Building and Construction Authority

BCA Industry Briefing on

ENHANCEMENTS TO BUILDABILITY FRAMEWORK

20 April 2022

Some webinar administration for you to note...

MUTE

Webinar participants are on ‘mute’ setting by default

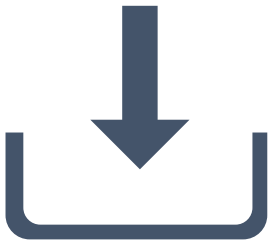
Q&A

Click the ‘Q&A’ button on the toolbar and type in your questions

Some webinar administration for you to note...

EVALUATION FORM*

After exiting the webinar, you will be directed to a Evaluation Survey



PRESENTATION MATERIALS

The presentation materials will be made available at the end of the webinar

* No certificate will be issued

Programme Highlights

TIME	PROGRAMME
4.05pm	**Introduction** *Mrs Foo-Leoh Chay Hong, Director, Buildable Design Department, Construction Productivity and Quality Group, BCA*
	Presentation:
4.10pm	**Enhancements to Buildability Framework** *Ms Wong Jia Min, Senior Manager, Buildable Design Department, Construction Productivity and Quality Group, BCA*
5.00pm	**Q&A Session**
5.30pm	**End of Industry Sharing**

BCA-Industry Briefing

Enhancements to Buildability Framework

1. Phased enhancements of Buildability framework to drive DfMA adoption

2. Buildability 2022

a. New min. B-Scores for large projects with GFA ≥ 25,000m²
b. New outcome-based options for large projects
c. New mandatory requirements for residential non-landed (RNL) projects to adopt specific industry standard components
d. Requirement for Professional Engineers (Mechanical & Electrical) to jointly endorse Buildability submission with Qualified Persons (QPs) for Architectural and Structural works

3. Collection of off-site construction productivity data

1. The COVID-19 experience has revealed vulnerabilities on manpower and supply chain, and reaffirmed need to transform the way we design and construct buildings

Current Landscape

From this…

Highly dependent on large no. of workers

Desired State

To this…

Advanced and highly automated manufacturing

Design **f**or **M**anufacturing **(off-site and automation)** and **A**ssembly **(on-site)**

Moving work offsite will improve **safety, productivity** and **quality**

Better quality products

Faster completion

Better site safety

Fewer deliveries

Lesser dust and noise

Fewer site workers

1. BCA has conducted extensive consultation with the industry including developers, consultants, builders and prefabricators. Inputs were considered in the Buildability framework review.

Approach

Phase 1: Buildability 2019
(effective from 15 Dec 19)

Started with large residential non-landed (RNL) projects to adopt DfMA

Phase 2: Buildability 2020
(effective from 28 Dec 20)

Revamped Buildable Design Appraisal System (BDAS) to integrate DfMA into each discipline of work –
Structural, Architectural and MEP

Phase 3: Buildability 2022
(effective from 30 Apr 22)

Require all other large projects to adopt DfMA

Key Changes

a. **Raised min. B-Score for large RNL projects** to adopt DfMA given the highest manpower utilization

b. **Introduced outcome-based options as alternative to meeting higher standards** (provide flexibility to industry)

a. **Min. B-Scores were calibrated to 2019 standards**

b. Extend open option to all large projects

a. **Raise min. B-Scores for non-RNL large projects** (commercial, industrial, institutional & others)

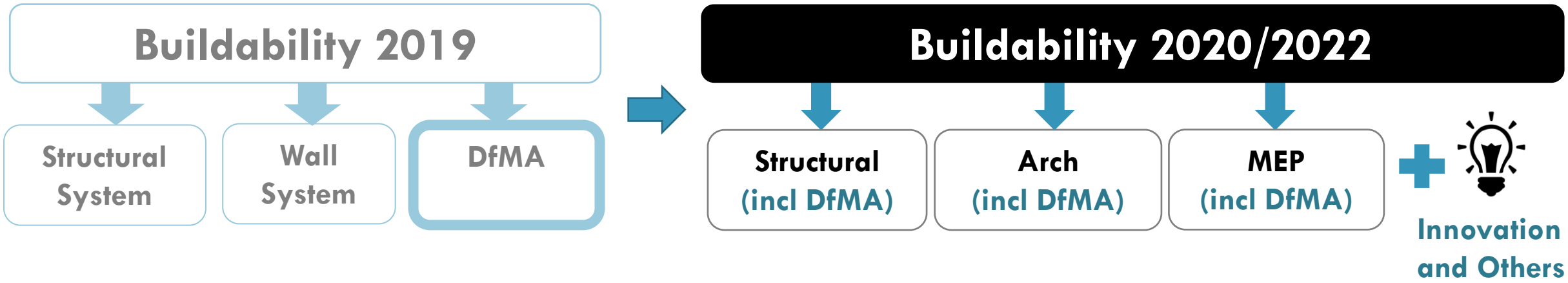
b. **Introduce outcome-based options for the above projects** (more flexibility to industry)

c. **Drive greater modularisation by requiring adoption of industry standard components/ sizes**

Note: Large projects refer to those with GFA ≥ 25,000m². Enhancements would only affect new projects with planning applications made on or after implementation.

