

Modular Integrated Construction

Introduction

Modular Integrated Construction (MiC) is a construction method that employs the technique of having freestanding volumetric modules (with finishes, fixtures, fittings, etc.) manufactured off-site and then transported to site for assembly. Proven benefits include improved site safety, more efficient and better quality control, shortened construction period, less construction waste, less demand for on-site labour, less disturbance and nuisance to the neighbourhood, etc., not just contributing to the quality and sustainable built-environment but also help ease some of the challenges of the local construction industry. To encourage MiC, the Buildings Department (BD) has formulated streamlined measures and guidelines to facilitate the industry in meeting the relevant standards and requirements under the Buildings Ordinance (BO).

Considerations Unique to MiC

2. Similar to the use of prefabricated building components, the project team should engage the MiC suppliers at the early design stage to sort out the issues usually not encountered in conventional in-situ construction. Apart from the extent of standardisation and buildability of such modules, the mode of delivery with due regard to the specific site conditions, the issues that may arise from meeting the relevant requirements including those on supervision as well as the programme of plan submissions to BD should be considered in advance. General guidelines on the design and quality control requirements under the BO for MiC are given in Appendices A and B respectively.

Pre-submission Enquiry

3. Authorized Persons (AP) and Registered Structural Engineers (RSE) are encouraged to make use of the established mechanism of pre-submission enquiry service mentioned in PNAP ADM-19 to clear with BD in the early design stage unconventional design or performance of a modular prototype for acceptance under the BO before preparing the detailed designs. A determination would be available within 45 days.

Pre-acceptance of MiC Systems/Components or Prototypes

4. Furthermore, BD has set up a pre-acceptance mechanism for granting in-principle acceptance (IPA) to individual MiC systems/components or prototypes on specific performance as listed in Appendix C. On the condition that the pre-acceptance application is accompanied with the required information and the MiC systems/components or prototypes are acceptable in meeting the standards and requirements under the BO and its subsidiary regulations, BD will advise its determination within 45 days from the date of receipt of the application by issuing a letter of IPA to AP/RSE. Otherwise, BD will issue a letter of comments on the application to AP/RSE also within 45 days.

/AP/RSE

AP/RSE should clarify/respond to all comments in 30 days from the date of the letter of comments, or the application will be considered as abandoned. Within 30 days of receipt of the responses/supplementary information from AP/RSE, BD may accept the application by issuing a letter of IPA, or if the responses/supplementary information cannot satisfactorily address BD's comments, BD will refuse¹ the application with a list of outstanding items/comments.

5. To facilitate the preparation of MiC systems/components or prototypes, applicants are encouraged to discuss with BD before submitting an application. Details of the pre-acceptance mechanism are available in BD's website www.bd.gov.hk. Nevertheless, the pre-acceptance is not a pre-requisite for the approval of general building plans.

(HO Chun-hung)
Building Authority

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¹ If the application is refused, any subsequent revised application will be processed according to the time frame as if it is a new application, i.e. BD will advise its determination within 45 days.

Design Requirements for Modular Integrated Construction

Fire Safety

The fire protection or performance of elements of construction of MiC should be addressed. Non-code-compliant designs should be justified for having equivalent performance as the prescriptive standards and, where necessary, supported by fire engineering assessments as stated in the Code of Practice for Fire Safety in Buildings.

Joints and Gaps

2. Modular constructions typically entail more joints and gaps, including those in drainage pipes and building envelope, which are prone to water seepage. Suitable design and construction should be provided to prevent ingress/penetration of water.

Structural Design

3. The requirements on the design and construction of reinforced concrete, precast concrete and structural steel given in the Code of Practice for Structural Use of Concrete, Code of Practice for Precast Concrete Construction and Code of Practice for the Structural Use of Steel also apply to MiC elements. Particular considerations should be given to the following design aspects:

(a) **Stability**

A building structure comprising modular units must possess adequate stability to resist wind and other lateral loads. Consideration should also be given to temporary stability during assembly and installation of the modular units. Adequate support should be provided at all stages of installation to ensure that stability is maintained;

(b) **Robustness and integrity**

The overall structural system comprising modular units should be designed to be robust and be able to resist disproportionate collapse. Structural integrity should be provided by tying all modular units and in-situ elements together horizontally and vertically. The modular units should be designed to be capable of sustaining accidental loading in such a way as to prevent the extent of any resulting collapse of individual modular unit being disproportionate to the cause of the collapse;

/(c) ...

(c) Design for temporary stages

Structural action and load path may be different during the temporary stages of construction, including fabrication, lifting, transportation, assembly and installation, and may result in higher stresses in individual MiC elements. Consideration should be given to the temporary imposed loading on the modular units during each stage of construction. The temporary stability and integrity of the modular units at all stages of construction should be ensured; and

(d) Design for movements

The MiC system should be designed to accommodate cumulative movements, usually by the provision of joints, occurred throughout the various construction stages and during its service life. Consideration should be given to the various causes of movements such as creep deformation, shrinkage, differential movement, thermal movement, etc. with due regard to the fact that such movements may be short-term or long-term and may or may not be coexistent or occur concurrently. Allowance should also be made for fabrication and installation tolerances.

Provisions for Maintenance

4. The provision of access points, inspection pits or accessible recesses to facilitate inspection and repair/replacement of structural connections, drainage pipes, building services and joints should be considered during the early design stage of the MiC system.

5. The design of a MiC module as a separate balcony or utility platform (UP) module to be assembled with in-situ joints on site will impose burden on long-term maintenance, thus should be avoided. In case where a separate balcony or UP module is proposed, the area of such balcony or UP module will not be accepted as MiC floor area in the context of Joint Practice Note No. 8 jointly issued by the Buildings Department, Lands Department and Planning Department for the purpose of gross floor area and site coverage concessions.

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Quality Control and Supervision of MiC

Quality Assurance Scheme

Modular units are to be fabricated by a factory with a valid Full Certificate issued by the Building Technology Research Institute under the Modular Integrated Construction Manufacturer Accreditation Scheme (Accredited MiC Manufacturer), ISO 9001 or equivalent quality assurance certification. This will be imposed as a condition under item 6 in section 17(1) of the Buildings Ordinance (BO) when giving approval of plans.

2. Upon approval of plans, a requirement will also be imposed under regulation 10 of the Building (Administration) Regulations (B(A)R), to require submission of a copy of valid Full Certificate of the Accredited MiC Manufacturer or the Quality Assurance Scheme (QAS) of the MiC supplier at least 14 days before the commencement of production work in the prefabrication factory unless such has been covered in BD's in-principle acceptance and remains unchanged¹. For an application choosing to submit with a QAS, the project AP and RSE should provide a written confirmation that the QAS has adequate provisions in ensuring the quality of production complying with the provisions of the BO and the approved plans.

3. The QAS should cover the following items:

- (a) Quality control tests (including raw materials delivered to the prefabrication factory) with specification of testing personnel/body, testing standard, testing procedure and acceptance criteria;
- (b) Calibration of equipment for tests and inspections/audits;
- (c) Production process;
- (d) Frequency and extent of inspections by in-house staff and independent parties²; and
- (e) Frequency and extent of audits by in-house staff and independent parties.

/Qualified Supervision...

¹ The MiC supplier should submit a written confirmation if the QAS is based on the one accepted under the Pre-acceptance Mechanism for MiC Systems. If some items of such QAS have been amended, only the amendments are required to be submitted.

² "Independent parties" refer to parties not under the direct employment of the prefabrication factory (i.e. either a certification body under the Hong Kong Certification Body Accreditation Scheme (HKCAS) of the Hong Kong Accreditation Service (HKAS) or an inspection body under HKAS's Hong Kong Inspection Body Accreditation Scheme (HKIAS)).

Qualified Supervision

4. Approval of plans will be imposed with conditions:
- (a) Under item 6 in section 17(1) of the BO to specify that qualified supervision is to be provided by AP, RSE and Registered Contractor (RC) for the fabrication, assembly, installation and examination of modular units and pre-installed finishes; and
 - (b) Under regulation 10 of the B(A)R to require submission of a MiC Supervision Plan³ at least 14 days before the commencement of the production work in the prefabrication factory.
5. AP and RSE should assign their respective Quality Control Supervisory Team (QCST) to supervise the modular unit production work 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 PNAP APP-158. Similarly, RC should assign a Quality Control Co-ordination Team (QCCT) to supervise the modular unit production work in the prefabrication factory. AP, RSE and Authorized Signatory (AS) of RC should respectively determine the required qualification of the supervisory personnel and necessary frequency of supervision of QCST and QCCT subject to the minimum standards in Table 1 below.

Table 1 Minimum Qualification and Supervision Frequency of QCST and QCCT

	AP Stream	RSE Stream	RC Stream	
Qualifications of Supervisory Personnel	T3*	T3*	T3*	T1*
Supervision Frequency	Weekly	Weekly	Weekly	Continuous

* T3/T1 refers to Grade T3/T1 Technically Competent Person equivalent as stipulated in the Code of Practice for Site Supervision.

6. The names and qualifications of the supervisory personnel assigned by AP, RSE and RC respectively should be recorded in an inspection log book. The details of production, inspection, auditing and testing of modular units should be recorded in the log book by the supervisory personnel. The log book should be kept in the prefabrication factory and a copy of it should be kept at the building site office and, when required, produced to officers of BD for inspection.

/Quality Audit...

³ The MiC Supervision Plan should contain the names, qualifications, identification, inspection frequency, confirmation of appointment and contact information of the supervisory personnel assigned by AP, RSE and RC under paragraph 5.

Quality Audit

7. AP, RSE and AS of RC should visit the prefabrication factory in person to inspect the production of the first batch of modular units⁴ (the first visit) and subsequently carry out quality audit checks to the prefabrication factory at least once every month. The quality audit checks should comprise inspections at the prefabrication factory in person at quarterly intervals while the monthly quality audit checks in between the first visit and quarterly quality audit checks (i.e. in the 2nd, 3rd, 5th, 6th months, and so on) may be carried out either by visiting the prefabrication factory in person or by videotelephony⁵. A requirement will be imposed under regulation 10 of the B(A)R, when giving approval of plans to specify that a copy of AP, RSE and AS's quality audit reports of the prefabrication factory duly endorsed by AP, RSE and AS respectively should be submitted to BD within 14 days after completion of the quality audit checks⁶ for record purpose. These quality audit reports should also cover the qualified supervisions by the respective QCST and QCCT.

8. Quality audit checks conducted by AP, RSE and/or AS using videotelephony should comply with the following requirements:

- (a) The inspection by AP, RSE and AS should be conducted with the assistance of QCST and QCCT under their respective stream in the prefabrication factory;
- (b) The level of supervision by videotelephony should not be inferior to that carried out personally at the prefabrication factory. In addition, all supervision items covered in the videos taken should be recorded contemporaneously in the audit reports of AP, RSE and AS, and should be submitted to BD together with the DVD-ROM discs as required in paragraph 8(c) below; and
- (c) AP, RSE and AS should submit the quality audit reports with non-rewritable DVD-ROM discs of the videos to BD within 14 days after completion of the quality audit checks by videotelephony. They should certify on each disc with a permanent marker signifying that they personally used videotelephony for compliance with the approval conditions.

/Alternative Arrangement...

⁴ The purpose of the first visit to the prefabrication factory is to verify that the QAS and quality assurance/quality control procedures are duly followed and the production line is functioning properly. For precast concrete works, the inspections by RSE and AS of the first batch of precast concrete production should cover items specified in clauses 3.1 to 3.14 and 4.1 of the Code of Practice for Precast Concrete Construction.

⁵ Videotelephony means two-way simultaneous communication with both audio and video in real time through telephone or computer network connection. The video should be recorded in colour with resolution of not less than 480p in a non-rewritable DVD-ROM.

⁶ Including the first visit and each subsequent quality audit check.

Alternative Arrangement for Quality Audit Checks at Prefabrication Factory

9. As an alternative to the requirement for the quality audit checks by AP/RSE at the prefabrication factory specified in paragraph 7 above, AP/RSE may consider to carry out the first visit to the prefabrication factory in person, then conduct on-site quality audit checks after the MiC elements are delivered to the building site. In such a situation, AP/RSE is required to notify the Building Authority in writing one month before the commencement of the production work in the prefabrication factory for the adoption of the alternative arrangement. AP/RSE should, in addition to the submission of quality audit report within 14 days of the first visit, submit on-site quality audit reports of the MiC elements delivered to the building site to BD within 14 days after completion of the on-site quality audit checks. The quality audit reports should cover the qualified supervision by the QCST. Minimum requirements of the on-site quality audit checks by AP/RSE are given in the Annex.

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**Minimum Requirements of AP's/RSE's On-site Quality Audit Checks
on MiC Elements Delivered to the Building Site**

The quality audit checks on the MiC elements delivered to the building site carried out by AP/RSE as an alternative to the quality audit checks on MiC elements at the prefabrication factory should comply with the requirements specified in paragraph 2 below.

2. The rate of sampling for the quality audit checks shall be at least 1% of each type of modular units delivered to the building site. The quality audit check for each sample of the modular units should include the following items, where applicable:

Works Item		Scope
AP		
1	The setting out and interior	<ul style="list-style-type: none"> ● Check critical dimensions including storey height, projections, balconies, utility platforms, A/C platforms, protective barriers, internal areas, exit routes, etc. ● Check conformity with general layout
2	Installation of windows and flue apertures	<ul style="list-style-type: none"> ● Check minimum areas of glazing and openable areas of prescribed windows and windows for rooms containing soil or waste fitment and water tightness in accordance with PNAP APP-116 ● Check positions and dimensions of flue apertures ● Check provisions required under modification/exemption
3	Provision of barrier free access	<ul style="list-style-type: none"> ● Check provisions and critical dimensions of bathrooms, toilets, ramps, corridors, lobbies, doors, handrails, signage, tactile guide paths, etc.
4	Drainage	<ul style="list-style-type: none"> ● Check provision of sanitary fitments ● Check drainage works including materials, dimensions, water seal traps, vent or anti-siphonic pipes and any other necessary components
5	Fire resisting construction ¹	<ul style="list-style-type: none"> ● Check materials, fire protection of structural elements and construction of fire barriers and installation of proprietary products such as FRR of fire doors, smoke seals, self-closing devices, pipe collars, etc.
6	Finishes and fittings	<ul style="list-style-type: none"> ● Check water proofing where appropriate such as roofs, shower areas, etc. including reports of water ponding tests/spray tests for impermeable construction ● Check provision of required mechanical ventilation and artificial lighting

¹ Open-up audit check of fire resisting dry walls is required.

