



CONSTRUCTION  
INDUSTRY COUNCIL  
建造業議會



## Reference Materials - Sample Clauses for Procurement of MiC Building Projects

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## PREFACE

The Construction Industry Council (CIC) is committed to seeking continuous improvement in all aspects of the construction industry in Hong Kong. To achieve this aim, the CIC forms Committees, Task Forces and other forums to review specific areas of work with the intention of producing Alerts, Reference Materials, Guidelines and Codes of Conduct to assist participants in the industry to strive for excellence.

The CIC appreciates that some improvements and practices can be implemented immediately whilst others may take more time for implementation. It is for this reason that four separate categories of publication have been adopted, the purposes of which are as follows:

- |                     |  |
|---------------------|--|
| Alerts              | The Alerts are reminders in form of brief leaflets produced quickly to draw the immediate attention of relevant stakeholders to the need to follow some good practices or to implement some preventive measures in relation to the construction industry.  |
| Reference Materials | The Reference Materials are standards or methodologies generally adopted and regarded by the industry as good practices. The CIC recommends the adoption of the Reference Materials by industry stakeholders where appropriate.  |
| Guidelines          | The Guidelines provide information and guidance on particular topics relevant to the construction industry. The CIC expects all industry stakeholders to adopt the recommendations set out in the Guidelines where applicable.   |
| Code of Conduct     | The Codes of Conduct set out the principles that all relevant industry participants should follow. Under the Construction Industry Council (Cap. 587), the CIC is tasked to formulate codes of conduct and enforce such codes. The CIC may take necessary actions to ensure compliance with the codes. |

If you have read this publication, we encourage you to share your feedback with us. Please take a moment to fill out the Feedback Form attached to this publication in order that we can further enhance it for the benefit of all concerned. With our joint efforts, we believe our construction industry will develop further and will continue to prosper for years to come.

## ABBREVIATIONS

ABIM	As-built Information Model
AP	Authorized Person registered under the Buildings Ordinance
AS	Authorized Signatory of Registered General Building Contractor or Registered Specialist Contractor
BD	Buildings Department
BEAM	Building Environmental Assessment Method
BIM	Building Information Modelling
BO	Buildings Ordinance
CDE	Common Data Environment
CNP	Construction Noise Permit
DfMA	Design for Manufacture and Assembly
DOC	Level of Documentation
EIMS	e-Inspection Management System
ELS	Excavation and Lateral Support
EPD	Environmental Protection Department
FRR	Fire Resistance Rating
FSD	Fire Services Department
GBP	General Building Plan
GFA	Gross Floor Area
GGBS	Ground Granulated Blast-furnace Slag
HKAS	Hong Kong Accreditation Service
HKPF	Hong Kong Police Force
HOKLAS	Hong Kong Laboratory Accreditation Scheme
HyD	Highways Department
IPA	In-principle Acceptance
ITIA	Independent Testing and Inspection Agent
ITP	Inspection and Test Plan
LEED	Leadership in Energy and Environmental Design
LOD	Level of Development
LOD-G	Level of Development - Geometry
LOIN	Level of Information Need
MEP	Mechanical, Electrical and Plumbing
MiC	Modular Integrated Construction

MiMEP	Multi-trade Integrated Mechanical, Electrical and Plumbing
PNAP	Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers issued by BD
PS	Particular Specification
QA	Quality Assurance
QC	Quality Control
QCCT	Quality Control Coordination Team
QCST	Quality Control Supervisory Team
QR	Quick Response
RFID	Radio Frequency Identification
RGBC	Registered General Building Contractor registered under the Buildings Ordinance
RGE	Registered Geotechnical Engineer registered under the Buildings Ordinance
RMO	Road Management Office
RSE	Registered Structural Engineer registered under the Buildings Ordinance
SCC	Special Conditions of Contract
TCP	Technically Competent Person
TD	Transport Department
TIA	Traffic Impact Assessment
TTM	Temporary Traffic Management



## 1. INTRODUCTION

It is well accepted that implementation of Modular Integrated Construction (MiC) in suitable construction projects can bring about many benefits, both tangible and intangible.

This publication presents sample clauses which could be adopted/adapted for use in a particular specification (PS) (or special conditions of contract (SCC) as appropriate) for the procurement of a MiC building project (i.e. a building designed with MiC parts). It covers the various technical aspects related to MiC that should be considered by a professional in the contract preparation. The project client or employer<sup>1</sup> should employ a qualified and experienced professional to prepare the contract to suit his/her chosen contract form and conditions and his/her preferred procurement and contract management approach.

Depending on the complexity of the project, the type of contract to be used and the specific project requirements, the professional will need to decide in consultation with the employer (i) which sample clauses are to be adopted/adapted, and (ii) what other suitable clauses should be included in the contract.

In the text, the word “shall” is used for those clauses which are mandatory, and “should” for those which are of advisory nature. Some notes are given in italics against some of the clauses, and they represent the issues that need to be considered or factors to be taken into account in finalising the contract requirements.

The sample clauses presented herein are written specifically for private MiC building projects. They could be used in a Design-Bid-Build (DBB) (or Design-Tender-Build) contract with a clearly defined design portion which includes only the MiC parts and some other works. In this case, the contractor takes up the detailed design responsibility for the contractor design portion only. They could also be used in a Design and Build (D&B) contract<sup>2</sup> where the contractor takes up the design responsibility for all of the building works in the project.

In a D&B contract, and also in a DBB contract where the contractor is required to take up the detailed design responsibility for the MiC parts under the contract, the employer should ask his/her in-house designer or project consultants to carry out a reference design for tendering, preferably a “MiC-ready” reference design<sup>3</sup>.

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<sup>1</sup> The employer refers to the developer or owner who owns the land for development.

<sup>2</sup> A D&B contract provides flexibility for the contractor to optimise the design and programming for production of offsite modules and for on-site construction works, with time and cost benefits to the project. Such a contract allows the tenderers to team up with MiC suppliers and logistics and transport providers for early supplier/subcontractor engagement (for this reason a longer tendering period is thus recommended). Such an arrangement could achieve a competitive price in some cases, especially for high-rise buildings with repeatable modules and significant foundation works. A D&B contract is also suitable for simple building projects such as small scale temporary transitional housing projects where the project client’s requirements can be clearly specified.

<sup>3</sup> In a “MiC-ready” reference design, the following issues should be considered: logistics and transport constraints and arrangements, building layout and usable space design, functional and maintenance access and space requirements of the building and its facilities, and the required building material quality. The reference design should be based on careful consideration of the detailed project needs and should provide sufficient information for preparing the Employer’s Requirements for the insitu construction and the MiC parts under

Some employers may carry out the design of the whole building including the MiC parts with the support of professionals and subcontractors with good experience in MiC. In such cases, the contractor will only be required to carry out the offsite production and onsite works under the DBB contract.

The contract should indicate whether the contractor is required to provide for the employer an AP/RSE/RGE to take up the statutory submissions and supervision responsibilities for the private development, or the employer will engage his/her own AP/RSE/RGE. In the former case, the employer will deploy his/her own project manager to take up the contract procurement and management including checking and supervision under the Employer's Requirements, except for the statutory requirements.

The sample clauses may serve as useful reference for public MiC building projects, but they will need to be amended to suit the terminology and practice of the project organisation.

In MiC building projects, careful consideration should be given to the optimal extent of MiC that could be beneficially adopted in the project, the likely constraints (e.g. by conducting a pre-tender study of logistics and transport, craneage requirements and construction noise impacts), and the tendering and tender assessment strategies to be adopted to ensure a competent contractor can be employed to meet the project objectives and value-based performance targets. The list of information required to be submitted by the tenderers should be carefully prepared and evaluated to reward good tenders and reject inadequate tenders.

Well conducted pre-tender design and planning of construction logistics, transport and work sequences will help greatly to reduce risk in the construction contract and allow a reasonably accurate pre-tender estimate to be obtained.

It is beneficial for the employer's professional team to obtain early contractor/manufacturer/supplier involvement in the project, e.g. through conducting pre-tender engagement meetings with experienced contractors and MiC manufacturers/suppliers, to inform them of the project objectives and key requirements, and consult them on the factory production constraints, logistics and transport aspects and onsite construction risks, in order to formulate early action plans to reduce risk in the implementation of the contract.

The CIC's MiC Resources Centre (<http://mic.cic.hk/en/Home>) contains information which could facilitate the planning, design and construction of MiC projects. It holds information on local MiC projects, consultants and contractors with MiC experience, MiC suppliers and systems with the Buildings Department's in-principle acceptance (IPA), and floor plans of projects with different arrangement of MiC modules. The CIC has also published Reference Materials on the following

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the contract. It should achieve effective modularisation, standardisation, and construction buildability and productivity. It should be carried out with the engagement or advice of professionals with MiC experience, experienced logistics and transport providers, and contractors and MiC suppliers who understand the needs of and the statutory requirements and standards for MiC projects in Hong Kong. Tendering on the basis of an approved General Building Plan with a "MiC-ready" design could allow the Employer's Requirements to be more clearly defined (including the layout of MiC modules and connections), increase the tender competitiveness, provide a clear demarcation of responsibilities between the project consultant and the contractor, and reduce the contract time, cost and quality risk.

topics to facilitate MiC implementation: Statutory Requirements for Modular Integrated Construction Projects, Logistics and Transport for Modular Integrated Construction Projects, and Use of Digital Technologies for QA/QC of MiC Modules in MiC Factories. These are accessible from the MiC Resources Centre website.

The BIM Portal (<https://www.bim.cic.hk/en/index/main>) and DfMA Alliance website ([http://www.cic.hk/eng/main/dfma\\_alliance/](http://www.cic.hk/eng/main/dfma_alliance/)) of the CIC also contain useful information and resources (such as BIM Objects, BIM Standards, etc.) which could facilitate the use of BIM and digital integrated design in the implementation of MiC projects.

For Multi-trade Integrated Mechanical, Electrical and Plumbing (MiMEP) works, reference should be made to the CIC's Reference Materials - DfMA for MEP Works (CIC, 2021).

To assist employers and/or their consultants in strengthening the corruption prevention measures in the integrity management of inspecting staff and the quality control of MiC modules in factories, the Corruption Prevention Department of the Independent Commission Against Corruption (ICAC) has prepared a corruption prevention checklist for reference by employers and/or their consultants when undertaking building projects adopting MiC (ICAC, 2021).

It should be noted that following the recommendations made in this publication does not imply in any way deemed compliance with the prevalent Ordinances (e.g. BO) and statutory requirements (e.g. PNAPs and Codes of Practice) for the statutory duties of AP/RSE/RGE/RGBC and conducting of MiC production, inspection and testing.

## 2. SAMPLE CLAUSES FOR PROCUREMENT OF MiC BUILDING PROJECTS

### 2.010 Preamble

2.011 General (1) This Specification is used where Modular Integrated Construction (MiC) is to be used and the Contractor is responsible for the design of the “Contractor Design Portion” and construction of all building works including the MiC parts.

(2) MiC is defined as a construction method that employs the technique of having freestanding volumetric modules (with finishes, fixtures, fittings, etc.) manufactured offsite and then transported to the site for assembly (see PNAP ADV-36).

(3) The Contractor Design Portion shall include:

*All building works as shown on the Drawings (including foundation works, excavation and lateral support (ELS) works, superstructure including the MiC parts, façade, secondary structures, fit-out works, etc., where required).*

OR

*Part of the building works as shown on the Drawings (including MiC parts, façade, secondary structures, fit-out works, etc., where required).*

*(Note: If the Employer uses his/her own design team for the design of the building works and the Contractor is only responsible for the design of the MiC parts and some other works, then this clause should be worded accordingly, and the subsequent clauses related to design should be amended appropriately.)*

(4) The Employer has appointed / The Contractor shall provide at his/her own cost for the Employer an Authorized Person (AP) / Registered Structural Engineer (RSE) / Registered Geotechnical engineer (RGE) to take up the statutory submission and supervision responsibilities.