2. Recent review of Buildability framework focused on making DfMA an integral part of the way we design and build and encourages adoption of prefabrication in each discipline of work

Buildable Design Appraisal System (BDAS)



Approach:

a) Make DfMA an integral part of the framework i.e. DfMA included in each discipline of works

b) A section on innovation to encourage innovative ideas to achieve productivity objective

c) Different points for Structural, Architectural and MEP depending on development type

2. Revamped Buildable Design Appraisal System (BDAS) enables designers to select the appropriate DfMA tech to meet the minimum B-Score

Total B-Score
(Max. 120 pts)

Buildability 2020/2022
Buildable Design Appraisal System (BDAS)

Work Disciplines	Structural	Architectural (Wall, Floor, Ceiling)	Mechanical, Electrical and Plumbing (MEP)	Innovation and others (20 pts)
DfMA Technologies	Prefabricated Prefinished Volumetric Construction (PPVC)			
	APCS, Structural Steel, MET	PBU, Dry applied finishes	Prefab MEP modules	
Non-DfMA	Flat plate/slab Beam-slab system	Cast in-situ walls Large format tiles	-	
Modularisation	Standard columns/beams Repeated layout	No complex form Repetition of PBU Standard doors	Mechanical connections Standard pump skids	

Considerations

a. New technologies
b. Manpower savings ≥ 20%

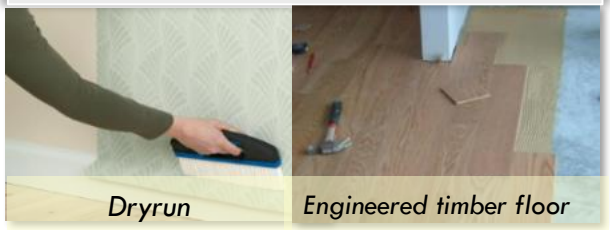
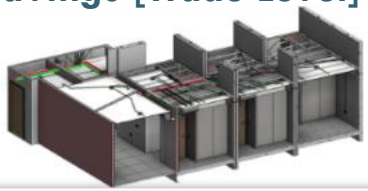
Examples (not exhaustive)

Prefab Common Toilet (PCT),
Prefab Kitchen Unit (PKU)

APCS – Advanced Precast Concrete System MET – Mass Engineered Timber PBU – Prefabricated Bathroom Unit

2. DfMA continuum comprises a wide spectrum of productive technologies covering all three disciplines of work – Structural, Architectural, MEP

Components: *Incremental Improvement* → **Integrated Assemblies:** *Game-Changing Improvement*

	Prefab Components	Advanced Prefab Systems	Integrated Sub-assemblies	Fully Integrated Assemblies
Structural	**Precast**	**Structural Steel / Advanced Precast / Hybrid**	**Mass Engineered Timber (MET) / Hybrid**	**PPVC**
				
	10%	20%	35%	40%
Architectural	**On-site Dry Applied Finishes**	**Prefinished Surfaces**	**PBU / Prefab Kitchens Units (PKU)/ Prefab Common Toilets (PCT)**	**PPVC**
	 *Dryrun* *Engineered timber floor*		 *Common Toilet* *Kitchen* *PBU*	
	30%	45%	60%	70%
MEP	**Flexible Water Pipe/ Sprinkler Dropper**	**Prefab Ceiling Module/ Prefab Plant**	**Prefab Module with Platform/ Catwalk**	**PPVC**
		 *Prefab Plant*	 *Prefab MEP Deck*	

Manpower Savings [Project Level]

Manpower Savings [Trade Level]

2. Different point weightages for different development types seek to encourage more buildable designs in the particular discipline of work that requires more manpower

Buildability 2019 weightage (across all categories)

Structural	Architectural	DfMA
45 pts	45 pts	20 pts

Buildability 2020/2022 allocation of points

✓ To account for actual manpower usage

Example 1: Residential (Non-Landed)

Structural	Architectural	MEP
35 pts	45 pts	20 pts

Example 2: HDB

Structural	Architectural	MEP
45 pts	40 pts	15 pts

Points allocation in each discipline for different categories of development

Category	Maximum points (based on manpower usage)		
	Structural	Architectural	MEP
Residential Non-landed	35	45	20
HDB	45	40	15
Industrial	50	25	25
Commercial, School, Institutional & Others	35	30	35

2a. New Min. B-Score for Buildability 2022

a. In 2019, we have raised the min. B-Score to drive larger residential non-landed (RNL) projects to adopt DfMA.
b. With revamped BDAS in 2020, min. B-Scores were re-based with changes in point allocation based on manpower usage.
c. From 30 Apr 2022, we will be raising the min. B-Scores for large non-RNL projects to drive DfMA adoption.

