Building and Construction Authority

Code of Practice for Building Information Modelling (BIM) e-Submission

ARCHITECTURAL REQUIREMENTS

Version 1.1

BCA acknowledges the leadership provided by the BIM Steering Committee in support of the production of the Code of Practice for Building Information Modelling (BIM) e-Submission.

This Code of Practice (CP) has been prepared by the Centre for Construction IT on behalf of BCA and the BIM Steering Committee.

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BUILDING AND CONSTRUCTION AUTHORITY (BCA)

1 BCA REQUIREMENTS

All BCA BIM submissions shall meet the following requirements specified under:

- Singapore BIM Guides-Modelling Requirements
- BIM e-Submission Template Guides

Complete and updated set of BIM guides can be found at *www.corenet.gov.sg*

All submissions shall be placed in sheets which shall contain the title block with information as boxed up in Fig. 1a.

Fig. 1a - Sheet with Title Block

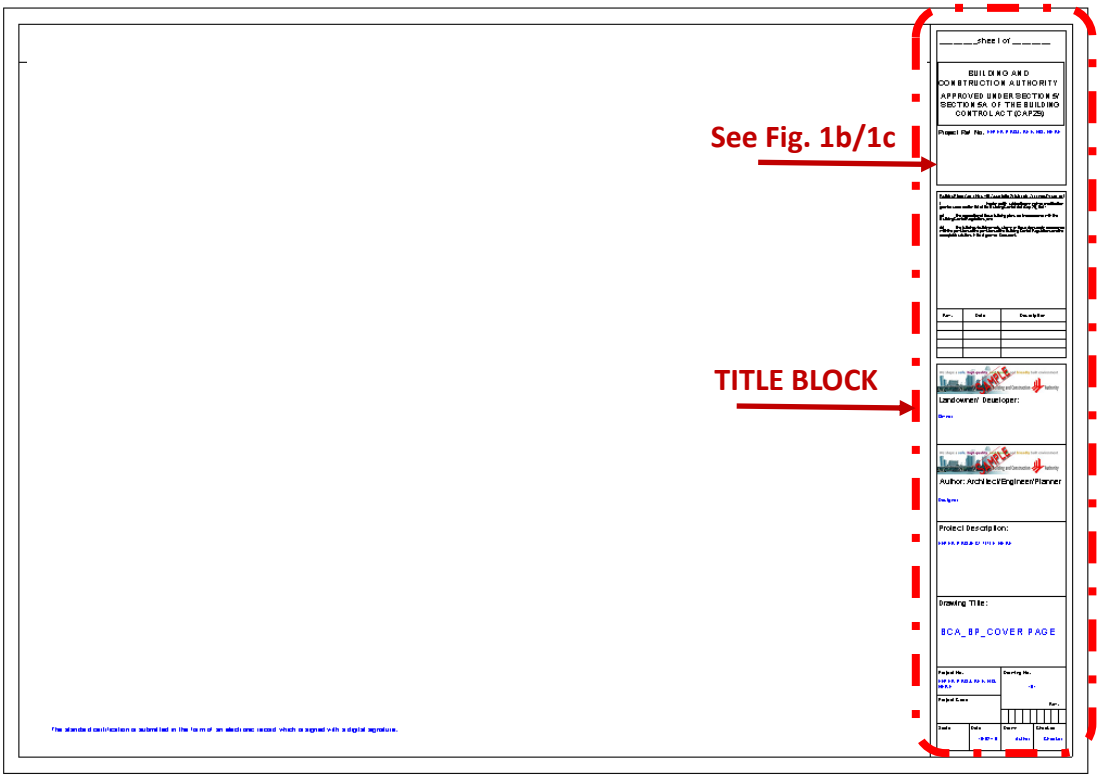


Fig. 1b - BCA Standard Approval Stamp

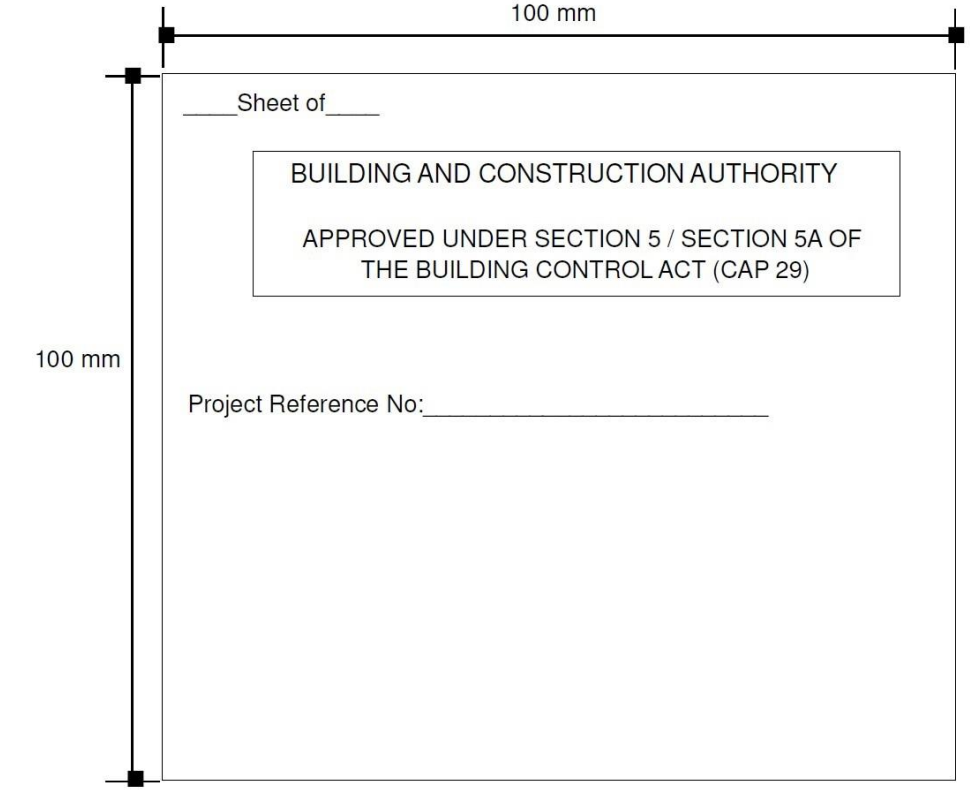
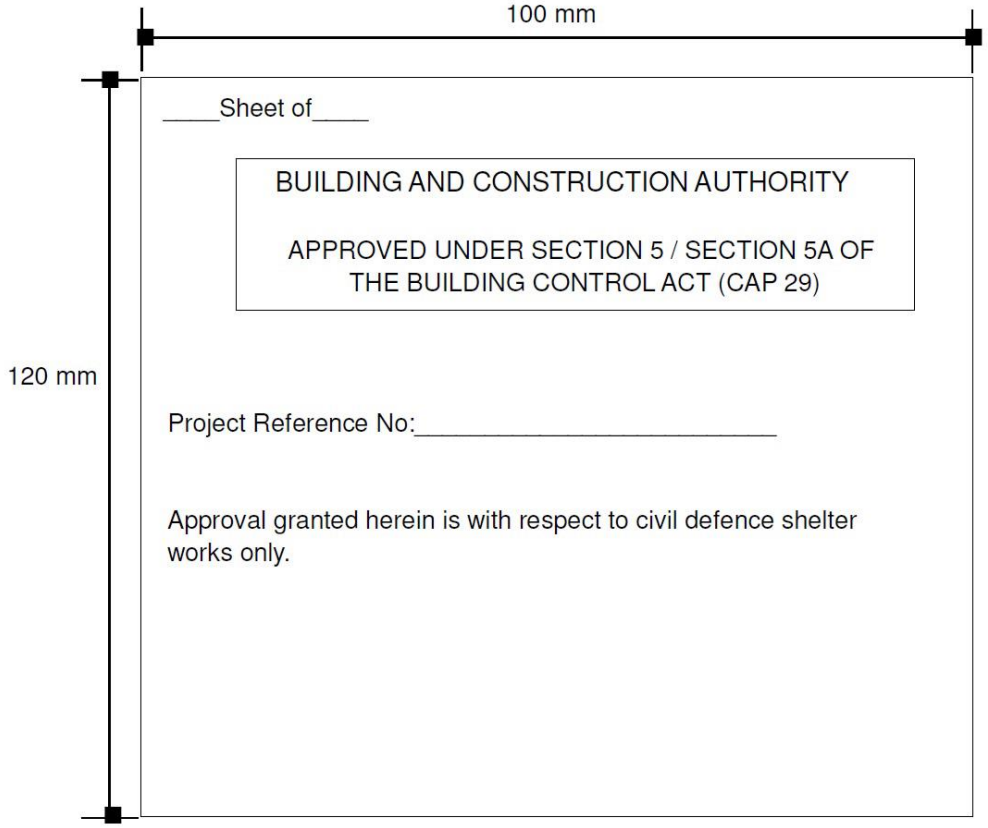


Fig. 1c - BCA Standard Approval Stamp (CD Shelter)



1.1 Building Plans (BP)

All submissions shall meet the following requirements specified under:

- Building Control Act Chapter 29, Building Control Regulations 2003
- Approved Document v6.2
- Code on Accessibility in the Built Environment 2013
- Any other relevant rules, regulations and Codes of Practice

Complete and updated set of Building Control Act and regulations can be found at *www.bca.gov.sg*

BP Submission Requirements

(Required Views, but not limited to)

2D Views	3D Views	Schedules
• Location Plan • Site Plan • Floor Plans • Ventilation Plans • Elevations • Sections • Typical Details	• Part-3D of floor plans • <any critical area that needs to be shown>	• Audience Seating • Hearing Enhancement System (HES) • Parking Lots • Rooms (for Hotels, Serviced Apartments, etc.) • Staircase (Industrial, Non- Industrial, Within Residential Units) • Statistical Gross Floor Area (SGFA)
All 2D Views and Schedules shall be placed on sheets.		

A. 2D Views

All views shall contain the following information generated from BIM.

2D Views shall follow the **BIM e-Submission Template Guides.**

1. Location Plan

- Development boundary in RED.

Fig. 2 - Example of Location Plan

2. Site Plan

- Site boundaries in RED;
- Building outlines to be erected/ building in which works are to be carried out shall be indicated;
- Road names, adjacent roads and streets;
- Town subdivision, mukim & lot number, and the adjoining lots;
- Building setback and distance between the new building to be erected or the building works to be carried out and its adjacent lot boundary;
- Ingress and egress to the Site;
- Barrier-free access route; and
- Grids and grids dimension to show the total length or width of the building.

3. Floor Plans

- Grids and grids dimension to show the total length or width of the building, as well as the distance between structural columns.
- Room/ space usage;
- Barrier-free access route;
- Hearing Enhancement System (HES), if applicable; and
- Family-friendly features, if applicable

Fig. 3 - Example of Site Plan

Image credit to DCA Architects

Fig. 4 - Example of Floor Plan

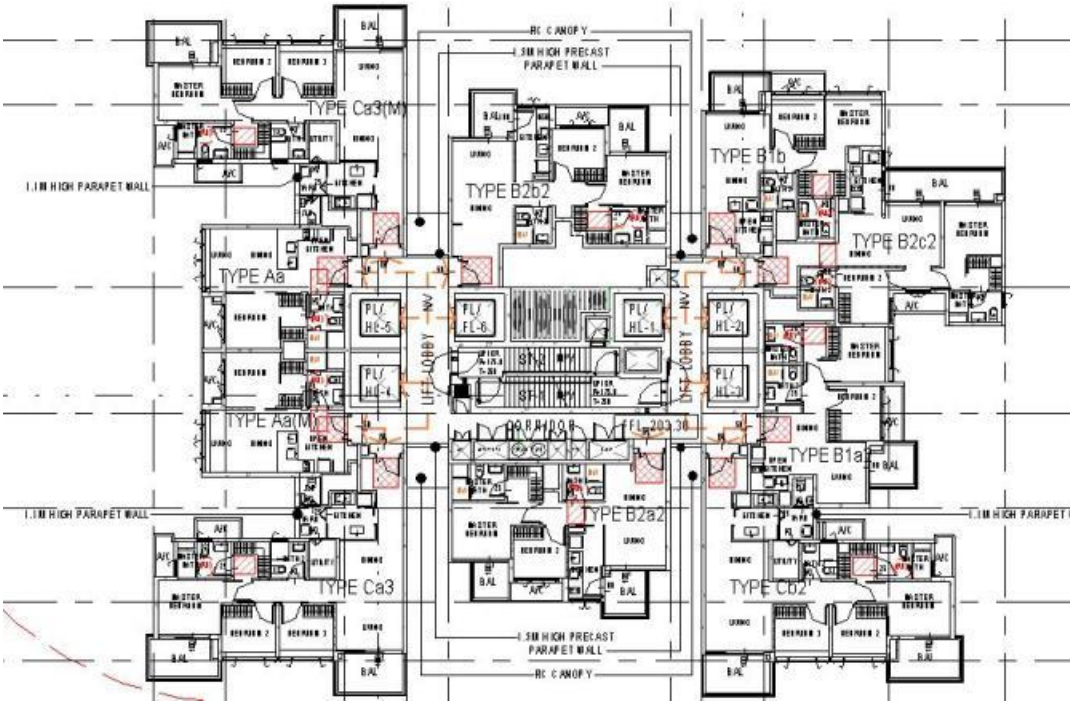


Image credit to DCA Architects

4. Ventilation Plans

- Grids and grids dimension to show the total length or width of the building, as well as the distance between structural columns;
- Room names and/ or space usage;
- Mode of Ventilation; and
- Location of air well spaces, if applicable.

Fig. 5 - Example of Ventilation Plan view naming

Floor Plans
- BCA_ FP_01_VP
- BCA _FP_02_VP

Table 1 - Colour used for Mode of Ventilation

Colour	• Mode of Ventilation	R	G	B
	Natural Ventilation	128	191	255
	Natural Ventilation with Air-Conditioning provided	185	220	255
	Air- Conditioning and Mechanical Ventilation (ACMV)	255	147	255
	Mechanical Ventilation	183	111	255

Fig. 6 - Example of Ventilation Plan

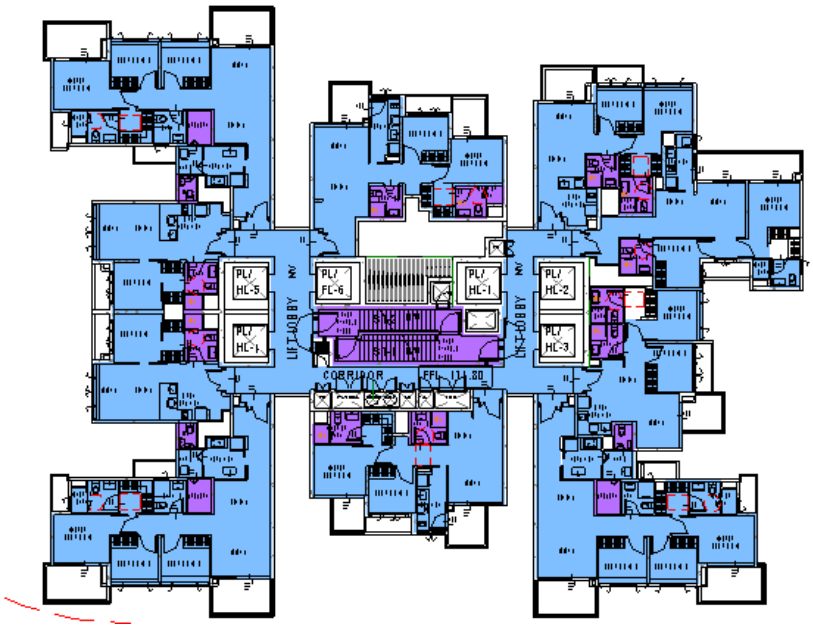


Image credit to DCA Architects

5. Statistical Gross Floor Area (SGFA) Plans

- Area usage;
- SGFA lines; and
- Different area types shall use the colour code in Table 2.

SGFA categories

1. General Building
    a. Above Sub level
    b. Below Sub level
2. Specified Building
    a. Above Sub level
    b. Below Sub level

Table 2 - Colour used for different area types

Colour	Area Type	R	G	B
	SGFA- General Building (Above Sub level)	255	128	128
	SGFA- General Building (Below Sub level)	204	104	0
	SGFA- Specified Building (Above Sub level)	204	153	255
	SGFA- Specified Building (Below Sub level)	204	0	255

Fig. 7 - Example of SGFA Plan: General Building (Above Sub level)

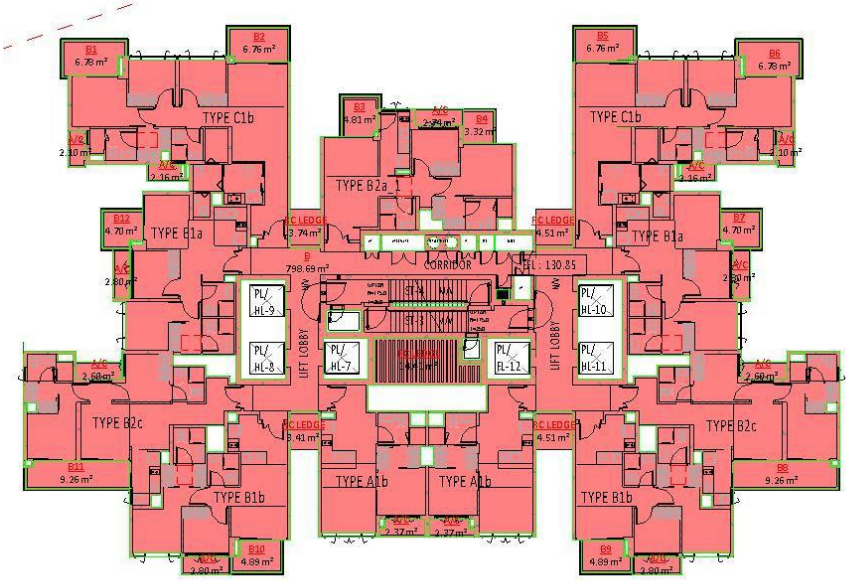


Image credit to DCA Architects

Fig. 7a - Example of SGFA Plan: General Building (Below Sub level)

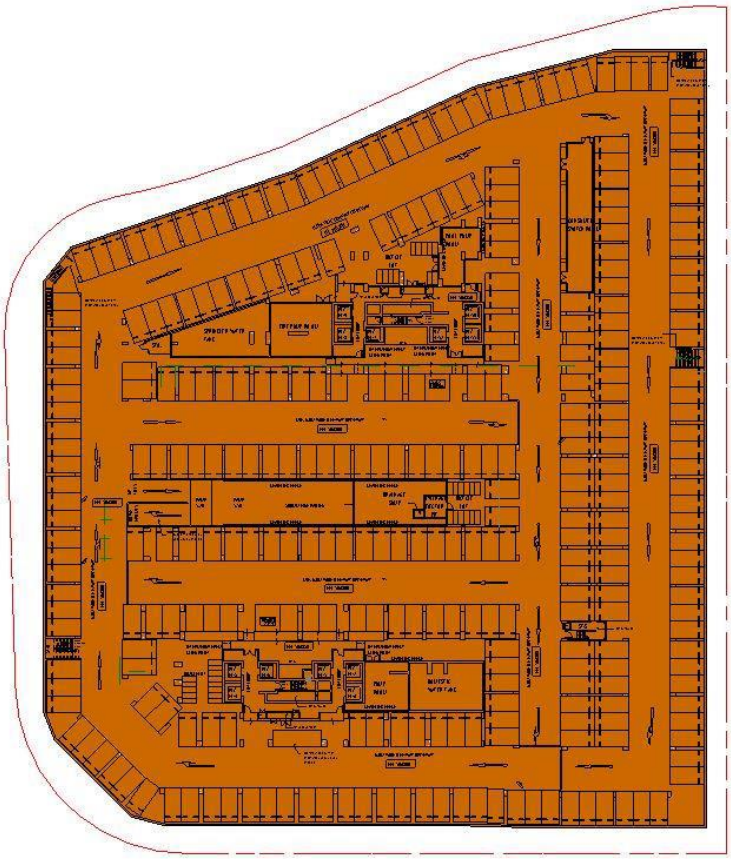


Image credit to DCA Architects

6. Elevations and Sections

- Grids and grids dimension to show the total length or width of the building, as well as the distance between structural columns;
- Room and/ or space usage;
- Floor to floor height; and
- Specify Top level of the building (SHD);

B. 3D Views

3D Views shall follow the **BIM e-Submission Template Guides.**

1. Part 3D

3D floor plans corresponding to each floor plan shall be provided. Part 3D Views shall show all necessary information of:

- Non-typical floor level;
- Typical floor level;
- Any critical area that needs to be shown.

Fig. 8 - Example Part 3D (all accessible objects are highlighted in Orange)

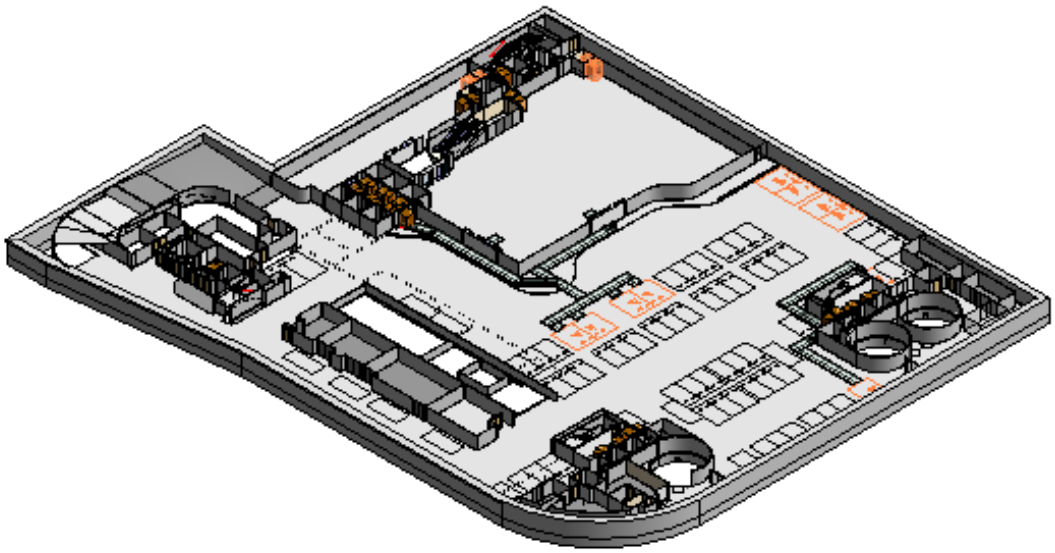


Image credit to WOHA

C. Schedules

Schedules are the extracted information from BIM.

Schedules shall follow the **BIM e-Submission Template Guides.**

Audience Seating

For developments that require Audience seating such as auditorium, theatre, etc.
Schedule shall indicate the fields as shown in Table 3.

Table 3 - Audience Seating

Storey	Type	Room Name	Accessible Yes/No	Count
			☐	0
			☐	0

Rooms (for Hotels, Serviced Apartments, etc.)

For developments such as Hotels, Services Apartments, etc.
Schedule shall indicate the fields as shown in Table 4.

Table 4 - Rooms (for Hotels, Serviced Apartments, etc.)

Storey	Room Name	Area	Accessible Yes/No	Occupancy	Count
			☐		0
			☐		0

Hearing Enhancement System (HES)

For developments with spaces that require hearing enhancement system such as auditorium, theatre, etc.
Schedule shall indicate the following fields as shown in Table 5.

