BIP Application Checklist for Prefabricated Bathroom Unit (PBU) Systems

Introduction:

a. ***This BIP application checklist outlines the potential issues related to the adoption of innovation during project implementation stage. The checklist is not exhaustive, and agencies may raise additional queries during BIP evaluation***

b. ***To facilitate BIP evaluation, applicants are required to address all issues in sections (A) to (H). All applications shall include the drawings, detailing, test reports, certificates, relevant approvals from overseas authorities, and other documentation of the proposed system covering sections (A) to (H) described below***

(A) General

1. Overview of the proposed system
   a) Construction cost
   b) Construction time & productivity improvement *(please request for the template from the BIP Secretariat)*
   c) Characteristics of the proposed system
   d) Manufacturing process in factory
   e) Method of assembly on site
   f) Project track records (both local and international, if any)

(B) Design & Construction (BCA)

1. General Layout of PBU
2. Shop Drawings
3. Manufacturing Process
4. Delivery and Storage
5. On-Site Installation
6. Annual Production Capacity
7. Compliance with Performance Requirements of the Prefabricated Bathroom Unit (PBU) which specifies the following:
   a) Performance requirements for wall panels (including Appendix C/Appendix D appended in Annex)
   b) Access to utilities for maintenance, repair and replacement
   c) Allow for replacement of tiles (Maintenance and renovation)
   d) Provision for barrier-free accessibility design requirements
   e) Affix a manufacturer's label
   f) Provide a homeowner user manual
8. Drawings to reflect areas of waterproofing application (Layouts, sectional details, and interfacing details)
9. Any additional Info

(C) Transportation & Logistics (LTA)

1. Proposed Transportation Plan -
   a) Indicate route from factory to holding area/construction site and travel schedule (to mark up on the map)
   b) State vehicle type, overall dimensions (width, rear overhang, length & height) and weight
   c) Refer to LTA.PROMPT for oversized vehicle movement (OVM) permit requirements

2. Lifting and Installation Method
3. Holding Areas - Proposed location to hold the proposed system (location to mark up on location map)
   a) The holding areas should be within development sites and lifting works should not affect public streets.
4. Road surface protection (where relevant) - Type of protection material and method to be clearly illustrated. For example, protection measures for the road bitumen surface.
5. Road signage relocation (where relevant)
   a) Type and quantity of affected signages
   b) New locations to house the affected signages must be clearly illustrated in the map and photographs.

(D) Management of Working & Design Risks (MOM)

1. Risk Management

1.1 An audit report with supporting documents from ***a MOM-recognised WSH Auditing Organisation*** on a document review of your Risk Assessments (RA) and Safe Work Procedures (SWP) related to PBU activities in casting and fitting out factories (if located in Singapore) and in your clients' worksites, including but not limited to the following:

- PBU casting and fitting out factory plant layouts (if located in Singapore);
- all dry and wet trades required for PBU fabrication in casting and fitting out factories (if located in Singapore);
- PBU transportation;
- PBU storage;
- PBU lifting, shifting and installation arrangements;
- access & egress onto & from PBU;
- lifting, rigging and guiding / restraint of PBU;
- working-at-height and fall prevention / protection of workers during PBU activities;
- Positioning of workers during adjusting and installation of PBUs, etc.

Note: A bizSAFE audit report is not acceptable as it does not meet the requirements in item 1.1

1.2 Your audit action plan and all necessary supporting documents/ photographic records to address and close the auditor's findings and recommendations from item 1.1.

1.3 Certification of (minimum) bizSAFE Level 3.

2. Design for Safety (DfS)

As a designer/ supplier of PBUs, when your PBUs are supplied and used in a project as defined Workplace Safety and Health (Design for Safety) Regulations (DfS Regulations), you are responsible to perform the duties of a Designer under the DfS Regulations. The design of your proposed PBUs has a significant impact on the safety and health of workers, particularly to those who construct, maintain, repair, and eventually demolish or remove the building / structure. It is therefore important that safety and health are considered at the start of your design process.

Hence, you are required to submit:

2.1 PBU lifting and installation plan at your clients' worksites, highlighting your DfS considerations, and detailing the following:

a) lifting equipment to be used (e.g. crane, lifting frame, chains, pulleys, loading platform, wheeled jack, etc);
b) relevant Professional Engineer's (PE) design and calculations (e.g. lifting frame, loading platform, etc);
c) rigging & load restraint methods;

d) lifting lugs built into the PBUs (if applicable);
e) schematic diagram showing the crane's lifting capacity over the project's layout relating to the PBU's position and weight;
f) summary table of all the PBU's dimensions and weights.

2.2 A statement by a PE indicating that the lifting frame(s) used to lift the PBU, and the lifting lugs built into the PBU component (if applicable),
a) are designed in accordance to an International Standard, and
b) have attained a minimum Factor of Safety of 3.

2.3 A complete step-by-step pictorial SWP illustration of the entire process of the onsite PBU lifting, movement and installation.

