

BIM

e - Submission Guideline

Mechanical, Electrical, Plumbing

While BCA tries to highlight the major points of submission requirements, BCA cannot take into account all the special cases in other regulatory agencies as well as the changing technology. Updated versions will continue to be issued to address and incorporate on-going feedback in an open, collaborative process. All readers of this provisional guide are encouraged to submit feedback to BCA CORENET.

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Information and contents set forth in this document are subject to changes and will be released as updates in subsequent version.

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Version	Revision Date	Summary of Changes	Remarks
1.0	Oct 10		Released to Pilot Sites
2.0	Apr 11	<ul style="list-style-type: none"> • Re-specification of BM project delivery to various regulatory agencies • Addition of requirements to the following agencies: <ul style="list-style-type: none"> ▪ IDA - TFCC ▪ CityGas ▪ PUB Water • Amendments on the requirements of the following agencies: <ul style="list-style-type: none"> ▪ FSSD ▪ NEA-CBPU / PUB-WRN 	Released April 2011
3	Jul 11	<ul style="list-style-type: none"> • Re-organized requirements of the City Gas agency 	For Release

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1. Introduction

1.1. Purpose of Document

The objective of this Document is to assist qualified persons (QPs) in developing BIM models to meet new requirements of Building Information Model (BIM) submission. It describes the requirements and guidance for creating BIM with specific object types, associated properties and presentation format to the following regulatory agencies for visual processing:

- a. National Environment Agency (NEA), Central Building Plan Unit
- b. Public Utility Board (PUB), Water Reclamation (Network) Department
- c. Public Utility Board (PUB), Water Supply Network Department
- d. Fire Safety and Shelter Department (FSSD)
- e. Infocomm Development Authority (IDA)
- f. CityGas Pte Ltd

Note: *The respective regulatory agency reserves the right to reject and request for necessary correction of any required deliverables or formats that do not meet the requirements.*

1.2. Scope

This submission guideline contains a list of requirements written in a concise form to guide QPs in preparing BIM submission to the above mentioned regulatory agencies. It is by no means an exhaustive list of requirements of the building works which must be complied with when making a building plan or planning submission. The items in this Standard Guideline may also be amended or revoked when new written laws come into force. For more information or enquiries on the specific submission requirements, please consult the appropriate regulatory agency above.

CAD vendors and retailers have developed their own application dependent user manuals. These user manuals should be read carefully as this Document cannot take into account all the special features of individual BIM application. For any submission requirements mentioned in the Appendices that require customisations to a certain extent, QPs are also advised to make reference to the training materials distributed or to consult the respective software vendor for any enquiries on the application.



2. General Requirements

2.1. Deliverable Format

QPs are required to submit BIM saved in the file format, as summarized in Table 1, upon submission to each of the above mentioned regulatory agencies.

Note: All BIM e-submission through CORENET e-Submission System is limited to **not more than 100MB** per file per submission. If the file size is larger than 100MB, QPs are requested to deliver in CD-ROM to the respective agency.

Table 1 Accepted file format in BIM submission for regulatory approval

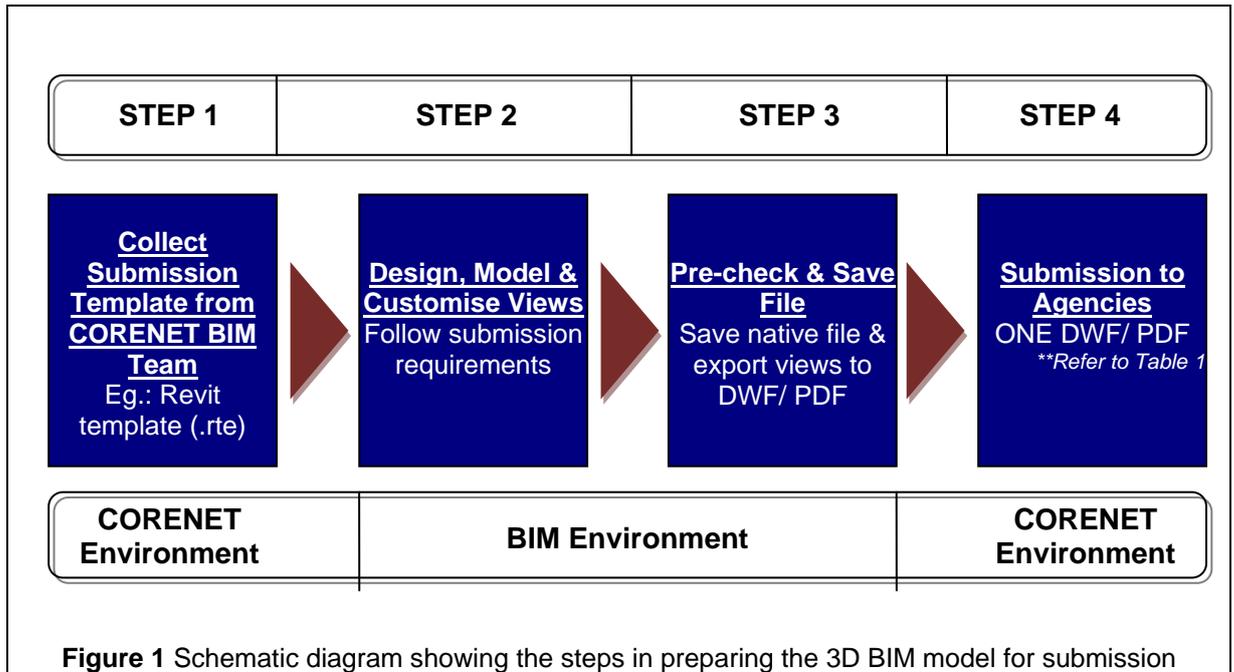
Regulatory Agencies	Accepted File Format for BIM Submission	Remarks
BIM submissions to other regulatory agencies: a. CBPU; b. PUB-WRN; c. PUB-WTR; d. FSSD; e. IDA-TFCC; and f. CityGas	a. A single light-weighted file format , as published from the similar BIM native file: i. DWF (.dwf); or ii. PDF (.pdf)	The respective regulatory agency reserves the right to request BIM native file for verification, ONLY if necessary.

All drawing views below should be compiled into a single **DWF/PDF** file.

Refer to Appendix C for detailed steps in publishing to DWF/PDF.

Note: QPs are advised to test the published DWF/PDF file prior to submission to respective agencies. If the published file failed or consumed time to open due to file size or volume of MEP elements involved, QPs are suggested to have separate DWF/PDF file for sheets and 3D views.

- a. Plans, elevations, sections, layout views or sheets (refer to Appendix A for specific requirements from each regulatory agency), with appropriate title block and QP's stamp;
- b. Schematic Diagram is required for submission to all agencies involved
- c. Legend is required for submission to all agencies involved
- d. 3D model views:
 - Complete 3D DWF model showing the complete services
 - Part 3D model (services + archi model, if any) by shafts/ important part cross sections (Refer to Appendix A)
 - Take note of the naming convention – if part section, include grid numbers (Refer to Section 2.4)



2.2. Model Scale

All 3D CAD models or BIM submitted for approval have to be drawn in real size as built (1:1) in metric scale.

2.3. Model Orientation and Site Configuration

The site, building model or its adjacent buildings should be drawn in the real orientation or spatial coordinate system and with reference to Singapore Standard Datum (>100M), rather than project reference level at zero ground.



2.4. Standard Naming of File and Drawing Views

File naming convention below (as modified from SS CP83 Part 3) should be used for all project files submitted:

Sample:

Project ID				Author	Zone		Version	User-defined
M	L	P	1	M	-	0	1	A

Table 2: Naming convention for each 3D model or BIM file submitted

Name of Field	Indicators	Description
Project Identification		User defined field for the project
Author	A-	Architect
	C-	Civil engineer
	E-	Electrical engineer
	L-	Land surveyor
	M-	Mechanical engineer
	N-	Equipment supplier
	S-	Structural engineer
	T-	Telecommunication/ Signal engineer
	V-	Other disciplines
Zone (or Block)	NN	where, N: zone or block number e.g.: 01 for Block 1 A1 for Zone A1
	--	For all blocks
Version (Revision/ Submission)	A-	1 st submission
	B-	2 nd submission
	C-	3 rd submission
User-defined (Optional)		User defined code for in-house applications (optional field)

Within each DWF/PDF submitted to the regulatory agencies, all its related drawing views (plans, elevations, sections and 3D views) and layouts (contain only data information such as qualified person's declarations and schedules) should follow the naming convention below:

Note: Follow the submission template provided and it should give you a guide to begin.

Sample:

Agency				Type of View	View Name							
F	S	S	D	F	P	1 ST	S	T	O	R	E	Y



Table 3 Naming convention for each drawing view

Name of Field	Indicators	Description
Agency	CBPU	Central Building Plan Unit
	PUB-WRN	Public Utility Board, Water Reclamation (Network)
	PUB-WTR	Public Utility Board, Water Supply Network
	FSSD	Fire Safety and Shelter Department
	IDA-TFCC	Infocomm Development Authority, Telecommunication Facility Coordination Committee
	CITYGAS	CityGas Pte Ltd
Type of View	SP	Site Plan
	FP	Floor Plan
	FE	Elevation
	FX	Section
	DT	Details
	3D	3D View
	LG	Legend
	DG	Schematic Diagram
View Name	1 ST STOREY; or 2 ND STOREY; or 3 RD STOREY; or N TH STOREY; or LOWER ROOF; or ROOF	where, N: Storey's number
	MEZZANINE N	where, N: Mezzanine's number
	BASEMENT N	where, N: Basement's number
	ELEVATION N or N ELEVATION	where, N: Directions (e.g.: East, West, North, South; or 1, 2, 3, 4)
	SECTION N	where, N: Section's number
	SUMMARY OF GFA; or SUMMARY OF INCENTIVE GFA; or SUMMARY OF X	Where, X: Schedule's Name

2.5. Annotations and Dimensions

Except for 3D model view, all other submitted views such as plans, schematic diagrams, elevations and sections should be indicated clearly with the necessary annotations, dimensions, scalebar and north point, as specified by the respective regulatory agency in Appendix A. Within each of the model view, QPs are also required to include the related name of view, as shown in Figure 2.

