

Skyscraper Superstar

Leslie Earl Robertson

By Richard G. Weingardt, P.E.



Leslie E. Robertson.

Topping the hierarchy of the pantheon of skyscraper designers stands the world-renowned California-born structural engineer Leslie “Les” Robertson. Responsible for the structural design of hundreds of spectacular high-rises around the world, his cutting-edge work has helped set today’s standards for the design of large-scale structures. Among his prominent tall building designs are the World Trade Center (New York), U.S. Steel Headquarters (Pittsburgh), Century Plaza Hotel (Los Angeles), Shanghai World Financial Center (China) and Bank of China Tower (Hong Kong).

A creative pioneer and visionary for new engineering concepts and applying computers in design, Robertson’s work has greatly advanced the art and the science of structural engineering theory, not only for skyscrapers but also for long-span roofs, domes and bridges. *Engineering News-Record* (ENR) named him its Man of the Year in 1989 – featuring him on the cover of its publication – for his innovations and “pioneering new design concepts.”

In that regard, Robertson is quick to point out that “innovation should not be sought for its own sake. Nor should it be undertaken unless substantial rewards and the full understanding of clients and investors are

realized. Innovation is what happens while in the design process. The goal is to design great buildings in the total sense – to meet societal, artistic, structural and financial goals.”

When innovating, he urges up-and-coming young engineers “always [to] understand the big picture and the costs, as well as your own part, of each project. Make sure that whatever you design can be built or produced. At the end of a project, always ask yourself, ‘How could I do it differently and better next time?’”

Les was born in southern California on February 12, 1928, the second son of Garnet Roy Robertson and Zelda (Ziegel) Robertson. He was named after the movie star Leslie Howard, a family friend. Howard, originally an English and Broadway stage actor, proved to be a natural for the talkies in the early 1930s because of his excellent stage-trained voice. He will forever be remembered for his role as Ashley Wilkes, the honor-bound, disillusioned, intellectual Southern gentleman, in the 1939 movie *Gone with the Wind*. Howard died in 1943 when his namesake was only 15 years old.

Les’s older brother, Taylor Donald Robertson, earned his living as a forester. The two boys’ father did a little of everything, including inventing things for use in whatever field

he was in at the moment. According to Les, he spent time in Chicago “as an acoustician changing lovely old vaudeville theaters into cinemas.” He characterized his father as “being an inventor, machinist, manager, rancher, salesman and seaman, with lots of stops between. He had a wonderful ability to see things. Little escaped his vision.”

Les dropped out of high school when he was 16 to enter the U.S. Navy, where he was an electronics technician’s mate. Following World War II, he attended the University of California at Berkeley on the G.I. Bill. He allowed that, without the Bill, he would never have been able to afford a college education from such a prominent university. His major areas of concentration at Berkeley were mathematics, electrical engineering and civil engineering, in that order. In addition, Les was influenced by the university’s activism and anti-establishment elitism. He said, “It taught me a lot about broader goals, personal freedoms, and people.”



Shanghai World Financial Center, China.



Bank of China Tower, Hong Kong.

When Robertson graduated with a bachelor of science in 1952, he was 24 years old, restless, eager and in search of his destiny. He began by working for three well-established California-based engineering firms – Kaiser Engineers (1952-4), John Blume and Associates (1954-7), and Raymond International (1957-8).



IBM Building, Pittsburgh, PA.

Said Robertson, “My first job after graduation was as a mathematician. Using mathematical tools rare for electrical engineers at the time, I worked out the distribution of electrical power in large (for me) power grids. Then I got interested in catenaries, length of insulators, distance between anchor towers and the like. Again, I relied on the mathematical tools not carried by others in the design team. After sorting out that issue, I addressed the dynamic loads on the anchor towers, then the design of the towers themselves. With that experience, I became a structural engineer.”

After his first jobs in California, Robertson found his way to Seattle in 1958, at a progressive consulting engineering company then called Worthington Skilling. “I had great opportunities there,” Robertson remembered. A landmark project for him was engineering the Federal Science Pavilion at the Seattle World’s Fair for architect Minoru Yamasaki, which started off a long relationship.

Robertson became a partner in the Seattle firm when it was reorganized.

In 1963, it was renamed Skilling Helle Christiansen Robertson (SHCR), a name that would last 19 years. At the time, he was 35 years old; the same year, SHCR opened a New York City (NYC) office to execute a Yamasaki mega-project – the World Trade Center (WTC). Robertson became the partner in charge of the NYC office, moving to the “Big Apple” and directing the engineering of the WTC’s two towers – one 417 meters high and the other 415 meters high.

