

Dynamic Wind Effects in Tall Buildings: A Comparative Study of Synthetic Wind and Brazilian Wind Standard

Authors : Byl Farney Cunha Junior

Abstract : In this work the dynamic three-dimensional analysis of a 47-story building located in Goiania city when subjected to wind loads generated using both the Wind Brazilian code, NBR6123 (ABNT, 1988) and the Synthetic-Wind method is realized. To model the frames three different methodologies are used: the shear building model and both bi and three-dimensional finite element models. To start the analysis, a plane frame is initially studied to validate the shear building model and, in order to compare the results of natural frequencies and displacements at the top of the structure the same plane frame was modeled using the finite element method through the SAP2000 V10 software. The same steps were applied to an idealized 20-story spacial frame that helps in the presentation of the stiffness correction process applied to columns. Based on these models the two methods used to generate the Wind loads are presented: a discrete model proposed in the Wind Brazilian code, NBR6123 (ABNT, 1988) and the Synthetic-Wind method. The method uses the Davenport spectrum which is divided into a variety of frequencies to generate the temporal series of loads. Finally, the 47- story building was analyzed using both the three-dimensional finite element method through the SAP2000 V10 software and the shear building model. The models were loaded with Wind load generated by the Wind code NBR6123 (ABNT, 1988) and by the Synthetic-Wind method considering different wind directions. The displacements and internal forces in columns and beams were compared and a comparative study considering a situation of a full elevated reservoir is realized. As can be observed the displacements obtained by the SAP2000 V10 model are greater when loaded with NBR6123 (ABNT, 1988) wind load related to the permanent phase of the structure's response.

Keywords : finite element method, synthetic wind, tall buildings, shear building

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