

# **Code of Practice on Buildability**

## **Addendum No. 1**

Effective from 30 June 2022

Applicable to 2022 Edition

This Addendum shall be read in conjunction with the Code of Practice on Buildability and shall form part of the Code.

## **Amendments to the Code**

The following parts of Section 7 on “Minimum Requirements for Developments on Government Land Sales (GLS) Sites” in Page 72 to 73 of the Code shall be replaced as provided below. The changes are highlighted in blue.

## 7 MINIMUM REQUIREMENTS FOR DEVELOPMENTS ON GOVERNMENT LAND SALES (GLS) SITES

This section covers the requirements on the minimum level of use of DfMA technologies or prefabrication systems, and [Integrated Digital Delivery \(IDD\) essential use cases](#) for GLS sites stipulated with productivity requirements, including all industrial developments with GFA of 5,000m<sup>2</sup> or more built on Industrial GLS. The land parcels selected are gazetted and may be found in the Building Control (Buildability and Productivity) Regulations.

**Table 1: Productivity Requirements for GLS Sites**

GLS Sites	Productivity Requirements								
All GLS sites	<p>IDD requirements as detailed in Section 7.1 below.</p> <p>a. Minimum 5 out of 14 IDD essential use cases across the design, fabrication and construction project life-cycle stages for residential non-landed building project/component and/or across the design, fabrication, construction, and handover management project life-cycle stages for industrial and commercial building project/component with at least 1 use case per stage</p> <p>b. Use of digital platform(s) based on Common Data Environment (CDE) data standard across the project life-cycle of a building development</p>								
Residential Non-landed and residential non-landed component of mixed-use developments on GLS sites	<p>For all sites, the minimum number of Prefabricated Bathroom Units (PBUs) to be adopted at each development shall be 65% of the total number of bathroom units. The requirements and acceptance framework for PBU systems are spelt out in Section 3.</p>								
Residential Non-landed and residential non-landed component of mixed-use developments, and hotels on GLS sites	<p>Selected residential non-landed and hotel sites are required to meet all of the following requirements:</p> <table border="1"> <thead> <tr> <th>DfMA Technology / Prefabrication / System</th> <th>Level of Adoption</th> </tr> </thead> <tbody> <tr> <td>PPVC</td> <td>Min. 65%</td> </tr> <tr> <td>Prefabricated MEP System</td> <td>Min. 65%</td> </tr> <tr> <td>System Formwork</td> <td>Min. 70%</td> </tr> </tbody> </table>	DfMA Technology / Prefabrication / System	Level of Adoption	PPVC	Min. 65%	Prefabricated MEP System	Min. 65%	System Formwork	Min. 70%
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**Table 1: Productivity Requirements for GLS Sites (continued)**