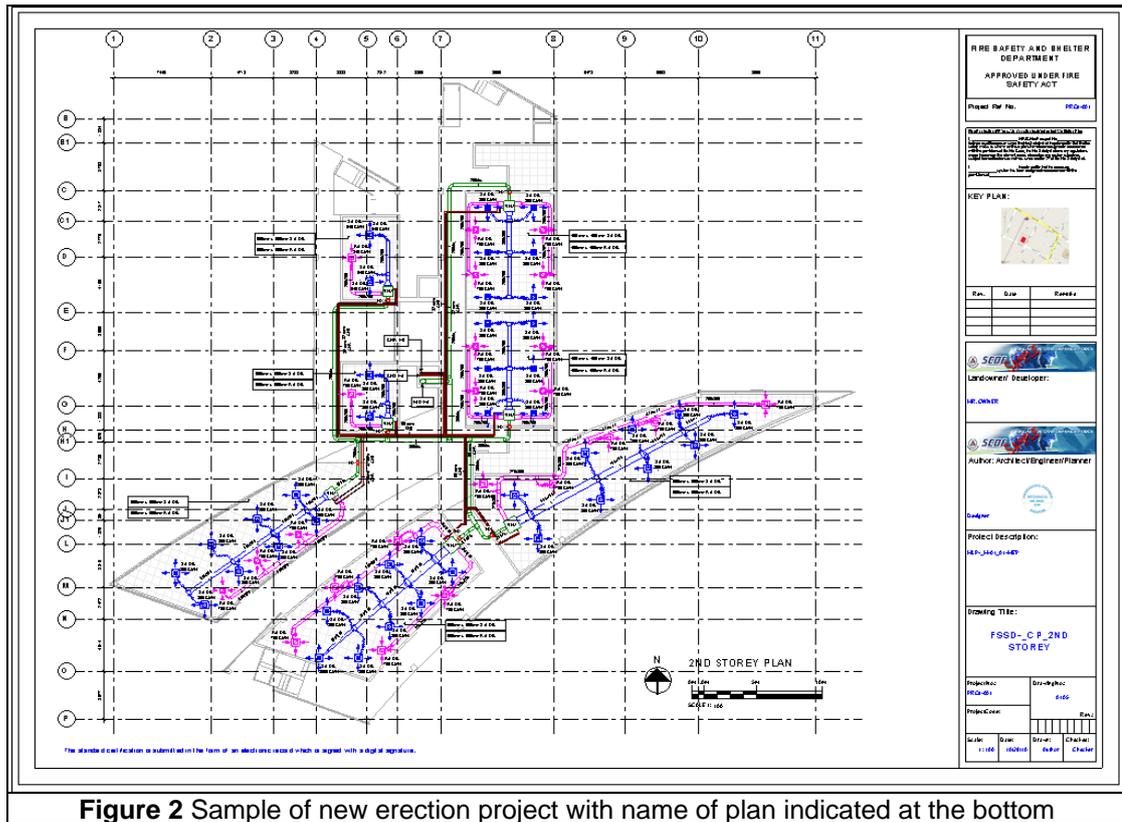


Figure 2 Sample of new erection project with name of plan indicated at the bottom

2.6. Last Saved Model or Last Saved View

Checking and approval from the regulatory agencies is based on the “Last Saved Model”, together with the “Last Saved View” of site plans, floor plans, elevations and sections submitted. Therefore, QPs are to ensure that the following items are checked upon submission:

- a. Maximum extent is saved for each drawing view;
- b. No hidden objects or annotations;
- c. Any link (3D model or BIM saved in other file) that is considered part of the submission is bind as a single integrated BIM;
- d. All other external references, irrelevant drawing layers, objects, annotations, draft work and construction lines, which are not part of the constructed building elements, are to be removed or purged upon submission; and
- e. No proprietary fonts are used for annotations and all the fonts should be legible; and
- f. All objects and annotation in each phase were displayed in the last saved view.



2.7. Model for Addition and Alteration Works/ Amendments

The same BIM model (with changes incorporated to comply with the requirements) should be used in resubmission (i.e. no shifting of spatial coordinate system in the re-submitted model). The revised submission should be indicated clearly in the name of BIM file submitted, following the format at Section 2.4.

For any plan of alteration or addition to an existing building, or, re-submission for regulatory approval, all the building objects or elements should be demarcated clearly by colours in Table 4 (in accordance with SS CP83 Part 5):

Table 4 Colours used for A&A project

Colour	Usage
Magenta	Proposed elements
Cyan	Existing elements
Yellow	Deleted elements

Any building works which are to be deleted, removed or demolished must be shown in dotted lines on the plans and presented in a manner that can be easily identified or distinguished, as shown in Figure 3.

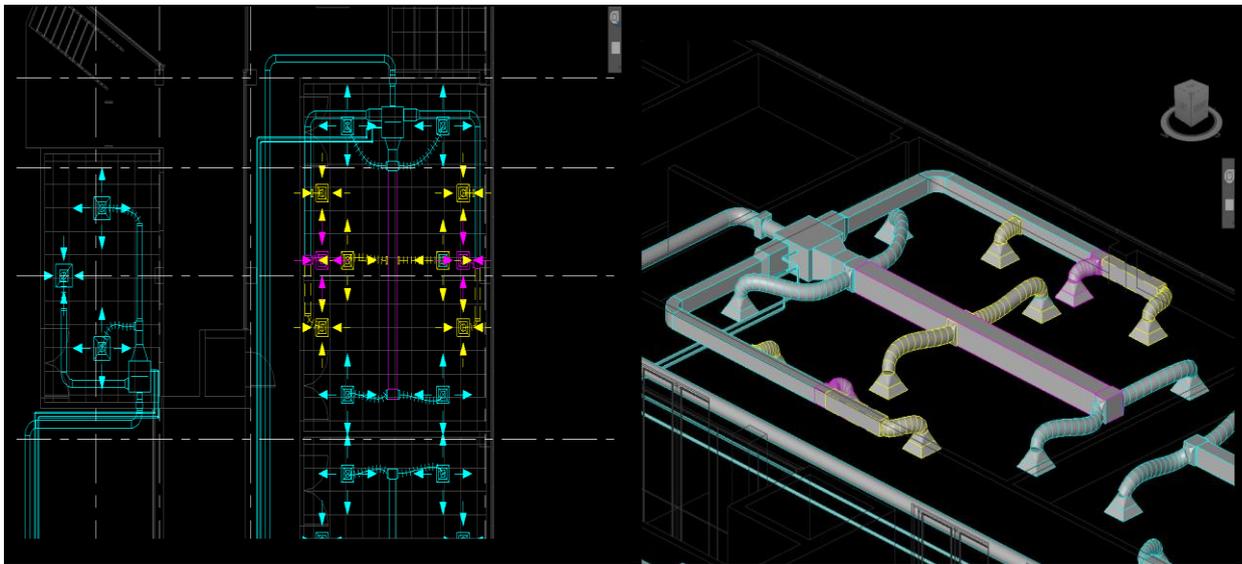


Figure 3 Sample of A&A project / project for re-submission (plan and 3D views)



QPs should include a complete set of all related model views (plans, elevations, sections and 3D views) in every submission, including the re-submission of amendments. For any model view which contains NO amendments, a box indicating that this is **“For Reference ONLY”** shall be placed on the top right corner of the model view, and all its building objects or elements shall be demarcated with **CYAN** colour, as shown in Figure 4.

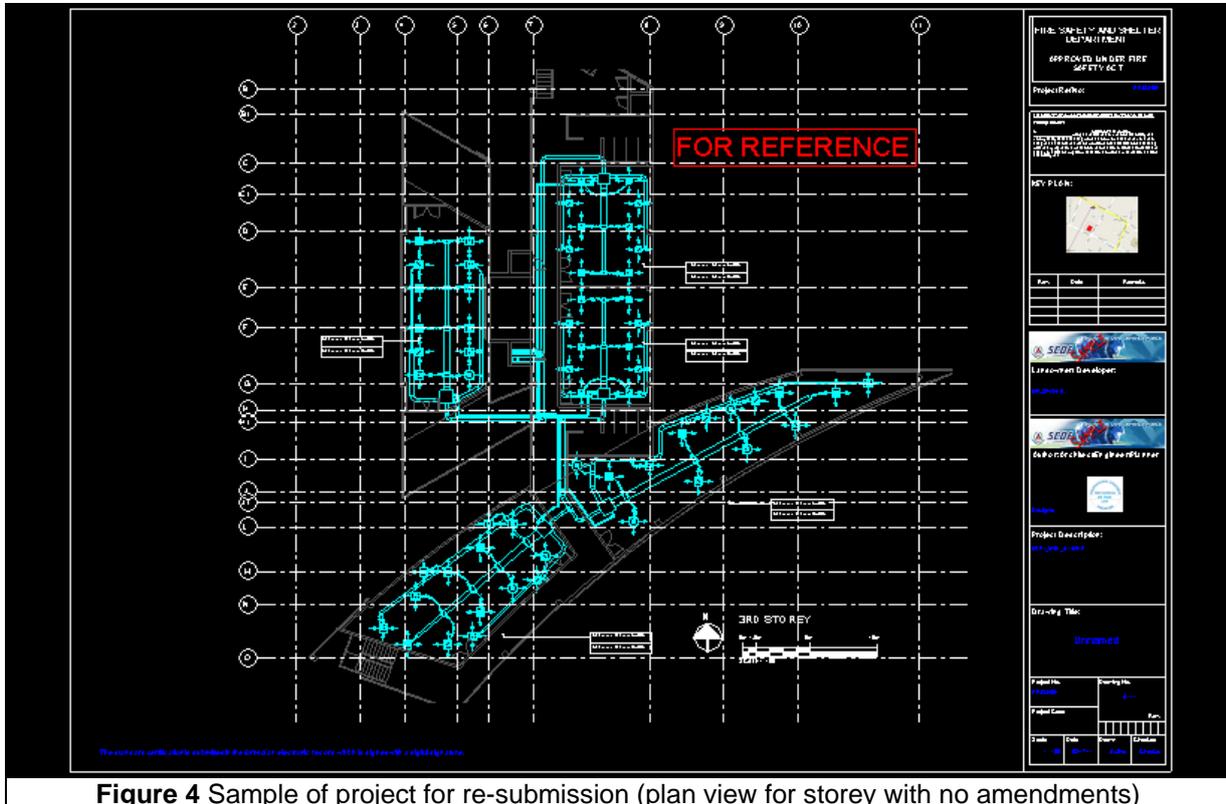


Figure 4 Sample of project for re-submission (plan view for storey with no amendments)



Appendix A Specific Submission Requirements

A-1 NEA-CBPU and PUB-WRN Submission Requirements

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

1. Development Control;
2. Building Plan on Pollution Control;
3. Building Plan on Environmental Health;
4. Detailed Plan on Sewerage Works (Proposed Sewer/ Sewer Diversion Works/abandoned sewers and pumping mains/grouting of abandoned sewers and pumping mains/Sewage treatment plant/holding tanks, etc);
5. Detailed Plan on Sanitary Works (for Sanitary Plumbing & Drainage System/ Sewer Connection);
6. Detailed Plan on Sewerage M&E Works;
7. Detailed Plan on Drainage Works – Main Development Submission;
8. Detailed Plan on Drainage Works – Proposed Roadside Drain/ Culvert;
9. As-built Plan for TOP/CSC – Proposed Sewer/ Pumping Mains/ Sewer/ Pumping Main Diversion Works; abandoned sewers and pumping mains/grouted abandoned sewers and pumping mains/Sewage Treatment Plants/Holding Tank, etc.;
10. As-built Plan for TOP/CSC – Sanitary Works (Sanitary Plumbing & Drainage System/ Sewer Connection);
11. As-built Plan for CSC – Proposed Roadside Drain/ Culvert;
12. As-built Plan for CSC – Pumped Drainage System at Basement;
13. As-built Plan for CSC – Internal Drain with Deviations;
14. Certified Survey Plan for CSC – Development in the vicinity of/ affected by Drainage Reserve; and
15. URA Approved Sub-division Plan for CSC – for Site affected by Drainage Reserve.

