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Construction Productivity and
Quality Group

1 March 2022

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Dear Sir/Madam

A. ENHANCEMENTS TO CODE OF PRACTICE ON BUILDABILITY AND AMENDMENTS TO BUILDING CONTROL (BUILDABILITY AND PRODUCTIVITY) REGULATIONS 2011 TO ACCELERATE ADOPTION OF DESIGN FOR MANUFACTURING AND ASSEMBLY (DfMA)

B. COLLECTION OF OFF-SITE CONSTRUCTION PRODUCTIVITY DATA

Objective

1 This circular informs the industry of the enhancements to be made to the Code of Practice (“COP”) on Buildability and changes to the Building Control (Buildability and Productivity) Regulations 2011 (the “Buildability Regulations”), which will take effect on **30 April 2022**. The changes are:

- I. Higher minimum Buildable Design Scores (B-Scores) for large commercial, industrial and institutional projects with Gross Floor Area (GFA) $\geq 25,000\text{m}^2$;
- II. Enhanced outcome-based options for all large development types, in lieu of meeting the minimum B-Score;
- III. Mandatory adoption of specific productive technologies for residential non-landed (RNL) projects; and
- IV. Requirement for Professional Engineers (PE) for Mechanical and Electrical Works to jointly declare B-Score submissions with Qualified Persons (QP) for Architectural and Structural Works.

2 In addition to the above changes, builders will be required to submit off-site construction productivity data through the Electronic Productivity Submission System (ePSS), which will also take effect from **30 April 2022**.

Background

3 The COVID-19 pandemic has accentuated the urgency for the built environment sector to transform and strengthen its resilience, particularly in reducing our reliance on manpower. Design for Manufacturing and Assembly (DfMA) would become the mainstream way to design and construct buildings. DfMA promotes efficient off-site fabrication of building components and eases assembly on-site. This results in a leaner workforce, time savings with works carried out on-site and off-site concurrently, better workmanship quality and reduced disamenities to the public.

4 The Building and Construction Authority (BCA) periodically reviews the Buildability framework. In 2019, we raised the minimum B-Score to encourage adoption of DfMA technologies in large RNL developments (GFA \geq 25,000m²). In December 2020, the Buildability framework was enhanced with (a) revamped Buildable Design Appraisal System (BDAS) to integrate DfMA adoption for the Structural, Architectural and Mechanical, Electrical and Plumbing (MEP) disciplines, including an 'Innovation' section to encourage innovative ideas to improve productivity, (b) recalibrated minimum B-Scores for all development types due to revamped BDAS, and (c) extension of 'open' option with productivity outcome to all large development types, in lieu of meeting the minimum B-Scores.

5 To accelerate the adoption of DfMA for large developments, BCA will enhance the COP on Buildability and make amendments to the Buildability Regulations as detailed below:

Key Changes

I. Higher minimum B-Scores for large commercial, industrial and institutional projects with GFA \geq 25,000m²

6 To accelerate DfMA adoption for large projects which have greater scope for DfMA application and economies of scale, the minimum B-Scores for superstructure works of large commercial, industrial and institutional projects will be raised. The details are provided in [Annex A](#).

II. Enhanced outcome-based options for all large development types, in lieu of meeting the minimum B-Score

7 Designers have the flexibility to decide on the DfMA designs and technologies that best meet their project needs. Large building projects can opt to comply with Buildability requirements, either by meeting the raised minimum B-Scores or fulfilling one of the outcome-based options¹. Outcome-based options include deemed-acceptable solutions which are currently applicable to large RNL projects only, while 'open' option is extended to all large projects. In the new COP on Buildability, BCA will make the following enhancements (refer to details in Annex B):

- (i) Revise deemed-acceptable solutions for large RNL projects;
- (ii) Introduce new deemed-acceptable solutions for large commercial, industrial and institutional projects; and
- (iii) For the 'open' option, raise the minimum productivity improvement requirement from 20% to 25% (from 2010's level).

III. Mandatory adoption of industry standard components for residential non-landed (RNL) projects

8 As modularisation is a key approach to achieve higher productivity and optimise benefits of DfMA, there is scope to steer the sector towards wider adoption of modularised components, especially with standardised dimensions at industry level. This would pave the way for more cost-effective prefabrication of standard components due to greater economies of scale. BCA will require the following industry standard components for RNL projects:

¹ An outcome-based option refers to any of the deemed acceptable solutions or 'open' option. Designers will be required to submit documents to support their deemed acceptable solution or 'open' option on how their proposal can achieve the stipulated productivity improvement at plan approval stage and upon completion of the project.

