Glodon

HANDBOOK TMEC

V 1.0.0.620

www.glodon.com/en/

Introduction

a 5D BIM Solution for MEP Professionals.

TMEC is a **M&E Quantity Take-Off software** which helps all MEP professionals in the construction industry including Developers, Consultants, and Contractors to take-off M&E quantities in both 2D and 3D mode.

Glodon

Training on Software Operation + MEP Background Knowledge

01 Software Overview

1.0 Introduction
2.0 Create Project
3.0 Drawing Management
4.0 Legend Quantification
5.0 Length Quantification
6.0 Quantification
7.0 Define Region
8.0 Addendum
9.0 General Edit
10.0 Project Settings
11.0 New Updates (620)

02 Overall Software Walkthrough

12.0 P&S Walkthrough
13.0 ACMV Walkthrough
14.0 Electrical Walkthrough
15.0 Fire Service Walkthrough

1.1 Trades Available in TMEC

1 ACMV

DUCTING
GRILLES & DIFFUSERS
PIPING

2 ELECTRICAL

LIGHTING
SWITCH & SOCKET
TRAY/TRUNKING

3 P&S

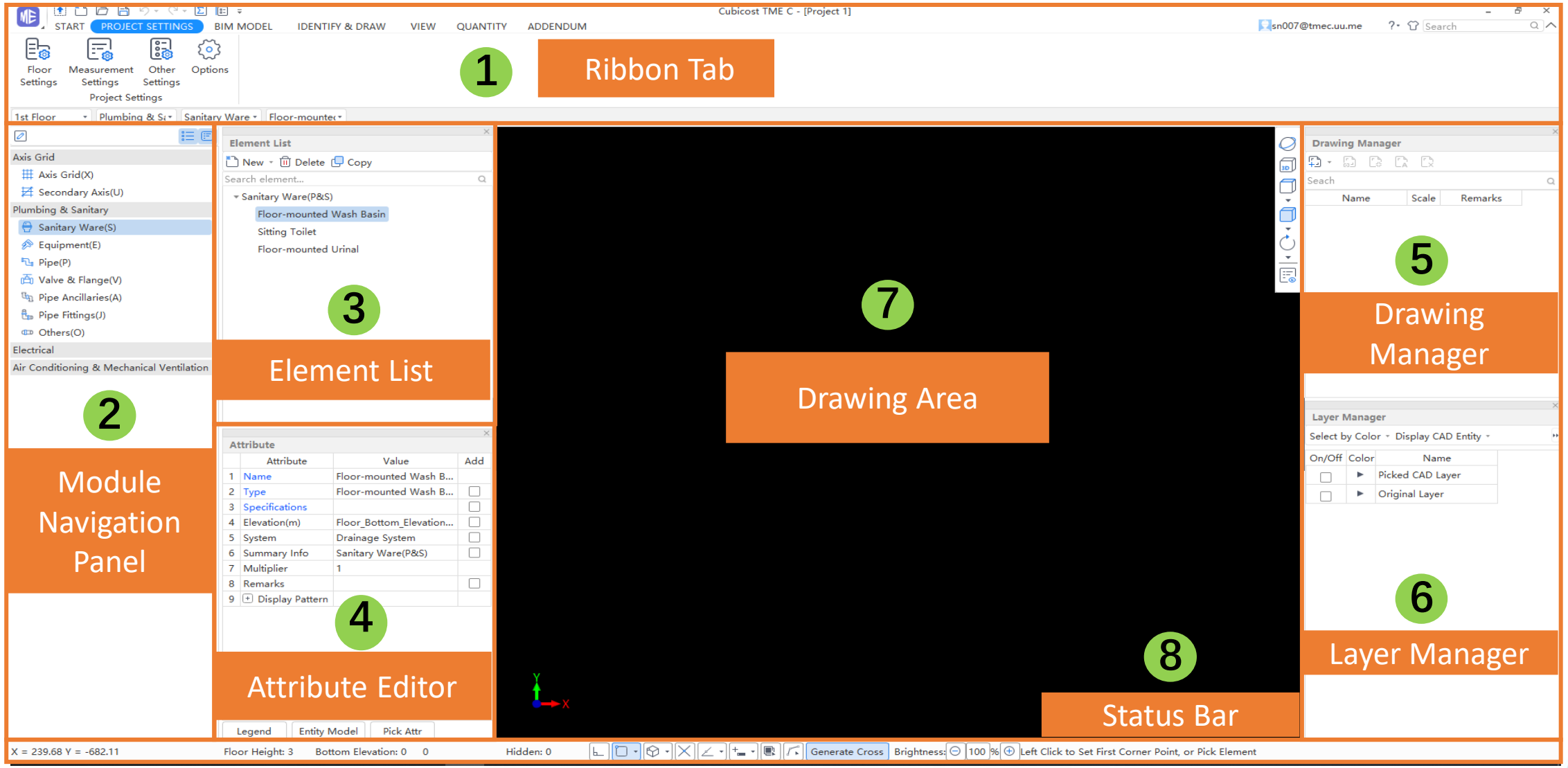
SANITARY WARES
PIPING
VALVES

4 FIRE SERVICE

SPRINKLERS
FIRE ALARM SYSTEM
HOSEREEL SYSTEM

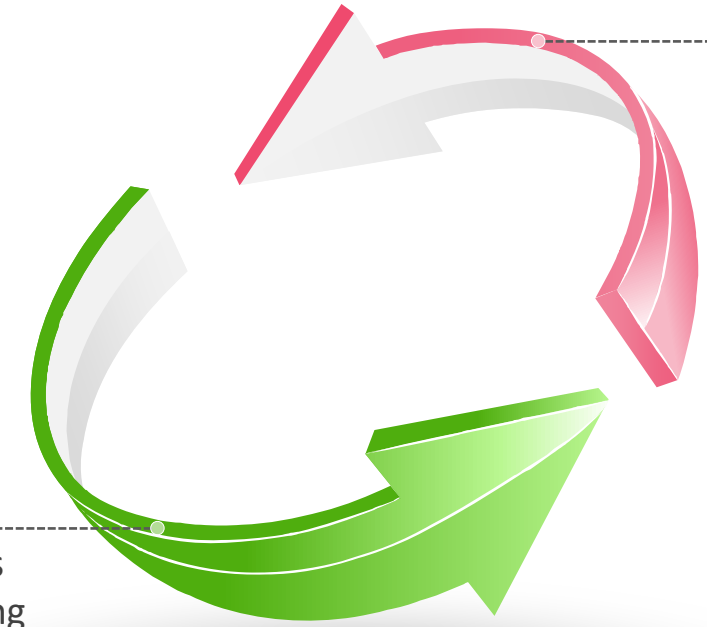
1. **NEW PROJECT**
   - Project Creation
2. **FLOOR SETTINGS**
   - Create Floor
   - Floor Height
3. **IMPORT DRAWING**
   - Drawing Management
   - Scale Drawing
4. **QUANTITY TAKE-OFF**
   - Point/Line
   - Identify Legends & Lengths
5. **VIEW QUANTITY**
   - View Quantity by Category
   - Reverse Check Model