Table 5 - Hearing Enhancement System (HES)

Storey	Room Name	Count
		0
		0

Staircase (Industrial, Non-Industrial, Within Residential Units)

There are separate schedules created for different types of development (Industrial, Non-Industrial &Within Residential Units). Use the appropriate schedule as required.
Schedule shall indicate the fields as shown in Table 6.

Table 6 - Staircase (Industrial, Non- Industrial, Within Residential Units)

Type	Base Level	Actual Riser Height	Actual Tread Depth	Overall Height	Detectable Warning Yes/No
					☐

Parking Lots

Schedule shall indicate the fields as shown in Table 7.

Table 7 - Parking Lots

Storey	Type	Dimension (W x L)	Accessible Yes/No	Count
			☐	0
			☐	0

Statistical Gross Floor Area

Schedule shall indicate the fields as shown in Table 8.

Table 8 – Computation of SGFA / Area of plan view

Blk No.	Storey	Name	SGFA (m2)
Below Sub level			
			0.00
			0.00
			0.00
Above Sub level			
			0.00
			0.00
			0.00
		Total:	0.00

1.2 Civil Defence Shelter Building Plan (CD)

All submissions for Household shelter (HS), Storey Shelter (SS), Staircase Storey Shelter (SSS), Public Shelter (PS) and MRT Transit shelter shall meet the relevant requirements specified under:

- Building Control Act Chapter 29, Building Control Regulations 2003
- Technical Requirements for Household Shelters
- Technical Requirements for Storey Shelters
- Technical Requirements for Public Shelters (S1 to S5)
- Technical Requirements for MRT Transit Shelters (S1 to S29)
- Any other relevant rules, regulations and Codes of Practice

Complete and updated set of Building Control Act and regulations can be found at *www.bca.gov.sg*

Essential Information on Cover Page

(Additional to that specified in Code of Practice for BIM e-Submission General Requirements)

- ✓ Standard Approval Stamp (refer to *Fig.1c - BCA Standard Approval Stamp for CD Shelter*) and
- ✓ Standard certification for shelter plan (refer to Annex II. Standard Certifications for Building Works)

Project Reference Number

HS, SS, SSS and PS plan shall be indicated with the same project reference number. The abbreviation, **CD**, shall be used for shelter building plans, for example, **A9999-12345-2016-CD01.**

For subsequent amendment submissions made to the approved shelter plans or re-submission of shelter plans after receipt of Notice of Disapproval (NOD) issued by BCA, the plans shall be indicated with respective plan type suffix and unique numbers in their application. For example, if shelter building plans CD01 has been used and subsequent amendment submissions shall be indicated with CD02.

1.2.1 HS, SS and SSS CD Submission Requirements

(Required Views, but not limited to)

2D Views	3D Views	Schedules
• Location Plan • Site Plan • Floor Plans of HS, SS and SSS • Sections of HS, SS and SSS • Elevations of HS, SS and SSS • Detailed Plans of HS, SS and SSS Legend: (HS) Household Shelter (SS) Storey Shelter (SSS) Staircase Storey Shelter	• Part- 3D of HS, SS and SSS • <any critical area that needs to be shown>	• Data of Household Shelter • Data of Storey Shelter • Data of Staircase Storey Shelter
All 2D Views and Schedules shall be placed on sheets.		

For reference: *(see Annex I.A -Household, Storey, Staircase Storey Shelter Plan, Elevation and Section to be shown with essential information of Technical Requirements)*

A. 2D Views

All views (floor plan, section and elevation) shall contain the following information generated from BIM.

2D Views shall follow the **BIM e-Submission Template Guides.**

1. Location Plan

- Development boundary in RED.

2. Site Plan

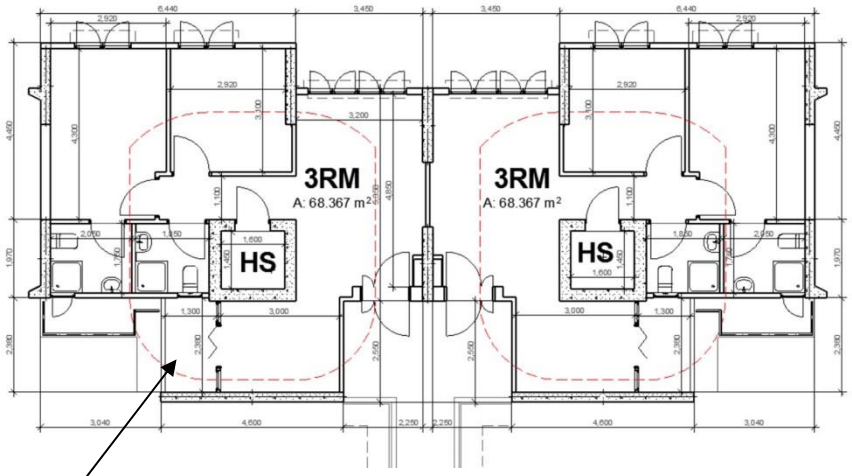
- Site boundaries in RED;
- Building outlines to be erected/ building in which works are to be carried out shall be indicated;
- Road names, adjacent roads and streets;
- Town subdivision, mukim & lot number, and the adjoining lots;
- Building setback and distance between the new building to be erected or the building works to be carried out and its adjacent lot boundary;
- Ingress and egress to the Site; and
- Grids and grids dimension to show the total length or width of the building.

3. Floor Plans for HS, SS and SSS

The floor plan shall show the design information and dimensions for HS, SS and SSS as follows:

- The location, marking and layout of HS, SS and SSS in relation to the overall building with the outline of the shelters marked;
- The Gross Floor Area (GFA) of the dwelling units;
- The internal area and volume of HS, SS and SSS;
- The internal and external width and length of HS, SS and SSS;
- The wall and slab thickness of HS, SS and SSS;
- The transfer system supporting the HS (if any);
- The setback distance envelop (refer to Fig. 9, *Annex I.A –Fig. 1A, 2A and 3A*)
- around HS, SS and SSS generated from an imaginary bounding box created in 3D model (refer to Fig. 10)
- The location and dimensions of switches and lighting point, switched socket outlet, telephone outlet, TV and radio outlets in the HS, SS and SSS (refer to *Annex I.A –Fig. 1B and 1C, 2B and 2C*);
- The location and size of ventilation sleeves for HS, SS and SSS (refer to *Annex I.A -Figure 1B and 1C, 2B and 2C, 3B*); and
- The location and size of rescue hatch and cat- ladder for SS.

Fig. 9 - Example of Floor Plan (for Household Shelter)



Setback distance envelope generated from 3D model

Image credit to P&T Consultants Pte Ltd

4. Floor Plans for SSS (Additional design information and dimensions)

- The location and thickness of shielding wall fronting SSS entrance door;
- The clear distance between shielding wall and SSS entrance door (refer to *Annex I.A, Fig. 3B and 3D);*
- The location and thickness of external and internal wall of SSS;
- The location and dimension of internal SSS door;
- The location and dimension of mechanical ventilation shaft;
- The location and dimension of the horizontal and vertical blast hatch;
- The details of reinforced concrete roof structures over the mechanical ventilation shaft. This is above main roof level; and
- The distance between SSS entrance door and edge of building line if the shielding wall fronting SSS door is discontinuous with opening that is not directly opposite the SSS door (refer to *Annex I.A, Fig. 3D*).

5. Sections for HS, SS and SSS

The sections in two directions shall cut cross the entire area of setback distance and shall show:

- The storey height measured floor to floor level;
- The clear height of HS, SS and SSS;
- The transfer system supporting the HS;
- The location and dimensions of switches and lighting point, switched socket outlet, telephone outlet. TV and radio outlets;
- The location of ventilation sleeve (refer to *Annex I- Fig. 1D & 2D*);
- The setback distance (refer to *Annex I- Fig. 1D & 2D*); and
- The protective structures of the refuse chute and service duct above the roof level.

6. Sections for SSS (Additional design information and dimensions)

- The location and dimension of the horizontal and vertical blast hatch;
- The details of protective structures at roof for the mechanical ventilation shaft.

B. 3D Views

3D Views shall follow the **BIM e-Submission Template Guides.**

1. Part 3D

3D floor plans corresponding to each floor plan shall be provided. Part 3D Views shall show all necessary information of:

- Non- typical floor level;
- Typical floor level;
- Any critical area that needs to be shown.

***Fig. 10**- Example of Part 3D (showing setback)*

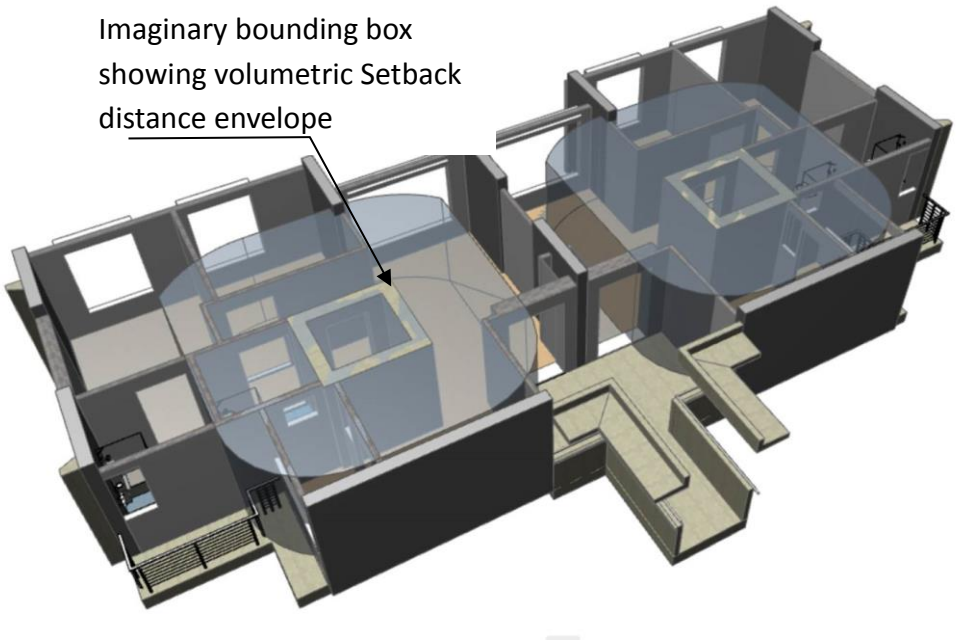


Image credit to P&T Consultants Pte Ltd

C. Schedules

Schedules are the extracted information from BIM. All schedules for approval of HS, SS, SSS and PS shall be placed in the sheets together with the Site Plan.

Schedule shall follow the **BIM e-Submission Template Guides.**

Table 9 - Data of Household Shelter (HS)

Data of Household Shelter						
Dwelling Unit Type	GFA of Unit (m2)	No. of HS	Internal Area of HS (m2)	No of Square Units #	Internal Volume of HS (m3)	Shelter Type*

* Abbreviation for Household Shelter Type
HA: HS Aboveground
HB: HS Basement

Applicable for HS which are trapezoidal or L-shaped HS.
No. of square units (0.6 m x 0.6 m) used for the assessment of trapezoidal or L-shaped HS

Table 10 - Data of Storey Shelter (SS)

Data of Storey Shelter									
Storey	Dwelling Unit Type	GFA (m2)	Nominal Occupancy	Total Nominal Occupancy (TNO)	Internal Area of SS(m2)		Internal Volume of SS (m3)		Shelter Type +
					Required (TNO x 0 .6m2)	Provided	Required (TNO x 1.8m3)	Provided	

\+ Abbreviation for Storey Shelter Type
SA: SS Aboveground
SB: SS Basement

Table 11 - Data of Staircase Storey Shelter (SSS)

Data of Staircase Storey Shelter									
Storey	Dwelling Unit Type	GFA (m2)	Nominal Occupancy	Total Nominal Occupancy (TNO)	Internal Area of SSS(m2)		Internal Volume of SSS (m3)		Shelter Type +
					Required (TNO x 0 .6m2)	Provided	Required (TNO x 1.8m3)	Provided	

+ Abbreviation for Staircase Storey Shelter Type

SA: SS Aboveground

SB: SS Basement

1.2.2 Public Shelter CD Submission Requirements

The Qualified Person (QP) shall familiarise himself with the CD Technical Requirements for S1 – S5 Public Shelters before preparing the Architectural BIM submission for Public Shelters. The submission shall comprise native BIM 3D models, 2D plans, sections and elevations that are illustrative with details and dimensions, to show compliance with the CD technical requirements. The level of detail and information shown in the 2D plans, sections and elevations shall be similar as that of traditional (2D) architectural plan submissions. The submission shall comprehensively cover important aspects of the shelter described in the following sections.

The QP shall consult the Civil Defence Shelter Engineering Department of BCA for clarification.

(Required Views, but not limited to)

2D Views	3D Views	Schedule
• Location Plan • Site Plan • Floor Plans of Public Shelter • Sections of Public Shelter • Elevations of Public Shelter • Detailed Plans of Public Shelter	• Part 3D of Public Shelters • <any critical area that needs to be shown>	• Data of Public Shelter
All 2D Views and Schedules shall be placed on sheets.		

For reference: *(*see *Annex I.B -Public Shelter Plan, Elevation and Section to be shown with essential information and Technical Requirements)*

1.2.2.1 Public Shelter Layout

A. 2D Views

All views (floor plan, section and elevation) shall contain the following information generated from BIM.

2D Views shall follow the **BIM e-Submission Template Guides.**

1. Floor Plans, Sections and Elevations

- General layout at levels or space associated with the public shelter (refer to *Annex I.B – Fig. 1*);
- Bounds of protection (refer to *Annex I.B – Fig. 2*);
- Layout of decontamination room and separation room (refer to *Annex I.B – Fig. 3*);
- Entrance area configurations leading from the opening at ground level (or elsewhere) to the CD doors, including imaginary line of sights from the CD doors and wall and slab thicknesses (refer to *Annex I.B – Fig. 4, 5, 6 and 7*);
- Blast doors (BD), blast hatches (BH), blast fragmentation door (BFD) and blast fragmentation window (BFW) clearances from adjacent walls, and adjacent wall and slab thicknesses;
- Blast valves, overpressure blast valves and overpressure valves;
- Ventilation air shafts configurations from opening at ground level (or above ground level) to plant room areas;
- CD dry toilet areas; and
- Layout showing the following information for different public shelter category as specified in the *Technical Requirements for S1 to S5 Public Shelter:*
    i. Span of floor/roof;
    ii. Area of Separation Room;
    iii. Area of Decontamination Room and Number of Shower Posts;
    iv. Area of First Aid Area; and
    v. Area of Shelter Management Room.

B. 3D Views

3D Views shall follow the **BIM e-Submission Template Guides.**

The 3D model shall show the entire CD shelter, and shall include the following:

- Entrance and exit configurations;
- Layout of decontamination room and separation room;
- Blast doors (BD), blast hatches (BH), blast fragmentation door (BFD), blast fragmentation window (BFW) and including any related bypass areas;
- Blast valves, overpressure blast valves and overpressure valves;
- Imaginary line of sight to the BD;
- Gas-tight doors (SSD);
- Air shafts; and
- Dry toilet areas

C. Schedules

Schedules are the extracted information from BIM. All schedules for approval of HS, SS, SSS and PS shall be placed in the sheets together with the Site Plan.

Schedule shall follow the **BIM e-Submission Template Guides.**

Table 12 - Data of Public Shelter (PS)

Data of Public Shelter							
Public Shelter Category	Main Shelter Area (m2)	Shelter Population	No. of Entrance Areas	No. of Standard Shelter Entrance Without Decontamination Facilities / Airlock	No. of Standard Shelter Entrance With Airlock	No. of Standard Shelter Entrance With Decontamination Facilities	Shelter Type*

* Abbreviation for Public Shelter Type

PA: PS Aboveground

PB: PS Basement

1.2.2.2 Entrance Areas

A. 2D Views

All views shall contain the following information generated from BIM.

2D Views shall follow the **BIM e-Submission Template Guides.**

1. Floor Plans, Sections and Elevations

- Entrance area layout leading from opening at ground level (or elsewhere) to the blast door (BD,BFD), blast hatch (BH) and blast window (BFW);
- Imaginary line of sight to the BD;
- Wall and slab thicknesses, in particular, those around the CD doors;
- Size of openings and type of services penetrations such as MCTs, puddle flanges, etc. in walls or slabs next to or in the vicinity of the CD doors;
- Layout and requirements

The drawings shall show all associated dimensions, spacing, labels, types of finishes, etc. to facilitate review and shall demonstrate compliance with the *Technical Requirements for S1 to S5 Public Shelters.* These include:

- Dimensions of Entrance Area for Standard Shelter Entrance and large shelter entrance;
- Safe Distance Between Shelter Entrance and Entrance of Access Way for public shelter above ground and below ground for different public shelter category; and
- Number of Standard Shelter Entrances for different public shelter category.

B. 3D Views

3D Views shall follow the **BIM e-Submission Template Guides.**

1. Part 3D

For each entrance area leading to a CD door, a Part 3D model shall be provided to illustrate clearly the following:

- Entrance configuration from opening at ground (or elsewhere) to the CD doors;
- Blast doors (BD), blast hatches (BH), blast fragmentation door (BFD) and blast fragmentation window (BFW), including any related bypass area;
- Imaginary line of sight to the BD; and
- Openings for services penetrations such as for air ducts, pipes, electrical cables, trunkings and conduits in walls or slabs next to or in the vicinity of the CD doors.

1.2.2.3 CD Doors and Supporting Structure

A. 2D Views

All views (floor plan, section and elevation) shall contain the following information generated from BIM.

2D Views shall follow the **BIM e-Submission Template Guides.**

1. Floor Plans, Sections and Elevations

CD doors (BD, BFD), hatches (SBH), blast windows (BFD) and its supporting structure shall be provided to illustrate clearly the following:

- Door frame dimensions;
- Floor levels and kerbs; and
- Openings for services penetrations such as for air ducts, pipes, electrical cables, trunkings and conduits in walls or slabs next to or in the vicinity of the CD doors.

The drawings shall show all associated dimensions, spacing and labels to facilitate review and shall demonstrate compliance with the *Technical Requirements for S1 to S5 Public Shelters.*

B. 3D Views

3D Views shall follow the **BIM e-Submission Template Guides.**

1. Part 3D

Part 3D models of the CD doors (BD, BFD), hatches (SBH), blast windows (BFD) and its supporting structure shall be provided to illustrate clearly the following:

- Door frame dimensions;
- Floor levels and kerbs; and
- Openings for services penetrations such as for air ducts, pipes, electrical cables, trunkings and conduits in walls or slabs next to or in the vicinity of the CD doors.

1.2.2.4 Air Shafts

A. 2D Views

All views (floor plan, section and elevation) shall contain the following information generated from BIM.

2D Views shall follow the **BIM e-Submission Template Guides.**

1. Floor Plans, Sections and Elevations

- Air shaft layout from opening at ground (or elsewhere) to the plant room interface;
- Wall and slab thicknesses; and
- Air shaft dimensions

The drawings shall show all associated dimensions, spacing and labels to facilitate review and shall demonstrate compliance with the *Technical Requirements for S1 to S5 Public Shelters.*

B. 3D Views

3D Views shall follow the **BIM e-Submission Template Guides.**

1. Part 3D

For each air shaft, a Part 3D model shall be provided to illustrate clearly the following:

- Air shaft configuration from opening at ground level (or elsewhere) to the plantroom interface.

1.2.2.5 Dry Toilet Areas

A. 2D Views

All views shall contain the following information generated from BIM.

2D Views shall follow the **BIM e-Submission Template Guides.**

1. Floor Plans, Sections and Elevations

- Location and demarcation of dry toilet areas in the CD shelter,
- Layout of dry toilets showing:
  i. net area occupied by dry toilets;
  ii. cubicles;
  iii. wash basins or troughs;
  iv. water supply points,
  v. foul air extraction points,
  vi. floor trap locations; and
  vii. location of ejector tank (if any)

The drawings shall show all associated dimensions, spacing and labels to facilitate review and shall demonstrate compliance with the *Technical Requirements for S1 to S5 Public Shelters.*

1.2.3 MRT Transit CD Submission Requirements

The Qualified Person (QP) shall familiarise himself/herself with the *CD Shelter Requirements for MRT Stations* before preparing the Architectural BIM submission for MRT Transit CD shelters. The submission shall comprise native BIM 3D models, 2D plans, sections and elevations that are illustrative with details and dimensions, to show compliance with the CD shelter requirements. The submission shall comprehensively cover important aspects of the shelter described in the following sections.

(Required Views, but not limited to)

2D Views	3D Views	Schedule
• Location Plan • Site Plan • Floor Plans of CD Shelter Layout • Sections of CD Shelter • Elevations of CD Shelter • Detailed Plans, Sections and Elevations of Entrance Areas • Detailed Plans, Sections and Elevations of Air Shafts and Bomb Pits • Detailed Plans, Sections and Elevations of Dry Toilet Areas	• (Full) 3D View of Shelter • Part 3D of Entrance Areas • Part 3D of Air Shafts and Bomb Pits • <any critical area that needs to be shown>	<NA>
All 2D Views and Schedules shall be placed on sheets.		

1.2.3.1 Shelter Layout

A. 2D Views

All views shall contain the following information generated from BIM.

2D Views shall follow the **BIM e-Submission Template Guides.**

1. Floor Plans, Sections and Elevations

- General layout at ground level, station concourse, station platform and any other level or space associated with the CD shelter, such as mezzanine floors and subway connections.
- Entrance area configurations leading from the opening at ground level (or elsewhere) to the CD doors, including associated strikepoint lines and wall and slab thicknesses.
- EHD/SLD and PT doors, clearances from adjacent walls, and adjacent wall and slab thicknesses.
- Ventilation air shafts with bomb pit configurations from opening at ground level (or above ground level) to plant room areas.
- CD dry toilet areas.
- Net shelter areas (NSAs) at each level of the CD shelter (eg. Concourse and Platform) and the number of occupants at each NSA based on 0.4m2/person.

B. 3D Views

3D Views shall follow the **BIM e-Submission Template Guides.**

The 3D model shall show the entire CD shelter, and shall include the following:

- Entrance and exit configurations;
- Strikepoint lines;
- Entrance hinged doors (EHDs), or sliding doors (SLDs) and associated door chambers (if used in place of EHDs);
- PT doors including any related bypass areas;
- Air shafts with bomb pit configurations; and
- Dry toilet areas.

1.2.3.2 Entrance Areas and CD Doors

A. 2D Views

All views shall contain the following information generated from BIM.

2D Views shall follow the **BIM e-Submission Template Guides.**

1. Floor Plans, Sections and Elevations

- Entrance area layout leading from opening at ground level (or elsewhere) to the EHD and PT door;
- Strikepoint line and distance measured from the strikepoint to the EHD and PT door;
- Wall and slab thicknesses, in particular, those around the CD doors;
- Services penetrations such as for air ducts, pipes, electrical cables, trunkings and conduits next to or in the vicinity of the CD doors; and
- EHD and PT door details such as, but not limited to:
    i. Location, layout and orientation;
    ii. Maximum door leaf opening position;
    iii. Door frame and leaf clearances from adjacent walls;
    iv. Finish floor levels and kerbs;
    v. Top and bottom maintenance pits;
    vi. Floor and wall hooks for chain block shackles;
    vii. Door stoppers and padlocking connectors;
    viii. Architectural wall finishes concealing door leafs including their locking mechanism; and
    ix. Architectural ceiling and floor finishes concealing the door frame including their locking mechanism.

