Study on Static and Dynamic Behavior of Roof Structures Consisting of Radially Arranged Cables under Strong Winds

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Abstract
In Japan, it is assumed that there will be many new constructions of stadiums with roofs and expansions and renovations of stadium roofs in the future. In this paper, the authors focused on a roof structure consisting of radially arranged cables in which cables are radially arranged between the inner tension ring and the outer compression ring. This structure has been adopted extensively both for new and renovated roofs on the stadiums outside of Japan, but there are no cases adopted in Japan. One of the factors is wind load. Since this structure is a lightweight structure, the wind load is generally dominant. In the case of Japan, wind load is larger than many places in the world due to the influence of typhoons. Deformation and stress are also considered to be larger than many places in the world. Various studies on this structure have been reported on the past, but detailed studies on structural behavior during strong winds have not yet reported. In this paper, with a view to adopt this structure in Japan, the authors consider the structural characteristics under wind load. The authors conducted wind tunnel tests using scale models, conducted static and dynamic studies by numerical analysis, and documented detailed structural behavior under the strong wind loads.

Figure 1. Wind Tunnel Test

Figure 2. Numerical Analysis Model

References