When the Seattle and NYC offices split in 1982, Robertson renamed his east coast operations Leslie E. Robertson Associates (LERA). Today, his partners are William Faschan, SawTeen See, Daniel Sesil and Richard Zottola, and his firm serves clients on five continents. Its projects, both overseas and domestically, range from the monumental to the moderate. Award-winning super-tall buildings and long-span structures have become the firm’s trademarks.

Feeling especially at home in southeastern Asia, Robertson’s business trips in the first part of 2007 included stops in Dubai, Hong Kong, Lahore, Macao, Shanghai and Qatar. His current projects include the Museum for Islamic Art in Doha, Qatar, and the Macao Science Center in Macao, China, both with architect I.M. Pei.

Robertson, who is licensed as a First Class Architect and Professional Engineer in Japan, is also registered as a Structural Engineer in California and a Professional Engineer in New York. He holds four patents, two in the U.S. – one for a viscoelastic damper for buildings and one for elevator cable dampers. In Japan, he has a patent for a long-span structural system and, in Europe, a patent for a cable stabilization system.

One of LERA’s most celebrated skyscrapers built in the late 1980s was the Bank of China Tower, Hong Kong. At one time, this 369-meter-high structure was the world’s tallest building outside of the U.S., and the tallest with a composite structural system. Robertson designed the building’s central composite steel and concrete system to take



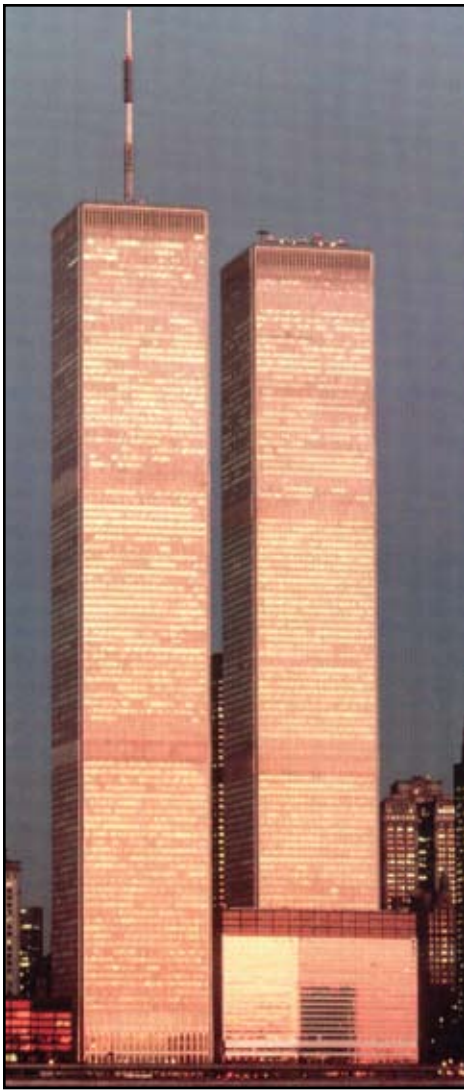
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World Trade Center, New York, NY.

the lion's share of the lateral and gravity loads. Its giant diagonals, which are also part of the wind and gravity system, are steel box members filled with concrete. The composite action of the concrete in various structural elements created a space frame structure that required only 50 percent as much steel as typical frame buildings.

In addition to the WTC and Bank of China towers, within Robertson's extensive portfolio of significant works are several favorites listed here. (The comments following each are Robertson's.)

- Shanghai World Financial Center, China. "The bringing together of so many of the concepts of the past into a 492-meter-high building."
- IBM Building, Pittsburgh, PA. "Perhaps one of the first uses of a 'diagrid' and the first use of the full range of yield points in structural steel to 100 ksi."
- U.S. Steel Headquarters, Pittsburgh, PA. "The mega-structure in structural steel, that outrigger hat truss (borrowed

from the World Trade Center), liquid-filled columns and a host of new ideas."

- Meyerson Symphony Center, Dallas, TX. "Such a lovely building, with a very simple complexity."
- Miho Museum Bridge, Shigaraki, Japan. "Post-tensioned structural steel used to create a light and airy bridge. And that beautiful porous bridge deck."

Much sought-after for speeches, Robertson said, "Each year, both domestically and overseas, I deliver a dozen or so seminars, lectures and the like. In 2006, I spoke in places like Chile, Germany, Hong Kong, Kazakhstan, the Netherlands, Mexico, Romania and the United Kingdom." Within in the U.S., he has made presentations at numerous universities, including California, Illinois, Cornell, Johns Hopkins, Notre Dame and Stanford. Named lectures he has delivered include Yale's Gordon Smith, MIT's Felix Candela and George Washington University's Frank Howard.