The drawings shall show all associated dimensions, spacing, labels, types of finishes, etc. to facilitate review and shall demonstrate compliance with the CD Shelter Requirements for MRT Stations.

The same shall apply if a sliding door and door chamber are used in place of the EHD.

1. PT Door

A smaller side swing door (also known as the PT door in CD Shelter terms) shall be installed beside or near a large door i.e. EHD or SLD. PT doors have concrete in-fill door leaves. They are designed to protect against blast, fragmentation and are gas-tight. PT doors shall be designed with dimensions as indicated in Table 13.

Table 13 - PT Door Dimension

Door Type	Clear Width (mm)	Clear Height (mm)
PT Door	1100	2100

During the planning of the MRT station layout, the designer shall ensure that the PT doors swing open in the correct direction. The full opening clearance must be available with the opened doors.

All PT doors shall be installed such that they swing outwards away from the protected area. In order to accommodate the door leaf and to maintain a clear accessway, side space must be adequately provided. In the plan view, the following minimum dimensions must be observed:

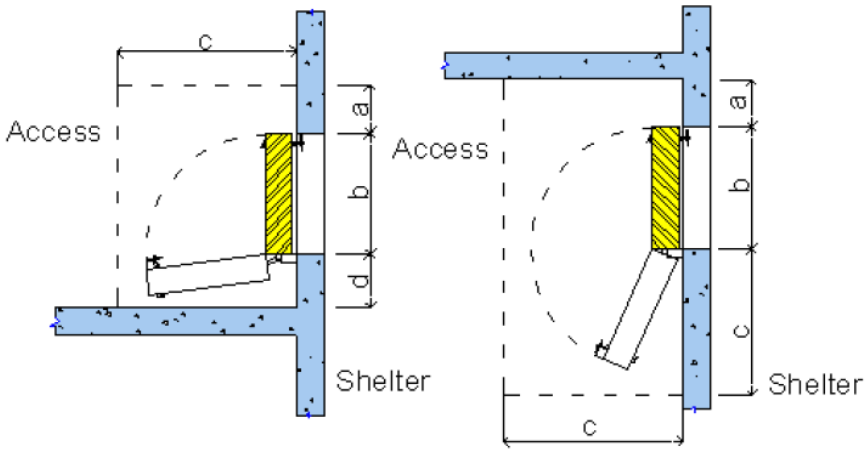


Table 14 - PT Door Minimum Clearances

Door Type	a (mm)	b (mm)	c (mm)	d (mm)
PT Door	200	1100	1650	500

B. 3D Views

3D Views shall follow the **BIM e-Submission Template Guides.**

1. Part 3D

For each entrance area leading to a CD door, a Part 3D model shall be provided to illustrate clearly the following:

- Entrance configuration from opening at ground (or elsewhere) to the CD doors
- strikepoint line;
- entrance hinged door (EHD) or, sliding door and associated chamber (if used in place of EHD);
- PT door including bypass area; and
- Services penetrations such as for ducts, pipes, electrical cable ladders and trunking next to or in the vicinity of the CD doors.

1.2.3.3 Air Shafts and Bomb Pits

A. 2D Views

All views shall contain the following information generated from BIM.

2D Views shall follow the **BIM e-Submission Template Guides.**

1. Floor Plans, Sections and Elevations

- Air shaft layout from opening at ground (or elsewhere) to the plantroom interface;
- Wall and slab thicknesses; and
- Ventilation air shaft and bomb pit dimensions.

The drawings shall show all associated dimensions, spacing and labels to facilitate review and shall demonstrate compliance with the CD Shelter Requirements for MRT Stations.

B. 3D Views

3D Views shall follow the **BIM e-Submission Template Guides.**

1. Part 3D

For each air shaft and bomb pit, a Part 3D model shall be provided to illustrate clearly the following:

- Air shaft configuration from opening at ground level (or elsewhere) to the plantroom interface; and
- Bomb pit.

1.2.3.4 Dry Toilet Areas

A. 2D Views

All views shall contain the following information generated from BIM.

2D Views shall follow the **BIM e-Submission Template Guides.**

1. Floor Plans, Sections and Elevations

- Location and demarcation of dry toilet areas in the CD shelter,
- Layout of dry toilets showing:
  i. Net area occupied by each cluster of dry toilets;
  ii. Cubicles;
  iii. Wash basins or troughs;
  iv. Water supply points;
  v. Foul air extraction points;
  vi. Floor trap locations;
  vii. Location of ejector tank; and
  viii. Sections or elevations showing no direct line-of-sight from Concourse to the top of the dry toilets at Platform (as there is no modesty cover on top of the dry toilet partitions).

The drawings shall show all associated dimensions, spacing and labels to facilitate review and shall demonstrate compliance with the CD Shelter Requirements for MRT Stations.

B. 3D Views

3D Views shall follow the **BIM e-Submission Template Guides.**

1. Part 3D

For each dry toilet cluster, a Part 3D model shall be provided to illustrate clearly the following:

- Dry toilet cubicle partition locations and dimensions (including lengths, widths and heights) and setting out to show no direct line-of-sight (such that personnel at the concourse perimeter looking down will not be able to look into the toilet cubicles);
- Floor trap locations, distance apart of the 2 floor traps and depth from the finished floor level (FFL).

1.2.4 Technical Requirements for S10-S29 Public Shelters

Where a transit CD shelter is to be designed and built based on the *Technical Requirements for S10-S29 Public Shelters*, or Addition and Alteration (A&A) works are carried out on such S10-S29 Shelters, the Qualified Person (QP) shall familiarise himself with the aforementioned document before preparing the Architectural BIM submission.

The submissions shall comprise native BIM 3D models, 2D plans, sections and elevations that are illustrative with details, dimensions, spacing, labels, schedules, material types, etc. to show compliance with the CD *Technical Requirements for S10-S29 Public Shelters*. The level of details and information shown in the 2D plans, sections and elevations shall be similar as that of traditional (2D) architectural plan submissions.

The QP shall consult the Transit Shelter Engineering Department of BCA for clarification.

1.3 Core Information for BCA Submissions

Core Information listed are minimum information for BCA submissions that shall be incorporated in BIM.

> Core Information shall follow the **BIM e-Submission Template Guides.**

Table 15 - Core Information for BCA Submissions

Building Plans			
Building Element	**Name**	**Sample Value**	**Remarks**
Grid	Name/Type	A	*Default*
Level	Name	Level 1	*Default*
	SHD Value	+0.00m	Level value of the development that fulfils PUB and URA's requirement
Area (Non- geometry)	Name/Type	Residential	*Default*
	Usage	☐	Added in template
	Area Type	SGFA	*Default*
Ceiling	Name/Type	Ceiling_50	*Default*
	Level	Level 1	*Default*
Column (Architectural)	Name/Type	Column_300x300	*Default*
	Level	Level 1	*Default*
	Build Type	--	Added in template
	Labour Savings Index	--	Added in template
Door	Name/Type	Door_1P	*Default*
	Dimension	900x2100	*Default*
	Level	Level 1	*Default*
Floor/ Slab	Name/Type	Floor_200	*Default*
	Thickness	200	*Default*
	Level	Level 1	*Default*
Parking Lot	Name/Type	Carpark_2500x5000	*Default*
	Level	Basement	*Default*
	Dimension	2500x5000	*Default*
	If Accessible	<Yes/No>	Added in template

Ramp	Name/Type	Ramp_200	*Default*
	Thickness	200	*Default*
	Level (Base)	Level 1	*Default*
	Slope Gradient	1/12	*Default*
Railing	Name/Type	Railing_900	*Default*
	Height	900	*Default*
	Level	Level 1	*Default*
Roof	Name/Type	Roof_300	*Default*
	Level	Level 4	*Default*
Room/ Space (Non- geometry)	Name	Bedroom	*Default*
	Level	Level 1	*Default*
	Area	30 sqm	*Default*
	Mode Of Ventilation	Natural Ventilation	Added in template
	If Accessible	<Yes/No>	Added in template
Staircase	Name/ Type	Stair_1200	*Default*
	Level (Base)	Level 1	*Default*
	Riser Height	175	*Default*
	Run Width	1200	*Default*
	Tread Depth	275	*Default*
	Number of Risers	<Auto>	*Default*
	Material	Precast	*Default*
	Detectable Warning	<Yes/ No>	Added in template
Wall	Name/Type	Wall_Int	*Default*
	Level	Level 1	*Default*
	Build Type	--	Added in template
	Material	--	*Default*
Window	Name/ Type	Window_4P	*Default*
	Dimension	2800x1200	*Default*
	Level	Level 1	*Default*
Topography	Z points value	+10.50m	Z points value shall be taken from Registered Land Surveyor
	Phase Created	New Construction	*Default*
Boundary Line	Area	56798.58 sqm	*Default*

URBAN REDEVELOPMENT AUTHORITY (URA)

2 URA REQUIREMENTS

All URA BIM Submissions shall meet the following requirements specified under:

- Singapore BIM Guide- Modelling Requirements
- BIM e-Submission Template Guides

Complete and updated set of BIM guides can be found at *www.corenet.gov.sg*

2.1 Requirements for URA Submissions

All submissions shall meet the following requirements specified under:

- Development Control Parameters for Residential development
- Development Control Parameters for Non-Residential development
- Handbook on Gross Floor Area
- Conservation Guidelines (Published 2011)
- Conservation Guidelines Technical Supplements (Published 1998)
- Conservation Technical Leaflets (Published 1993)
- Any other relevant rules, regulations and Codes of Practice

Complete and updated set regulations can be found at *www.ura.gov.sg*

URA Submission Requirements

(Required Views, but not limited to)

2D Views	3D Views	Schedule
• Location Plan • Site Plan • Floor Plans • Elevations • Sections • Unit/ Area Plans • Area Plans for GFA • Landscape Plans • Landscape Section	• Part- 3D of floor plans • <any critical area that needs to be shown>	• Summary of Unit • Summary of Gross Floor Area • Summary of GFA Exempted • Summary of GFA Incentive • Site Coverage Computation • Communal Open Space Computation
All 2D Views and Schedules shall be placed on sheets		

A. 2D Views

All views shall contain the following information generated from BIM.

2D Views shall follow the **BIM e-Submission Template Guides.**

1. Location Plan

- Development boundary in RED.

2. Site Plan

- Cadastral details such as Lot Number, Lot Boundary etc. with a surrounding radius range of 10m to 50m shall be incorporated. If this is not possible, applicants are to provide a cadastral key plan at a separate view;
- Site boundaries in RED;
- All building setbacks, building outline and basement outlines;
- All building plots, and area for communal use/open space for building coverage and communal open space calculations shall be shown as separate plots;
- Parcels of land for vesting such as road widening and drainage reserve etc. shall be shown as separate plots;
- Road reserve lines and drainage reserve lines shall be indicated clearly on plan;
- Existing ground levels for the subject site and adjoining sites immediately across the common boundaries (more than 1m beyond the subject site) & proposed platform levels shall be included. Proposed earthwork (cut and fill) shall be clearly indicated and modelled in the models;
- Retaining walls or boundary wall, if any, shall be indicated;
- 2 m planting strip provision if any ,shall be indicated clearly;
- Access arrangement, road name text, road centre lines, road kerbs and road categories shall be indicated clearly; and
- Plot boundaries and plot numbers of right of way/easement, parkway reserve, if applicable, shall be indicated clearly.

3. Floor Plans

- Grids and grids dimension to show the total length or width of the building, as well as the distance between structural columns;
- Rooms and/ or space usage; and
- Platform level.

4. Elevations and Sections

- Grids and grids dimension to show the total length or width of the building, as well as the distance between structural columns;
- Room and/ or space usage;
- Floor to floor height;
- Specify top level of the building (SHD);
- Basement protrusions, if any;
- Lines of existing ground level;
- Retaining walls, if any;
- Minimum crest level as required by PUB; and
- Minimum platform level as required by PUB.

B. 3D Views

3D Views shall follow the **BIM e-Submission Template Guides.**

1. Part 3D

3D floor plans corresponding to each floor plan shall be provided. Part 3D Views shall show all necessary information of:

- Non- typical floor level; and
- Typical floor level.

In addition, appropriate Part 3D views shall also be included to explain the critical part of design (e.g. retaining wall, basement protrusions, earth work etc.) in the proposal.

2.2 Unit/Unit Plan

Unit/ Strata Unit Plan shall follow the **BIM e-Submission Template Guides.**

A. 2D Views

All views shall contain the following information generated from BIM.

1. Area Plan

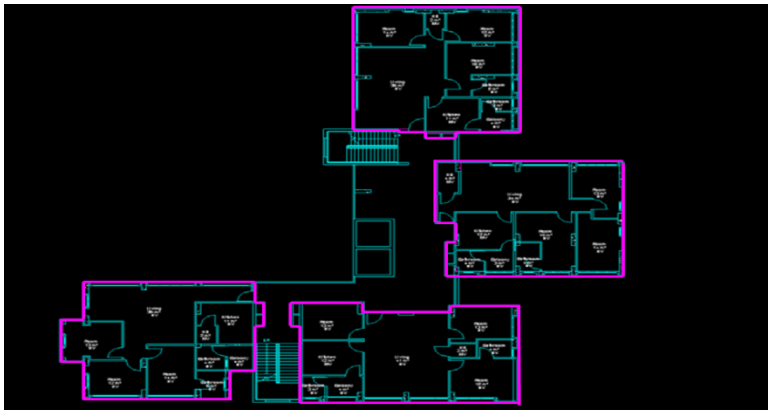
Fig. 10 - Example of Unit Plan view naming

Area Plan (Unit)

- URA_ AP_01_UNIT
- URA _AP_02_UNIT

- Area usage; and
- Floor area of each unit per floor.

Fig. 10a - Example of Unit Plan view



B. Schedules

Schedules are the extracted information from BIM.

Schedules shall follow the **BIM e-Submission Template Guides.**

Table 16 - Summary of Unit

Unit No.	Unit Type	Unit Area (sqm)	Unit Use
1st Storey			
01-01	A(1)	28.51	Shop
01-02	A(2)	28.51	Shop
01-03	B(1)	29.38	Shop
01-04	B(2)	29.38	Shop
01-05	B(3)	29.38	Shop
01-06	C(1)	91.8	Restaurant
2nd Storey			
02-01	D(1)	65.26	Residential
02-02	D(2)	65.26	Residential
02-03	D(3)	65.26	Residential
02-04	E(1)	95.82	Residential
02-05	E(2)	95.82	Residential

2.3 Sky Terrace

A. 2D Views

For proposed sky terraces that are to be exempted from the GFA, the following information is required to be incorporated in the submitted plan/model:

- The extent of the areas to be exempted by indicating the 45-degree line with dimensions;
- Computation details for the residual area and the extent of perimeter opening (at least 60 % must be opened); and
- The sky terrace areas that are within the 45-degree line and the residual areas are to be clearly illustrated and annotated as shown in Figure 1 & Figure 2 (refer to *Annex I C - URA Requirements*) Appropriate part 3D floor and sectional plans/models shall also be provided.

2.4 Envelop Control

For all proposals involving new erection or reconstruction works to landed houses, using Massing object (Please refer to software specific guide) showing the permissible building envelope shall be provided. The object shall comply with the relevant requirements as stated in the Envelope Control Guidelines for Landed Housing issued by URA.

Envelop control shall follow the **BIM e-Submission Template Guides.**

2.5 Building setback and buffer zone provision

For all proposals involving new erection or reconstruction of buildings, using Massing object (Please refer to software specific guide) showing the permissible building setbacks/buffer zone provisions shall be provided. The object shall comply with the relevant requirements as stated in the DC handbooks issued by URA.

Building setback and buffer zone provision shall follow the **BIM e-Submission Template Guides.**

2.6 Earthworks and existing topographic conditions

Existing ground levels for the subject site and adjoining sites immediately across the common boundaries (more than 1m beyond the subject site) & proposed platform levels shall be included. Proposed earthworks (cut and fill) and toposurface shall be clearly indicated and modelled in the 3D models. Where applicable, relevant part 3D views shall be included to explain the critical part of the earth work. In addition, the minimum crest level and platform level as required by PUB shall also be indicated.

Earthworks and existing topographic conditions shall follow the **BIM e-Submission Template Guides.**

2.7 GFA Calculation

GFA Calculation shall follow the **BIM e-Submission Template Guides.**

A. 2D Views

All views shall contain the following information generated from BIM.

Separate calculation plans/area plans and drawing views shall be provided for all the required calculations. All calculations shall be based on the latest Handbook on Gross Floor Area (*http://www.ura.gov.sg/circulars/text/dcdqfahb_d0e4.htm*).

1. Area Plan

Fig. 10b - Example of GFA Area Plan view naming

Area Plan (URA Caln)
- URA_ AP_01_TGFA
- URA _AP_02_TGFA
- URA_AP_01_EGFA
- URA_AP_01_IGFA
- URA_AP_SITE
- URA_AP_COS
- URA_AP_COVR

- Area usage;
- Floor area of each demarcated area that to be included in the GFA calculation. Boundary lines of the area's tag shall follow the current GFA guidelines (e.g. to include the thickness of external walls). To do this, QPs are required to define the external boundary lines of either the areas or unenclosed spaces (e.g. balconies and terraces),
- Service Ducts without floor slabs and voids shall be indicated clearly with crosses;
- If applicable, details calculations on quantum use and secondary use shall be incorporated;
- If applicable, details calculations on area to be computed over and above the Master Plan allowable gross plot ratio shall be incorporated;
- If applicable, detailed calculations on GFA exemption items shall be incorporated; and
- Detailed calculations on Building Coverage and Communal Open Space shall be incorporated.

B. Schedules

Schedules are the extracted information from BIM. A summary of GFA breakdown, GFA Exempted, Incentive GFA, Building Coverage and Communal Open Space computations (as shown below) shall be tabulated and placed in sheets.

Table 17 - Summary of Gross Floor Area (GFA)

SUMMARY OF GROSS FLOOR AREA									
Blk No.	Storey	GFA (m2)	Breakdown of Gross Floor Area (m2)						
			Commercial	Residential	Hotel	Industry	Warehouse		
1	Basement								
	1st Storey								
	2nd Storey								
	3rd Storey								
	Roof								
	Subtotal:								
2	Basement								
	1st Storey								
	2nd Storey								
	3rd Storey								
	Roof								
	Subtotal:								
Total									
Quantum %									

Table 18 - Summary of GFA Exempted

SUMMARY OF INCENTIVE (EXEMPTED) GFA							
Blk No.	Storey	GFA (m2)	Breakdown				
			e.g. Communal Landscaped Areas	*e.g. Covered Walkways*	*e.g. Thur Block/ Upp Level Linkages*	*e.g. Sky Terrace*	
1	Basement						
	1st Storey						
	2nd Storey						
	3rd Storey						
	Roof						
	Subtotal:						
2	Basement						
	1st Storey						
	2nd Storey						
	3rd Storey						
	Roof						
	Subtotal:						
Total:							

Table 19 - Summary of Bonus GFA

SUMMARY OF INCENTIVE (BOUNS) GFA							
Blk No.	Storey	GFA (m2)	Breakdown				
			e.g. Balcony				
1	Basement						
	1st Storey						
	2nd Storey						
	3rd Storey						
	Roof						
	Subtotal:						
2	Basement						
	1st Storey						
	2nd Storey						
	3rd Storey						
	Roof						
	Subtotal:						
Total:							

Table 20 - Site Coverage Computation

SITE COVERAGE COMPUTATION			
1.	Site		**0.00 Sqm**
2.	Plots To Be Excluded	Road Reserve	0.00 Sqm
		Drainage Reserve	0.00 Sqm
		Others	0.00 Sqm
3.	Net Site Area (Item 1 - Total Of Item 2)		**0.00 Sqm**
4.	Site Coverage Area	Block 1	0.00 Sqm
		Block 2	0.00 Sqm
		Block 3	0.00 Sqm
		Block 4	0.00 Sqm
		Block 5	0.00 Sqm
		Block 6	0.00 Sqm
		Block 7	0.00 Sqm
		Block 8	0.00 Sqm
		Ancillary Building	0.00 Sqm
		Clubhouse	0.00 Sqm
		ESS	0.00 Sqm
		Guard House	0.00 Sqm
		Carpark Shed	0.00 Sqm
		Total	**0.00 Sqm**
5.	Proposed Site Coverage (%)	$\frac{\text{Site Coverage Area}}{\text{Net Site Area}}$ X 100%	**0.00 %**

Table 21 - Communal Open Space Computation

COMMUNAL OPEN SPACE COMPUTATION			
1.	Net Site Area		**0.00 Sqm**
2.	Plots To Be Excluded	Building and other ancillary structure which are already included in site coverage	0.00 Sqm
		Driveways & Car parks	0.00 Sqm
		Fire- engine hard- standing ground	0.00 Sqm
		Voids at ground level overlooking basement (void space)	0.00 Sqm
		Private Enclosed Space	0.00 Sqm
		Total	**0.00 Sqm**
3.	Communal Open Space (Net Site Area - Total Of Item 2)		**0.00 Sqm**
4.	Communal Open Space (%)	$\frac{\text{Communal Open space Area}}{\text{Net Site Area}}$ X 100%	**%**

2.8 Landscape Plan

A. 2D Views

The landscape plan shall be submitted with the application for submission with covered communal landscaped area, landscaped deck or sky terrace.

1. Landscape Plans

- Location and species of proposed small to medium size shade trees are to be shown on plan;
- A legend for the proposed trees shall be provided;
- All proposed green buffer/planting verges shall be indicated as tree planting strip only;
- Widths of all proposed planting provision provided shall be indicated; and
- All slopes shall be shown on plan with standard symbols. The gradients of all proposed slopes shall also be clearly indicated.

2. Sections

- Sections showing the depth of the planting beds.

2.9 Core Information for URA Submissions

Core Information listed are minimum information for URA submissions that shall be incorporated in BIM.

