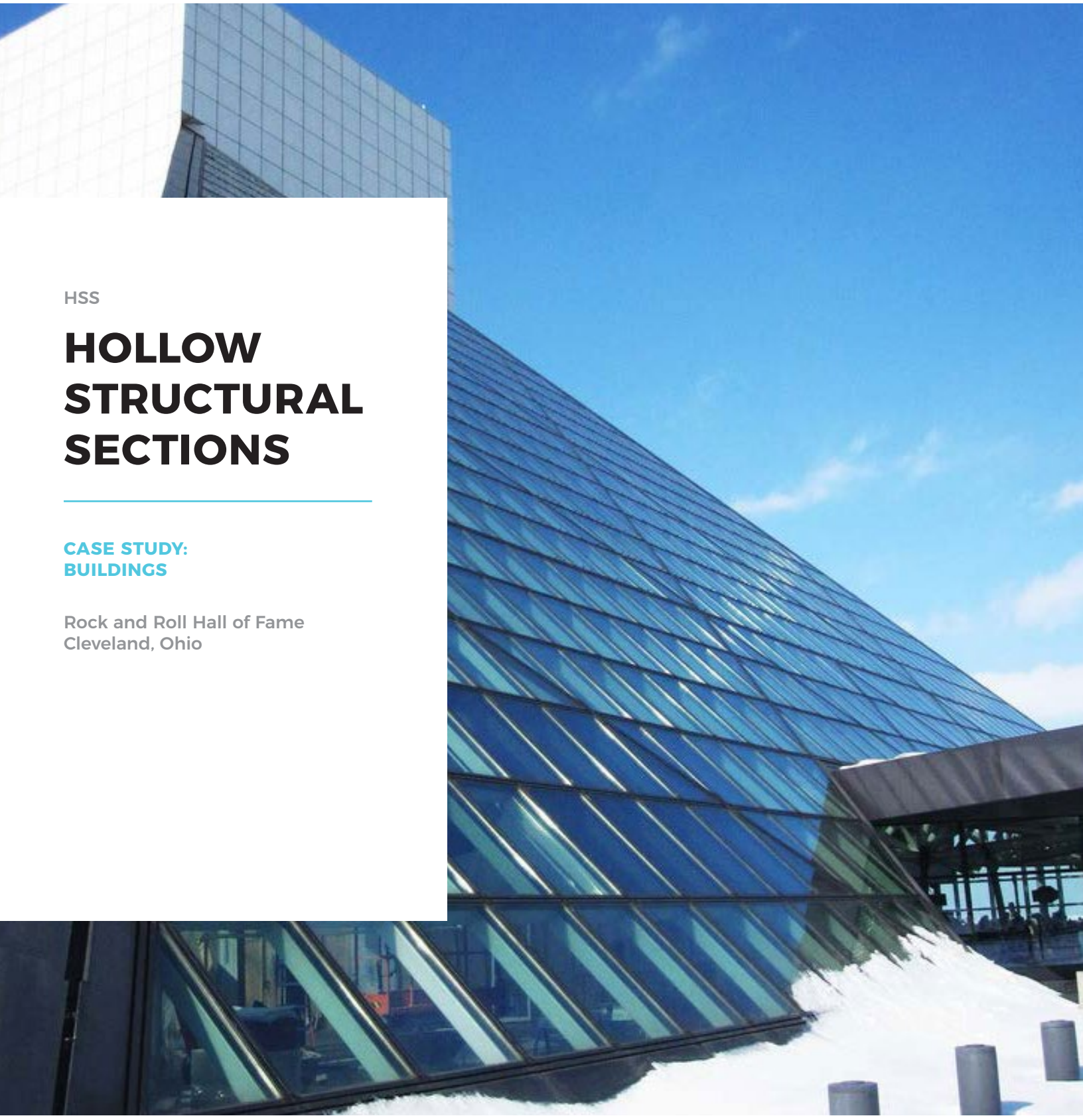
STEEL TUBE INSTITUTE

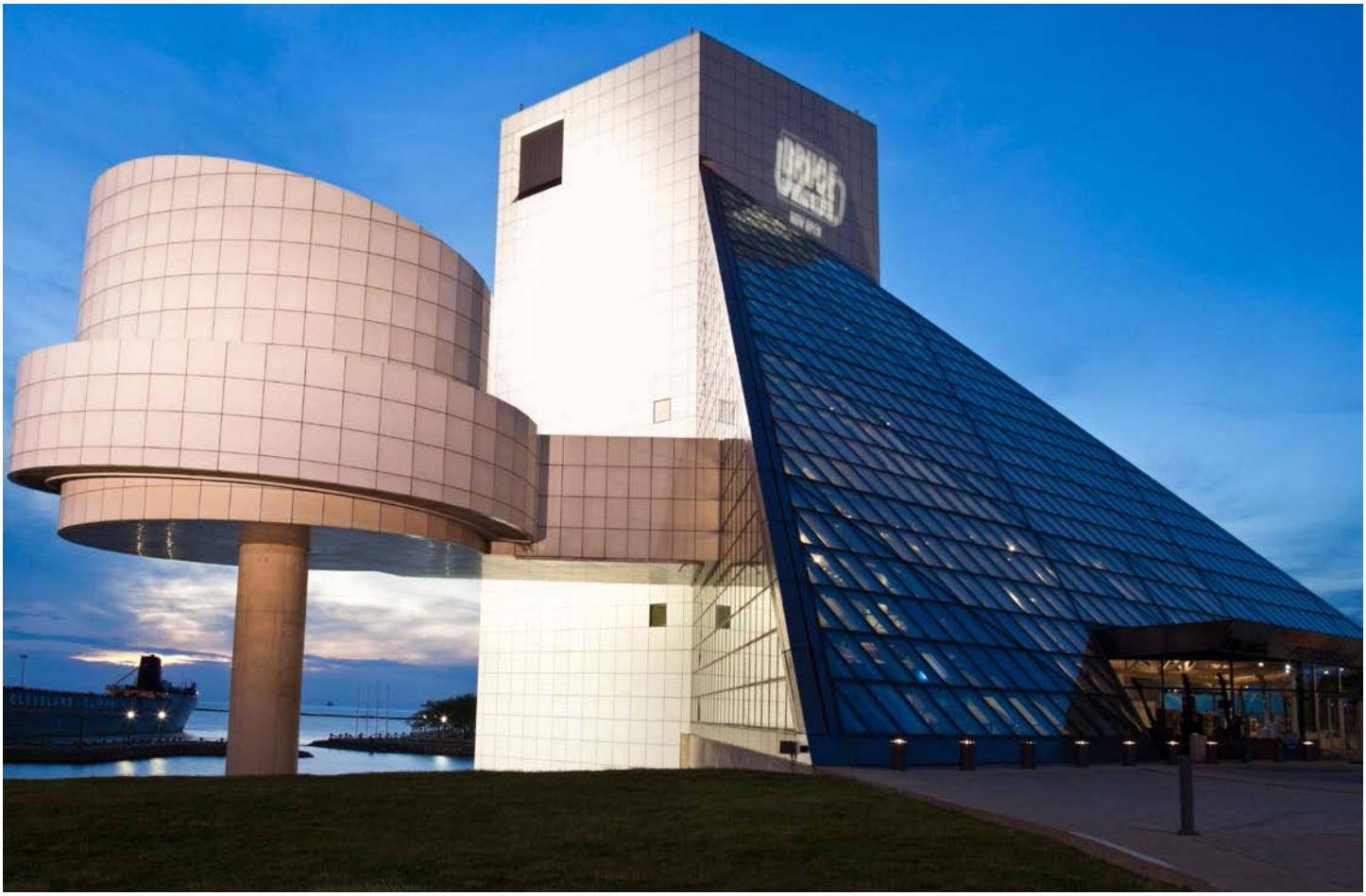


HSS

HOLLOW STRUCTURAL SECTIONS

CASE STUDY:
BUILDINGS

Rock and Roll Hall of Fame
Cleveland, Ohio



A SOARING TRIBUTE TO LEGENDS OF ROCK.

HSS FRAMES A STRIKING 'DOORWAY' TO ROCK AND ROLL HALL OF FAME

Rock 'n' roll, to famed architect I. M. Pei, is a musical demonstration of youth, energy and rebellion. The explosive force of this heritage is reflected in his design for the Rock and Roll Hall of Fame and Museum on the Cleveland harbor front.

Pei likens the structure's central, 162- foot-high, steel tower to the epicenter of structure's other elements rippling out from it like shock waves.