1.3 Software Interface



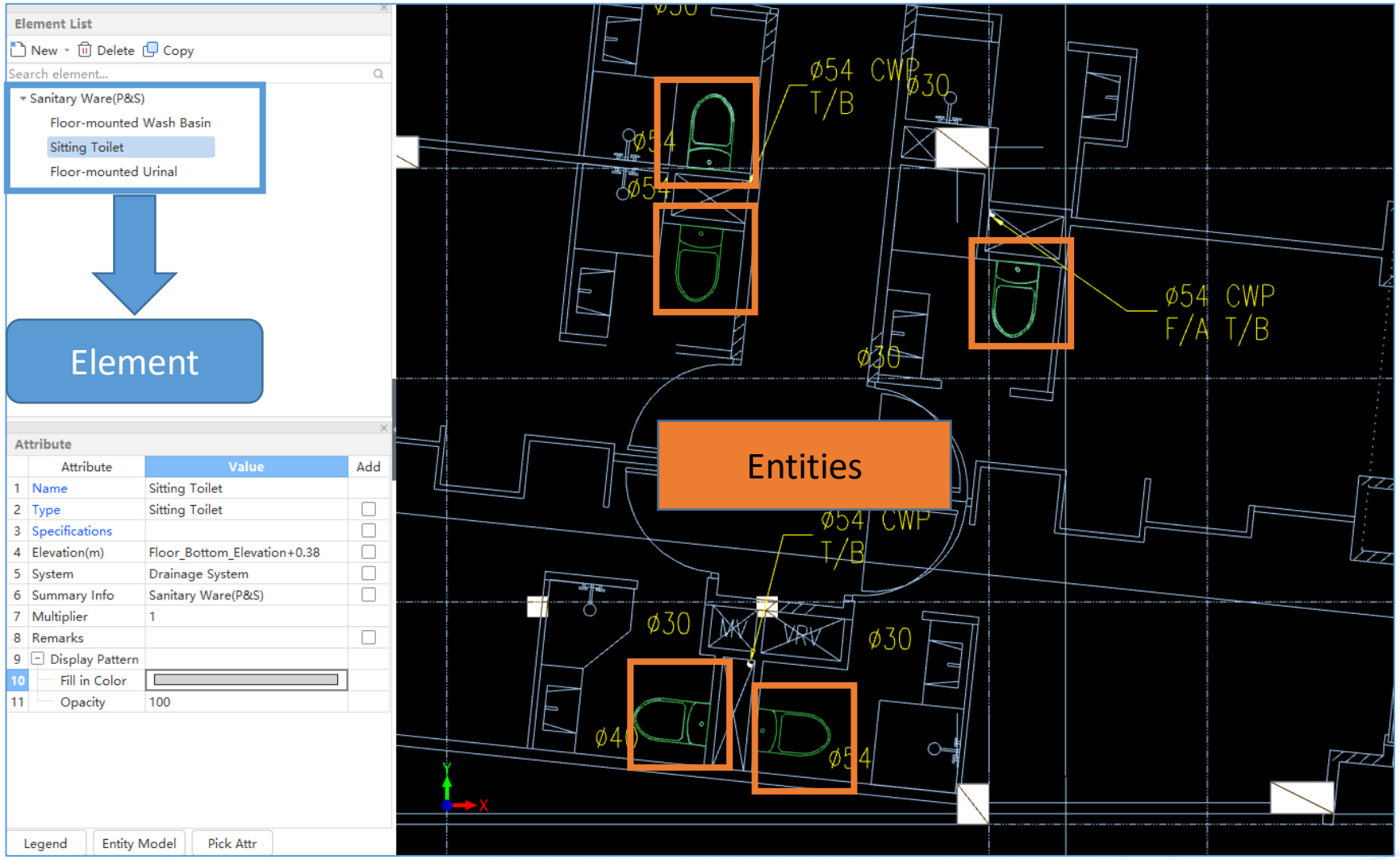
Elements

"Empty Model"
In The Element Lists

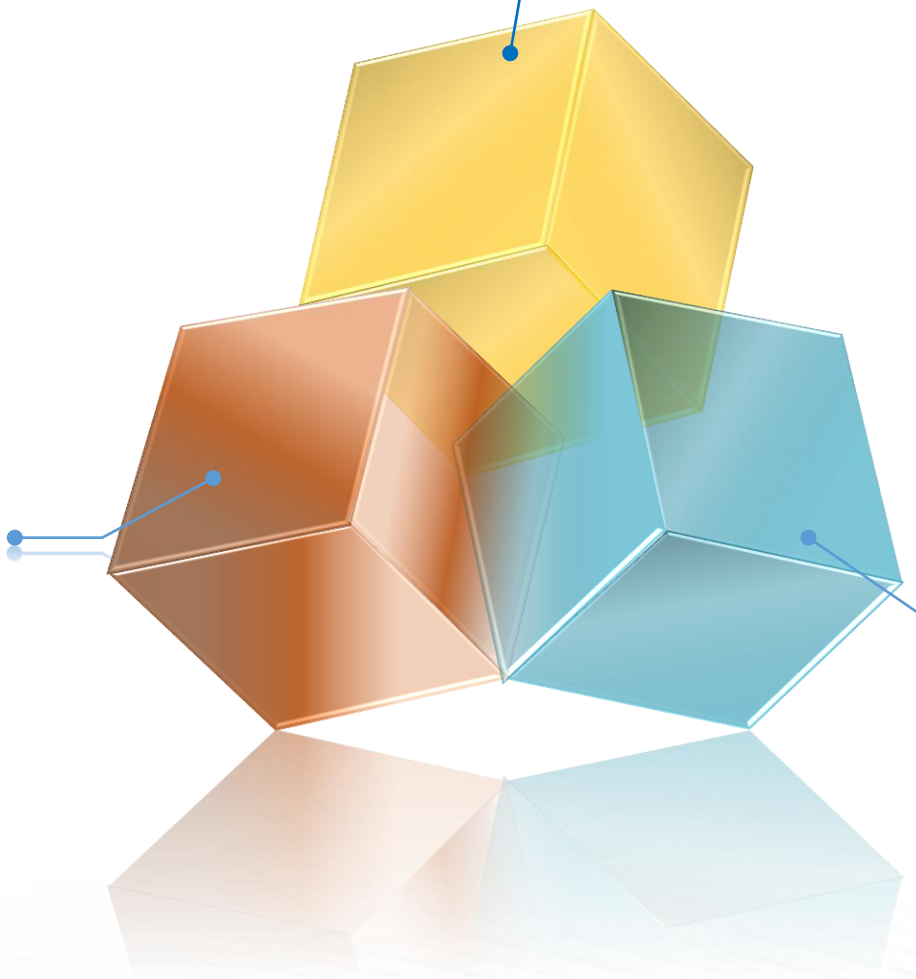


Entities

Models that Contains Quantity in the Drawing Area


Element List
New
Delete
Copy
Search element...
Sanitary Ware(P&S)
Floor-mounted Wash Basin
Sitting Toilet
Floor-mounted Urinal
Element
Attribute
Attribute
Value
Add
1 Name Sitting Toilet
2 Type Sitting Toilet
3 Specifications
4 Elevation(m) Floor_Bottom_Elevation+0.38
5 System Drainage System
6 Summary Info Sanitary Ware(P&S)
7 Multiplier 1
8 Remarks
9 Display Pattern
10 Fill in Color
11 Opacity 100
Legend
Entity Model
Pick Attr
Entities
ø54 CWP T/B
ø30
ø54 CWP F/A T/B
ø54 CWP T/B
ø30
ø30
ø40
ø54
VRV
VRV