*(Note: The Employer should indicate whether the Contractor is required to provide for him/her an AP/RSE/RGE to take up the statutory submission and supervision responsibilities for the project, or he will use his/her own AP/RSE/RGE.)*

(5) The Contractor has been provided with the following by the Employer:

(a) development parameters and constraints, functional layout plans (showing areas including but not limited to preferred building layout and orientation, rooms with different functions and uses, finishes, fixtures and furniture requirements *(if any)*), and the future changes in use required to be considered in the design), structural framing plans *(if any)*, essential dimensional and weight constraints on the modules,

major building services and furniture provisions (*and KPIs, if required*) for the project;

*(Note: Unless otherwise agreed by the Employer, the plans should be generated from a BIM model (use of BIM is optional, e.g. for small-scale projects with value less than \$30M). The BIM model should be shared with the tenderers during the tendering process via a digital platform designated by the Employer for the project's use throughout its lifecycle (such as a Common Data Environment (CDE) specified or accepted by the Employer; for the definition of CDE, reference should be made to the "CIC BIM Standards - General (Version 2 - December 2020). The Employer should designate a single CDE for sharing, storage, retrieval and use of BIM data across multiple parties in a project, as this could ensure a single source of information for the different parties including the Employer, consultants, contractor, subcontractor and suppliers in the different project stages, viz. planning, design, fabrication, construction, contract and statutory acceptance, and asset and facility management. The Contractor should be required to use or adapt the BIM model provided by the Employer for his design of the building project and ensure the building information could be shared and stored in the Employer's designated digital platform in a timely manner.)*

(b) performance requirements (see Clause 2.015);

(c) target dates for design freeze for regulatory submissions, obtaining approval of all statutory plans required, design freeze for ordering of materials for factory mass production, and obtaining the Occupation Permit for the building;

*(Note: Depending on the complexity of the project and level of development of the Employer's requirements, a period of 3 to 6 months from the contract commencement date will normally be needed to finalise the design for statutory submissions, taking into account the time required for consultation with the Employer, regulatory bodies, the designers of different disciplines, the MiC and other key prefabricated component suppliers, logistics and transport providers and the maintenance party, and if required, development of a BIM model for the design. However, a longer period may be needed to finalise the design if there are complex/new components to be used, as this will involve a longer period of consultation and coordination with the regulatory bodies to verify the components' compliance with the relevant standards and requirements under the Buildings Ordinance and to obtain HOKLAS or equivalent endorsed test/assessment reports. Another key decision which must involve the Employer is the design freeze after review of the acceptability of the module/assembly prototype(s). Any substantial design change after confirming the orders for materials and start of mass production could result in significant delay in works completion and/or additional cost to the Contract.)*

- (d) results of a pre-tender logistics and transport study carried out (see Clause 2.021);
- (e) results of a pre-tender construction noise impact assessment carried out (see Clause 2.022); and
- (f) the design documentation and the loading schedule for the foundation works and at the ground floor or transfer plate level on which the MiC modules are to be assembled/placed/erected and at the floor levels on which the MiC modules are connected to the in-situ construction parts.

*(Note: These should be provided to the tenderers for reference, if the Employer has or plans to let an advance contract for the foundation works and/or carry out the design of the insitu construction parts.)*

2.012  
Contractor's  
Responsibility

- (1) The Contractor (hereinafter means Registered General Building Contractors registered under the Buildings Ordinance) shall carry out the design of all building works in the Contractor Design Portion, and construct these building works including the production of the modules offsite and assembly of the modules at the Site. The Contractor shall also make the logistics arrangements for delivery of the modules to the Site.

*(Note: The clauses under 2.012 should be modified or adapted to suit the design and statutory submission and supervision responsibilities allocated to the Contractor and the different procurement approaches mentioned in Section 1 of this publication, which may include complying with the Employer's specified development parameters and constraints, functional layout plans, essential dimensional and weight constraints, major building services and furniture provisions, loading schedule at ground floor or transfer plate level on which the MiC modules are to be assembled and at the floor levels on which the MiC modules are connected to the in-situ construction parts, etc.)*

- (2) If the Contractor is responsible for the design of the MiC parts, he shall engage registered building professionals with MiC design experience to undertake the design of the MiC system/modules, and a MiC supplier for the production of the modules. Alternatively, the Contractor may adopt/adapt an MiC design for an MiC system with In-principle Acceptance (IPA) granted by the Buildings Department (BD). The Contractor shall also be responsible for the design of the interface elements with the remaining structure and for ensuring that the remaining building structure and its foundation are not affected adversely in terms of load carrying capacity and compatibility of deformations.

*(Note: Use of an MiC system with IPA could help to speed up the approval process and implementation of the project, especially for small-scale projects.)*

- (3) The AP/RSE/RGE shall be responsible for obtaining approval of the plans of building works or street works and associated applications including the application for factory production of the MiC modules, consent to the commencement and carrying out of building works at the Site or street

works for the project pursuant to the Buildings Ordinance, and for coordinating with the relevant parties as necessary.

- (4) The Contractor shall submit all design proposals related to the Contractor Design Portion (the BIM model, where BIM is used) to the Employer for checking and acceptance prior to their submission by the AP/RSE/RGE to the relevant regulatory government departments/utility undertakers (see Clause 2.040).

*(Note: If the Employer asks his/her own AP/RSE/RGE to take up the statutory submission and supervision responsibilities, clauses (3) and (4) above refer to the AP/RSE/RGE appointed by the Employer.)*

- (5) The Contractor may make applications to the Construction Industry Council to obtain the relevant subsidies under the Construction Innovation and Technology Fund (CITF) related to implementation of BIM, MiC and other advanced construction technologies required under the Contract, where there is benefit in adopting such technologies in the execution of the contract.
- (6) The Contractor shall submit to the Employer a programme for the project within 30 days of award of the Contract for comment. The programme shall identify the responsible party for each action item in the programme and indicate sufficient time being allowed for preparing the design plans, seeking comment and obtaining approval from the Employer and the relevant regulatory government departments/utility companies, applying for factory production and wide load permit for transport, obtaining consent to commence works at the Site, applying for Occupation Permit, etc., with appropriate time risk allowance.

2.013  
Contractor's  
Design Team

- (1) The Contractor shall engage qualified and experienced designers for the design work required to be carried out by him under the Contract (i.e. the "Contractor Design Portion"). The composition of the design team shall include, but not be limited to, the following<sup>4</sup>, in particular:

*(Note: The post-professional qualification experience of the respective disciplines given below should be used for reference only, particularly on MiC design, as there are currently not too many professionals with completed MiC project experience in Hong Kong):*

- (a) Architectural design. The designer for architectural works (herein called 'architectural designer') shall be a Registered Architect in Hong Kong. He/She shall possess a minimum of eight (8) years of post-professional qualification experience in the design, coordination and supervision of construction of building projects. If he/she is required to take up statutory submission and supervision responsibilities, he/she shall also be an Authorized Person (AP) (List of Architects) as registered under the Buildings Ordinance.

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<sup>4</sup> The composition of the design team suggested is for reference only. The actual personnel requirements would depend on the complexity of the project and the specific project requirements.

To ensure that the overall design of the proposed development is well-integrated and fully complies with the statutory requirements, Employer's Requirements and Specification to the satisfaction of the Employer, the architectural designer shall be the lead person responsible for the overall coordination and integration of all design output required in the Contractor Design Portion produced by the other team members, viz. the structural designer, building services designer, landscape designer, interior designer, MiC consultant, BIM personnel (*if appropriate*), MiC supplier, logistics and transport provider, etc. He/she shall work closely with the AP and provide the AP with all plans and documentation required for timely statutory submissions if he/she is not the AP for the project.

- (b) Structural design. The structural designer for any foundation and structural works (herein called 'structural designer') required in the Contractor Design Portion shall be a Registered Professional Engineer (Structural) in Hong Kong. He/She shall possess a minimum of eight (8) years of post-professional qualification experience in the design, coordination and supervision of construction of structural elements in building projects. If he/she is required to take up statutory submission and supervision responsibilities, he/she shall also be a Registered Structural Engineer (RSE) as registered under the Buildings Ordinance.

The structural designer shall liaise with the geotechnical engineer on any foundation, excavation and lateral support and site formation designs required in the Contractor Design Portion and the method and sequence of such works. He/She shall also liaise closely with the architectural designer and building services designer on the buildability of the MEP subassemblies, assemblies and modules within the structural framing of the building and the method and sequence of installation of such works at the Site. He/She shall work closely with the RSE and provide the RSE with all plans and documentation required for timely statutory submissions if he/she is not the RSE for the project.

- (c) Geotechnical design. The geotechnical designer for any site formation and other building works with significant geotechnical content (herein called 'geotechnical designer') required in the Contractor Design Portion shall be a Registered Professional Engineer (Geotechnical) in Hong Kong. He/She shall possess a minimum of eight (8) years of post-professional qualification experience in the design, coordination and supervision of construction of geotechnical works in building projects. If he/she is required to take up statutory submission and supervision responsibilities, he/she shall also be a Registered Geotechnical Engineer (RGE) as registered under the Buildings Ordinance. He/She shall work closely with the RGE and provide the RGE with all plans and documentation required for timely statutory submissions if he/she is not the RGE for the project.
- (d) Building services design. The designer for building services works including electrical, mechanical, ventilation, plumbing, drainage and



fire services works (herein called ‘building services designer’) shall be a corporate member of the Hong Kong Institution of Engineers or equivalent in a relevant discipline. He/She shall possess a minimum of eight (8) years of post-professional qualification experience in the design, coordination and supervision of building services installations in building projects.

The building services designer shall support the architectural designer and structural designer for the MiC design. In parts of the building where MiC is not adopted, multi-trade integrated mechanical, electrical & plumbing (MiMEP) works<sup>5</sup> shall be implemented as far as practicable, and the building services designer shall be the lead person (integrator) responsible for the overall coordination and integration of design input and output for such works, liaising closely with the architectural and structural designers and the different MEP trade subcontractors and suppliers.

- (e) MiC design and implementation. The architectural designer, structural designer and building services designer mentioned above shall collaborate to carry out the MiC design and provide details of factory manufacture and site assembly. If the Contractor Design Portion includes the MiC parts, and if the Contractor and his/her designers, subcontractors and manufacturers/suppliers cannot provide an adequate level of input for these parts, the Contractor shall employ an MiC consultant and other specialists to advise on the MiC design and implementation aspects, including on optimisation of modularisation to maximise MiC and MiMEP adoption, implementation of DfMA using BIM, offsite production and on-site assembly of modules, assemblies and subassemblies, logistics and transport, and coordination and integration of the various disciplines and trades under the project.
- (f) Design, production and construction using BIM (use of BIM is optional, e.g. for small-scale projects with value less than \$30M). A BIM team, consisting of a BIM Team Leader and BIM Coordinators, shall be established if BIM is used for the project. The BIM Team Leader shall be a CIC-certified BIM Manager with experience in the design, coordination or supervision of construction of building projects, preferably including use of MiC. He/She shall be the BIM data and information manager and lead the team of BIM coordinators in carrying out BIM coordination work and, where required, provide training to them and other BIM users in the Contract. The BIM coordinators shall meet the qualifications and experience requirements given in the Certification Scheme for CIC-certified BIM Coordinators. There shall be at least one BIM coordinator in each of the architectural, structural and building services (MEP) disciplines/trades who shall have experience in the design, coordination or supervision of construction of building projects.

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<sup>5</sup> MiMEP works are based on three major principles: (i) Offsite Prefabrication; (ii) Multi-trade Integration and Module Maximisation; and (iii) Plug & Play. See Reference Materials - DfMA for MEP Works (CIC, 2021) for more details.

*(Note: The BIM Team Leader should preferably be the professional architectural, structural or building services designer and the BIM coordinators should preferably be the assistant professional architectural, structural and building services designer or supporting technical staff in the respective discipline, and both should preferably have some MiC knowledge and experience.)*

- (2) Within 14 days of commencement of the Contract, the Contractor shall confirm to the Employer the full personnel particulars and details (including post-professional qualifications, relevant experience, etc.) of the design team members submitted with his/her Tender. The scope of service for each member of the design team shall be submitted to the Employer. The responsibilities for design for the different parts of the building, including the MiC parts, non-MiC parts and the interfaces between the various parts shall be clearly defined.
- (3) When the Contractor cannot reasonably maintain any key staff in the submitted design team, viz. designer or MiC consultant or BIM personnel (*if appropriate*), he/she shall notify the Employer in writing of any substitution or replacement for acceptance by the Employer.