Category	Mid-sized Projects $5{,}000m^2 \leq GFA < 25{,}000m^2$		Large Projects $GFA \geq 25{,}000m^2$		
	2019	2020 & 2022* (re-based from 2019)	2019	2020 (re-based from 2019)	2022*
HDB	85	68	92 from 90 pts in 2017	80	80
Private RNL	85	68	92 from 90 pts in 2017	80	80
Commercial	87	60	90	63	70 *NEW*
Industrial	87	65	90	68	70 *NEW*
Institutional and others	79	60	82	63	66 *NEW*

Applicable to projects applying for URA planning permission on or after 30 Apr 2022

2b. Designers have flexibility to select one of three ways to meet Buildability requirements

1. Code compliance option

Meeting minimum B-Score using BDAS

2. Outcome-based option for large projects

(GFA ≥ 25,000m²)

a. Deemed acceptable solutions

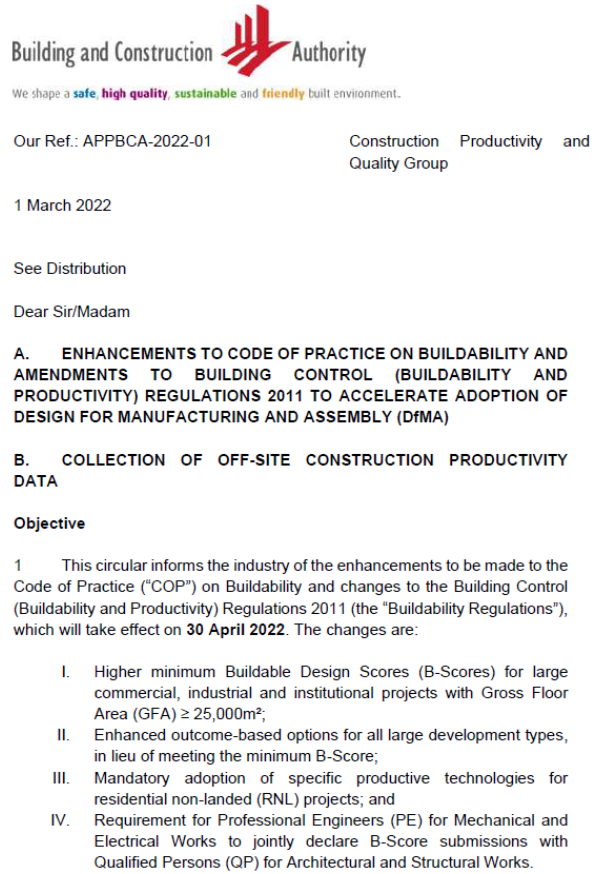
*(currently only for large **RNL** projects)*

- **High prefabrication level (Structural, Architectural and MEP)**
  E.g. 50% prefab + 70% system formwork + 50% MEP or 65% prefab + 70% system formwork
- **DfMA adoption**
  E.g. 60% PPVC or 50% PPVC (≤ 5-storey)

b. Open option

- Proposal demonstrating **min. 20% productivity improvement**

BCA issued circular on 1 Mar to inform that Buildability 2022 will apply to projects applying for URA planning permission on and after 30 Apr 2022



Building and Construction Authority

We shape a safe, high quality, sustainable and friendly built environment.

Our Ref.: APPBCA-2022-01

Construction Productivity and Quality Group

1 March 2022

See Distribution

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) ≥ 25,000m²;
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.

2b. Buildability 2022 – Requirements for large RNL projects (GFA ≥ 25,000m²)

Min. B-Score & Outcome-based options

Building Typology	Buildability 2020		Buildability 2022	
	Min. B-Score	Outcome-based options	Min. B-Score	Outcome-based options
HDB	80	**Deemed-acceptable Solution: Option 1** Structural: 50% Prefab Archi: 50% Prefab MEP: 50% Prefab System Formwork: 70% **Deemed-acceptable Solution: Option 2** Structural: 65% Prefab Archi: 65% Prefab System Formwork: 70% **Deemed-acceptable Solution: Option 3** a. 60% PPVC b. 50% PPVC (5-storey and below) **Open Option: Option 4** Meeting min. 20% productivity improvement over 2010 levels	80	*Revised* **Deemed-acceptable Solution: Option 1** Structural: 65% Prefab Archi: **80%** Prefab MEP: 50% Prefab System Formwork: 70% *Revised* **Deemed-acceptable Solution: Option 2** a. 60% PPVC + **70% System Formwork** b. 50% PPVC (≤ 5-storey) + **70% System Formwork** **Open Option: Option 3** *Revised* Meeting min. **25%** productivity improvement over 2010 levels
Private RNL	80		80	

