

people to know

DELAYED REACTION

As a Princeton engineering student, Diane Hartley unearthed a design flaw in a prominent Manhattan skyscraper project—the importance of which remained a secret for nearly two decades.

IN TODAY'S WORLD of social media, omnipresent cameras and the widespread tendency to trumpet one's successes (and sometimes failures), great accomplishments are noticed and broadcast immediately, and credit is given—often self-appointed—where credit is due.

Things were different in the '70s. Back then, for example, an ambitious engineering student might have shed light on a design error, overlooked by experienced engineers, that saved a Manhattan skyscraper from eventual collapse—and not be acknowledged for several decades.

Of course, the same type of thing could happen today. But whether a sign of the times, an oversight or a situation of someone or something “slipping through the cracks,” the above scenario did indeed take place.

The ambitious engineering student was Diane Hartley, initially an architecture and urban planning major at Princeton University. Hartley, who loved math and science—and was quite good at both subjects—didn't give much consideration to structural engineering early on.

“In the '70s, ‘engineering’ wasn't part of a guidance counselors' vocabulary for girls,” Hartley says.

However, after her sophomore year at Princeton, she landed a summer job with a structural engineering firm (thanks to her typing skills) where she edited design-related documents and showed an aptitude for the profession. At the end of the summer, her boss told her that he'd like to see her study engineering.

And so she did. As a matter of fact, Princeton had a program that combined her initial focus on architecture and urban planning with civil engineering. Hartley enrolled in the program, which required an undergrad thesis during the senior year, and it was working on her thesis that led her to her discovery.

For her thesis, which was to focus on an existing structure, Hartley wanted something that was tall, unique and in a dense,

urban environment. She chose the recently opened Citicorp Center (now the Citigroup Center) in Manhattan, as it met all of her criteria. The 915-ft-tall building, completed in 1977 and designed by LeMessurier Consultants (called LeMessurier Associates at the time), sits on four 114-ft-tall columns positioned at the center of each side of the building rather than at the corners. This unorthodox design provided an open area at the tower's base as well as allowed one of the corners to cantilever over a church on the site, a condition dictated by the church (the existing church was actually demolished, but a new one was built in its place).

David Billington, one of Hartley's professors and also her thesis advisor, encouraged her to be as hands-on as possible with her thesis—maintaining a close relationship with LeMessurier Associates, reviewing drawings and doing her own calculations by hand to compare to the actual calculations from the structural design. In doing so, she made a rather alarming discovery: the unique design was susceptible to quattering winds (which were relatively unknown at the time). Initially, LeMessurier wasn't concerned, as they thought the building had a safety factor of at least 2. Still, Citicorp was impressed with her thesis and initially even offered her a stipend to turn it into a book, an opportunity she says, “would have deferred me from having to get a real job for a little while.” And that was that for her.

The book deal didn't pan out, and upon graduation in 1978 Hartley took a job as a structural engineer with TY Lin Associates in San Francisco. She went on to spend several years in engineering, eventually returning to the Washington, D.C., area. She worked mostly on transit and infrastructure jobs, including projects for the Washington Metropolitan Area Transit Authority and Amtrak. In the mid-1980s, she earned an MBA from the Harvard University Graduate School of Business Administration and switched her focus from engineering to real estate development. When the real estate market declined in the early 1990s, she went



- ◀ **Far left:** The base of Citigroup Center in Manhattan.
- ◀ **Left:** Hartley, “the student.”

back to engineering for a few years, this time for the U.S. General Services Administration (GSA), then eventually found her way back into real estate development. There was much more, though, to the Citicorp Center story (as explained in “The Fifty-Nine-Story Crisis” in the May 29, 1995 issue of the *New Yorker*).

However, it wasn’t until the mid-1990s that Hartley realized the importance of her discovery. She was at home, putting one of her two sons to bed, and her husband was watching a TV documentary—on the Citicorp Center structural flaw that was discovered, repaired and unknown until much later. When he called her to the TV, she watched as the documentary credited an unknown New Jersey engineering student for saving the building from potential disaster.

“I nearly dropped my son,” she recalls.

While the safety factor was initially thought to be at least 2, it was later discovered that a late design change, from welded to bolted joints, actually put the safety factor at closer to 1. And worse, the building could not be shown to be able to withstand the wind loads it was previously thought to be able to handle. It was at high risk for collapse in a high-wind event, like a hurricane.

Once the problem was discovered (in 1978), two-in.-thick steel plates were welded over the bolted joints in an emergency procedure conducted throughout the building. The crisis was averted—and the story did not reach the public for nearly two decades.

“My husband told me, ‘The greatest thing you ever did, you didn’t even know you did,’” she says.

The documentary referred to the unknown engineering student as a “he,” but Hartley had her suspicions. She immediately thought to look back at her thesis but didn’t have a copy at the time, having lent it to a friend with a strong interest in skyscrapers. And once again, that was that—until 2003, that is.

That year, she attended an event honoring her old professor, Dr. Billington. At dinner, she was seated next to Billington, and he asked her, “Do you know why you’re sitting here?”

Billington went on to explain that no one was aware of any other New Jersey engineering student that had any connection with the Citicorp Center project at the time the error was discovered. “It was most likely you,” he told her.

The Citicorp story and William LeMessurier’s ethical example have gone on to become one of the most studied cases in engineering ethics. And though she was not credited by name until later, there has been a growing interest in Hartley’s role in the saga since the initial realization. This has ranged from inquiries from engineering professors who use the story as a case study to teach ethics, to attorneys who similarly use the story in corporate seminars. And in 2011, Caroline Whitbeck of the National Academies of Science posted an addendum, “The Diane Hartley Case,” to the National Academy of Engineering’s Online Ethics Center’s case study (www.onlineethics.org/cms/24528.aspx). Most recently, Hartley was interviewed by a team preparing a documentary on engineering projects that left their mark on the profession. And of course, the topic is always a fun one at social gatherings whenever engineers are present; Hartley enjoys their response after springing the fact that she was “the student.”

Hartley has remained in the real estate world and most recently has established a boutique real estate consulting practice that couples strategic planning and business development. Her two sons are fully grown now. One is currently studying mechanical engineering at Boston University and appears to want to follow in his mother’s footsteps in terms of career—and also averting crises. He even maintains a Facebook page where he posts about D.C.-area public transportation issues (“Hub and Spoke” at www.facebook.com/hubspoke).

“He wants to save the world through public transportation,” says Hartley.

If he does, there’s a good chance he’ll post about it.

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