

Architects, Engineers, and Design

CHAPTER 1

To the general public the distinction between architects and engineers, and their relationship to design, is blurred. What exactly is the difference between an architect and an engineer? Between architecture and engineering? Don't architects, after all, study engineering? What do engineers have to do with design? Isn't design what architects do? And if architects and engineers are so highly trained in design and construction, why is a third group—contractors—needed to construct buildings? The confusion is understandable.

For centuries, there was little, if any, distinction among architects, engineers, and builders. With the advent of the Industrial Revolution, the world became increasingly complex. The guild and trades system, in which skills and techniques were handed down from generation to generation, began to break down. By the mid-1800s, architecture in the United States evolved into a profession distinct from engineering and construction.

There are many ways to define architecture, but perhaps the most expressive definition was the one provided by Marcus Vitruvius Pollio, a first-century AD Roman writer, architect, and engineer. Vitruvius wrote *De architectura*, a Latin

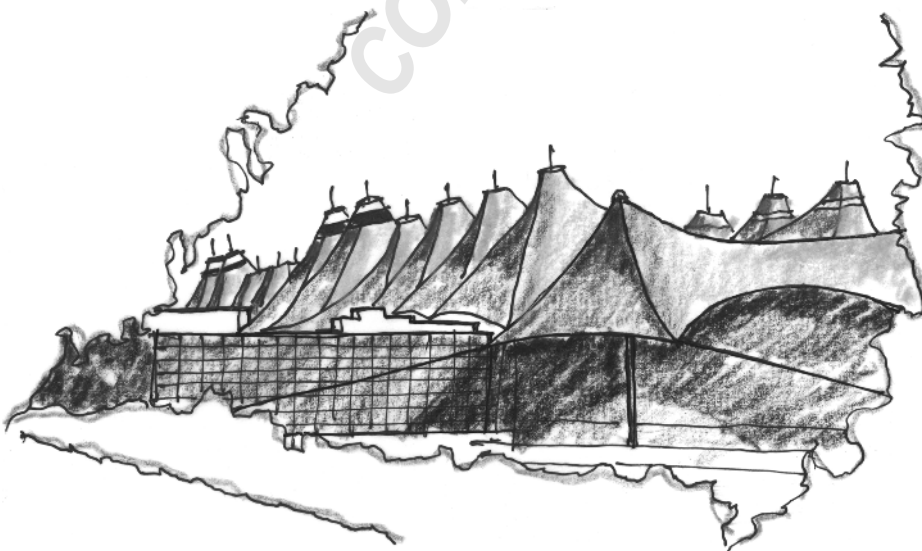


Figure 1.1 Denver International Airport, Denver, CO

treatise on architecture, in which he asserted that a structure (architecture) must exhibit the three qualities of *firmitas*, *utilitas*, and *venustas*, loosely translated as strength, having soundness of construction; usefulness, having practical value or purpose; and beauty, giving pleasure and delight to those who experience it.

Determining strength and usefulness is relatively easy. Determining beauty is more difficult, since each of us is free to decide what gives us visual pleasure and delight. With all due respect to Vitruvius, perhaps another way to define architecture is to simply call it the *art and science* of constructing.

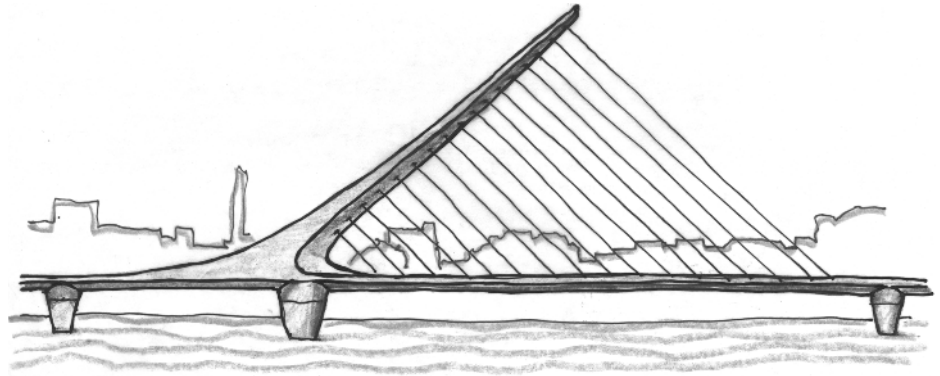


Figure 1.2 Puente de la Mujer, Buenos Aires, Argentina

In modern practice, the knowledge and information needed to design and construct a large building requires many areas of expertise, too much for any one profession to know. The entire process of determining a building's appearance, the materials and systems to be used, and their configurations and sizes is broadly called *design*. Design falls mainly on the shoulders of architects and engineers. Architects have primary responsibility for determining the building's size and