		<ul style="list-style-type: none"> ● Check provision of required fire services installations such as smoke detectors and sprinkler heads for open kitchens, etc.
7	Inspection records	<ul style="list-style-type: none"> ● Log books of the supervisory personnel of QCST assigned by AP
8	Others	<ul style="list-style-type: none"> ● Any other items considered essential by AP for the project
RSE		
1	Steel reinforcing bars	<ul style="list-style-type: none"> ● Opening-up of the concrete surface at three locations, each with an area of 100mm x 300mm, to check the size, pattern and layout of the steel reinforcing bars; and the concrete covers ● Measurement of the concrete cover to steel reinforcing bars by covermeter at six locations, each with six readings taken in an area of 450mm x 450mm ● Material testing reports
2	Concrete	<ul style="list-style-type: none"> ● Concrete strength by non-destructive test[#] (e.g. rebound hammer test) at three locations ● Material testing reports
3	Structural steel	<ul style="list-style-type: none"> ● Non-destructive testing of welded joints by means of visual inspection, magnetic particle inspection/dye penetration inspection and ultrasonic examination, where appropriate^{2#} ● Tensile strength testing^{3#} of one specimen for every 40 tonnes of each section or plates of same thickness from the same cast to be used for fabrication of modular units selected at random by the QCST in the prefabrication factory ● Material testing reports
4	Finished products	<ul style="list-style-type: none"> ● Concrete surface and defects ● Steel surface/corrosion protection ● Sizes, dimensions and fabrication tolerances ● Starter steel reinforcing bars ● Shear connectors
5	Inspection records	<ul style="list-style-type: none"> ● Log books of the supervisory personnel of QCST assigned by RSE
6	Others	<ul style="list-style-type: none"> ● Any other items considered essential by RSE for the project

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² Refer to the requirements specified in section 14.3.6 of the Code of Practice for the Structural Use of Steel.

³ Refer to the requirements specified in BS EN 10002-1:2001 or BS EN ISO 6892-1:2009.

[#] Test results should be submitted to BD within 60 days of the delivery of the modular units to the building site.

Pre-acceptance Application Checklist for MiC

This application checklist aims to remind AP and RSE of the essential information which should be contained in the plans and supporting documents accompanied with the application. The checklist should be completed by ticking the items relevant to the application. Sample drawings showing acceptable standards for the pre-acceptance application are attached at Annex I for reference.

BD will conduct regular review on this application checklist in the light of experience gained in processing different MiC systems, feedbacks from the building industry on the use of various MiC systems and technological development in the relevant fields.

- Essential information to be provided on plans
- △ Essential information to be provided in the supporting document accompanied with the plans

Section		Essential Information
1.	General	<ul style="list-style-type: none"> ○ General notes on compliance with applicable regulations/codes of practice/design manual/guidelines. ○ Schedule/notes on intended building height, number of storeys and use of building and modules. ○ General building plans¹ (plans of all MiC floors or MiC individual system/component or prototype) in scale not less than 1:100 with full dimensions. ○ Diagrams to indicate the extent and configuration of all types² of MiC modules. ○ Structural plans¹ (plans of floors constructed by MiC, and sections/elevations) in scale not less than 1:100 showing the layout and dimensions of all structural elements at floor and ceiling levels, modular units, structural connections and locations of movement joints. ○ Plans, sections and elevations of each module type and their interfaces with upper, lower and adjacent modules/in-situ construction in scale not less than 1:50 with full dimension indicating features, if applicable, like gas flue aperture, balcony, utility platform, A/C platform, curtain/window wall, non-structural external wall system/cladding, sunken slab, impermeable construction of rooms with water supply,

¹ The pre-acceptance mechanism is applicable to individual MiC system/component or prototype. In this regard, such application accompanied with essential information should include the module(s) of the proposed MiC system/component or prototype that represents the entire building and building height when assembled.

² Different structural/building layouts and/or different dimensions of the modules constitute different types of MiC modules (e.g. mirrored modules are considered as one type of module).

Section	Essential Information
	<p>protective barrier, projections, vertical greening, pipe ducts, etc.</p> <ul style="list-style-type: none"> ○ Standard details to show the connections and methods of sealing up gaps at roof, floor, partition or internal wall, between modules and in-situ construction indicating the cavity barriers and waterproofing provisions. ○ Schedule of Finishes, Fixtures and Fittings Prefabricated/Installed Off-site. A sample schedule is attached at Annex II for reference.
2. Fire Safety	<ul style="list-style-type: none"> ○ Demonstration on compliance with the Code of Practice for Fire Safety in Buildings (FS Code) in terms of means of escape, fire resisting construction and means of access for firefighting and rescue for MiC portion only, for example: <ul style="list-style-type: none"> (a) Tables to demonstrate the following: <ul style="list-style-type: none"> (i) Occupant capacity, required and provided no. and width of exit doors and exit routes; (ii) Construction and materials for walls, floors, columns, beams and stairs with fire resistance rating of elements of construction; and (iii) Application of fire resisting products and materials of non/limited combustibility including the references of the corresponding test/assessment reports. A sample schedule is attached at Annex III for reference; (b) Direct distance and travel distance of exit routes; (c) Fire resisting construction of fire barriers separating different occupancies, uses, compartments and the areas of special hazard; of the protected exit routes, vertical shafts and required staircases; and of the MiC portion and the interface with in-situ construction; (d) Provision of fireman's lift and firefighting and rescue stairway; and (e) Provisions in general notes on: <ul style="list-style-type: none"> (i) Non-combustibility requirements for cladding/external wall/curtain wall including the insulation/water proofing materials; (ii) Limited combustibility requirements for linings/coverings of internal wall, ceiling, floor and decorative finishes; and (iii) Non-combustibility requirements for acoustic and thermal insulation in ductings and concealed location.

Section		Essential Information
		<p>△ Documentary proofs to illustrate compliance of FS Code, for example:</p> <p>(a) Test/assessment reports for the fire rated products and materials as well as combustibility of materials as necessary; and</p> <p>(b) Fire safety review of the system conducted by fire safety engineer, if applicable.</p>
3.	Lighting and Ventilation	<p>○ Table to demonstrate the provision of prescribed windows for habitable rooms and offices as well as provision of natural lighting and ventilation for rooms containing soil or waste fitments with indication of adequate window area. Detailed calculations of the provisions are not required.</p>
4.	Drainage	<p>○ Drainage part plans/diagrams for MiC portion only to be incorporated into the general building plans (i.e. no separate submission of drainage plans is required) to demarcate the extent of drainage works prefabricated off-site and to be carried out on site, as well as to illustrate compliance with Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations, for example:</p> <p>(a) Standard details and connections of traps with replenishing function for floor drains of kitchens of domestic units, toilets or pantries (PNAP APP-164);</p> <p>(b) Provision of surface water discharge for cantilevered structures exposed to weather;</p> <p>(c) No pipework for a domestic unit shall protrude into the unit under separate occupancy;</p> <p>(d) Common above-ground soil/waste/rainwater stacks and underground drains located in common parts of the building (PNAP APP-93);</p> <p>(e) No water-borne pipe embedded in structural elements (PNAP APP-105); and</p> <p>(f) Provision of condensate disposal system for A/C units (PNAP APP-112).</p>
5.	Barrier Free Access	<p>○ Provision of access and facilities for persons with a disability for MiC portion only, for example, adequate door width and provision of manoeuvring space in corridor, accessible toilets and bathrooms, if applicable.</p>
6.	Structure	<p>○ Structural system including design assumptions of the building and MiC, details of modular units illustrated with plans at floor and ceiling levels and sections/elevations (including recess for in-situ casting or installation works), and method of assembly and installation.</p> <p>○ Material specifications and compliance standards.</p>

Section	Essential Information
	<ul style="list-style-type: none"> ○ Design loads (including temporary/construction loads and load effects from temperature change and top floor(s) cast in-situ/installed on-site). ○ Durability (e.g. corrosion protection) and fire protection of structural elements. ○ Quality control requirements. ○ Details of structural connections between modular units and between modular units and cast in-situ structural elements (if any). △ Vertical and lateral load transfer mechanism both within modular unit and at connections at permanent and temporary stages. △ Structural stability (e.g. resisted by both/either modular units and/or cast in-situ structural elements) at permanent and temporary stages. △ Robustness (i.e. design of vertical and horizontal ties, and hypothetical removal of critical element). △ Consideration for temporary stages (lifting, storage, installation, etc.).
7. Quality Assurance	<ul style="list-style-type: none"> △ Full Certificate issued by the Building Technology Research Institute under the Modular Integrated Construction Manufacturer Accreditation Scheme. OR △ Certification on ISO 9001 quality assurance to the prefabrication factory; and △ Quality Assurance Scheme of the prefabrication factory in accordance with paragraphs 2 and 3 of Appendix B of PNAP ADV-36.
8. Fabrication & Installation	<ul style="list-style-type: none"> △ Description of on-site installation works with step-by-step pictorial illustrations of procedures/sequence (may be supplemented by Building Information Modelling files in digital format as specified in PNAP ADV-34) including: <ul style="list-style-type: none"> (a) Master construction sequence indicating cast in-situ structures and installation sequence of the MiC modules; and (b) Detailed installation process of structural connections among modular units and between modular units and cast in-situ structural elements (if any). ○ Fabrication and installation tolerances.

Section		Essential Information
9.	Maintenance	<p>○ Accessible recesses at strategic locations for the repair/replacement/monitoring of the critical structural members and modular units connections, e.g. joint fillers, waterproofing arrangement, structural connections (e.g. bolts/welds/interlocking), etc., if any.</p> <p>Considerations on :</p> <ul style="list-style-type: none"> (a) Access for future external maintenance and repair of external features, A/C units, cladding, etc., if any (Code of Practice on Access for External Maintenance and PNAP ADV-14); (b) Provision of pipe duct/pipe well (PNAP APP-93); and (c) Access points for inspection of drains housed in sunken slabs.

* Delete as appropriate

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GENERAL NOTES :

1. BUILDINGS ORDINANCE (BO) AND ITS ALLIED REGULATIONS SHALL BE COMPLIED WITH.
2. STRUCTURAL SUBMISSIONS ARE SUBMITTED IN CONJUNCTION WITH THIS BUILDING AND DRAINAGE SUBMISSION FOR APPLICATION FOR IN--PRINCIPLE ACCEPTANCE.
3. ALL LEVELS GIVEN ARE IN METRES ABOVE P.D. UNLESS NOTED OTHERWISE.
4. ALL DIMENSIONS SHOWN ON ALL DRAWINGS ARE STRUCTURAL AND IN MILLIMETERS EXCEPT OTHERWISE STATED.
5. FOR HABITABLE SPACE, THE MINIMUM CLEAR HEIGHT FROM FLOOR TO STRUCTURAL CEILING SHALL BE 2500MM AND THAT TO THE UNDERSIDE OF BEAM SHALL BE 2300MM.
6. EVERY OPENING PLACED ON AN EXTERNAL WALL ABOVE THE GROUND FLOOR OF ANY BUILDING SHALL BE PROTECTED BY A BARRIER WHICH SHALL BE NOT LESS THAN 1100 MM HIGH AND THE LOWERMOST 150 MM OF SUCH BARRIER SHALL BE BUILT SOLID.
7. WATER AUTHORITY'S REQUIREMENTS FOR PLUMBING WORKS TO BE COMPLIED WITH.
8. THE FLOOR OF EVERY ROOM TO WHICH A WATER SUPPLY IS PROVIDED SHALL BE CONSTRUCTED OF SUITABLE IMPERMEABLE MATERIAL. THE INTERNAL SURFACES OF EVERY KITCHEN AND BATHROOM SHALL BE FACED WITH TILES OR RENDERED IN CEMENT MORTAR OF NOT LESS THAN 12.5MM THICK OR OTHER NON--ABSORBENT MATERIAL, TO A HEIGHT OF NOT LESS THAN 1.2m FROM THE LEVEL OF THE FLOOR OF THE KITCHEN AND BATHROOM.
9. ALL BUILDING ELEMENTS, MATERIALS AND COMPONENTS HAVING THE REQUIRED FIRE PROPERTIES SHALL BE TESTED IN ACCORDANCE WITH THE RELEVANT STANDARDS IN PART E OF THE CODE OF PRACTICE FOR FIRE SAFETY IN BUILDINGS 2011 (FS CODE).
10. CAVITY BARRIERS HAVING AN F.R.R. OF NOT LESS THAN --/30/15 WILL BE PROVIDED TO CLOSE THE EDGES OF CAVITIES AT THE JUNCTIONS BETWEEN MIC MODULES FOR SEPARATING DIFFERENT USES/ OCCUPANCIES.
11. EXTERNAL WALL OF THE BUILDING AT ANY FLOOR SHALL BE SEPARATED FROM THE EXTERNAL WALL AT THE FLOOR NEXT BELOW BY VERTICAL SEPARATION OF NOT LESS THAN 900MM AND WITH AN F.R.R. OF NOT LESS THAN THAT OF THE INTERVENING FLOOR.
12. ALL NON--LOAD BEARING FIRE BARRIERS BETWEEN DOMESTIC FLAT AND INTERNAL COMMON CORRIDOR SHALL HAVE AN F.R.R. OF NOT LESS THAN --/60/60 MINUTES.
13. GAPS BETWEEN THE PIPES AND THE FLOOR/FIRE BARRIERS, AND ALL OPENINGS WITHIN THE PIPE DUCT FOR PASSAGE OF VENTILATION DUCTS, ELECTRICAL TRUNKINGS, CONDUITS, PIPES, CABLES AND THE LIKE SHALL BE PROPERLY FILLED BY FIRE RATED MATERIAL HAVING AN F.R.R. OF NOT LESS THAN --/60/-- MINUTES.
14. ALL LININGS/COVERINGS/DECORATIVE FINISHES OF INTERNAL WALL, CEILING AND FLOOR WITHIN PROTECTED EXITS SHALL COMPLY WITH EUROPEAN CLASSIFICATION C WHEN TESTED IN ACCORDANCE WITH BS EN 13501--1:2007; OR CLASS 1 REQUIREMENTS OF SPREAD OF FLAME WHEN TESTED IN ACCORDANCE WITH THE BRITISH STANDARD 476: PART 7.
15. ALL ACOUSTIC AND THERMAL INSULATION IN DUCTINGS AND CONCEALED LOCATIONS SHOULD BE TESTED IN ACCORDANCE WITH THE RELEVANT STANDARDS IN PART E OF THE FS CODE.
16. DETAILS INFORMATION OF FIRE RESISTING DOORS SHOULD BE PROVIDED AND CERTIFIED IN COMPLIANCE WITH THE RELEVANT PROVISIONS OF THE BO IN ACCORDANCE WITH PNAP APP--13 UPON COMPLETION OF WORKS.
17. ALL INTERNAL INSULATION MATERIAL OF DUCTWORK, INCLUDING ASSOCIATED FASTENERS, ADHESIVES, TAPES ETC. SHALL COMPLY WITH BS 476: PART 6 WITH THE INDEX OF OVERALL PERFORMANCE ("I") NOT EXCEEDING 12, SUB INDEX ("I'") NOT MORE THAN 6 OR EQUIVALENT NATIONAL OR INTERNATIONAL STANDARD. FSD CIRCULAR LETTER NO. 4/96, PART XI, 4.3.1 REFERS.
18. ALL EXTERNAL INSULATION MATERIAL OF DUCTWORK, INCLUDING ASSOCIATED FASTENERS, ADHESIVES, TAPES ETC. SHALL COMPLY WITH BS 476: PART 7 OR EQUIVALENT NATIONAL OR INTERNATIONAL STANDARD. FSD CIRCULAR LETTER NO. 4/96, PART XI, 4.4.1 REFERS.
19. AIR DUCT SHALL BE WHOLELY CONSTRUCTED OF NON--COMBUSTIBLE MATERIAL HAVING A STRENGTH AND DURABILITY NOT LESS THAN THAT OF GALVANIZED SHEET--IRON OR STEEL AS STATED IN CAP. 123J.
20. THE MIC SYSTEM WILL BE ADOPTED AT A DOMESTIC BUILDING EXCEEDING FOUR STOREYS. DESIGN MANUAL: BARRIER FREE ACCESS 2008 SHALL BE APPLICABLE TO ALL COMMON AREAS OF THE BUILDING; RELEVANT REQUIREMENTS IN THE DESIGN MANUAL SHALL BE COMPLIED WITH ACCORDINGLY.
21. LIQUID WATERPROOFING MEMBRANE TO BE APPLIED TO FACES OF ALL EXTERNAL WALL PANELS.
22. SUITABLE, ADEQUATE AND SAFE MAINTENANCE AND REPAIR ACCESS FOR EXTERNAL MAINTENANCE COMPLYING WITH THE CODE OF PRACTICE ON ACCESS FOR EXTERNAL MAINTENANCE 2021. PRIOR TO THE APPLICATION FOR THE CONSENT TO COMMENCEMENT OF SUPERSTRUCTURE WORKS, PROVISIONS FOR M&R ACCESS AS REQUIRED UNDER THE COP WILL BE SUBMITTED TO AND APPROVED BY BD IN THE FORMAL GBP SUBMISSION STAGE.
23. OPEN KITCHEN:

A. SMOKE DETECTORS FITTED WITH SOUNDER BASE SHOULD BE PROVIDED INSIDE THE SUBJECT FLAT. THE ALARM SIGNAL OF THE SMOKE DETECTORS SHOULD BE CONNECTED TO THE LOCAL FIRE SERVICES CONTROL PANEL OF THE BUILDING ALARM AND SHOULD NOT BE LINKED TO THE FIRE SERVICES COMMUNICATION CENTRE.

B. SMOKE DETECTORS SHOULD BE PROVIDED AT THE COMMON AREA OUTSIDE THE SUBJECT FLAT. THE ALARM SIGNAL OF THE SMOKE DETECTORS SHOULD BE CONNECTED TO THE LOCAL FIRE SERVICES CONTROL PANEL, THE COMMON FIRE ALARM SYSTEM OF THE BUILDING AND THE FIRE SERVICES COMMUNICATION CENTRE.

C. SPRINKLER HEAD SHOULD BE PROVIDED TO COVER THE NOTIONAL OPEN KITCHEN AREA, THE ALARM SIGNAL OF THE SYSTEM SHOULD BE CONNECTED TO THE LOCAL FIRE SERVICES CONTROL PANEL. THE COMMON FIRE ALARM SYSTEM OF THE BUILDING AND THE FIRE SERVICES COMMUNICATION CENTRE.

FIRE RESISTANCE REQUIREMENT FOR ELEMENTS OF CONSTRUCTION														
FLOOR	USE	CLASS	FLOOR HEIGHT (m)	COMPARTMENT OF BLDG. PER FLOOR		FRR REQUIRED (min)	MIN. DIMENSION OF ELEMENT OF CONSTRUCTION							
				FLOOR AREA (m ²)	VOLUME (m ³)		SLAB		BEAM		COLUMN		WALL	
							THICKNESS	COVER TO STEEL	WIDTH	COVER TO STEEL	OVERALL SIZE	COVER TO STEEL	THICKNESS	COVER TO STEEL
TYPICAL	FLAT	1	-	-	-	60	100 (Min.)	20 (Min.)	200 (Min.)	30 (Min.)	-	-	75* (Min.)	15 (Min.)

REMARK: * REINFORCED CONCRETE CONTAINING NOT LESS THAN 1 PER CENT OF VERTICAL REINFORCEMENT

CALCULATION OF MINIMUM OF EXIT ROUTE & EXIT DOOR																			
			CAPACITY OF STOREY (IN PERSON)					MINIMUM NO. EXIT DOORS (FROM ROOMS) OR EXIT ROUTE (FROM STOREY)		MINIMUM TOTAL WIDTH OF (mm)				MINIMUM WIDTH OF EACH (mm)					
FLOOR	CLASS	USE	UNIT	UFA (m²)	FACTOR	NUMBER OF PERSON	NUMBER OF FLAT	NUMBER OF PERSON PER FLAT TYPE	TOTAL NUMBER OF PERSON			EXIT DOORS		EXIT ROUTES		EXIT DOORS		EXIT ROUTES	
										REQ.	PRO.	REQ.	PRO.	REQ.	PRO.	REQ.	PRO.	REQ.	PRO.
1/F TO 39/F	1b	FLAT	A	10.825	4.5	3P	Rm. 01, 02, 03, 04, 06, 07, 08, 09, 11, 12, 13, 14, 16, 17, 18 & 19	16 U 48 P	60P	2	2	1750	1800	2100	2200	850	900	1050	1200
		FLAT	B	10.358	4.5	3P	Rm. 05, 10, 15 & 20	4 U 12 P											

SCHEDULE FOR BUILDING HEIGHT

1. TOP LEVEL OF HIGHEST MIC MODULES: 129.56m
2. TYPICAL FLOOR TO FLOOR HEIGHT: 3.15m
3. NUMBER OF MIC STOREYS: 39
4. PROVISIONS OF REFUGE FLOOR / SKYGARDEN: N/A

DISCHARGE VALUE CALCULATION

(REMARKS: ONLY FOR STAIRCASES FORM MIC PORTION)

39 STOREYS ABOVE GROUND FLOOR SERVED BY 2 NOS. MIN. 1200MM WIDE STAIR

DISCHARGE VALUE:
= (582*(29x38)) x 2 x 0.7 = 2357 PERSONS

ACTUAL CAPACITY OF PERSON:
1/F = 60 PERSON
to x
39/F = 39 STOREYS
TOTAL = 2340 PERSON
< 2357 PERSON

ABBREVIATIONS & LEGEND

AS

SUPPORTING STRUCTURE FOR A/C UNITS.

EXIT

EXIT SIGN.

ST-X

STAIR NO.

DIRECTION SIGN.

F.H.

FIRE HYDRANT

H.R.

HOSE REEL

V.G.

VERTICAL GRATING

P.D.

PIPE DUCT

W.M.C.

WATER METER CABINET

ELV

EXTRA LOW VOLTAGE ROOM

EL

ELECTRICAL ROOM

TRE

TELECOMMUNICATION AND BROADCASTING EQUIPMENT ROOM

FSMRC

REFUSE STORAGE AND MATERIAL RECOVERY CHAMBER

S

SECTIONAL

E

ELEVATION

LIVING

LIVING ROOM

BATH

BATHROOM

H/A

AT HIGH LEVEL

FL

FLUE APERTURE

EA0

EXHAUST AIR DUCT

VENTILATION FAN

F.T.

FLAT TYPE

1500x1500 CLEAR MANEUVERING SPACE

WORKS FOR REFERENCE ONLY NOT FOR ACCEPTANCE

HP

INSPECTION HATCH PANEL WITH FRR -/60/60
FIRE RATED BOARD AT CEILING

DOOR MARK:

1

B

-/60/60 FRR SELF-CLOSING TIMBER DOOR WITH SMOKE SEAL

2

B

-/60/60 FRR SELF-CLOSING TIMBER DOOR WITH CLEAR GLASS VISION PANEL & SMOKE SEAL

3

B

-/60/60 FRR SELF-CLOSING TIMBER DOOR WITH SMOKE SEAL

4

B

-/120/120 FRR METAL DOOR

COLOR INDICATIONS:

NON-ABSORBENT MATERIALS

GLASS WORKS

SANITARY FITMENTS

-/80/60 FRR WALL PROTECTION BOARD/ CEILING

-/60/- FIRE RATED SEALANT

60/-/4 FIRE RATED PAINTING PROTECTED STEEL MEMBER

STEEL & METAL WORKS

R.C. WORKS (SECTION)

R.C. WORKS (ELEVATION)

TIMBER

NON FIRE RATED PLASTER BOARD

WORKS FOR REFERENCE ONLY NOT FOR ACCEPTANCE

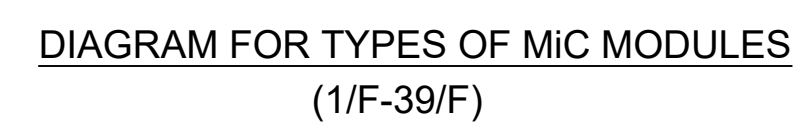
B.D. REF.		
F.S.D. REF.		
REV.	DATE	DESCRIPTION
APPLICANT		
ARCHITECT		
STRUCTURAL ENGINEER		
AP		
PROJECT: <div>BD SAMPLE PROPOSED 40 STOREYS RESIDENTIAL DEVELOPMENT IN CONCRETE MIC</div>		
DRAWING TITLE: <div>GENERAL NOTES AND SCHEDULES</div>		
DRAWING NO. MIC-01		
REVISION		
-		
DRAWN BY		CHECKED BY
JOB No.	DATE	SCALE N.T.S.
BD'S OFFICAL USE		

SCHEDULE OF FINISHES, FIXTURES AND FITTINGS PRE-FABRICATED/INSTALLED OFF-SITE
(REFER TO ANNEX II OF APPENDIX C)

SCHEDULE FOR THE APPLICATION OF FIRE RESISTING PRODUCTS AND MATERIALS OF NON/LIMITED COMBUSTIBILITY
(REFER TO ANNEX III OF APPENDIX C)

TYPICAL DETAIL OF FLUE APERTURE (ELEVATION VIEW)

