Structural Membrane of Levante Stadium Cable Roof

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ABSTRACT

The need to adapt the Levante UD Stadium to the new regulatory requirements of La Liga and UEFA, along with the objective of improving the spectator comfort experience has been the premise for the new roof for the existing stadium. For this propose, a lightweight membrane cable roof with spans up to 40 m has been chosen, in order to minimize the overall weight of the structure. The roof design is derived from the bicycle wheel principle, with two inner tension rings and an outer compression ring. The ability to support the new cantilevered roof independently from the existing structure and with minimal intervention have been the key factors in choosing a roof of this type.

In order to give a renovated architectural view of the stadium, the roof has been mainly covered with a translucent PVC membrane which is supported by 3 m high tilting arch structure that balances it out of the plane thanks to the preload. At the back, a light opaque metal deck roof has been placed and a transparent polycarbonate roof extension has been added at the inner ring to increase the covered span. The new membrane roof covers all the stands with 28 membrane panels supported in two arches and fixed in the cable net structure, covering a total surface of around 9.000 sqm.

An assessment of the tensioned membrane has been carried out with the aim of introducing the expected tensions in the integral model, by means of a local nonlinear model. A formfinding has been made in order to optimize the necessary stresses due to prestressing. Additionally, a wind tunnel analysis has been carried out to obtain, in addition to the structural wind loads, the local wind loads for the cladding design of the roof.