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## **REVISION TO EARLY PRE-CONSULTATION OF STRUCTURAL CONCEPT FOR COMPLEX BUILDINGS**

This circular informs the industry of the revised criteria for early pre-consultation of structural concept for complex buildings. This circular supersedes the circular on 'Early Pre-Consultation of Structural Concept for Complex Buildings' issued by BCA on 02 Jun 2014 ("2014 Circular").

### **Background**

2 Similar to the 2014 Circular, the key objective of early pre-consultation of structural concept for complex buildings is to ensure the structural robustness of complex buildings, where specific considerations need to be given to the design and construction of such complex buildings. These considerations have been enhanced to ensure robustness and buildability.

3 In order to ensure that the enhanced considerations are pertinent, we have consulted and gotten support from industry members, comprising professional engineers from the Institution of Engineers Singapore and the Association of Consulting Engineers Singapore. The enhancements and revisions are described below.

### **Revised types of complex buildings**

4. The types of complex buildings have been revised to address long span transfer structures, buildings with irregular layouts or behaviour and removal of any existing column or vertical support. Details of the types of complex buildings can be found in Annex A ("**Complex Buildings**"). The submission process for Approval of Building and Structural Plans for Complex Buildings remains unchanged, and relevant details are set out in Annex B. In particular, please note that a qualified person for architectural works has to submit a form BE-EP-ANNEX C found in Annex C, as completed by a qualified person for structural works to determine if there is any Complex Building in the project, together with the first building plan submission for the project. The corenet forms will be updated in due course.

### **Early pre-consultation of structural concept prior to obtaining clearance from the relevant agencies**

5. Currently, it is industry practice that a Qualified Person ("QP") appointed in respect of a project to develop a Complex Building approaches BCA for pre-consultation of structural concept after obtaining clearance from relevant agencies. In recent years, there is an increasing number of projects in which the QPs for structural works faced difficulties in enhancing the structural system of the Complex Building as clearance from relevant agencies have been approved. According to the QPs, the options available for them to improve the robustness of the structural system are limited as the plans have been finalised and any changes would often require re-submission to the various technical agencies.

6. BCA wishes to reiterate that consideration for a robust structural form be prioritised for Complex Buildings. Such buildings tend to be high-risk in nature and sensitive to disproportionate collapse. Therefore, QPs for structural works involved in such Complex Buildings are **strongly advised to come to BCA for early pre-consultation of structural concept prior to obtaining** clearance from relevant agencies.

#### **Robustness check to prevent disproportionate collapse**

7. While it is necessary to identify consequences class for all buildings, it is all the more important to identify consequences class for Complex Buildings and follow the recommended strategies for robustness check in accordance with SS EN 1991-1-7 Annexes A and B (e.g. systematic risk assessment for buildings in Consequences Class 3).

8. It should be noted that the use of 34kPa for design of “key element” is often neither relevant nor significant to the structural safety of Complex Buildings such as transfer structures. Therefore, for robustness checks of Complex Buildings, QPs for structural works should **carry out member removal checks to ensure that there is an alternative load path** to transfer the building loads safely, so that disproportionate collapse may be prevented.

#### **Revised arrangement for early pre-consultation with BCA**

9. BCA has also revised the contact information for the arrangement of early pre-consultation with BCA. For completeness, the revised forms are also included in this circular as follows:

- (i) Form BE-EP-ANNEX C
- (ii) Form BE-EP-ANNEX D
- (iii) Annex E-1 (extract showing revision to section III of Form BPD\_BP03 - “Application for Approval of Building Plans”)
- (iv) Annex E-2 (extract showing revision to Section II of Form BCA-BE-STAPPV01 - “Application for Approval of Structural Plans”)

10. Therefore, if the project has buildings meeting the type as listed in Annex A, the QP for structural works should make arrangement for early pre-consultation with BCA by sending the completed Form BE-EP-ANNEX D to:

- (i) By Email: [BCA\\_preconsultation@bca.gov.sg](mailto:BCA_preconsultation@bca.gov.sg) or
- (ii) By Mail / Fax:  
Building and Construction Authority  
52 Jurong Gateway Road #12-01  
Singapore 608550  
Fax: 63342561

#### **Clarification**

11. Please bring to the attention of your members the contents of this circular. Should you need any clarification, please contact either Er. Dr Tran Chi Trung (Tel. 68044642, email: [tran\\_chi\\_trung@bca.gov.sg](mailto:tran_chi_trung@bca.gov.sg)) or Er. Kang Yi Shu Vance (Tel. 68044632, email: [vance\\_kang@bca.gov.sg](mailto:vance_kang@bca.gov.sg)).

12. Thank you.

Yours faithfully



ER. VIVIEN FOO WEI WAN  
DIRECTOR, BUILDING ENGINEERING GROUP  
for COMMISSIONER OF BUILDING CONTROL

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## ANNEX A

### **COMPLEX BUILDINGS**

A building (excluding a bridge, viaduct, tunnel, and MRT/LRT station) is deemed to be a complex building if it consists of one or more of the following:

- 1) Multiple level transfer structure (2 or more transfer floors each carrying 3 or more floors) or cantilevered transfer structure (carrying 5 or more floors) or transfer structure with span of more than 10m (carrying 5 or more floors);
- 2) Non-vertical/inclined structural element (with offset of floor plate more than 3m from the edge of the floor above or below);
- 3) Structure with unconventional geometry (e.g. dome or arch-shaped) or a building (> 20 storeys) with irregular layout or behaviour (e.g. building governed by torsional mode; slender building with natural frequency < 0.2Hz; or building coupled/ connected by link bridge at height > 10 storeys);
- 4) Large span structure (with span more than 40m) or large cantilever span structure (where cantilever span is more than 8m);
- 5) Addition and alteration projects involving removal of any existing column or vertical support.

## **ANNEX B**

### **SUBMISSION PROCESS FOR APPROVAL OF BUILDING AND STRUCTURAL PLANS**

1 During submission of structural plans for foundation works or building plans, QP for structural or architectural works (as the case may be) will have to indicate, on the relevant application forms BPD\_BP03 and BEV/A1 in Corenet, whether a structure in their project is a Complex Building. QP for architectural works will also have to submit a form BE-EP-ANNEX C found in Annex C which is to be completed by the QP for structural works to determine if there is any Complex Building(s) in their project, together with the first building plan submission.

2 For a project involving any Complex Building(s), the respective QP will also have to indicate on the application form whether early pre-consultation has been made prior to the submission. If the QP fails to arrange for early pre-consultation, it may slow down the approval process for plan submission. Hence, to enable a smoother and faster processing of plans, QPs are advised to plan ahead and come for an early pre-consultation with BCA.

3 For early pre-consultation, the QP for structural works should provide the following details:

- (i) Architectural layout plans and drawings showing the proposed development and building
- (ii) Structural plans and drawings showing overall structural concepts, including structural systems, framing layout and details
- (iii) Structural modelling, analyses and designs, including checks on robustness of buildings and design of critical elements
- (iv) Issues affecting building performance, e.g. deflection, vibration and acceleration and long-term effects; measures to prevent disproportionate collapse etc
- (v) Preliminary Buildable Design score computation and highlighting any transfer beams, inclined columns, complex building forms and high voids (where relevant)
- (vi) Tentative methods of construction for the complex building structures

4 Parties involved in the project, namely the Developer, Architect, Accredited Checker and Builder (if they are on board) should also attend the session. A Pre-consultation Completion letter will be issued after the session when queries and comments, if any, from BCA are adequately addressed.