2b. Buildability 2022 – Requirements for large non-RNL projects (GFA ≥ 25,000m²)

Min. B-Score & Outcome-based options

<table>
<tr><th rowspan="2">Building Typology</th><th colspan="2">Buildability 2020</th><th colspan="2">Buildability 2022</th></tr>
<tr><th>Min. B-Score</th><th>Outcome-based options</th><th>Min. B-Score</th><th>Outcome-based options</th></tr>
<tr><td>Industrial</td><td>68</td><td rowspan="3">Open Option:
Meeting min. 20% productivity improvement over 2010 levels</td><td>70
(+2)</td><td rowspan="3"><u>Deemed-acceptable Solution: Option 1</u> *NEW*
Structural: 60% Prefab <u>or</u> 50% Steel/APCS/MET
Archi: 80% Prefab <u>or</u> 70% Prefab* (for office only)
MEP: 50% Prefab
System Formwork: 70%

<u>Deemed-acceptable Solution: Option 2</u> *NEW*
60% PPVC + 50% Prefab MEP + 70% System Formwork

<u>Open Option: Option 3</u> *Revised*
Meeting min. 25% productivity improvement over 2010 levels</td></tr>
<tr><td>Commercial</td><td>63</td><td>70
(+7)</td></tr>
<tr><td>Institutional & Others</td><td>63</td><td>66^
(+3)</td></tr>
</table>

**Lower prefab architectural level as office buildings have less internal walls since the office space is tenanted out*

^Lower points to cater for diverse range of institutional projects

2b. What do you need to prepare for Buildability submissions?

Building projects with GFA ≥ 5,000m² required to submit B-Score when making structural and building plan submissions

Code Compliance option

Meeting min. B-Score using BDAS

1. **B-Score form with B-Score computation** (BS01 for ST and BP submissions and BS03 for as-built TOP submissions)
2. **BDIP** including mark-ups on plans with computation of coverage of building systems/components, site photos (TOP stage)
3. **Constructability form (CS01)** (by builder)
4. **Constructability Implementation Plan (CIP)** (by builder)

Outcome-based option

Deemed-acceptable solution

1. **B-Score form for declaration of option chosen** (BS01 for BP submissions and BS03 for as-built TOP submissions)
2. **Deemed-acceptable Proposal** to illustrate the extent of use of DfMA/prefabrication systems/system formwork
3. **Site photos** (TOP stage)

Outcome-based option

Open option

1. **B-Score form for declaration of option chosen** (BS01 for BP submissions and BS03 for as-built TOP submissions)
2. **Project Productivity Improvement Plan (PPIP)** to explain the design concept including:
   a. Proposed design technologies/systems
   b. Level of use of prefabrication, buildable features, off-site finishes
   c. Innovative features, robotics and automation
   d. Proposed construction process, construction management
   e. Demonstration e.g. through simulation of how project can achieve Productivity improvement of **at least 25%**
3. **Site photos** (TOP stage)

2b. Outcome-based options: How to compute prefab level (structural, architectural, MEP)?

Prefabrication level is measured based on superstructure works

Prefab Structural Systems
(based on total Constructed Floor Area, CFA)

1. PPVC
2. APCS
3. Structural Steel
4. MET
5. Hybrid Steel/Precast Concrete/MET
6. Prefabricated column/wall, prefabricated beam and prefabricated slab
7. Prefabricated beam and prefabricated slab
8. Prefabricated column/wall and prefabricated slab
9. Prefabricated slab

Prefab Architectural Systems
(based on total wall length)

1. PPVC
2. PBU
3. Prefabricated and prefinished wall with MEP services
4. Prefabricated and prefinished wall / Off-form precast wall
5. Drywall
6. Curtain wall / Full height glass partition
7. Prefabricated railing
8. Precast wall
9. Lightweight concrete panel

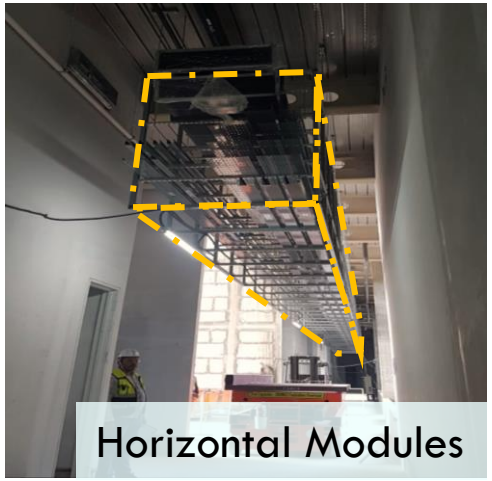
Prefabricated MEP Systems
(based on qualifying area^)

1. Prefabricated MEP vertical modules
2. Prefabricated MEP horizontal modules
3. Prefabricated MEP plant modules

^*Qualifying area refers to the area suitable for adoption of prefab MEP system. More details in B-Score form.*

2b. Outcome-based options: How to compute prefab level (structural, architectural, MEP)?

