THOMAS R. KUESEL

1926–2010

Elected in 1977

"For innovations in the design of long-span bridges, immersed tunnel-tubes, and other special transit structures, and contributions to seismic design of underground structures."

BY JAMES L. LAMMIE

THOMAS ROBERT KUESEL, an internationally recognized authority on tunnel and bridge engineering and a former partner and director at Parsons Brinckerhoff (PB), died on February 17, 2010, at the age of 83 after a lengthy illness.

During a 43-year career with PB, Tom contributed to the design of more than 130 bridges and more than 140 tunnels in 36 states and on six continents. As one of the great PB engineers of the last half-century, he was often recognized for his unique and innovative solutions to structural and underground challenges.

Tom was born on July 30, 1926. He graduated from Yale University in 1946 with highest honors in civil engineering at the age of 19 and received a master of civil engineering from Yale in 1947 at age 20. He was a member of Tau Beta Pi, the national engineering honor society.

In 1947 he joined Parsons Brinckerhoff Quade & Douglas as a junior engineer and worked his way up to chairman of the board in 1984. He retired in 1990 but continued on as chairman emeritus and consulting engineer.

Tom was very active in his profession and fulfilled his personal obligation to communicate his ideas, experiences, and concerns through more than 60 widely circulated papers and presentations. While listing the detailed citations is not

appropriate here, the breadth of topics is illustrated by a few titles: "Whatever Happened to Long-Term Bridge Design?," "Improving Contracting Methods," "A Tale of Three Tunnels," "Alternative Concepts for Undersea Tunnels," "Earthquake Design for Subways," and "Underground Structures—Designing for Constructability." Tom was also coeditor of *Tunnel Engineering Handbook,* first published in 1982 (Van Nostrand Reinhold Co.), the only comprehensive textbook covering the design and construction of virtually every type of tunnel.

In addition to many publications, his actions to improve the profession of engineering led to his active participation in many professional organizations, including the National Academy of Engineering, American Society of Civil Engineers, American Consulting Engineers Council, International Association for Bridge and Structural Engineers, The Moles (fraternal organization of the U.S. heavy underground construction industry), British Tunneling Society, Structural Engineers Association of California, and the American Railway Engineering Association. He was also a registered professional engineer in 21 states.

Tom's broad background was recognized by his selection to participate in many special committees such as:

- Steering Committee and Charter Member, U.S. National Committee on Tunneling Technology, for the report *Better Contracting for Underground Construction,* 1974
- Steering Committee, American Society of Civil Engineers (ASCE) Conference on Construction Risks and Liability Sharing, Scottsdale, Arizona, 1979
- Senior advisor to the Underground Technology Research Council for its "Guidelines for Tunnel Lining Design"
- International Advisory Committee for the International Conference on Cable-Stayed Bridges, Bangkok

- American Association of State Highway and Transportation Officials Advisory Committee for Development of "Guidelines for Vessel Collision Design of Highway Bridges," 1987–1990
- Geotechnical Board of the National Research Council, Chairman, 1988–1989
- Chairman of the National Research Council Marine Board Committee on Ship-Bridge Collisions, 1982–1983

In addition to his many committee appointments, Tom was recognized with awards from professional engineering societies. He considered his election to the National Academy of Engineering in 1977 to be the greatest recognition. He was also designated an honorary member of the American Underground Construction Association and received the Golden Beaver Award in 1989 from the Beavers, the West Coast heavy construction honorary association. In 1988 he received the Ernest E. Howard Award for Structural Engineering from the ASCE.

Tom was often referred to as an "engineer's engineer" because of his vast knowledge and experience and his willingness to mentor others. He was a real believer in the "observational method of design," which recognized the importance of the continuing interaction of the structural engineer with the construction of underground projects, observing that the most valuable design tool is the project itself. This approach, combined with Tom's practical knowledge of construction, led to the introduction of many innovations in the industry. He is given credit by his peers for innovations such as:

- Design of 100-foot-diameter structural reinforcement for underground chambers to resist nuclear effects (North American Air Defense Command Center, 1962)
- First use of flexible ring design concept for transit tunnel linings (Bay Area RapidTransit, 1964)

- First design criteria for earthquake-resistant design of subways (Bay Area Rapid Transit, 1965)
- First use of rock reinforcement for permanent support of U.S. transit stations (Metropolitan Atlanta Rapid Transit Authority, Peachtree Center, 1976)
- First precast concrete segmental liners for U.S. transportation tunnels (Baltimore Lexington Market Tunnels, 1977)
- First use of permanent structural slurry walls for transit construction (Bay Area Rapid Transit, 1965)
- Permanent shot crete lining for tunnel support in weak sandstone (Stanford Linear Accelerator Center/ Positron Electron Project, California, 1977)
- Use of rock reinforcement to reduce the size and cost of tunnel lining (Glenwood Canyon Tunnels, Colorado, 1981; Rogers Pass Tunnel, British Columbia)
- First use of New Austrian Tunneling Method design in U.S. transit tunnel (Mount Lebanon Tunnel, Pittsburgh, 1981)
- Extension of state of the art in earthquake-resistant design; special design to exclude natural gas infiltration (Los Angeles Metro, 1966)

The greatest tribute to a civil engineer is the memorial of his structures that survive him, recognizing that a complex project is never the work of one person. They are all team efforts. But one name usually stands out as the driving force behind the project or the contributor of a critical design or decision that enabled the project to move forward. The list of such projects for Tom is lengthy, but a few deserve special mention.

NORAD (North American Air Defense Command Center)

When NORAD was being mined in Cheyenne Mountain, Colorado, an unforeseen and potentially unsafe shear zone was found at the intersection of two rock chambers, creating a construction crisis. Sitting in a café, Tom sketched an alternative

design, which he described as a "grapefruit with four tin cans attached," to support the rock loads. Tom detailed the design to resist nuclear blast effects and construction proceeded.

BART
(Bay Area Rapid Transit, the first modern U.S. transit system)

From 1963 to 1968, on behalf of BART's general engineering consultant joint venture, Tom directed the design of 20 miles of subways, 25 miles of aerial structures, two rock tunnels, and the 3.6-mile immersed tunnel between San Francisco and Oakland, California. In the course of his work, he developed the design basis for the resistance of underground structures to earthquakes.

Mount Macdonald/Rogers Pass Tunnel

The 9-mile Mount Macdonald / Rogers Pass Tunnel in British Columbia, Canada, the longest rail tunnel in North America, was driven under 5,500 feet of rock in a national park, which greatly constrained geotechnical exploration. Tom developed a series of generic designs that applied to different sections of the tunnel as conditions changed. This allowed work to proceed and eliminated disputes on differing site conditions.

Fort McHenry Tunnel, Maryland

Traffic volume in Baltimore demanded the widest immersed tube tunnel and the largest underwater highway tunnel in the world (at that time). With Tom as principal-in-charge, the project was successfully completed with many value engineering cost savings. The Fort McHenry Tunnel won major awards from the largest U.S. civil engineering societies.

Tom's many other projects and contributions are too numerous to mention. But as a summary statement, those who worked closely with him described Tom as a leader, a teacher, a mentor, an advisor, a consultant, a problem solver, and, above all, a constant gentleman and a very nice human being.

Tom left behind his beloved wife of 51 years, Lucia Elodia, and two sons, Robert Livingston Kuesel and William Baldwin Kuesel, and five grandchildren.