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PhD subject: Numerical investigation of the structural response of steel wind turbine towers under wind loads
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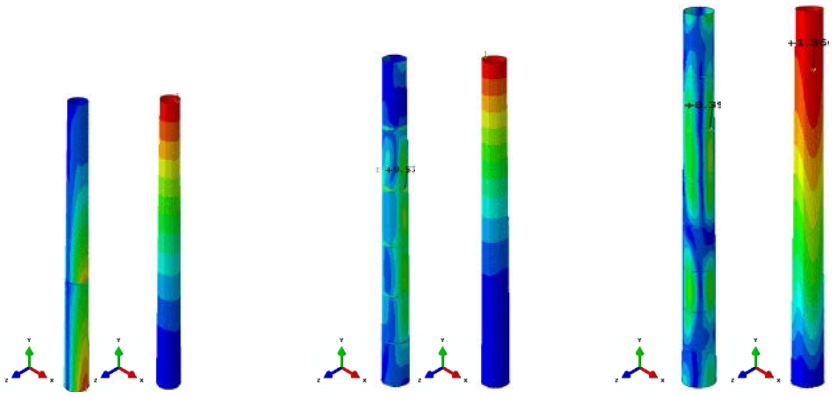
Research Background:
Due to the growth of awareness on the protection of the environment, during the last decade renewable energy has attracted increased reliance due to the fact that renewables do not emit greenhouse gases. Wind turbines being the principal technology to generate electrical power as wind energy converters need to be thoroughly investigated with respect to their capacity, effectiveness and integrity. This development led to significant increase of the size of the energy converters. To avoid collapse and improve the structural response of these tall wind turbine towers, stiffening rings added to the inner side of the tower to resist buckling of towers are nowadays often used. Therefore, the numbers and dimensions of stiffening rings of various height towers need to be considered to be design variables to guide the design of wind turbine towers. Furthermore, all these design solutions need to satisfy the strength and serviceability requirements as specified by the relevant design codes.

Aims and objectives:
- To model the structural behaviour of towers having various heights under wind loading.
- To assess the effect of stiffening rings and wall thickness on the strength of these towers and to explore a more efficient method to adopt stiffening rings and reduce wall thickness in the strength change of the towers.
- To estimate the effect of stiffening rings and wall thickness on the stability of three height towers, analyse the buckling modes and eigenvalues of three towers with different heights.

Methodology:
The Finite Element Method software ABAQUS is applied to model the structural response of the towers. The complicated wind loads are simplified along tower height and around the circumference. The method is validated by comparing the numerical results with the experimental ones recently obtained from HISTWIN project.


50m tower 150m tower 250m tower

Publications:
Y. Hu, C. Baniotopoulos, J. Yang. Effect of internal stiffening rings and wall thickness on the structural response of steel wind turbine towers, **Engineering Structures** 2014;81;148-161.