> Core Information shall follow the **BIM e-Submission Template Guides.**

Table 22 - Core Information for URA Submissions

Development Control			
Building Element	**Name**	**Data List**	**Remarks**
Grid	Name/Type	<Manual>	*Default*
Level	Name	<Manual>	*Default*
	SHD Value	<Auto>	Level value of the development that fulfill PUB's and URA's requirement
Area (Non- geometry)	Name/Type	<Manual>	*Default*
	Usage	Yes/ No	Added in template
	Area Type	<Manual>	*Default*
Column (Architectural)	Name/Type	<Manual>	*Default*
	Level	<Manual>	*Default*
Door	Name/Type	<Manual>	*Default*
	Dimension	<Manual>	*Default*
	Level	<Manual>	*Default*
Floor/ Slab	Name/Type	<Manual>	*Default*
	Thickness	<Manual>	*Default*
	Level	<Manual>	*Default*
Parking Lot	Name/Type	<Manual>	*Default*
	Level	<Manual>	*Default*
	Dimension	<Manual>	*Default*
Ramp	Name/Type	<Manual>	*Default*
	Thickness	<Manual>	*Default*
	Level	<Manual>	*Default*
	Slope Gradient	<Auto>	*Default*
Railing	Name/Type	<Manual>	*Default*
	Height	<Manual>	*Default*
	Level	<Manual>	*Default*

Roof	Name/Type	<Manual>	*Default*
	Level	<Manual>	*Default*
	Material	<Manual>	*Default*
Room/ Space (Non- geometry)	Name	<Manual>	*Default*
	Level	<Auto>	*Default*
Staircase	Name/Type	<Manual>	*Default*
	Level	<Auto>	*Default*
	Riser Height	<Auto>	*Default*
	Run Width	<Auto>	*Default*
	Tread Depth	<Auto>	*Default*
	Number of Risers	<Auto>	*Default*
	Material	<Manual>	*Default*
Wall	Name/Type	<Manual>	*Default*
	Level	<Manual>	*Default*
	Material	<Manual>	*Default*
Window	Name/Type	<Manual>	*Default*
	Dimension	<Manual>	*Default*
	Level	<Manual>	*Default*
Topography	Z points value	<Auto>	Z points value shall be taken from Registered Land Surveyor
	Phase Created	<Existing/New Construction>	*Default*
Plants/Trees	Name/Type	<Manual>	*Default*
	Phase Created	<Existing/New>	*Default*
	Dimension	<Manual>	*Default*
Boundary Line	Area	<Auto>	*Default*

NATIONAL ENVIRONMENT AUTHORITY (NEA)

3 NEA-CBPD REQUIREMENTS

All NEA-CBPD BIM Submissions shall meet the following requirements specified under:

- Singapore BIM Guide- Modelling Requirements
- BIM e-Submission Template Guides

Complete and updated set of BIM guides can be found at *www.corenet.gov.sg*

Requirements for NEA-CBPD Submissions

The individual section below covers the specific presentation requirements necessary for each of the drawing views submitted to CBPD at the various stages below:

3.1 Development Control;
3.2 Building Plan on Pollution Control; and
3.3 Building Plan on Environmental Health.

3.1 Development Control

A. Site Plan View

In specific, all key plan, location plan and site plan of development control shall show the following:

1. Key Plan

- Development boundary in RED; and
- Outline of neighbouring development plots or buildings within 1km radius shall be shown.

2. Location Plan

- Development boundary in RED; and
- Outline of neighbouring development plots or buildings and MRT tracks, within a 100m radius shall be shown.

3. Site Plan

- Layout of the site boundary in RED;
- Outline of adjacent buildings or structure;
- Building setback from MRT track or Major Aerial Road (i.e. Cat 1 or Cat 2);
- Bin Centre location and vehicular access and sanitary drainage system; and
- Existing road levels or ground levels.

B. Floor Plan View

In specific, all basement, 1st storey and higher storey plan of development control shall show the following:

1. Basement Plan

- For industrial development, use of floor space for industrial processes or activities;
- Provision for pollution control equipment;
- Toilets, refuse chute chambers, car washing bays, garage gully and oil interceptor;
- Food shops and grease traps; and
- Bin Centre location, vehicular access to the bin centre and sanitary drainage system.

2. First Storey Plan

- For industrial development, use of floor space for industrial processes or activities;
- Provision for pollution control equipment;
- Bin centre and vehicular access to the bin centre and sanitary drainage system;
- Location of refuse chute chambers and sanitary drainage system;
- Proposed or existing platform level, adjacent road/ground levels at the outlet discharge points of internal drains; and
- Link to MRT station and /or existing building link to MRT station, if any.

3. Second Storey to Highest Storey Plan (for industrial buildings only)

- For industrial development, use of floor space for industrial processes or activities; and
- Provision for pollution control equipment.

C. Roof Plan View

In specific, the roof plan of development control shall show the following:

- For industrial buildings, location of flue gas stacks and chimneys;
- Provision for pollution control equipment;
- Private roof terraces, gardens, common areas, common staircases;
- Refuse chute, refuse chute ventilation openings, maintenance access to the refuse chute; and
- Roof gutter, rain water channel or or scupper drains (if any), parapet walls, railings and gradient of roof fall.

D. Elevation View

In specific, the elevation view of development control shall show the following:

- For industrial buildings, location of flue gas stacks and chimneys;
- Provision for pollution control equipment;
- Building height;
- Refuse chute ventilation openings, roof gutter or scupper drains (if any), parapet walls, railings and gradient of roof fall;
- Bin centre and the height of roller shutter to the floor; and
- Provision for kitchen exhaust location, its termination point and its air direction flow at the roof level.

3.2 Building Plan on Pollution Control

A. Site Plan View

In specific, all key plan, location plan or site plan of pollution control shall show the following:

1. Key Plan

- Development boundary in RED; and
- Outline of neighbouring development plots or buildings within 1km radius shall be shown.

2. Location Plan or Site Plan

- Development boundary in RED; and
- Outline of neighbouring development plots or buildings and MRT tracks, within a 100m radius shall be shown.

B. Floor Plan View

In specific, all basement, 1st storey and higher storey plan of pollution shall show the following:

1. Basement Plan

- All details or processes inside the basement of the building;
- Trade effluent drainage or piping system to collect and convey trade effluent generated;
- Location of trade effluent treatment plant;
- Location of trade effluent sampling sump or system and the connection to the internal sanitary drainage system;
- Open process areas which may cause contamination to rain water and system to collect contaminated rain water and system of treatment before discharge to open drain;
- Types and locations of fuel burning equipment;
- Locations of air pollution control equipment;
- Containment facility for storage tanks;
- Locations of toxic industrial water treatment and disposal facilities;
- Containment facilities for generator; and
- Car washing bays, garage gully or oil interceptor.

2. First Storey Plan

- All details or processes inside the first storey of the building;
- Trade effluent drainage or piping system to collect and convey trade effluent generated;
- Location of trade effluent treatment plant;
- Location of trade effluent sampling sump or system and the connection to the internal sanitary drainage system;
- Location of Last Inspection Chamber (includes pH monitoring and discharge control system);
- Open process areas which may cause contamination to rain water and system to collect contaminated rain water and system of treatment before discharge to open drain;
- Types and locations of fuel burning equipment;
- Locations of air pollution control equipment;
- Containment facility for storage tanks;
- Locations of toxic industrial water treatment and disposal facilities;
- Location of containment facilities for generator; and
- Air intake or exhaust points for mechanical ventilation system.

3. Second Storey to Highest Storey Plan

- All processes or activities inside the second to highest storey of the building;
- Trade effluent drainage or piping system to collect and convey trade effluent generated;
- Location of trade effluent treatment plant;
- Location of trade effluent sampling sump or system and the connection to the internal sanitary drainage system;
- Open process areas which may cause contamination to rain water and system to collect contaminated rain water and system of treatment before discharge to open drain;
- Types and locations of fuel burning equipment;
- Locations of air pollution control equipment;
- Containment facility for storage tanks;
- Locations of toxic industrial water treatment and disposal facilities; and
- Air intake or exhaust points for mechanical ventilation system.

C. Roof Plan View

In specific, the roof plan of pollution control shall show the following:

- Location of chimneys for the dispersion of flue gases;
- Types and locations of fuel burning equipment;
- Stacks for the dispersion of exhaust gases;
- Cooling towers location and its overflow or drain-off point;
- Locations of air pollution control equipment; and
- Air intake or exhaust points for mechanical ventilation system.

D. Elevation View

In specific, the elevation of pollution control shall show the following:

- Flue gas stacks and chimneys;
- Types and locations of fuel burning equipment;
- Building height;
- Air pollution control equipment;
- Trade effluent treatment plant and toxic industrial water treatment and disposal facilities; and
- Air intake or exhaust points for mechanical ventilation system.

3.3 Building Plan on Environmental Health

A. Site Plan View

In specific, all key plan, location plan and site plan of environmental health shall show the following:

1. Key Plan

- Boundary of development site shall be edged RED; and
- Outline of neighbouring development plots or buildings within 1km radius shall be shown.

2. Location Plan

- Boundary of development site shall be edged RED; and
- Outline of neighbouring development plots or buildings and MRT tracks, within a 100m radius shall be shown.

3. Site Plan

Layout of the site with boundary lines verged in RED.

- Neighbouring buildings;
- Neighbouring clean and light industrial buildings (if any) within 50m setback distance;
- Overhead MRT within 35m setback distance from building or structure; and
- Bin centre and access, swimming pool and restaurant/foodshops.

B. Floor Plan View

In specific, the basement, 1st storey and higher storey floor plan of environmental health shall show the following:

1. Basement Plan

- Refuse chute chambers and sanitary drainage system;
- Sanitary facilities i.e. toilets;
- Food shops.

2. First Storey Plan

- MRT setback lines and distance;
- Bin centre and access;
- Swimming pool, open spa or jacuzzi;
- Refuse chute chambers and sanitary drainage system;

- Sanitary facilities or toilets; and
- Food shop and its kitchen or food preparation area, outdoor refreshment area (if any) and washing area, sanitary pipes, drip tray, double floor slab, hood and flue system and grease trap;

3. Second Storey to Highest Storey Plan

- Swimming pool, open spa or Jacuzzi;
- Restaurant;
- Refuse chute chambers and sanitary drainage system;
- Sanitary facilities i.e. toilets; and
- Food shop and its kitchen or food preparation area and washing area, overhead sanitary pipes in food shop kitchens, drip tray, double floor slab, hood and flue system.

C. Roof Plan View

In specific, the roof plan of environmental health shall show the following:

- Location and ventilation openings for refuse chutes, common areas, maintenance access to refuse chutes;
- Roof gutter or scupper drains (if any), parapet walls or railing, permanent and safe access to the roof gutters or roof scupper drains; and
- Kitchen exhausts for foodshops.

D. Elevation View

In specific, the elevation view of environmental health shall show the following:

- Refuse chutes and their ventilation openings, roof gutters or scupper drains (if any), parapet walls, railings;
- Building height;
- Bin centre; and
- Proposed boundary fence or walls.

PUBLIC UTILITIES BOARD (PUB)

4 PUB REQUIREMENTS

All PUB BIM Submissions shall meet the following requirements specified under:

- Singapore BIM Guide- Modelling Requirements
- BIM e-Submission Template Guides
- Code of Practice on Surface Water Drainage
- Code of Practice on Swewerage and Sanitary Works

Complete and updated set of BIM guides can be found at *www.corenet.gov.sg*

Requirements for PUB Submissions

The individual section below covers the specific presentation requirements necessary for each of the drawing views submitted to PUB at the various stages below:

4.1 Development Control;
4.2 Detailed Plan on Sewerage Works (Proposed Sewer/ Sewer Diversion Works);
4.3 Detailed Plan on Sanitary Works (for Sanitary Plumbing & Drainage System/ Sewer Connection);
4.4 Detailed Plan on Sewerage M&E Works;
4.5 Detailed Plan on Drainage Works – Main Development Submission;
4.6 Detailed Plan on Drainage Works – Proposed Roadside Drain Culvert;
4.7 As-built Plan for TOP/CSC – Proposed Sewer/ Pumping Mains/ Sewer/ Pumping Main Diversion Works;
4.8 As-built Plan for TOP/CSC – Sanitary Works (Sanitary Plumbing & Drainage System/ Sewer Connection);
4.9 As-built Plan for TOP/CSC – Proposed Roadside Drain/ Culvert;
4.10 As-built Plan for TOP/CSC – Pumped Drainage System at Basement;
4.11 As-built Plan for TOP/CSC – Internal Drain with Deviations;
4.12 Certified Survey Plan for CSC – Development in the vicinity of/ affected by Drainage Reserve; and
4.13 URA Approved Sub-division Plan for CSC – for Site affected by Drainage Reserve.

4.1 Development Control

A. Site Plan View

In specific, all key plan, location plan and site plan of development control shall show the following:

1. Key Plan

- Development boundary in RED; and
- Outline of neighbouring development plots or buildings within 1km radius shall be shown.

2. Location Plan

- Development boundary in RED; and
- Outline of neighbouring development plots or buildings and MRT tracks, within a 100m radius shall be shown.

3. Site Plan

- Layout of the site boundary in RED;
- Outline of adjacent buildings or structure;
- Building setback from MRT track;
- Existing sewers (including DTSS tunnels), pumping mains and sewerage facilities, including their sizes, as reflected in Sewerage Interpretation Plans, within 25m of development boundary;
- Building setback from sewers or pumping mains and setback distance from structures or buildings;
- Bin Centre location and vehicular access;
- Existing Drainage reserves, entrance culverts or roadside drains;
- Proposed sewers or pumping mains or drains, sewer or pumping main or drain diversion work, holding tank or sewage treatment plant or pump sump;
- Existing or proposed point of sewer connection;
- Existing or proposed internal drains serving the development site from summit points to its outlet connection to the existing or proposed roadside drain or outlet drain; and
- Existing road levels or ground levels at the outlet discharge point of internal drains.

B. Floor Plan View

In specific, all basement, 1st storey and higher storey plan of development control shall show the following:

1. Basement Plan

- Provision for pump sewerage system, if used water is generated;
- Existing, proposed and abandoned sewers, pumping mains, sewer connection for the proposed development, sewer connection from the neighbouring development in the proposed development site (if any), including all their sizes, manholes, discharge chambers, their top and invert levels, and their setback from buildings, structures, piles/ footings;
- Existing and proposed finished floor levels;
- Reinforced concrete trench for sewer that do not meet building setback requirements, if any;
- All entrance or openings to the basement, platform levels, cut-off drains, crest levels, threshold levels and drainage pump system;
- Areas open to sky to be served by pumped drainage system.

2. First Storey Plan

- Existing, proposed and abandoned sewers, pumping mains, sewer connection for the proposed development, sewer connection from the neighbouring development in the proposed development site (if any), including all their sizes, manholes, discharge chambers, their top and invert levels, and their setback from buildings, structures, piles/ fottings;
- Existing and proposed finished floor levels;
- The last inspection chamber, pipe size， the top and invert of the last IC and connecting manhole;
- Reinforced concrete trench for sewer that do not meet building setback requirement, if any;
- Drainage reserve and its alignment and width;
- Common drains and its alignment and flow of existing common drain within the development site, layout of internal drainage system and discharge point to the public drains and the drain size;
- Proposed or existing platform level, crest level, adjacent road/ground levels at the outlet discharge points of internal drains;
- Proposed Linkages to special underground facilities (e.g. MRT station) and /or existing building linkages to special underground facilities, if any;

- Proposed detention tank system shall be dimensioned. To indicate the effective depth, the connection point to upstream internal drains and connection point to downstream internal and external drains;
- Hydraulic calculations or modelling results of detention tank system shall be separately submitted to PUB C&W Department for approval;
- Proposed flood barriers at points of entry and exit for building premises, if any.

C. Elevation View

In specific, the elevation view of development control shall show the following:

- Building height;
- Sewer setback from building or structures;
- Location and width of reinforced concrete trench;
- Drainage reserve, common drains, roadside or external drains, existing and proposed boundary fence or walls; and
- Structures closer than 2.0m from the edge of the Drainage Reserve.

4.2 Detailed Plan on Sewerage Works (Proposed Sewer/ Sewer Diversion Works)

A. Site Plan View

In specific, all key plan and site plan of proposed sewer or sewer diversion works shall show the following:

1. Key Plan

- Boundary of development site shall be edged RED; and
- Outline of neighbouring development plots or buildings within 1km radius shall be shown.

2. Site Plan

- Layout of the site with boundary lines verged in RED;
- Proposed or existing sewer or pumping main or diversion, and their setback distance from building or structures or Drainage Reserve or neighbouring lot;
- Reinforced concrete trench with removable slabs (annotated on the plan) for existing or proposed sewer under building or structures or with insufficient setback from building or structures;
- Invert or top and pipe size levels of the connecting manhole(s); and
- Provision of pump sump or holding tank or sewage treatment plant.

B. First Storey Floor Plan View

In specific, the 1st storey floor plan of proposed sewer or sewer diversion works shall show the following:

- Proposed or existing sewer or pumping main or diversion, and their setback distance from building or structures or Drainage Reserve or adjacent lot;
- Reinforced concrete trench with removable slabs (annotated on the plan) for existing or proposed sewer under building or structures or with insufficient setback from building or structures;
- Pipe size and invert or top levels of the connecting manhole(s); and
- Provision of pump sump or holding tank or sewage treatment plant.

C. Elevation View

In specific, the elevation view of sewer or sewer diversion works shall show the following:

- Headroom for overhanging structures or roof eaves above existing or proposed sewer or pumping main;
- Pipe size and invert levels of the existing or proposed sewer or pumping mains and their setback distance from building or structures;
- Reinforced concrete trench with removable slabs (annotated on the plan) for existing or proposed sewer under building or structures or with insufficient setback from building or structures;
- Width or reinforced concrete trench;
- Pipe size and invert or top levels of the connecting manhole(s);
- Building height;
- Proposed boundary fence or walls; and
- Pump sump or holding tank or sewage treatment plant.

D. Longitudinal Section View

In specific, the section view of sewer or sewer diversion works shall show the following:

- All existing or proposed manholes and sewers or pumping mains and its materials, pipe sizes, distance, gradient and invert or top levels of manhole with tumbling bay or backdrop connections (if any);
- Method of laying and pipe haunching details; and
- Headroom clearance of overhanging or overhead structures.

4.3 Detailed Plan on Sanitary Works (for Sanitary Plumbing & Drainage System/ Sewer Connection)

Please refer to clause 5.2 of the Code of Practice for BIM e-Submission (MEP Requirements)

4.4 Detailed Plan on Sewerage M&E Works

Please refer to clause 5.2 of the Code of Practice for BIM e-Submission (MEP Requirements)

4.5 Detailed Plan on Drainage Works – Main Development Submission

A. Site Plan View

In specific, all location plan and site plan of drainage works for main development submission shall show the following:

1. Location Plan

- Boundary of development site shall be edged RED; and
- Outline of neighbouring development plots or buildings and MRT tracks, within 100m radius shall be shown.

2. Site Plan

- Boundary of development site shall be edged in RED ;
- Proposed platforms levels and road or ground levels at the outlet discharge point of the internal drains;
- Drainage reserves and common drains, which shall also be dimensioned;
- Lots or plot number of development;
- The alignment, type, size and flow direction of the existing roadside drain or outlet drain adjacent to the development site and existing common drain, if any;
- Internal drains incorporating flow direction and outlet discharge points connecting to the existing drains; and
- If the development site is affected by common drain, the following requirements are to be endorsed on site plan:
    i. Surface runoff from the proposed site and all neighbouring lots shall continue to be allowed to discharge through the common drain within the premises; and
    ii. The owner shall be responsible for the maintenance of the common drain within their premises.

B. Floor Plan View

In specific, the basement and 1st storey floor plan of drainage works for main development submission shall show or indicate the following:

1. Basement Plan

- Cut-off drains;
- Crest level of entrances and openings comply with "Code of Practice on Surface Water Drainage" and to indicate on plan;
- Pumped drainage system complies with "Code of Practice on Surface Water Drainage" to indicate on plan;
- Proposed basement platform level, fronting and adjacent road levels of development;
- Details of pumped drainage system shall be submitted separately for PUB C&W Department's record;
- The areas in meter square (m2)
- Underground linkage to MRT Station or underground linkage to development having underground linkage to MRT Station.

2. First Storey Plan

- Proposed platforms levels for all areas;
- Drainage reserves which shall also be dimensioned;
- Site boundary;
- Road reserve or road widening line and road levels;
- Runoff from neighbouring lot and type, size of the common drain affected by the development;
- Proposed or existing drainage provided for runoff from neighbouring lot;
- Internal drains incorporating flow direction and outlet discharge points connecting to the external drains;
- Outlets discharge points of the proposed or existing internal drains connecting to the existing or proposed drains; and
- Crest level for all entrances or openings to the basement or proposal linkage to underground MRT Station;
- Proposed detention tank system shall be dimensioned. To indicate the effective depth, the connection point to upstream internal drains and connection point to downstream internal and external drains;
- Proposed flood barriers at points of entry and exit for building premises, if any
- Details of the Standard Operation Procedure on the operation and maintenance of the detention system (including pumped discharge system, if applicable) and

the flood barrier system shall be separately submitted to PUB C&W Department for record.

4.6 Detailed Plan on Drainage Works – Proposed Roadside Drain/ Culvert

A. Site Plan View

All location plan and site plan of drainage works for proposed roadside drain or culvert shall show or indicate the following:

1. Location Plan

- Boundary of development site shall be edged RED; and
- Outline of neighbouring development plots or buildings and MRT tracks, within 100m radius shall be shown.

2. Site Plan

- Boundary of development site shall be edged RED;
- Alignment and extent of proposed drain;
- Highlight the proposed drain;
- Summit point and direction of flow of proposed drain;
- Width and type of proposed drain;
- Road reserve or widening line or boundary line;
- Drainage reserve lines with dimensions (if applicable);
- Invert levels, top levels and road or ground levels;
- Size and spacing of grating covers for closed drain; and
- Drop inlet chambers and scupper drains.

B. Floor Plan View

In specific, the 1st storey floor plan of drainage works for proposed roadside drain or culvert shall show or indicate the following:

- Alignment and extent of proposed drain;
- Highlight the proposed drain;
- Summit point and direction of flow of proposed drain;
- Width and type of proposed drain;
- Road reserve or widening line or boundary line;
- Drainage reserve lines with dimensions (if applicable);
- Invert levels, top levels and road or ground levels;
- Size and spacing of grating covers for closed drain; and
- Drop inlet chambers and scupper drains.

C. Cross Sectional View

In specific, the cross section of drainage works for proposed roadside drain or culvert shall show the following:

- Boundary line or road reserve line and drainage reserve line, if applicable;
- Clear width, minimum and maximum depth;
- Type and size of Dry Weather Flow channel;
- Type of safety railings, if applicable;
- Thickness of walls, top and base slab;
- Reinforced details and grade of concrete;
- 300mm thick false bottom, if applicable;
- Weep holes, hardcore backing and geotextile;
- Lean concrete and hardcore sub base;
- Aluminium rungs, if applicable;
- Cross fall of benching;
- Cross section of ramp within maintenance access, if applicable;
- Steel posts and chains across maintenance access, if applicable; and
- Details of box drain connections within drainage reserve, if applicable.

D. Longitudinal Section View

In specific, the longitudinal section of drainage works for proposed drain/ culvert shall show the following:

- Existing and proposed invert levels;
- Soffit, coping, ground and road levels;
- Extent, size and type of proposed drain or culvert;
- Gradient and direction of flow of proposed drain or culvert;
- Clear depth and chainages; and
- Size and type of existing drain at both ends of the proposed drain or culvert.
- Slab Crossing Over Existing Drain shall show the following:
    i. Cross section of proposed slab over drain;
    ii. Dimension clearance between cope of drain and soffit of slab;
    iii. Dimension clearance between pile cap or footing and drain-wall;
    iv. Endorsement on maintenance and removal of slab by owner as and when required by PUB;
    v. Safety railings, if applicable;
    vi. Boundary line or road widening line;
    vii. Concrete paving on ground below the slab;
    viii. Cross fall of concrete paving; and
    ix. Show location of slab crossing on site or 1st storey plan.

4.7 As-built Plan for TOP/CSC – Proposed Sewer/ Pumping Mains/ Sewer/ Pumping Main Diversion Works

A. Site Plan View

In specific, all key plan and site plan of TOP/CSC sewer or pumping mains or sewer or pumping main diversion works shall show the following:

1. Key Plan

- Boundary of development site shall be edged RED; and
- Outline of neighbouring development plots or buildings within 1km radius shall be shown.

2. Site Plan

- Layout of the site with boundary lines verged in RED;
- Proposed or existing sewer or pumping main or diversion, gradient, and their setback distance from building or structures or Drainage Reserve or neighbouring lot;
- Reinforced concrete trench with removable slabs (annotated on the plan) for existing or proposed sewer under building or structures or with insufficient setback from building or structures;
- Invert and top levels of the connecting manhole(s); and
- Provision of pump sump or holding tank or sewage treatment plant; and
- Party maintaining.