1.5 Type of Elements



Legend

- Sanitary Wares
- Lighting Fixtures
- Sprinklers
- Equipment
- Valves

Linear Elements

- Piping
- Cabling
- Trunking
- Ducting

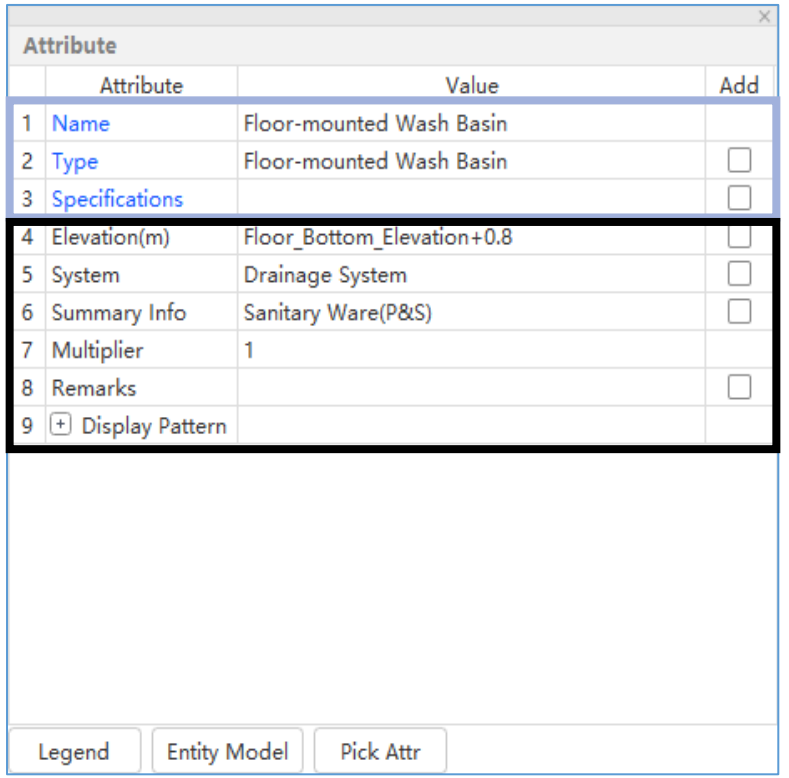
Others

- Pipe Fittings

1.6 Private Attribute VS Public Attributes

Public

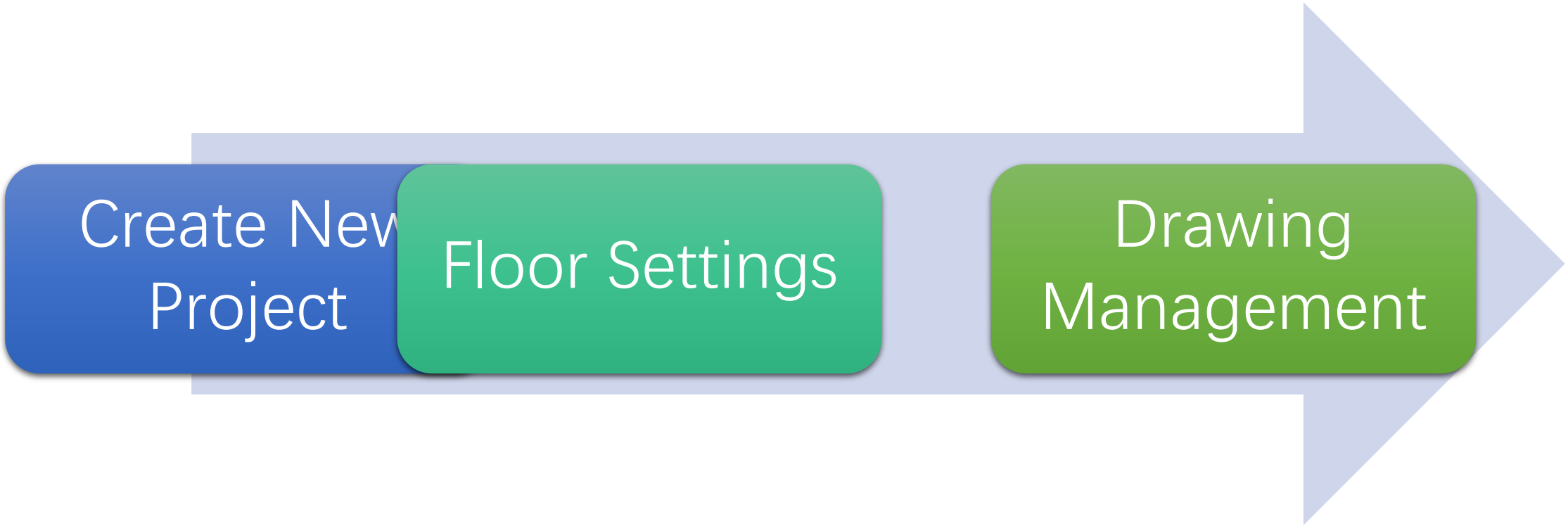
Public: WITHOUT SELECTION, The changes apply to all the same name entities



Private: The changes will only take effect with the items/Model/entity being **SELECTED (MUST)**, otherwise the modification will be invalid

