonry walls. Weight savings of this magnitude rapidly translated into major dollar savings for Otis because less structural steel and less extensive underground support pilings were required.

The shaftwall system also went up much faster than masonry, accommodating Otis’ desire to hasten project completion. And because the system is
built from one side, one floor at a time, no hoistway scaffolding was required during installation.

In addition to facilities for hydraulic elevator prototyping and escalator testing, marketing offices, conference rooms and training facilities are also clustered at the tower’s base. These additions to the testing facility’s original intent changed the building’s classification from laboratory to business use, necessitating increased fire protection.

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**Fire Rating . . .**

The I-Stud System’s two-hour fire rating from either side of the partition satisfied this requirement. None of the fire-resistive qualities of masonry were lost using the Gold Bond enclosure system because the core of the gypsum panels contains approximately 21 percent water by weight. With exposure to fire, this shaftwall water content is released slowly as steam to effectively retard heat transmission.

Personnel from Otis’ Research and Development Center in nearby Farmington, CT will staff the new Bristol test tower. As David summarized, “Our new research facility will ensure that Otis meets market demands with not only the most innovative products, but also with the most reliable and efficient.”

Because of its overwhelming emphasis on elevator technology, the Otis facility is a perfect showcase for a shaftwall enclosure system that blends elevating art with high-rise construction. Although the Gold Bond I-Stud Cavity Shaftwall System is a recent highlight in elevating’s 130-year history, the benefits of faster shaftwall installation, weight savings and superior fire resistance are helping to shape the future of skyscraper and elevator technology.