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9. Harry S. Truman Sports Complex, Kansas City, MO (USA)

Owner: Jackson County, Missouri

Project Architect: Kivett & Myers, Division of Howard Needles Tammen & Bergendoff, Kansas City, Missouri, with Charles Deaton, Design Associate

Structural Engineer: Bob D. Campbell and Company, Kansas City, Missouri

General Contractor: Sharp Kidde Webb (a Joint Venture), Kansas City, Missouri

Complex Completed: April 1973

Dimensions and Arrangements:

Seating Capacity:
Football, 78,000 permanent arm chair seats
Baseball, 42,000 permanent arm chair seats

Stadium Heights:
Football, 44.2 m (includes 13.7 m below grade)
Baseball, 39.0 m (includes 10.1 m below grade)

Playing Fields:
Football, 8,825.8 m^2
Baseball, 13,470.5 m^2

Lighting:
Football, 350 foot candles
Baseball, 350 infield and 250 outfield

Facilities:
Stadium clubs; business suites; home and visiting team locker rooms; training facilities; central maintenance and storage (below grade); parking for 20,000 automobiles and 200 buses; and team administrative offices

Material Used:
Excavation: 3,975,707 m^3 (both stadiums)
Concrete: 80,279 m^3 (both stadiums)

Design Solution

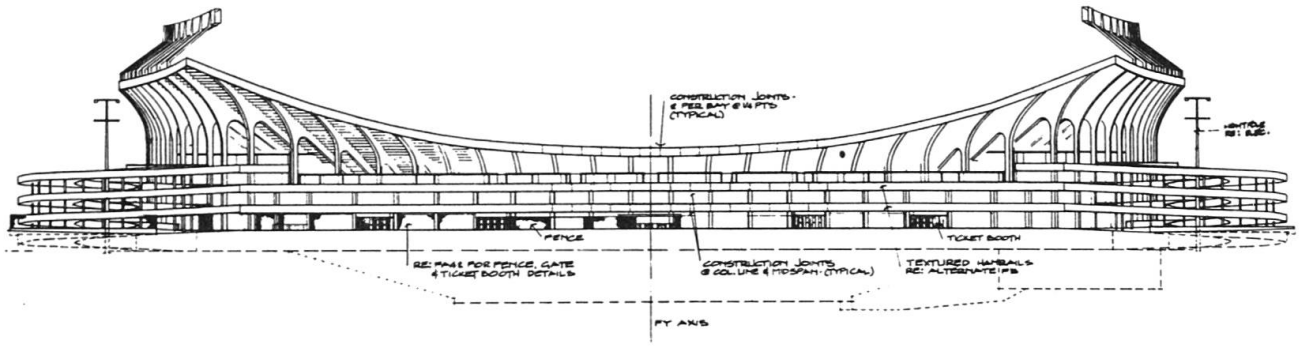
The top priority in the design of new stadium facilities for Kansas City, MO, was the provision of unobstructed spectator viewing in both proximity and orientation to the playing field. A second design consideration was the incompatibility of field sizes and contours required by the two sports. Because a multipurpose stadium could not resolve these conflicts, a twin-stadia concept was selected as the design solution.

