

Structural Engineer

by Sergio Londono, Engineer with Thornton-Tomasetti

What Does a Structural Engineer Do?

The Structural Engineer designs the support of all sorts of shelters that humans use for living, working, leisure, etc. The Structural Engineer finds the adequate size of the elements that support large and small buildings, bridges, memorials, roller coasters, all kinds of mechanical and electrical equipment, pipes, earth-retaining structures, water-retaining structures like dams, elevated tanks, and pools. Without the structural engineer's contribution, many architectural special structures would not be able to stand. The process of finding or calculating the size of structural elements is called design. Usually the vertical elements that support structures are called columns, while the horizontal elements are called beams.



When the Structural Engineer is designing a structure, he or she has to study and consider the loads that the structure will have to withstand. He has to find out the weight of everything that is going to be placed on the structure, including the people, the force of the wind blowing against it, the weight of the snow that will accumulate on top of the structure, the force of any earthquakes that may occur in the zone, and other forces that result from changes in temperature from day to night or from season to season. Many forces are not static but changing in time, like an earthquake and the wind, for which the Structural Engineer has to find the maximum forces that may affect the structure using special types of studies called dynamic analyses.

Many different construction materials are used by the Structural Engineer such as steel, concrete, mortar, brick, wood, and aluminum, and he has to know the properties of them. There is always a reason why one material is preferred over others for a specific project, and the Structural Engineer should be able to know it. The reasons may be related to the size of the structure, the geographical location, the price of the materials, and the architectural requirements among others.

The Structural Engineer does not work alone. Most of the time he or she has to work in collaboration with other disciplines such as Architecture, Mechanical Engineering, Electrical Engineering, Piping Engineering, Geotechnical Engineering, Environmental Engineering,

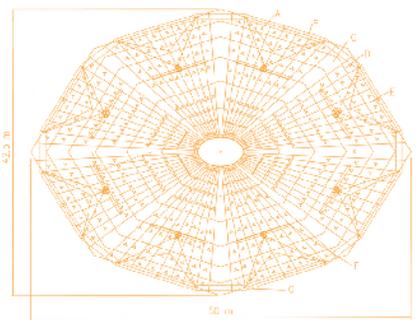
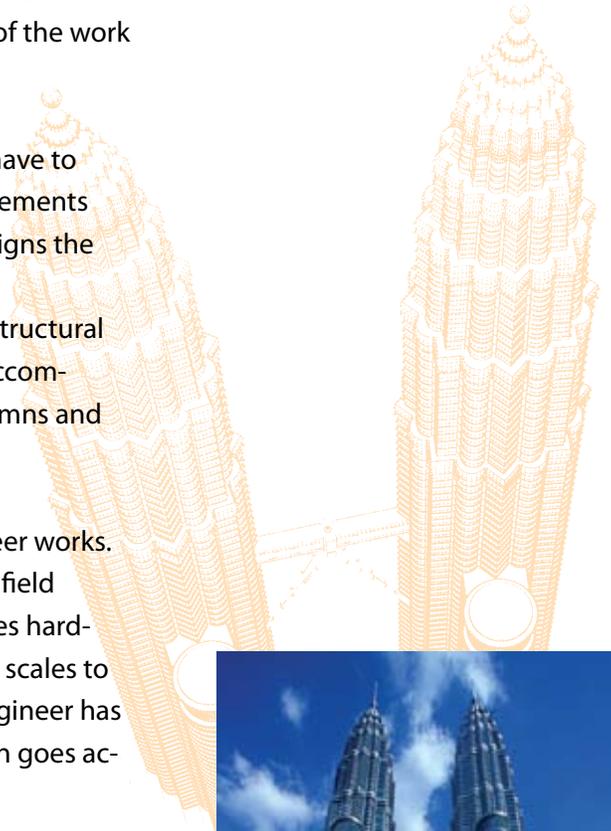
Acoustical Engineering, and several others. The interaction of the work among all these disciplines is called project coordination.

The most common instance in which different professions have to interact in order to discuss and to coordinate specific requirements is with the Architect. In general, the Structural Engineer designs the structure of a specific building, a bridge or other project that the Architect has already planned for. In this case, the Structural Engineer has to understand the Architect's project and to accommodate the location of the structural elements such as columns and beams based on the requirements of the Architect's design.

There are two different settings where the Structural Engineer works. One is at the office doing consulting, and the other is in the field doing construction. In the office, the Structural Engineer uses hardware such as computers, calculators, drafting materials, and scales to analyze and design structures. In the field, the Structural Engineer has to walk the construction site and verify that the construction goes according to the drawings.

The final product of the Structural Engineer who works on the consulting phase of a project is usually presented on drawings, where the project is shown pictorially and the size and dimensions of the structural elements are established. In general, the drawings present the plan view of the entire project along with cross sections and elevations to show the localization and size of the different structural elements. The drawings also contain details that instruct the contractor how to build specific parts of the project or how to perform element connections. The drawings constitute the materialization of the ideas that the consulting Structural Engineer developed in his office.

The Structural Engineer who works on the construction phase of a project has to deal with and coordinate many contractors. These are the specialized trades that provide and build all the different components of the project, such as site preparation, concrete construction, steel assemblage, mechanical, electrical, plumbing and air conditioning systems, facades, interior finishes, and landscaping, among many others. The Structural Engineer has to keep track of the materials that arrive at the site, has to decide which construction equipment is most suitable for the work, has to correctly interpret the drawings and has





to ask the consulting engineers when there is a conflict between the different trades.

There are other areas where the Structural Engineer can work. Many engineers in colleges and universities conduct research and teach classes. Some Structural Engineers work in testing laboratories where different materials are being studied in order to find their properties. Other Structural Engineers engage in business and trading in the market, while still others sell products and services, doing presentations and providing support on the use of specific engineering products.

The Structural Engineer is a well-prepared professional that most of all uses common sense and good criteria to apply all the knowledge he has acquired not only during his college studies but also during the practice of his career. ▽

Sergio Londono, a mentor with the ACE Newark, New Jersey Affiliate and an engineer with Thornton-Tomasetti, originally wrote this Structural Engineer description for the Greater New York affiliate.

