Special Issue on Human Response to Wind-induced Building Motion

Preface

The recent surge in the design and construction of tall and very-tall buildings, reaching 800 m or more in height, to meet the growing demands for office and residential high-rise developments in developed countries and emerging economies in Asia, South Asia, and the Middle East has challenged the ingenuity of the design and construction professionals. In addition to designing for strength and safety to withstand wind, earthquake and other environmental loads, many of these wind-sensitive buildings invariably exhibit perceptible wind-induced building motion. Perceptible building motion raises fear and alarm amongst some building occupants. Prolonged or frequent exposure to perceptible building motion can cause discomfort and affect the well-being of occupants, leading to complaints. These effects on occupant can also adversely affect workplace performance and productivity due to degraded cognitive and task performance. Hence the design of these wind-sensitive buildings poses critical serviceability consideration in terms of occupant comfort.

Human response to and tolerance of wind-induced building motion is largely based on subjective assessment and influenced by a complex mix of physiological, psychological and societal factors. Although occupant comfort serviceability criteria have been available since 1970s to guide assessment of occupant comfort in wind-excited tall buildings, understanding the subjective human response to building motion and its effect on workplace performance and productivity remains a considerable challenge.

The papers in this Issue cover a broad range of studies reflecting recent work in this field, including theory on motion sickness, motion simulator experiments, field experiments and design implications. The paper by Walton, Lamb and Kwok reviews the theories on motion sickness and discusses the effects of low-dose building motion on motion sickness symptoms and potential degradation of workplace performance. The paper by Burton, Kwok and Hitchcock describes motion simulator experiments of a manual tracking task performed by standing test subjects under simulated motion typical of a wind-excited tall building. Denoon and Kwok reported the results, in terms of perception thresholds, tolerability and adaptability, of a long-term field study involving self-reporting and interviewer-conducted surveys of occupants in three wind-sensitive control tower structures. The paper by Huang, Chan and Kwok describes tall building design strategies involving an integrated wind-induced dynamic analysis and computer-based design optimization technique to minimize the structural cost of tall buildings to meet static and dynamic acceleration serviceability design criteria.

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