Architectural Forms

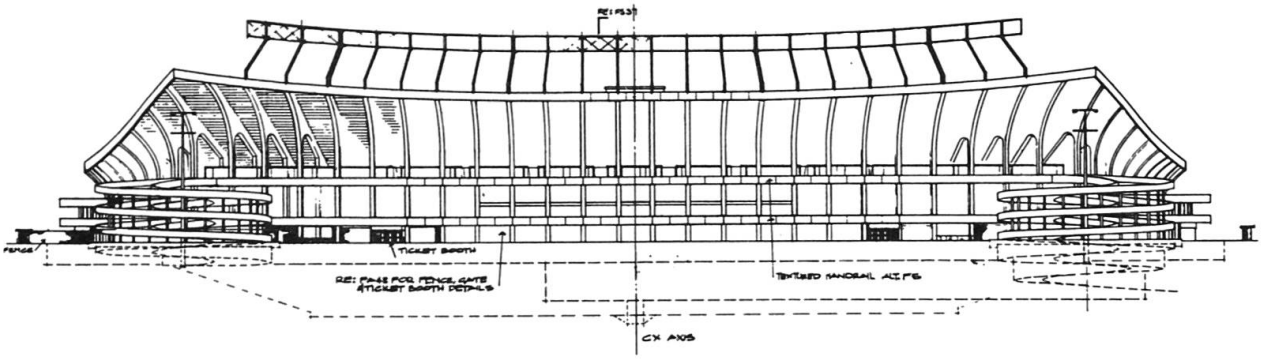
Architectural forms in the design of both three-level stadia make a definite curvilinear sculptural statement, establishing a bowl effect with one high point at each corner of the football facility and two end points on the baseball stadium. The curved sculptural forms of the total design necessitated the use of a plastic structural material. Therefore, reinforced concrete was chosen.

Special Design Challenge

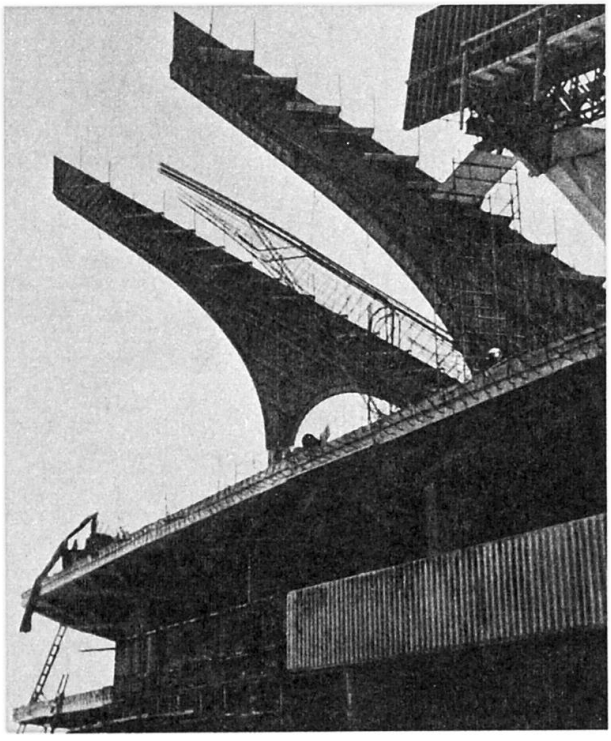
A special design challenge involved the spacing and geometry of structural bents (main supports) of the upper structures. As a solution, regular modular spacing was developed because of the equal span it afforded the precast concrete units used for the upper structure seating. With the architectural design providing cantilevers at both front (to eliminate column obstruction in the seating) and rear, the result was a structural bent supported on two columns, cantilevered approximately 10 m front and back and spanning approximately 15 m between columns. These are horizontal dimensions. Exact lengths, however, are somewhat longer.



NORTHWEST ELEVATION



SOUTHWEST ELEVATION



Structural Bent Design

The basic design – sculptural, curved lines – was also applied to the bents. These lines and curves had to be set to computable shapes for the structure to be accurately designed and detailed, and for forms to be constructed and reinforcing steel (60 grade) to be manufactured. Thus, the front curves from the columns are circle radii, while the back curves are parabolas. An additional curve is the cross section of seating. All levels have an elliptical cross section, creating smaller risers at the front than at the back. This provides every spectator with a sight line to the same point.

In designing the bents, careful attention was given to the construction methodology. To avoid the expense of numerous different-sized bent forms, designers attempted to standardize as much as possible. A way was devised to vary the actual dimensions of the bent while reusing existing forms. Each stadium is symmetrical about one or two axes, which aided in standardizing the bents. The football stadium is symmetrical about two axes; therefore, the design is worked about one quadrant and the bents then repeated three times. The baseball stadium is symmetrical about one axis with the design set on one-half and repeated for the other.

(HNTB)