2.4 An acceptable PBU installation/ transfer method such as:
a) Top-down critical path installation method, and / or
b) Horizontal entry (non-critical path installation) through the use of PE certified materials receiving platform.

Note: For all other methods, applicant shall submit proposal to MOM separately for case by case assessment on per project basis.

2.5 Self-declaration of installation method(s) from item 2.4.

2.6 An owner's manual on related building maintenance, defect rectifications and demolition work processes.

(E) Bathroom, Sanitary & Water Services (PUB)

1. Sanitary System

1.1 The design of the sanitary work shall comply with the Sewerage and Drainage (Sanitary Work) Regulation and the code of practice for sewerage and sanitary work.

1.2 Mock-up Bathroom Drawing and Sectional Plan

1.3 Sanitary and Discharges Pipes Detail Plan

1.4 Corrosion Protection and Water Proofing (if relevant)

1.5 Floor-Trap Details

1.5.1 State the model no of shallow FT to be used

1.5.2 To submit certificate of compliance EN1253-1, with test reports to be enclosed:

- Anti-Blockage test
- Water tightness test
- Flow Rate Test
- Odour tightness Test
- Resistance of Water Seal to Pressure
- Depth of Water Seal
- Access for Cleaning
- Side inlet

1.5.3 On top of the requirement specified in EN1253, the following requirement for shallow floor trap are to be complied:

Descriptions	**Standard Requirements**
Depth of Water Seal	Min 50mm
Passage Clearance	Min 25mm
Outlet Diameter	Min 75mm
Floor Trap (Water Compartment)	Shall be integral type, removable trap is not allowed.
Floor Trap Grating and Anti-Mosquito Valve	Shall incorporate an approved type of floor trap grating and anti-mosquito valve
Service Plug in the Floor Trap (if provided)	To provide permanent instruction label to the service plug.

2. Water Service Installation

2.1 The design of the water service installation and the water service work shall comply with the Public Utilities (Water Supply) Regulations as well as the Singapore Standard CP48 - The Code of Practice for Water Services.

2.2 Water pipes and fittings to be used shall comply with the standards and requirements stipulated by PUB.

(F) Fire Safety (SCDF)

1. The proposed system shall comply with the prevailing Fire Code requirements.
2. Detailed sectional plans of all typical floor, wall, façade, ceiling construction and roof coverings for the proposed system shall be submitted to SCDF for further evaluation and approval.
3. Where required to indicate the performance of the products/materials/systems, test reports issued by test laboratories accredited by Singapore Accreditation Council (SAC) or recognised under the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Agreement (i.e. between Singapore and other countries) shall be provided.
4. In the case of regulated fire safety products, test performance reports shall be certified by any of the accredited Certification Bodies (CB) in Singapore before they can be used for building construction in Singapore.
5. To avoid unnecessary delay of project completion, Qualified Person (QP) should engage the CB for early conduct of inspections to fulfil the surveillance regime requirements, where required.

(G) Environmental (NEA)

1. The system shall comply with the technical requirements and provisions stipulated in the following:
   1.1. Code of Practice on Environmental Health
   1.2. Singapore Standard SS 593: Code of Practice for Pollution Control
   1.3. Environmental Protection and Management Act and its attendant regulations, including the Environmental Protection and Management (Control of Noise at Construction Sites) Regulation
   1.4. Environmental Public Health Act and its attendant regulations

(H) Planning (URA)

1. Prefabricated Bathroom Unit (PBU) will be transported directly from factory premises to the development site. Storage or holding areas, if needed, will be located within factory premises or the development site

Appendix C :
Test Reports for Panel Boards used as wall and floor of PBUs

Product Name	
Manufacturer	
Type of Board	
Density (kg/m^3)	

Instructions

1. Unless otherwise stated, please conduct and submit test reports according to the test standards listed below.
2. All test reports shall be the original or certified true copies issued by local or overseas laboratories accredited to ISO/IEC 17025, SAC-SINGLAS and SAC-MRA[Note 1] within last 5 years.
3. The manufacturer of panel boards used in the PBU system shall establish a Quality Management System certified according to EN ISO 9001.

S/N	Test Standard	Criteria/Remarks
A	**Strength Performance**	
1.	SS492:2001 Specification for performance requirements for strength and robustness (including methods of test) for partition walls	To achieve a grade of **Medium Duty (MD)** and above.
B	**Thermal Properties**	
2.	BS 476 Part 21: 1987* Fire tests on building materials and structures.	*Only applicable for single-slab PBU system
3.	BS 476 Part 22: 1987* Fire tests on building materials and structures.	*Only applicable for PBU wall system which is also used as party wall or compartment wall
4.	BS 476 Part 4: 1970 Fire tests on building materials and structures. Non-combustibility test for materials	**Non-combustible**
5.	EN 13501-1: 2007 +A1: 2009 Fire classification of construction products and building elements on flame spread and smoke density.	
C	**Acoustic Properties**	
6.	ASTM E90: 2004 Standard test method for laboratory measurement of airborne sound transmission loss of building partitions and elements	

