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Estimation of wind load on a greenhouse and evaluation of its structural stability

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ABSTRACT : Among all the loads that act on the greenhouse, wind load is the major one. In India, the basic wind speed varies from 33 to 55 m/s. Along with wind speed, wind load also depend on the geometry, height to width ratio, effective frontal area etc. So greenhouse design should be customized as per the localized wind load. 'One size fits all approach' in greenhouse design may leads to failure of the structure or being expensive. Unfortunately the standard for greenhouse design is lagging far behind in India. In this experiment, wind load for the double arch type naturally ventilated greenhouse was estimated as per IS code 875 (part 3) and IS 14462: 1997. The design wind pressure estimated to be 772 N/m^2 and wind load on the roof of the greenhouse is 222 kN (Suction) and 185 kN (Pressure). A model of the greenhouse is developed by means simulation with Finite Element Method using ANSYS 15.0 to test its stability at the calculated wind load. The truss and columns are studied with deflections and failure zones diagrams and possible failures were found out to redesign the elements.

KEY WORDS : Wind load, Structural stability, FEM, Pressure co-efficient, Truss

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