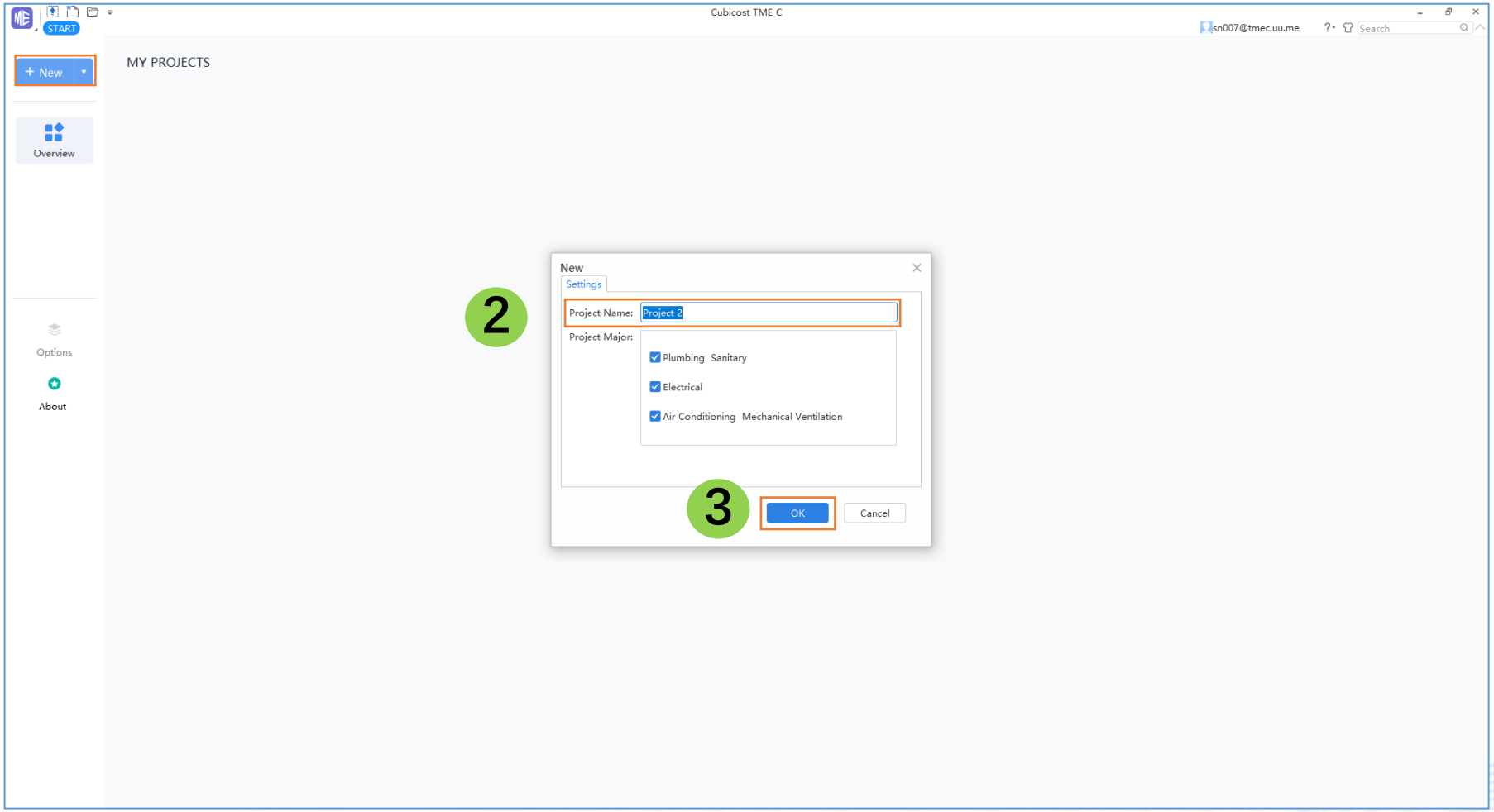
Private

Starting New Project


Create New Project
Floor Settings
Drawing Management

2.1 Create New Project

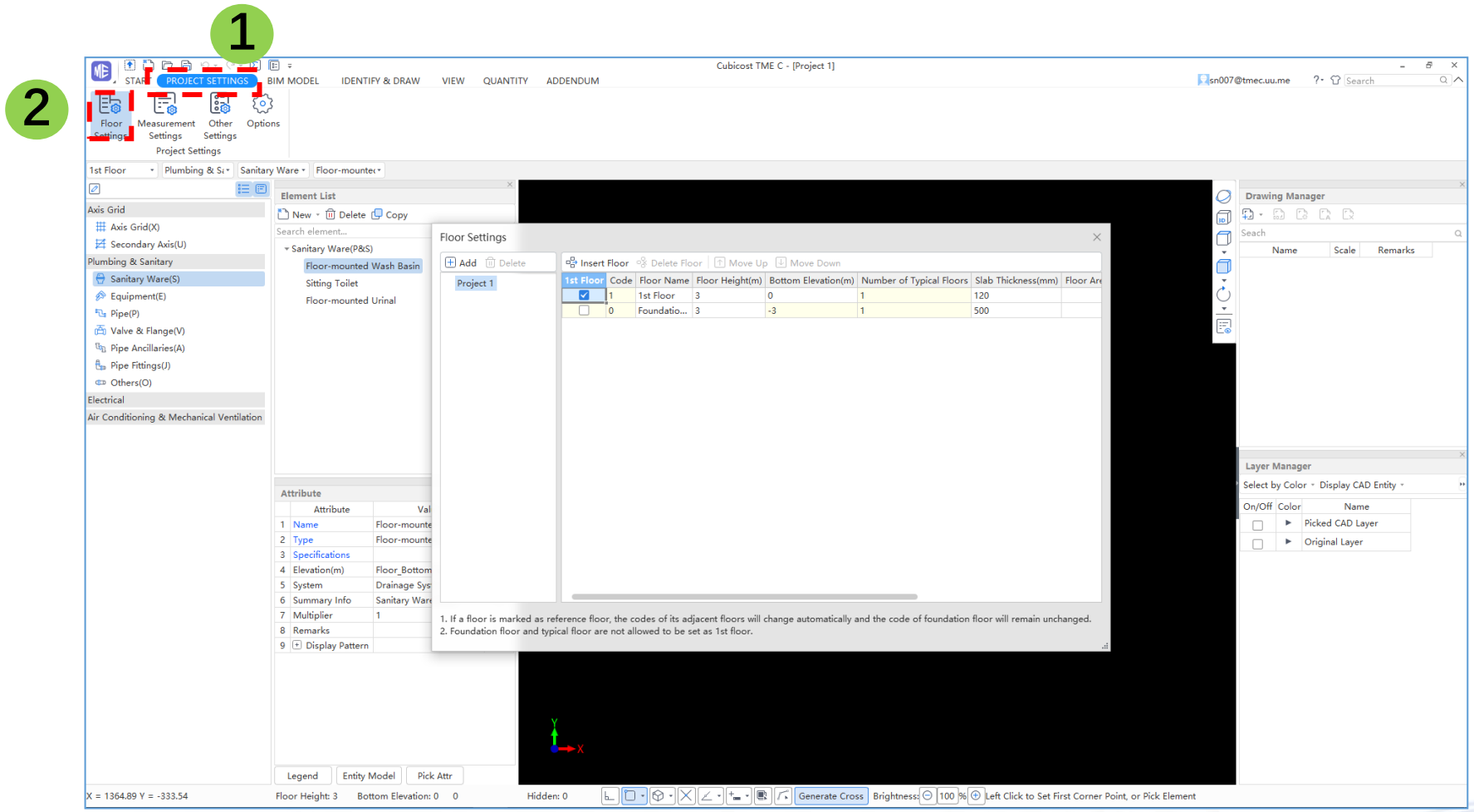
Step 1: Create a [New] Project
Step 2: Input Project Title
Step 3: Click Ok



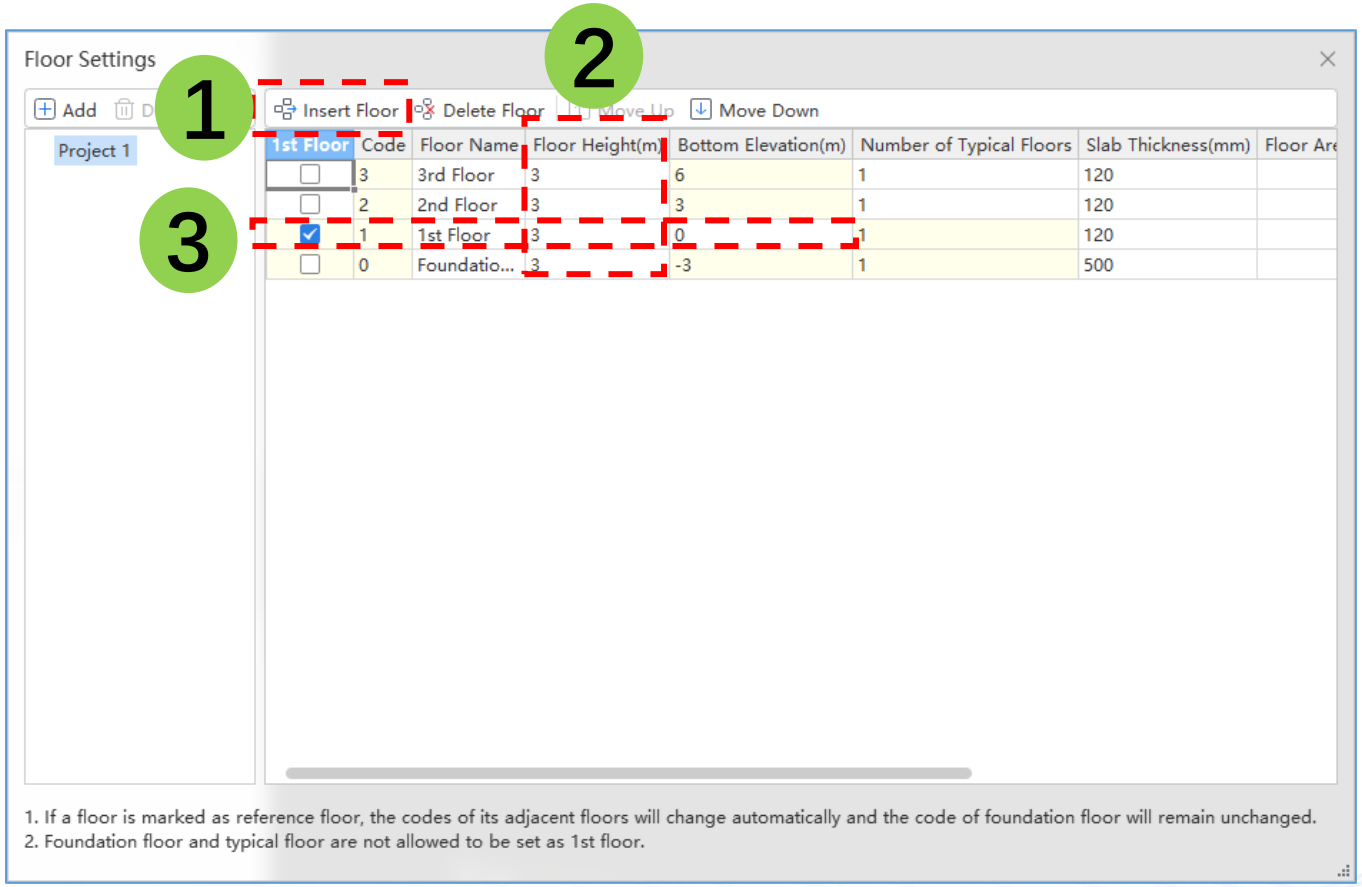
2.2 Floor Settings

Step 1: Go to [Project Settings]

Step 2: Activate Floor Settings

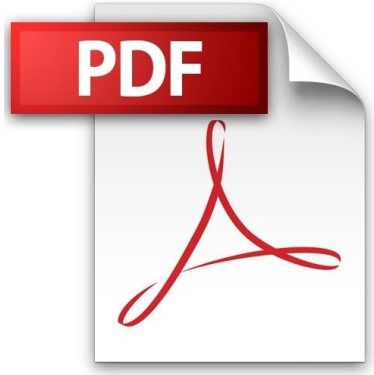


Step 1: (a) Select at 1st Floor and [Insert Floor] for Super-Structure
(b) Select at Foundation Floor and [Insert Floor] for Sub-Structure
Step 2: Input [Floor Height] of every floors
Step 3: Input the [Bottom Elevation] of 1st Floor ONLY
Step 4: Input [Number of Typical Floors]

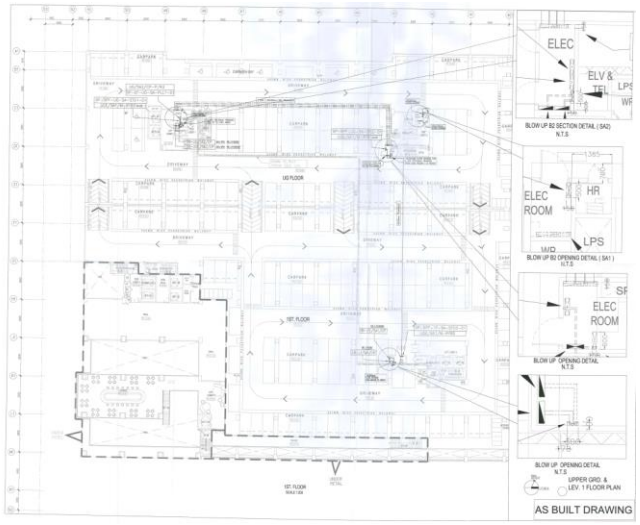


Drawing Management

CAD Drawing (.dwg)



Vector PDF Drawing (.pdf)