B. First Storey Floor Plan View

In specific, the 1st storey floor plan of TOP/CSC sewer or pumping mains or sewer or pumping main diversion works shall show the following:

- Proposed or existing sewer or pumping main or diversion, gradient, and their setback distance from building or structures or Drainage Reserve or adjacent lot;
- Reinforced concrete trench with removable slabs (annotated on the plan) for existing or proposed sewer under building or structures or with insufficient setback from building or structures;
- Invert level of the connecting manhole(s); and
- Provision of pump sump or holding tank or sewage treatment plant.

C. Elevation View

In specific, the elevation view of TOP/CSC sewer or pumping mains or sewer or pumping main diversion works shall show the following:

- Headroom for overhanging structures or roof eaves above existing or proposed sewer or pumping main;
- Existing or Proposed Sewer or pumping mains setback distance from building or structures;
- Reinforced concrete trench with removable slabs (annotated on the plan) for existing or proposed sewer under building or structures or with insufficient setback from building or structures;
- Invert level of the connecting manhole(s);
- Building height;
- Proposed boundary fence or walls; and
- Pump sump or holding tank or sewage treatment plant.

D. Longitudinal Section View

In specific, the longitudinal section view of TOP/CSC sewer or pumping mains or sewer or pumping main diversion works shall show the following:

- All existing or proposed manholes and sewers or pumping mains, pipe sizes, material, pipe depth, gradient and platform levels, invert levels of tumbling bay or backdrop connections to manholes;
- Pipe haunching details and type of foundation;
- Method of construction (jacking, open cut, etc); and
- Headroom clearance of overhanging or overhead structures.

Note: Legend for sewers or pumping mains or drainlines as follows:

Colour	**Usage**
Magenta	Deviations (Compared to Detailed Plan)
Cyan	Existing (Compared to Detailed Plan)
Yellow	Demolished or Abandoned sewers or drainlines (Compared to Detailed Plan)

4.8 As-built Plan for TOP/CSC – Sanitary Works (Sanitary Plumbing & Drainage System/ Sewer Connection)

Please refer to clause 5.3 of the Code of Practice for BIM e-Submission (MEP Requirements)

4.9 As-built Plan for CSC – Proposed Roadside Drain/ Culvert

A. Site Plan View

In specific, the location and site plan of CSC proposed roadside drain or culvert shall show or indicate the following:

1. Location Plan

- Boundary of development site shall be edged RED; and
- Outline of neighbouring development plots or buildings and MRT tracks, within 100m radius shall be shown.

2. Site Plan

- Boundary of development site shall be edged RED;
- Alignment and extent of proposed drain;
- Highlight the proposed drain;
- Summit point and direction of flow of proposed drain;
- Width and type of proposed drain;
- Road reserve or widening line or boundary line;
- Drainage reserve lines with dimensions (if applicable);
- Invert levels, top levels and road or ground levels;
- Size and spacing of grating covers for closed drain; and
- Drop inlet chambers and scupper drains.

B. Cross Sectional View

In specific, the cross section of CSC proposed roadside drain or culvert shall show the following:

- Boundary line or road reserve line and drainage reserve line, if applicable;
- Clear width, minimum and maximum depth;
- Type and size of Dry Weather Flow channel;
- Type of safety railings, if applicable;
- Thickness of walls, top and base slab;
- Reinforced details and grade of concrete;
- 300mm thick false bottom, if applicable;

- Weepholes, hardcore backing and geotextile;
- Lean concrete and hardcore sub base;
- Aluminium rungs, if applicable;
- Cross fall of benching;
- Cross section of ramp within maintenance access, if applicable;
- Steel posts and chains across maintenance access, if applicable; and
- Details of box drain connections within drainage reserve, if applicable.

C. Longitudinal Section View

In specific, the longitudinal section of CSC proposed roadside drain or culvert shall show the following:

- Existing and proposed invert levels;
- Soffit, coping, ground and road levels;
- Extent, size and type of proposed drain or culvert;
- Gradient and direction of flow of proposed drain or culvert;
- Clear depth and chainages; and
- Size and type of existing drain at both ends of the proposed drain or culvert.

Note: Legend for proposed roadside or culvert as follows:

Colour	**Usage**
Magenta	Deviations (Compared to Detailed Plan)
Cyan	Existing (Compared to Detailed Plan)
Yellow	Demolished or Abandoned sewers or drainlines (Compared to Detailed Plan)

4.10 As-built Plan for CSC – Pumped Drainage System at Basement

A. Floor Plan View

In specific, the basement and 1st storey plan of CSC pumped drainage system shall show or indicate the following:

1. Basement Plan

- Storm water pump, storm water storage tank; and
- Pipeline running from basement to outlet at 1st storey surface drain.

2. First Storey Plan

- Pipeline running from basement to outlet at 1ststorey surface drain; and
- Swan neck connection level of discharge pipe from pump sump tp surface gravity drain.

B. Elevation View

In specific, the elevation view of CSC pumped drainage system shall show the following:

- Storm water pump, storm water storage tank;
- Pipeline running from basement to outlet at 1st storey surface drain; and
- Swan nexk connection level of discharge pipe from pump sump to surface gravity drain.

Note: Legend for proposed roadside or culvert as follows:

Colour	**Usage**
Magenta	Deviations (Compared to Building Plan)
Cyan	Existing (Compared to Building Plan)
Yellow	Demolished or Abandoned sewers or drainlines (Compared to Building Plan)

4.11 As-built Plan for CSC – Internal Drain with Deviations

A. Site Plan View

In specific, the location and site plan of CSC internal drain with deviations shall show or indicate the following:

1. Location Plan

- Boundary of development site shall be edged RED; and
- Outline of neighbouring development plots or buildings and MRT tracks, within 100m radius shall be shown.

2. Site Plan

- Internal drain deviations from the approved plan.

B. Floor Plan View

In specific, the basement and 1st storey plan of CSC internal drain with deviations shall show or indicate the following:

1. Basement Plan

- Internal drain deviations from the approved plan.

2. First Storey Plan

- Internal drain deviations from the approved plan.

Note: Legend for proposed roadside or culvert as follows:

Colour	**Usage**
Magenta	Deviations (Compared to Detailed Plan)
Cyan	Existing (Compared to Detailed Plan)
Yellow	Demolished or Abandoned sewers or drainlines (Compared to Detailed Plan)

4.12 Certified Survey Plan for CSC – Development in the Vicinity of/ Affected by Drainage Reserve

A. Site Plan View

In specific, the site plan of certified CSC survey plan shall show or indicate the following:

- Proposed structure or foundation which is less than 300mm away from the Drainage Reserve; and
- Lots numbers of the drainage reserve, if affected.

B. Cross Section View

In specific, the cross section view of certified CSC survey plan shall show or indicate the following:

- Proposed structure or foundation which is less than 300mm away from the Drainage Reserve.

4.13 URA Approved Sub-division Plan for CSC – for Site Affected by Drainage Reserve

A. Site Plan View

In specific, the site plan of URA approved sub-division plan for CSC shall show or indicate the following:

- Sub-division Plan with separate lot number; and
- Certified Survey Plan (CP) with separate lot number.

SINGAPORE CIVIL DEFENCE SHELTER (SCDF)

5 SCDF-FSSD REQUIREMENTS

All FSSD BIM Submissions shall meet the following requirements specified under:

- Singapore BIM Guide- Modelling Requirements
- BIM e-Submission Template Guides

Complete and updated set of BIM guides can be found at *www.corenet.gov.sg*

5.1 Requirements for FSSD Submissions

The documents submitted under section 23 (1) of the Fire Safety Act shall consist of a location plan, a site plan, a floor plan of each storey, a roof plan of the building and sectional and elevation drawing of the building. All dimension and grid shall be indicated clearly on plans.

Complete and updated set regulations can be found at *www.scdf.gov.sg*

FSSD Submission Requirements

(Required Views, but not limited to)

2D Views	3D Views	Schedule
• Location Plan • Site Plan • Floor Plans; Roof Plan • Elevations • Sections	• 3D View	• Statistical Gross Floor Area (SGFA) • Unprotected Openings • Occupancy Load • Travel Distance
All 2D Views and Schedules shall be placed on sheets.		

A. 2D Views

All views shall contain the following information generated from BIM.

2D Views shall follow the **BIM e-Submission Template Guides.**

1. Location Plan

- The coloured location of the lot relative to neighbouring lots; and
  The various roads constituting the access layout in the lot.

2. Site Plan

- The means of access to the site and to the perimeter of each building for fire fighting vehicles and equipment;
- Distances between each building or fire safety works and the relevant lot boundaries, other proposed or existing buildings or installations on the site;
- The location of existing and proposed internal fire-hydrants on the site; and
- Any other feature on or in the vicinity of the site which is likely to be a fire hazard or is likely to cause obstruction to fire fighting vehicles and equipment and rescue operations.

3. Floor Plans & Roof Plan

The plan shall contain or clearly identify and show in distinct colours for the following:

- Room/ Space Usage
- Schematic drawings shall be included for the fire protection system (fire zones);
- Location of all the fire alarm panels, control valves and breeching inlets etc;
- Clear statements indicating the proposed or existing use of every part;
- Details of all openings and voids penetrating floors including their usage, dimensions and the nature and arrangement of enclosing walls and barricades;
- Clear statements indicating the design occupant load for that storey or roof for which means of escape in case of fire have been provided in accordance with the Fire Code;
- The fire resistance ratings of all elements of structure, fire doors, shutters, dampers and such other fire safety measures;
- Details of all means of escape to the external at ground level from every part of the floor such as exit doors, corridors, passageways, aisles, gangways, balconies, lobbies, ramps, exit passageways, escape and firefighting staircases and areas of refuge;

- Locations of all existing and proposed fire lifts, fire lift lobbies, the Fire Command Centre, fire pumps, water tank rooms and generator rooms;
- Locations of all areas designated for the storage of flammable liquids or gases, boiler rooms, transformer rooms and any other area of special risk;
- The types and extent of provision of fire detection and alarm systems and voice communications systems;
- Clear statements indicating the type and ratings of all proposed or existing portable fire extinguishers and their locations;
- The type and extent of provision of hydraulic hosereels, sprinklers systems, wet and dry rising mains and other fire extinguishing systems;
- The type and extent of provision of smoke control and ventilation systems and their related air or smoke shafts; and
- Indicate clearly waiver approved location and quote the waiver reference number.

4. Elevation

- The provisions of fireman access panels on the external walls and claddings; and
- The clear distance of the external wall from the fire fighting vehicles and equipment access, lot boundary, adjacent buildings and other structures.

5. Section

- The provisions of fireman access panels on the external walls and claddings; and
- The full height of each storey and the depth of ceiling space;
- Details of all openings and voids penetrating floors including their dimensions, usage and height of enclosing walls and barricades;
- Details of the junction between the roof and any compartment walls;
- The dimensions of treads and rises of staircases;
- The dimensions of openings in external walls;
- The clear height of all structures or projections directly above the access for fire fighting vehicles and equipment;
- The clear distance of the external wall from the fire fighting vehicles and equipment access, lot boundary, adjacent buildings and other structures;
- The types of materials used in and the thickness of all walls, floors, roofs, ceilings, beams and other related parts of the building; and
- Enlarged details of curtain walling at the junction with the typical floor slab to show the provision of fire stopping or fire cavity barriers.

B. Schedules

Schedules are the extracted information from BIM.

Schedules shall follow the **BIM e-Submission Template Guides.**

Table 23 - Summary of SCDF Statistical Gross Floor Area (SGFA)

Blk No.	Storey	File Name	GFA (m2)	Non GFA (m2)	Total SGFA (m2)	Other areas (no of levels)
			0.00	0.00	00.00	*e.g. open sky terrace*
			0.00	0.00	00.00	
			0.00	0.00	00.00	
			0.00	0.00	00.00	
			0.00	0.00	00.00	

5.2 Air-Conditioning, Mechanical Ventilation and Fire Protection Works

A. 2D Views

Plans to be submitted for air-conditioning, mechanical ventilation and fire protection works shall include the following:

- Key features of the building in which the system is to be installed the particulars listed in Fire Safety(Building and Pipelines Fire Safety) regulations 6 and 7;
- A schematic diagram of the overall system showing clearly the key features and their functions, relative locations in the building, lots, sizes, capacities and other essential information including the air distribution design arrangement in the case of air-conditioning and mechanical ventilation systems;
- A schematic diagram of the overall system showing clearly the key features and their functions, relative locations in the building, capacities and other essential information including the design arrangement for fire protection systems;
- The layout of the system on every floor plan showing clearly the various parts and their functions, locations, arrangements, sizes, capacities and other essential information;
- Necessary cross-sectional views as superimposed on the building or part thereof to fully describe the details and configurations of the system;

- A colour scheme to clearly distinguish the various distinct parts of the system and the different systems from one another;
- For air-conditioning and mechanical ventilation systems such additional details as:
    i. The volumetric rate of flow of air at each point of inlet and outlet of each system including those serving protected staircases, exit passageways, lobbies, areas of refuge, the Fire Command Centre, fire pump rooms, generator rooms, rooms used for the storage of flammable liquids or gas or other areas of special risk;
    ii. The location of fire compartment walls, floors and air shafts;
    iii. The location of fire dampers;
    iv. The location of smoke detectors; and
    v. The location and function of other fire precautionary features.
- The colour scheme use for identifying air-conditioning and mechanical ventilation and fire protection systems:

Table 24 - Colour used for ACMV and Fire Protection systems

Colour	Services	R	G	B
	Air- conditioned Supply air duct	94	120	232
	Air- conditioned Return air duct	9	205	42
	Mechanical Ventilation fresh air Duct	225	151	131
	Mechanical Ventilation exhaust Air Duct	170	103	54
	Water Supply Pipe for fire protection systems	255	0	0

B. 3D Views

1. Part- 3D

3D floor plans corresponding to each floor plan shall be provided. Part 3D Views shall show all necessary information of fire protection and ACMV systems:

- Non- typical floor level;
- Typical floor level; and
- Schematic diagram identifying and describing each system installed in the building and its design, features and operational arrangements.

NATIONAL PARKS (NPARKS)

6 NPARKS REQUIREMENTS

All NParks BIM Submissions shall meet the following requirements specified under:

- Singapore BIM Guides - Modelling Requirements
- BIM e-Submission Template Guides

Complete and updated set of BIM guides can be found at *www.corenet.gov.sg*

6.1 Development Application (DC)

All submissions shall meet all the requirements specified by the National Parks Board.

Complete and updated set regulations can be found at *www.nparks.gov.sg*

Development Application (DC) Submission Requirements

(Required Views, but not limited to)

2D View	3D Views	Schedules
• Site Plan • Elevations • Cross Sections • Sky rise/Rooftop Greenery or Vertical Greenery	• 3D view	• Existing Trees/ Single Stem Palms within Development Site Boundary • Existing Trees/ Single Stem Palms on Neighbouring Lots • Existing Roadside Trees/ Single Stem Palms Abutting The Development Site Boundary
All 2D views and Schedules shall be placed on sheets		

A. 2D Views

All views shall contain the following information generated from BIM.

1. Site Plan

- Cadastral based (with details of lot numbers, lot boundary etc. site plan with a surrounding radius of 10m to 50m shall be incorporated;
- Names of the adjacent roads and streets;
- Site boundaries shall be clearly indicated in RED;
- All building setbacks. The outline of building to be erected/building in which works are to be carried out; and the outlines of all proposed basements in BROWN colour;
- All building plots, and area of communal use/open space for building coverage and communal open space calculations shall be shown as separate plots;
- Road reserve lines, drainage reserve lines, MRT lines, MRT protection zones, if applicable, etc. shall be indicated clearly on plan with dimensions;
- Existing ground levels for the subject site and adjoining sites immediately across the common boundaries and proposed platform levels;
- Retaining walls, boundary wall and other proposed boundary fencings;
- Existing and proposed buffer zone provision (Green buffer and physical buffer lines with dimensions) and 2m wide peripheral planting strips;
- Proposed gradients of green buffer and 2m peripheral planting strips;
- Types of ancillary structures, with height and width, within the green buffer or 2m peripheral planting strips;
- All existing tree(s) (with tree species and girths) or single stem palm(s) within the development boundary and within 10m from surrounding the subject site;
- Existing tree(s), within the development boundary, to be retained shall be indicated clearly in GREEN colour, and existing tree(s) to be felled shall be indicated in YELLOW colour;
- The proposed TREE PROTECTION ZONES (TPZ) for existing tree(s), within the development, to be retained; the dimension (in radius) of each TPZ is clearly indicated;
- All existing roadside tree(s) or single stem palm(s) fronting the subject site;
- Existing roadside tree(s) or palm(s) to be retained shall be indicated clearly in GREEN colour, and existing roadside tree(s) or palms to be felled shall be indicated in YELLOW colour.
- Crown spread of all existing trees within the development boundary, especially those within the green buffer and 2m peripheral planting strips;
- Access arrangement, road name text, road centre lines, road kerbs and road categories;

- Plot boundary and plot numbers of right of way/easement parkway reserve, if applicable;
- Planting strips (with dimensions) at open surface at grade car parks;
- MRT setback lines and distance;
- Existing and proposed underground services, for example: sewerage line, newater pipes;
- Ingress, egress to the site, access to bin centre and access to substation; and
- Proposed/existing structures (with dimensions) within green buffer and 2m wide peripheral planting verge.

2. Elevations and Cross Sections

- Floor to floor height;
- Basement protrusions, if any;
- Lines of existing ground level and proposed level;
- Thickness of retaining wall, boundary wall or other type of boundary fencing, wall base, soil depth;
- Green buffer(s) (with dimension(s)) or/and 2m wide peripheral planting strip;
- Existing tree(s) with existing level(s) and proposed level(s);
- Boundary line, road reserve line or drainage reserve, if applicable;
- Services underground /above ground level to be shown;
- Dimensions of above mentioned elements; and
- Existing and proposed gradients of green buffer or/and peripheral planting strip.

3. Sky rise/Rooftop Greenery or Vertical Greenery

- Boundaries of these greeneries are shaded in green lines.

B. Schedules

Table(s) shows:

- The species and girth of all the existing trees(s)/single stem palm(s) within the subject site boundary, on neighbouring lots and all the existing roadside tree(s)/single stem palm(s) abutting the development site. (Refer to Tables below)

Table 25 - Table format for summary of existing trees/ single stem palms (for DC Submission)

Existing Trees/ Single Stem Palms within Development Site Boundary							
Serial No.	Tree/ Palm Number	Botanical Name of tree/ palm	Girth Size		Propose to remove	Propose to retain	Reason for removal
			= < 1m (a)	= < 1m (b)			

Existing Trees/ Single Stem Palms on Neighbouring Lots (Up to a Distance of 5m from the Development Site (Boundary)							
Serial No.	Tree/ Palm Number	Botanical Name of tree/ palm	Girth Size		Propose to remove	Propose to retain	Reason for removal
			= < 1m (a)	= < 1m (b)			

Existing Roadside Trees/ Single Stem Palms Abutting The Development Site Boundary							
Serial No.	Tree/ Palm Number	Botanical Name of tree/ palm	Girth Size		Propose to remove	Propose to retain	Reason for removal
			= < 1m (a)	= < 1m (b)			

- Computation of ancillary structures that encroach into green buffer and 2m peripheral planting strip respectively;
- Area and soil depth of sky rise/rooftop greenery at each storey, if applicable;
- Computation of public open space area in a conventional housing development, if applicable; and
- Parcels of land for vesting such as road widening, drainage reserve line and public open space etc. shall be shown as separate plots.

6.2 Building Plan (BP) Excluding External Works

All submissions shall meet all the requirements specified by the National Parks Board.

Complete and updated set regulations can be found at *www.nparks.gov.sg*

Building Plan (BP) Submission Requirements

(Required Views, but not limited to)

2D View	3D Views	Schedule
• Site Plan • Elevations • Sections • Sky rise/Rooftop Greenery or Vertical Greenery • Tree Planting Plan	• 3D view	• Existing Trees/ Single Stem Palms within Development Site Boundary • Existing Trees/Single Stem Palms on Neighbouring Lots • Existing Roadside Trees/Single Stem Palms Abutting The Development Site Boundary
All 2D Views and Schedules shall be placed on sheets		

A. 2D Views

All views shall contain the following information generated from BIM.

1. Site Plan

- Cadastral based (with details of lot numbers, lot boundary etc.) site plan with a surrounding radius of 10m to 50m shall be incorporated;
- Names of the adjacent roads and streets;
- Site boundary, road reserve line and drainage reserve line (if applicable) shall be indicated clearly in RED
- All building setbacks. The outline of building to be erected/building in which works are to be carried out; and the outlines of all proposed basements in BROWN colour;
- All building plots, and area of communal use/open space for building coverage and communal open space calculations shall be shown as separate plots;
- Parcels of land for vesting such as road widening, drainage reserve line and public open space etc. shall be shown as separate plots;
- Road reserve lines, drainage reserve lines, MRT lines, MRT protection zones, if applicable, etc. shall be indicated clearly on plan with dimensions;
- Existing ground levels for the subject site and adjoining sites immediately across the common boundaries and proposed platform levels;
- Retaining walls, boundary wall and other proposed boundary fencings;
- Buffer zone provision (Green buffer and physical buffer lines with dimensions) and 2m wide peripheral planting strip;
- Proposed gradients of green buffer and 2m peripheral planting strip;
- Types of ancillary structures, with height and width, within the green buffer or 2m peripheral planting strip;
- All existing tree(s) (with tree species and girths) or single stem palm(s) within the development boundary and within 10m radius surrounding the subject site;
- Existing tree(s), within the development boundary, to be retained shall be indicated clearly in GREEN colour, and existing tree(s) to be felled shall be indicated in YELLOW colour.
- The proposed TREE PROTECTION ZONES (TPZ) for existing tree(s), within the development, to be retained; the dimension (in radius) of each TPZ is clearly indicated;
- All existing roadside tree(s) or single stem palm(s) fronting the subject site;
- Existing roadside tree(s) or palm(s) to be retained shall be indicated clearly in GREEN colour, and existing roadside tree(s) or palms to be felled shall be indicated in YELLOW colour.

- Crow spread of all existing trees within the development boundary, especially those within the green buffer and 2m peripheral planting strip;
- Access arrangement, road name text, road centre lines, road kerbs and road categories;
- Plot boundary and plot numbers of right of way/easement parkway reserve, if applicable;
- Planting strips (with dimensions) at open surface at grade car parks;
- MRT setback lines and distance;
- Existing and proposed underground services, for examples: sewerage line, newater pipes; and
- Ingress, egress to the site, access to bin centre and access to substation.

2. Elevations and Cross Sections

- Floor to floor height;
- Basement protrusions, if any;
- Lines of existing ground level and proposed level;
- Thickness of retaining wall, boundary wall or other type of boundary fencing, wall base, soil depth;
- Green buffer(s) (with dimension(s)) or/and 2m wide peripheral planting strip;
- Existing tree(s) with existing level(s) and proposed level(s);
- Boundary line, road reserve line or drainage reserve, if applicable; and
- Existing and proposed gradients of green buffer or/and peripheral planting strip.

3. Sky rise/Rooftop Greenery or Vertical Greenery

Boundaries of these greeneries are shaded in green lines.

