

Geodetic Domes for great-span structures: Mandela Forum Project proposal in Florence

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Summary

The paper concerns the design of a new sports arena and in particular of a aluminium roof structure for the Mandela Forum, which is the major sports arena of Florence. The project key-element is the aluminium geodesic dome, chosen in order to set up a covering with optimal and functional structure and shape. The key topic discussed in this paper concerns the geometrical issue of the structural optimization, in fact comparing several types of iron framework domes, the geodesic one seemed to be the best choice, as proved through mathematical and computational models. The numerical analyses showed that the geodesic framework is stiffer than other configurations, moreover it minimizes the material used: indeed the overall beam length is optimized. Furthermore, due to the framework regularity, the stress state is almost uniform in the whole structure beams.

Keywords: Geodetic dome, aluminium beams, structural optimization, Mandela Forum, sphere tessellation.

1. Introduction

The project proposal concerns the requalification of the Mandela Forum, that is the major sports arena of Florence. It's a multi-purpose structure with a capacity of 8000 spectators and it is located in the "Campo Marte" urban compartment, in a densely urbanized area. The urban structure spotlights this area as the most important sports activities district of the town (Fig.1). The current sports arena has an irregular shape plan of 100x75 meters approximately, a maximum height of 18 meters and it has a flat roof made by lattice girders (Fig.2). The capacity is about 7000 spectators.