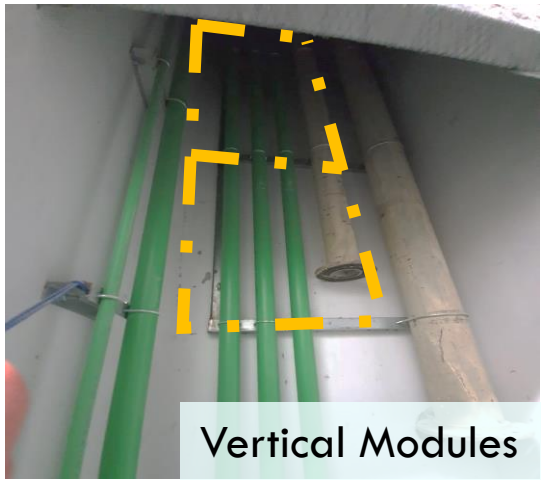
$$\text{Prefab MEP level (\%)} = \frac{\text{Total Prefab MEP area (horizontal + vertical + plant)}}{\text{Total qualifying area (horizontal + vertical + plant)}}$$



Horizontal Modules

<u>Qualifying Area*</u>

Common corridor areas (including lift lobbies)



Vertical Modules

<u>Qualifying Area*</u>

a. Chilled water risers
b. Plumbing & Sanitary risers
c. Fire fighting services
d. Electrical risers

Plant Modules

<u>Qualifying Area*</u>

Rooms/skids containing pumps serving:

a. Potable water pumpsets
b. NEWater pumpsets
c. Sprinkler pumpsets
d. Hosereel pumpsets
e. Chilled water pumpsets
f. Condenser water pumpsets

**More details in B-Score form*

2b. Outcome-based options: How to compute prefab level (structural, architectural, MEP)?

More information on Prefab MEP systems:

Scan QR code to download materials:

Topics:

1. Key principles of Prefab MEP & strategies in developing Prefab MEP Ecosystem in Singapore *(BCA)*
2. **Measuring Prefab MEP coverage under Buildability framework *(BCA)***
3. IDD as an enabler for MEP modularisation process *(BCA)*
4. Adoption of Prefab MEP system: A Builder's Perspective *(Dragages Singapore)*
5. Innovative way of construction: MEP Module System *(YJME Engineering)*
6. Ensuring quality of Prefab MEP modules through Accreditation *(Ohmz and Associates)*


SPECIALISTS TRADE ALLIANCE OF SINGAPORE

Building and Construction Authority

BCA-STAS Introductory course on **MODULAR MEP DESIGN AND PREFABRICATION**

DETAILS

VENUE: BCA Braddell Campus
FEE (incl of GST):
S$720 (without Funding)
S$114.39# (with WTU funding support for eligible participants)
For more information on the funding requirement, please refer to https://www1.bca.gov.sg/buildsg/buildsg-transformation-fund/workforce-training-and-upgrading-scheme-wtu

SPEAKERS
MEP Industry Practitioners, STAS & BCA

TARGET AUDIENCE
Developers, engineers, builders, prefab suppliers, and MEP subcontractors

INTRODUCTION
Aligned with the Construction Industry Transformation Map's thrust of Design for Manufacturing and Assembly (DfMA), the prefabricated modular MEP system is one of the identified key DfMA enablers to improve overall construction productivity in Singapore. BCA and Specialist Trade Alliance of Singapore (STAS) had earlier launched the Manufacturer Accreditation Sche
there is an increased adoption in using modula
to train relevant professionals on how prefabric
designed, fabricated in factory and installed to
and high workmanship standards to support in
highly mechanised, productive and efficient BE

To increase depth of knowledge in design, man
learning curves, participants will gain an unders
- design consideration, coordination and fabri system
- logistics involved and site-based requiremen
- application of IDD in module production and
- practical application on quality assurance ar installation of MEP modules;
- best practices and how to set processes to pr
- processes and operation of MEP Manufactur

CONTENTS
- Prefab MEP Manufacturer Accreditation Sch
- Procurement process in prefab MEP modular
- Modular Design sharing by Project / Design
- Implementation of IDD in prefab MEP module
- Production and Installation Process
- Digitalisation in prefab MEP Production Moni

Scan QR code to register for next run in 24 & 25 Aug 2022:
Course code: 80067

2b. Outcome-based options: How to compute DfMA coverage?

