LEONARDO ZEEVAERT WIECHERS

1914–2010

Elected in 1978

"Analysis, design, and construction of tall, heavy structures on difficult foundations in severe seismic environments."

BY WILLIAM H. HANSMIRE

LEONARDO ENRIQUE ZEEVAERT WIECHERS, professor emeritus of the Universidad Nacional Autónoma de México (UNAM; National University of Mexico), passed away in Mexico City on February 16, 2010, at age 95.

He was born in Veracruz, Mexico, on November 27, 1914. A strong student in math and physics, he became interested in engineering during his high school studies in San Idelfonso. He obtained a civil engineering degree from UNAM in 1937 and, after a stint with the National Highway Commission, resumed his studies. In 1940 he got a master's degree in Structures and Soil Mechanics from the Massachusetts Institute of Technology, where he also assisted in the hydraulics laboratory. Back in Mexico, he was recommended by one of his MIT professors to work on a local project with Karl Terzaghi, who invited him to collaborate at the University of Illinois at Urbana-Champaign, where he earned his PhD in civil engineering in 1949.

In his professional practice as a consulting engineer, he carried out soil mechanics surveys and performed analysis and design of structures and foundations for nearly 700 projects during his career of more than 50 years. He developed several foundation systems for highly compressible soils such as those encountered in Mexico City, including the concept of

intergranular viscosity to explain and calculate the phenomenon of secondary consolidation.

In the technical area of soil mechanics and foundation engineering, he developed a number of calculation procedures and tools, introduced the basic theory of compensated foundations combined with friction piles, and proposed a new method to estimate negative skin friction on point-bearing piles. He extensively studied the seismic behavior of the soil-foundation-structure complex. He designed the free torsion pendulum to be able to estimate in the laboratory the dynamic modulus of rigidity of the soil and thus determine the speed of shear and surface seismic waves. This work earned him Mexico's National University Award in Technological Innovation in 1989.

One of the most important projects in which he was a leading participant was the Latinoamericana Tower, a 44-story building in Mexico City for which he conducted soil mechanics studies and designed the foundation. He was also the consulting engineer and director for the design of the steel structure, where the concept of controlled flexibility was applied for the first time (1947–48). At the time of its construction (completed in 1956), it was the tallest building in Latin America.

Dr. Zeevaert developed a new procedure for the construction of buildings, eliminating columns in the facade to provide more architectural flexibility at the ground floor level. These ideas were introduced in the design of the headquarters of Compañía de Seguros Monterrey (1960) and Celanese Mexicana SA (1968), both built in Mexico City.

He did the analysis and design of foundations for electric power turbine generators at several industrial plants and provided advice for the foundation design of an atomic energy plant in San Jose, California.

He was also active in the field of coastal engineering, studying wave action on the coastline and hydraulics of marginal lagoons. He designed harbors and marinas for small boats at various sites in Mexico.

In some of his most important research Dr. Zeevaert sought to develop improved analysis methods for different foundation systems and to forecast the seismic behavior of building

foundations and superstructure. The innovative methods that he developed to assess interactions between soil and structure are still used worldwide.

For the first time in Mexico City he recorded earthquakes (May 11 and 19, 1962), making it possible, using the seismic records of those magnitude 7 earthquakes, to define the response spectra of the subsoil in the downtown area. These data were subsequently used in the preparation of the building code for seismic design in the city's Federal District.

He also developed a method to determine subsoil resonance periods, for use in the design of tall buildings subjected to seismic forces, and sought in his research to solve problems in coastal engineering and in dewatering systems.

In addition to his substantial technical work, he was the first professor of soil mechanics and foundation engineering at UNAM's School of Engineering. After teaching at the undergraduate level (1941–71) he joined the graduate faculty, where he introduced a course on Seismic Design of Foundations. He continued teaching until 2000, including as emeritus professor after 1985.

He wrote more than 200 papers on diverse topics of soil mechanics, foundation engineering (now referred to as geotechnical engineering), and earthquake engineering. He authored the books *Foundation Engineering for Difficult Subsoil Conditions* (Van Nostrand Reinhold, 1974), *Interacción Suelo-Estructura de Cimentaciones Superficiales y Profundas Sujetas a Cargas Estáticas y Sísmicas* (Limusa, 1980), and *Seismo-Geodynamics of the Ground Surface* (Editoria e Impresora Internacional SA de CV, 1988).

In recognition of his expertise, Dr. Zeevaert was appointed an official delegate to a number of international conferences and presented his work in various technical forums. He was also invited to deliver lectures and courses on soil mechanics and earthquake engineering at universities in the United States, Europe, Central and South America, the West Indies, Taiwan, and the People's Republic of China.

He was nationally and internationally recognized for his considerable contributions. The American Institute of Steel Construction honored him with a prize for the resilience of the

Latinoamericana Tower during the magnitude 7.9 earthquake of 1957 in Mexico City. This prize was the first awarded to the tallest building outside the United States subjected to a strong earthquake and built on difficult subsoil. In 1964, for the time capsule to be buried during the World's Fair in New York, he was invited to supply information on advances in civil engineering. In 1965 he received the gold Allied Professions Medal from the American Institute of Architects. He was an honorary member of the Royal Academies for Science and the Arts of Belgium and a foreign associate of the US National Academy of Engineering. In 1987 the American Society of Civil Engineers (ASCE) selected him to deliver the Terzaghi Lecture at the convention in Anaheim, CA.

He was a member of the Asociación de Ingenieros y Arquitectos de México, Colegio de Ingenieros Civiles de México, American Concrete Institute, ASCE, Geological Society of America, Seismological Society of America, Earthquake Engineering Research Institute, and Sociedad Mexicana de Mecánica de Suelos (now Sociedad Mexicana de Ingeniería Geotécnica), for which he was a founding member and president from its establishment in 1954 until 1968. He also served as vice president for North America of the International Society for Soil Mechanics and Foundation Engineering (1961–65).

He enjoyed athletic engagement and, after youthful participation in soccer, boxing, and swimming, became proficient in golf in his later years.

His wife Celia Alcántara Sordo-Noriega died in 1995. They are survived by their two daughters and three sons: María Celia Zeevaert Alcántara (husband Alberto Peniche Echánove), Leonardo Ángel Zeevaert Alcántara, Alejandro Zeevaert Alcántara, Leonardo Zeevaert Alcántara (wife María del Rosario Zardáin), and N. Zeevaert Alcántara.

A man of great integrity and discipline, he was dedicated to his native country and revered by colleagues and students.