GLS Sites	Productivity Requirements															
Commercial office developments on GLS sites	<p>Selected office sites are required to meet <b>all</b> of the following requirements:</p> <table border="1" data-bbox="560 533 1350 770"> <thead> <tr> <th data-bbox="564 539 1082 607">DfMA Technology / Prefabrication / System</th> <th data-bbox="1082 539 1345 607">Level of Adoption</th> </tr> </thead> <tbody> <tr> <td data-bbox="564 607 1082 689">Structural Steel</td> <td data-bbox="1082 607 1345 689">Min. 80% of total office area</td> </tr> <tr> <td data-bbox="564 689 1082 728">Prefabricated MEP System</td> <td data-bbox="1082 689 1345 728">Min. 65%</td> </tr> <tr> <td data-bbox="564 728 1082 766">System Formwork</td> <td data-bbox="1082 728 1345 766">Min. 70%</td> </tr> </tbody> </table>	DfMA Technology / Prefabrication / System	Level of Adoption	Structural Steel	Min. 80% of total office area	Prefabricated MEP System	Min. 65%	System Formwork	Min. 70%							
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All industrial developments with GFA of 5,000m <sup>2</sup> or more on GLS sites	<p>The minimum prefabrication level for both structural systems and architectural systems must be met. The computation method for prefabrication level is spelt out in Section 6.</p> <table border="1" data-bbox="560 1003 1386 1359"> <thead> <tr> <th data-bbox="564 1010 836 1122">Minimum Prefabrication Level</th> <th data-bbox="836 1010 1109 1122">5,000 m<sup>2</sup> ≤ GFA &lt; 25,000 m<sup>2</sup></th> <th data-bbox="1109 1010 1382 1122">GFA ≥ 25,000 m<sup>2</sup></th> </tr> </thead> <tbody> <tr> <td data-bbox="564 1122 836 1160">Structural System</td> <td data-bbox="836 1122 1109 1160">30%</td> <td data-bbox="1109 1122 1382 1160">60%</td> </tr> <tr> <td data-bbox="564 1160 836 1243">Architectural System</td> <td data-bbox="836 1160 1109 1243">70%</td> <td data-bbox="1109 1160 1382 1243">80%</td> </tr> <tr> <td data-bbox="564 1243 836 1326">Prefabricated MEP System</td> <td data-bbox="836 1243 1109 1326">40%</td> <td data-bbox="1109 1243 1382 1326">50%</td> </tr> <tr> <td data-bbox="564 1326 836 1359">System Formwork</td> <td data-bbox="836 1326 1109 1359">70%</td> <td data-bbox="1109 1326 1382 1359">70%</td> </tr> </tbody> </table>	Minimum Prefabrication Level	5,000 m <sup>2</sup> ≤ GFA < 25,000 m <sup>2</sup>	GFA ≥ 25,000 m <sup>2</sup>	Structural System	30%	60%	Architectural System	70%	80%	Prefabricated MEP System	40%	50%	System Formwork	70%	70%
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Others including mixed-use developments and developments on GLS sites subject to review by URA's Design Advisory Panel (DAP)	<p>Selected sites are required to meet all of the following requirements:</p> <table border="1" data-bbox="560 1559 1350 1915"> <thead> <tr> <th data-bbox="564 1565 1139 1632">DfMA Technology / Prefabrication / System</th> <th data-bbox="1139 1565 1345 1632">Level of Adoption</th> </tr> </thead> <tbody> <tr> <td data-bbox="564 1632 1139 1715">Prefabricated Structural System (Minimum use of APCS)</td> <td data-bbox="1139 1632 1345 1715">Min. 65%</td> </tr> <tr> <td data-bbox="564 1715 1139 1753">Prefabricated Architectural System</td> <td data-bbox="1139 1715 1345 1753">Min. 80%</td> </tr> <tr> <td data-bbox="564 1753 1139 1792">Prefabricated MEP System</td> <td data-bbox="1139 1753 1345 1792">Min. 65%</td> </tr> <tr> <td data-bbox="564 1792 1139 1830">System Formwork</td> <td data-bbox="1139 1792 1345 1830">Min. 70%</td> </tr> <tr> <td data-bbox="564 1830 1139 1912">Minimum Productivity Improvement over 2010 Levels</td> <td data-bbox="1139 1830 1345 1912">Min. 30%</td> </tr> </tbody> </table>	DfMA Technology / Prefabrication / System	Level of Adoption	Prefabricated Structural System (Minimum use of APCS)	Min. 65%	Prefabricated Architectural System	Min. 80%	Prefabricated MEP System	Min. 65%	System Formwork	Min. 70%	Minimum Productivity Improvement over 2010 Levels	Min. 30%			
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Minimum Productivity Improvement over 2010 Levels	Min. 30%															

## 7.1 IDD Requirements

The developer, builder and Qualified Persons shall comply with the IDD requirements as specified in Table 1.

