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Assessment of outdoor thermal comfort in Hong Kong based on the individual desirability and acceptability of sun and wind conditions

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Abstract

Outdoor thermal comfort is crucial for encouraging people to participate in outdoor activities beneficial to human health. It can be achieved by employing appropriate urban design. An advanced assessment of outdoor thermal comfort can provide useful suggestions for urban design. Therefore, in this study, outdoor thermal comfort was assessed from a new perspective by investigating subjects' perceptions of sun and wind conditions. A field test including a physical measurement and a questionnaire survey was carried out. Subjects' thermal sensations and desirability of the sun and wind conditions were investigated using the Universal Thermal Climate Index (UTCI). The acceptability of sun or wind conditions to subjects were proposed to reveal the influences of sun and wind conditions on subjects. The results showed that the surveyed thermal sensation responding to the UTCI depended on the desirability of sun and wind conditions for subjects. The probability of these desirabilities fitted well with the UTCI in logistic regressions. The expected mean thermal sensation votes (MTSV) versus UTCI determined considering the effects of these desirabilities on thermal sensations was better agreed with the surveyed MTSV. Acceptable UTCI ranges of 16.5–35.0° and 18.5–32.5° were determined by sun acceptability and wind acceptability respectively. Wind conditions were predominant in influencing subjects' thermal perceptions at UTCI of less than 26.0°, while sun conditions were predominant at UTCI of greater than 26.0°. Subjects were more tolerant of sun conditions than wind conditions. These investigations are significant for thermally comfortable urban design and future studies.

Keywords: Outdoor thermal comfort; Universal thermal climate index (UTCI); Thermal sensation votes; Sun and wind desirability; Sun and wind acceptability

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