2.014  
Materials  
Requirements

- (1) The structural system of the MiC modules shall be formed of concrete/ steel/both concrete and steel (hybrid)# (*#delete as appropriate*). In a concrete module, reinforced concrete is used as a structural material. In a steel module, steel elements are used as the structural frame. A hybrid module has two or more types of materials as structural elements, such as use of steel for the frame and concrete for the floor.
- (2) For the materials, components and systems used in the modules and/or elements designed for manufacture and/or assembly, the performance regarding structural properties, fire resistance rating (FRR), weather tightness, weathering resistance, sound insulation and thermal insulation shall comply with the statutory requirements, Employer's Requirements and Specification and shall be similar to or better than as used in conventional construction methods.
- (3) For on-site assembly of the modules, the Contractor shall propose appropriate connections and joints between different modules and/or other parts of the building to form the complete system. Accessible recess/access panels at strategic locations shall be provided for the monitoring /repair/replacement of the critical structural members and module connections, including joint fillers, waterproofing, structural connections (bolts/welds/interlocking), etc., if any.
- (4) The Contractor shall follow the Quality Assurance (QA)/Quality Control (QC) requirements given in Clause 2.071. Facility for on-site audit checks of materials, components, systems and assembly shall be allowed in the design. Accessible recess/access panels shall be designed at strategical points to facilitate such work. The accessible recess/access panels provided shall be inconspicuous and recessed to match with the surrounding finishes.
- (5) The Contractor shall source and select materials for the module production locally or within the region of the factory, so as to minimise carbon

emissions and its impacts on the environment. The materials shall as far as possible follow the BEAM Plus/ LEED requirements, have CIC Green Product Certification, CIC Carbon Assessment Tool, etc.

*(Note: For example, Ground Granulated Blast-furnace Slag (GGBS) should be used in the concrete to reduce carbon emission.)*

- (6) The Contractor shall follow the material requirements for the specified grade of concrete, thickness of hot dipped galvanising for steel/use of zinc primer, thickness of floor slab, type of wall system and functional requirements, etc., specified in the Contract.

2.015  
Performance  
Requirements

- (1) The MiC modules shall be designed and constructed, internally and externally where appropriate, so as to: (i) prevent water from entering the modules and between the modules (including during transportation, temporary storage, erection and use), and (ii) allow foul water to be properly discharged and drained out completely from toilet and kitchen. No water shall be trapped inside and between modules within the completed building.

*(Note: Trapped water may result in concrete spalling in concrete modules and corrosion in structural steel modules. Such issues may not be readily detectable and repairable.)*

- (2) The Contractor and his designers shall give due consideration to “Design for Safety” in construction (viz. identification of high risk works in design, provision of buildable method statements with adequate access and working platforms, specifying use of skilled workers with up-to-date training, provision of full time supervision of all high risk works by competent site supervisors with up-to-date training, etc.) and in operation and maintenance (viz. provision of safe access for future internal and external maintenance including minor repair of external features, drainage works, A/C modules or cladding, etc., if any are provided, see PNAP APP-93 and PNAP APP-163).
- (3) The Contractor shall refer to the Specification clauses on the material schedule (e.g. finishes, ironmongery, sanitary fittings, hardware and fixtures, etc.), appliance and furniture schedule, plant and equipment schedule, BIM requirements *(if appropriate)*, etc.
- (4) The Contractor shall submit for the Employer’s comment the dimensional and/or performance requirements in his design (e.g. acoustic, insulation, design load, deflection, headroom, concealed/exposed services conduits, locations and sizes of access openings for future maintenance inspection, demountable structural connections, point load resistance walls, FRR of different fire compartments, standard of exterior finishing, etc.).
- (5) The design life of the building structure shall be 50<sup>6</sup> years.

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<sup>6</sup> The number of years suggested is for reference only. It would depend on a number of factors, such as owner and regulatory requirements.

## 2.020 Project Planning

2.021 Logistics and Transport Study *(Use (1)\* to (3)\* below if results of a traffic study are provided; this is the preferred approach as it will reduce risk in the contract and allow more competitive tenders)*

- (1)\* The Contractor shall have been provided by the Employer with the results of a logistics and transport study *(if any)* carried out previously for the project, including the proposed routes and conditions, such as delivery logistics for the modules, constraints to be imposed on module width, height and length, delivery time and frequency, etc., details of any hoisting or loading/ unloading of modules required to be carried out outside the Site boundary and details of contingency temporary parking space and/or storage locations for the modules, for which in-principle approval has been given by the Transport Department (TD)/Road Management Office (RMO) of the Hong Kong Police Force (HKPF).
- (2)\* This information is provided to the Contractor for reference only to facilitate the tendering. The Contractor is deemed to have studied the Site and the logistics and transport arrangements when submitting his/her tender.
- (3)\* The Contractor shall be required to fulfil the obligations under (1)# to (4)# below after the award of the Contract.

*(Use (1)# to (4)# below if no traffic study has been carried out or the results of a traffic study are not provided)*

- (1)# The Contractor shall engage a Traffic Consultant to carry out a traffic study to establish the routes for the delivery, taking into account ports and marine unloading points for marine transport, road conditions and constraints for road transport, and the need for traffic impact assessments at different stages of the project, etc.
- (2)# In the traffic study, the traffic impact on the proposed delivery routes for the selected hours of delivery should be assessed, in consultation with TD/HKPF. To facilitate consideration by TD/HKPF, the following information shall be submitted for approval, in particular for the case of a load exceeding 3 m in width, unless exempted by the relevant authorities:
  - (a) Swept path analysis to demonstrate the manoeuvrability of the vehicles loaded with MiC module(s) of maximum width and height at critical road sections such as narrow road segments, sharp bends, junctions, vehicular ingress and egress to the destination/Site and within the Site, etc. *(e.g. using AutoTrack, AutoTurn, AutoPath, etc.)*;
  - (b) Traffic Impact Assessment (TIA) or traffic review to demonstrate the practicability of the delivery proposal, particularly on the time of delivery and its impact on road and junction capacities *(Note: Reference can be made to Guidance Notes No. RD/GN/021A (Feb 2020) - Guidelines on Traffic Impact Assessment & Day-time Ban*

*Requirements for Road Works on Traffic Sensitive Routes published by HyD (2020));*

- (c) Temporary Traffic Management (TTM) schemes (or traffic improvement schemes) for the module transportation, if any, to illustrate the escort and road/ lane closure arrangements, details of any hoisting or loading/unloading of modules required to be carried out outside the Site boundary, contingency temporary loading bays, and temporary parking places, etc. (*Note: See HyD's Guidance Notes No. RD/GN/021A (Feb 2020), in particular Annex 2 of Appendix 1, for advice on the conditions under which TTM is required*); and
  - (d) a contingency plan for handling emergency situations, including the rescue arrangement for breakdown of a transportation vehicle, an evacuation proposal when the delivery route is blocked by other vehicles, and procedures for reporting incidents to relevant personnel, etc.
- (3)# The Contractor shall seek and obtain from TD/HKPF prior written approval of the delivery routes, and the conditions to be followed on the use of the routes/vehicles.
- (4)# The Contractor shall identify the locations of loading/unloading of modules at the Site, locations of mobile/tower cranes needed for hoisting modules to the final locations, and, as a contingency measure when 'just-in-time delivery' of the modules to the Site is not feasible, the temporary parking spaces and/or storage locations for the modules along or close to the delivery route or the Site, based on advice from experienced logistics and transport providers and trailer drivers on the logistics of delivery.

2.022  
Construction  
Noise Impact  
Assessment

*(Use (1)\* to (3)\* below if results of a construction noise impact assessment are provided; this is the preferred approach)*

- (1)\* The Contractor shall have been provided by the Employer with the results of a construction noise impact assessment (*Note: Such an assessment, if available, is development-related and may not cover MiC assembly-related noise impact*) carried out previously for the project, including the mitigation measures proposed and the conditions imposed on the construction works to be carried out at the Site or outside the Site boundary within the restricted hours<sup>7</sup>, for which in-principle approval has been given by the Environmental Protection Department (EPD).
- (2)\* This information is provided to the Contractor for reference only to facilitate tendering. The Contractor is deemed to have studied the Site and carried out a construction noise impact assessment including for the MiC-related assembly works when submitting his/her tender.
- (3)\* The Contractor shall be required to fulfil the obligations under (1)# to (3)# below after the award of the Contract.

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<sup>7</sup> Restricted hours are 7 pm to 7 am or at any time on a general holiday (including Sunday) under the Noise Control Ordinance (NCO) (Cap. 400).

*(Use (1)# to (3)# below if no construction noise impact assessment has been carried out or if the results of a construction noise impact assessment are not provided)*

- (1)# The Contractor shall carry out an assessment of the construction noise impacts of the MiC works at the Site and outside the Site boundary, in consultation with EPD, to establish the feasibility of carrying out the MiC works within the restricted hours, and to identify any potential construction noise issues that the project may face.
- (2)# The Contractor shall review the results of the assessment together with the traffic restrictions imposed by TD/HKPF to check if it is necessary to carry out the MiC works at the Site or outside the Site boundary within the restricted hours. If such works are unavoidable, the Contractor shall make recommendations on the appropriate construction noise mitigation measures, such as use of the quietest practical construction equipment and methods, to eliminate or minimise the impacts.
- (3)# The Contractor shall seek and obtain prior written approval from the EPD on the construction noise impact assessment, the mitigation measures proposed, and the conditions imposed on any MiC works to be carried out at the Site or outside the Site boundary within the restricted hours.

2.023 Overall  
Project  
Programme  
and Time  
Frame

- (1) The Contractor shall have been provided by the Employer an overall project programme and time frame, indicating the following key milestone dates, amongst other information, as planned by the Employer:
  - (a) engagement of the main contractor and designers (including consultants if needed) for the MiC design work;
  - (b) engagement of logistics and transport provider;
  - (c) engagement of MiC supplier;  
  
*(Note: The MiC supplier should preferably be confirmed at the contract commencement. Sufficient time should be allowed for the main contractor to establish partnership with and engage the services of the MiC supplier, and for any BIM coordination work.)*
  - (d) completion of the design, including for the MiC and other offsite prefabrication parts and the insitu construction parts;
  - (e) completion of IPA application (if applicable);
  - (f) completion of statutory submissions;
  - (g) commencement of on-site construction works including foundation works;
  - (h) commencement and completion of offsite production for both mock-up and MiC mass production;

- (i) commencement and completion of on-site assembly of the modules; and
- (j) completion of all the building works and obtaining the Occupation Permit from the Building Authority.

*(Note: The Employer should state which key milestone dates are the Employer's Requirements for the Contractor to follow under the Contract.)*

## **2.030 Design for the Contractor Design Portion**

- 2.031 General (1) The Contractor shall develop the design of the Contractor Design Portion adopting the DfMA approach and, where applicable, using Building Information Modelling (BIM) *(use of BIM is optional, e.g. for small-scale projects with value less than \$30M)* and relevant CIC BIM Standards. If BIM is used, it shall be implemented to an appropriate Level of Information Need (LOIN), Level of Development (LOD) and Documentation (DOC). Definitions of LOIN, LOD and DOC, and details of implementation shall be as given in the "CIC BIM Dictionary (December 2020) and Section 2 of the "CIC BIM Standards - General (Version 2 - December 2020) respectively. A collaborative approach involving the entire supply chain and the Employer shall be adopted for such design.

*(Note: Before approval of each milestone payment, the BIM model and the associated deliverables in the design and production stages, including construction drawings and statutory plans (which shall be generated from the BIM model) shall be accepted by the designers in the relevant disciplines, the MiC and other key component suppliers and the Employer in BIM coordination meetings involving all relevant parties.)*

- (2) Unless otherwise agreed by the Employer, the BIM model shall be submitted *(if appropriate)* and all design drawings, and statutory plans, including the as-built plans, shall be generated from the BIM model *(use of BIM is optional, e.g. for small-scale projects with value less than \$30M)*. The BIM model shall be developed generally to at least Level of Graphics (LOD-G) 300 for detailed design, and generally to at least LOD-G 400 for fabrication of the modules and other components, taking into account the advice from the BIM Team Leader on the appropriate LOIN and DOC.
- (3) The Contractor shall agree with the Employer design freeze dates for statutory submissions and for mass production of the offsite modules in order to meet the target date for obtaining the statutory approvals and commencement of factory production respectively, and also a target date for obtaining the Occupation Permit for the building specified in the Contract.
- (4) The Employer reserves the right to accept and reject any part of the Contractor's design if it is considered not meeting the Employer's Requirements or Specification (e.g. a requirement for the MiC modules with connections to be demountable for future removal and reassembly such as for transitional social housing projects), or not practical or buildable for execution of the related construction works or for future maintenance

and/or operation. The Contractor shall not be entitled to any loss and expenses incurred or any other compensation, damages or other amount whatsoever, or any extension of time, for the time incurred to modify the proposal to demonstrate the buildability and sustainability of the design, etc.

