Memphis Sports and Events Center at Liberty Park

Memphis, Tennessee

FISHER ARNOLD

PROJECT EXPERIENCE

The Memphis Sports and Events Center is a 227,000 square foot single story building divided into two segments of roughly equal size. The southern segment hosts eight full-size basketball/volleyball courts while the north segment's column-free space is intended for hosting indoor track and field and can serve as an event venue for concerts, conventions, or other similar events. The bleachers on the south segment can seat 2500 spectators. The two-story central spine located between each segment houses office space, press boxes and VIP suites. Groundbreaking for this project commenced in June 2021 and the first athletic event was hosted in December 2022. For this project, Fisher Arnold served as the Structural Engineer of Record.

This is a steel framed structure consisting of wide flange columns and beams, and ultra-long span 290-foot primary roof trusses. The roof framing consists of steel bar joists and steel deck. A buckling-restrained bracing system provides seismic force resistance. Shallow spread footings supported on approximately 700 aggregate piers comprise the foundation system. The exterior façade consists of insulated metal panels which are supported on steel tube girt system spanning between exterior building columns. The second floor of the central spine is designed using a concrete-filled composite deck system supported on steel beams and columns. Typically, buildings of this size, i.e., roughly 400-foot x 550-foot, would utilize expansion joints to limit movement of the building structure due to changes in ambient temperature. However, this building was designed in such a way that the stresses due to temperature changes were minimized. By locating the bracing at or near the middle of the building, by incorporating steps into the roof diaphragm, and by use of tall columns, thermal stresses were limited, and expansion joints were not required.

In close proximity to the New Madrid Seismic zone, this project required special design features to resist the design forces from anticipated ground motion. The use of multi-tiered buckling-restrained braces (BRB) was selected as a needed design feature in this building. Typically, traditional bracing terminates only at floors or roof diaphragms. Since the maximum roof height of the Arena is 58-feet above the ground floor, brace lengths were expected to exceed sixty feet, an impractical length for BRB manufacturers. The multi-tier bracing configuration allowed for shorter brace lengths which were fabricated, shipped, and installed economically. The BRB's provided the needed resistance to seismic forces and allowed for construction to progress.

The Memphis Sports and Events Center complements the existing sports infrastructure at Liberty Park which includes the football stadium, the coliseum and outdoor playing fields. The structural design of the building provides a large, column-free indoor space, allowing for multi-use and flexibility of space. Roof-supported curtains were included in the design and provide additional flexibility in dividing space. Designing and constructing an iconic Sports Center such as this provides a host of challenges; budget, schedule, design features, etc., and the timing of th e project during the height of the Covid 19 pandemic elevated those challenges. Several rounds of value engineering with the general contractor were required to bring the project costs in line with the budget. This included a redesign of the foundation system from the originally planned deep auger-cast pile system to shallow footings atop ground improved aggregate piers. Value engineering also involved redesign of the lateral system to accommodate long braces and revise wind and seismic loadings to optimize wind girts and long roof trusses. The design of roof framing to support hanging basketball goals and volleyball net system required intense coordination with the sports equipment vendor and the joist designer. The design, fabrication, shipping, and erection of the ultra-long span trusses was a complex process and required coordination, communication, and concessions by all stakeholders to ensure that a successful project could be delivered.

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