STUDY OF WIND SPEEDS IN INDIA AND THEIR EFFECTS ON TYPICAL STRUCTURES

By

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DEDICATED TO

my late parents

CERTIFICATE

This is to certify that the thesis titled, "STUDY OF WIND SPEEDS IN INDIA AND THEIR EFFECTS ON TYPICAL STRUCTURES" being submitted by Mr. B.L.P. SWAMI to the Indian Institute of Technology, Delhi, for the award of the degree of DOCTOR OF PHILOSOPHY is a record of the bonafide research work carried out by him. Mr. B.L.P. Swami has worked under our guidance for the submission of this thesis which to our knowledge has reached the requisite standard.

This thesis or any part thereof has not been submitted to any other University or Institution for the award of any degree or diploma.

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ABSTRACT

There are several gaps in the knowledge of wind engineering at present particularly in the Indian context. In India limited work has been done so far in studying the wind Climate. Studies on atmospheric turbulence and wind spectra are almost non-existent. The Indian standard code of practice pertaining to wind effects on structures is highly conservative and in certain cases it may not be realistic enough in the absence of information pertaining to extreme winds, peak as well as mean. No data is available on field measurements of wind and response of structures. Model studies using boundary layer wind tunnels have not been taken up so far.

In the present study an attempt has been made to fill some of the above gaps in the total design process based on wind climate, aerodynamic effects and response of the structures.

The wind climate i.e., extreme winds, mean hourly winds, gust factors have been studied herein on the basis of the available data. A detailed study for establishing design wind speeds for Indian Conditions has been taken up and suitable procedures are recommended for the design of rigid structures as well as flexible structures.

Estimation of extreme peak winds on the basis of short term records has been examined. A correlation between short duration and long duration extreme wind speeds has been suggested. This procedure would be useful in predicting suitable extreme wind speeds on the basis of available short term records for places where long term records are not available.

Atmospheric mean wind speeds, turbulence have been studied by conducting field measurements. An elastic structure has been designed, erected and measurements have been taken to study the response to wind. By conducting the field measurements, attempts have been made to derive the gust spectrum for the Indian conditions and to verify this spectrum with the help of response spectrum of the proto-type structure. This type of study has been taken up for the first time in India.

Model testing of typical rigid structures has been conducted through actual case studies of rigid structures, under simulated boundary layer conditions. The effects of shape, curvature, interference etc. on mean wind pressures of these typical rigid structures have been investigated.

On the basis of the study undertaken conclusions have been drawn on extreme wind speeds, atmospheric wind parameters and their influence on elastic structures. Procedures have been suggested for design wind speeds. Recommendations have also been given for wind pressures on rigid structures.

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