- (5) In the building design, consideration shall be given to integration and interfacing of the MiC modules with the other building elements and building services installations, to cope with the operational parameters and requirements, address the site and any other constraints, and ensure ease and safety of maintenance and operation for future repair, replacement and alteration.
- (6) Construction materials shall comply with the Building (Construction) Regulation and this Specification, and suit the production of MiC modules by the MiC supplier taking into account any advantages offered by materials available from the MiC supply chain which meet standards equivalent to those commonly used in Hong Kong.
- (7) The design shall specify that the materials, components and systems (including equipment) to be used in the modules shall be supported by either HOKLAS or equivalent endorsed test certificates or a product certificate (if so specified for the materials or components requiring product certification) issued by a certification body which has a mutual recognition agreement with the Hong Kong Accreditation Service (HKAS). To demonstrate compliance with the statutory requirements, the properties of the building materials, products or construction components shall be tested in accordance with the required standards or assessed against the required standards based on the relevant test reports issued by a laboratory accredited under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) or by another laboratory accreditation scheme which has a mutual recognition agreement with HOKLAS for the particular tests concerned. All materials and/or components to be provided shall meet statutory requirements.
- (8) The design and construction of all structural elements, including those in the MiC modules, shall comply with the Building (Construction) Regulation, Employer's Requirements and Specification, including any latest corrigendum, relevant codes of practice, regulations and PNAPs, which shall include but not be limited to the following:
  - (a) Code of Practice on Wind Effects in Hong Kong 2019;
  - (b) Code of Practice for Structural Use of Concrete 2013;
  - (c) Code of Practice for Fire Safety in Buildings 2011;
  - (d) Code of Practice for the Structural Use of Steel 2011;
  - (e) Code of Practice for Dead and Imposed Loads 2011;
  - (f) Code of Practice for Foundations 2017;



- (g) Code of Practice of Precast Concrete Construction 2016;
  - (h) Code of Practice for Structural Use of Glass 2018;
  - (i) Code of Practice for Site Supervision 2009;
  - (j) Code of Practice on Access for External Maintenance 2021;
  - (k) Technical Memorandum for Supervision Plans 2009;
  - (l) Design Manual - Barrier Free Access 2008;
  - (m) PNAP APP-68 for Cantilever Structures; and
  - (n) PNAP ADV-36 Modular Integrated Construction.
- (9) The design of the foundation works, including but not limited to the permanent structure(s) and temporary structure(s) such as tower crane base(s), and ELS and site formation works, if needed, shall be completed early and the AP/RSE/RGE shall obtain approval and consent from BD where necessary to commence such works as early as possible, so that the offsite production of the MiC modules can be done in parallel. The foundation design shall have the flexibility to take the weight and design loads and distribution of all the MiC modules designed to integrate with the insitu construction parts of the building to meet the Employer's Requirements and Specification.
- (10) The Contractor shall at the discretion of Employer use an e-Inspection Management System (EIMS) or appropriate digital technologies to carry out e-inspection and acceptance of the constructed products under the Contract. The Contractor shall keep digital records on a digital platform such as a CDE designated or accepted by the Employer, including photographs and videos taken during inspection and testing in the production factory and during the on-site assembly process, for ready examination by the Employer, AP/RSE, ITIAs and the representatives of the statutory authorities.
- (Note: It is advisable to have early discussion with the relevant authorities on how such e-inspection records can be used for meeting statutory quality supervision requirements.)*
- (11) The Contractor shall follow the naming of modules and components produced in the factory as specified by the Employer, and ensure each module and component is identifiable and traceable from the factory to the destination/Site. Each module shall be assigned with a unique code for identification in the design, fabrication and assembly process. Details such as room name or number, floor level, etc., shall be included in the label (to ensure all modules are properly positioned as designed). A radio frequency identification (RFID) tag, Quick Response (QR) code or other equivalent acceptable identification mark attached to each model, or other traceability methodology agreed with the Employer, shall be used to facilitate tracking of fabrication, delivery and assembly of modules to ensure traceability. The Contractor shall upload the key information and data, including the BIM and other digital data, related to each module in the timely manner to

a digital platform such as a CDE designated or accepted by the Employer. At least one (1) month before the commencement of the offsite production and the on-site works, the Contractor shall make a proposal to the Employer for his acceptance, including measures to record the traceability trail for the prefabricated products from the factory to the destination/Site with traceability to the responsible supervision, delivery and acceptance personnel.

*(Note: The Contractor should give careful consideration to Intellectual Property Right issues and licence conditions in adopting or modifying a patented MiC system.)*

2.032  
Architectural  
Design

- (1) The Contractor shall consider the following aspects in the architectural design:
  - (a) building functions, i.e. suitability and capability of serving an intended purpose (*e.g. residential buildings for dwelling purpose or office buildings for business activities*);
  - (b) layout modularisation, i.e. module dimensions taking into account the constraints imposed by the supply chain (e.g. transport regulations and feasibility of logistics and transport) and construction (e.g. crane capacity, crane locations and site accessibility), to achieve the maximum possible level of modularisation and offsite prefabrication;  
  
*(Notes: 1. 6% of the MiC floor area<sup>8</sup> of a new building may be exempted from the GFA of the development as stated in PNAP APP-161; 2. The Contractor shall not be liable for not achieving the full 6% GFA exemption, if the Contractor has made every effort to achieve this aim in consultation with the Employer.)*
  - (c) construction tolerance, i.e. practical dimensional variations related to the functions of the materials or finished works within an acceptable range (*Note: Reference should be made to the relevant clauses in the Specification*);
  - (d) use of materials to meet functional and aesthetic requirements (*e.g. use of suitable sealants at gaps between the building parts or components, etc.*) and to meet the materials requirements under clause 2.014; and
  - (e) watertightness, i.e. watertightness test of each module shall be tested in the factory and re-tested on-site.
- (2) The Contractor shall provide a design proposal and the BIM model (*if appropriate*) for adoption of MiC, as marked on the plans provided in the Employer's Requirements according to the minimum clear headroom and interior dimensional requirements under the prevailing regulations and

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<sup>8</sup> MiC floor area is the floor area contained within the external walls of the combined MiC modules, together with the areas of MiC balconies and associated construction joints (including the thickness of such walls).

Codes of Practice, and/or as specified on approved plans, as given in Table 1 below:

Table 1 – Exterior and Interior Dimension Requirements

Type of Modules#	Maximum Exterior Width#	Maximum Exterior Height#
1 Single Room	2.5 m (for reference)	3.3 m (for reference)
2 Double Room	2.8 m (for reference)	
3 Large Double Room	3.1 m (for reference)	
# Amend as appropriate		

(3) In the MiC design, consideration shall be given to offsite prefabrication of pre-finished modules with multi-trade integration of elements, such as architectural, structural, building services, etc.

2.033  
Structural  
Design

(1) The Contractor shall consider the following aspects in the structural design for MiC (see PNAP ADV-36):

- (a) Stability, i.e. the ability of the structures to resist lateral loads such as wind loads;
- (b) Robustness and integrity, i.e. the structural systems and components including but not limited to the permanent structure(s), temporary structure(s) and secondary structure(s) are fit for purpose under normal operation conditions, and are capable of sustaining accidental loading in such a way as to prevent the extent of any resulting collapse of individual modular units being disproportionate to the cause of the collapse (i.e. progressive collapse);
- (c) Lateral load resistance, mainly to resist wind load, i.e. the structural design of the modular buildings should comply with the relevant regulations and code of practice in order to resist strong wind load (e.g. typhoon);

*(Note: Resistance to seismic load is not a mandatory requirement at the time of publication unless it is specified by the Employer with details of the relevant design code and standard required to be complied with under the Contract.)*

- (d) Joints and gaps, i.e. the design of the structural connections between MiC modules, which shall take into consideration the following aspects: (i) ease of installation (welding on site shall be prohibited unless with the prior written approval of the Employer), (ii) access and workplace to carry out the connections safely, (iii) simplified details which can be measured and recorded for proper assembly to meet the QA/QC requirements, in particular for concealed connections, (iv) construction tolerances to allow sufficient adjustment for slight misalignment during the assembly process while ensuring the design intent and structural performance, and (v) cumulative fabrication and installation deformations which occur throughout various construction stages; and (vi) construction sequence and the installation and assembly methodology to ensure occupational safety;

- (e) Construction tolerance including fabrication tolerance and on-site installation tolerance;

*(Note: Reference should be made to the minimum tolerances shown on the approved MiC superstructure plans.)*

- (f) Alteration and disassembly and re-assembly requirements, if needed;
- (g) Accessibility for inspection and maintenance requirements;
- (h) Open space design, i.e. the design shall achieve maximum modularisation and standardisation while using the minimum number of columns and partition walls to allow future modification of floor layout plans to accommodate the evolving operational/workflow needs (e.g. to meet the clinical demands of the day in the case of hospital uses);
- (i) Connections between MiC elements and the insitu structure, i.e. the design shall not affect adversely the load carrying capacity of the insitu structure and foundation, and shall be able to cope with relative movement, expansion and contraction, etc., between different parts of the building constructed by MiC and by insitu construction; and
- (j) Other considerations on structural design (e.g. corrosion protection, fire protection to structural elements, design for temporary stages, etc.) stated in PNAP ADV-36.

2.034  
Building  
Services  
Design

- (1) The Contractor shall consider the following aspects in the building services design:
  - (a) MEP functions:
    - (i) Heating ventilation and air conditioning systems, i.e. those used to maintain internal air quality, air change and to regulate internal temperature and humidity to maintain the occupants' comfort;
    - (ii) Electrical systems, i.e. those used to provide electrical power supply, distribution and protection, interior and exterior lighting, security and access control, information and telecommunications, etc.;
    - (iii) Plumbing systems, i.e. those systems which allow the movement of fluids including pipes;
    - (iv) Drainage systems, i.e. those systems which discharge waste water, foul water and surface water, including pipes and sanitary fitments, to maintain a hygienic environment; and
    - (v) Fire services systems, i.e. those fire service installations and equipment which satisfy the requirements laid down in the Code of Practice for Minimum Fire Service Installations and

Equipment issued by the Fire Services Department to protect life and property in the event of a fire emergency.

- (b) Combination of MEP services into a modularised system with modular fixings, and maximisation of factory-installed MEP services with due consideration given to the jointing of services between modules, and traversing of electrical conduits through fire-rated walls including provisions to deal with relative movement resulting from installation and use;
  - (c) Close coordination between different disciplines is required for modules finished in the factory with complete MEP systems;
  - (d) Coordination with the structural designer, building services designer, MEP suppliers and other relevant parties for the design, so as to mitigate the potential adverse impacts of MEP services on structural and fire integrity;
  - (e) System integrity of MEP services;
  - (f) Accessibility for MEP installations, and inspection and maintenance after assembly of modules, without the need for damaging the structure or the fire proofing installations; and
  - (g) Construction tolerance.
- (2) The Contractor shall propose a well-planned design of building services installations in MiC, including the heating, ventilation and air-conditioning system, fire services system, electrical system, plumbing and drainage system completed with all the necessary concealed installation and fixing elements to form an integrated solution for each module.

