Japan National Stadium

By Joanne Lu

The Japan National Stadium located in Shinjuku City, Japan is 192000 square meters and was constructed for the 2020 Tokyo Olympics, and replaced the previous National Olympic Stadium that was used in 1964. The building was a collaborative project between Kengo Kuma & Associates, the main architecture firm, and Taisei Corporation and Azusa Sekkei, who provided secondary architecture design and construction and engineering services.

One of the largest concerns about this project was the cost, which was what made the Japanese government eventually reject Zaha Hadid's design for the stadium. To combat the cost, the stadium was made without air conditioning and instead featured an open roof with traditional Japanese architecture inspired eaves. The roof was designed specifically with Japanese weather in mind. Without air conditioning, there needed to be a way for air to circulate through and keep the athletes and spectators cool during the hot Japanese summers. The angled roof design blocks the sunlight and brings in seasonal wind. The lattices woven in the roof differ in size, and are based on the location on the roof. The narrower openings are on the south side and direct summer breeze to the stands while the wider openings on the north side divert winter wind into the roof. The architects utilized the thermal environment to account for the loss of a circulated air conditioning system[1].

Due to loss of construction time and in an effort to decrease cost, the structure of the building is simplified. The steel frames in the roof and stands are a simple repeating structure, and many prefabricated materials were also used[2]. Additionally, Japan is prone to many earthquakes and other natural disasters that require the building to have a strong foundation and lateral stability. A laminated timber and steel beamed truss structure is used in the roof to minimize the deformation caused by earthquakes and heavy winds, while the lower floors of the building have damping materials that help absorb the impact and energy from earthquakes.

The building also considers its environmental awareness and fitting the building to its surrounding nature. The timber beams used in the eaves are from different trees in all 47 of Japan's prefectures, and more than 47000 trees were also planted around the building to make it more eco-friendly[3]. The building was designed to fit into its surroundings, and the use of trees and vegetation allow it to blend with the Meiji forest, which surrounds the location. The use of reimagined eaves also pay homage to traditional Japanese architecture, while also being useful for air circulation and environmentally friendly.

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[1]https://www.archdaily.com/964848/japan-national-stadium-taisei-corporation-plus-azusa-sekkei-plus-kengo-kuma-and-associates?ad_medium=office_landing&ad_name=article

[2]https://www.metalocus.es/en/news/japanese-tradition-climate-and-technology-new-tokyo-national-stadium-kengo-kuma

[3]https://www.designboom.com/architecture/exclusive-first-images-kengo-kuma-olympic-stadium-tokyo-01-20-2020/