Functioning as the lens that brings the structure's epicenter into focus is a multiangled, 114-foothigh steel-and-glass "tent" that is its entry atrium and creates an "inhabited sculpture" that brings the hall's design to life. The tent is visual testimony to the spectacular designs that can be obtained through the use of steel hollow structural sections (HSS) in construction.

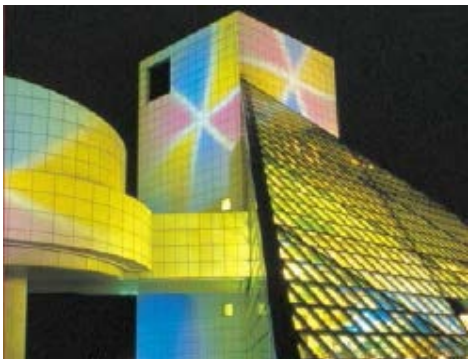
The major elements of Pei's design developed by Pei Cobb Freed & Partners, New York, were its central tower; a theater cantilevered 85 feet out over the waters of Lake Erie; a 75-foot-diameter cylindrical exhibit hall connected by elevated walkway to the central tower; the tetrahedral steeland-glass tent; and an outdoor plaza that covers a large, underground exhibit area.

COST EFFECTIVENESS HELPED DICTATE CHOICE OF HSS

Pei utilized HSS for the tent's frame because of its aesthetic appeal and because it provided a relatively economic means of enclosing the area, which houses a record shop and a cafe, as well as escalators leading to exhibitions and the Hall of Fame at the top of the tower and down to the main exhibit space beneath the tent and plaza.

By creating a transparent entry area, the architect allowed visitors to become an integral part of the facility's visual appeal, making the tent, in essence, a performance area. Viewed from the plaza, the procession of people through the tent on escalators and on the exposed layered floor plates provides a colorful contrast to the structure's off-white aluminumpaneled walls and the blue sky and lake behind it.

OTHER PRINCIPAL PARTICIPANTS IN THE PROJECT INCLUDED THE ASSOCIATE ARCHITECT, ROBERT P. MADISON INTERNATIONAL, INC.; THE FABRICATOR, KILROY STRUCTURAL STEEL CO., AND THE CONSTRUCTION TEAM HEADED BY TURNER CONSTRUCTION CO.



TUBULAR EDGE TRUSSES CREATE 200-FOOT SPAN

The tent is composed of a main triangular section connected to an offset parallelogram- shaped area in a different plane. Two tubular steel edge trusses, spanning approximately 200 feet, bring the sloping, triangular front wall of the tent to a peak, and another supports the other side of the parallelogram.

An intersecting grid of 16 bowstring trusses formed of 10-inch and 6-inch round HSS supports the sloping glass front wall, and the vertical glass curtain walls on the two other sides of the triangular area are supported by 14-inch round HSS trusses.

Use of the bow trusses—which are perpendicular to the sloped surface—was suggested by the project's structural engineer, Leslie E. Robertson Associates, RLLP, New York. The bowstrings curve from as much as 6-1/2 feet deep in the center down to zero at the ends. The longest is 162 feet in length.

‘BOWSTRINGS’ DRAW A TRIANGULAR GRID

The bottom cords of the bowstring trusses follow the imaginary surface that would be formed by a membrane if it were held at the edges of the tent and a uniform pressure were applied to the membrane. Because of that, the trusses are deepest in the center, where strength and stiffness are needed most. That makes them quite efficient.

The graceful curves of the bowstring trusses not only extend horizontally across the width of the sloping wall but also run diagonally, creating a triangular shaped grid pattern throughout the under side of the tent.

The trusses support a grid formed by rectangular 4-inch by 7-inch hollow steel sections. This, in turn, is the base for the prefabricated, unitized system of aluminum- framed glass that is the outside “skin” of the tent.

ANGLED SHAPE OF TENT KEPT TOLERANCES TIGHT

Complicated structural assemblies, where three or four tubular sections come together, were shop welded. Field welds were almost all straight joints.

The rectangular HSS grid supporting the tent’s glass skin was prefabricated in large panels, shipped to the jobsite and welded together. Because of the unconventional, multi-angled shape of the tent, tolerances for all of the structural elements were extremely tight to assure that the frame fit together properly and precisely accommodated the unitized glazed outer glass skin.