2.035 Module Design

- (1) The Contractor shall propose a design of offsite modules designed for manufacture and/or assembly compatible with the building's structural design. Alternatively, the Contractor may adopt/adapt an MiC design for an MiC system with IPA granted by BD. The modules shall be designed and constructed with sufficient stability, robustness and integrity and to fulfil all codes of practice and statutory requirements in respect of all stages of construction and any movements (e.g. creep deformation, shrinkage, thermal and differential movement, etc.).
- (2) In terms of robustness, in the event of failure of a module in the building due to an accidental or extreme cause, the remaining structure shall remain sufficiently robust to support the loads acting on it without disproportionate collapse or damage.
- (3) The modules shall be designed to cater for any temporary static and/or dynamic forces during lifting, transportation, storage and the erection sequence, taking into account availability of cranes with sufficient capacity for lifting, feasible crane set up locations within and outside the Site, accessibility of the Site and the possible need for a Wide Load Permit given the dimensional size of the modules, etc.

- (4) If the permanent structural elements are used to temporarily support construction access, parking spaces, and an erection deck for the holding/lifting/ erection/assembly of the modules, these structural elements shall be strengthened if needed to take such temporary forces at the Contractor's own cost.
- (5) The design of MiC modules and other components shall comply with the relevant statutory requirements for fire safety and Code of Practice for Fire Safety in Buildings 2011 considering, but not limited to the following aspects:
  - (a) fire compartmentation design;
  - (b) fire resisting construction of elements of construction and other building components in terms of stability, integrity and insulation;
  - (c) fire protection for separation between different uses/occupancies/buildings;
  - (d) fire protection for openings and cavities; and
  - (e) construction tolerance.

2.036 Design for Maintenance

- (1) The design shall provide adequate access and a suitable workplace to ensure safety during maintenance and repair works.
- (2) Adequate measures shall be included to address the long-term maintenance issues related to MiC construction, which may introduce more joints, splices, connections and gaps/voids in the structural and building services infrastructure of the building (e.g. the design shall be able to mitigate the risks related to water leakage, air tightness/isolation, risk of medical gas leakage, etc.)

**2.040 Design Checking by Employer**

2.041 Role of Employer

- (1) The Employer's in-house staff or project consultants shall check the design of the Contractor Design Portion carried out by the Contractor. In particular, they shall check whether the design has been completed and submitted following the Overall Project Programme and Time Frame (see Clause 2.023) and Project Design Plan (see Clause 2.042 below) and in compliance with the Employer's Requirements, the Specification and the statutory requirements.

2.042 Project Design Plan

- (1) The Contractor shall submit a Project Design Plan to give details of the design checking process by the Employer within one month after the contract commencement. The following shall be included in the Project Design Plan:

*(Note: Being a programme critical item, the Employer may require tenderers to submit their tentative Project Design Plans for technical assessment during the tender evaluation process.)*

- (a) various design stages and trade packages for each stage;
  - (b) organisation chart of the Contractor's design team and the duties and responsibilities of the team leader and key members (including the BIM team leader and BIM coordinators *(if appropriate)*) in respect of each of the design packages and interfaces);
  - (c) document flow chart, and Employer's acceptance plan and statutory submissions plan;
  - (d) target design freeze date for production of MiC, MiMEP and other offsite modules, and the design change management procedure;
  - (e) the BIM Implementation Plan (BIM IP), including the BIM Execution Plan (BEP) *(use of BIM is optional, e.g. for small-scale projects with value less than \$30M)*, detailed responsibility matrix, schedule of software and hardware, etc. For details of the BIM IP reference shall be made to the "CIC BIM Standards - General (Version 2 - December 2020)";
  - (f) the schedule of coordination meetings using BIM with the Employer, consultants, subcontractors, MiC suppliers and the building management company/end user, with the required space, software and hardware and other facilities needed for such meetings to be provided by the Contractor *(use of BIM is optional, e.g. for small-scale projects with value less than \$30M)*;
  - (g) a design and submissions programme, in line with the factory production, modules delivery, site assembly and on-site construction programme, and capable of meeting the Employer's target date for occupation of the building;
  - (h) proposed title block layout and document numbering system; and
  - (i) proposed standard forms, in particular, document approval forms showing the audit trail, record forms for the training and competence assessment of workers and frontline supervision personnel, e-forms incorporating hold points and witness points for the Inspection and Test Plan and for trial implementation, and supervision personnel, and e-supervision and physical supervision arrangements.
- (2) The Project Design Plan shall be reviewed by the Employer or his/her Representative/consultants and the AP/RSE/RGE. Design shall start only after the Project Design Plan has been accepted.

2.043 Design Acceptance

- (1) The Contractor shall make submissions to the Employer in accordance with the Project Design Plan for design acceptance. The Employer shall either give his/her acceptance in writing or notify the Contractor in writing of his/her reasons for not accepting it within the time (or times) and in such manner as stated in Clause 2.043(2). The Contractor shall submit the following to the Employer or his/her Representative/consultants and the

AP/RSE/RGE for each submission in accordance with the Project Design Plan:

- (a) two copies of the Certified Design Drawings (and the BIM model, *if appropriate*); and
  - (b) relevant Check Certificate(s).
- (2) The Employer or his/her Representative/consultants and the AP/RSE/RGE shall, within the specified period of receipt of the Contractor's design, part or parts thereof submitted in accordance with the Project Design Plan, notify the Contractor in writing that:
  - (a) Design Acceptance is given; or
  - (b) Design Acceptance is not given, in which case reasons for not accepting the design shall be given; or
  - (c) further information is required to be submitted, in which case the information to be submitted shall be stated.
- (3) The Contractor shall, within the specified period of receipt of the notification under Clause 2.043(2)(c), or within such further period as the Employer may allow in writing, provide the further information requested, failing which Design Acceptance shall be deemed to have not been accepted. The Employer shall, within the specified period of receipt of such further information, grant or not grant Design Acceptance in accordance with Clause 2.043(2).
- (4) If at any time it becomes apparent to the Contractor that an amendment to the Contractor's design is required for the proper completion of that part of the works, then he/she shall:
  - (a) immediately advise the Employer and the AP/RSE/RGE of the proposed amendment; and
  - (b) re-submit drawings (with the BIM model, *if appropriate*), plant and material schedules and/or documents to the Employer and the AP/RSE/RGE in accordance with Clause 2.043(2), provided that the finished appearance of the Works shall remain substantially unaltered.
- (5) In addition to the documents generally prepared by the Contractor's designer, unless otherwise agreed by the Employer and the AP/RSE/RGE, the Contractor shall prepare the BIM model (*use of BIM is optional, e.g. for small-scale projects with value less than \$30M*) to the LOIN, LOD and DOC as stipulated in Clause 2.031, and the shop drawings and coordination drawings generated from the BIM model, which are required for offsite production of the modules and on-site assembly of the modules in the permanent works. Such documents and the BIM model, as long as they do not deviate from the design accepted by the Employer and the AP/RSE/RGE and approved by the relevant government departments, generally do not require the acceptance or approval of the Employer. The documents and the BIM model shall be vetted by the Contractor's designer



and the BIM team leader as complying with the accepted and approved design and copies shall be submitted to the Employer and the AP/RSE/RGE upon acceptance by the Contractor's designer and BIM team leader.

## **2.050 Design Approval by Relevant Authorities**

- (1) The Contractor shall be responsible for the preparation of all plans, BIM model (*if appropriate*) and documents required for statutory submissions via the AP/RSE/RGE as necessary including those related to the MiC parts, insitu construction parts and the interface works in the Contractor Design Portion, and for coordination and liaison with relevant parties including the AP/RSE/RGE, so as to obtain approval and clearances from the relevant authorities having jurisdiction for the proposed offsite module production works and on-site modules assembly and other building works prior to commencement of the works.

*(Note: The Contractor may select a MiC system with BD's IPA, but project- and site-specific statutory submissions will still be required. However, it may not be necessary for him/her to obtain IPA first before making the project- and site-specific statutory submissions. For direct statutory submissions using a MiC system without IPA, some essential information required under the IPA mechanism, such as material/product specifications, documentary evidence of the proposed materials/components complying with the relevant standards/requirements under the Buildings Ordinance, HOKLAS or equivalent endorsed test reports for the proposed materials/components will need to be submitted during plan submission stage while Quality Assurance Scheme and ISO 9001 or equivalent quality certification of the offsite production factory will need to be submitted at least 14 days before the commencement of the production work in the prefabrication factory.)*

- (2) The Contractor shall prepare information and documents to support his/her design proposals to facilitate approval of the submissions. The submission quality shall be checked for compliance with the relevant government requirements and endorsed by the Contractor's designers, and the AP, RSE and RGE as necessary.
- (3) The Contractor shall allow adequate time in the programme for the preparation of the design proposals and BIM model (*if appropriate*) and for submission and obtaining comments/approval from the Employer, the AP/RSE/RGE and the relevant authorities. The submission dates and target dates for obtaining approvals shall be provided to the Employer and the AP/RSE/RGE as part of the design and submission programme.
- (4) As a contingency measure, the Contractor may at his/her own cost be required to implement a conventional insitu works design and obtain approval of the relevant authorities to meet the Contract programme requirements if he/she anticipates that any part of his/her offsite works design cannot obtain approval from the relevant authorities by the target date set in the approved Contract programme.

## **2.060 Submissions to Employer and AP/RSE/RGE Prior to Prefabrication Works**

- (1) The Contractor shall submit the following details, among others, for acceptance by the Employer and the AP/RSE/RGE no later than one (1) months (to be assessed based on the project scope), or as required under the Contract, from the notified date for commencement of construction of works:
  - (a) Design development including the MiC parts for the proposals submitted in the tender to indicate the full implementation of the proposals;
  - (b) Materials, sizes and weights of offsite components involved and the level of integration (structure, finishes, fixtures, fittings, buildings services and furniture) upon leaving the offsite factory (or yard), and the maximum loads each of the components can sustain;
  - (c) Substantiations (test reports/standards/certificates) that demonstrate the durability of the modules over the design life;
  - (d) Confirmation on the locations and details of the offsite production factories, the processes and plant involved, and the production capacity submitted with the Tender;
  - (e) Details of job references for the proposed MiC system (and BD's IPA reference no. if any) and the proposed factory/factories with similar extent/forms of offsite production, and evidence of the relevant ISO 9001 or equivalent quality assurance certification as required by the regulating government departments, if more information on these items becomes available compared with that submitted with the Tender;
  - (f) Detailed offsite production cycle, modules production rate, trained worker and offsite supervision personnel requirements, and on-site assembly programme of the modules or components, and their relation with the overall design, production and construction programme, to demonstrate just-in-time delivery and no adverse traffic impact;
  - (g) Detailed method and sequence of offsite production of the modules and other components;
  - (h) Submission of all documents demonstrating compliance with the Specification, including but not limited to fire resistance tests and material strength tests;
  - (i) Proposal for delivery of offsite modules and other components including delivery mode and routes, any special traffic arrangement (particularly any which involve approval of relevant government departments), working hours, customs clearance, temporary protection measures against damage and weather, and storage arrangement at the Site or the temporary storage locations;

- (j) Method statements to show the proposed waterproofing protection measures to be put in place throughout the on-site assembly process for pre-finished materials/components/systems (including equipment) in the modules which are vulnerable to water/moisture attack, in particular wooden finishes, electric wiring and accessories, etc.
- (k) Measures for traceability of modules and other components and/or materials used from the offsite factory to the designation/Site;
- (l) Detailed method statement for on-site assembly of modules/components/systems and site planning, including a step-by-step pictorial illustration (by means of BIM modelling, with reference made to the relevant BIM uses including ‘Phase Planning (4D Modelling)’ and ‘Site Utilisation Planning’ stated in the BIM Standards – General (Version 2 – December 2020)) (*use of BIM is optional, e.g. for small-scale projects with value less than \$30M*) on the safe work procedures and sequence of the entire process of on-site lifting, movement and assembly of modules and other components;
- (m) Locations and details of all connection interfaces of offsite architectural, structural and building services components and their connections with insitu construction works; and any subsequent on-site waterproofing and finishing work;
- (n) Locations of concealed services, vertical stacks, access points, inspection pits and maintenance accessible recess/access panels;
- (o) Inspection/monitoring/repair/replacement arrangements for critical structural members and module connections, e.g., joint fillers, waterproofing arrangements, structural connections (e.g., bolt/weld/interlocking, etc.), if any;
- (p) Method statements for future maintenance and inspection works; and
- (q) BIM Execution Plan to demonstrate the integrated use of BIM (*use of BIM is optional, e.g. for small-scale projects with value less than \$30M*) to:
  - (i) act as an integrated collaborative environment which facilitates planning, adapting and optimising the design at an early stage to facilitate offsite production of the modules and other components and subsequent on-site assembly and other insitu construction;
  - (ii) incorporate increased level of details in all architectural, structural and building services model elements, including fitting-out at the detailed design stage and subsequent offsite production and on-site construction stages; and
  - (iii) provide animations for the assembly of the modules, on-site construction, and disassembly (if applicable) of the modules.