Table 1: Mandatory adoption of industry standard components for RNL developments and RNL component of mixed-use developments

Current	From 30 April 2022
65% Precast Household Shelters (Precast HS)	65% Precast HS (of which 60% Precast HS are of standard sizes)
65% Prefabricated Bathroom Units (PBU) <i>only for RNL developments or RNL component of mixed-use developments on Government Land Sales sites</i>	65% PBUs (of which 60% PBUs are of standard sizes)

IV. Requirement for PEs for M&E Works to jointly declare B-Score submissions with QPs for Architectural and Structural Works

9 Presently, both the QPs for Architectural and Structural Works are required to declare and submit B-Scores for their projects, together with the building plans for approval. As MEP works also contribute towards raising construction productivity and with the revamped BDAS placing more emphasis on these works, PEs for M&E works now play a bigger role to influence the design of MEP systems. To foster greater collaboration across disciplines during upstream design, BCA would require PEs for M&E works to jointly declare B-Score submissions.

Requirement for builders to submit off-site construction productivity data through ePSS

10 Currently, BCA collects construction productivity data for building projects with GFA $\geq 5,000\text{m}^2$ through ePSS. As DfMA becomes the mainstream way of construction, more on-site construction works would be shifted off-site. To enhance data collection and facilitate overall productivity measurement, builders are required to submit off-site construction productivity data, in addition to the on-site construction productivity data, including but not limited to (i) manpower utilisation (e.g. mandays required to carry out prefabrication works), and (ii) construction output (e.g. volume of precast components). The revised format of construction productivity data submission will be made available on the ePSS website.

Implementation Timeline

11 The changes outlined in paragraphs 6 to 9 apply to projects submitted to the Urban Redevelopment Authority (URA) for Planning Permission on or after 30 April 2022. Requirements in paragraph 10 apply to projects with Permit to Carry Out Structural Works issued by BCA on or after 30 April 2022.

Clarification

12 Should you or your members have any queries concerning this circular, please contact Ms Wong Jia Min at 6804 4226 (email: Wong_Jia_Min@bca.gov.sg) or Ms Jenny Tan at 6804 4230 (email: Jenny_XY_Tan@bca.gov.sg).

13 For queries on ePSS requirements, please contact Mr Jaycee Chen at 6804 6855 (email: Jaycee_Chen@bca.gov.sg) or Ms Toh Xing Juan at 6804 4249 (email: Toh_Xing_Juan@bca.gov.sg).

Thank you.

Yours faithfully



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Annex A

New Minimum Buildable Design Score for Projects with GFA ≥ 25,000m²

Year	FROM 30 APRIL 2022*	
CATEGORY OF BUILDING WORK/ DEVELOPMENT	MINIMUM BUILDABLE DESIGN SCORE	
	5,000 m ² ≤ GFA < 25,000 m ²	GFA ≥ 25,000 m ²
Public Residential (non-landed)	68	80
Private Residential (non-landed)	68	80
Commercial	60	70
Industrial	65	70
Institutional, School and Others	60	66
MRT Station	60	

**based on date of planning application made to URA*

New Outcome-based Options for Projects with GFA ≥ 25,000m²

S/No	CATEGORY OF BUILDING WORK/ DEVELOPMENT	OUTCOME-BASED OPTIONS FROM 30 APRIL 2022*	
		Deemed-acceptable Solution	'Open' Option
1	Public Residential (non-landed)	<p>Any proposal which can achieve min. 25% productivity improvement over 2010 levels</p>	
2	Private Residential (non-landed)		
3	Commercial		
4	Industrial		
5	Institutional, School and Others		
		<p><u>Deemed-acceptable Solution: Option 1</u> Structural System: Min. 65% Prefabrication Level Architectural System: Min. 80% Prefabrication Level MEP System: Min. 50% Prefabrication Level System Formwork: Min. 70%</p>	
		<p><u>Deemed-acceptable Solution: Option 2</u> Min. 60% PPVC + 70% System Formwork; <u>or</u> Min. 50% PPVC (5-storey and below) + 70% System Formwork</p>	
		<p><u>Deemed-acceptable Solution: Option 1</u> Structural System: Min. 60% Prefabrication Level or 50% Structural Steel/APCS/MET Architectural System: Min. 80% <u>or</u> 70% Prefabrication Level (for office only) MEP System: Min. 50% Prefabrication Level System Formwork: Min. 70%</p>	
		<p><u>Deemed-acceptable Solution: Option 2</u> Min. 60% PPVC + 50% Prefabricated MEP + 70% System Formwork</p>	

Note:

- a. PPVC refers to Prefabricated Prefinished Volumetric Construction
- b. APCS refers to Advanced Precast Concrete System
- c. MET refers to Mass Engineered Timber

**based on date of planning application made to URA*