

Design Features of K.D Yadav Wrestling Stadium

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SUMMARY

Hosting the Commonwealth Games 2010 in Delhi required construction of several new stadiums. It was desired that the roofs of the stadiums were unsupported in the middle, offering uncluttered look to the enclosure as well as provide obstruction-free line of sight. The generic solution involved steel roofs, as has been provided and described in this paper for the K.D. Yadav Wrestling Stadium, situated within the Indira Gandhi Stadium complex, on the banks of River Yamuna. The paper describes the structural engineering features of the stadium, which also had to accommodate the requirements of the planned legacy use of the facility.

KEYWORD: Long span roof, steel roof, stadium.

1. Wrestling Stadium:

The Indira Gandhi Stadium Complex, in which the main arena is the Indoor Stadium hosted the gymnastics events of the 1982 edition of the Asian Games, was chosen to be the venue for wrestling competitions of the Commonwealth Games 2010. The new stadium was to have three wrestling podiums with dedicated warm up hall (vis-à-vis sharing the facility with the gymnastics arena), seating capacity of 7,500, and a large column free hall for legacy use. The basic shape selected was a curved roof over main arena & warm-up hall and flat roof over the seating area, totaling about 8,000 m².

2. Design Approach for Wrestling Stadium

The basic architectural requirement was for a central hall measuring 140m and 40m along the two major axes. This is to be flanked by a building on both side containing spectator seating, and facilities for conduct of the event. A curved roof for the central hall and two buildings curved in plan with flat roofs were proposed. The hall was to serve as the main arena/podium and warm up hall during the Games events and the same hall could be used as banquet hall or cater to other legacy use demands as may arise. To achieve the design seating capacity a temporary gallery was designed and fabricated with all bolted connection so that same could be removed during legacy easily.

To cater to these requirement, a structural configuration with 2 steel longitudinal trusses (T1) supported on RCC columns were proposed. The maximum spacing of the RCC columns is 88 m and full length of each truss is 145 m with an overhang of 17 m. The two trusses are 40 m apart transversely and are to be bridged with cross girder trusses at spacing of 18 m. On these cross girders, purlins are installed which span 18 m and carry the roof sheeting (Fig. 4). To keep the roof light, spacing of purlins were kept 5.6m and so the underdeck, onto which the galvalume standing seam roof rests.

The primary problems faced in the design of long span steel structures are the large deflections and thermal forces. To handle the first of the two required the use of relatively flexible accessories which can accommodate the large deflections. To minimize the thermal forces, POT-PTFE bearings allowing translation in the longitudinal direction were used atop the concrete support columns.



This long span roofs houses the sports lighting and PA. As it becomes difficult to reach the lights and services for maintenance, a special arrangement, catwalk was provided to provide access to these services. The catwalk system was suspended from the cross girders. It also supports many fixtures of the sports lighting and PA systems.

The stadium is located within Indira Gandhi complex, on the banks of River Yamuna. Designing the foundation for the high loads coming down from the roof was a major challenge as the soil bearing capacity is low. Thus, it was decided to use pile foundations. Bored, cast-in-place piles of diameter 600mm & 1,000mm were used.

The structure was analyzed and designed with STAAD PRO 2006. The sections used for the trusses were all built up open sections using Fe 490B (E350) grade of structural steel. Open sections were used as they are easier to fabricate and less expensive than box sections. For bracings, shot rolled sections were used.

The flat roof on the side of main roof were having very shallow slope it was further checked that even after deflections due to DL+SIDL minimum slope for drainage is maintained.

3. Contractor & Steel Fabricator:

Wrestling Stadium – Era Infrastructure Ltd.

4. Acknowledgement :

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