## 2.070 Module Production

- 2.071 QA/QC Requirements
- (1) The Contractor shall ensure the quality of the offsite production and on-site assembly, and that all modules manufactured offsite comply with the approved design and Specification clauses on quality of materials and workmanship.
  - (2) The Contractor shall submit for the approval of the Employer and the AP/RSE/AS a Quality Supervision Plan addressing the manufacture, assembly, inspection, testing and commissioning of the different components in the modules. The information and details to be submitted shall include, but not be limited to, the following:
    - (a) An organisation chart indicating the roles and responsibilities of the various parties for quality control and supervision;
    - (b) Inspection schedule of the components in the production factory or on-site/ offsite prefabrication yard;
    - (c) Inspection and acceptance processes in accordance with the requirements in the MiC Supervision Plan/Quality Site Supervision Plan (QSSP) /Inspection and Test Plan (ITP); and
    - (d) The form of inspection and contract and statutory acceptance records, and the mechanism for ready examination by the Employer.
  - (3) The AP/RSE/AS shall provide adequate quality supervision personnel (AP/RSE Representatives and relevant TCPs) with training and competence assessment in factory supervision to supervise the factory production works.

*(Note: The AP/RSE Representatives and relevant TCPs may supervise the factory production and work of the ITIAs via online means.)*
  - (4) The Contractor shall allow the Independent Testing and Inspection Agents (ITIAs)<sup>9</sup>, Licensed Plumbers, Licensed Electrical Workers, etc., to carry out supervision inspections, in particular, at the hold points and witness points, for the production process, verification checks and tests at the factory (or yard). Testing items and methods shall follow the relevant statutory requirements and the Specification.
  - (5) The Contractor shall obtain the Quality Assurance Scheme of the MiC factory production prepared by the production factory. Under the Quality Assurance Scheme, all modules shall be manufactured at a factory with ISO 9001:2015 or equivalent quality certification by a certification body recognised under the Hong Kong Certification Body Accreditation Scheme of the Hong Kong Accreditation Service (HKAS). The Contractor shall check and ensure that the scope of ISO 9001:2015 or equivalent quality certification

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<sup>9</sup> ITIA refers to a party not under the direct employment of the factory or the Contractor and which has no conflict of interest with them. The certification body and inspection body should be under the Hong Kong Certification Body Accreditation Scheme and the Hong Kong Inspection Body Accreditation Scheme respectively of the Hong Kong Accreditation Service (HKAS).

of the factory covers the type(s) of MiC modules required under the Contract (concrete, steel or hybrid MiC, and the structural frame, connections and building services to be included), as well as stating the factory's maximum production capacity and required types and frequency of worker training and competence assessment and associated factory supervision personnel required (e.g. maximum number of modules that can be produced to meet quality standards per week with adequate supervision).

- (6) At least two months prior to the production of modules, the Contractor shall submit to the Employer and the AP/RSE the Quality Assurance Scheme accepted by the recognised quality certification body for the production processes in the factory. The Quality Assurance Scheme shall be reviewed by the AP/RSE and the architectural, structural and building services designers, and if found acceptable, the AP and RSE shall provide a written statement confirming that the scheme has adequate provisions in ensuring the quality of production of the modules complying with the statutory requirements, Specification and approved plans.

*(Notes: According to PNAP ADV-36, the AP and RSE should provide a written confirmation that the submitted scheme has adequate provisions in ensuring the quality of production complying with the provisions of the BO and the approved plans. However, BD has no objection to this proposed additional requirement for the designers to submit such a statement.)*

The Contractor shall then submit details of the Quality Assurance Scheme to the Employer or his/her Representative for approval. The Quality Assurance Scheme with the written statement from the AP and RSE, which shall be submitted to BD 14 days before factory production (see PNAP ADV-36), shall cover the following items:

- (a) Quality control tests of materials;
  - (b) Calibration of laboratory equipment for quality control tests;
  - (c) Efficiency and proper operation of equipment at the factory;
  - (d) Production process;
  - (e) Sampling and testing procedures and requirements; and
  - (f) Frequency and extent of inspections by the factory in-house staff and independent parties such as independent testing and inspection agents (ITIAs) specified by the Employer or as required by the regulatory government departments.
- (7) The quality control and supervision shall be in compliance with the requirements as stipulated in PNAP ADV-36, PNAP APP-158, Code of Practice for Site Supervision 2009 and Technical Memorandum for Supervision Plans 2009 issued by BD.
  - (8) The AP/RSE shall assign their respective Quality Control Supervisory Team (QCST) to supervise the module production in respect of fire resisting constructions (such as fire resisting doors and fire resisting pipe collars),

drainage works, structures, etc., in accordance with the requirements stipulated in the PNAP APP-158. Similarly, the Contractor shall assign a Quality Control Coordination Team (QCCT) to supervise the module production in the factory. The minimum qualifications and supervision frequencies of the QCST and QCCT shall be as given in Table 2 below.

Table 2 - Minimum Qualifications and Supervision Frequencies of QCST and QCCT

	AP Stream	RSE Stream	RGBC Stream	
Qualifications of Supervisory Personnel	T3	T3	T3	T1
Supervision Frequency	<i>Weekly</i>	<i>Weekly</i>	<i>Weekly</i>	<i>Continuous</i>
<i>Note: T3/T1 refers to Grade T3/T1 Technically Competent Person (TCP) equivalent as stipulated in the Code of Practice for Site Supervision 2009.</i>				

- (9) The names, identity proof and qualifications of the supervisory personnel assigned by the Contractor and the AP and RSE shall be recorded in an inspection log book. The details of production, inspection, auditing and testing of modules and identification of the parties responsible for conducting the quality assurance supervision and inspection checking shall be recorded in the log book by the supervisory personnel. The master log book shall be kept in the factory and a copy of it shall be kept at the Site office and, when required, produced to the Employer for inspection.
- (10) In addition, the AP/RSE and the Contractor shall inspect and carry out audit checks at the factory at least once every month. A copy of the audit reports of the factory duly endorsed by them shall be submitted to Employer for record purpose. These audit reports shall also cover the quality and qualified supervisions by the respective QCST and QCCT.
- (11) As an alternative<sup>10</sup> to the requirement for the audit checks at the factory specified above, the AP/RSE may consider carrying out on-site audit checks on the quality of the modules delivered to the Site. The AP/RSE shall notify BD in writing before commencement of the production, and submit a copy of the on-site audit reports on the quality of the modules delivered to the Site to the Employer for record purpose, covering the quality and qualified supervisions by the QCST. The rate of sampling for the audit checks shall be at least 1% of each type of modules delivered to the Site. The site audit checks by the AP/RSE for each sample of the modules shall include the following items in Table 3 below, where applicable.
- (12) Owing to COVID-19, BD has adopted a pragmatic and flexible approach for supervision and inspection checks of the production work carried out in the MiC factory. As an interim measure, the TCP T3 and AS, working with their assistant in the MiC factory (who is not a member of the RGBC’s supervisory personnel team providing the required continuous supervision under the approved conditions), can employ videotelephony to conduct supervision and inspection checks, instead of carrying out the supervision

<sup>10</sup> The alternative approach of on-site audit checks by the AP/RSE is generally not recommended because this will affect the just-in-time delivery implementation. This approach should only be considered under the condition when physical audit checks at the factory are not feasible, e.g. at the time of a pandemic.

and inspection checks physically at the MiC factory. The AP/RSE and the AS are required to submit the videos taken to BD within 14 days after completion of the supervision. However, in this case, the rate of sampling for the audit checks shall be increased to at least 2% of each type of MiC modules delivered to the Site (see BD’s Circular Letter dated 7.2.2020).

Table 3 - Minimum Requirements of the AP/RSE’s On-site Audit Check on MiC Modules Delivered to the Site

**Architectural Aspects**

Work Item		Scope (by AP)
1	Setting out and interior	<ul style="list-style-type: none"> <li>• Check critical dimensions including storey height, projections, balconies, utility platforms, A/C platforms, protective barriers, internal areas, exit routes, etc.</li> <li>• Check conformity with general layout</li> </ul>
2	Installation of windows and flue apertures	<ul style="list-style-type: none"> <li>• Check minimum areas of glazing and openable areas of windows and prescribed windows and windows for rooms containing soil or waste fitment and watertightness in accordance with PNAP APP-116</li> <li>• Check positions and dimensions of flue apertures</li> <li>• Check provisions required under modification/exemption</li> </ul>
3	Provision of Barrier Free Access	<ul style="list-style-type: none"> <li>• Check provisions and critical dimensions of bathroom, toilets, Barrier Free ramps, corridors, lobbies, doors, handrails, signage, tactile access guide path, etc.</li> </ul>
4	Drainage	<ul style="list-style-type: none"> <li>• Check provision of sanitary fitments</li> <li>• Check drainage works including materials, dimensions, water seal traps, vents or anti-siphonic pipes and any other necessary components</li> </ul>
5	Fire resisting construction <sup>11</sup>	<ul style="list-style-type: none"> <li>• Check materials, fire protection of structural elements and construction of fire barriers and installation of proprietary products such as Fire Resisting Rating of fire doors, smoke seal, self-closing device, pipe collars, etc.</li> </ul>
6	Finishes and fittings	<ul style="list-style-type: none"> <li>• Check waterproofing at appropriate locations, e.g. roof, shower fittings areas, etc., including reports of water ponding test/spray test for impermeable construction</li> <li>• Check provision of required mechanical ventilation and artificial lighting</li> <li>• Check provision of required fire services installations such as smoke detectors and sprinkler heads for open kitchens, etc.</li> </ul>
7	Others	<ul style="list-style-type: none"> <li>• Check any other items considered essential</li> </ul>

**Structural Aspects**

Work Item		Scope (by RSE)
1	Steel reinforcing bars	<ul style="list-style-type: none"> <li>• Open-up concrete surface at 3 locations, each with an area of 100mm x 300mm, to check the size, pattern and layout of steel reinforcing bars; and concrete covers</li> <li>• Measure concrete cover to steel reinforcing bars by covermeter at 6 locations, each with 6 readings taken in an area of 450mm x 450mm</li> <li>• Provide material testing reports</li> </ul>

<sup>11</sup> Open-up audit check of the fire-resisting dry walls is required.

2	Concrete	<ul style="list-style-type: none"> <li>• Conduct concrete strength testing<sup>12</sup># of concrete cores taken at 3 locations</li> <li>• Provide material testing reports</li> </ul>
3	Structural steel	<ul style="list-style-type: none"> <li>• Conduct non-destructive testing of welded joints by means of visual inspection, magnetic particle inspection/ dye penetration inspection and ultrasonic examination, where appropriate<sup>13</sup>#</li> <li>• Conduct tensile strength testing<sup>14</sup># of one specimen for every 40 tonnes of each section or plates, of same thickness from the same cast, to be used for production of modules selected at random by the QCST in the factory</li> <li>• Provide material testing reports</li> </ul>
4	Finished products	<ul style="list-style-type: none"> <li>• Check concrete surface</li> <li>• Check steel surface/ corrosion protection</li> <li>• Check sizes, dimensions and fabrication tolerances</li> <li>• Check starter steel reinforcing bars</li> <li>• Check shear connectors</li> </ul>
5	Inspection records	<ul style="list-style-type: none"> <li>• Provide robust records of the supervisory personnel assigned by the RSE in the QCST</li> </ul>
6	Others	<ul style="list-style-type: none"> <li>• Check any other items considered essential</li> </ul>

#### **Building Services Aspects**

	Work Item	Scope (by AP/MEP designer)
1	Concealed work	<ul style="list-style-type: none"> <li>• Check the correct number of concealed conduits and junction boxes with the setting out details on all sides of the module</li> </ul>
2	Certification	<ul style="list-style-type: none"> <li>• Check the certification of the components and equipment installed in the module, such as energy label and WSD certificate</li> </ul>
3	Plumbing and drainage	<ul style="list-style-type: none"> <li>• Check plumbing and drainage works including materials, dimensions, water seal traps, vents or anti-siphonic pipes and any other necessary components</li> </ul>
4	Finishes and fittings	<ul style="list-style-type: none"> <li>• Check provision of required mechanical ventilation, electrical works and artificial lighting</li> <li>• Check provision of required fire services installations such as fire dampers, smoke detectors and sprinkler heads, etc.</li> </ul>
5	Access Panel	<ul style="list-style-type: none"> <li>• Check provision of access panel / inspection opening to facilitate future inspection and maintenance access</li> </ul>
6	Mounting of equipment	<ul style="list-style-type: none"> <li>• Check all equipment mounting, such as exhaust fans, exhaust air grilles, sensors, etc., are securely mounted</li> </ul>
7	Others	<ul style="list-style-type: none"> <li>• Check any other items considered essential</li> </ul>

<sup>12</sup> Refer to the requirements specified in CS1:2010.