4. Tree Planting Plan

- Green buffer and 2m wide peripheral planting strip, with dimensions;
- Location and species of proposed trees or palms;
- A legend for the proposed trees or palms;
- Types of ancillary structures with height and width shall be clearly shown; and
- All slopes (with gradients) shall be shown on plan with standard symbols.

B. Schedules

Table(s) shows:

- The species and girth of all the existing trees(s)/single stem palm(s) within the subject site boundary, on neighbouring lots and all the existing roadside tree(s)/single stem palm(s) abutting the development site. (Refer to Tables below)

Table 26 - Table format for summary of existing trees/single stem palms (for BP Submission)

Existing Trees/Single Stem Palms within Development Site Boundary							
Serial No.	Tree/ Palm Number	Botanical Name of tree/ palm	Girth Size		Propose to remove	Propose to retain	Reason for removal
			= < 1m (a)	= < 1m (b)			

Existing Trees/Single Stem Palms on Neighbouring Lots (Up to a Distance of 5m from the Development Site (Boundary)							
Serial No.	Tree/ Palm Number	Botanical Name of tree/ palm	Girth Size		Propose to remove	Propose to retain	Reason for removal
			= < 1m (a)	= < 1m (b)			

Existing Roadside Trees/Single Stem Palms Abutting The Development Site Boundary							
Serial No.	Tree/ Palm Number	Botanical Name of tree/ palm	Girth Size		Propose to remove	Propose to retain	Reason for removal
			= < 1m (a)	= < 1m (b)			

- Computation of ancillary structures that encroach into green buffer and 2m peripheral planting strip respectively;
- Area and soil depth of sky rise/rooftop greenery at each storey, if applicable;
- Computation of public open space area in a conventional housing development, if applicable; and
- Parcels of land for vesting such as road widening, drainage reserve line and public open space etc. shall be shown as separate plots.

6.3 Certificate of Statutory Completion (CSC) Excluding External Works

All submissions shall meet all the requirements specified by the National Parks Board

Complete and updated set regulations can be found at www.nparks.gov.sg

Certificate of Statutory Completion (CSC) Submission Requirements

(Required Views, but not limited to)

2D View	3D Views	Schedule
• Site Plan • Subdivision Plan	• 3D view	<NA>
All 2D Views and Schedules shall be placed on sheets		

A. 2D Views

All views shall contain the following information generated from BIM.

1. Site Plan

- Site boundary and the road reserve line in RED;
- Basement line in BROWN colour;
- All constructed building(s) and structures;
- Underground/above-ground services;
- green buffer, 2m peripheral planting strip and all ancillary structures within the green buffer or w2m peripheral planting strip;
- The locations, species and girth size of tree(s) or palm(s) planted on site;
- Existing tree(s) or palm(s) retained at site with provided TPZ;
- Ingress and egress to the site, access to bin centre and access to substation, if applicable;
- Road reserve lines and drainage reserve lines, if applicable; and
- Retaining/boundary wall or other types of fencing.

2. Subdivision Plan (for conventional housing development, and Certified Survey Plan with lot numbers)

- The subdivision plan approved by the Planning Authority, URA and the final certified survey plan are to be submitted.

LAND TRANSPORT AUTHORITY (LTA)

7 LTA REQUIREMENTS

All LTA BIM Submissions shall meet the following requirements specified under:

- Singapore BIM Guides- Modelling Requirements
- BIM e-Submission Template Guides

Complete and updated set of BIM guides can be found at *www.corenet.gov.sg*

7.1 LTA-DBC (Vehicle Parking)

All submissions shall meet all the requirements specified by LTA-DBC (Vehicle Parking).

Complete and updated set regulations can be found at *www.lta.gov.sg*

LTA (Vehicle Parking) Submission Requirements

(Required Views, but not limited to)

2D View	3D Views	Schedule
• Location Plan • Site Plan • Floor Plans • Elevations • Sections	• Part- 3D of site • Part- 3D of floor plans	• Carpark Lots
All 2D Views and Schedules shall be placed on sheets		

A. 2D Views

All views shall contain the following information generated from BIM.

1. Location Plan

- Development boundary in RED.

2. Site Plan

- Site boundaries in RED;
- Building outlines to be erected/ building in which works are to be carried out shall be indicated;
- Road names, adjacent roads and streets;
- Town subdivision, mukim& lot number, and the adjoining lots;
- Building setback and distance between the new building to be erected or the building works to be carried out and its adjacent lot boundary;
- Ingress and egress to the Site;
- Grids and grids dimension to show the total length or width of the building.

3. Floor Plans

- Grids and grids dimension to show the total length or width of the building, as well as the distance between structural columns;
- Room/ space usage; and
- All critical dimensions of the parking layout such as size of parking spaces, width of driveways/ ramps, parking aisles, headroom clearance, etc.

4. Elevations and Sections

- Grids and grids dimension to show the total length or width of the building, as well as the distance between structural columns;
- Floor to floor height; and
- All critical dimensions of the parking layout such as size of parking spaces, width of driveways/ ramps, parking aisles, headroom clearance, etc.

B. 3D Views

3D Views shall follow the **BIM e-Submission Template Guides.**

1. Part 3D

3D floor plans corresponding to each floor plan shall be provided. Part 3D Views shall show all necessary information of:

- Site Level showing the entire development
- Floor level/s showing the parking lots and driveway

Table 27 - Colour used for different vehicle types

Colour	Vehicle Type	R	G	B
	Car	177	164	156
	Lorry	0	176	240
	Articulated Vehicle	203	213	222
	Coach	113	69	36
	Motorcycle	204	142	96
	Bicycle Rack	173	86	200

C. Schedule

Schedule is the extracted information from BIM.

Schedule shall follow the **BIM e-Submission Template Guides.**

Table 28 - Schedule of Parking Lots

Schedule of Parking Lots					
Level	Type of Vehicle	Stall Size			Count
		Length	Width	Height	
				Total :	

7.2 Core Information for LTA (Vehicle Parking) Submissions

Core Information listed are minimum information for URA submissions that shall be incorporated in BIM.

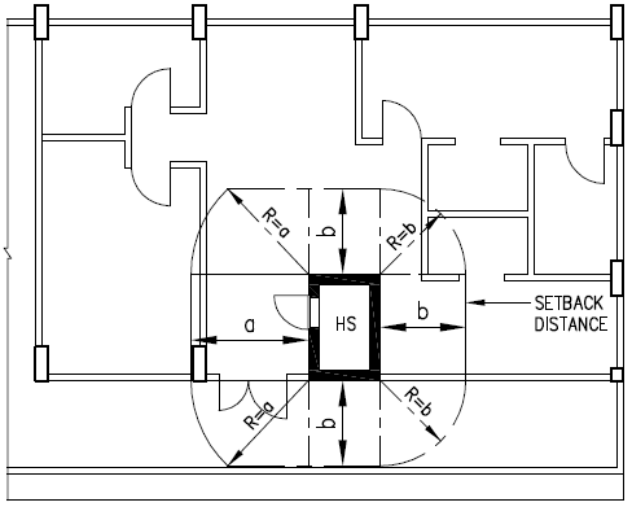
> Core Information shall follow the **BIM e-Submission Template Guide.**

Table 29 - Core Information for LTA (Vehicle Parking) Submissions

Development and Building Control (Vehicle Parking)			
Building Element	**Name**	**Data List**	**Remarks**
Grid	Name/ Type	<Manual>	*Default*
Level	Name	<Manual>	*Default*
	SHD Value	<Auto>	Level value of the development that fulfils PUB and URA's requirement
Parking Lot	Name/ Type	<Manual>	*Default*
	Level	<Manual>	*Default*
	Length	<Manual>	*Default*
	Width	<Manual>	*Default*
	Height	<Manual>	*Default*
	Number	<Manual>	Added in Template
	If Accessible	<Yes/ No>	Added in template
Ramp	Name/ Type	<Manual>	*Default*
	Thickness	<Manual>	*Default*
	Level	<Manual>	*Default*
	Slope Gradient	<Auto>	*Default*
Room/Space (Non- geometry)	Name	<Manual>	*Default*
	Level	<Auto>	*Default*
	Area	<Auto>	*Default*

ANNEX I. TECHNICAL REFERENCES

A. HOUSEHOLD, STOREY, STAIRCASE STOREY SHELTERS REQUIREMENTS



Dimension 'a' is larger than Dimension 'b'

Fig. 1A -Plan – Household Shelter With Setback Distance

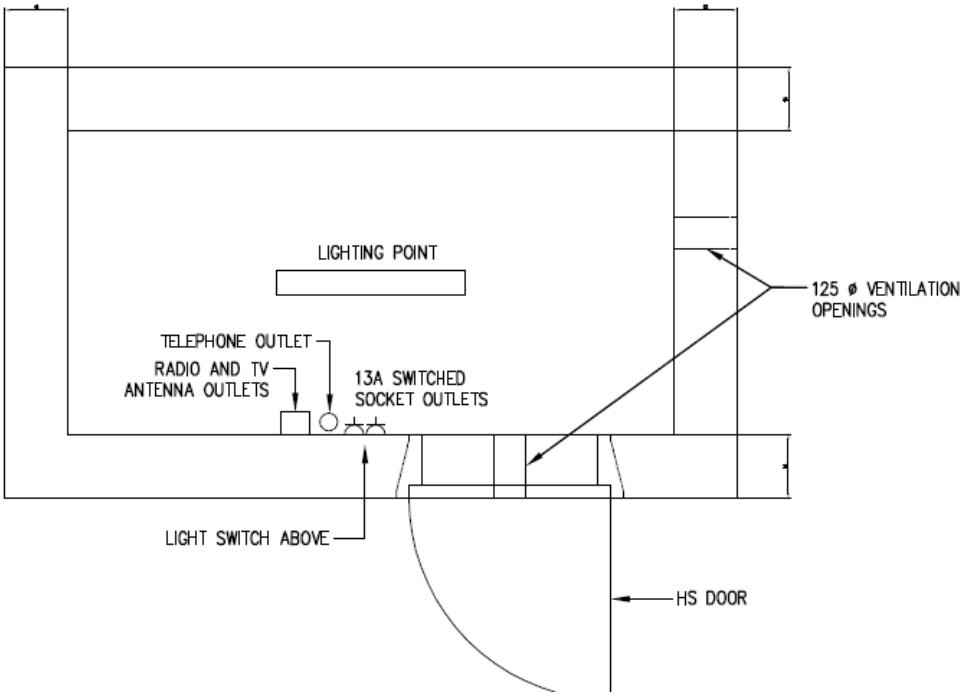


Fig. 1B - Plan – Household Shelter And Its Services

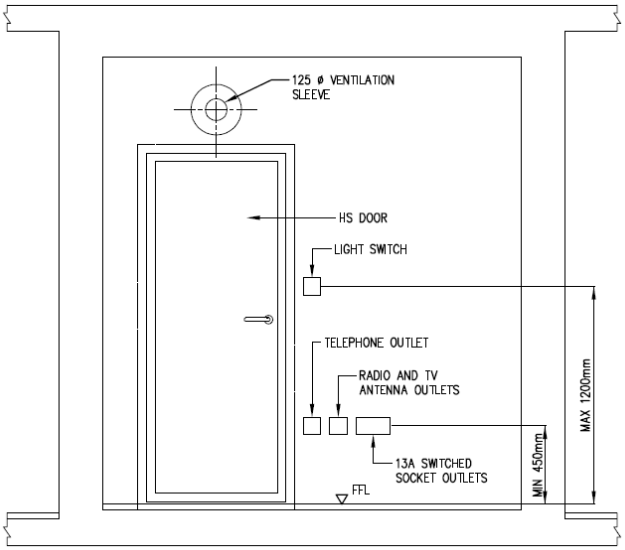


Fig. 1C - Elevation- Household Shelter And Its Services

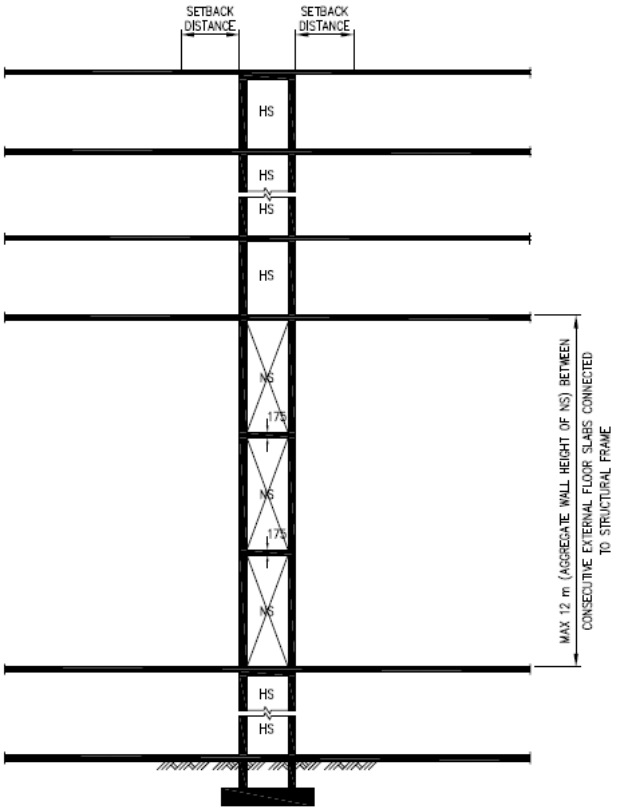


Fig. 1D - Section – Household Shelters And Non Shelters In Household Shelter Tower

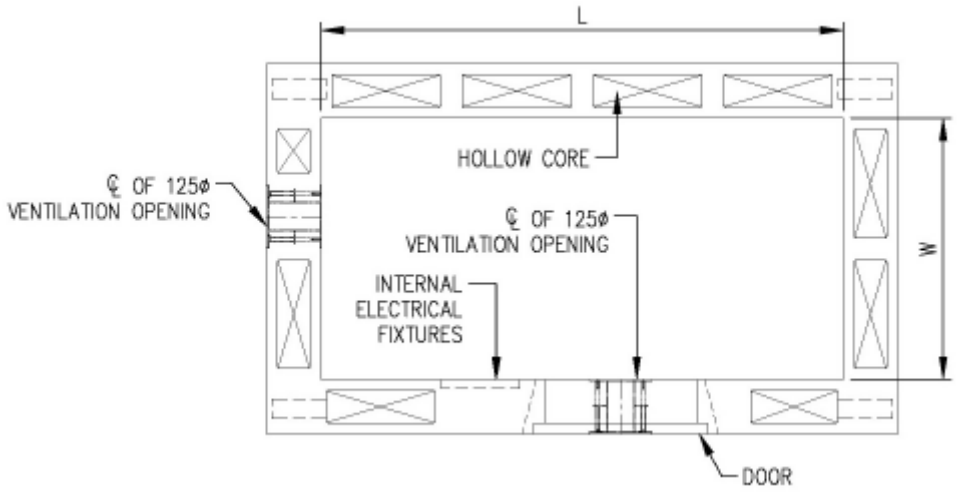


Fig. 1E – Precast HS With HS Door On Longer Wall And One Of Ventilation Sleeves Above The Door

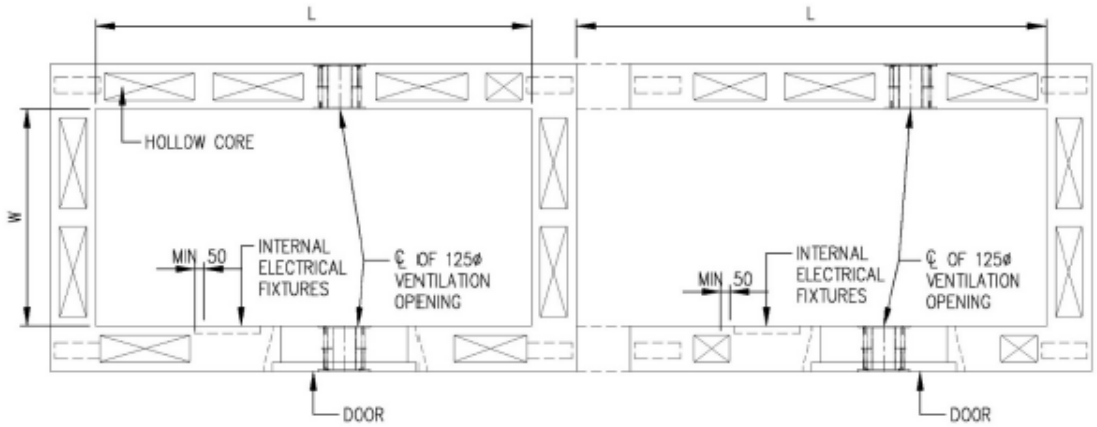


Fig. 1F – Precast HS And C-Shaped Precast HS Connected At The Shorter Wall And With HS Door On Longer Walls

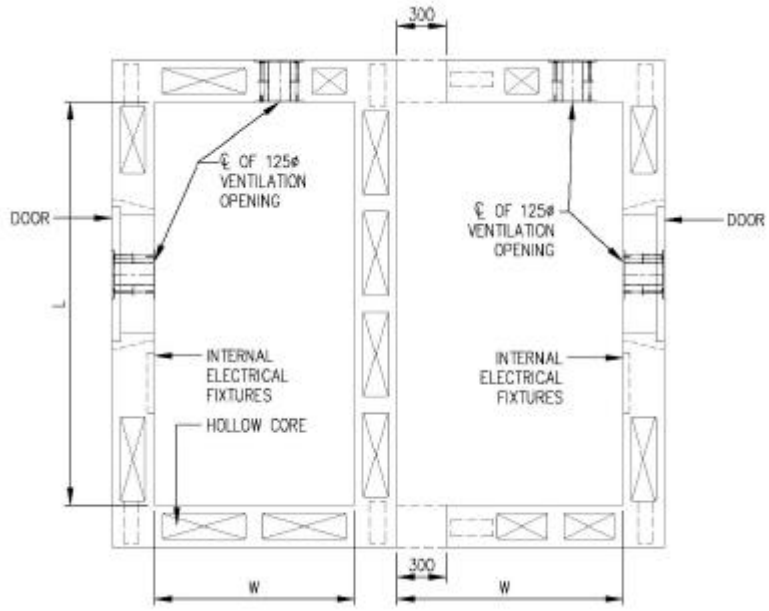


Fig 1G - Precast HS And C-Shaped Precast Hs Connected At The Longer Wall And With HS Door On Longer Walls

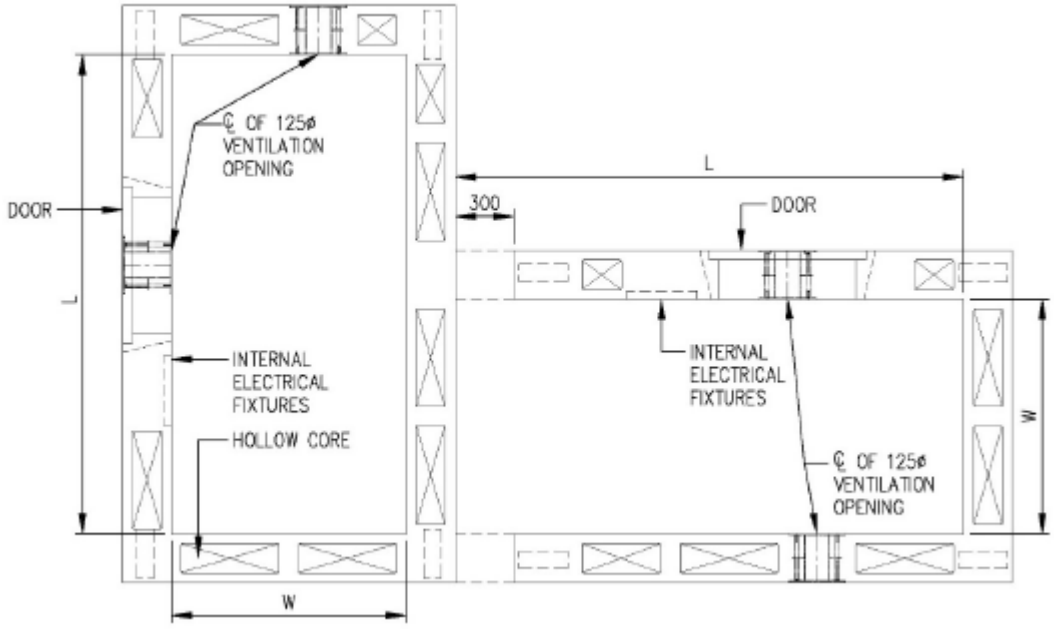


Fig. 1H - Precast HS And C-Shaped Precast HS With Connection Between Longer And Shorter Walls Respectively And With HS Doors On Long Wall

