Building and Construction Authority

Mass Engineered Timber (MET)

Information Kit

Revision 1.0 – Dec 2022

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Information Kit for MET Projects

1. Introduction

This information kit aims to share key information on MET with project teams, and serves as a guide to provide stakeholders with the necessary knowledge to MET construction.

Different sections of this kit may be more applicable to certain stakeholders. Each section is labelled with the target audience in mind. The table summarises the contents and respective target audience.

Section	Content	Developer	Consultant	Builder
2	Regulatory requirements	√	√	√
3	Cost premium	√		√
4	Design for maintainability		√	
5	Quality assessment	√		√
6	Logistics management and good practices on site			√
7	Maintenance regime	√		
8	Useful resources (Contacts, list of firms with track record in MET)	√	√	√

2. Regulatory Requirements

Developer | Consultant | Builder

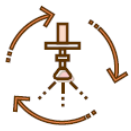
Project parties are advised to seek early pre-consultation (1-2 months before ST submission) with relevant agencies such as BCA and SCDF, to have greater clarity on the requirements.

2.1 BCA Requirements

The structural design of MET structures should comply with SS EN 1995 (Eurocode 5), and the relevant product codes EN 14080 (Glulam) and EN 16351 (CLT). In addition, manufacturers should obtain the "CE" mark certification.

2.2 SCDF Requirements

All buildings constructed using MET should comply with the prevailing Fire Code. Section 9.9.5 of the code includes requirements specific to MET construction. The key requirements are:

 SPRINKLER SYSTEM	 HEIGHT LIMIT	 FIRE PROTECTION FOR EXTERNAL FACADE	 PRODUCT LISTING SCHEME (PLS)
• MET buildings to be fully protected by automatic sprinkler systems • May be exempted under certain conditions	• Healthcare: 12m • Non-healthcare: No height limit. If > 12m, to adopt Performance Based (PB) approach, carried out by a Fire Safety Engineer (FSE)	• External façade should be non-combustible. • If MET façade is exposed, Deluge system, or equivalent is required.	• Certified to Scheme 5* • Fire test and annual factory audit required *Scheme 5 certification requires site inspection every 3,500m2, triggered by Declaration of Compliance (DoC).* *Hence, project teams are encouraged to obtain Scheme 5 CoC before the DoC site inspections.*

** Scheme 5 Certificate of Conformity (CoC) is required to obtain Temporary Fire Permit (TFP) and Fire Safety Certificate (FSC). The TFP / FSC would be used for application of Temporary Occupation Permit (TOP) and Certificate of Statutory Completion (CSC) respectively. The process of obtaining the CoC,*

including fire tests by overseas testing laboratories and certification by certifying bodies, may take about 6-9 months.

Developer | Builder

3. Cost and Funding Support

The estimated cost premium for MET project is about 10 – 15% of the project cost. Funding support is available under the BuildSG Transformation Fund (PIP Scheme) to defray the cost of MET adoption. Support is on a case-to-case basis, and terms and conditions apply.

Consultant

4. Design for Maintainability

4.1 Key Principles

Designing timber structures for maintainability is similar to other structures such as steel or concrete. The four key principles when designing for maintainability are:

a) Forecast maintenance
b) Access for maintenance
c) Minimise maintenance interventions
d) Enable simple maintenance

More information can be found in BCA's Design Guide for Maintainability.

4.2 Durability

Upfront consideration should be given to prevent termite attacks, and potential discolouration of MET due to UV exposure. More information can be found in the MET Guidebook (see Section 8a).

4.2.1 Service Class

The appropriate service classes should be used, based on the environments the MET would be in. In Singapore, the service classes are generally Service Class 2 or 3.

Class 1	Internal environment with negligible risk of decay or insect attack.
Class 2	Unheated internal environments or with risk of occasional exposure to moisture.
Class 3	Higher risk of wetting or higher moisture content than Service Class 2

4.2.2 Ultraviolet (UV) Exposure

It is not recommended to use MET where there is direct exposure to weather, as MET can discolour. A protective coating or additional architectural cladding layer could be applied on the MET elements to reduce the impact of exposure to UV.