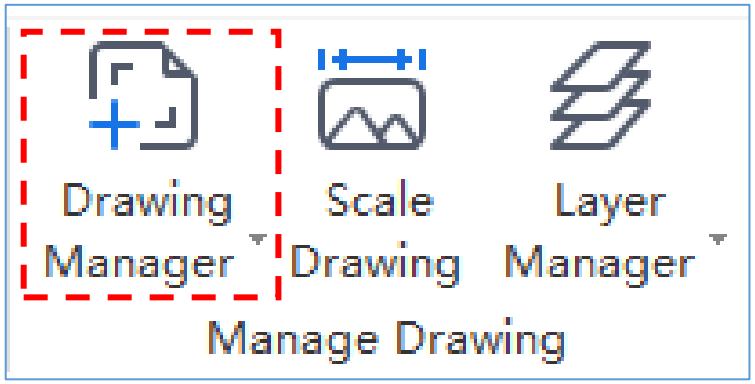


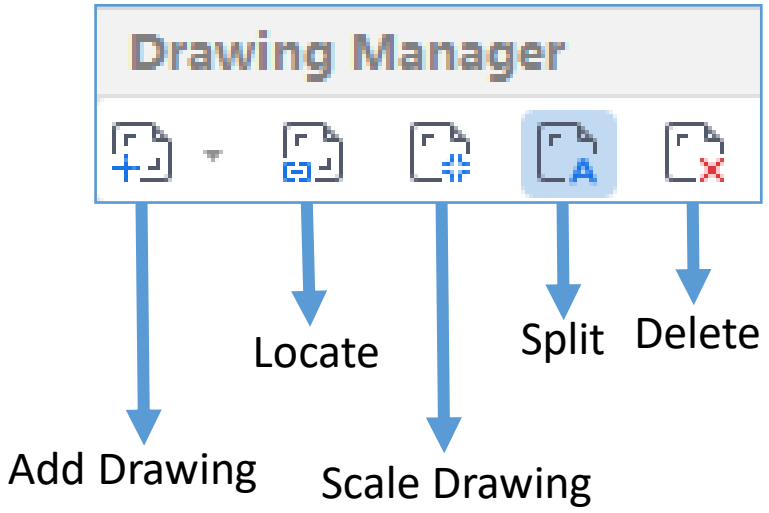
Scanned PDF Drawing (.pdf)

Activate Drawing Manager

Add Drawings

Scale Drawing





3.2 Add Drawings

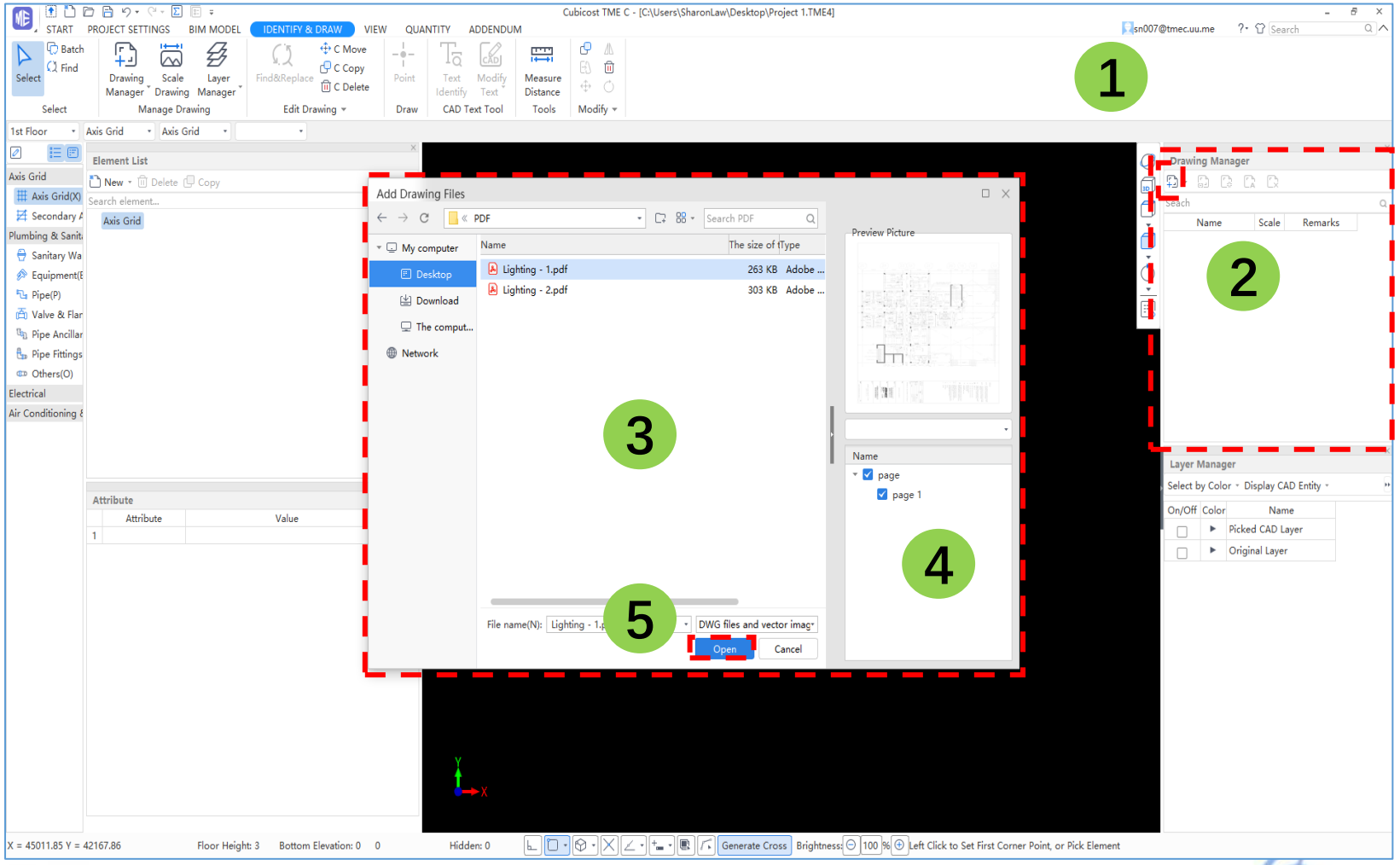
Step 1: Go to [Drawing Manager]

Step 2: Select Add Drawing

Step 3: Select Drawing(s)

Step 4: For Multiple Pages Tick Pages

Step 5: Select Open After Select Drawing



3.3 Scale Drawing

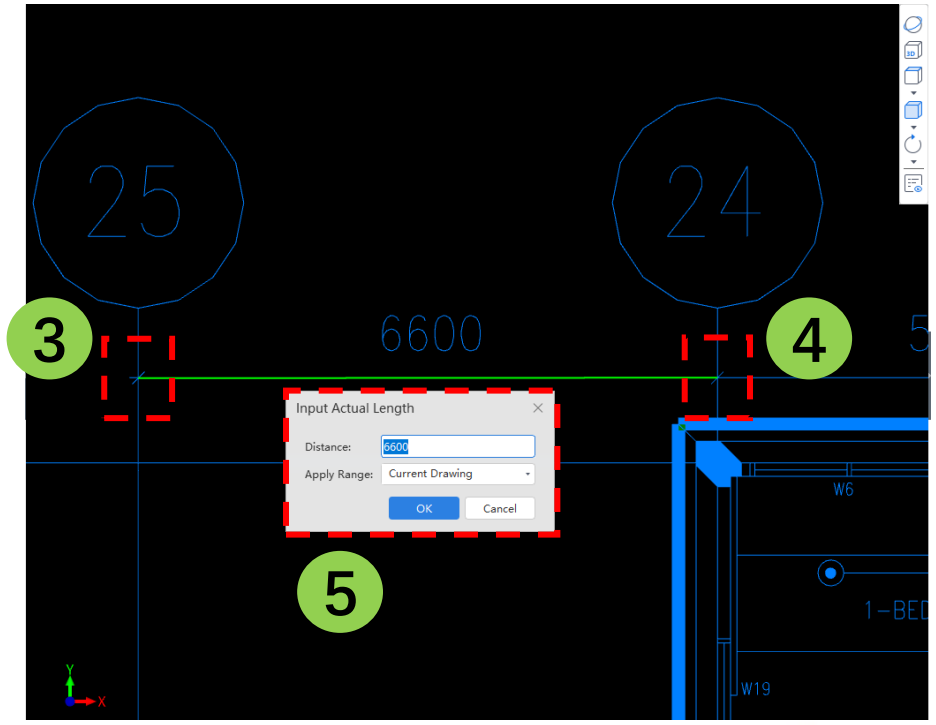
Step 1: In Drawing Manager, select [Scale Drawing]