### Submission Requirements at Different Stages of Project

- a. Before commencement of super-structural stage
  - IDD activity log
- b. At every six-month interval thereafter
  - IDD activity log
- c. At TOP/CSC stage
  - Final report comprising achievements of IDD essential use cases and a list of firms that have participated in the use cases

**Table 2: IDD Essential Use Cases**

IDD Essential Use Case	Applicable Stage	Definition	Digital Deliverables
1. Digital Request for Information	<ul style="list-style-type: none"> <li>• Design</li> <li>• Fabrication</li> <li>• Construction</li> </ul>	Use digital technology to request information or facilitate communication, in relation to any issue arising from the building works	<ul style="list-style-type: none"> <li>• Issues and resolution dashboards</li> <li>• Digital notes of discussion</li> <li>• Updates to Building Information Modelling (BIM)</li> </ul>
2. Integrated Concurrent Engineering Meetings	<ul style="list-style-type: none"> <li>• Design</li> <li>• Fabrication</li> <li>• Construction</li> </ul>	Conduct an integrated concurrent engineering meeting in relation to the building works using digital technology and BIM	<ul style="list-style-type: none"> <li>• Digital records of decisions, actions to be taken and party responsible</li> </ul>
3. Visualisation and Design Checks	<ul style="list-style-type: none"> <li>• Design</li> <li>• Fabrication</li> <li>• Construction</li> </ul>	Utilise a BIM model, a digital 3-dimensional model or immersive technology to visualise, seek feedback and validate the design of the building	<ul style="list-style-type: none"> <li>• BIM or other digital 3D models</li> <li>• Rendered models</li> </ul>
4. Digital Submission and Approval	<ul style="list-style-type: none"> <li>• Design</li> <li>• Fabrication</li> <li>• Construction</li> </ul>	Use digital technology to submit and obtain approval relating to the design of the building or any component involved in the building works	<ul style="list-style-type: none"> <li>• Tracking of design issues, comments, submission, and revisions through digital means</li> <li>• Decision records</li> </ul>

**Table 2: IDD Essential Use Cases (continued)**

<b>IDD Essential Use Case</b>	<b>Stage</b>	<b>Definition</b>	<b>Digital Deliverables</b>
5. BIM-based Documentation	<ul style="list-style-type: none"> <li>• Design</li> <li>• Fabrication</li> <li>• Construction</li> </ul>	Prepare documents relating to the building works based on information primarily generated from a BIM model	<ul style="list-style-type: none"> <li>• BIM</li> <li>• Drawings</li> <li>• Tender specifications</li> </ul>
6. BIM-based Cost Estimation	<ul style="list-style-type: none"> <li>• Design</li> <li>• Fabrication</li> <li>• Construction</li> </ul>	Estimate costs at various stages of the building works based on information generated from a BIM model	<ul style="list-style-type: none"> <li>• Costing models</li> <li>• Costing and quantity-take-off documentation</li> </ul>
7. Digital Logistics	<ul style="list-style-type: none"> <li>• Fabrication</li> <li>• Construction</li> </ul>	Use digital technology to plan the prefabrication production schedule of the building works, and digitally track and monitor the production, delivery and installation of prefabricated components	<ul style="list-style-type: none"> <li>• Production schedule</li> <li>• Digital logistic delivery records</li> </ul>
8. Digital Construction Scheduling and Sequencing	<ul style="list-style-type: none"> <li>• Fabrication</li> <li>• Construction</li> </ul>	Use digital scheduling to plan and monitor the construction activities of the building works	<ul style="list-style-type: none"> <li>• Construction schedules, and sequencing models</li> </ul>
9. Digital Progress Monitoring	<ul style="list-style-type: none"> <li>• Fabrication</li> <li>• Construction</li> </ul>	Use digital solutions or digital scanning to track and monitor the progress of the building works	<ul style="list-style-type: none"> <li>• Records of site progress photos, or scanned models</li> <li>• Progress reports (actual vs planned)</li> </ul>
10. Digital Quality Assurance (QA)/ Quality Control (QC) Inspections	<ul style="list-style-type: none"> <li>• Fabrication</li> <li>• Construction</li> </ul>	Use digital solutions to record the observations from site inspections of the building works and track the necessary follow-up actions taken	<ul style="list-style-type: none"> <li>• Records of QA/QC site inspections</li> <li>• Audit trails of resolution/approvals</li> </ul>