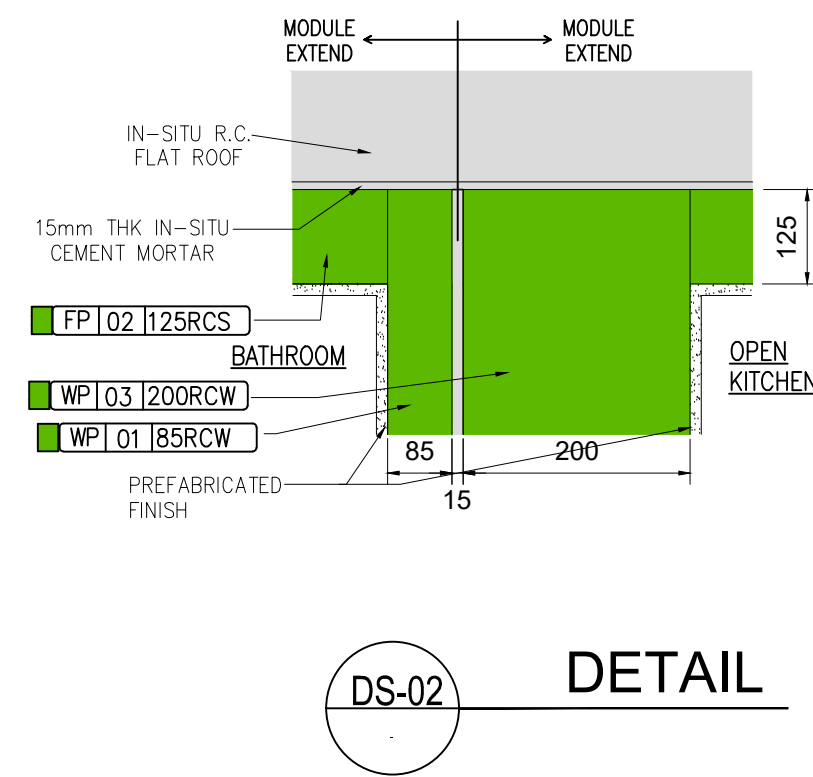
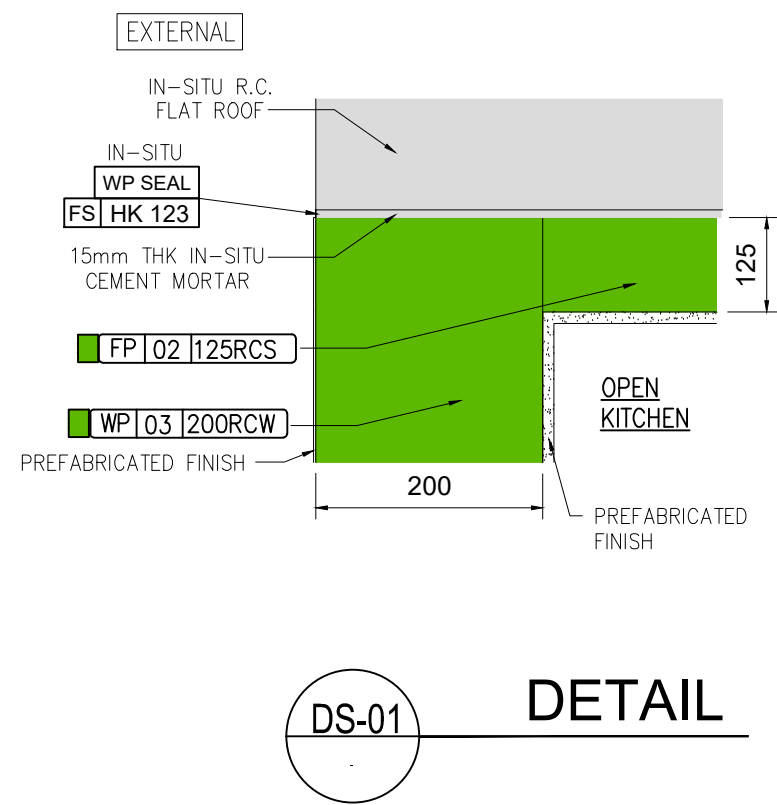
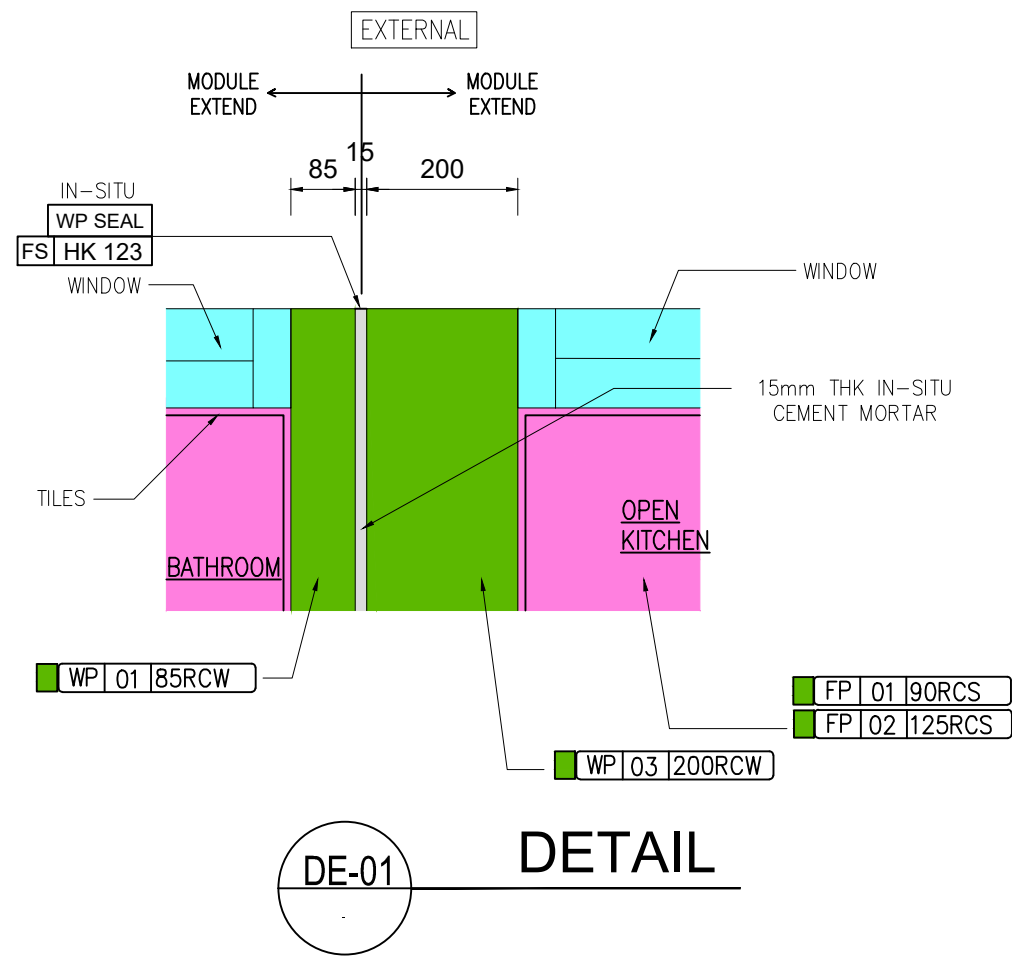
NOTE:
THE FLUE APERTURE SHALL BE TEMPORARY SEALED UP BY FIRE RATED BOARD FRR -/60/60 IF NO HEATER IS PROVIDED





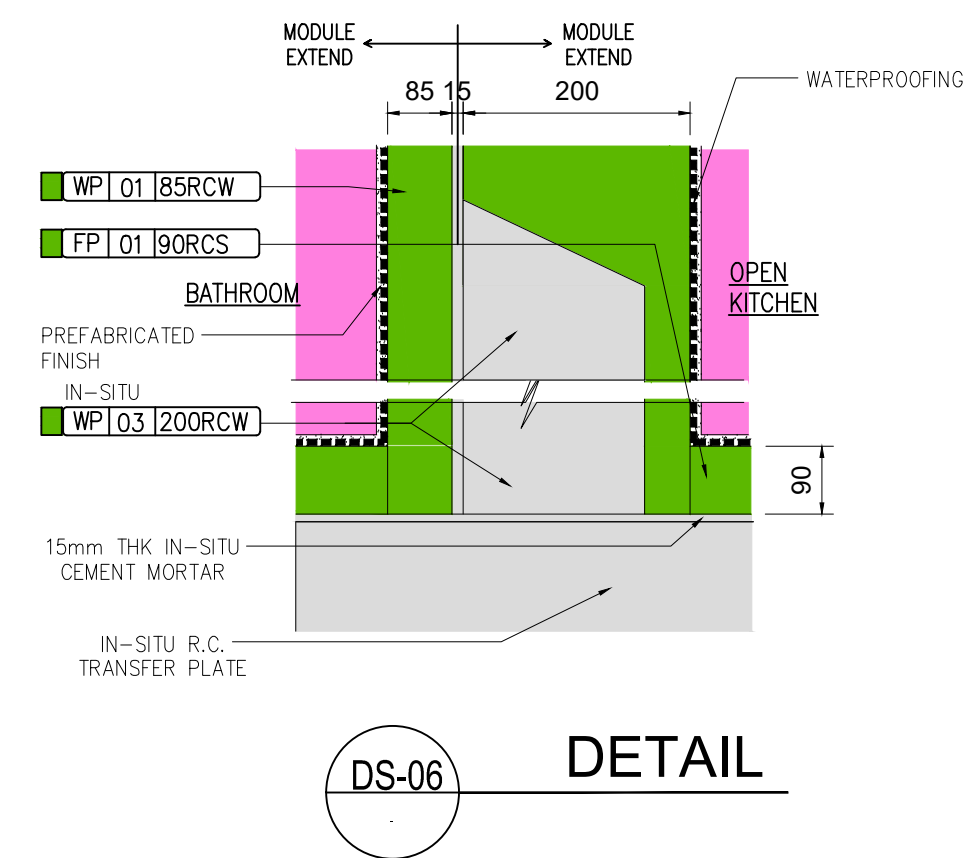
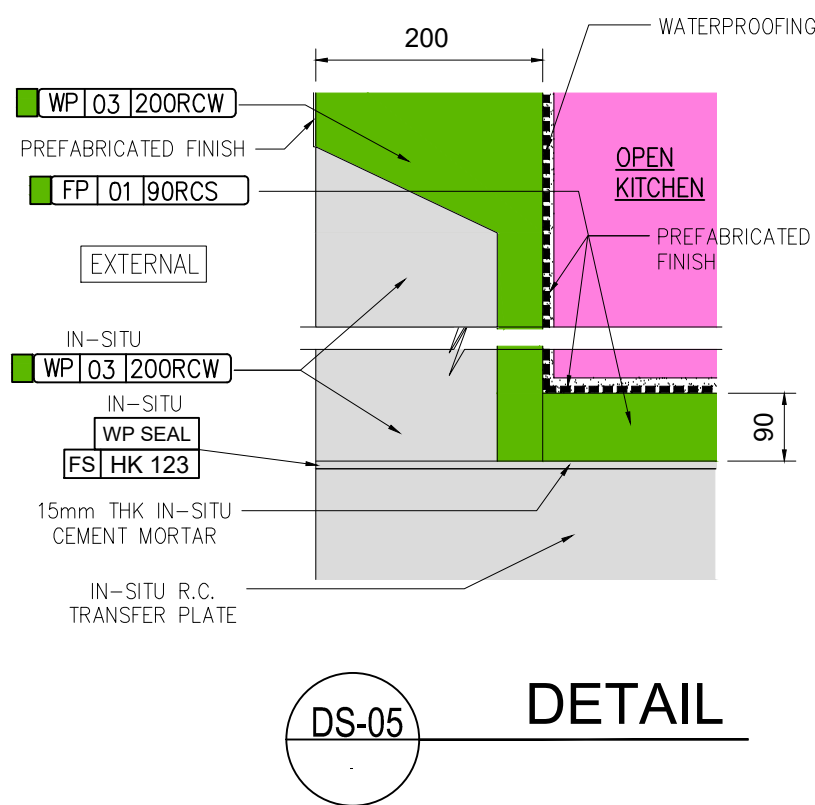
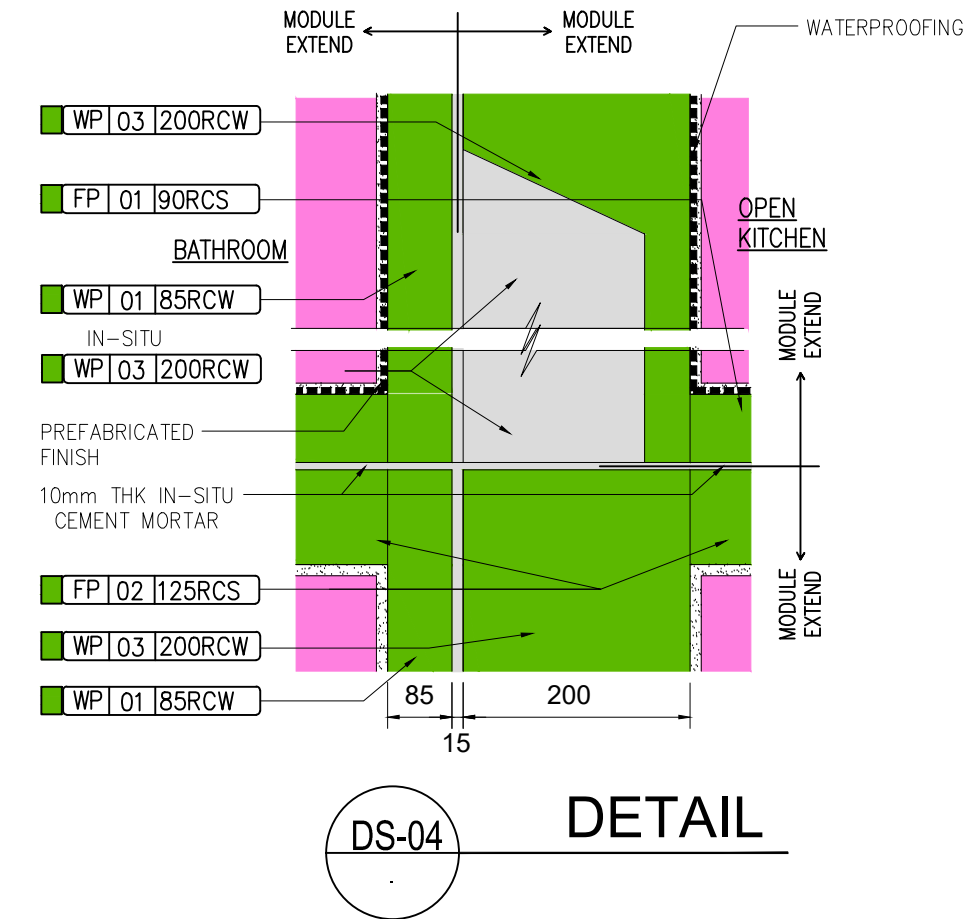
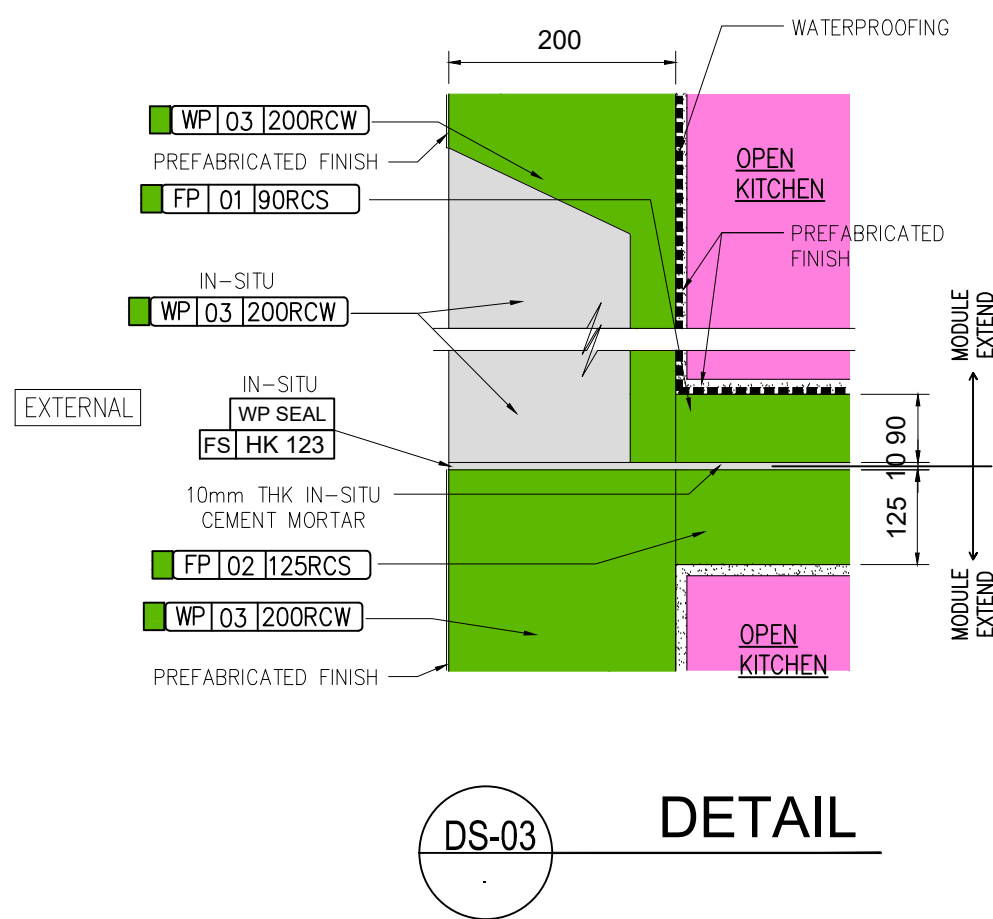
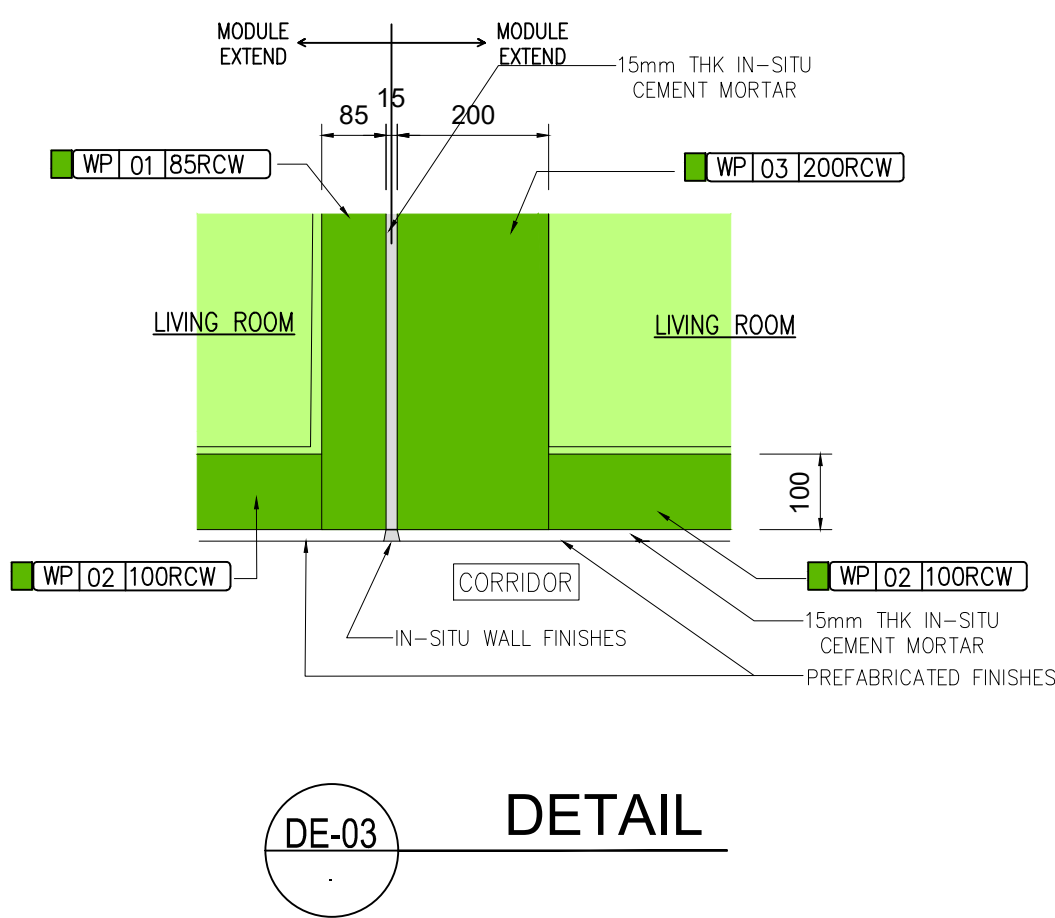
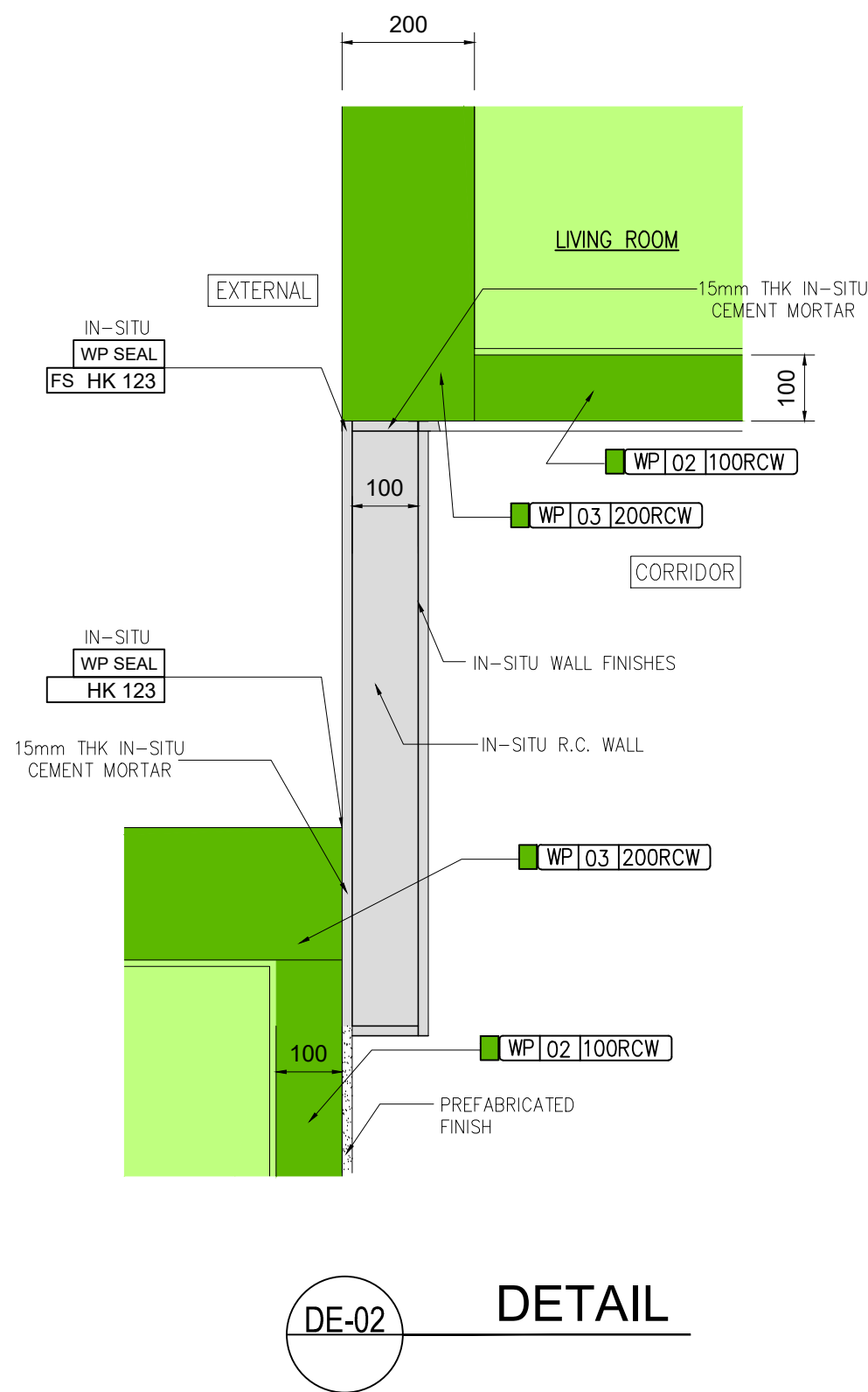
USE	UFA (M ²)	GLAZING AREA		OPENABLE WINDOW AREA	
		REQUIRED	PROVIDED	REQUIRED	PROVIDED
LIVING ROOM + OPEN KITCHEN	13.444	1.344	1.993	0.841	1.993
BATHROOM	1.604	0.160	0.812	0.160	0.812

