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HUMAN COMFORT ANALYSIS OF REINFORCED CONCRETE BUILDINGS WHEN SUBJECTED TO WIND LOADINGS

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Nowadays, modern tall buildings present greater slenderness and have been constructed with more challenging structures that encompass the experience and knowledge of structural designers. As a result, these buildings have become more sensitive to dynamic excitations, related to wind loads, more vulnerable to problems related to excessive vibrations and human discomfort. In this context, structural systems with few beams have being widely used in the buildings design practice. However, this design strategy may cause two kinds of problems: reduction of the bracing system of the building and excessive vibrations [1]. Therefore, it is vital in such cases, the verification of the global stability, using sensitivity indexes and design parameters, as well as the development of a dynamic structural analysis, based on a human comfort evaluation. Thus, this research work aims to investigate the dynamic structural behaviour of a 30 stories reinforced concrete residential building, with 90m height, when subjected to the non-deterministic wind dynamic actions, based on a proper consideration of the soil-structure interaction effect. The present study considered the results of a dynamic structural analysis for serviceability limit states, when the human comfort was investigated. The structural model nondeterministic dynamic response, in terms of displacements and peak accelerations was obtained and compared to the limiting values proposed by several authors and design standards [2-3]. The investigated building presented very low natural frequencies, with the fundamental frequency value around 0.25 Hz. This fact becomes very relevant due to the slenderness of the structure and the utilised structural system, which may be subjected to excessive vibrations. Thus, based on the nondeterministic structural dynamic analysis and having in mind the evaluation of the peak acceleration values, it can be concluded that the building presents a perception level classified as “perceptible”, when the human comfort of the investigated building was analysed.

REFERENCES

[1] L.S. Bastos, “Nondeterministic dynamic structural analysis and human comfort assessment of buildings when subjected to random wind loadings” (In Development). PhD Thesis. Civil Engineering Post-graduate Programme, PGECIV. State University of Rio de Janeiro, UERJ. Rio de Janeiro/RJ, Brazil, 2017.

[2] Associação Brasileira de Normas Técnicas (ABNT). *NBR 6123: Wind forces in buildings (In Portuguese)*. Rio de Janeiro/RJ, Brazil, 1988.

[3] Bachmann, H. et al., *Vibration problems in structures: practical guidelines*. Birkhäuser. Berlin, Germany, 1995.