Engineering Ethics: Citicorp Center - The Engineering Disaster That Didn't Happen

An Online Continuing Education Course for Engineers

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Credit: 1 Hour / 1 PDH / 1 CPD

Engineering Ethics: Citicorp Center – The Engineering Disaster That Didn't Happen

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Prologue

When New York City's Citicorp Center was completed in 1977, it was celebrated as one of the most innovative designs of its time. The work of William LeMessurier (pronounced "Le-Measure"), the skyscraper's lead structural engineer, was already well known. Having studied architecture at Harvard's Graduate School of Design and receiving a master's degree in building engineering and construction from Massachusetts Institute of Technology (MIT), he was attentive to both aesthetics and engineering.

The sleek Citicorp building was one of LeMessurier's favorite projects. Its distinctively sloped roof dominated the Manhattan skyline. The Midtown Book describes it as "Easily the most important new building project in New York in the 1970's because of its sheer size, the prominence of its developer and its high visibility. Citicorp Center is the most dramatic skyscraper to be erected in midtown since the Chrysler Building and the raising of its tower on stilts was one of the most daring designs to be completed in the city's history."[i]

Early in 1978, LeMessurier was elected to the National Academy of Engineering, one of the highest honors in the engineering profession. He had a highly successful engineering company, William LeMessurier and Associates, and taught a structural engineering class to architecture students at Harvard.

Then, in June of 1978, LeMessurier received a fateful phone call. He met the inquiry from the New Jersey engineering student with amusement and condescension. The student was writing a paper on the Citicorp building and questioned the placement of the columns and their ability to withstand a quartering wind. The student's professor had reviewed the paper and calculations and was in agreement. According to LeMessurier, his response was "Listen, I want you to tell your teacher that he doesn't know what the hell he's talking about, because he doesn't know the problem that had to be solved."[ii]

However, a horrified LeMessurier came to realize in the ensuing days that the student was correct.

Introduction

LeMessurier faced a predicament in which he feared his career and professional reputation would be destroyed and he would face litigation and bankruptcy. He considered a variety of options, ranging from suicide, to silence, to informing the client. After an internal struggle, he formulated a plan, contacted Citicorp, and worked with a crisis team to retrofit the deficient joints. The details of the case were carefully obscured from the public for 20 years, until writer Joe Morgenstern uncovered the story and published *The Fifty-Nine Story Crisis* in the New Yorker in May 1995.

Contrary to his worst fears, LeMessurier was acclaimed a hero after publication of the story. Any discussion of LeMessurier and his life's work today includes a recounting of the Citicorp crisis and the actions that he took to avoid a catastrophic failure. It is used as a story of what went right: LeMessurier developed a plan, contacted his associates and client, and worked with the team to implement safety and remediation plans.

As he once told a Harvard class, "You have a social obligation. In return for getting a license and being regarded with respect, you're supposed to be self-sacrificing and look beyond the interests of yourself and your client to society as a whole. And the most wonderful part of my story is that when I did it, nothing bad happened."[iii]

Course Objectives

This course will explain the factors and decisions that lead to the inadequacy of the Citicorp building's structural support. It will also discuss the actions taken by LeMessurier and the crisis team to safeguard the public and correct the deficiencies.

Most discussions focus on the exemplary aspects of the LeMessurier's actions in the Citicorp case. This course will indeed apply the NSPE Code of Ethics to examine LeMessurier's laudable decisions. However, other sections of the Code relate to the case and some critics question if LeMessurier adequately addressed all of his ethical obligations. Some aspects of the Code may even appear to conflict with each other in LeMessurier's case. This course will present the criticism and discuss it in light of NSPE Case No. 98-9. The NSPE ethics case was released three years after the New Yorker article and, while anonymous, outlines a fact pattern that is nearly identical to the Citicorp case. The reader is encouraged to formulate his/her own opinion on the ethical response and apply it to his/her own practice.

NSPE Code of Ethics for Engineers

Below is a list of the Canons of the NSPE Code of Ethics that are applicable to this case.