Please note that symbols, layers, drafting conventions, line types and colours should follow the **Singapore Standard CP83: Code of Practice for Construction computer aided design (CAD)**.



1. General Requirements for all CBPU/ PUB-WRN Submissions

QPs are to take note of the requirements below for all CBPU/ PUB-WRN submission:

- a. Site Plan: Include the connection to main pipe
- b. Drawing scale of Site Plan: Use either 1:500, 1:1000 (do not use odd scale)
- c. Key plan/Location plan to show surrounding site and location

2. Development Control

2.1. Site Plan View

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

2.1.1. Key Plan

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

2.1.2. Location Plan

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

2.1.3. Site Plan

Site plan shall show the following:

- a. Layout of the site with boundary lines verged in **RED**. Road name, town subdivision, mukim and lot numbers and areas (m²)
- b. Outline of buildings or structure;
- c. Building setback from MRT track;
- d. Existing sewers (including DTSS tunnels), pumping mains and sewerage facilities, including their sizes, as reflected in Sewerage Interpretation Plans, within 25m (for sewers) or 36m (for DTSS tunnels) of development boundary; Outline of the Sewer Protection zone (25m from sewers or 36m from DTSS tunnels).
- e. Outline of sewer setback distance from sewers or pumping mains and clear horizontal distance between structures or buildings and the sewers;
- f. Bin centre location and vehicular access;
- g. Existing Drainage reserves line with dimensions, entrance culverts or roadside drains;



- h. Proposed, proposed abandon sewers and sewer connection line or pumping mains or drains, sewer or pumping main diversion work (including their sizes), holding tank or sewage treatment plant or sewage pump sump;
- i. 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
- j. Road reserves line with dimensions, road levels or ground levels including the existing road levels or ground levels at the outlet discharge point of internal drains.

2.2. Floor Plan View

In specific, all basement, 1st storey and higher storey plan of development control shall show the proposed platform levels for all areas, room's tag and the following:

2.2.1. Basement Plan

- a. For industrial development, use of floor space for industrial processes or activities;
- b. Provision for pollution control equipment;
- c. Toilets/sanitary facilities, refuse chute chambers, car washing bays, garage gully and oil interceptor;
- d. Food shops and grease traps;
- e. Provision for pump sewerage system, if used water is generated;
- f. All entrance or openings to the basement, platform levels, cut-off drains, crest levels, threshold levels and drainage pump system; and all adjacent road levels (both at the front and the back of site) or ground levels.
- g. Areas open to sky to be served by pumped drainage system; and
- h. Bin centre and vehicular access to the bin centre.

2.2.2. First Storey Plan

- a. For industrial development, use of floor space for industrial processes or activities;
- b. Provision for pollution control equipment;
- c. Bin centre and vehicular access to the bin centre;
- d. Location of refuse chute chambers;
- e. Existing, proposed and proposed abandon sewers, pumping mains, sewer connection, including all their sizes, manholes, discharge



- chambers, their top and invert levels, and their setback from buildings or structures;
- f. Sewer and Manhole ID for existing or proposed abandon sewer / pumping main/ manhole
 - g. Adjacent lots and existing sewer/sanitary drain lines from adjacent lots,
 - h. Overhanging structures or roof eaves above existing or proposed sewer or pumping main;
 - i. The last inspection chamber, pipe size, the top and invert of the last IC and connecting manhole;
 - j. Reinforced concrete trench for sewer that do not meet building setback requirement;
 - k. Drainage reserve and its alignment and width;
 - l. 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;
 - m. Proposed or existing platform level, adjacent road/ground levels at the outlet discharge points of internal drains;
 - n. Road reserves line with dimensions;
 - o. Link to MRT station and /or existing building link to MRT station, if any;
 - p. Proposed ramp and boundary fence or walls.

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

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

2.3. Roof Plan View

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

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

2.4. Elevation View

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

- a. For industrial buildings, location of flue gas stacks and chimneys;
- b. Provision for pollution control equipment;
- c. Building height;



- d. Sewer setback from building or structures; Clear horizontal and vertical distances between the building or structure and the sewers or pumping mains
- e. Location of reinforced concrete trench;
- f. Refuse chute ventilation openings, roof gutter or scupper drains (if any), parapet walls, railings;
- g. Bin centre and its height;
- h. Drainage reserve, common drains, roadside or external drains, existing and proposed boundary fence or walls; and
- i. Structures closer than 2.0m from the edge of the Drainage Reserve.

3. Building Plan on Pollution Control

3.1. Site Plan View

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

3.1.1. Key Plan

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

3.1.2. Location Plan or Site Plan

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

3.2. Floor Plan View

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

3.2.1. Basement Plan

- a. All details or processes inside the basement of the building;
- b. Trade effluent drainage or piping system to collect and convey trade effluent generated;
- c. Location of trade effluent treatment plant;
- d. Location of trade effluent sampling sump or system and the connection to the internal sanitary drainage system;



- e. 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;
- f. Types and locations of fuel burning equipment;
- g. Locations of air pollution control equipment;
- h. Containment facility for storage tanks;
- i. Locations of toxic industrial water treatment and disposal facilities;
- j. Containment facilities for generator; and
- k. Car washing bays, garage gully or oil interceptor.

3.2.2. First Storey Plan

- a. All details or processes inside the first storey of the building;
- b. Trade effluent drainage or piping system to collect and convey trade effluent generated;
- c. Location of trade effluent treatment plant;
- d. Location of trade effluent sampling sump or system and the connection to the internal sanitary drainage system;
- e. Location of Last Inspection Chamber (includes pH monitoring and discharge control system);
- f. 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;
- g. Types and locations of fuel burning equipment;
- h. Locations of air pollution control equipment;
- i. Containment facility for storage tanks;
- j. Locations of toxic industrial water treatment and disposal facilities;
- k. Containment facilities for generator; and
- l. Air intake or exhaust points for mechanical ventilation system.

3.2.3. Second Storey to Highest Storey Plan

- a. All processes or activities inside the second to highest storey of the building;
- b. Trade effluent drainage or piping system to collect and convey trade effluent generated;
- c. Location of trade effluent treatment plant;
- d. Location of trade effluent sampling sump or system and the connection to the internal sanitary drainage system;
- e. 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;
- f. Types and locations of fuel burning equipment;



- g. Locations of air pollution control equipment;
- h. Containment facility for storage tanks;
- i. Locations of toxic industrial water treatment and disposal facilities; and
- j. Air intake or exhaust points for mechanical ventilation system.

3.3. Roof Plan View

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

- a. Location of chimneys for the dispersion of flue gases;
- b. Types and locations of fuel burning equipment;
- c. Stacks for the dispersion of exhaust gases;
- d. Cooling towers location and its overflow or drain-off point; and
- e. Locations of air pollution control equipment.

3.4. Elevation View

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

- a. Flue gas stacks and chimneys;
- b. Types and locations of fuel burning equipment;
- c. Building height;
- d. Air pollution control equipment; and
- e. Trade effluent treatment plant and toxic industrial water treatment and disposal facilities.

4. Building Plan on Environmental Health

4.1. Site Plan View

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

4.1.1. Key Plan

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

4.1.2. Location Plan

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

4.1.3. Site Plan



Layout of the site with boundary lines verged in **RED**.

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

4.2. Floor Plan View

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

4.2.1. Basement Plan

- a. Refuse chute chambers and sanitary facilities or toilets; and
- b. Food shops.

4.2.2. First Storey Plan

- a. MRT setback lines and distance;
- b. Bin centre and access;
- c. Swimming pool, open spa or jacuzzi;
- d. Refuse chute chambers and sanitary facilities or toilets;
- e. 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; and
- f. Common drain.

4.2.3. Second Storey to Highest Storey Plan

- a. Swimming pool and restaurant;
- b. Refuse chute chambers and sanitary facilities or toilets; and
- c. 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.

4.3. Roof Plan View

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

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



- c. Kitchen exhausts for foodshops.

4.4. Elevation View

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

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

5. Detailed Plan on Sewerage Works (Proposed Sewer/ Sewer Diversion Works, abandoned sewers and pumping mains/grouting of abandoned sewers and pumping mains/Sewage treatment plant/holding tanks, etc)

5.1. Site Plan View

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

5.1.1. Key Plan

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

5.1.2. Site Plan

Layout of the site with boundary lines verged in **RED** and outline of building and structure.

- a. Proposed or existing or proposed abandon sewer or pumping main or diversion and their setback distance from building or structures or Drainage Reserve or neighbouring lot;
- b. 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;
- c. Pipe sizes, invert and top levels of all manholes including the connecting manhole(s); and



- d. Provision of or existing pump sump or holding tank or sewage treatment plant.

