

Design and Research on A Stadium Dome of Spoke Tension Structure of Cable and Membrane

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Abstract

Tongren olympic center stadium is located in guizhou province in china, which roof adopts ellipse spoke tension structure of cable and membrane with 283*265m plan size and 240m span. This paper focuses on major difficulties in the process of design, which involved to structure form-finding, shape optimization, snow load distribution, anti-collapse performance, and presents corresponding solution. Firstly, based on force density method and structure plan layout, it gains upper and lower chords force density, and node vertical coordinate subsequently. Furtherly, it is found that the inner and outer ring shape of spoke tension structure shall be similar, the radial rope which connects to the inner and outer ring shall be perpendicular to the two rings. Through the above way, it becomes a self-balance mechanics system, which means that outer ring of spoke tension structure is in a state of pure pressure basically, and the columns below only support vertical load of the dome. The horizontal truss, which made to the outer ring, significantly reduces the impact of the force bearing caused by inner ring deformed after radial rope broken. The snow load distribution is fixed through windy snow drift test, and it shows that the snow distribution can refer to saddle roof at A.0.1 in Chinese “Technical specification for cable structures”, and the snow distribution coefficient is suggested to 1.1 in deform and strength calculate. In addition, it proves that damage of single radial rope or inner brace don't leads to failure of the whole spoke tension structure and local membrane broken will not cause othe whole membrane structure failure.

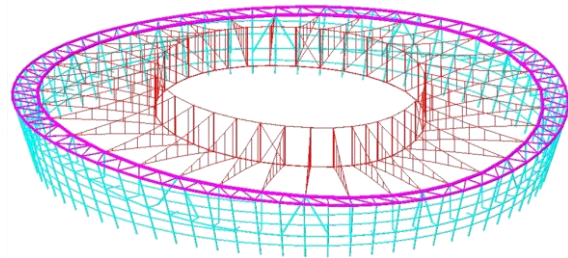


Fig1. tongren olympic center stadium

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