Step 2: Drag select entire drawing and Right Click

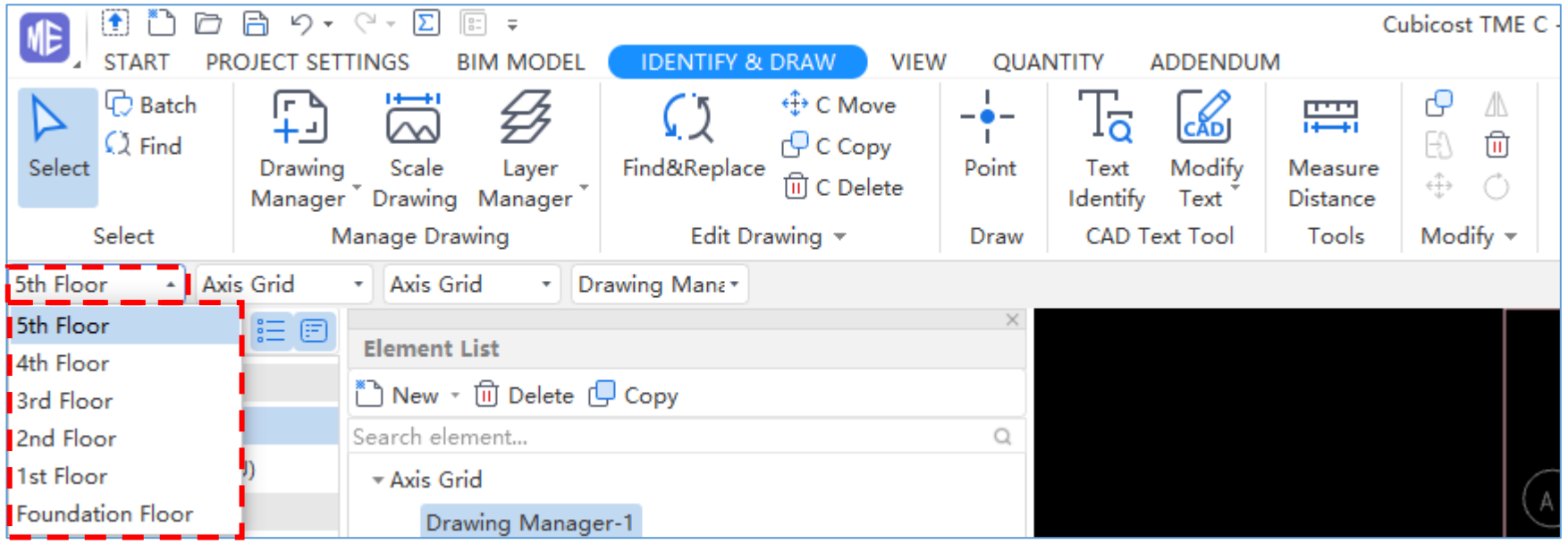
Step 3: Specify Start point

Step 4: Specify End point

Step 5: Input actual Length accordingly



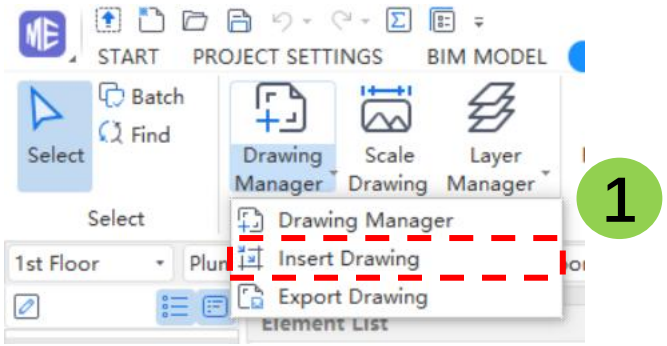
3.4 Switch Floor

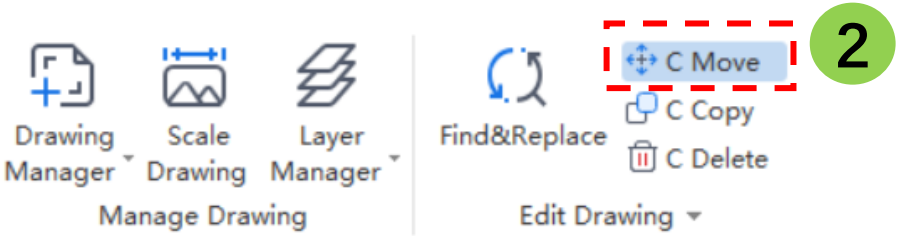


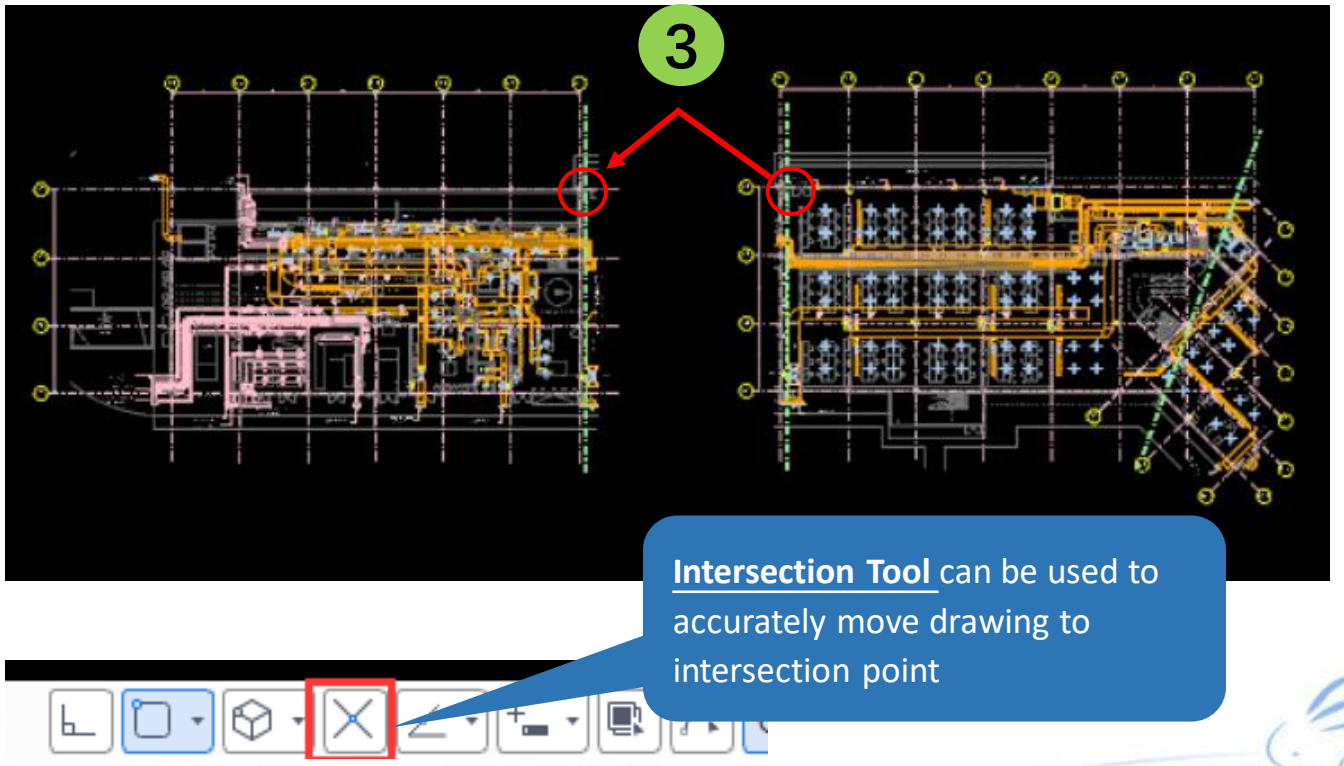
Step 1: In Drawing Manager, select [Insert Drawing] and insert the Second Drawing

Step 2: Activate Move in Edit Drawing, drag select the Second Drawing and Right Click

Step 3: Move the Second Drawing to a chosen Intersection Point to merge both drawings

