

Structural analysis of common existing greenhouses designs in different agro climatic zones of India

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■ **ABSTRACT** : Greenhouse is popular throughout the country for growing high value crops, which is available in different designs suiting different agro climatic conditions but single design of greenhouse cannot be adopted throughout the country. The wind is the major force responsible for failure of the structure, therefore popular greenhouse designs Quonset, walk in tunnel, gothic and double arc single span and multi-span were selected for the study. In India, the basic wind speed varies from 33 to 55 m/s. The pressure co-efficients due to local wind load were determined as per IS : 14462: 1997 for the designs. Selected designs were analyzed for dead load, live load, snow load, wind load and load combination as per Loads were calculated as per BIS standards. Standards IS: 875 (1987) (Part I – Dead Load, Part II-Live Load, Part III-Wind Load and Part IV-Snow Load) and NGMA. All the forces acts on the structures due to individual and combination of loading were determined and behaviour of structural member analyzed and studied using ANSYS 15.0 (finite element model). Two wind angle of attack 0° and 90° were used in dynamic loading of the structures. Wind load was found in the range of 772.42 to 1396.25 N/mm². It has been found that some of the specification of the structures need to be revised as some members of the structure fail under combination of loadings. Major changes in specification of structural members (G.I. pipe) of truss, purlins and column of selected greenhouse were determined and standardized to suit local wind loading conditions for greater stability. Results were also validated in field for one of the selected design by installing its improved structure and it was found that total stress value reduced by 35-46 per cent and deformation by 8-10 per cent. It means sufficient strength was added to the structure without dismantling and any additional cost.

■ **KEY WORDS** : Agro climatic zones, Greenhouse, Crops, Climatic

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