<sup>13</sup> Refer to the requirements specified in section 14.3.6 of the Code of Practice for the Structural Use of Steel 2011.

<sup>14</sup> Refer to the requirements specified in BS EN 10002-1:2001 or BS EN ISO 6892-1:2009.

# The tests should be carried out by a laboratory accredited under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) or by another laboratory accreditation scheme which has a mutual recognition agreement with HOKLAS for the particular tests concerned. The test results shall be reported in a HOKLAS or equivalent endorsed test report and submitted for the Architect's approval within 60 days of the delivery of the modules to the Site.



2.072  
Independent  
Testing &  
Inspection  
Agent (ITIA)

- (1) The Employer may deploy ITIAs, including persons in the architectural, structural and building services disciplines, to carry out audits of the testing and inspection of the factory production process (see PNAP ADV-36). The Contractor shall give reasonable advance notice to the Employer of not less than 48 hours to allow the Employer to deploy his/her Representative/the ITIAs to carry out the audits. Any works/inspections/tests that have been carried out without reasonable advance notice shall be deemed to be rejected unless otherwise demonstrated to the satisfaction of the Employer. The Contractor shall provide necessary office accommodation in the production factory to facilitate the ITIAs to be stationed full time at the factory, if necessary, to execute the inspection and checking duties.
- (2) The Contractor shall provide access, adequate lighting and attendance during the offsite inspections carried out by the Employer or his/her Representative/ITIAs. As and when necessary, the Employer or his/her Representative/ITIAs may require samples of materials, workmanship, installation and the like to be provided/demonstrated for review. The Employer or his/her Representative/ITIAs may call for meetings on quality matters for which the Contractor's and MiC Supplier's attendance is required.
- (3) The Employer of his/her Representative may order other inspections or tests, in addition to those stipulated in the approved Quality Plan and Quality Assurance Scheme, after the modules are delivered to the Site, in order to verify compliance with the Specification. Based on such additional inspections or tests, if it is found that the modules concerned comply with applicable requirements and specifications, save for cosmetic blemishes or defects not affecting the assembly of the modules, any additional time and cost so incurred as a direct result of the additional inspections or tests shall be compensated for by the Employer.

2.073 Offsite  
Prototype at  
the Factory

- (1) The Contractor shall complete a prototype of typical modules and components (including connection elements) at the factory. The prototype and a trial assembly of the modules and components shall be made accessible for inspections and tests by the Employer or his/her Representative in the factory. The Contractor shall programme the manufacture of the prototype modules and components and the trial assembly in such a sequence as to enable the Employer of his/her Representative to progressively conduct inspections and tests before the completion of entire prototype modules and components and the trial assembly.
- (2) The prototype shall be completed with all architectural elements in place, including but not limited to finishes, fixtures, fittings, building services installations, furniture and the associated works. It shall comprise at least four interface modules and components which can demonstrate the framing system, details of both the horizontal and vertical connections of the modules prefabricated offsite and to the insitu structural elements, and connection details between the modules and/or other components designed for manufacture and/or assembly.
- (3) The weather tightness/waterproofing/damp proofing of the completed works, including but not limited to roofing, facade and external wall

treatment, shall be demonstrated in the prototype by a water spray or other suitable test. The number of waterproofing tests proposed, and the extent of the prototype and the testing arrangement, shall be provided to the Employer for approval before production of the prototype.

- (4) The Contractor shall not proceed with mass production of the modules prior to the approval of the prototype by the Employer. The Employer reserves the right to reject any works commenced, installed and/or completed and materials ordered before approval of the prototype has been given. All cost and time implications arising out of or in connection with the same shall be borne by the Contractor.
- (5) Upon the Employer’s review and approval of the prototype, the prototype shall set the types of materials, standard and quality of workmanship as well as the approved/designed locations of all finishes, fixtures, fittings, building services installations, furniture and the associated works allowed under the Contract. Unless otherwise instructed by the Employer, the production of all remaining modules at the factory shall be carried out and completed in exact conformity with, or at a higher level of quality than, the standard and quality of workmanship and materials completed for the prototype.
- (6) The offsite prototype shall only be taken down after approval has been given by the Employer or his/her Representative.

2.074 Level of Completeness for Offsite Manufactured Modules

- (1) For cross-disciplinary productivity enhancement measures, involving offsite manufactured modules with finishes, fixtures, fittings, building services and the associated works, the minimum level of completeness of the modules before leaving the factory as stipulated in Table 4 shall apply: *(Note: The minimum level of completeness is project-specific and should be decided by the Employer with advice from the designers. While such minimum level of completeness is not required by BD, the extent of finishes, fittings and fixtures of the MiC modules prefabricated/pre-installed offsite should be submitted to BD for acceptance prior to prefabrication.)*

Table 4 – Minimum level of finishes, fixtures, fittings and building services to be completed offsite in a factory-controlled environment

<b>Trades</b>	<b>Minimum level to be completed in factory-controlled environment</b>
Internal floor and ceiling finishes	<i>80% completed (except joints between modules to be carried out on site)</i>
Wall finishes (including external walls)	<i>Fully completed</i>
Painting	<i>Base coat fully completed, only final coat is permitted to be applied on site</i>
Windows (including frames and glazing) and louvres	<i>Fully completed</i>
Doors and ironmongeries	<i>Fully completed, only door leaves allowed for on-site installation</i>
Wardrobes and cabinets	<i>Fully completed, only doors are allowed for on-site installation</i>

General building services installations, including plumbing, drainage and sanitary fitment	<i>Fully completed, except cable wiring crossing different modules and fixing of associated accessories, making connections/joints for cable containments, pipes and ducts, and touching up of thermal insulation, are allowed for on-site installation.</i>
Electrical sockets, light fittings and switches	<i>Fully completed, only those sockets/switch plates and light fittings with wiring connections from adjacent modules are allowed for on-site installation</i>

- (2) Removal of protection, minor touch up and final testing & commissioning of assembled modules are generally acceptable procedures to be carried out at the Site.
- (3) Where there are minor deviations from the above-mentioned levels of completeness due to technical constraints, the Contractor shall obtain approval from the Employer prior to adoption.

## **2.080 Transportation of Modules**

- (1) The Contractor shall be responsible for all aspects of delivery, logistics, protection and temporary storage involved in transporting the modules from the production factory to the Site for assembly. The Contractor shall engage a logistics and transport provider for the delivery of the modules from the factory to the Site.
- (2) The Contractor shall be responsible for applying for all necessary permits, including a Wide Load Permit (WLP) from TD for delivering any load exceeding 2.5 m in width by vehicle, and a Construction Noise permit (CNP) from EPD for any works carried out within the restricted hours.
- (3) During the delivery, the Contractor shall allow for protection of all items installed in the modules and make necessary provisions, including temporary supports, if necessary, for road transport / shipping delivery to the Site and hoisting into place for assembly.
- (4) The Contractor shall be responsible for liaising in advance with TD/HKPF/EPD and all relevant authorities for permit and/or escort vehicles, if necessary, for the delivery of the modules, in particular for MiC modules with excessive width, height, length or weight thus requiring a permit.
- (5) TD/HKPF/EPD/other authorities may impose various conditions, including restriction on working hours for transportation. The Contractor shall allow for all necessary time and costs, and intermediate stopping / storage points involved, to enable the delivery of modules to the Site to complete the works.
- (6) The Contractor shall be responsible for carrying out any Temporary Traffic Management (TTM) scheme mentioned in the TIA for the project, as required for narrow road segments, sharp bends, junctions, vehicular

ingress and egress to destinations, etc. The Contractor shall liaise with the traffic police for the setup of the TTM scheme for implementation.

- (7) The Contractor shall make arrangement for the use of temporary parking spaces and offsite storage for the modules, as appropriate, with advice from the logistics and transport provider and trailer drivers on the logistics of delivery, as a contingency measure.
- (8) Upon delivery of the modules to the Site, the Contractor shall arrange inspection and checking with various parties as necessary. Any damaged parts or components shall be recorded and repaired or replaced before on-site assembly work, unless the damaged part is fully accessible for rectification or replacement after the module is put in place at the Site.

## **2.090 Assembly and Construction**

### **2.091 Trial Assembly of Modules**

- (1) The Contractor shall complete a trial assembly of modules and components for review, comments, alteration and acceptance. The trial assembly shall be made accessible to the Employer or his/her Representative for inspections and tests. The Contractor shall programme the trial assembly in such a sequence as to enable the Employer or his/her Representative to progressively conduct inspections and tests before the assembly of the modules and components is completed. The cost and time of the trial assembly of modules and components shall be borne by the Contractor.
- (2) Typical lifting arrangements, work sequence, temporary works, connections of all structural, architectural and building services, weather tightness treatment, etc., shall be demonstrated in the trial assembly in compliance with the construction tolerance and workmanship as stated in the method statements for hoisting and trial assembly of modules and components and in the Contract. The method statements shall include the QA/QC inspection and check points and hold points, the person responsible for inspection, checking and acceptance, the checking method and procedure, and relevant acceptance criteria.
- (3) Trial assembly of modules and components shall normally be carried out at the Site. However, in the case of a congested site, and time restriction, the Contractor may make a proposal to the Employer for approval to carry out the trial assembly of modules in the factory.
- (4) The Contractor shall not proceed with the trial assembly of the modules and components prior to approval of the trial assembly by the Employer. The Employer reserves the right to reject any works commenced, installed and/or completed before approval of the trial assembly has been given. All cost and time implications arising out of or in connection with the same shall be borne by the Contractor.
- (5) If the Employer's review finds that the trial assembly has been conducted satisfactorily, the trial assembly shall set as the type of materials, standard and quality of workmanship for assembly. Unless otherwise instructed by the Employer, the assembly of all remaining modules and components at the Site shall be carried out and completed to exact conformity with, or at

a higher level of quality than, the standard and quality of workmanship completed for the trial assembly.

- (6) The Contractor shall provide a person with adequate experience and authority to plan and coordinate with the various subcontractors, suppliers and logistics providers the transport and site access, sequence of works for each trade/subcontractor, and the site logistics in such a manner as to avoid conflict and ensure a smooth assembly process for the offsite modules and components delivered to the Site.
- (7) The Contractor shall allow for the completion, protection, housekeeping, security and maintenance of both the offsite prototype and the on-site/offsite trial assembly modules and components in advance of the remaining site works, and the Contractor shall not be entitled to any loss and expenses incurred or any other compensation, damages or other amount whatsoever, or any extension of time in connection with the same.

2.092  
Hoisting  
*(Depending on  
the project  
scope, more  
than one crane  
may be  
required)*

- (1) The Contractor shall be responsible for designing the crane grillage/supporting structure, including its foundation, and selecting a crane that best fits the project and site conditions for assembly of the modules and components. The following aspects shall be considered in the crane selection:
  - (a) lifting capacity (load weight, lift height, reach, moving distance, etc.);
  - (b) crane type;
  - (c) the time and duration of lifting, sensitive receivers and construction noise; and
  - (d) hoisting load points and optimal location of the crane to minimise the reach from the lifting point to the installation position (*Note: These should be shown on the layout design drawings for clarity*).
- (2) The Contractor shall arrange a trial lifting and arrange advance booking of a suitable crane for the project if a special crane with a long reach is required to lift heavy modules.
- (3) The Contractor shall consider appropriate arrangements for and provide the following in the preparation work for the lifting of modules and components:
  - (a) loading/unloading points;
  - (b) MiC delivery trucks running in and out of the Site;
  - (c) application of lifting frame and accessories (e.g. anchorage blocks specific to lifting of modules and components, etc.);
  - (d) safety guardrails;

- (e) optimisation of setup/preparation time/module assembly sequence, and levelling and shimming of the base fixing points to receive the modules;
- (f) calculations to check the forces induced in the lifting assembly and the modules during lifting;
- (g) design of all lifting accessories to meet BD's requirements; and
- (h) worker and site supervisor qualifications and recent (within the last 3 years) safety and relevant construction supervision training certificates.