PPVC/APCS/Structural Steel/MET/Hybrid

1. PPVC coverage is measured based on superstructure works

Coverage of PPVC at project level (%) =

$$\frac{\textbf{CFA of PPVC system (m}^2\textbf{)}}{\textbf{Total CFA of superstructure or component used for residential or accommodation purposes (m}^2\textbf{)} \text{ including:}}$$

Total CFA of superstructure or component used for residential or accommodation purposes (m²) including:

a. Lift lobbies
b. Corridor

Excluding:

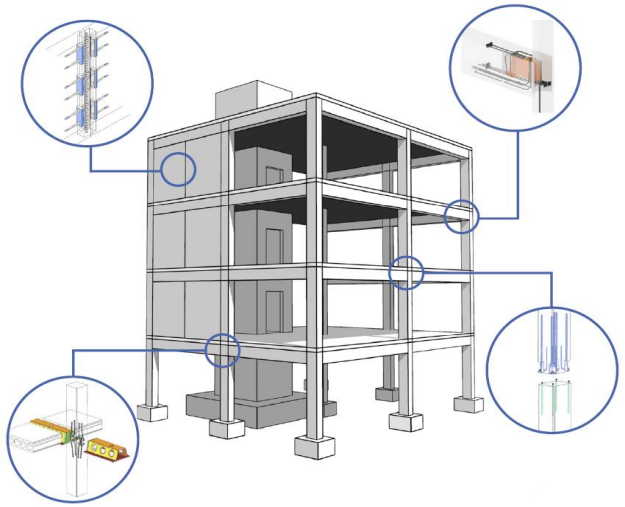
a. E-deck / Void deck
b. Swimming pool
c. Roof
d. Carpark
e. Landscape area but include residential floor area at the same storey (if there are dwelling units)
f. Hotel lobby

2b. Outcome-based options: How to compute DfMA coverage?

PPVC/APCS/Structural Steel/MET/Hybrid

2. APCS coverage is measured based on superstructure works

$$\text{Coverage of APCS at project level (\%)} = \frac{\text{CFA of Precast Slab (m}^2\text{) with at least 4 out of 6 APCS features, each with} \geq 65\% \text{ coverage}}{\text{Total CFA of superstructure works (m}^2\text{)}}$$



S/N	Feature
1	**Integrated precast components (comprising at least 2 structural/architectural elements)** e.g. double bay façade wall, beam-façade wall, multi-tear column/wall, precast HS, precast refuse chute, PBU, prefinished façade walls, precast external wall w cast-in windows
2	**Mechanical connection for precast column / precast wall (horizontal joints)** e.g. column shoes, spiral connector, grouted sleeves
3	**Mechanical connection for precast beam** e.g. telescopic beam connector, grouted sleeves
4	**Mechanical connection for precast wall (vertical joints)** e.g. flexible loops
5	**Mechanical connection for other precast components** e.g. precast staircase flight + precast landing
6	**Large panel slab / hollow core slab / double T slab ≥ 2.4m width**

2b. Outcome-based options: How to compute DfMA coverage?

PPVC/APCS/Structural Steel/MET/Hybrid

3. Steel/MET/Hybrid coverage is measured based on superstructure works

$$\text{Coverage of Steel/MET/Hybrid at project level (\%)} = \frac{\text{CFA of Structural Steel (steel beam, steel column, steel decking) or CFA of MET (MET beam, MET column, MET slab) or CFA of Hybrid Structural Steel, Precast Concrete, MET (beam, column, slab) } (m^2)}{\text{Total CFA of superstructure works } (m^2)}$$

2b. Outcome-based options: How to compute system formwork level?

System formwork coverage is measured based on superstructure works, each must be ≥ 70% of the remaining CIS area

System	Min. Prefabrication Level	Min. System Formwork
Structural System (measured by constructed floor area)	60% ✓	*(70% of remaining 40%)* **To adopt min. 28% horizontal system formwork (for slab and beam) out of total constructed floor area**
Architectural System (measured by wall length)	80% ✓	*(70% of remaining 20%)* **To adopt min. 14% vertical system formwork (for wall and column) out of total formwork vertical contact area**

2c. In addition, we have introduced new items to encourage greater design modularisation in consultation with the industry. This includes refreshing the list of standard components to ensure relevance while providing design flexibility.