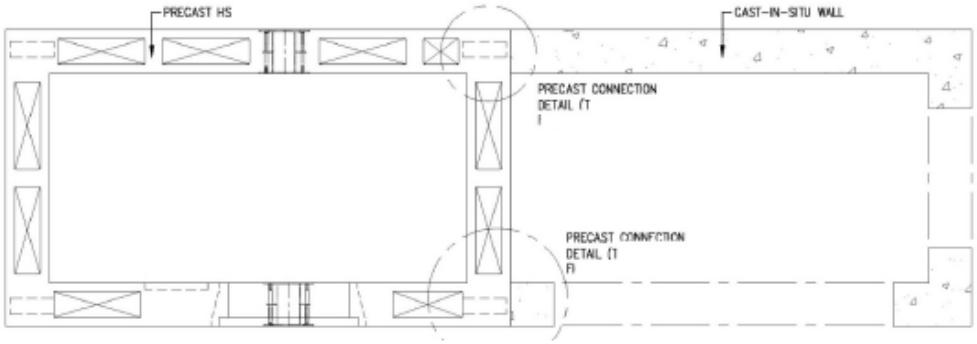


Fig. 1J - Precast SS Adjoining Cast In-Situ Walls/Columns

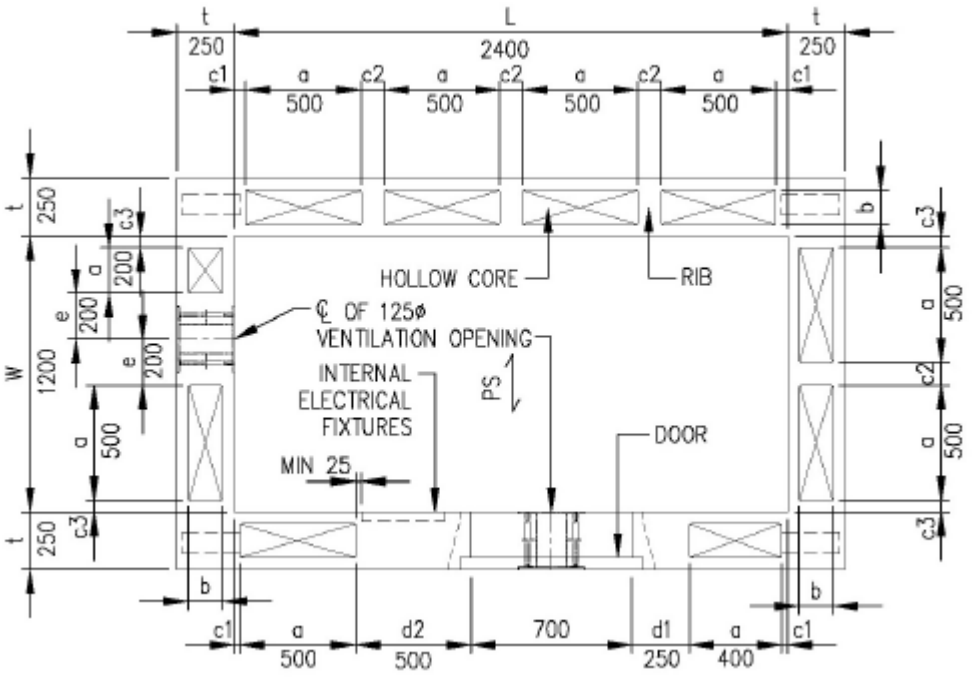


Fig. 1K - Precast HS Dimensions

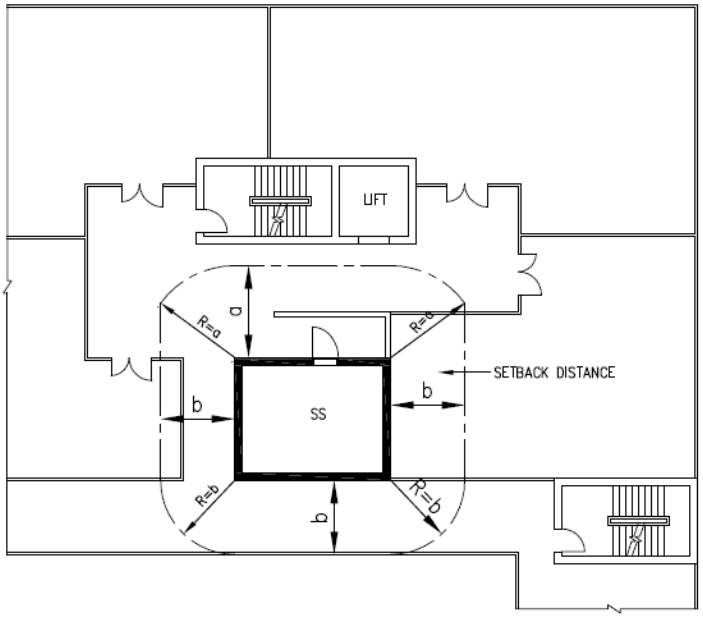


Fig. 2A - Plan – Storey Shelter With Setback Distance

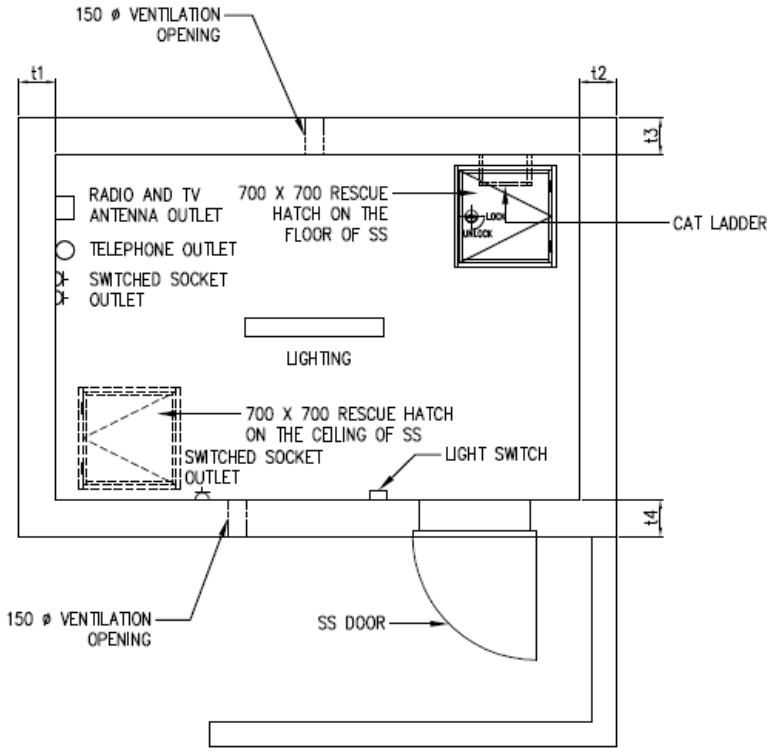


Fig. 2B - Plan – Storey Shelter And Its Services

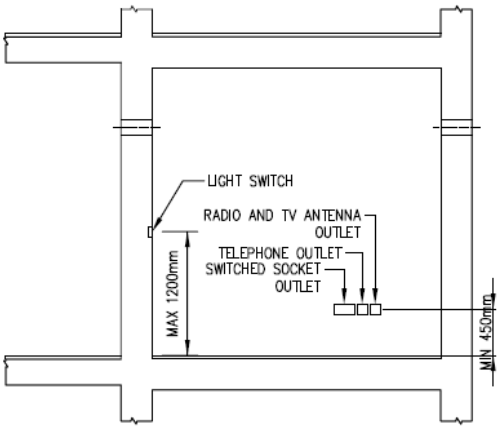


Fig. 2C - Elevation- Storey Shelter And Its Services

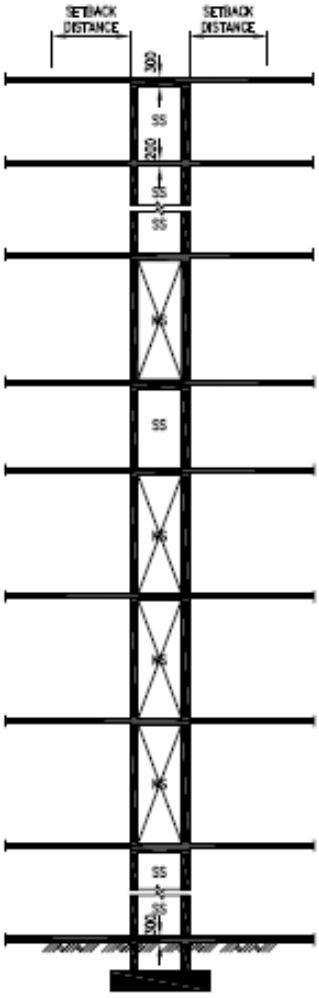


Fig. 2D - Section – Storey Shelters And Non Shelters In Storey Shelter Tower

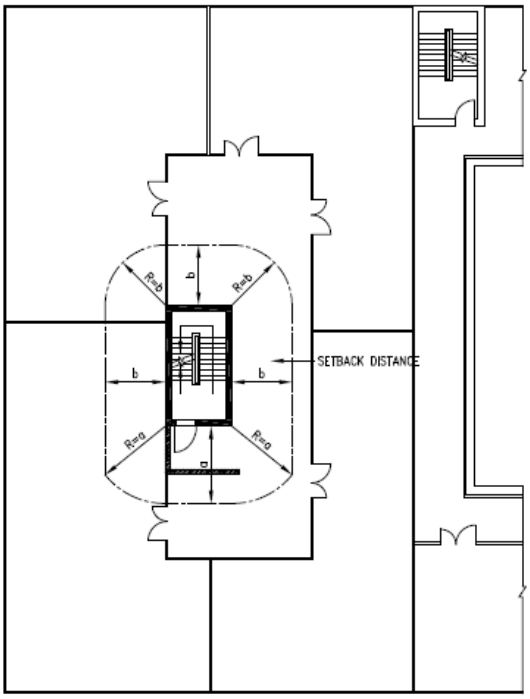


Fig. 3A - Plan – Staircase Storey Shelter With Setback Distances

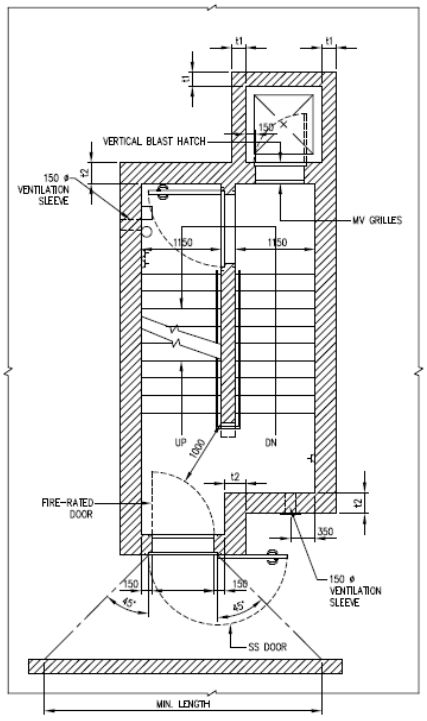


Fig. 3B - Plan – Staircase Storey Shelter And Its Services

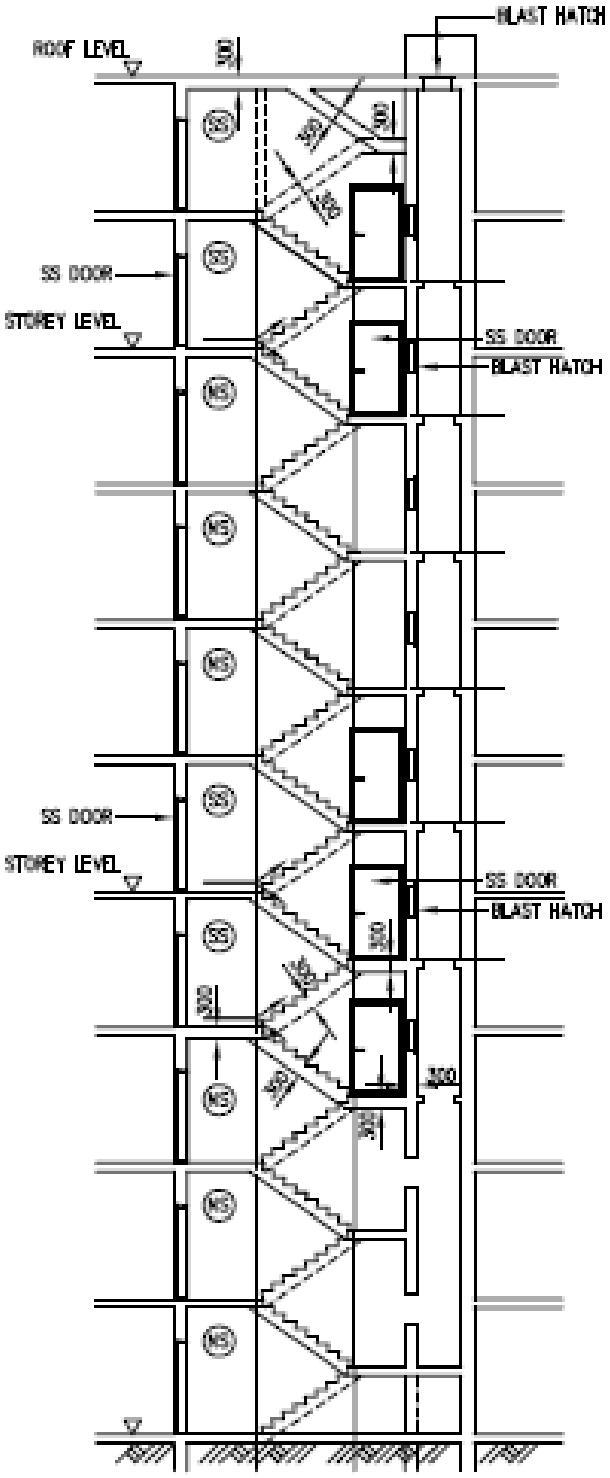


Fig. 3C - Section - Staircase Shelter And Non Shelter, Blast Door And Blast Hatch

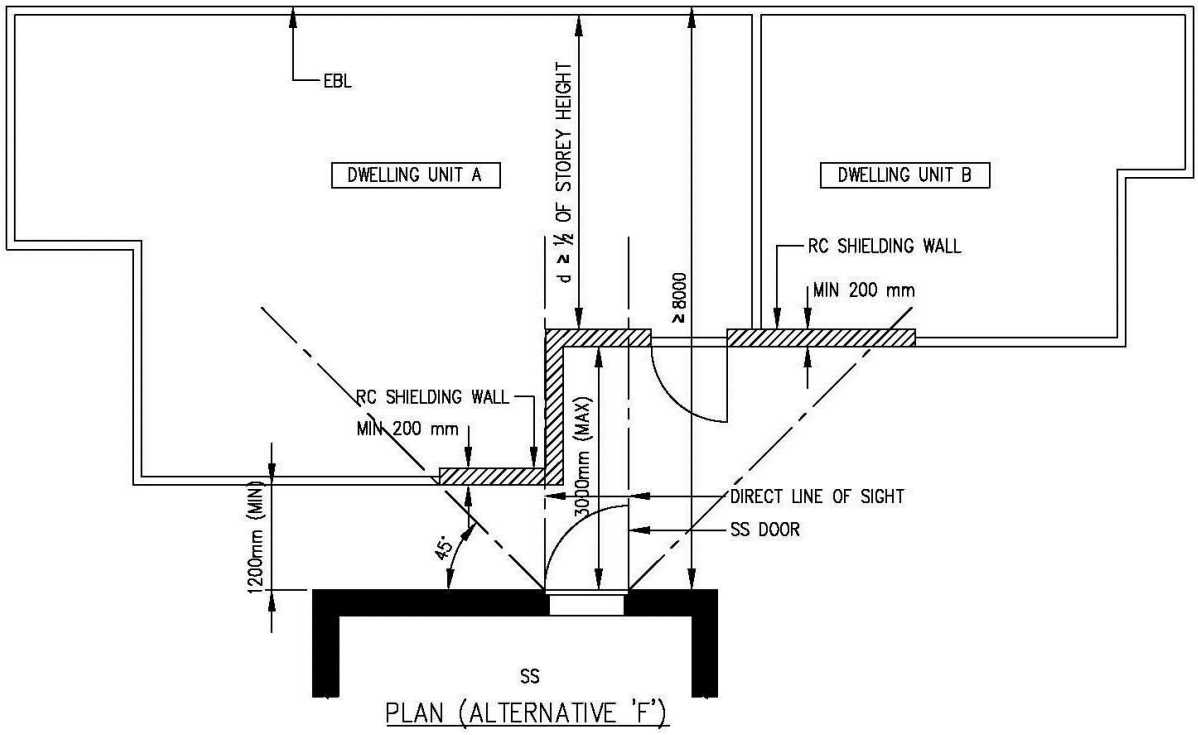


Fig. 3D - Plan – Discontinuous Shielding Wall With Opening Fronting The SS Door

B. PUBLIC SHELTER REQUIREMENTS

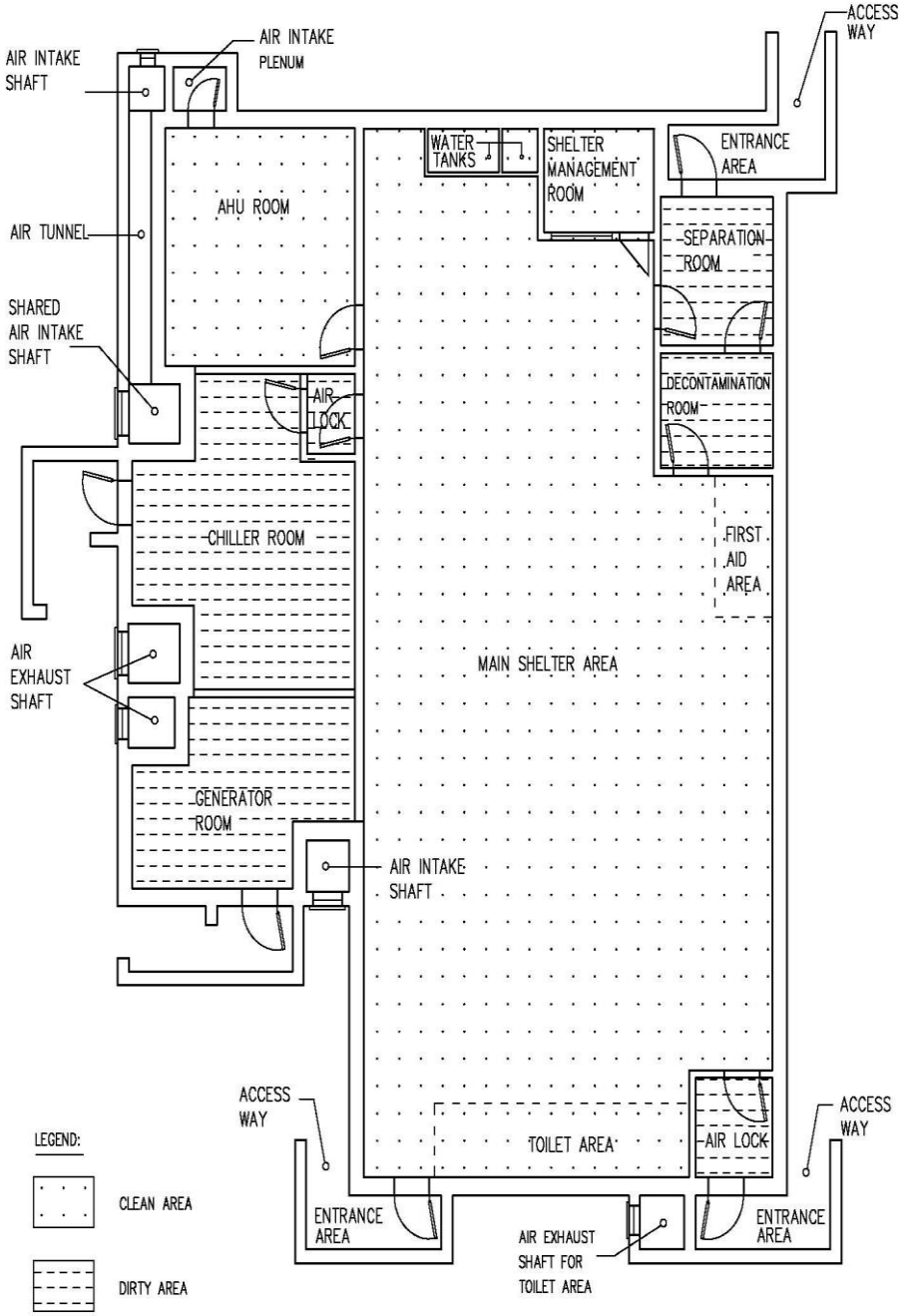


Fig. 1 - Plan - Typical Public Shelter Layout

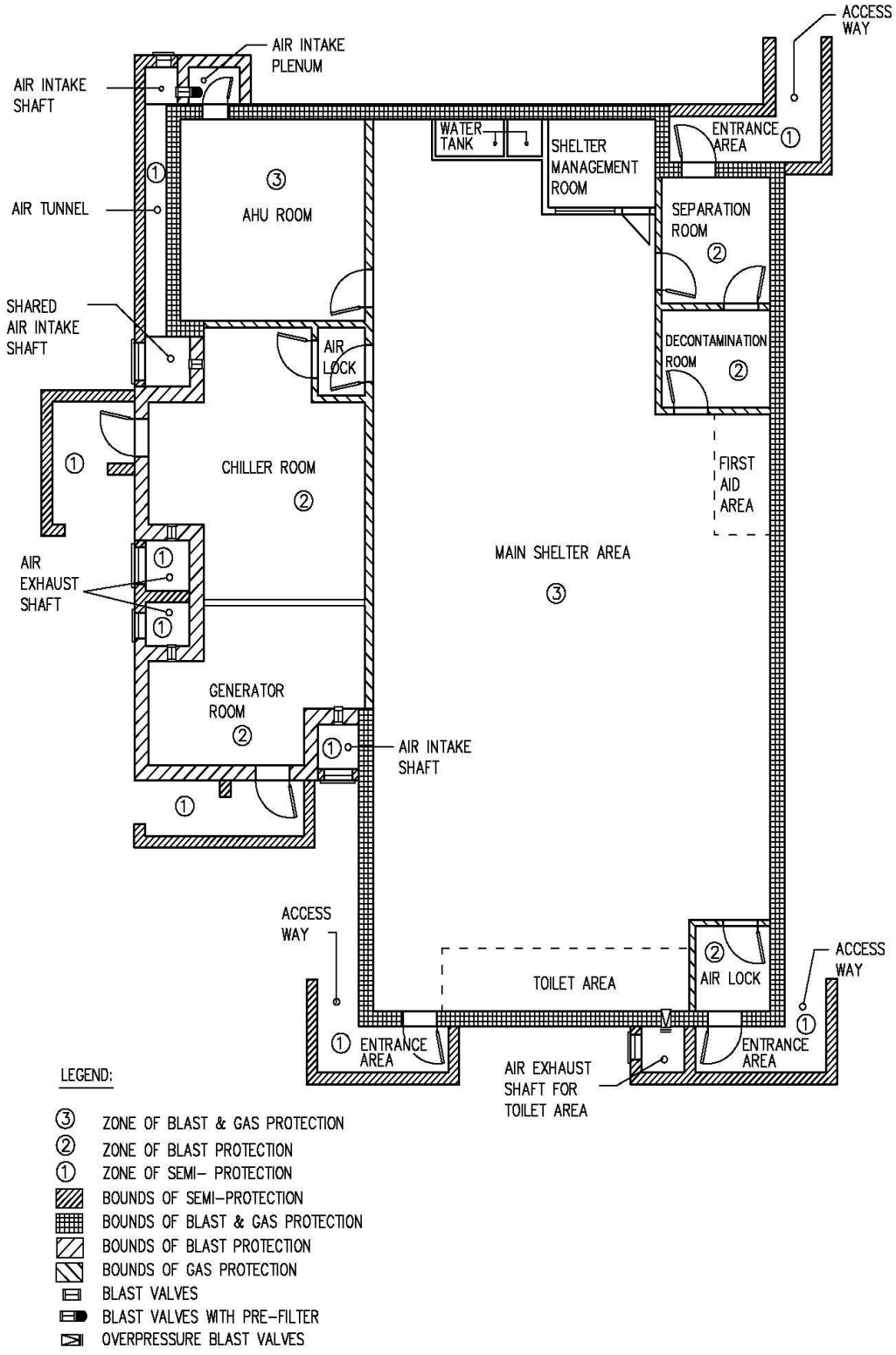


Fig. 2 - Plan - Different Bounds And Zones Of Protection For A Typical Shelter Layout