USE	UFA (M ²)	GLAZING AREA		OPENABLE WINDOW AREA	
		REQUIRED	PROVIDED	REQUIRED	PROVIDED
LIVING ROOM + OPEN KITCHEN	12.667	1.267	1.734	0.791	1.734
BATHROOM	1.795	0.180	0.906	0.180	0.906

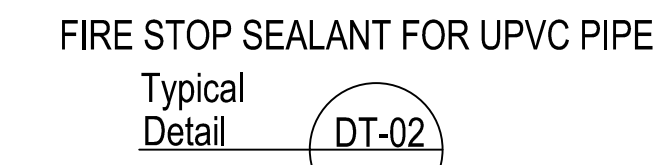


LEGEND:

FS HK 123	FIRESTOP MASTIC SEALANT
FS HK 456	FIRESTOP INTUMESCENT SEALANT
FS HK ABC	FIRESTOP INTUMESCENT
FP 01 190RCS	90mm THK. CONCRETE SLAB
FP 02 125RCS	125mm THK. CONCRETE SLAB
WP 01 185RCW	85mm THK. CONCRETE WALL
WP 02 100RCW	100mm THK. CONCRETE WALL
WP 02 130RCW	130mm THK. CONCRETE WALL
WP 03 200RCW	200mm THK. CONCRETE WALL
WP SEAL	WEATHERPROOF SEALANT



B.D. REF.		
F.S.D. REF.		
REV.	DATE	DESCRIPTION
APPLICANT		
ARCHITECT		
STRUCTURAL ENGINEER		
AP		
PROJECT: BD SAMPLE PROPOSED 40 STOREYS RESIDENTIAL DEVELOPMENT IN CONCRETE MIC		
DRAWING TITLE: DETAILS 1		
DRAWING NO. MIC-05		
REVISION		
DRAWN BY		CHECKED BY
JOB No.	DATE	SCALE 1:10 @ A1
BD'S OFFICIAL USE		



GENERAL NOTES FOR DRAINAGE WORKS :

1. ALL DESIGN AND CONSTRUCTION OF DRAINAGE WORKS SHOULD BE COMPLIED WITH CAP. 123 I BUILDING (STANDARDS OF SANITARY FITMENTS, PLUMBING, DRAINAGE WORKS AND LATRINES) REGULATION AND RELEVANT PNAPS.

2. ALL ABOVE GROUND DRAINAGE WORKS WITHIN MIC MODULES TO BE CONSTRUCTED OFF-SITE IN MIC FACTORY AND FOR ACCEPTANCE IN THIS SUBMISSION; ALL ABOVEGROUND AND UNDERGROUND DRAINAGE WORKS OUTSIDE THE MIC MODULE TO BE CONSTRUCTED ON SITE AND DETAIL WILL BE SUBMITTED TO BUILDING AUTHORITY FOR APPROVAL UPON FORMAL DRAINAGE PLAN SUBMISSION.

3. UNLESS OTHERWISE SPECIFIED, PIPING MATERIAL SHALL BE GENERALLY AS FOLLOWS:
- | | | |
|---|---------------|--|
| TYPE OF PIPE | SIZE (MM) | MATERIAL OF PIPE |
| RAINWATER, VENT, WASTE, CONDENSATE WATER, SOIL REFILLING PIPE OR COMBINED SOIL AND WASTE PIPES (ABOVEGROUND) (WITHIN SAME FIRE COMPARTMENT) | Ø 32 TO Ø 150 | UPVC PIPES AND FITTINGS TO BS 4514 AND BS 5255 IN WHITE COLOR FROM 1M ABOVE THE LOWEST RESIDENTIAL FLOOR LEVEL FROM BATHROOM, TOILET, KITCHEN TO EXTERNAL DRAIN STACKS |
4. THE BEND OF SOIL / WASTE / RAIN WATER PIPE SHALL HAVE AN OBTUSE ANGLE; HAVE LARGEST PRACTICAL RADIUS CURVATURE AND NOT CHANGE IN ANY WAY THE CROSS SECTION OF THE PIPE.

5. ALL TRAPS FOR SANITARY FITMENTS AND FLOOR DRAIN SHALL BE RESEALING (ANTI-SYPHONAGE) TYPE AND WITH WATER SEAL OF 80MM UNLESS OTHERWISE STATED.

6. EVERY ANTI-SYPHONAGE PIPE SHALL BE CONNECTED WITH THE BRANCH SOIL OR WASTE PIPE AT A POINT NOT MORE THAN 300mm FROM THE TRAP OUTLET.

7. SUFFICIENT ACCESS SHALL BE PROVIDED BY MEANS OF CLEANING EYES TO OTHER APPROVED METHOD TO ENABLE ALL DRAINAGE PIPES TO BE CLEARED OF ANY OBSTRUCTION. SUCH ACCESS POINTS SHALL BE SO SITED AS TO ALLOW CLEARANCE FOR THE EASY ENTRY OF CLEANING ROD.

8. EVERY DRAIN TO BE LAID TO A MINIMUM FALL OF NOT LESS THAN SPECIFIED IN BUILDING REGULATION CAP. 123 MIN. FALL FOR DRAINS:
- | | |
|---------------|--------|
| DIA. OF PIPE | FALL |
| Ø 32 TO Ø 100 | 1 : 40 |
| Ø 150 | 1 : 70 |
9. NO WATER-BORNE PIPING EMBEDDED IN STRUCTURAL ELEMENTS AS STATED ON PNAP APP-105.

10. PNAP APP-93 FOR THE PLANNING AND DESIGN OF DRAINAGE WORKS INCLUDING PIPES DUCTS AND PIPE WELL SHALL BE COMPLIED WITH. COMMON ABOVEGROUND AND UNDERGROUND DRAINS SHOULD BE LOCATED IN COMMON PART OF THE BUILDING. NO PIPE FOR A UNIT SHALL PROTRUDE INTO THE UNIT UNDER SEPARATE OCCUPANCY ON THE FLOOR BELOW. ALL PIPE DUCTS AND PIPE WELLS SHALL BE PROVIDED WITH ADEQUATE ACCESS FOR INSPECTION AND MAINTENANCE.

11. THE OPEN END OF EVERY VENTILATING PIPE WITH VENT COWL/WIRE MESH BALLOON ON TOP FOR ANY DRAIN OR SEWER ON THE ROOF SHOULD BE NOT LESS THAN 3 METERS FROM A COMMON BOUNDARY WITH AN ADJACENT SITE, AND ANY WINDOW, OPENING OR FRESH AIR INTAKE OF A BUILDING AS STIPULATED IN PNAP APP-164.