Scope	Modularisation items recognised under the Buildability Framework (enhancements shown in blue)
Industry Level	**Mandatory (no points)** a. Floor height (all projects, multiples of 150/175mm) – min 80% coverage b. Prefab staircase (all projects, 250/275/300mm tread width) – min **80%** coverage c. Precast refuse chutes (RNL, 6 standard sizes) – min **80%** coverage d. Doors (RNL, 7 standard sizes) – min 65% coverage **e. PBU (RNL, 20 standard sizes) – min. 65% PBUs; of which 60% in industry standard size/s** **f. Precast household shelters (RNL, 17 standard sizes) - min. 65% precast HS; of which 60% in industry standard size/s** **more standard sizes introduced for a start and to be reviewed subsequently*
	Non-mandatory (points given) a. Prefab pump skid sizes (all projects, 3 standard sizes) **b. PPVC modules for bedrooms (width) (RNL, 4 standard sizes)** **c. Windows (width) (RNL, 6 standard sizes)** **d. Precast beams (RNL, 6 standard sizes)** BCA is also working with specifiers and precasters to develop a catalogue of standard precast components
Project Level	**Non-mandatory (points given)** a. Floor layout (repetition of structural layout) b. Horizontal spacing (multiples of 300mm) c. Horizontal design repetition of unit layout d. PBU (repetition) e. PPVC (repetition) f. Dimension of PPVC modules (multiples of 50mm) g. Columns and beams (multiples of 50mm) h. Doors (multiples of 50mm) i. Windows (multiples of 100mm) **j. Precast façade/wall (multiples of 300mm)** **k. Precast service duct (multiples of 150mm)**

2d. New requirement for PE (M&E) to jointly endorse Buildability submissions with QPs for architectural and structural works

Rationale

- ✓ Greater emphasis on DfMA which includes MEP discipline
- ✓ Foster greater collaboration across disciplines during upstream design
- ✓ MEP works contribute towards raising construction productivity

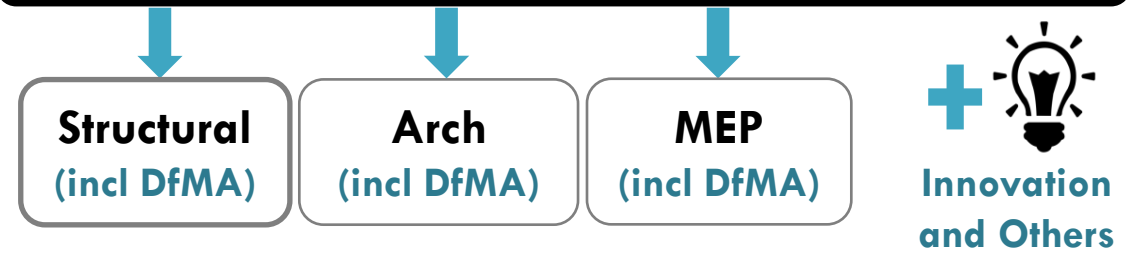
Which PE (M&E) to endorse?

- ✓ PEs for M&E works executing detailed design are required to jointly endorse with QP (Architectural & Structural works)

What to prepare?

- ✓ B-Score form
- ✓ BDIP including mark-ups on plans with computation of coverage of MEP modules/systems

Buildability framework



Category	Maximum points (based on manpower usage)		
	Structural	Architectural	MEP
Residential Non-landed	35	45	20
HDB	45	40	15
Industrial	50	25	25
Commercial, School, Institutional & Others	35	30	35

3. With DfMA becoming mainstream way of construction, more on-site works will be shifted off-site. To effectively measure productivity, BCA requires builders to submit both on-site and off-site productivity data.

Builders for all building projects with GFA ≥ 5,000m² are required to submit construction productivity data monthly through **electronic Productivity Submission System (ePSS)**

Productivity Data Submission Workflow

Precaster (2D components)

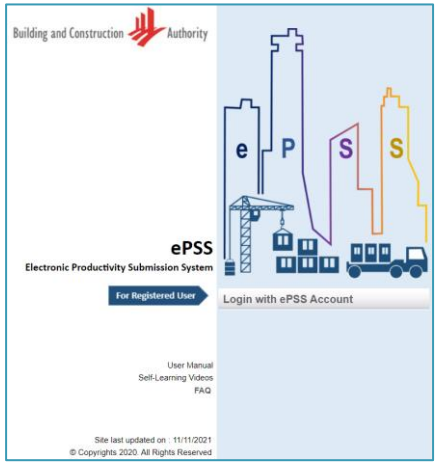
Precaster (PPVC/PBU shell)

PPVC/PBU Fit-out facility

Other DfMA facility^

→ Appointed Builder

Builder to upload onto ePSS on monthly basis via BAS or manually (excel template) →



For projects with Permit to Carry Out Structural Works issued by BCA on or after 30 Apr 2022:

- Various off-site DfMA facilities (local and overseas, if any) will have to provide their inputs to the Builder for submission
- **Builder to submit both on-site and off-site manpower data** ***NEW***

Current Requirement:

- **To submit on-site manpower data only**
- Submitted by Builder

For submission and enquiries:
BCA_EPSS@bca.gov.sg

^*DfMA facility includes prefabricators/precasters, PPVC/PBU fit-out suppliers, structural steel suppliers and specialist MEP subcontractors*

BAS refers to Biometric Authentication Systems installed on-site for recognition of personnel by biometric characteristics (e.g. fingerprint, facial feature, etc.)

