

Ariake Arena - Seismically-isolated Large-Space Roof Structure -

Yuki HAMADA*, Masahiro HOSHINO*, Masanori SAKATA*, Masaki Tabei*

*Takenaka Corporation
1-1,1-chome, Shinsuna, Koto-ku, Tokyo, Japan
Email hamada.yuuki@takenaka.co.jp

Abstract

Ariake Arena is planned to be an indoor stadium as a venue of the Olympic and Paralympic Games Tokyo 2020, which has a main arena used for volleyball games that can accommodate about 15,000 spectators. After the Olympic and Paralympic Games, plans call for the arena as a venue for not only sports events but also concerts.

The main arena has a configuration in which the exterior wall upwardly opens outwards and the roof inside the arena is structured in a downwardly convex form. Under the restricted site conditions, certain devices are incorporated so that the air volume inside the main arena is minimized while securing the spectator capacity.

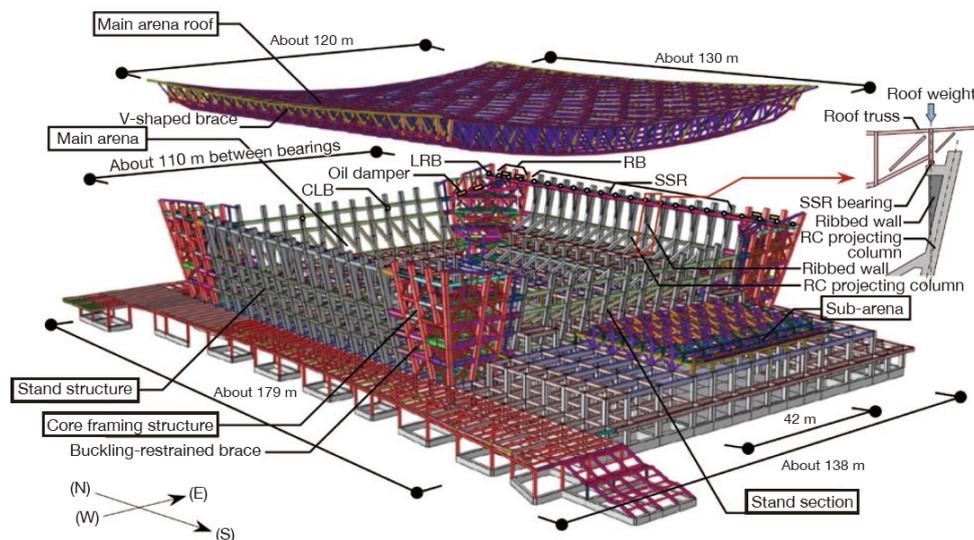
The main structure of the stand section is planned as a reinforced concrete structure with high stiffness from the viewpoint of preventing vibrations due to excitation caused by a great number of spectators.

For the core framing structure at four corners that carries the horizontal force of the roof section during earthquakes, a steel-frame structure is selected and planned to have sufficient redundancy in terms of both stiffness and strength.

In order to mitigate the danger of falling ceiling and suspended equipments during great earthquakes, a seismically-isolated roof structure is adopted in which the isolation devices are arranged just beneath the roof.

For the roof structure, the steel-frame plane trusses are used, which are composed of 22 main trusses and 7 connecting trusses arranged orthogonally to the main truss. The main trusses are arranged at 6-m spacing, with a truss depth of approx. 6.4 - 9 m, and a span of about 120 m.

Especially, the travelling construction method is adopted for the roof erection in which each steel-frame plane truss is assembled on the temporary platform, and then a large block of trusses are travelled in the orthogonal direction to the main truss.



Structural Diagram of Main Arena and Sub-arena