12. SEPARATE DRAINAGE PIPEWORKS SHALL BE PROVIDED FOR SANITARY FITMENTS AT G/F (IN-SITU) & 1/F FOR DISCHARGING DIRECT TO A MANHOLE AS STIPULATED IN PNAP APP-164.

13. ADEQUATE CROSS-VENTILATION CONNECTIONS SHALL BE PROVIDED AT INTERVALS NOT MORE THAN THREE STOREYS STARTING FROM THE LOWEST STOREYS WITH BRANCH DISCHARGE PIPE CONNECTED TO THE DRAINAGE STACK AS STIPULATED IN PNAP APP-164. CROSS-VENTILATION CONNECTIONS SHALL BE PROVIDED FOR SEPARATE DRAINAGE PIPEWORKS AT G/F (IN-SITU) & 1/F.

14. NO DRAINAGE PIPE CONNECTION WITHIN A RESTRICTED ZONE AT EVERY OFFSET AS STIPULATED IN PNAP APP-164.

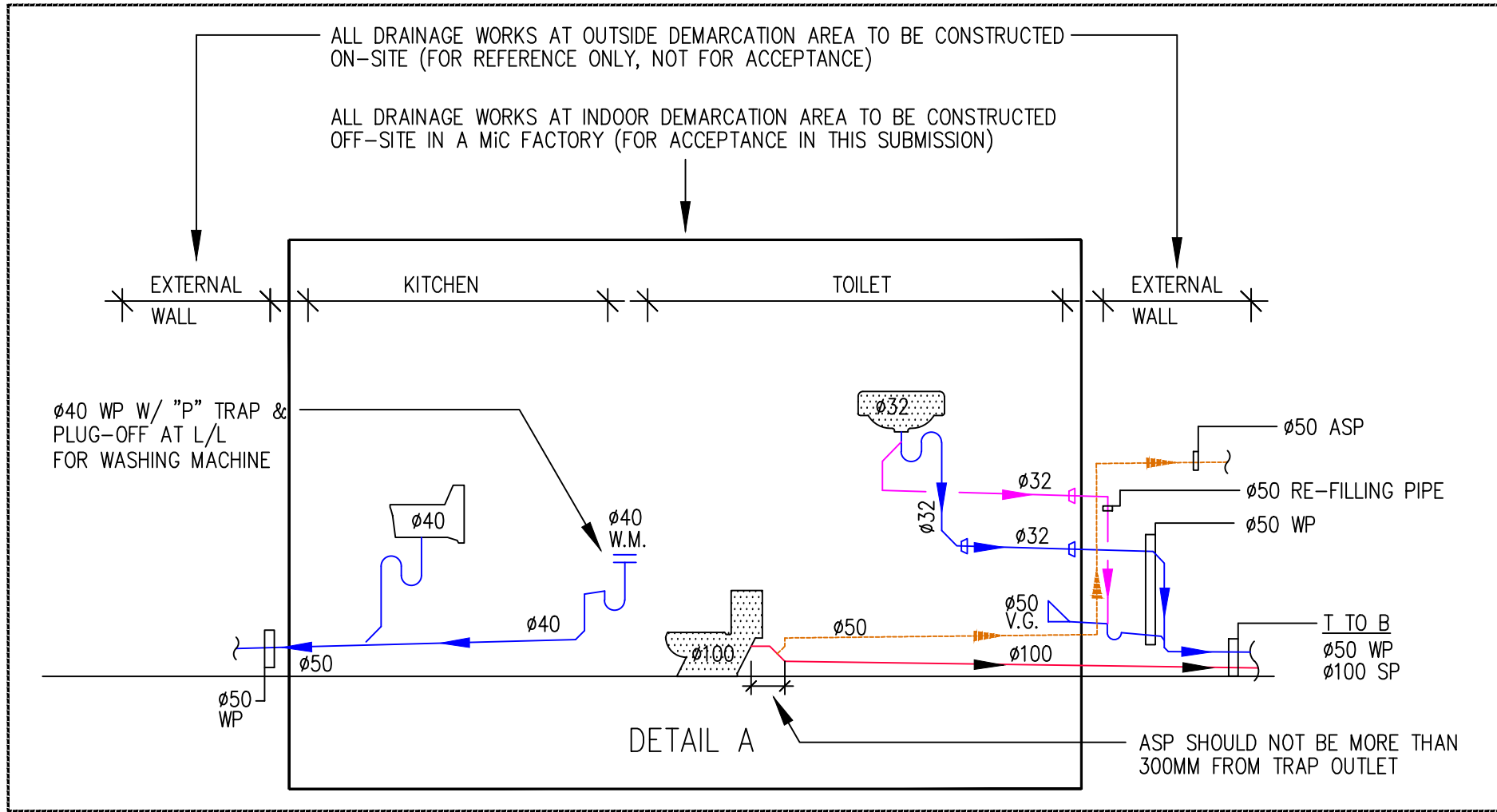
15. CONDENSATE DISPOSAL SYSTEM FOR A/C UNITS IS PROVIDED IN ACCORDANCE WITH PNAP APP-112.

LEGENDS:

	RAINWATER PIPE		OR		WATER CLOSET
	SOIL AND WASTE PIPE / SOIL PIPE		OR		WASH BASIN
	WASTE PIPE				
	ANTI-SYPHONAGE PIPE / VENT PIPE		OR		SHOWER AREA
	CONDENSATE DRAIN PIPE				ANTI-SYPHONAGE TRAP
	RE-FILLING PIPE				ANTI-SYPHONAGE BOTTLE TRAP
	PIPE TO BE INSTALLED ONSITE				CONNECTION OF WASHING MACHINE
	PLUG-OFF FOR CONDENSATE DRAIN				WIRE BALLOON
	TOP ACCESS SHOWER DRAIN		OR		VERTICAL GRATING
					VERTICAL RAINWATER OUTLET

ABBREVIATION:

uPVC	UNPLASTICIZED POLYVINYL CHLORIDE	H/L	HIGH LEVEL	C/W	COMPLETED WITH
RWP	RAINWATER PIPE	M/L	MID LEVEL	/W	WITH
WP	WASTE PIPE	L/L	LOW LEVEL	T TO B	TOP TO BELOW
VP	VENT PIPE	F/A	FROM ABOVE	L TO R	LEFT TO RIGHT
CDP	CONDENSATE WATER PIPE	F/B	FROM BELOW	EX.	EXISTING
ASP	ANTI-SYPHONAGE PIPE	T/A	TO ABOVE	PD	PIPE DUCT
FD	FLOOR DRAIN	T/B	TO BELOW		
VG	VERTICAL GRATING	C.E.	CLEANING EYE		
SP	SOIL PIPE				



DRAINAGE SCHEMATIC DIAGRAM FOR MIC MODULES TYPE A /B

B.D. REF.		
F.S.D. REF.		
REV.	DATE	DESCRIPTION

APPLICANT

ARCHITECT

STRUCTURAL ENGINEER

AP

PROJECT:
**BD SAMPLE
PROPOSED 40 STOREYS
RESIDENTIAL DEVELOPMENT
IN CONCRETE MIC**

DRAWING TITLE:
DRAINAGE SCHEMATIC DIAGRAM

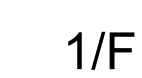
DRAWING NO. MIC-20

REVISION -

DRAWN BY	CHECKED BY
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JOB No.	DATE	SCALE N.T.S.
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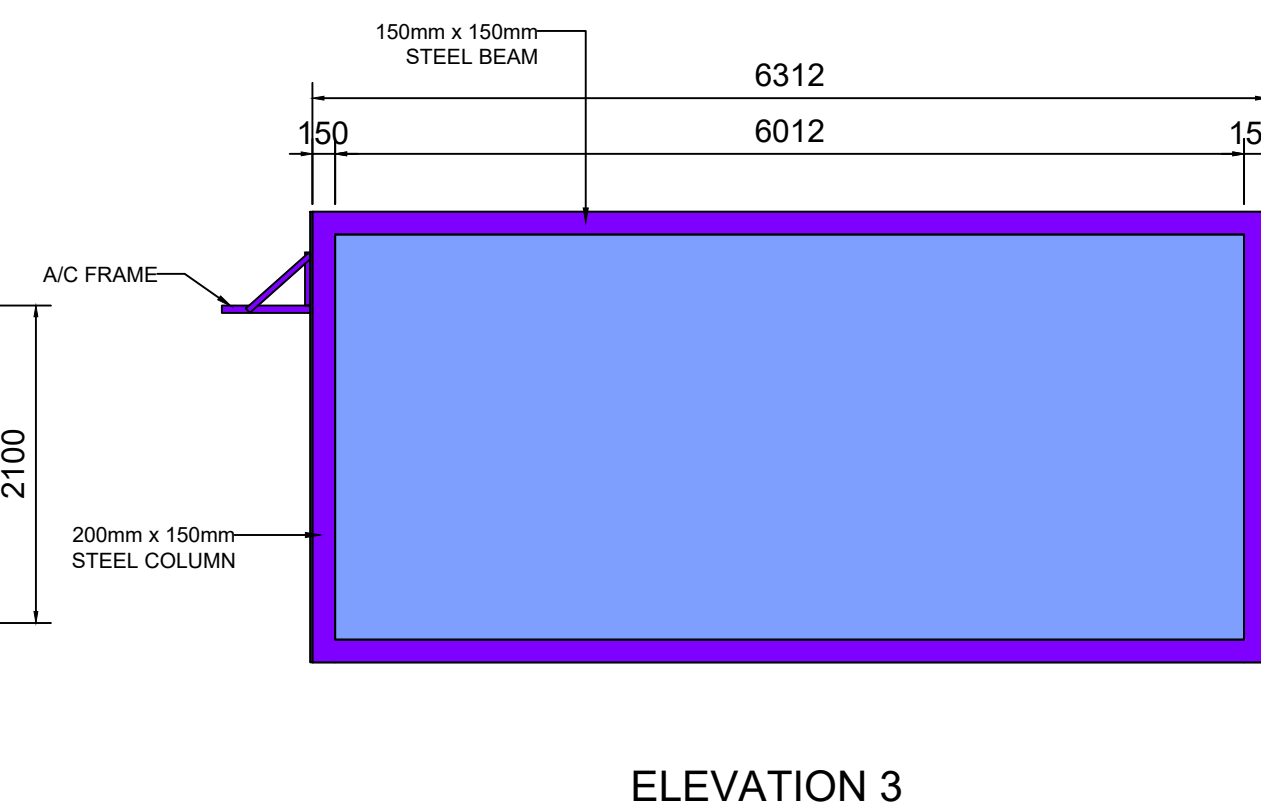
BD'S OFFICAL USE



B.D. REF.		
F.S.D. REF.		
REV.	DATE	DESCRIPTION

BD'S OFFICAL USE

DD'S OPTICAL USE



USE	UFA (M ²)	GLAZING AREA		OPENABLE WINDOW AREA	
		REQUIRED	PROVIDED	REQUIRED	PROVIDED
LIVING ROOM + OPEN KITCHEN	13.048	1.305	1.327	0.818	1.012
BATHROOM	1.399	0.140	0.241	0.140	0.241

(REFER TO ANNEX III OF APPENDIX C)

BD'S OFFICAL USE

BD'S OFFICAL USE

USE	UFA (M ²)	GLAZING AREA		OPENABLE WINDOW AREA	
		REQUIRED	PROVIDED	REQUIRED	PROVIDED
LIVING ROOM + OPEN KITCHEN	8.813	0.881	1.164	0.551	1.012
BATHROOM	1.382	0.138	0.241	0.138	0.241