This form may take you 10 minutes to complete.

| <b>VERIFICATION BY QUALIFIED PERSON FOR STRUCTURAL WORKS<br/>ON WHETHER PROJECT FALLS UNDER COMPLEX BUILDING CRITERIA<br/>(THIS IS TO BE ATTACHED DURING FIRST PLAN SUBMISSION)</b> |  |
|---|--|
| <b>A. PROJECT DETAILS</b>   |  |
| 1   | Project Reference No.: _____<br>Project Title:<br>_____<br>_____<br>Lot/Plot: _____ TS/MK: _____<br>House No: _____ Road: _____<br>_____   |
| 2   | As the QP for Structural Works of the above project, I have reviewed and confirmed that the project: <ul style="list-style-type: none"> <li>i) <input type="checkbox"/> does not involve any complex building structure.</li> <li>ii) <input type="checkbox"/> involves one or more of the following complex building structures:                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Multiple level transfer structure (2 or more transfer floors each carrying 3 or more floors) or cantilevered transfer structure (carrying 5 or more floors) or transfer structure with span of more than 10m (carrying 5 or more floors)</li> <li><input type="checkbox"/> Non-vertical/inclined structural element (with offset of floor plate more than 3m from the edge of the floor above or below)</li> <li><input type="checkbox"/> Structure with unconventional geometry (e.g. dome or arch-shaped) or a building (&gt; 20 storeys) with irregular layout or behaviour (e.g. building governed by torsional mode; slender building with natural frequency &lt; 0.2Hz; or building coupled/ connected by link bridge at height &gt; 10 storeys)</li> <li><input type="checkbox"/> Large span structures (with span more than 40m) or large cantilever span structures (where cantilever span is more than 8m).</li> <li><input type="checkbox"/> Addition and alteration projects involving removal of any existing column or vertical support.</li> <li><input type="checkbox"/> Obtained a letter from our Building Engineering Group after completing pre-consultation session on the structural concept of the complex buildings. The Pre-consultation Completion Letter Reference No. is _____.</li> </ul> </li> </ul> <p>Note:<br/>                     If such pre-consultation has not been made, please arrange for it before any building or foundation plans can be processed.<br/>                     These criteria do not apply to bridges, viaducts, tunnels, and MRT/LRT stations.</p> |
| <b>B. DECLARATION BY THE QUALIFIED PERSON FOR STRUCTURAL WORKS</b>  |  |
| _____<br>Address of Qualified Person<br><br>UEN: _____ Tel No.: _____ Fax No.: _____<br>H/P No. : _____   | _____<br>Stamp & Signature of Qualified Person<br><br>Date: _____  |



This form may take you 10 minutes to complete.

| <b>REQUEST FORM FOR EARLY PRE-CONSULTATION OF<br/>STRUCTURAL CONCEPT FOR COMPLEX BUILDINGS</b> |   |
|--|---|
| <b>A. PROJECT DETAILS</b>  |   |
| 1  | Project Reference No.: _____<br>Project Title:<br>_____<br>_____<br>Lot/Plot: _____ TS/MK:<br>_____<br>House No: _____ Road: _____<br>_____<br>Usage: Residential/ Commercial/ Industrial / Institutional and others<br>No. of Storey: _____ Est. Project Cost: _____<br>Developer/Owner: _____<br>QP for Structural Works: _____<br>QP for Architectural Works: _____<br>Builder: _____  |
| <b>B. REQUEST FOR EARLY PRE-CONSULTATION</b>   |   |
| 2  | Building Engineering Group<br>Building and Construction Authority<br>Email: BCA_preconsultation@bca.gov.sg<br><br>Attention: Er. Dr Tran Chi Trung / Er. Kang Yi Shu Vance<br><br>Dear BCA Officer<br><br>I would like to request for an early pre-consultation with BCA for the project which involves the following complex structures:<br><u>Tick where applicable:</u><br><br><input type="checkbox"/> Multiple level transfer structure (2 or more transfer floors each carrying 3 or more floors) or cantilevered transfer structure (carrying 5 or more floors) or transfer structure with span of more than 10m (carrying 5 or more floors)<br><input type="checkbox"/> Non-vertical/inclined structural element (with offset of floor plate more than 3m from the edge of the floor above or below)<br><input type="checkbox"/> Structure with unconventional geometry (e.g. dome or arch-shaped) or a building (> 20 storeys) with irregular layout or behaviour (e.g. building governed by torsional mode; slender building with natural frequency < 0.2Hz; or building coupled/ connected by link bridge at height > 10 storeys)<br><input type="checkbox"/> Large span structure (with span more than 40m) or large cantilever span structure (where cantilever span is more than 8m)<br><input type="checkbox"/> Addition and alteration projects involving removal of any existing column or vertical support<br><br>Note:<br>The QP is to sign and send/email the form to the Building Engineering Group.<br>These criteria do not apply to bridges, viaducts, tunnels, and MRT/LRT stations.<br><br>Endorsement of QP for Structural Works _____ QP's contact no. and email _____<br><br>_____ Date: _____ |