Robertson is the author of more than 300 papers on structural, earthquake and wind engineering. He also teaches sessions at Princeton University, where he is the professor for one undergraduate class and one graduate-level class. His subject is the design of large-scale structures. Said Robertson, "For my students, I teach the obvious and the fundamentals – and the premise that if you wish to become good at something, you practice, practice, practice, and you always chase the better idea."

Certain of the impact the profession can make in society, Robertson advocates that engineers get involved beyond engineering. He said, "It seems to me that if engineers of today would develop broader interests, they'd better be able to make our world a better place. When you're not involved in non-engineering activities, you're not living. I would counsel all engineers to get out from behind their computer screens and participate in the vital, rough-and-tumble world that swarms about us. Giving five hours a week to a cause beyond personal gain and family is not an unreasonable goal."

Active in many professional organizations, Robertson is an honorary member in the American Society of Civil Engineers (ASCE), American Institute of Architects/New York Chapter, Structural Engineers Association of New York and National Society of Romanian Engineers. He is a member of the National Academy of Engineering, Architectural Institute of Japan, Japan Structural Consultants Association and Architects, Engineers, Planners for Social Responsibility, a group that educates the public about the danger of nuclear war.

Robertson is a fellow in the Singapore Structural Steel Society and New York Academy of Sciences, and an honorary fellow in the Tokyo Society of Architects and Engineers. He is also on the Committee on Human Rights of Scientists for the National Academy of Sciences, where he is an associate member.

Robertson was founder and past chairman of the Wind Engineering Research Council. He serves (or served) as a director for the Architectural League of New York, Skyscraper Museum and MacDowell Colony (the nation's oldest artists' colony). He was chairman of the Council of Tall Buildings and Urban Habitat for three years, and a member of the Committee on Bombing Preparedness for the Japan Institute of Architects, and the Commission on Engineering and Technical Systems for Federal Construction Design Criteria.

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U.S. Steel Headquarters, Pittsburgh, PA.



Meyerson Symphony Center, Dallas TX.

The university engineering advisory boards on which he has served include Columbia, Penn State and California at Berkeley. He holds honorary degrees from four institutions – Lehigh (Doctor of Engineering), Notre Dame (Doctor of Engineering), Rensselaer (Doctor of Engineering) and Western Ontario (Doctor of Science).

Among his many awards and honors are:

- Distinguished Engineering Alumnus, University of California at Berkeley.
- Gengo Matsui Prize.
- Henry C. Turner Prize for innovation in construction technology (presented by the National Building Museum and Turner Construction).
- ASCE's Raymond C. Reese Research Prize.
- OPAL Award for lifetime contributions in design from ASCE.
- J. Lloyd Kimbrough Award from the American Institute of Steel Construction.
- Mayor's Award for Excellence in Science and Technology from NYC.
- John F. Parmer Award from the Structural Engineers Association of Illinois.
- Honor Award from the American Institute of Architects/New York Chapter.
- Named one of the top 20 structural engineers in the world over the last 125 years by ENR.

When Robertson and his wife SawTeen See are not traveling, they reside in either their high-rise apartment in NYC or their home in Connecticut. See, a native of Malaysia and a noted structural engineer herself, is managing partner in LERA and partner-in-charge of many of the firm's projects. The two, who

were married on August 11, 1982, are both Honorary Members in ASCE, the first husband and wife ever to be honored this way.

Robertson is the father of four children – Jeanne Allyson, Christopher Alan, Sharon Miyuki and Karla Mei. Chris is a geotechnical engineer, and Karla Mei is a recent graduate of Stanford in product design. Self-confident, intense and candid and, when relaxed, introspective and philosophical, Robertson loves listening to Brahms and following other pursuits soothing to the soul. Over his life, his hobbies have included skiing, sailing iceboats, wind surfing, mountain climbing and race car driving.

An acknowledged leader and believer of the engineering profession, Robertson allows, "I'm overly supportive of structural engineering as a career because the profession has been so good to me. Being a structural engineer brings a level of personal satisfaction not found in other disciplines, and does so at all levels of achievement, at all levels of salary, and at all levels of longevity in the profession. At what other endeavor can one be engulfed in the joy of seeing one's efforts molded into a modern masterpiece? And getting the sensation, 'Hey, I did that!'"

At age 79, the self-proclaimed "workaholic" structural superstar points out, "I still average 240 hours a month on my time sheet." And he enjoys every minute of being a structural engineer, championing creative and efficient engineering systems. ■

Richard G. Weingardt, P.E., Chairman, Richard Weingardt Consultants, Inc. Denver, CO. He is the author of eight books. His latest Engineering Legends, published by ASCE Press, features numerous great American structural engineers. Weingardt was the 1995-96 national president of ACEC. He can be reached at rweingardt@aol.com.

All photos are courtesy of Leslie E. Robertson Associates (LERA).



Miho Museum Bridge, Shigaraki, Japan.