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ANALYSIS AND DESIGN OF IRREGULAR TALL BUILDINGS IN HONG KONG BY A STRENGTH-BASED DESIGN APPROACH

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Abstract

The development of design principles for tall buildings for any level of seismic hazard is much in need because the current codes of practice worldwide still do not fully provide the required guidance. The availability of design experience and guidance for low-to-moderate seismicity regions is especially scant. As buildings become taller, wind effects increase and earthquake effects decrease. Hong Kong, situated in a region of high typhoon and low-to-moderate seismicity, with an abundance of tall buildings, may offer a unique experience in the design of tall buildings for the effects both of wind and seismicity. This paper presents a strength-based design approach for the seismic design of irregular tall buildings in low-to-moderate seismicity regions, and provides a Hong Kong example with a transfer plate as an illustration. It is found that the example building, which has satisfactory performance under strong typhoon conditions, is capable of meeting force and displacement demands during rare earthquakes, using the proposed softened stiffnesses, expected strength factors and inter-storey drift ratios for structural members. Consideration is also given to the effects of a massive and stiff transfer plate in the building as regards the displacement responses, any abrupt change to the inter-storey drifts, as well as shear concentration in the shear walls. These effects are confirmed but found not to be critical in the example building.

Keywords: *Irregular tall buildings, Low-to-moderate seismicity regions, Strength-based design approach, Three-dimensional finite element analysis, Response spectrum analysis*