**Annex E -1 (extract showing revision to section III of BPD\_BP03 form and II of the BCA-BP-BPAPPV01 - “Application for Approval of Building Plans”)**

(8) I confirm that the project:

- i)  does not involve any complex building structure as shown in the attached form (BE-EP-ANNEX C).
- ii)  involves one or more complex building structures as shown in the attached form (BE-EP-ANNEX C).  
 obtained a letter from our Building Engineering Group after completing pre-consultation session on the structural concept of the complex buildings. The Pre-consultation Completion Letter Reference No. is \_\_\_\_\_.

(Note: If such pre-consultation has not been made, please arrange for it before any building or foundation plans can be processed).

(9) ETTV plans and calculations are –

- i) not applicable;
- ii) applicable and a set of these calculations are attached.

(10) Alternative solutions are :

- i) adopted (schedule of alternative solution attached);
- ii) not adopted.

(11) Under the Building Control (Buildable Design) Regulations, submission of buildability score is –

- i)  Applicable  a set of these calculations (Form BPD\_BS01) is attached.  
The buildability score is \_\_\_\_\_ for GFA of \_\_\_\_\_ m<sup>2</sup>.  
The planning permission was 1<sup>st</sup> applied on \_\_\_\_\_ (state the date).
- Buildability score submitted in the previous BP submission and is unchanged
- ii)  Not applicable:  Planning Permission requirements:
- GFA < 2000m<sup>2</sup> (planning permission applied after 1 Jan 2004).
  - GFA < 5000m<sup>2</sup> (planning permission applied before 1 Jan 2004).
  - Planning permission applied before 1 Jan 2001.
- Waiver obtained.
- Exempted.

**Annex E-2 (extract showing revision to section II of BCA-BE-STAPPV01 form -  
“Application for Approval of Structural Plans”)**

**Declaration by the Qualified Person for Structural Works**

|  |  |
|--|--|
| II.3. I confirm that the project   |  |
| (a)  | <input type="radio"/> does not involve any complex building structure.   |
| (b)  | <input type="radio"/> involves one or more of the following complex building structures: <ul style="list-style-type: none"><li><input type="checkbox"/> Multiple level transfer structure (2 or more transfer floors each carrying 3 or more floors) or cantilevered transfer structure (carrying 5 or more floors) or transfer structure with span of more than 10m (carrying 5 or more floors).</li><li><input type="checkbox"/> Non-vertical/inclined structural element (with offset of floor plate more than 3m from the edge of the floor above or below).</li><li><input type="checkbox"/> Structure with unconventional geometry (e.g. dome or arch-shaped) or a building (&gt; 20 storeys) with irregular layout or behaviour (e.g. building governed by torsional mode; slender building with natural frequency &lt; 0.2Hz; or building coupled/connected by link bridge at height &gt; 10 storeys).</li><li><input type="checkbox"/> Large span structure (with span more than 40m) or large cantilever span structure (where cantilever span is more than 8m).</li><li><input type="checkbox"/> Addition and alteration projects involving removal of any existing column or vertical support.</li><li><input type="checkbox"/> Obtained a letter from our Building Engineering Group after completing pre-consultation session on the structural concept of the complex buildings. The Pre-consultation Completion Letter Reference No. is<br/><input type="text"/></li></ul> |
| <p>Note: If such pre-consultation has not been made, please arrange for it before any building or foundation plans can be processed.</p> |  |