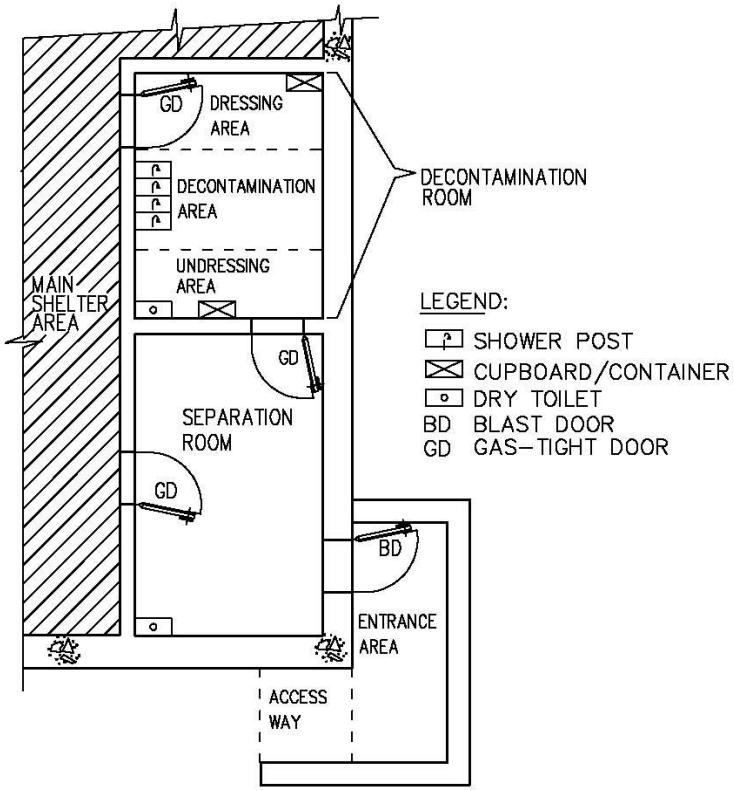


Fig. 3 - Plan - Typical Layout Of Separation Room And Decontamination Rom

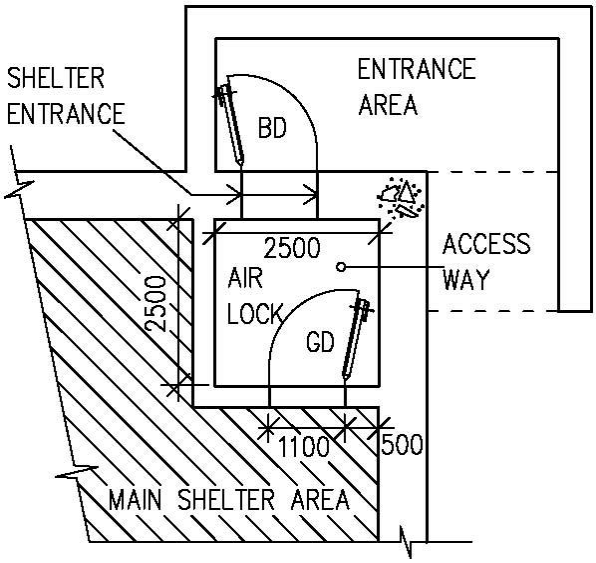


Fig. 4 - Plan - Typical Layout Of A Standard Shelter Entrance With Air Lock

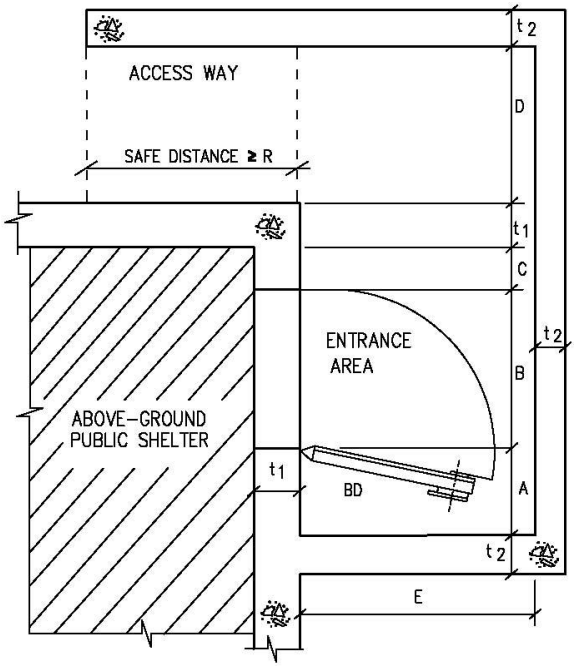


Fig. 5 - Plan - Typical Layout Of An Entrance Area To An Above-Ground Public Shelter (Possibility A)

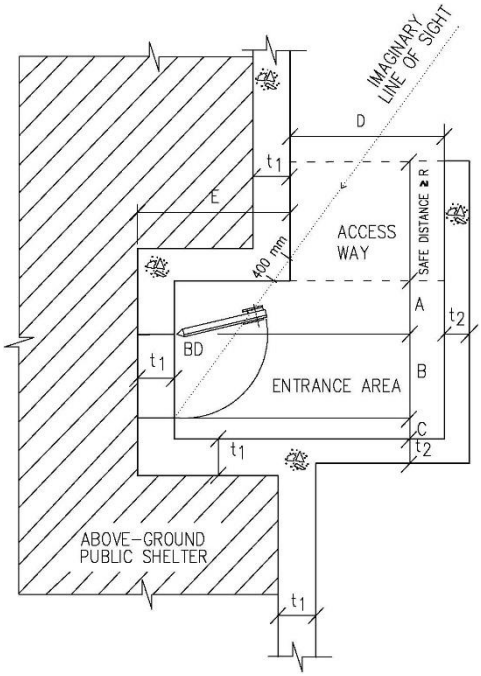


Fig. 6 - Plan - Typical Layout Of An Entrance Area To An Above-Ground Public Shelter (Possibility B)

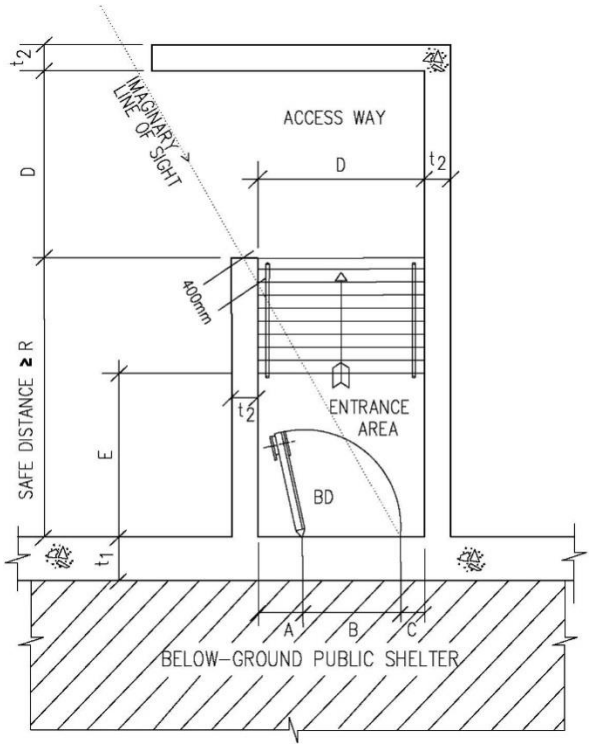
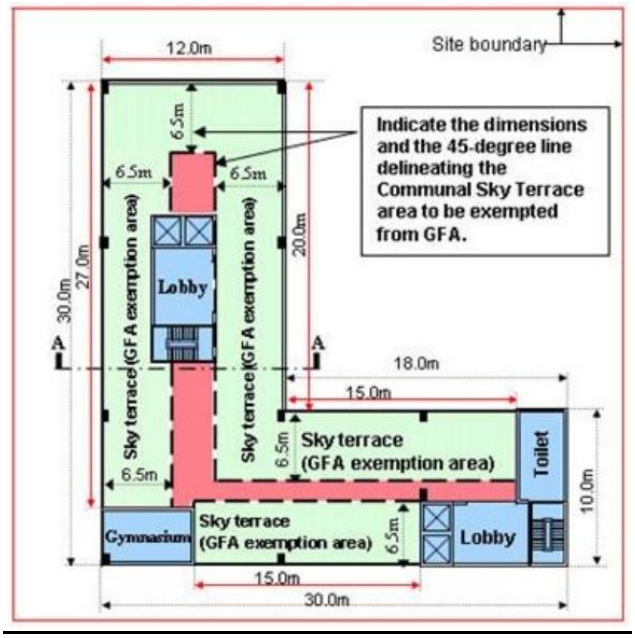


Fig. 7- Plan - Typical Layout Of An Entrance Area To A Below-Ground Public Shelter

C. URA REQUIREMENTS



Plan presentation for GFA computation of sky terraces

Computation of GFA Exemption For Sky Terrace

Sky Terrace Area		345.0sqm
Residual Area		60.0sqm
Area of Floor Plate		540.0sqm
% of Perimeter Opening	74%	>60%, therefore 345 sqm of sky terrace area can be exempted from GFA
% of Sky Terrace vs floor Plate	64%	>60%, therefor additional GFA exemption for sky terrace residual area is applicable
% of Residual Area vs Floor Plate	11%	<20%, therefore 60.0sqm of the residual area can be exempted from GFA
Total GFA to vs exempted		405.0sqm

Fig. 1 - Detail Calculations for Sky Terrace

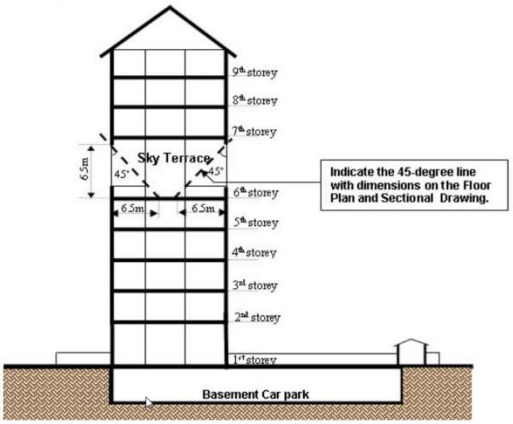


Fig. 2- 45-Degree Line To Be Shown In Section A-A

ANNEX II. STANDARD CERTIFICATIONS FOR BUILDING WORKS

BCA: Qualified Person's Endorsements

1. Building Plans Complying with Acceptable Solutions in Approved Document

I, (Name of qualified person), hereby certify, subject to any waiver/ modification granted under section 6A of the Building Control Act (Cap 29), that –

(a) the preparation of these building plans are in accordance with the Building Control Regulations; and

(b) the buildings/ building works shown on these plans are in accordance with the provisions of the provisions of the Building Control Regulations and the acceptable solutions in the Approved Document.

2. Building Plans with Alternative Solutions-Sole Certification

I, (Name of qualified person), hereby certify, subject to any waiver/ modification granted under section 6A of the Building Control Act (Cap 29), that –

(a) the preparation of these building plans are in accordance with the Building Control Regulations; and

(b) notwithstanding the deviation(s) from the acceptable solutions in the Approved Document, the buildings/ building works shown on these plans are in accordance with the provisions of the Building Control Regulations and the performance requirements in Fifth Schedule therein.

3. Building Plans with Alternative Solutions-Joint Certification by Qualified Persons

I, (Name of 1st qualified person), hereby certify, subject to any waiver/ modification granted under section 6A of the Building Control Act (Cap 29), that –

(a) the preparation of these building plans are in accordance with the Building Control Regulations; and

(b) the buildings/ building works shown on these plans are in accordance with the provisions of the Building Control Regulations.

I, (Name of 2nd qualified person), hereby certify that notwithstanding the deviations from the acceptable solutions in the Approved Document, the buildings/ building works shown on these plans meet the performance requirements in the Fifth Schedule of the Building Control Regulations.

4. Alteration and Addition Works

I, (Name of qualified person), hereby certify that I have inspected the existing building and investigated its overall structure and that, in my opinion, the building is capable of resisting the forces and moments which may be increased or altered by reason of the repairs, alterations or additions shown in the building plans.

5. Structural Works and Design Calculations Complying with Acceptable Solutions in Approved Document

Certification by Qualified Person

In accordance with Regulation 9 of the Building Control Regulations, I (Name of qualified person for structural works), hereby submit the detailed structural plans and design calculations prepared by me and certify that they have been prepared in accordance with the provisions of the Building Control Regulations, the Building Control Act and any other written law pertaining to buildings and construction for the time being in force.

2. I further certify that these detailed plans and design calculations are in reference to Project Ref. No.: _____.

3. Total number of structural plans submitted: _____ and total number of pages of design calculations in this book: _____.

Certification by Accredited Checker

I, (Name of accredited checker), hereby certify that I have carried out an evaluation, analysis and review of the detailed structural plans and design calculations presented herein and am satisfied that there are no inadequacies in the key structural elements.

2. I further certify that these detailed structural plans and design calculations are in reference to Project Ref. No.: _____and the key structural elements are consistent with the layout shown in the building plans.

3. Total number of structural plans checked: _____ and total number of pages of design calculations in this book: _____.

4. I hereby declare that I have no professional or financial interest in the building works shown in the plans as defined in section 18 of the Building Control Act (Cap 29).

6. Structural Works and Design Calculations with Alternative Solutions

Certification by Qualified Person

In accordance with Regulation 9 of the Building Control Regulations, I, (Name of qualified person for structural works), hereby submit the detailed structural plans and design calculations prepared by me and certify that they have been prepared in accordance with the provisions of the Building Control Regulations, the Building Control Act and any other written law pertaining to buildings and construction for the time being in force.

2. I further certify that these detailed structural plans and design calculations are in

reference to Project Ref. No.: _____.

3. Total number of structural plans submitted: _____ and total number of pages of design calculations in this book: _____.

4. Notwithstanding the deviation(s) from the acceptable solutions in the Approved Document, the structural works shown on these plans are in accordance with the provisions of the Building Control Regulations and the performance requirements in Fifth Schedule therein.

Certification by Accredited Checker

I, (Name of accredited checker) hereby certify that I have carried out an evaluation and review of the detailed structural plans and design calculations presented herein and am satisfied that there are no inadequacies in the key structural elements.

2. I further certify that these detailed structural plans and design calculations are in reference to Project Ref. No.: _____ and the key structural elements are consistent with the layout shown in the building plans.

3. Total number of structural plans checked: _____ and total number of pages of design calculations in this book: _____.

4. I hereby declare that I have no professional or financial interest in the building works shown in the plans as defined in section 18 of the Building Control Act (Cap 29).

5. Notwithstanding the deviation(s) from the acceptable solutions in the Approved Document, the structural works shown on these plans are in accordance with the provisions of the Building Control Regulations and the performance requirements in Fifth Schedule therein.

7. Standard Certification for Civil Defence Shelter Plans

I, (Name of qualified person), hereby submit the detailed civil defence shelter plans *(and design calculations) prepared by me and certify that –

(a) the preparation of these civil defence shelter plans are in accordance with the Building Control Regulations; and

(b) the civil defence shelter works shown on these plans are designed in accordance with the shelter technical requirements.

2. Total number of civil defence shelter plans submitted: _____ and total number of pages of design calculations: _____.

*Delete where not applicable

URA: Qualified Person's Endorsements

1. Owner's Consent

For all submissions:

> I/ We, (Name of person e-signing the plan), hereby declare that –
>
> (a) I/ We am/ are not the owner(s) of the land within the meaning of the term "owner" as defined in Section 2 of the Planning Act (Cap 232, 1998Ed); and
>
> (b) I/ We have shown this plan to the owner(s) of the land, and have obtained the consent of the said owner(s) to submit this plan to the Competent Authority under the Planning Act (Cap 232, 1998Ed).

2. Drainage Interpretation Plan (DIP) and Road Line Plan (RLP)

For new erection applications:

> **DRAINAGE INTERPRETATION**
>
> I, (Name of architect/ professional engineer), confirm that the drainage details as shown in the relevant drawings in this file are in accordance with the current information provided by the Chief Engineer, Central Building Plan Unit, NEA.

> **ROAD LINE**
>
> I, (Name of architect/ professional engineer), confirm that the road reserve lines, the category of the proposed and existing roads and other related road information as shown in the layout plan is in accordance with the current information provided by the LTA.

3. Subdivision Application

> I, (Name of surveyor) declare that the building layout tallies with the development approved plans registered as plan ( ) in DC/AP_ES_____ dated _____.
> I also declare that the setbacks shown on this plan do not deviate more than 3% of the setback as approved under the said development plans.

4. Strata Subdivision Applications

For strata subdivision applications, if diagrammatic plan is provided, the following declaration shall be properly done by the surveyor:

> 1. I, (Name of surveyor) certify that the strata unit layout is in accordance with the Building Plan approved on date: _____ under BP number: _____.
>
> 2. I, (Name of surveyor) declare that the strata unit excludes all common properties indicated and referred to in the planning permission granted by the Competent Authority under the Planning Act (Cap 232).

5. Conservation Projects-Architect's Endorsement

For projects involving conservation buildings, the following endorsements by Architect is to be included:

ARCHITECT'S ENDORSEMENT

FLUE
Flues and vents shall be located either on the rear slope of the main roof or the rear secondary roofs or abutting the wall of the rear façade / rear service block within the rear court. The roof of the flue can be pitched or flat and shall not be higher than the ridge of the main roof.

AIR-CONDITIONING
The installation of air-conditioning units shall comply with the conservation guidelines.

SIGNAGES
Detailed drawings of signage design indicating the size, location, lettering typeface and method of support and illumination shall comply with the conservation guidelines and shall be submitted to the Building and Construction Authority (BCA) for licensing.

6. Conservation Projects-Engineer's Endorsement

ENGINEER'S ENDORSEMENT

As a qualified person, I agree with and endorse the alterations to the structure as shown on this plan and that they are generally in accordance with conservation principles and good engineering practice. Where further strengthening or additional structural members are required to support addition and alteration work, formal approval will be sought from the Competent Authority under Planning Act and Building Authority under Building Control Act prior to commencement of work on site.

FSSD: Qualified Person's Endorsements

1. Fire Safety Works Complying with Prescriptive Provisions in Fire Code

BUILDING PLAN (BP)

I, (Name of qualified person) NRIC No./Passport No._____, being a qualified person under the Fire Safety Act, hereby certify that the fire safety works as shown on these plans have been designed in accordance with the provisions of the Fire Code, the Fire Safety Act and any regulations made thereunder, the relevant codes of practice and design guidelines, subject to modifications or waivers under section 27 of the Fire Safety Act.

FIRE PROTECTION (FP) AND AIR-CONDITIONING/MECHANICAL VENTILATION PLAN

I, (Name of qualified person) NRIC No./Passport No._____, being a qualified person under the Fire Safety Act, hereby certify that the fire safety works as shown on these plans have been designed in accordance with the provisions of the Fire Code, the Fire Safety Act and any regulations made thereunder, the relevant codes of practice and design guidelines, subject to modifications or waivers under section 27 of the Fire Safety Act.

I, (Name of qualified person) hereby certify that the proposed _____ system has been designed in accordance with the provisions of (State the code used).

2. Fire Safety Works with Alternative Solution (Performance-based Fire safety Engineering)

BUILDING PLAN (BP) – OPTION 1

To be completed by the qualified person who is a fire safety engineer and who prepares the plans of fire safety works which include any alternative solution, and the fire safety engineering report.

I, (Name of qualified person), NRIC No./Passport No._____ being a qualified person and a fire safety engineer under the Fire Safety Act, hereby certify that —

(a) the fire safety works as shown on these plans have been designed in accordance with the provisions of the Fire Code, the Fire Safety Act and any regulations made thereunder, the relevant codes of practice and design guidelines, subject to modifications or waivers under section 27 of the Fire Safety Act; and

(b) the alternative solution in the plans, and the fire safety engineering report, satisfy the fire performance requirements in the Fire Code, and comply with the Fire Safety Act and any regulations made thereunder, the relevant codes of practice and design guidelines, subject to any deviation or modification approved by the Commissioner.

BUILDING PLAN (BP) – OPTION 2

To be completed by a qualified person who is NOT a fire safety engineer and who prepares the plans of fire safety works, and prepares the alternative solution in the plans under the supervision of a fire safety engineer.

I, (Name of qualified person), NRIC No./Passport No. _____ being a qualified person under the Fire Safety Act, hereby certify that —

(a) the fire safety works as shown on these plans have been designed in accordance with the provisions of the Fire Code, the Fire Safety Act and any regulations made thereunder, the relevant codes of practice and design guidelines, subject to modifications or waivers under section 27 of the Fire Safety Act; and

(b) the alternative solution in the plans adheres to the fire safety engineering report.

To be completed by the fire safety engineer who is not a qualified person and who supervises the preparation of the alternative solution in the plans of fire safety works, and prepares the fire safety engineering report.

I, (Name of fire safety engineer), NRIC No./Passport No._____ being a fire safety engineer under the Fire Safety Act, hereby certify that the alternative solution shown on these plans, and the fire safety engineering report, satisfy the fire performance requirements in the Fire Code, and comply with the provisions of the Fire Safety Act and any regulations made thereunder, the relevant codes of practice and design guidelines, subject to any deviation or modification approved by the Commissioner.

FIRE PROTECTION (FP) AND AIR-CONDITIONING/MECHANICAL VENTILATION PLAN – OPTION 1

To be completed by the qualified person who is a fire safety engineer and who prepares the plans of fire safety works which include any alternative solution, and the fire safety engineering report.

I, (Name of qualified person), NRIC No./Passport No._____ being a qualified person and a fire safety engineer under the Fire Safety Act, hereby certify that —

(a) the fire safety works as shown on these plans have been designed in accordance with the provisions of the Fire Code, the Fire Safety Act and any regulations made thereunder, the relevant codes of practice and design guidelines, subject to modifications or waivers under section 27 of the Fire Safety Act; and

(b) the alternative solution in the plans, and the fire safety engineering report, satisfy the fire performance requirements in the Fire Code, and comply with the Fire Safety Act and any regulations made thereunder, the relevant codes of practice and design guidelines, subject to any deviation or modification approved by the Commissioner.

I, (Name of qualified person) hereby certify that the proposed _____ system has been designed in accordance with the provisions of (State the code used).

FIRE PROTECTION (FP) AND AIR-CONDITIONING/MECHANICAL VENTILATION PLAN – OPTION 2

To be completed by a qualified person who is NOT a fire safety engineer and who prepares the plans of fire safety works, and prepares the alternative solution in the plans under the supervision of a fire safety engineer.

I, (Name of qualified person), NRIC No./Passport No. _____ being a qualified person under the Fire Safety Act, hereby certify that —

(a) the fire safety works as shown on these plans have been designed in accordance with the provisions of the Fire Code, the Fire Safety Act and any regulations made thereunder, the relevant codes of practice and design guidelines, subject to modifications or waivers under section 27 of the Fire Safety Act; and

(b) the alternative solution in the plans adheres to the fire safety engineering report.

I, (Name of qualified person) hereby certify that the proposed _____ system has been designed in accordance with the provisions of (State the code used).

To be completed by the fire safety engineer who is not a qualified person and who supervises the preparation of the alternative solution in the plans of fire safety works, and prepares the fire safety engineering report.

I, (Name of fire safety engineer), NRIC No./Passport No._____ being a fire safety engineer under the Fire Safety Act, hereby certify that the alternative solution shown on these plans, and the fire safety engineering report, satisfy the fire performance requirements in the Fire Code, and comply with the provisions of the Fire Safety Act and any regulations made thereunder, the relevant codes of practice and design guidelines, subject to any deviation or modification approved by the Commissioner.

3. Addition and Alteration Works

I, (Name of qualified person) in accordance with Regulation 4(5) of the Fire Safety (Building Fire Safety) Regulations hereby certify that the Minor Addition/Alteration works have been satisfactorily completed on date: _____ ; and

I certify that the addition / alteration works do not affect the existing fire protection system in accordance with Regulation 4(5) of the Fire Safety (Building Fire Safety) Regulations; or

I certify that the addition / alteration works as shown in these drawings affected the existing *sprinkler / automatic fire alarm systems and I have supervised the works on site to ensure that the said system(s) have been modified in accordance with Regulation 4(5) of the Fire Safety (Building Fire Safety) Regulations.

*include whichever is applicable

LIST OF TABLES

LIST OF FIGURES

ANNEX I.B

ANNEX I.C

CODE OF PRACTICE FOR BIM E-SUBMISSION SERIES

This section is part of the Code for Practice for BIM e-Submission series:

Code of Practice for BIM e-Submission	
	A. General Requirements
	B. Architectural Requirements
	C. Civil & Structural (C&S) Requirements
	D. Mechanical, Electrical & Plumbing (MEP) Requirements

All documents related to BIM e-Submission can be downloaded from the CORENET website:

- Code of Practice for BIM e-Submission
- BIM e-Submission Templates
- BIM e-Submission Template Guides

https://www.corenet.gov.sg/general/building-information-modeling-(bim)-e-submission.aspx

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For more information and feedback on the Code of Practice for Building Information Modelling series, please visit the CORENET website:
www.corenet.gov.sg