**Table 2: IDD Essential Use Cases (continued)**

IDD Essential Use Case	Stage	Definition	Digital Deliverables
11. Digital Defects Management	<ul style="list-style-type: none"> <li>• Fabrication</li> <li>• Construction</li> <li>• Handover</li> </ul>	Use digital checklists or digital dashboards to manage and track the defects of the building works and the rectification of those defects	<ul style="list-style-type: none"> <li>• Master defects list</li> <li>• Defects rectification reports</li> </ul>
12. Digital Handover	<ul style="list-style-type: none"> <li>• Construction</li> <li>• Handover</li> </ul>	Use digital technology to generate and digitally handover: <ul style="list-style-type: none"> <li>• A digital model of a physical asset that is built as part of the building works; and</li> <li>• Any other documents relating to the physical asset.</li> </ul>	<ul style="list-style-type: none"> <li>• Digital asset models</li> <li>• Any other documents relating to the physical asset, including but not limited to the following:               <ol style="list-style-type: none"> <li>i. As-built records;</li> <li>ii. Manufacturer's specifications and warranties;</li> <li>iii. Operation and maintenance manuals.</li> </ol> </li> </ul>
13. Real-time monitoring of assets performance	<ul style="list-style-type: none"> <li>• Handover</li> </ul>	Set up a digital platform to monitor the real-time performance and track the key operating parameters of a physical asset that is built as part of the building works	Digital platform for building performance tracking
14. Digital operations and maintenance	<ul style="list-style-type: none"> <li>• Handover</li> </ul>	Set up a digital platform to integrate other technologies to perform the operations or maintenance of a physical asset that is built as part of the building works	Digital platform for operations and maintenance

## **7.2 PPVC**

For selected residential non-landed, hotel or mixed-use GLS sites with residential non-landed component, the minimum level of use of PPVC shall be 65% of the total super-structural floor area of (i) the building or the component of the building that is a residential non-landed building, or (ii) the building, or the aggregate of the component of the building that is a hotel building and the component of the building that is a residential non-landed building, as the case may be. The requirements and acceptance framework of PPVC systems are spelt out in Section 4.

## **7.3 Structural Steel**

For selected office GLS sites, the minimum level of use of structural steel construction for buildings constructed for use solely or partly as an office shall be 80% of the total office floor area of a building.

Structural steel construction refers to the construction method whereby a building or part of the building is constructed using composite steel, concrete deck floors that are connected to steel beams or steel trusses, and supported by steel components, composite steel columns or precast concrete columns.

Total office floor area, in relation to a building, refers to the total super-structural floor area of the building less any floor area that is not constructed for use as an office.

## **7.4 APCS**

For selected GLS sites where APCS is adopted to meet the minimum level of prefabrication for structural systems, the minimum level of use of APCS shall be 65% of the total super-structural floor area of the building. The requirements for APCS are spelt out in Section 5.

## **7.5 Prefabricated MEP System**

For selected GLS sites, the minimum level of use of prefabricated MEP systems shall be 65% of the total qualifying area for MEP systems as spelt out in Section 2 – Table 5A on Computation of Qualifying and Prefabricated Area of Prefabricated MEP System. Prefabricated MEP systems shall be manufactured and assembled in an accredited fabricated facility, in accordance with any accredited fabrication method, and then installed in a building under building works.

## **7.6 System Formwork**

For selected GLS sites, the minimum level of use of system formwork shall be 70% of the remaining Constructed Floor Area (CFA) outside the areas where the stipulated DfMA/prefabricated system are adopted.