5.2. First Storey Floor Plan View

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

- a. Proposed or existing or proposed abandon sewer or pumping main or diversion, and their setback distance from building or structures or Drainage Reserve or adjacent lot;
- b. Reinforced concrete trench with removable slabs (*annotated on the plan with width and length dimension*) for existing or proposed sewer under building or structures or with insufficient setback from building or structures;
- c. Pipe sizes, gradients, materials, invert and top levels of all the manholes including the connecting manhole(s);
- d. Provision of pump sump or holding tank or sewage treatment plant; and
- e. Proposed ramp, boundary fence or walls.

5.3. Elevation View

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

- a. Headroom for overhanging structures or roof eaves above existing or proposed sewer or pumping main;
- b. Pipe size and invert levels of the existing or proposed sewer or pumping mains and their setback distance from building or structures;
- c. Reinforced concrete trench with removable slabs (*annotated on the plan with width and depth dimension*) for existing or proposed sewer under building or structures or with insufficient setback from building or structures;
- d. Pipe sizes, invert and top levels of all the manholes including the connecting manhole(s);
- e. Building height;
- f. Proposed boundary fence or walls; and
- g. Pump sump or holding tank or sewage treatment plant.

5.4. Longitudinal Section View

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



- a. 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);
- b. Method of laying and pipe haunching/bedding details;
- c. Horizontal and vertical clearance distances of underground services or structures from sewers or pumping mains, and
- d. Headroom clearance of overhanging or overhead structures and their horizontal clearance distance from sewers or pumping mains.

4.5 Cross-sectional view

In specific, the cross section view shall show or indicate the followings.

- a. all technical details and dimensions of pump sump, holding tank or sewage treatment plant, deep manhole (>6m) with backdrop or vortex connections.
- b. detail capacity sizing calculation for holding tank or sewage treatment plant.

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

6.1. Site Plan View

In specific, all key plan and site plan of sanitary plumbing and drainage system or sewer connection shall show the following:

6.1.1. Key Plan

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

6.1.2. Site Plan

Layout of the site with boundary lines verged in **RED**.

- a. Outline of building or structure
- b. Sewer connection and its pipe size, the invert and top levels of last inspection chamber and the connecting manhole;
- c. Existing or proposed sewer or pumping main and their setback distance from building or structures, pipe sizes, invert and top levels of manholes;
- d. 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; and

- e. Provision of or existing pump sump or holding tank or sewage treatment plant.

6.2. Floor Plan View

In specific, the basement, 1st storey and higher storey floor plan of sanitary plumbing and drainage system or sewer connection shall show the following:

6.2.1. Basement Plan

- a. All sanitary appliances or fittings and internal sanitary plumbing and drainage system connected to the 1st storey inspection chambers or the sewerage system;
- b. Pipe sizes, gradients, materials, invert and top levels of the sumps/chambers and inspection chambers;
- c. Declaration of all pipe sizes and materials used for sanitary appliances (eg. discharge pipe, urinal pipe, vent pipe, discharge stack, etc);
- d. Provision of Sewerage pumping system;
- e. Eating establishments/food shops and its kitchen or food preparation areas and grease trap or sewage divertor, if any.
- f. Potable water tank,
- g. Overhead sanitary pipes in food shops' kitchens or potable water tank;
- h. Toilets/sanitary facilities, refuse chutes, and washing areas; and
- i. Platform levels

6.2.2. First Storey Plan

- a. All sanitary appliances or fittings or soil and vent stack(s) and their connection to inspection chambers;
- b. Internal sanitary drainage system and its connection to existing or proposed sewer or manhole;
- c. Pipe sizes, gradients, materials, invert and top levels of the sumps/chambers and inspection chambers;
- d. Declaration of all pipe sizes and materials used for sanitary appliances (eg. discharge pipe, urinal pipe, vent pipe, discharge stack, etc);
- e. Double floor slab (including access opening) for sanitary pipes sited over bedroom, living room, dining room and kitchen area;
- f. Reinforced concrete trench with removable slabs (*annotated on the plan with width and length dimension*) for existing or proposed sewer under building or structures or with insufficient setback from building or structures;



- g. Existing & proposed sewer or pumping main and their sizes, setback from building or structure;
- h. Invert and top levels of all the manholes including the connecting manhole(s);
- i. Adjacent lot and existing sewer/sanitary drainlines from adjacent lots,
- j. Provision of pump sump or holding tank or sewage treatment plant.
- k. Eating establishments/food shops and its kitchen or food preparation areas and grease trap or sewage divertor, if any.
- l. Potable water tank, and
- m. Overhead sanitary pipes in food shops' kitchens or potable water tank.
- n. Toilets/sanitary facilities refuse chutes/bin centres, and washing areas.
- o. Existing sanitary drainlines that would be retained;
- p. Proposed ramp, boundary fence or walls;
- q. Length of branch drainline from WC to the Inspection Chamber; and
- r. Platform levels.

6.2.3. Second Storey to Highest Storey Plan

- a. All sanitary appliances or fittings or soil and vent stack(s) and internal sanitary plumbing and drainage system;
- b. Eating establishments/food shops and its kitchen or food preparation areas and grease trap or sewage divertor, if any;
- c. Overhead sanitary pipes in food shops' kitchens or potable water tank;
- d. Toilets/sanitary facilities, refuse chutes/bin centres and washing areas;
- e. Length of WC's discharge pipe to the discharge stack; and
- f. Double floor slab (including access opening) for sanitary pipes sited over bedroom, living room, dining room and kitchen area.

6.3. Roof Plan View

In specific, the roof plan of sanitary plumbing and drainage system or sewer connection shall show the following:

- a. Termination of sanitary ventilation stacks;
- b. Roof garden and window openings of penthouse units (indicated with distance from the ventilation stack to the window opening); and
- c. Potable water tank, if any.

6.4. Schematic Diagram for Sanitary Plumbing and Drainage system

In specific, the schematic diagram of sanitary works shall show all the sanitary plumbing and drainage system in the premises.



6.5. Elevation View

In specific, the elevation view of sanitary plumbing and drainage system or sewer connection shall show the following:

- a. Sanitary plumbing and drainage system within the premises connected to the sewerage system;
- b. Sewer connection and its pipe size, the last inspection chamber and the connecting manhole;
- c. Pipe size and invert or top levels of existing or proposed sewer or pumping main, and the setback distance from building or structures;
- d. Reinforced concrete trench with removable slabs (with width and depth dimension); and
- e. Pump sump, sewage ejector tank, holding tank or sewage treatment plant.
- f. Building height;
- g. Sewer setback from building or structures; horizontal and vertical clearance distances between the building or structure/substructure and the sewers or pumping mains
- h. Headroom for overhanging structures or roof eaves above existing or proposed sewer or pumping main; and
- i. Proposed ramp, boundary fence or walls;
- j. Potable water tank
- k. Height of stack terminated on roof/roof garden

7. Detailed Plan on Sewerage M&E Works

7.1. Electrical Floor Plan View

In specific, the electrical drawings must be endorsed by LEW/ Electrical QP and shall include the following:

- a. Electrical Single Line Diagram;
- b. Electrical Control Schematic Diagram;
- c. Electrical Panel Diagram;
- d. Float Switches or Electrodes Level Arrangement Diagram and the description of their operations; and
- e. Statement of declaration by the LEW / Electrical QP.

7.2. Mechanical Floor Plan and Section View



In specific, the mechanical floor plan and sectional view must be endorsed by Mechanical QP and shall show the following:

- a. Dimension, size and material used for the equipments;
- b. Pipe material and size;
- c. Discharge point of the pump system;
- d. Make and model of pump;
- e. Centre line of RSJ (lifting equipment);
- f. Ventilation system;
- g. Indicate the end point of vent pipe connection;
- h. Indicate the inflow pipe;
- i. Location of control panel;
- j. Kerb round the pit opening (if the pump system is not in a room);
- k. Detail calculation for the sizing of the pumps with catalogue and pump curve; and
- l. Statement of declaration by the Mechanical QP.

8. Detailed Plan on Drainage Works – Main Development Submission

8.1. Site Plan View

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

8.1.1. Location Plan

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

8.1.2. Site Plan

Boundary of development site shall be edged in **RED**

- a. Proposed platforms levels and road or ground levels at the outlet discharge point of the internal drains;
- b. Drainage reserves and common drains, which shall also be dimensioned;
- c. Lots or plot number of development;
- d. 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;
- e. Internal drains incorporating flow direction and outlet discharge points connecting to the existing drains; and



- f. 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.

8.2. 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:

8.2.1. Basement Plan

- a. Cut-off drains;
- b. Crest level of entrances and openings comply with “Code of Practice on Surface Water Drainage” and to indicate on plan;
- c. Pumped drainage system complies with “Code of Practice on Surface Water Drainage” to indicate on plan;
- d. Proposed basement platform level, fronting and adjacent road levels of development;
- e. Details of pumped drainage system shall be submitted separately for PUB C&W Department’s record;
- f. The areas in meter square (m²) which are exposed to ingress of rainwater; and
- g. Underground linkage to MRT Station or underground linkage to development having underground linkage to MRT Station.

8.2.2. First Storey Plan

- a. Proposed platforms levels for all areas;
- b. Drainage reserves which shall also be dimensioned;
- c. Site boundary;
- d. Road widening line and road levels;
- e. Runoff from neighbouring lot and type, size of the common drain affected by the development;
- f. Proposed or existing drainage provided for runoff from neighbouring lot;
- g. Internal drains incorporating flow direction and outlet discharge points connecting to the external drains;



- h. Outlets discharge points of the proposed or existing internal drains connecting to the existing or proposed drains; and
- i. Threshold level for all entrances or openings to the basement or proposal linkage to underground MRT Station.

9. Detailed Plan on Drainage Works – Proposed Roadside Drain/ Culvert

9.1. Site Plan View

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

9.1.1. Location Plan

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

9.1.2. Site Plan

Boundary of development site shall be edged **RED**.

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

9.2. 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:

- a. Alignment and extent of proposed drain;
- b. Highlight the proposed drain;
- c. Summit point and direction of flow of proposed drain;
- d. Width and type of proposed drain;
- e. Road reserve or widening line or boundary line;
- f. Drainage reserve lines with dimensions (if applicable);
- g. Invert levels, top levels and road or ground levels;



- h. Size and spacing of grating covers for closed drain; and
- i. Drop inlet chambers and scupper drains.