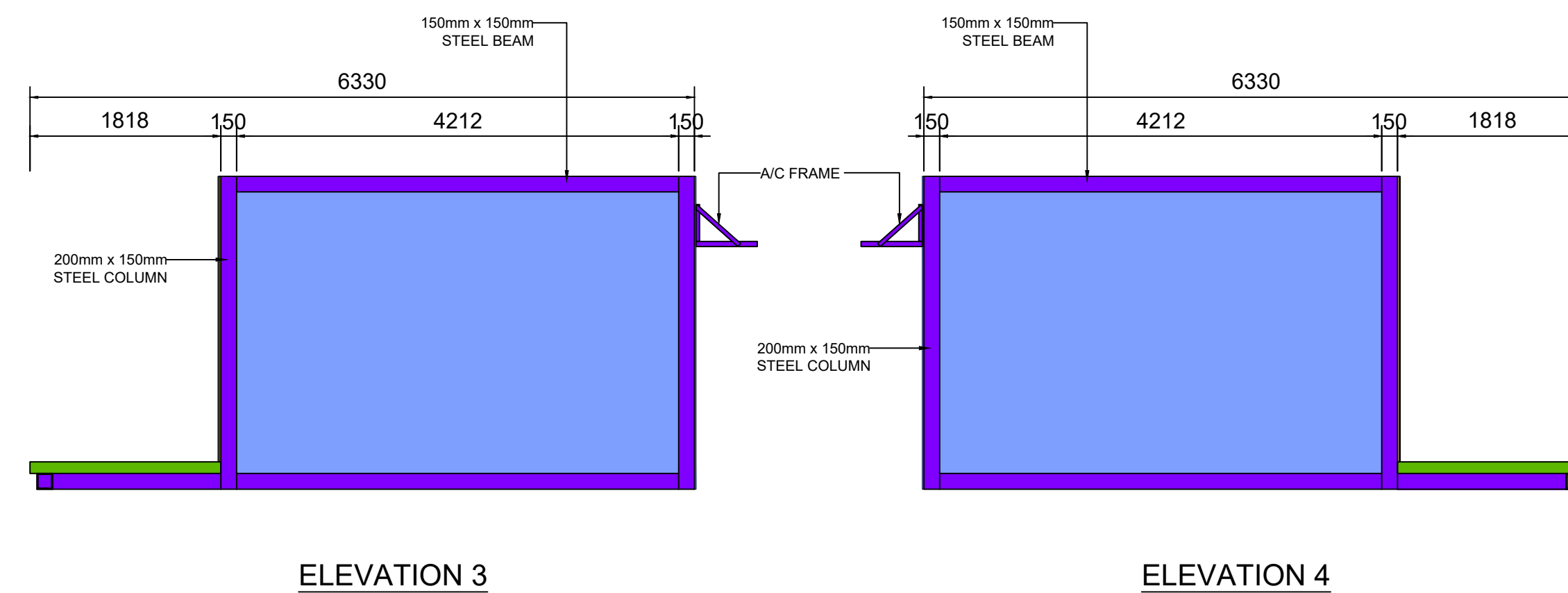
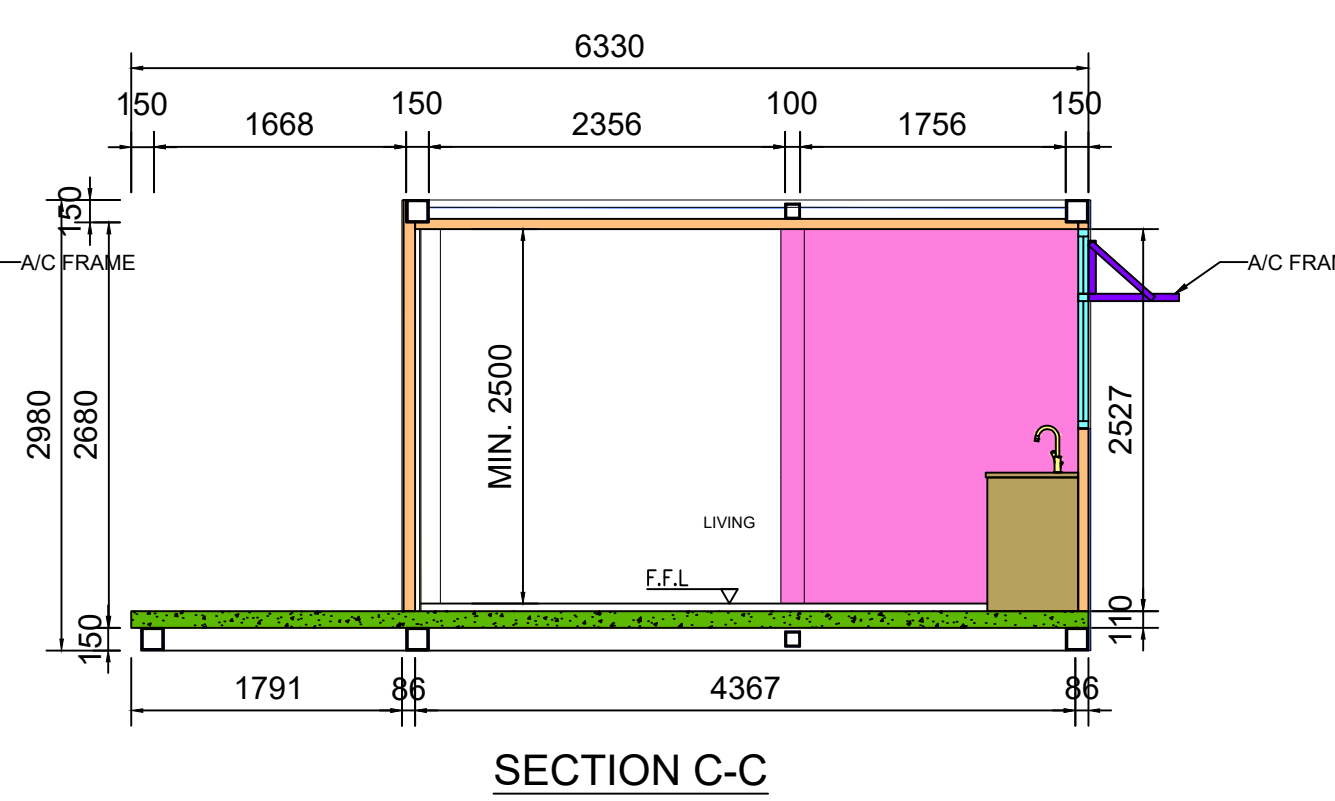
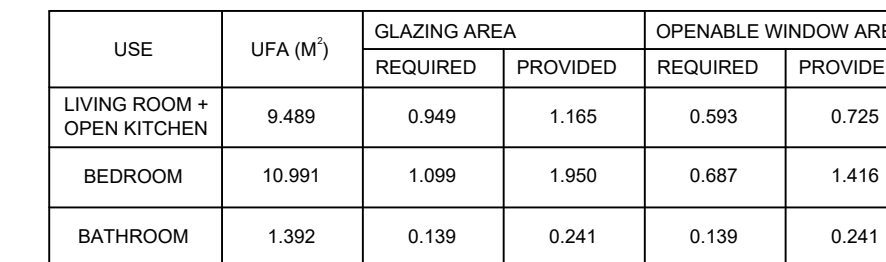
SECTION A-A

SECTION B-B

ELEVATION 1ELEVATION 2ELEVATION 3

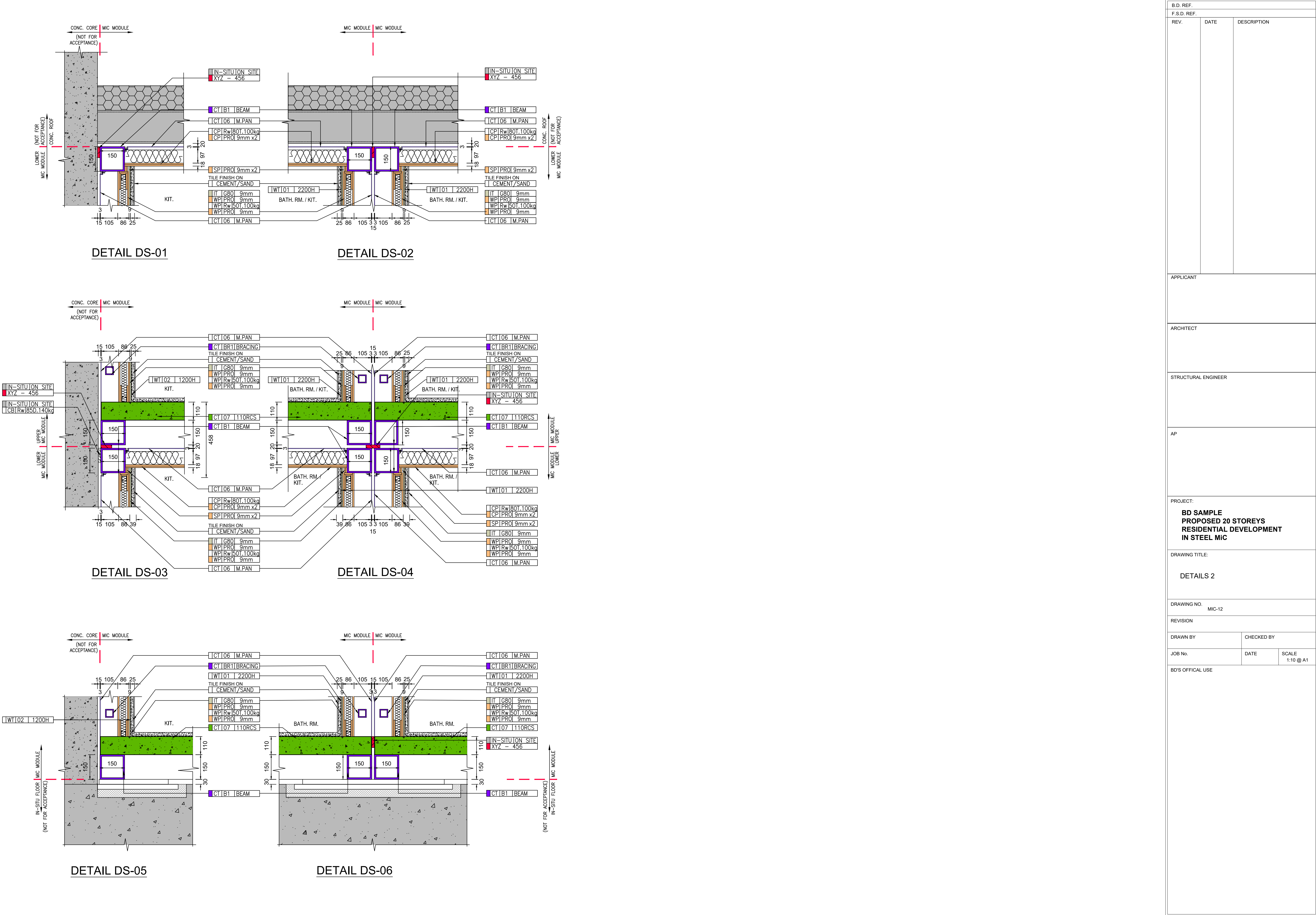
BD'S OFFICAL USE

B.D. REF.		
F.S.D. REF.		
REV.	DATE	DESCRIPTION
APPLICANT		
ARCHITECT		
STRUCTURAL ENGINEER		
AP		
PROJECT:		
BD SAMPLE PROPOSED 20 STOREYS RESIDENTIAL DEVELOPMENT IN STEEL MIC		
DRAWING TITLE:		
FLAT TYPE 5 MODULE NO. 3 & 4		
DRAWING NO.	MIC-05	
REVISION		
DRAWN BY		CHECKED BY
JOB No.	DATE	SCALE 1:50 @ A1
BD'S OFFICAL USE		



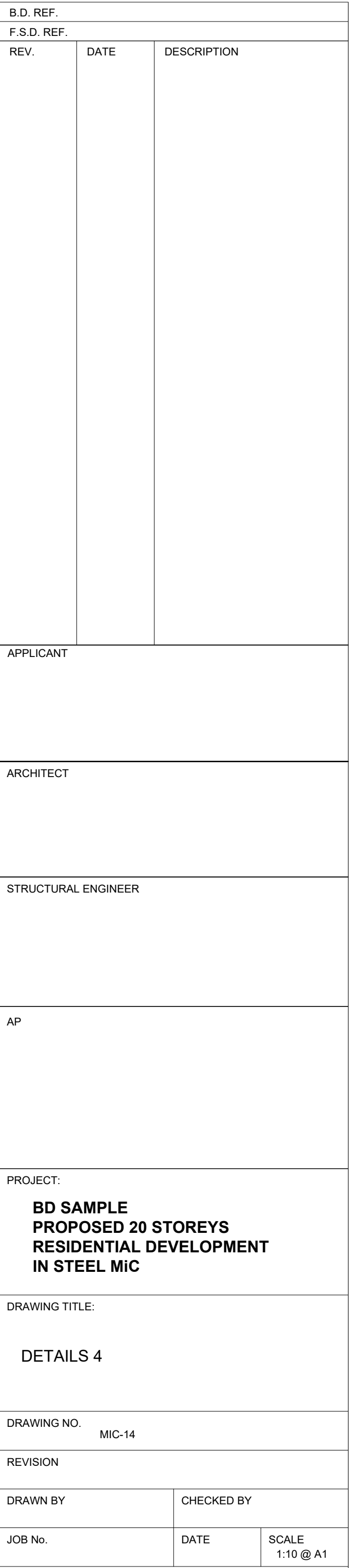
BD'S OFFICAL USE

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B.D. REF.		
F.S.D. REF.		
REV.	DATE	DESCRIPTION
APPLICANT		
ARCHITECT		
STRUCTURAL ENGINEER		
AP		
PROJECT: BD SAMPLE PROPOSED 20 STOREYS RESIDENTIAL DEVELOPMENT IN STEEL MIC		
DRAWING TITLE: DETAILS 2		
DRAWING NO. MIC-12		
REVISION		
DRAWN BY		CHECKED BY
JOB No.	DATE	SCALE 1:10 @ A1
BD'S OFFICIAL USE		




























GENERAL NOTES FOR DRAINAGE WORKS :

1. ALL DESIGN AND CONSTRUCTION OF DRAINAGE WORKS SHOULD BE COMPLIED WITH CAP. 123 I BUILDING (STANDARDS OF SANITARY FITMENTS, PLUMBING, DRAINAGE WORKS AND LATRINES) REGULATION AND RELEVANT PNAPS.
2. ALL ABOVE GROUND DRAINAGE WORKS WITHIN MIC MODULES TO BE CONSTRUCTED OFF-SITE IN MIC FACTORY AND FOR ACCEPTANCE IN THIS SUBMISSION; ALL ABOVEGROUND AND UNDERGROUND DRAINAGE WORKS OUTSIDE THE MIC MODULE TO BE CONSTRUCTED ON SITE AND DETAIL WILL BE SUBMITTED TO BUILDING AUTHORITY FOR APPROVAL UPON FORMAL DRAINAGE PLAN SUBMISSION.
3. UNLESS OTHERWISE SPECIFIED, PIPING MATERIAL SHALL BE GENERALLY AS FOLLOWS:

TYPE OF PIPE	SIZE (MM)	MATERIAL OF PIPE
RAINWATER, VENT, WASTE, CONDENSATE WATER, SOIL REFILLING PIPE OR COMBINED SOIL AND WASTE PIPES (ABOVEGROUND) (WITHIN SAME FIRE COMPARTMENT)	Ø 32 TO Ø 150	UPVC PIPES AND FITTINGS TO BS 4514 AND BS 5255 IN WHITE COLOR FROM 1M ABOVE THE LOWEST RESIDENTIAL FLOOR LEVEL FROM BATHROOM, TOILET, KITCHEN TO EXTERNAL DRAIN STACKS
<p>4. THE BEND OF SOIL/ WASTE / RAIN WATER PIPE SHALL HAVE AN OBTUSE ANGLE; HAVE LARGEST PRACTICAL RADIUS CURVATURE AND NOT CHANGE IN ANY WAY THE CROSS SECTION OF THE PIPE.</p> <p>5. ALL TRAPS FOR SANITARY FITMENTS AND FLOOR DRAIN SHALL BE RESEALING (ANTI-SYPHONAGE) TYPE AND WITH WATER SEAL OF 80MM UNLESS OTHERWISE STATED.</p> <p>6. EVERY ANTI-SYPHONAGE PIPE SHALL BE CONNECTED WITH THE BRANCH SOIL OR WASTE PIPE AT A POINT NOT MORE THAN 300mm FROM THE TRAP OUTLET.</p> <p>7. SUFFICIENT ACCESS SHALL BE PROVIDED BY MEANS OF CLEANING EYES TO OTHER APPROVED METHOD TO ENABLE ALL DRAINAGE PIPES TO BE CLEARED OF ANY OBSTRUCTION. SUCH ACCESS POINTS SHALL BE SO SITED AS TO ALLOW CLEARANCE FOR THE EASY ENTRY OF CLEANING ROD.</p> <p>8. EVERY DRAIN TO BE LAID TO A MINIMUM FALL OF NOT LESS THAN SPECIFIED IN BUILDING REGULATION CAP. 123 MIN. FALL FOR DRAINS:</p>		
DIA. OF PIPE	FALL	
Ø 32 TO Ø 100	1 : 40	
Ø 150	1 : 70	