D	**Green Label and Mold Resistance**	
7.	Singapore Green Building Product Labelling Scheme (SGBPLS) Category: Panel Board	Panel board used in the PBU system must be certified under SGBPLS
8.	ASTM D3273 – 12* Standard test method for resistance to growth of mold on the surface of interior coatings in an environmental chamber	**To achieve a rating of 9 and above** *Test to be conducted on uncoated panel boards (e.g. without water proofing, paint, tiles etc)
E	**Physical and Moisture Related Properties**	
9.	BS EN 12467: 2012* Fibre-cement flat sheets – Product specification and test methods	*Test standards and requirements to adopt **Category A** unless otherwise stated
	a) Flexural strength (Bending strength) b)	
	c) Moisture movement	Value of **moisture movement to achieve ≤ 0.07%**
	d) Water impermeability*	*For panel boards used as floor panels within the PBU system, please adopt a water height of 50mm above the sample panel board during the test
	e) Warm water*	* Please adopt a water bath in excess of lime for this test
	f) Heat-rain*	*Test to be conducted on uncoated panel boards (e.g. without water proofing, paint, tiles etc) for 50 cycles. Any additional material which appears on the back panel surface during the test should be sampled and tested for identification purpose
	g) Soak-dry*	*Test to be conducted on uncoated panel boards (e.g. without water proofing, paint, tiles etc) for 50 cycles
10.	BS EN 317:1993 Particleboards and fibreboards – Determination of swelling in thickness after immersion in water	**Swelling in thickness to achieve ≤ 1.5%**

Note 1: Singapore Accreditation Council (SAC) signs bilateral Mutual Recognition Arrangement (MRA) with other national accreditation bodies. It is a signatory to the International Laboratory Accreditation Cooperation (ILAC) Arrangement and regional cooperation bodies such as the Asia Pacific Laboratory Accreditation (APLAC).

Appendix D : Test Reports for Lightweight Concrete Panels used as wall and floor of PBUs

Product Name	
Manufacturer	
Concrete Mix Raw Materials ***(No need to indicate proportion)***	
Grade of concrete	
Density of concrete (kg/m3)	

Instructions

4. Unless otherwise stated, please conduct and submit test reports according to the test standards listed below.
5. All test reports shall be the original or certified true copies issued by local or overseas laboratories accredited to ISO/IEC 17025, SAC-SINGLAS and SAC-MRA[Note 1] within last 5 years.
6. The manufacturer of the lightweight concrete panels used in the PBU system shall establish a Quality Management System certified according to EN ISO 9001.

S/N	Test Standard	Criteria
A	**Strength Performance**	
1	SS492:2001 Specification for performance requirements for strength and robustness (including methods of test) for partition walls.	To achieve a grade of **Medium Duty (MD)** and above.
B	**Fire Safety[#] and Thermal Properties**	
2.	EN 13501-1: 2007 +A1: 2009 Fire classification of construction products and building elements on flame spread and smoke density.	As per the Section 3.15.19 of the Code of Practice for Fire Precautions in Buildings 2018 available on the SCDF website.
3.	BS EN 45545-2:2013+A1:2015 Toxicity emission of construction products and building elements.	
	[#] The tests required for fire safety may vary according to the type and composition of lightweight concrete. As such, please be advised to consult SCDF on the necessary tests to be conducted. The consultation can be facilitated by the PBU screening panel secretariat after the submission of application.	

C	**Physical and Moisture Related Properties**	
4.	BS EN 772-11:2011 Methods of test for masonry units Part 11: Determination of water absorption due to capillary action.	**Coefficient of Water Absorption due to Capillary Action ($g/m^2 . s^{0.5}$) should not exceed 30, 25 and 20** (rounded to nearest integer) at test duration of 10 minutes, 30 minutes and 90 minutes respectively.
5.	BS EN 772-1:2000 Methods of test for masonry units – Part 1: Determination of compressive strength* *To adopt conditioning by immersion.	**≥80% of mean declared value** (compressive strength in dry state, as tested in the normal cube strength test), accordance with EN 771-4.
6.	BS EN 12467: 2012* Moisture resistance properties of material. *Test standards and requirements to adopt Category A unless otherwise stated.	
	a) Water impermeability* *For panel boards used as floor panels within the PBU system, please adopt a water height of 50mm above the sample panel board during the test.	Traces of moisture may appear on the under face of the sheet, **but in no instance shall there be any formation of drops of water.**
	b) Heat-rain* *Test to be conducted on uncoated panel boards (e.g. without water proofing, paint, tiles etc) for 50 cycles. Any additional material which appears on the back panel surface during the test should be sampled and tested for identification purpose. The same specimen is to be tested for water impermeability after the heat-rain test, in accordance with the test methods specified in the BS EN 12467.	**No visible cracks, delamination, warping and bowing or other defects**. Traces of moisture may appear on the under face of the sheet, **but in no instance shall there be any formation of drops of water.**

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