I. Fundamental Canons

Engineers, in the fulfillment of their professional duties, shall:

1. Hold paramount the safety, health, and welfare of the public.
2. Perform services only in areas of their competence.
3. Issue public statements only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.

II. Rules of Practice

3. Engineers shall issue public statements only in an objective and truthful manner.
    a. Engineers shall be objective and truthful in professional reports, statements, or testimony. They shall include all relevant and pertinent information in such reports, statements, or testimony, which should bear the date indicating when it was current.

III. Professional Obligations

1. Engineers shall be guided in all their relations by the highest standards of honesty and integrity.
    a. Engineers shall acknowledge their errors and shall not distort or alter the facts.
    b. Engineers shall advise their clients or employers when they believe a project will not be successful.

3. Engineers shall avoid all conduct or practice that deceives the public.
    a. Engineers shall avoid the use of statements containing a material misrepresentation of fact or omitting a material fact.

4. Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve.

Citicorp Center Under Construction

History of Citicorp Center[iv]

Known then as Citibank, the bank had been housed at 399 Park Avenue since 1961, but was outgrowing its space. The Citibank building was directly across Lexington Avenue from what is now Citicorp Center. St. Peter's Lutheran Church on Lexington was considering selling its property on the northwest corner of Lexington, between 53rd and 54th Streets. Donald Schnabel and Charles McArthur, brokers with the real estate company of Julien J. Studley & Co., pitched Citicorp on the idea of setting up several corporations to buy the properties adjacent to the church. The strategy was designed to hide the identity of the purchaser and avoid driving up real estate prices. The purchase of the city block eventually entailed five years and $40 million.

Two retail tenants, Howard Johnson's coffee shop and Carroll's Pub, insisted on remaining in their locations until their leases ran out. The architect was instructed to erect the building around them, if necessary. The buildings would be demolished later.

The deteriorating St. Peter's Church was built in 1905. Citicorp purchased air rights from the church and agreed to demolish the structure and rebuild one in the same location. The Citicorp building was to be built around it, leaving the new church completely freestanding from the skyscraper. The bank built the shell of the new church and paid St. Peter's $9 million.[v]

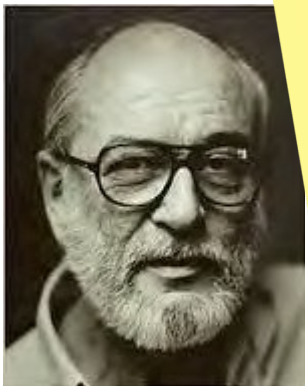
Citicorp Center standing over St. Peter's church

The Design

Hugh Stubbins and Associates, design architects, and Emery Roth and Sons, associate architects, designed the Citicorp building. William LeMessurier and Associates was the structural engineering company.

The cost of the project was estimated to be $175 million. The building was constructed of concrete and steel, with aluminum and reflective glass facing materials. The building rose to 59 stories and 915 feet, making it one of the largest in the world. The audacious structure was built on 9-story tall stilts, which towered over the pre-existing buildings directly below. Four massive columns were situated at the center of each side, allowing the building to cantilever 72 feet over St. Peter's Church. Because the design had so much open space at the ground level, it skirted zoning laws and was built to heights that ...uld not otherwise h...ve been permitted.

The concrete cent... ...he building, and the four 127-foot colu... ...osition over and around the church, ...lumns could not be placed on the corne... ...racing was used to resist gravity. LeM... ...races, which channeled the load t... ...d columns.



William LeMessurier

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The original ...hey didn't meet ...g's mechanical ...mass damper.

The Tuned Mass Damper

The Citicorp building was the first skyscraper in the US to utilize a tuned mass damper, a pendulum-like device that counterbalances wind and reduces the building's sway.

LeMessurier designed the tuned mass damper after consultation with Alan Davenport of the University of Western Ontario and Robert Scanlon, then at Princeton University. Davenport was one of the world's leading experts on wind resistance of structures and Scanlon had done research on bridge damping.