9.3. Cross Sectional View

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

- a. Boundary line or road reserve line and drainage reserve line, if applicable;
- b. Clear width, minimum and maximum depth;
- c. Type and size of Dry Weather Flow channel;
- d. Type of safety railings, if applicable;
- e. Thickness of walls, top and base slab;
- f. Reinforced details and grade of concrete;
- g. 300mm thick false bottom;
- h. Weepholes, hardcore backing and geotextile;
- i. Lean concrete and hardcore sub base;
- j. Aluminum rungs, if applicable;
- k. Cross fall of benching;
- l. Cross section of ramp within maintenance access, if applicable;
- m. Steel posts and chains across maintenance access, if applicable; and
- n. Details of box drain connections within drainage reserve, if applicable.

9.4. Longitudinal Section View

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

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

Slab Crossing Over Existing Drain shall show the following:

- a. Cross section of proposed slab over drain;
- b. Dimension clearance between cope of drain and soffit of slab;
- c. Dimension clearance between pile cap or footing and drain-wall;
- d. Endorsement on maintenance and removal of slab by owner as and when required by PUB;
- e. Safety railings, if applicable;



- f. Boundary line or road widening line;
- g. Concrete paving on ground below the slab;
- h. Cross fall of concrete paving; and
- i. Show location of slab crossing on site or 1st storey plan.

10. As-built Plan for TOP/CSC – Proposed Sewer/ Pumping Mains/ Sewer/ Pumping Main Diversion Works/abandoned sewers and pumping mains/grouting of abandoned sewers and pumping mains/Sewage treatment plant/holding tanks, etc

10.1. 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 with deviations shall show the following:

10.1.1. Key Plan

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

10.1.2. Site Plan

Layout of the site with boundary lines verged in **RED**.

- a. New or existing sewer or pumping main or diversion, and their setback distance from building or structures or Drainage Reserve or neighbouring lot;
- b. Sewer and Manhole ID for existing sewer/pumping main;
- c. 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;
- d. Invert and top levels of all the manholes including the connecting manhole(s);
- e. Abandoned sewers/pumping mains and grouted abandoned sewers/pumping mains;
- f. Provision of pump sump or holding tank or sewage treatment plant;
- g. Temporary Benchmark (TBM);
- h. Party maintaining; and
- i. Grid coordinates on the SVY21 datum (Nothing and Easting) of manholes.



10.2. 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 with deviations shall show the following:

- a. New or existing sewer or pumping main or diversion, and their setback distance from building or structures or Drainage Reserve or adjacent lot;
- b. Sewer and Manhole ID for existing sewer/pumping main;
- c. Reinforced concrete trench with removable slabs (*annotated on the plan with width and length dimension*) for existing or new sewer under building or structures or with insufficient setback from building or structures;
- d. Pipe sizes, gradients, materials, invert and top levels of all the manholes including the connecting manhole(s);
- e. Abandoned sewers/pumping mains and grouted abandoned sewers/pumping mains;
- f. Provision of pump sump or holding tank or sewage treatment plant;
- g. Temporary Benchmark (TBM);
- h. New ramp, boundary fence or walls; and
- i. Grid coordinates on the SVY21 datum (Nothing and Easting) of manholes.

10.3. Elevation View

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

- a. Headroom for overhanging structures or roof eaves above existing or proposed sewer or pumping main;
- b. Existing or New Sewer or pumping mains setback distance from building or structures;
- c. Reinforced concrete trench with removable slabs (*annotated on the plan with width and depth dimension*) for existing or new sewer under building or structures or with insufficient setback from building or structures;
- d. Pipe sizes, invert and top levels of all the manholes including the connecting manhole(s);
- e. Building height;
- f. New boundary fence or walls; and
- g. Pump sump or holding tank or sewage treatment plant.

10.4. Longitudinal Section View

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



- a. All existing or new 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;
- b. Pipe haunching/bedding details and type of foundation;
- c. Method of construction (jacking, open cut, etc); and
- d. Headroom clearance of overhanging or overhead structures.
- e. Horizontal and vertical clearance distances of underground services or structures from the sewers or pumping mains

Note: Legend for sewers or pumping mains or drainlines 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)

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

11.1. Site Plan View

In specific, all key plan and site plan of TOP/CSC sanitary works with deviations shall show the following:

11.1.1. Key Plan

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

11.1.2. Site Plan

Layout of the site with boundary lines verged in **RED**.

- a. Outline of building or structure
- b. Sewer connection and its pipe size, material, the invert and top levels of last inspection chambers and the connecting manhole;
- c. Existing sewer or pumping main and their setback distance from building or structures; pipe sizes, invert and top levels of manholes including the connecting manholes;
- d. Sewer and Manhole ID for existing sewer/pumping main;
- e. Abandoned sewers/pumping mains;
- f. 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;
- g. New sewer or diversion and their setback from building or structure, adjacent lot, Drainage Reserve, and Road Reserve;
- h. Provision of pump sump or holding tank or sewage treatment plant; and
- i. Party maintaining.

11.2. Floor Plan View

In specific, the basement, 1st storey and higher storey floor plan of TOP/CSC sanitary works with deviations shall show the following:

11.2.1. Basement Plan

- a. All sanitary appliances or fittings and internal sanitary plumbing and drainage system connected to the 1st storey inspection chambers or the sewerage system;
- b. Pipe sizes, gradients, materials, invert and top levels of the sumps/chambers and inspection chambers;
- c. Toilets/sanitary facilities, refuse chute chambers, car washing bays and garage gully;
- d. Sewerage pumping system;
- e. Platform levels;
- f. Eating establishments/food shops and its kitchen or food preparation areas and grease trap or sewage divertor, if any;
- g. Potable water tank (if any), and
- h. Overhead sanitary pipes in food shops' kitchens or potable water tank.

11.2.2. First Storey Plan

- a. Platform levels
- b. All sanitary plumbing and drainage system and their pipe size, gradients, materials within the premises connected to the sewerage system, sewer connection and its pipe size, the top and invert levels of all inspection chambers and the connecting manhole, invert levels of backdrop connection pipes to inspection chamber/manhole;



- c. All sanitary appliances or fittings or sanitary plumbing system (soil and vent stacks) and their connection lines to inspection chambers;
- d. Declaration of all pipe sizes and materials used for sanitary appliances (eg. discharge pipe, urinal pipe, vent pipe, discharge stack, etc);
- e. Double floor slab (including access opening) for sanitary pipes sited over bedroom, living room, dining room and kitchen area;
- f. Sanitary facilities or toilets; refuse chutes/bin centres and washing areas.
- g. All existing or new sewers, diversion sewers or pumping mains and their sizes, gradients, and setback distances from building or structures; Invert and top levels of all the manholes including the connecting manhole(s); Adjacent lots and sewer/sanitary connection lines from adjacent lots, Drainage Reserve and Road Reserve
- h. Sewer and Manhole ID for existing sewer / pumping main;
- i. Reinforced concrete trench with removable slabs (*annotated on the plan with width and length dimension*) for existing or proposed sewer under building or structures or with insufficient setback from building or structures;
- j. Eating establishments/food shops and its kitchen or food preparation areas and grease trap or sewage divertor, if any;
- k. Potable water tank;
- l. Overhead sanitary pipes in food shops' kitchens or potable water tank;
- m. Provision of pump sump or holding tank or sewage treatment plant;
- n. New ramp, boundary fence or walls;
- o. Length of branch drainline to the Inspection Chamber

11.2.3. Second Storey to Highest Storey Plan

- a. All sanitary appliances and fittings, soil and vent stacks and sanitary plumbing and drainage system connected to the inspection chambers and sewerage system at 1st storey;
- b. Double floor slab (including access opening) for sanitary pipes sited over bedroom, living room, dining room and kitchen area;
- c. Sanitary facilities or toilets, washing areas;
- d. Eating establishments/food shops and its kitchen or food preparation areas and grease trap, if any;
- e. Overhead sanitary pipes in food shops' kitchens or potable water tank;
and
- f. Length of WC's discharge pipe to the discharge stack

11.3. Roof Plan View



In specific, the roof plan of TOP/CSC sanitary works with deviations shall show the following:

- a. Sanitary pipes and potable water tank; and
- b. Termination of Vent stacks, roof garden and window openings of penthouse units (with dimension from the vent stack to the opening of window).

11.4. Schematic Diagram for Sanitary Plumbing and Drainage system.

In specific, the schematic diagram of TOP/CSC sanitary works with deviations shall show all the sanitary plumbing and drainage system in the premises.

11.5. Elevation View

In specific, the elevation view of TOP/CSC sanitary works with deviation shall show the following:

- a. All sanitary appliances or fittings, soil and vent stacks and the sanitary plumbing and drainage system within the premises connected to the sewerage system;
- b. Double floor slab for sanitary pipes sited over bedroom, living room, dining room and kitchen area;
- c. Sewer connection and its pipe size, the last inspection chamber and the connecting manhole;
- d. Platform levels;
- e. Existing or Proposed sewer or pumping main, pipe sizes, gradients, and horizontal and vertical clearance distances between the building or structure/substructure and the sewers or pumping mains
- f. Building height; headroom for overhanging structures or roof eaves above existing or proposed sewer or pumping main;
- g. Reinforced concrete trench with removable slabs;
- h. Pump sump or holding tank or sewage treatment plant;
- i. Proposed ramp, boundary fence or walls;
- j. Potable water tank (if any); and
- k. Height of vertical stack terminated on roof / roof garden

11.6. Summary tables indicating the numbers of the sanitary appliances (water closets, urinals, bidets and slop sinks)



installed at each units in the premises or lots of the development

Note: Legend for sewers or pumping mains or drainlines 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)

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

12.1. Site Plan View

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

12.1.1. Location Plan

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

12.1.2. Site Plan

Boundary of development site shall be edged **RED**.

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

12.2. First Storey Floor Plan View

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

- a. Alignment and extent of proposed drain;
- b. Highlight the proposed drain;
- c. Summit point and direction of flow of proposed drain;
- d. Width and type of proposed drain;



- e. Road reserve or widening line or boundary line;
- f. Drainage reserve lines with dimensions (if applicable);
- g. Invert levels, top levels and road or ground levels;
- h. Size and spacing of grating covers for closed drain; and
- i. Drop inlet chambers and scupper drains.

12.3. Cross Sectional View

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

- a. Boundary line or road reserve line and drainage reserve line, if applicable;
- b. Clear width, minimum and maximum depth;
- c. Type and size of Dry Weather Flow channel;
- d. Type of safety railings, if applicable;
- e. Thickness of walls, top and base slab;
- f. Reinforced details and grade of concrete;
- g. 300mm thick false bottom;
- h. Weepholes, hardcore backing and geotextile;
- i. Lean concrete and hardcore sub base;
- j. Aluminium rungs, if applicable;
- k. Cross fall of benching;
- l. Cross section of ramp within maintenance access, if applicable;
- m. Steel posts and chains across maintenance access, if applicable; and
- n. Details of box drain connections within drainage reserve, if applicable.

