

Design of Prestressed Concrete-filled Double-skin Steel Tubular Lattice Wind Turbine Tower

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ABSTRACT

To date, a proliferation of studies have been carried out on concrete-filled steel tubular (CFST) lattice wind turbine towers attributed to the superiorities of high load-bearing efficiency, economic benefits, good ductility, and convenient construction. The prestressed concrete-filled double-skin steel tubular lattice wind turbine tower is proposed in this paper. The corner column adopts the concrete-filled double-skin steel tube, which increases the stiffness and reduces the amount of steel. The hollow part of the corner column is used as the prestressed channel, and the overall tension along the height length increases the strength and stability of the lattice tower. CFST members can be used as the connection member between the corner columns, which can make full use of the compressive properties of concrete and the tensile properties of steel. As a transfer structure connecting the upper steel tower and the lower lattice tower, the behaviors of the transition piece is extremely important to the whole tower. This paper takes the design of an 80 m quadrilateral concrete-filled double-skin steel tubular lattice wind turbine tower in a low wind speed field as an example. Based on ABAQUS software, the behaviors of the transition piece were studied. The study results demonstrated that under the ultimate working conditions, the maximum stress of steel and concrete in the transition piece did not reach the design strength of the respective materials, so the strength of both concrete and steel met the design requirements.

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