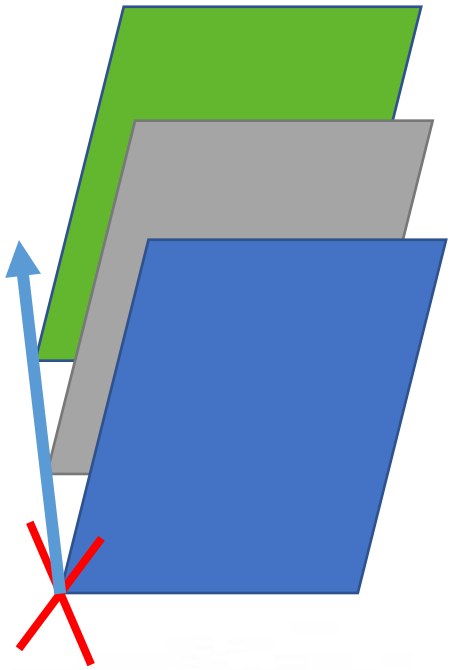


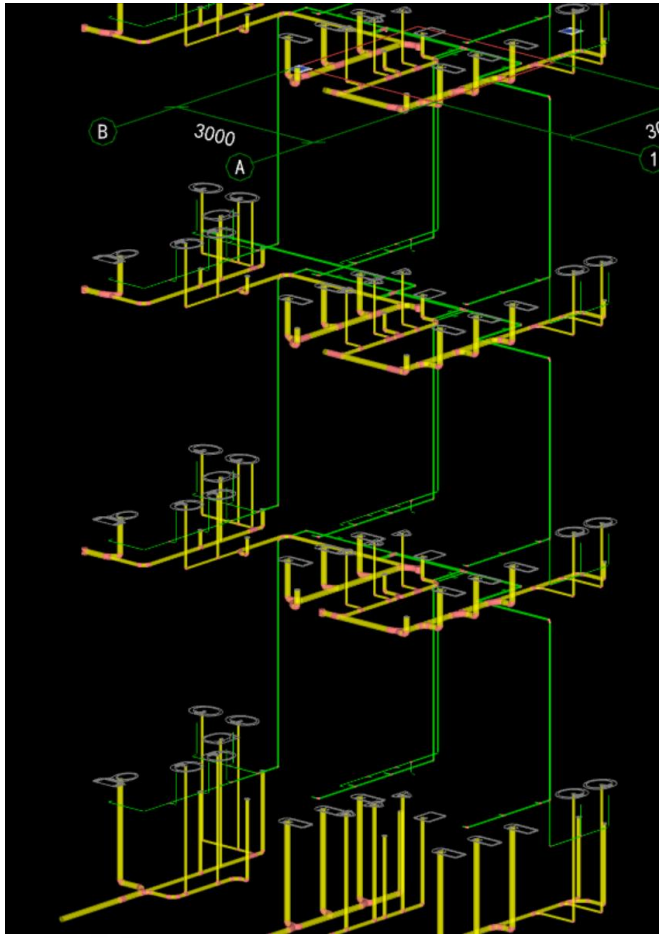




Function Purpose:

To make sure that all the drawings for different floors align with each other

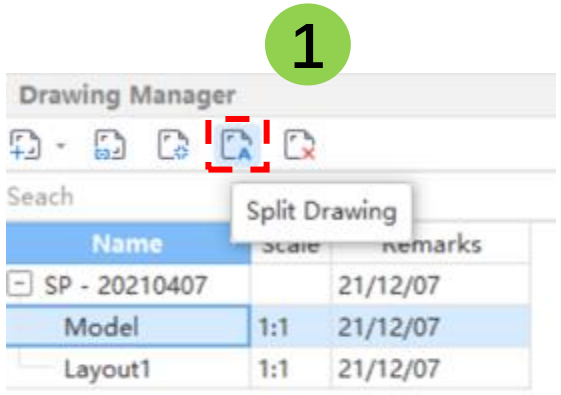


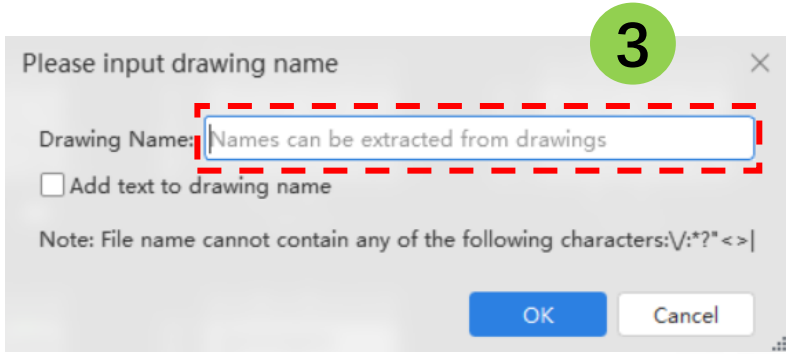


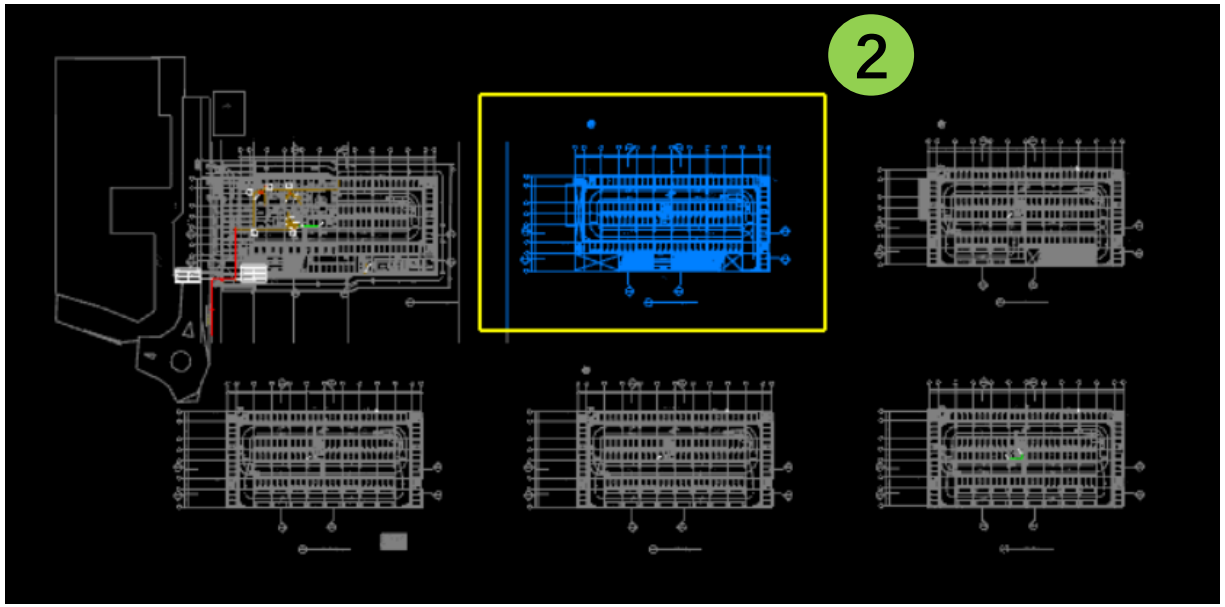
Step 1: In Drawing Manager, select [Split Drawing]