12.4. Longitudinal Section View

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

- a. Existing and proposed invert levels;
- b. Soffit, coping, ground and road levels;
- c. Extent, size and type of proposed drain or culvert;
- d. Gradient and direction of flow of proposed drain or culvert;
- e. Clear depth and chainages; and
- f. 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 Building Plan)
Cyan	Existing (Compared to Building Plan)



Yellow	Demolished or Abandoned sewers or drainlines (Compared to Building Plan)
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13. As-built Plan for CSC – Pumped Drainage System at Basement

13.1. Floor Plan View

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

13.1.1. Basement Plan

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

13.1.2. First Storey Plan

- a. Pipeline running from basement to outlet at 1st storey surface drain.

13.2. Elevation View

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

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

14. As-built Plan for CSC – Internal Drain with Deviations

14.1. Site Plan View

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

14.1.1. Location Plan

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

14.1.2. Site Plan

- a. Internal drain deviations from the approved plan.



14.2. Floor Plan View

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

14.2.1. Basement Plan

- a. Internal drain deviations from the approved plan.

14.2.2. First Storey Plan

- a. Internal drain deviations from the approved plan.

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)

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

15.1. Site Plan View

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

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

15.2. Cross Section View

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

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

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

16.1. Site Plan View



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

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

17. Requested Drawing File Format

Requested 2D drawing file format such as .dwg/.dgn and others for the particular views should be submitted upon approval of the project.

18. Layout Views or Sheets

QPs should include the following items in the layout views or sheets:

18.1.1. Title Block

See Figure 4 of Section 2.7 for reference.

18.1.2. Qualified Person's Declaration

Refer to Appendix B for QP's declaration required by regulatory agency.

Note: *Follow the submission template provided and it should have all the approving stamp and declaration statements prepared for you.*



A-2 PUB-WTR Submission Requirements

1. General Requirements for all PUBWTR Submissions

This section below covers the guideline for BIM submission to PUB Water Supply (Network) Department.

1.1. 2D Views

1.1.1. Location and site plan including the following details:

- a. Proposed water meter location
- b. Entrance to development
- c. Boundary of development site

1.1.2 Overall water reticulation system schematic drawing shall indicate the following:

- a. Proper labelling to be provided for the various water pipes
- b. The following colour scheme shall be adopted:

- i. Direct water supply from PUB water mains in **BLUE**

— DW — DW — DW —

- ii. Indirect water supply via gravity feed in **GREEN**

— CWG — CWG — CWG —

- iii. Indirect water supply via pump feed in **BROWN**

— CWP — CWP — CWP —

- iv. Hot water supply pipes in **BLACK**

— HWS — HWS — HWS —

- v. Hot water return pipes in **BLACK**

-- HWR -- HWR -- HWR --

- vi. NEWater in **PURPLE**

— NW — NW — NW —

- c. Reduced level of platform
- d. Reduced level of highest water fitting / fire hydrant (if applicable) receiving direct supply from PUB water mains



- e. Diameter of all water pipes
- f. Terminal water draw-off fittings
- g. Breakdown of estimated daily direct and indirect water requirements
- h. Water tank including the following details:
 - i. Inlet, outlet, overflow, warning and drain pipes with their diameters indicated
 - ii. Reduced level of inlet to tank
 - iii. Material of tank
 - iv. Nominal size and effective capacity of tank to be indicated
- i. PUB water / NEWater meters and chambers - for meter size 25 mm and above

Plan view

- i. Meter spacing
- ii. Valve assemblies downstream of water meter leading to the respective systems (eg. domestic, fire hydrant, fire sprinklers, etc)

Elevation view

- i. Height of chamber
- ii. Chamber cover details
- iii. Drainage

- j. PUB water meter for landed properties (for 15 mm meter)

Elevation view

- i. Meter spacing
- ii. Position in gate pillar

- k. PUB water submeter compartment (if applicable)

Plan view

- i. Distance from submeter to the door of compartment
- ii. Clearance between submeter and side wall of compartment

Elevation view

- i. Spacing between PUB submeters
- ii. Drainage
- iii. Height of submeter



1.2. 3-D Views (For reference only)

1. Water tank and housing / enclosure
2. PUB water / NEWater meters, chambers and surrounding structures PUB water submeters and compartment

1.3. Professional Engineer's Endorsement

Refer to Appendix B for Professional Engineer's endorsement required by PUB.

1.4. Professional Engineer's Declaration

Refer to Appendix B for Professional Engineer's declaration required by PUB.



A-3 FSSD Submission Requirements

1. General Requirements for All FSSD Submissions

The plans 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 drawings of the building. All dimension and grid shall be indicated clearly on plans.

When publishing to DWF/PDF, all plans submitted under section 23 (1) of the Fire Safety Act shall be set to the following scales:

Note: Refer to your vendor's instructions manual or Appendix C for tips in doing so.

- a. Site plan — 1:500;
- b. Key or location plan — 1:1000; and
- c. Plan of a building — 1:100, except where the size of the building is too large for the plan to be fit in the required standard size paper, the Commissioner may allow the plan to be prepared to a scale not smaller than 1:200.

The scales and grid references shall be also indicated on all plans, sections and other drawings.

1.1. Site Plan View

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

1.1.1. Location Plan

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

1.1.2. Site Plan

- a. the means of access to the site and to the perimeter of each building for fire fighting vehicles and equipment;
- b. distances between each building or fire safety works and the relevant lot boundaries, other proposed or existing buildings or installations on the site;
- c. the location of existing and proposed internal fire-hydrants on the site; and
- d. 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.



1.2. Floor Plan & Roof Plan View

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

- a. key features of the building in which the system is to be installed the particulars listed in regulations 6 and 7;
- b. 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;
- c. 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;
- d. necessary cross-sectional views as superimposed on the building or part thereof to fully describe the details and configurations of the system;
- e. a colour scheme as per CP83 to clearly distinguish the various distinct parts of the system and the different systems from one another;
- f. 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.

1.3. 3D Cross-Sectional Model

QP shall cut the important 3D cross-section of their BIM model, as specified below, for submission. The 3D Cross –sectional model shall show the following:

1.3.1. ACMV:

- a. Fire compartment in the 3D model – to insert the hour rating into the parameter
- b. Fire Damper in the 3D model, if any, also include hours rating
- c. Assign appropriate materials for the ducts



1.3.2. Fire Protection System:

- a. Include flow switch

1.4. Layout Views or Sheets

QPs should include the following items in the layout views or sheets:

1.4.1. Title Block

See Figure 4 of Section 2.7 for reference.

1.4.2. Qualified Person's Declaration

Refer to Appendix B for QP's declaration required by regulatory agency.

Note: *Follow the submission template provided and it should have all the approving stamp and declaration statements prepared for you.*



A-4 IDA-TFCC Submission Requirements

1. General Requirements for Submission of Plans to IDA

The plans to be submitted shall meet the requirements specified under chapter 3 of the Code of Practice for Info-communication Facilities in Buildings (**COPIF**). The plans shall contain but not limited to the sectional and elevation drawings of the building. All dimensions and grids shall be indicated clearly on the plans.

When submitting the plans using DWF/PDF documents, the plans shall have the following scales:

- d. Site plan — 1:500;
- e. Key or location plan — 1:1000; and
- f. Floor plan — 1:100 or 1:200.

The scales and grid references shall also be indicated on all plans.

1.1. Site Plan View

The plans shall contain details of the following:

1.1.1. Location Plan

- a. the location of the lot relative to its neighboring lots; and
- b. the various roads constituting the access layout to the lot.

1.1.2. Site Plan

- a. the means of access to the site and to the perimeter of each building;
- b. distances between buildings and/or structures
- c. the existing (if any) and proposed underground telecommunication systems at the site;
- d. the North/East Coordinates (e.g.E12345.678/N12345.678), and
- e. Temporary Occupancy Date

1.2. Floor Plan & Roof Plan View

Plans to be submitted for lead-in pipes, main distribution frame (**MDF**) room, telecommunication equipment room (**TER**), telecommunication riser and residential units or tenant premises shall include the following:

- a. dimensions and the location of the lead-in pipes including the depth which the lead-in pipes is to be located;
- b. dimensions of the MDF and TER rooms (i.e. length, breadth and height);



- c. dimensions of the telecommunication riser (i.e. width and depth) and the location and size of the metal cable trays to be provided on the depth sides of the telecommunication riser; and
- d. the layout plan for every floor highlighting the location and height of the respective telecommunication points, i.e. TV points, telephone points, data points, fibre termination point, etc.

1.3. 3D Cross-Sectional Model

QP shall provide the 3D cross-section of the BIM model. The 3D cross-section model shall indicate the following:

1.3.1. Main Distribution Frame room or Telecommunication Equipment Room:

- a. location of the door into the MDF or TER room and louvers for ventilation. Where central air-conditioning is provided, the height of the air-conditioning ducting shall be indicated;
- b. if a column is allowed to be located at any corner of the MDF or TER room, this is to be indicated inside the model; and
- c. if a beam is allowed to be located at a height of higher than 3.5m in the MDF or TER room, this is to be indicated inside the model

1.3.2. Telecommunication Risers:

Location of cable trays, distribution boxes or frames, equipment, etc.

2. Layout Views or Sheets

QPs should include the following items in the layout views or sheets:

2.1.1. Title Block

See Figure 4 of Section 2.7 for reference.

2.1.2. Qualified Person's Declaration

Refer to Appendix B for QP's declaration required by regulatory agency.

Note: Follow the submission template provided and it should have all the approving stamp and declaration statements prepared for you.