BCA-Industry Briefing

Enhancements to Buildability Framework

20 April 2022

Frequently asked questions

Q1. Why the new min. B-Score seems to be lower than before?

- The lower min. B-Score is not a decline in productivity standards
- We have revamped Buildable Design Appraisal System (BDAS) in 2020 to give different point weightages for various disciplines of work for each development type
- Each technology is allocated points based on manpower savings (in lieu of using Labour Saving Index (LSI))
- Please ensure to use the correct B-Score form to assess the adequacy of your design

Q2. Outcome-based options: Can I opt for deemed-acceptable solutions for projects with GFA < 25,000m²?

No, outcome-based options are currently applicable to large projects with GFA ≥ 25,000m² only.

Q3. Outcome-based options: Can I opt for deemed-acceptable solutions for mixed development projects?

Yes, mixed developments can choose to comply using deemed-acceptable solutions. Each building use must meet the required min. prefabrication or DfMA levels.

Note: For mixed developments where a particular extent of use is small, please consult BCA separately

RNL: Option 1
Structural: 65% Prefab
Archi: 80% Prefab
MEP: 50% Prefab
System Formwork: 70%

RNL: Option 2
a. 60% PPVC + 70% System Formwork
b. 50% PPVC (5-storey and below) + 70% System Formwork

Commercial / Institutional / Industrial
Structural: 60% Prefab or 50% Steel/APCS/MET
Archi: 80% Prefab or 70% Prefab* (for office only)
MEP: 50% Prefab
System Formwork: 70%

Q4. Outcome-based options: System Formwork – What if you adopt prefab systems beyond requirement?

Constructed Floor Area (CFA) of prefab structural systems adopted above stipulated level can be considered towards fulfilling System Formwork (SF) requirement

Horizontal System Formwork	Consideration	System Formwork (SF) Requirement for remaining cast in-situ (CIS) area
Measured by constructed floor area (CFA)	**CFA of DfMA systems including** PPVC, precast RC slab, steel decking, MET slab and/or other prefab structural systems	**70% of the remaining CFA** outside the stipulated % of DfMA/prefab system
Example: RNL project chooses 60% PPVC + 70% System Formwork option		
Total CFA: 100,000m² CFA of PPVC: 65,000m² **CFA of precast slab: 4,500m²**	**CFA of PPVC system:** 65,000m² (assuming that it equates to 60% PPVC)	70% x (100,000m² – 65,000m²) = 24,500m² As prefab slab has also been adopted, horizontal system formwork requirement: 24,500 – 4,500 = **20,000m²**

Note: All figures used in examples are for illustration purposes only.

Q4. Outcome-based options: System Formwork – What if you adopt prefab systems beyond requirement?

Vertical contact area of prefab wall systems adopted above stipulated level can be considered towards fulfilling System Formwork (SF) requirement

Vertical System Formwork	Consideration	System Formwork (SF) Requirement for remaining cast in-situ (CIS) area
Measured by vertical contact area	**Wall length of DfMA systems including** PPVC, precast RC walls, MET, and/or other prefab wall systems	**70% of the remaining vertical contact area** (wall length x height) outside the stipulated % of DfMA/prefab wall system
Example: RNL project chooses 60% PPVC + 70% System Formwork option		
Total wall length: 10,000m Wall length of PPVC: 7,000m **Wall length of other prefab walls: 1,000m (assuming vertical contact area is 10,000m²)**	**Wall length of PPVC system:** 7,000m (assuming that it equates to 60% PPVC)	70% x (10,000m – 7,000m) = 2,100m (assuming vertical contact area is 12,000m²) As other prefab walls have also been adopted, vertical system formwork requirement: 12,000m² - 10,000m² = **2,000m²**

Note: All figures used in examples are for illustration purposes only.

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Q&A Session

Building and Construction Authority

BCA Industry Briefing on

ENHANCEMENTS TO BUILDABILITY FRAMEWORK

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Thank You

We have come to the end of this session; you may leave the webinar platform.

Once you have exited, you will be automatically redirected to the Course Evaluation Survey. The presentation materials will be made available at https://www.bcaa.edu.sg/bca-buildability-framework