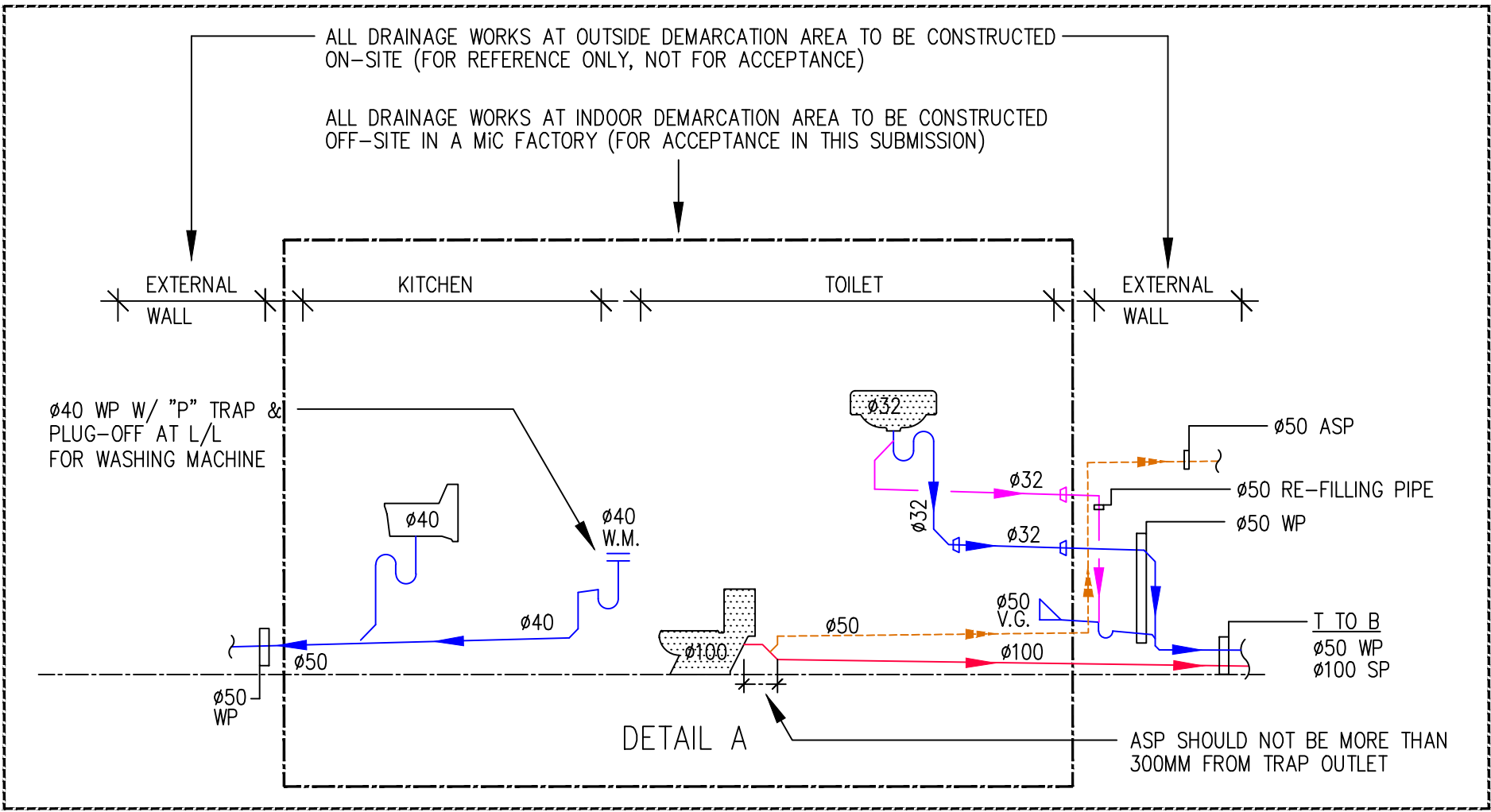
10. NO WATER-BORING PIPE EMBEDDED IN STRUCTURAL ELEMENTS AS STATED ON PNAP APP-105.
11. PNAP APP-93 FOR THE PLANNING AND DESIGN OF DRAINAGE WORKS INCLUDING PIPES DUCTS AND PIPE WELL SHALL BE COMPLIED WITH. COMMON ABOVEGROUND AND UNDERGROUND DRAINS SHOULD BE LOCATED IN COMMON PART OF THE BUILDING. NO PIPE FOR A UNIT SHALL PROTRUDE INTO THE UNIT UNDER SEPARATE OCCUPANCY ON THE FLOOR BELOW. ALL PIPE DUCTS AND PIPE WELLS SHALL BE PROVIDED WITH ADEQUATE ACCESS FOR INSPECTION AND MAINTENANCE.
12. THE OPEN EDGE OF EVERY VENTILATING PIPE WITH VENT COWL/WIRE MESH BALLOON ON TOP FOR ANY DRAIN OR SEWER ON THE ROOF SHOULD BE NOT LESS THAN 3 METERS FROM A COMMON BOUNDARY WITH AN ADJACENT SITE, AND ANY WINDOW, OPENING OR FRESH AIR INTAKE OF A BUILDING AS STIPULATED IN PNAP APP-164.
13. SEPARATE DRAINAGE PIPEWORKS SHALL BE PROVIDED FOR SANITARY FITMENTS AT G/F FOR DISCHARGING DIRECT TO A MAN-HOLE AS STIPULATED IN PNAP APP-164.
14. ADEQUATE CROSS-VENTILATION CONNECTIONS SHALL BE PROVIDED AT INTERVALS NOT MORE THAN THREE STOREYS STARTING FROM THE LOWEST STOREYS WITH BRANCH DISCHARGE PIPE CONNECTED TO THE DRAINAGE STACK AS STIPULATED IN PNAP APP-164. CROSS-VENTILATION CONNECTIONS SHALL BE PROVIDED FOR SEPARATE DRAINAGE PIPEWORKS AT G/F.
15. NO DRAINAGE PIPE CONNECTION WITHIN A RESTRICTED ZONE AT EVERY OFFSET AS STIPULATED IN PNAP APP-164.
16. CONDENSATE DISPOSAL SYSTEM FOR A/C UNITS IS PROVIDED IN ACCORDANCE WITH PNAP APP-112.

LEGENDS:

	RAINWATER PIPE	 OR 	WATER CLOSET
	SOIL AND WASTE PIPE / SOIL PIPE	 OR 	WASH BASIN
	WASTE PIPE		
	ANTI-SYPHONAGE PIPE / VENT PIPE	 OR 	SHOWER AREA
	CONDENSATE DRAIN PIPE		ANTI-SYPHONAGE TRAP
	RE-FILLING PIPE		ANTI-SYPHONAGE BOTTLE TRAP
	PIPE TO BE INSTALLED ONSITE	W.M. 	CONNECTION OF WASHING MACHINE
	PLUG-OFF FOR CONDENSATE DRAIN		WIRE BALLOON
 OR 	TOP ACCESS SHOWER DRAIN	 OR 	VERTICAL GRATING
			VERTICAL RAINWATER OUTLET

ABBREVIATION:

UPVC	UNPLASTICIZED POLYVINYL CHLORIDE	H/L	HIGH LEVEL	C/W	COMPLETED WITH
RWP	RAINWATER PIPE	M/L	MID LEVEL	/W	WITH
WP	WASTE PIPE	L/L	LOW LEVEL	T TO B	TOP TO BELOW
VP	VENT PIPE	F/A	FROM ABOVE	L TO R	LEFT TO RIGHT
CDP	CONDENSATE WATER PIPE	F/B	FROM BELOW	EX.	EXISTING
ASP	ANTI-SYPHONAGE PIPE	T/A	TO ABOVE	PD	PIPE DUCT
FD	FLOOR DRAIN	T/B	TO BELOW		
VG	VERTICAL GRATING	C.E.	CLEANING EYE		
SP	SOIL PIPE				



DRAINAGE SCHEMATIC DIAGRAM FOR MIC MODULES

F.D. REF.		
F.S.D. REF.		
REV.	DATE	DESCRIPTION
APPLICANT		
ARCHITECT		
STRUCTURAL ENGINEER		
AP		
PROJECT: BD SAMPLE PROPOSED 20 STOREYS RESIDENTIAL DEVELOPMENT IN STEEL MIC		
DRAWING TITLE: DRAINAGE SCHEMATIC DIAGRAM		
DRAWING NO. MIC-20		
REVISION		
DRAWN BY		CHECKED BY
JOB No.	DATE	SCALE N.T.S.
BD'S OFFICAL USE		

Schedule of Finishes, Fixtures and Fittings Pre-fabricated/Installed Off-site [Sample]

Item		Finishes, Fixtures and Fittings Pre-fabricated/Installed Off-site			Remarks
External Finishes	Façade	● Paint / Tiles			
	Window	● Window frames and leaves			
	Facing Internal Corridor	● Paint			
Internal Finishes	Location	Living/Dining Room	Kitchen	Bathroom	
	Ceiling	● Paint	● Paint	● Paint / False ceiling	Except for jointing areas between modules
	Floor	● Tiles	● Tiles with waterproofing membrane underneath	● Tiles with waterproofing membrane underneath	Except for jointing areas between modules
	Wall	● Paint	● Tiles with waterproofing membrane up to 1100mmH underneath	● Tiles with waterproofing membrane up to 2200mmH underneath	Except for jointing areas between modules
Fixtures and Fittings	Electrical	● MCB Board ● Conduits & Wirings ● Sockets, switches, telephone point, TV point	● Conduits & Wirings ● Sockets	● Conduits & Wirings ● Sockets ● Electrical heater	Except for jointing areas between modules / wiring across modules
	Lights	● Conduits & Wirings ● Lights Fittings	● Conduits & Wirings ● Lights Fittings	● Conduits & Wirings ● Lights Fittings	Except for jointing areas between modules / wiring across modules
	Plumbing	● N/A	● Vertical Stack ● Branch Pipes ● Water Taps	● Vertical Stack ● Branch Pipes ● Water Taps	(Connection to main stack by site work)
	Drainage	● N/A	● Vertical Stack ● Branch Pipes ● Drain Outlets	● Vertical Stack ● Branch Pipes ● Drain Outlets	(Connection to main stack by site work)
	Fire Services	● N/A	For Open Kitchen: ● Sprinkler Pipe and Sprinkler Head ● Smoke Detector with wiring and conduit	● N/A	(Connection to main stack by site work)
	Gas	● N/A	● Vertical Stack ● Branch Pipes ● Gas Heater	● Vertical Stack ● Branch Pipes ● Gas Heater	(Connection to main stack by site work)
	MVAC	● A/C Supporting Frame ● AC Units ● Refrigerant Pipes ● Condensation Pipes	● Exhaust Fan	● Exhaust Fan ● Exhaust Air Duct	
	Fixtures	● Entrance FRR Door ● Internal Timber Door ● Cabinets	● FRR Door ● Sink ● Stove ● Kitchen Countertop ● Kitchen Cabinet	● Timber Door ● Basin ● Water Closet ● Shower Fittings ● Bathtub ● Cabinet	

Schedule for Application of Fire Resisting Products and Materials of Non/Limited Combustibility [Sample]

Item		Location of Application	Product Name	Description of Construction	Performance	Testing Standard	Details of Test or Assessment Report					Remarks
							Name of Accreditation Body	Name of Laboratory / Assessing Organisation	Report No.	Date of Test / Report	Validity Date	
Loadbearing Element	1	Structural frame including beam and column	ABC Protection Board	2 layers of 9mm boards	120/120/120	BS EN 1365-3 BS EN 1365-4	HOKLAS	ABC Laboratory	ABC-123	12-Jul-21	11-Jul-26	
	2	Wall	N/A	N/A	N/A	BS EN 1365-1	N/A	N/A	N/A	N/A	N/A	
	3	Floor	CDE Composite Slab	125mm thick composite slab system	120/120/120	BS EN 1365-2	HOKLAS	ABC Laboratory	ABC-456	12-Jul-21	11-Jul-26	
Non-loadbearing Element	4	Separation wall	EFG Board Dry Wall System	9mm EFG brand board + 50mm (100kg/m³) Rockwool + 9mm EFG brand board	- /60/60	BS EN 1364-1	HOKLAS	123 Laboratory	123-456	12-Jul-21	11-Jul-26	
	5	Spandrel										
	6	Ceiling	EFG Board	9mm EFG brand board + 50mm (100kg/m³) Rockwool	- /60/60	BS EN 1364-2	HOKLAS	123 Laboratory	123-456	15-Aug-21	14-Aug-26	
Protection of Openings in Fire Barriers	7	Sealant	HK123 Fire Sealant	15mm in depth backing with backrod, up to 40mm linear joint	- /120/120	BS EN 1366-4	UKAS	Overseas Laboratory	OS-123456789	5-Jan-19	N/A	
	8	Sealant	HK456 Firestop Sealant	For steel pipe penetration, 15mm thick on both sides of wall and with backing of 60mm in depth of 100kg/m³ Rockwool	- /120/30	BS EN 1366-3	UKAS	Overseas Laboratory	OS-987654321	5-Jan-19	N/A	
Linings and Insulation (Non-combustibility)	9	External wall insulation	123 Rockwool	100kg/m³ Rockwool	Non-combustible	BS-EN 13501-1 – A1 BS EN ISO 1182	HOKLAS	123 Laboratory	123-123	15-Aug-21	14-Aug-26	
Others	10	Cavity barrier	HK123 Fire Sealant	15mm in depth backing with backrod, up to 40mm linear joint	- /120/120	BS EN 1366-4	UKAS	Overseas Laboratory	OS-123456789	5-Jan-19	N/A	