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See **Distribution**

Dear Sir/Madam

REQUIREMENTS FOR WIND TUNNEL TEST FOR TALL, SLENDER AND COMPLEX BUILDINGS AND STRUCTURES

Building codes such as the British Standard BS 6399-2 (Code of Practice for Wind Loads) and Eurocode SS EN 1991-1-4 (General actions on structures – Wind actions) provide guidance on the wind forces to be considered in the design of buildings and structures. However, these codes have limitations in their applications as they only cover buildings and structures of certain geometry and dynamic characteristics[1] but not those with highly complex shapes.

2 There are recently more tall and slender buildings and structures being built with unique and complex forms and shapes. When these buildings and structures (either very tall or with highly complex shapes) do not fall within the provisions of the BS 6399-2 and SS EN 1991-1-4, wind tunnel tests are recommended to be carried out to determine the design wind forces.

3 Qualified Persons (QPs) for structural works are reminded of these code limitations and the need for wind tunnel tests when the provisions in the codes are not applicable. When conducting wind tunnel tests, QPs are to ensure that an appropriate and competent wind tunnel testing regime is selected so as to obtain a better understanding of the behaviour of such complex buildings and structures under wind forces. Please refer to the attached Annex A on the criteria when selecting wind tunnel tests to be carried out.

[1] Geometry and dynamic characteristics refer to the building's shape, height, slenderness and its propensity to experience torsional effects and higher modes of vibration due to wind forces.

4 I would appreciate it if you could bring to the attention of your members the contents of this circular. Please contact Er. Dr Tran Chi Trung at Tel. 63257484 or email: tran_chi_trung@bca.gov.sg if you need further clarification.

Thank you.

Yours faithfully

K THANABAL
DIRECTOR, BUILDING ENGINEERING GROUP
for COMMISSIONER OF BUILDING CONTROL

Annex A

CRITERIA FOR WIND TUNNEL TESTS

1 Wind tunnel tests are recommended for the design of buildings and structures when one or more of the following criteria are met:

I. **Highrise or slender buildings/structures susceptible to dynamic wind excitation**

Dynamic effects are difficult to anticipate as they are dependent on many factors, but could be significant when any of the following apply:

- height of building or structure of more than 200m
- building or structure with fundamental natural frequencies less than 0.2Hz.

II. **Lowrise buildings/structures with complex shape and form**

Lowrise buildings/structures whose shape in plan or vertical cross section differs significantly from the shapes and forms in BS 6399 Part 2 (Code of Practice for Wind Loads) or those in Chapter 7 of SS EN 1991-1-4 (Eurocode 1: Actions on Structures, Part 1-4: General actions – Wind actions), whichever is applicable. QPs should seek specialist advice, where necessary, in such circumstances taking into account the size and extent of such structures to determine if wind tunnel testing is warranted.

Limitations on loads derived by the wind tunnel test methods

2 When wind tunnel tests are conducted on a specific building, the lateral wind actions determined for use in structural designs **should not be less than 80% of those determined from codebased empirical approaches**.

3 Compliance with the above does not in any way imply exemptions from other requirements that may be specified in the codes BS 6399-2 and SS EN 1991-1-4.

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