

高層建築順風向設計風載重分析模式與風洞實驗之研究

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摘要

本文提出順風向設計風力修正模式。根據風洞實驗數據假設迎風面之平均風力及擾動風力在高度上分佈遵循條狀定理(strip theory)與準穩定理論(quasi-steady theorem);背風面風力則為均勻分布。擾動風力之背景部份引入折減因子以適度考慮空間相關性的影響;共振部份之設計風力則依慣性力進行高度上的分配。依據上述風力架構,提出新的順風向設計風力模式。並以高寬比7之方柱模型進行表面風壓試驗,量取各壓力點之擾動風力歷時,並由實驗結果迴歸出擾動風力在空間上之相關性。文中推導之模式所得的等值靜態風載重,對於正方斷面、高寬比7之200公尺大樓,在地況C之流場作用下,能較國內現行規範準確預測建築物之設計風載重,有效掌握風載重隨高度變化之趨勢。本文計算所得較風洞實驗略偏保守,符合作為高層建築耐風設計規範之要義。

關鍵字: 順風向, 設計風載重, 相關函數, 風洞實驗。

Development of an analytical alongwind design wind load model

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ABSTRACT

A modified procedure for alongwind design wind load is proposed. The mean and dynamic wind forces on the windward face follow the strip theory strictly; the wind forces on the leeward face assumed to be uniformly distributed. The spatial coherence functions are derived from the wind tunnel testing data of a square shaped building. A correlation reduction factor is introduced to amend the spatial correlation effect on the background part wind load. The resonant part of dynamic design wind load is distributed based on the inertia force. Numerical study is then performed on a 200m prototype building in open terrain flow field. The equivalent static wind load based on the present model is compared with current wind code and wind tunnel measurement. The result indicates that the present design wind load model is slightly higher than wind tunnel results, and much more accurate than the current wind code.

Keywords: Alongwind, Design Wind Loads, Coherence Function, Wind Tunnel Test.