A-5 CITYGAS Submission Requirements

1. Plans Submission

The plans submitted shall consist of the following plans;

1.1 Location plan

- Highlight the development boundary line in Green

1.2 Site plan

- Highlight the development boundary line in Red
- Scale of 1: 500 or 1:1000
- Plan shall have grid lines and dimension indicated
- Indicate the location of service pipe connection

1.3 Floor plan

- Scale of 1: 100 should preferably be submitted
- Plan shall have grid lines and dimension indicated
- Indicate the location of the service pipe connection

1.4 Roof plan

- Roof plan shall be submitted if the ventilation opening for gas duct is provided at the roof level

1.5 Schematic Diagram and Detail plan

- Submit schematic diagram of gas installation for each building
- Typical detail of the gas installation (such as gas duct ventilation, trench, box-up detail, meter installation, duckfoot support design)

1.6 3D Model View

- 3D view showing the overall gas installation
- 3D view / cross section of gas shaft / vent duct / pipe duct / pipe channel

Note: 3D model view is for better visualization of the gas pipe installation. Process of gas application is based on 2D model view

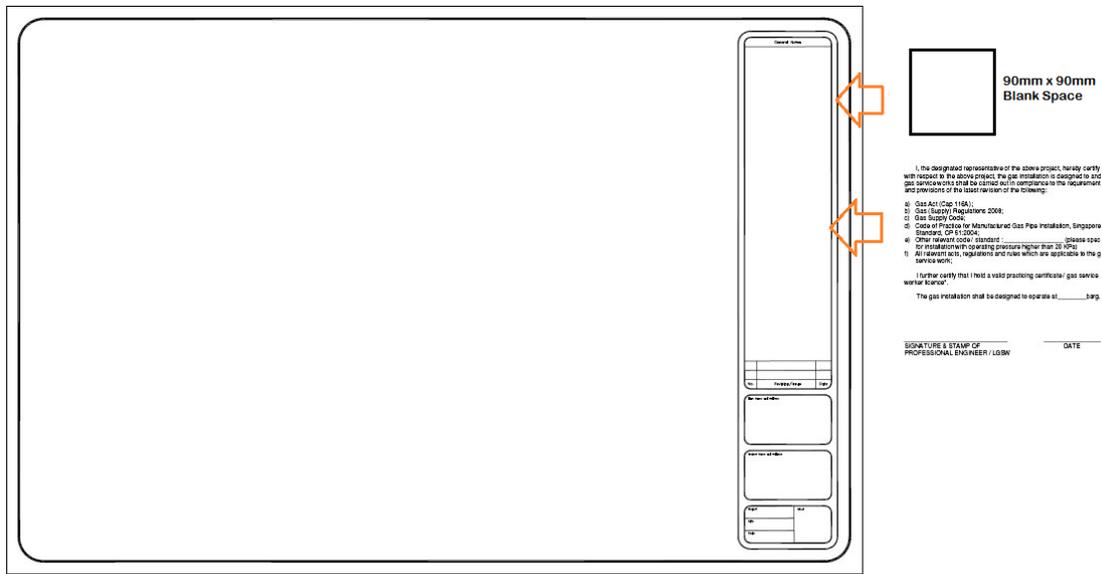


2. Layout Views or Sheets

QPs should include the following items in the layout views or sheets:

2.1 Qualified Person's Declaration

All plans shall bear the declaration on the right hand column of the layout sheet. A blank space of 90mm x 90mm shall also be provided on the right hand column for City Gas processing. Refer to City Gas Handbook for QP's declaration required by City Gas.



3. File Deliverable Requirements

- 3.1 Submission plans must be saved in the file format stated in the BIM submission guideline. Each plan shall be submitted individually in its own file.
- 3.2 For amendment submission – QPs are required to submit only the deviated plans for approval.



Appendix B Standard Certifications for M&E Works

B-1 NEA-CBPU / PUB-WRN: Qualified Person's Endorsements

I, _____, confirm that the drainage details as shown on the relevant drawings in this file are in accordance with the current information provided by the Chief Engineer, Central Building Plan Unit, NEA

B-2 PUB Water: Qualified Person's Endorsements

I, _____, the Professional Engineer-in-charge hereby certify that the water service installation is designed in full compliance with the Public Utilities Board's requirements including the Public Utilities (Water Supply) Regulations, Singapore Standard CP 48 – Code of Practice for Water Services, other Authorities' requirements and other statutory requirements. I also confirm that potable water storage tanks shall not be located below sanitary pipes and other non-potable water pipes, and that all the water fittings to be installed in the water service installation shall be of the types that comply with standards prescribed / stipulated by PUB and all water conservation measures will be adopted.

PUB Water: Professional Engineer's Declaration

The Professional Engineer in-charge shall provide written confirmation (either in title block or letter) on the following items, if applicable to the project:

- Flow rates available at the water fittings taking direct supply from PUB water mains will not be adversely affected when the low and / or high level water tanks are being replenished and the replenishment of the low and / or high level water tanks will not be affected by the direct supply draw offs.
- Pipes that serve future connections will not lead to stagnation.
- The proposed water service installations can cater to the draw-offs of water supply to the future connections.
- The structural integrity of the existing building is not adversely affected by the proposed additional / extension work to the water service installation.
- The existing water service installation is adequately sized to cater for the additional draw-offs of water supply to the proposed water service installation.
- Installation of PUB submeters:
 - The PUB submeter will be under a different account holder from the master meter account holder.
 - The submeters will be properly housed in enclosures which are accessible from the common areas.
 - Proper drainage will be provided for the submeter compartment.



- Permanent unit-number tag will be provided and securely mounted upstream of the submeter.
- Sufficient space will be provided around the submeter to facilitate installation, maintenance and meter reading.
- The common water services will not encroach into the tenanted areas and the water services downstream of the submeter will not be laid within other tenanted premises.
- All connections between the tees from the service / distributing pipes and the stop cocks upstream of the submeters will be by means of threaded joints or brazed joints. Compressions fittings will not be used.
- Private submeters are used for monitoring purpose and not for the sale of PUB water to others.
- Installation of hot water system:
 - The cold water supply to the water fittings will not fail before the hot water supply and the hot water system is safe to use.
 - There are no differential pressures in the cold and the hot water supplies to the terminal fittings.
 - The hot water system installation, including the provision of appropriate backflow preventer, will be carried out in compliance with the specifications and requirements of the heater manufacturer.

B-3 FSSD: Qualified Person's Endorsements

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

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)

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

B-4 IDA-TFCC: Qualified Person's Endorsements

I, _____, hereby submit the proposed provision of Telecommunication Facilities for your approval. I certify that the digital information submitted is accurate for the stated development project.

B-5 CITYGAS: Qualified Person's Endorsements

I, _____ the designated representative of the project, hereby certify that with respect to the project, the gas installation is designed to and all gas service works shall be carried out in compliance to the requirements and provisions of the latest revision of the following:

- a) Gas Act (Cap 116A);
- b) Gas (Supply) Regulations 2008;
- c) Gas Supply Code;
- d) Code of Practice for Manufactured Gas Pipe Installation, Singapore Standard, CP51:2004;
- e) Fire code, the Fire Safety Act and any regulations made thereunder;
- f) Other relevant code/standard: _____ (please specify for installation with operating pressure higher than 20KPa)
- g) All relevant acts, regulations, and rules which are applicable to the gas service work;

I further certify that I hold a valid practising certificate/gas service worker license. The gas installation shall be designed to operate at _____ barg.



Appendix C Step-by-Step Guide Preparing for BIM Submission

DWF/PDF files are significantly smaller than the native files, making them easy to send through e-Submission. After the modeling is completed and all the necessary building information such as annotations, dimensions and etc (as specified by the respective regulatory agency) are added on the relevant drawing views, QPs are required to publish the drawing views as DWF/PDF (both 2D and 3D). The steps below will serve as a detailed guide to QPs in preparing the DWF/PDF file, with the use of different BIM tools.

C-1 Users of Autodesk Revit

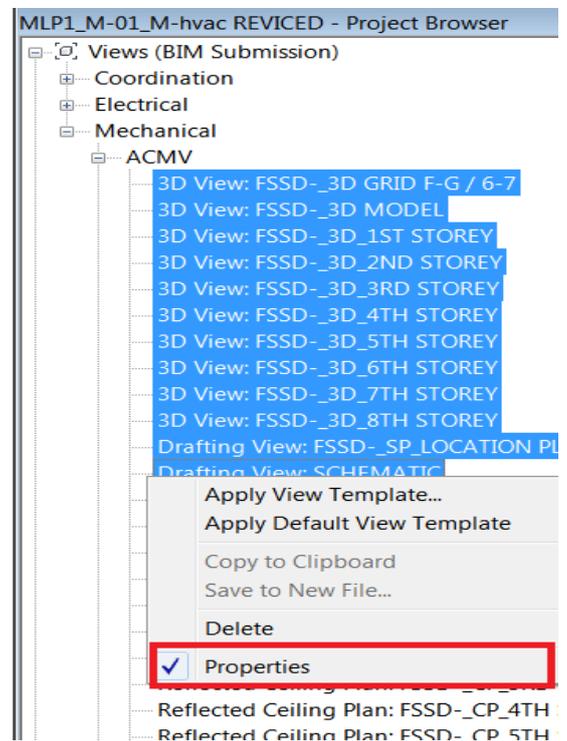
Note: The following step-by-step guide is prepared based on Autodesk Revit Architecture v2010 and Autodesk Design Review v2010.

PART I: To export 2D drawing views and 3D model views into a single DWF file

- 1 In the Project Browser, multiple select all the model views (plans, elevations & sections) meant for submission.

Tips: Hold on to Ctrl key while selecting the multiple views.

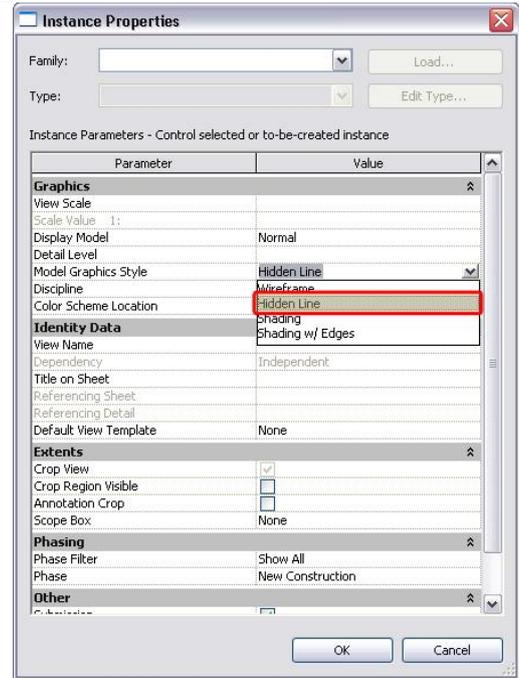
- 2 Right click and select Properties.