4.2.3 Termite Attack

The following could be taken to protect MET against termites:

Elevating timber from ground	Install physical barriers	Apply chemical treatment	Conduct regular inspection
			
Ensure no direct contact between timber and ground	Using geotextile or mesh	Anti-termite treatment to the ground / timber	Checks on moisture content and presence of termites

4.2.4 Delivery

It is recommended to have a checklist for the Resident Engineer / site staff to check on the following when the MET is delivered to site:

a) Quality of material (eg. grade, discolouration, cracks, dimensions, moisture content)
b) Quality of assembly (eg. screws, bolts, steel plates, angles, brackets, connectors)

5. Quality Assessment

Developer | Builder

The CONQUAS assessment standard for MET buildings are in CONQUAS 2019. The key requirements are:

a) No stain marks and damages

b) Voids to be filled if specified

c) Visual finish surface to be planed and sanded

d) No hollowness for exposed MET elements

e) Crack tolerance

Domestic Grade	Industrial and Standard Grade
Not more than 200 mm long and 2 mm width	Not more than 400 mm long and 4 mm width

f) Knot size tolerance

Domestic Grade	Industrial and Standard Grade
Not more than 20 mm diameter	Not more than 50 mm diameter

6. Logistics Management and Good Practices on Site

Builder

6.1 Shipping

Transportation of MET from Europe to Singapore could take 8 to 10 weeks, after shop drawings are approved by client. It is advisable to finalise the key design parameters early, as subsequent changes to design may lead to delayed production and shipping.

6.2 Transportation

Auxiliary police escort is required if:

Height	> 4.5 metres (inclusive of truck height)
Width	≥ 3.4 metres
Laden Weight	> 80 tonnes
Length	> 12 metres

6.3 Temporary Storage and Protection

Timber elements should be stored in a dry area free from potential damage. Good practices include:

a) Sweep away standing water on MET elements.
b) Protect the end grain to reduce moisture absorbed by MET.
c) Stack MET components off the ground or on a levelled dry area to avoid soiling and distortion.
d) Review moisture content prior to the application of finishes.

7. Inspection, Maintenance and Repair Regime

Developer

Regular building maintenance checks are applicable to all structures during their operational lifespan. Where treatment or coating is applied, as recommended by the supplier and/or specialists, there should be a maintenance regime for the reapplication of treatment or coating. Structural members should be readily accessible for inspection. For structural members that are covered/ protected with fire-rated boards, access panels must be provided for inspection, maintenance and repair.

Qualified persons should focus on the following checks applicable to timber structures:

Task	Checking Method	Frequency
Moisture content	Moisture meter	To be advised by PE
End grain	Visual inspection	
Insect and fungi attack		
UV treatment		
Corrosion		

Significant cracks, delamination, warpage		
Deflection (for long-span structure of more than 20m)	Measurement	

For building that is susceptible to insect and fungi attack, developer/owners may adopt a more frequent inspection and maintenance regime for insect and fungi attack

A user manual containing the following list of information shall be provided to developer/ building owner upon the handing over of the building:
(a) General information about the MET building
(b) Layout of the critical elements
(c) Inspection and maintenance advice
(d) Instructions for drilling and fixing

8. Useful resources

Developer | Consultant | Builder

a) **MET Guidebook** [link]

b) **Firms with track record in MET** [link]

c) **BCA Contact Person**

Group	Name	Email
Construction Productivity and Quality	Lucas Loke	lucas_loke@bca.gov.sg
Building Engineering	Ng Kay Beng	ng_kay_beng@bca.gov.sg

d) **SCDF**

Group	URL
SCDF Fire Code	
Performance Based process	
List of Fire Safety Engineers	
List of Performance Based projects	

e) **Product Listing Scheme**

For enquiries on SCDF's Product Listing Scheme, please contact any of the Certification Bodies below:

Certification Body	Contact Person	Email
Setsco Services Pte Ltd [link]	Fiona Leong	fionaleong@setsco.com
	Dixon Ng	ngds@setsco.com

Singapore Test Services [link]	-	sales.sts@stengg.com
TUV SUD PSB Pte Ltd [link]	-	Enquiries may be sent through TUV-SUD website