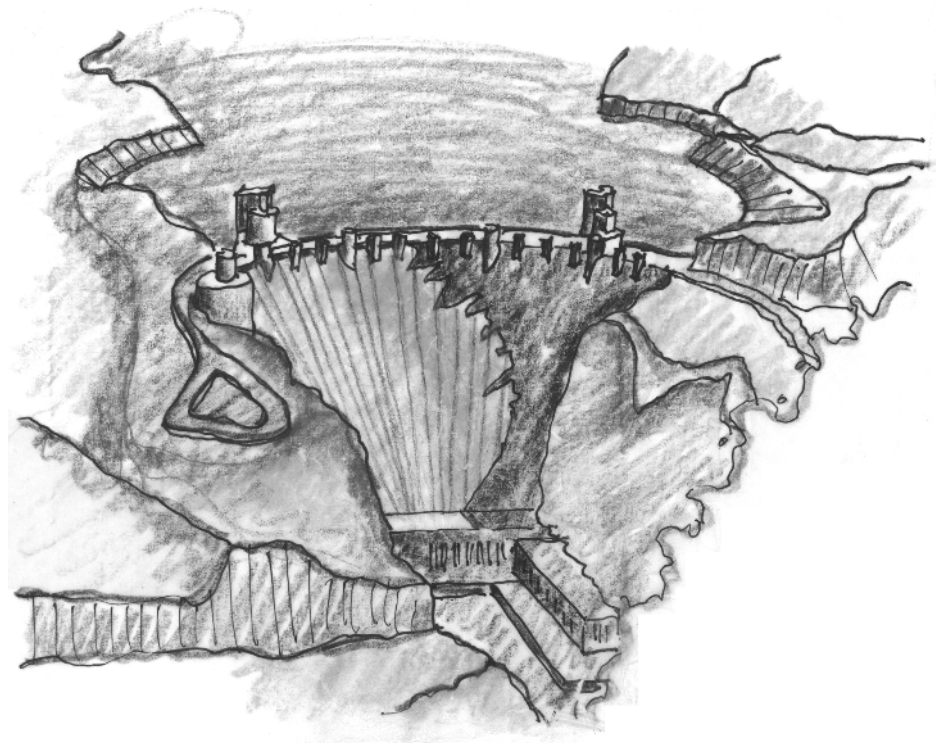


Figure 1.3 Hoover Dam, Boulder City, NV

shape, along with the myriad architectural materials, finishes, and details. Engineers have primary responsibility for determining the mechanical, electrical, and structural systems, along with the many engineering calculations and details.

Contemporary architects, as the leaders and orchestrators of most building projects, are trained as generalists and humanists conversant with aesthetics, planning, sociology, and economics, as well as engineering. By contrast, the training of contemporary engineers is highly technical and focused on a specific engineering discipline. Early engineering had only two disciplines, *military* and *civil*. As technology advanced, new branches of engineering such as mechanical, electrical, and chemical engineering emerged from civil engineering as individual disciplines. Structural engineering, however, the branch of engineering concerned with designing buildings and other types of structures to stand up and resist loads, has always been considered a part of civil engineering and remains so today.

Structural engineering is the engineering discipline most closely intertwined with architectural form. The best architecture exhibits a strong understanding of how forces move through a structure. Toward that end, the primary intent of this book is to increase the structural vocabulary of future architects. It is our hope that by doing so, the architect's dialogue with the structural engineer will be enriched, thereby affording architecture the opportunity to reach its fullest potential.



Figure 1.4 CN Tower, Toronto, Canada