3 Under the Graphics Section, select the **Hidden Line** as Model Graphics Style.

Note: For 2D DWF, ensure that all drawing views are published in Hidden Line mode, such that the DWF remains as vector line.



4 Click OK.

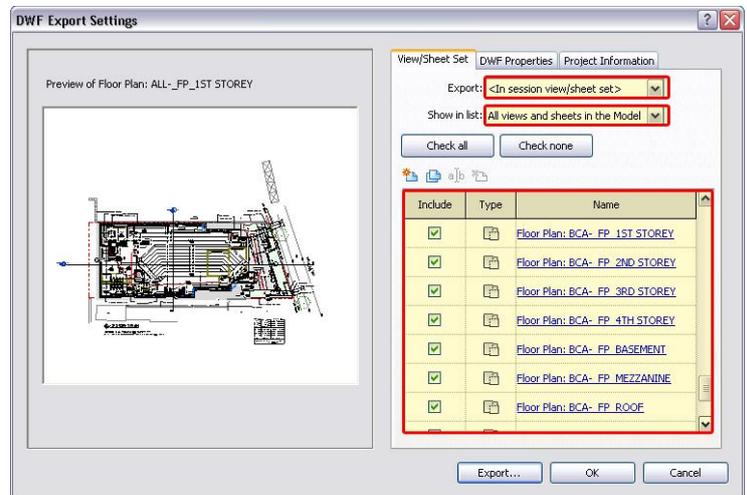
5 Click  > Export > DWF. The Export dialog opens.

6 On the View/Sheet Set tab, select In Session View/Sheet Set from the Export list.

Tips: If you are exporting a single view, select Current View/Sheet Only from Export list.

7 Select All Views and Sheets in the Model from the Shown in list.

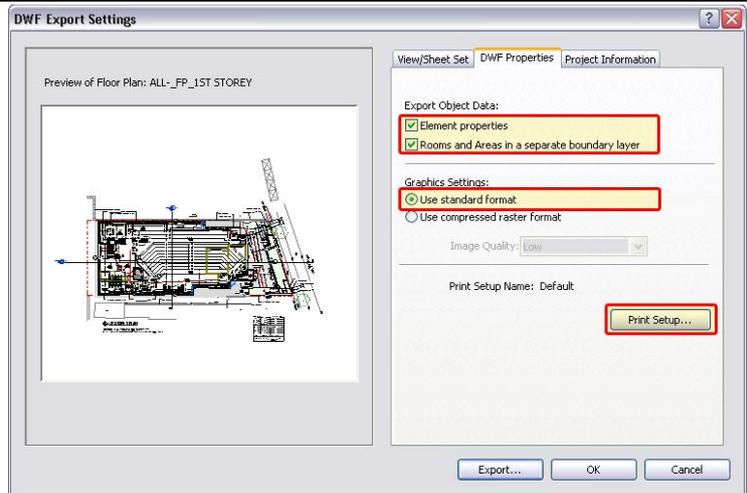
8 Select the views and sheets to export, including a 3D model view.



9 Click the DWF Properties tab, select Export Object Data for both Element Properties & Rooms and Areas in A Separate Boundary Layer.

10 Select the Graphics Settings as Use Standard Format.

11 Click the Print Setup button below.

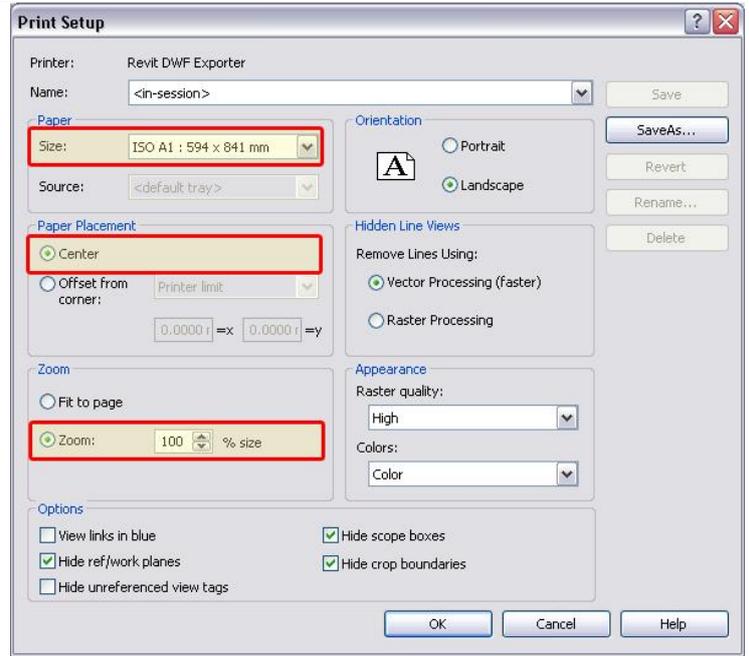




12

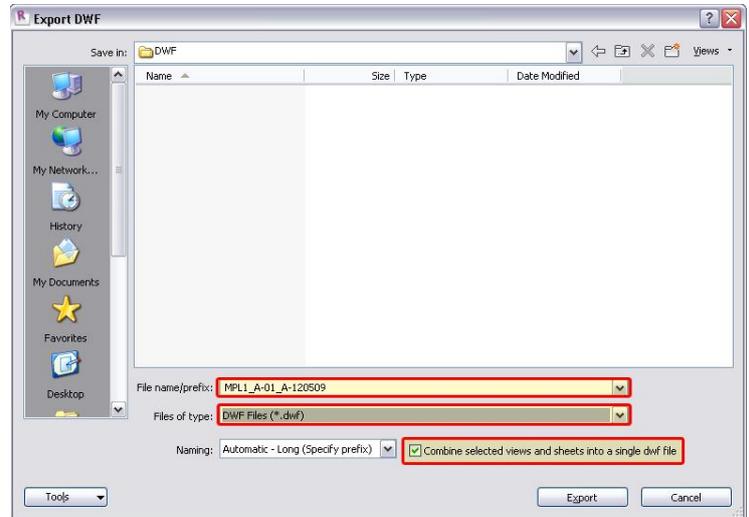
In the Print Setup dialog, choose Sheet Size, Paper Placement, Zoom, and other settings. Then click OK.

Note: Under the Paper Size, select paper size; Paper Placement as Center; and Zoom to 100% size (as highlighted in the diagram). The rest shall be kept as the default settings.



13

Back to the DWF Export Settings dialog, click Export. (Optional: Click the Project Information tab before exporting, if one wishes to edit the project metadata)



14

Navigate to the target folder and name the DWF file according to standard naming convention at Section 2.4.

Note: Select the Files of type as DWF Files (*.dwf) and check the box at the bottom of the dialog to combine selected views and sheets into a single dwf file (as highlighted in the diagram).

15

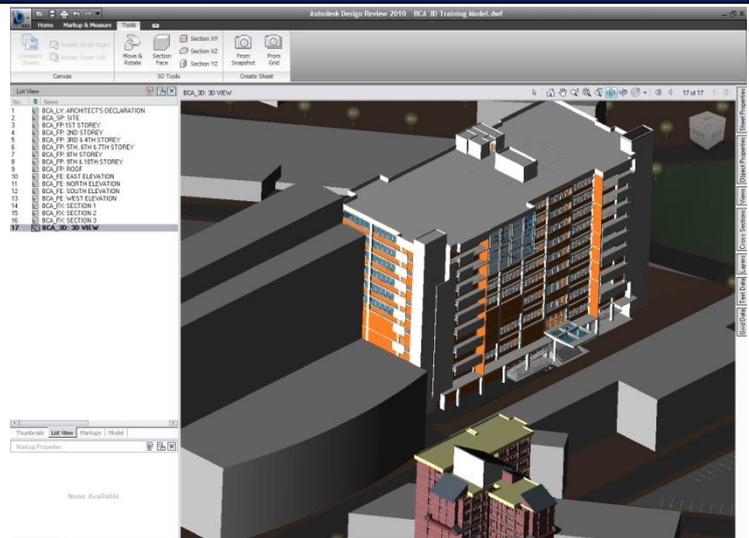
Click Export.

PART II: Pre-check DWF file before submission

16

Open the previously saved DWF file using Autodesk Design Review.

Note: Re-arrange the list of model views, if they are not in a correct order of sequence, such that the drawings are presented in a manner you want. Make sure that both 2D drawing views and a 3D model view is saved into a single DWF file for submission.





ACKNOWLEDGEMENTS

The development of this BIM Submission Guideline has been a collaborative effort among a cadre of very knowledgeable consultants, vendors and processing officers from different regulatory agencies. Significant contributors are listed below:

National Environment Agency

- Pollution Control Department, Central Building Plan Unit

Public Utility Board

- Water Reclamation (Network) Department
- Water Supply Network Department

Ministry of Home Affairs

- Fire Safety and Shelter Department, Fire Safety Consultation Branch
- Singapore Civil Defense Force, Technology Department

Infocomm Development Authority

- Telecommunication Facility Coordination Committee

City Gas Pte Ltd

Participating Organizations and Vendors

- Autodesk Asia Pte Ltd



GLOSSARY OF ACRONYMS USED

Following are the acronyms and abbreviations used in this submission guideline with their full definitions:

No.	Terms	Definitions
1.	A&A	Acronym for Addition and Alteration works
2.	AMSL	Acronym for Above Mean Sea Level
3.	BIM	Acronym for Building Information Model
4.	CAD	Acronym for Computer Aided Design
5.	CSC	Acronym for Certificate of Statutory Completion
6.	DWF	A type of file format known as Design Web Format
7.	PDF	Acronym for Portable Document Format
8.	GFA	Acronym for Gross Floor Area
9.	Legend	A list of the various building components and annotations used in a project
10.	LEW	Acronym for Licensed Electrical Worker
11.	M&E	Acronym for Mechanical and Electrical
12.	QP	Acronym for Qualified Person
13.	RVT	A type of file format known for Autodesk Revit
14.	SS CP	Acronym for Singapore Standard Code of Practice
15.	Sheet/ Layout	The drawing composition environment of a CAD file. This is the actual printing or “layout” environment where the Model Space is viewed and fitted within a drawing border.
16.	Schedule	A tabular display of information, extracted from the properties of elements in a project
17.	SIP	Acronym for Sewerage Interpretation Plan
18.	TOP	Acronym for Temporary Occupation Permit
19.	View	Orientation of the project model from the point of a viewer, such as floor plan view, elevation view, section view and 3D view