2.093 Module Assembly (1) The Contractor shall check the following quality/safety aspects/items during module assembly:

- (a) Installation tolerance;
- (b) Vertical and horizontal alignments;
- (c) Watertightness (by a water spray or other suitable test);
- (d) Fire cavity barrier treatment;
- (e) Design and provision of safe access and working platform for lifting and connection installation;
- (f) Worker safety equipment, e.g. safety belts, safety shoes and hardhats;
- (g) Compliance with the supervision plans; and
- (h) On-site audit checks, aided by a checklist for the modules and components, including fittings and equipment, and a contingency plan for possible failure of the lifting equipment.

*(Note: Consideration should be given to requiring the Contractor to appoint a safety auditor to carry out safety audits for the trial assembly, the module hoisting works during transport and on site, and the module assembly works at the Site.)*

## **2.100 Advance Payments**

*(The Employer should decide on the advance payment mechanism and milestones and stipulate the details in the Special Conditions of Contract. Some proposed payment milestones and percentages are given in Table 5 for reference. The payment milestones and percentages should be suitably adjusted or modified to suit each particular project, taking into account the contract sum, risk exposure, mitigation measures that can be implemented, minimum level of completeness of the modules before leaving the factory (see Table 4), etc. For Government subsidised projects, the funding approval/controlling authority should be consulted before adopting such advance payment mechanism in the contract.)*

*Table 5 – Payment milestones and percentages*

<i>Item</i>	<i>Description</i>	<i>%</i>
1	<i>Submission of certified Design Drawings (to be produced by a BIM model, unless otherwise agreed by the Employer to be produced by other means) and the relevant Check Certificate(s) in compliance with the Project Design Plan (Clause 2.042) to the satisfaction of the Employer</i>	5
2	<i>Submission of the required details (e.g. production cycle, method statement, Quality Plan, Quality and Qualified Supervision Plan, etc.) for production of modules to the satisfaction of the Employer (Clauses 2.060 &amp; 2.070)</i>	5
3	<i>Completion and acceptance of a prototype of typical modules and components at the factory (Clause 2.073)</i>	5
4	<i>Procurement and delivery of materials to the factory for mass production of modules supported by evidence of payment<sup>15</sup></i>	10
5	<i>Completion of the storage and protection of a certain number and value of traceable module carcasses produced in the factory (a module carcass shall mean a self-standing structural frame which complies in all aspects with the design approved by the relevant authorities and the Employer)<sup>14</sup></i>	25
6	<i>Completion of the storage and protection of a certain number and value of traceable completed modules produced in the factory (a completed module shall mean a self-standing structural frame with all finishes, fixtures, fittings, furniture, building services installations, etc., installed to the minimum level of completeness specified and which complies in all aspects with the design approved by the relevant authorities and the Employer)<sup>14</sup></i>	25
7	<i>Completion of assembly of a certain number and value of traceable modules with sealed up works and other necessary building works at the building site</i>	20
8	<i>Expiry of Defects Liability Period and completion of all required remedial works to the satisfaction of the Employer</i>	5
		100

*(Note: The above percentages are suggested amounts only. The interim payment claims submitted by the Contractor and the retention sum should exclude such amounts.)*

- (1) The Contractor is allowed, unless otherwise stated in the Contract, to claim advance payments under the Contract for the works completed offsite and on site, based on the milestone payment conditions specified in the Contract.

<sup>15</sup> Items 4, 5 and 6 should be linked to the Inspection and Test Plan (ITP), i.e. factory compliance inspection. This arrangement has the benefit of reducing the advanced payment bond sum for the MiC modules. The bond sum may only be the down payment sum and thereby reducing the premium charges of the bond. Modern technologies, such as in cybersecurity, cloud computing, mobile technologies, 5G, Internet of Things, Radio Frequency Identification (RFID), Quick Response (QR) codes, big data and analytics, augmented reality, blockchain, etc., can be used in the inspection and payment process to enhance efficiency and quality performance. Reference should be made to the Reference Materials - Use of Digital Technologies for QA/QC of MiC Modules in MiC Factories (CIC, 2021) for details.

- (2) The Contractor shall submit to the Employer in his/her application a statement (with an electronic copy to facilitate checking by the Employer), together with all relevant inspection records, test reports and certificates and other documentary evidence certified by the project AP/RSE, to substantiate the claims based on milestone payment conditions specified in the Contract.
- (3) Upon approval of the application by the Employer or his/her Representative, the Contractor shall issue a vesting certificate to the Employer in respect of those materials purchased, and/or modules and components produced, accepted by the Employer for partial/full payment and stored at a premise (or premises) designated by the Employer, to confirm the transfer of ownership of the materials and/or modules paid for to the Employer, with each material or module stored clearly identifiable and traceable.

*(Note: The stipulations on the vesting certificate, transfer of ownership, and the manner in which the materials or partially or fully completed modules offsite and the premises are to be identifiable and traceable should be clearly specified.)*

- (4) The Contractor shall provide a security from a mutually agreed third party (e.g. the maintenance of an effective bond of required value) to secure the advance payments for the materials and/or modules.

*(Note: Provision for off-site payment through procurement of a bond covering the cost of off-site items to be claimed for that payment application has also been allowed for in Government contracts, e.g. see GCC for Buildings Works Clause 12 and Clause 79(1)(c).)*

## **2.110 Completion**

- 2.111 As-built Submission (1) On completion of the module assembly works at the Site, the Contractor shall submit the following as-built information as hard or electronic copies:
- (a) a drawing register;
  - (b) general arrangement and other as-built drawings;
  - (c) design calculations for any project-specific connections designed, or reference to standard connections;
  - (d) fabrication drawings for all modules;
  - (e) the fixtures, fittings, furniture, etc., supplied within each module;
  - (f) the as-built BIM model including evidence of submission to BD (named as the As-built Information Model (ABIM) in the CIC BIM Standards - General (version 2 - December 2020)) and key building information and data, which shall be uploaded to a digital platform such as a CDE designated or accepted by the Employer (*if appropriate*); and



*(Note: For a self-operated, self-used or self-maintained building, the adoption of a digital platform, such as a CDE or other suitable digital platform, for the storage, exchange and retrieval of BIM information and data required for operation and maintenance under the project is strongly encouraged as this can greatly facilitate BIM-enabled building asset management and facility management and reduce the lifecycle cost. To facilitate BIM for asset management and facility management, the Contractor should collaborate with the maintenance agent designated by the Employer to agree on the type and format of the digital data sets required, to ensure that the submitted as-built BIM models are sufficient and useful for asset and facility management purposes.)*

- (g) Disassembly Manual (in case the MiC modules are required to be demountable for relocation and reassembly for reuse).

2.112  
Maintenance

- (1) Upon completion of the Contract, the Contractor shall provide a Maintenance Manual, which shall cover the following aspects for the maintenance of the building(s) incorporating MiC and MiMEP:
  - (a) Inspection and maintenance plans to cover, e.g. regular walls and roof, windows and doors, flooring and electrical and mechanical utilities, facades (e.g. external aluminium cladding), and watertightness;
  - (b) Access points for inspection, repair and replacement of critical elements;
  - (c) Renovation guidance, e.g. procedures, appropriate tools, any required renovator qualifications;
  - (d) Availability and supply of spare parts; and
  - (e) Homeowner user advice, e.g. safety notices, instructions for use, structural layout, fire safety protection, cleaning and maintenance.
- (2) The Maintenance Manual shall cover maintenance of the offsite modules prefabricated in the factory-controlled environment, to a level of detail that will enable the future operator and maintenance agents to understand all issues related to the usage, maintenance and alterations of the modules.
- (3) Apart from general information on the construction, layout, materials, general cleaning inspection maintenance procedure of the modules, the Maintenance Manual shall draw particular attention to aspects which are not commonly anticipated in conventional insitu building works, including but not limited to the following:
  - (a) Particular routine inspection and checking requirements on the integrity of the modules;
  - (b) Survey/measurement of the displacement of the assembled modules to check the allowable limit is not exceeded;

- (c) Inspection, testing and repair of structural, architectural and building services connections;
  - (d) Inspection, testing and repair of waterproofing at the external walls and the roof;
  - (e) Locations of inspection pits and access panels;
  - (f) Safety notices and instructions for drilling and fixing requirements inside the modules (Appendix C to PNAP ADV-36 refers);
  - (g) Safety notices and instructions for alterations, e.g. fire rated walls and floors, internal partitions and building services; and
  - (h) Instructions for repair or replacement of installed fixtures, fittings, building services, etc.
- (4) If the MiC design is required to be relocatable for reuse, the Contractor shall also provide a Manual for disassembly and re-assembly at a new site, which shall provide details on the sequence of work, and the personnel, equipment and operating supplies needed.

*(Note: This clause is only for buildings required to be moved to another site later, such as transitional social housing projects.)*

## **2.120 Tax, Insurance and Warranties**

- (1) The Contractor shall pay the relevant taxes for all materials, components and systems required to be imported and/or included in the modules, excluding the materials supplied by the Employer or prime cost rate items<sup>16</sup>.

*(Note: The Contractor should be encouraged and allowed to use materials originating from the country/jurisdiction of module production, provided they meet Hong Kong regulations and standards, in order to avoid double handling of taxation matters.)*

- (2) The Contractor shall provide Contractor's All Risk Insurance<sup>17</sup>, to cover all the offsite and on-site works, and the period of transport and delivery of offsite works to the Site and any temporary storage needed offsite and at the Site.

*(Note: The insurance policy should cover loss of or damage to: (i) The works including the MiC modules that have been completed but not yet handed over to the Employer; (ii) Materials used for the project stored on-site or elsewhere; (iii) Temporary structures; (iv) Hired plant and equipment; (v) Contractor-owned plant and equipment; and (vi) Transit to and from the contract site. The insurance should protect against claims for*

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<sup>16</sup> Prime cost rate items are those materials which have been selected by the Employer in advance for use in the Contract. The Contractor shall charge the installation, profit and wastage only, if applicable.

<sup>17</sup> "All Risk Insurance" refers to a type of insurance coverage that automatically covers any risk that the contract does not explicitly omit. Basically, this type of insurance will cover all activities to be undertaken by the Contractor for a project.

*(i) Third-party bodily injury; (ii) Third-party death; and (iii) Third-party property damage.)*

- (3) The Contractor shall hold an Employee's Compensation insurance policy to cover liability in the event that any staff suffered an injury or illness during the normal course of work, including but not limited to work associated with the land/marine transit of MiC modules and other prefabricated products from the factory to the Site and work in offsite temporary storage areas.
- (4) The Contractor shall provide a *12-month (or another duration if required by the Employer)* defects liability period for the whole building to cover any defects other than those clearly resulting from normal wear and tear, misuse, abuse or accidental damage.
- (5) The Contractor shall provide a x-year warranty<sup>18</sup> for the products which form any part of the external fabric of the building, including the floor and wall panels, roof deck, windows and doors. This warranty shall not apply to internal floor finishes, wall finishes, ceiling finishes or internal fixtures and fittings, all of which shall be covered by the 12-month defects liability period.
- (6) The Contractor shall provide a y-year warranty<sup>17</sup> for all joints of the MiC modules, roofing, waterproofing and weather tightness works constructed under the Contract.

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<sup>18</sup>The number of years of warranty to be specified would depend on many factors, such as material specifications, the construction details, the conditions imposed on product installation and use and maintenance of the building during its service life, whether there are suppliers who can provide such level of warranty for the products required, etc. The designer should take these factors into account and specify a suitable warranty period that best fits the project needs and availability of supply.

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