Step 2: Drag select region to split drawing and Right Click

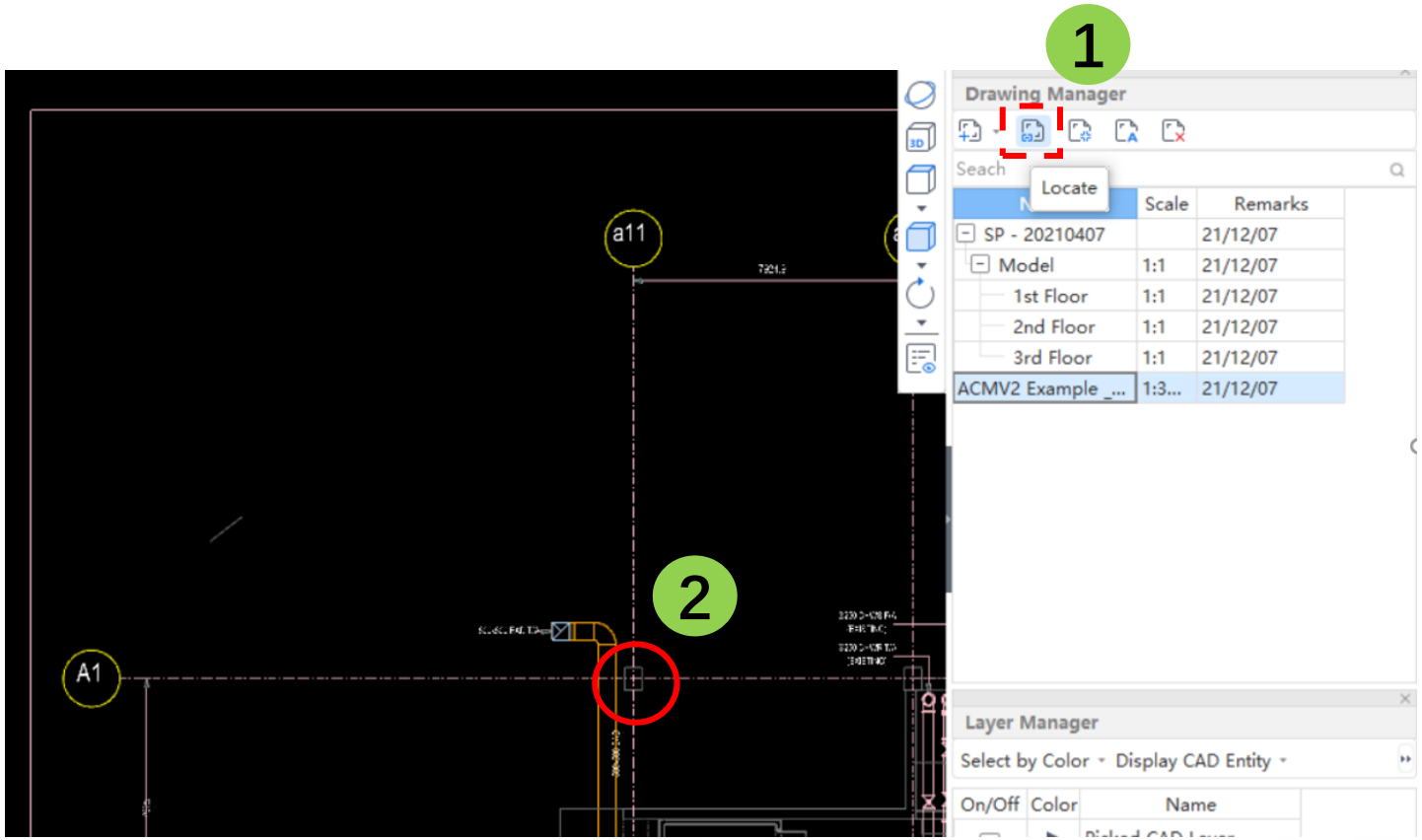
Step 3: Type in split drawing name and confirm

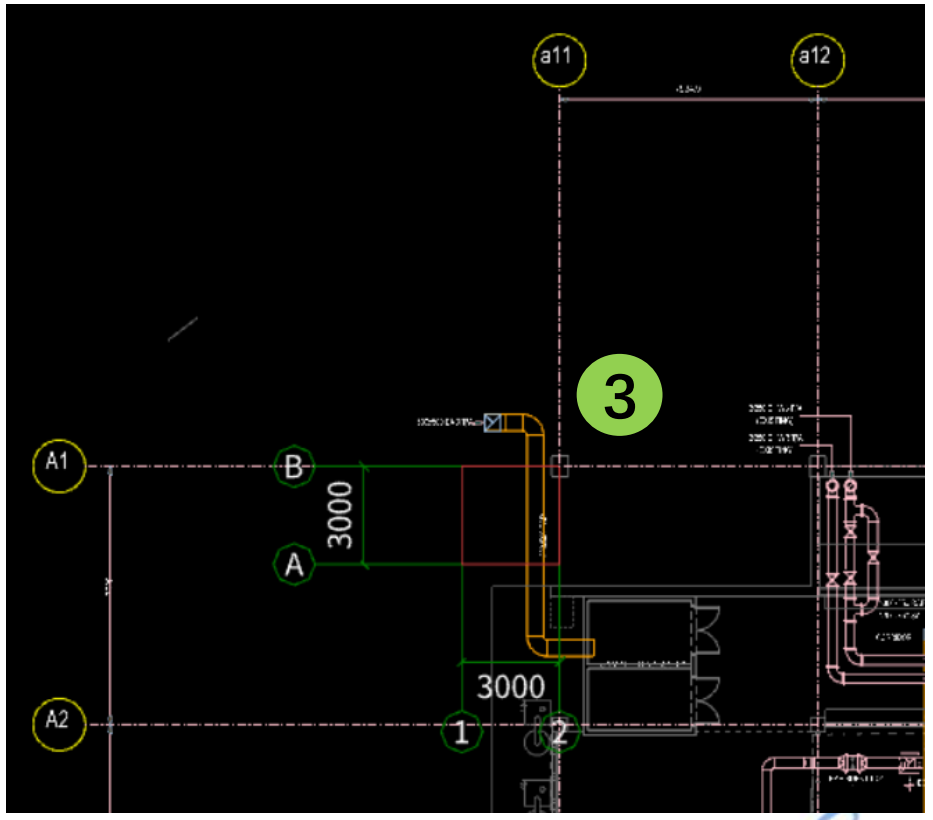




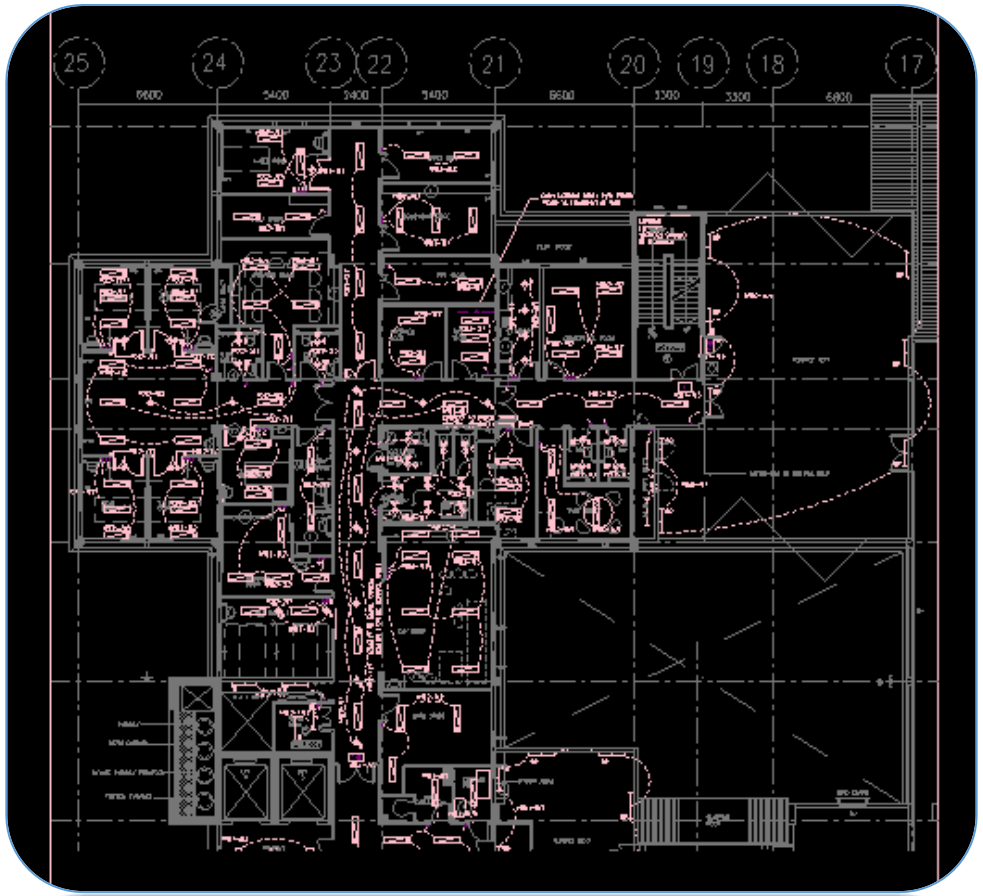


Step 1: In Drawing Manager, select [Locate Drawing]
Step 2: Select a Reference Point and Right Click
Step 3: Move the drawing to default Axis Grid
Step 4: Repeat the same steps for All Floors





3.7 Hide / Show Drawings by Colors



3.8 Hide / Show Drawings Workflow

Selection of Entity

Activate function
Select by colour

In Drawing,
Select 1 or more color

To Confirm Selection
Right Click on your mouse

Control Selected Entity

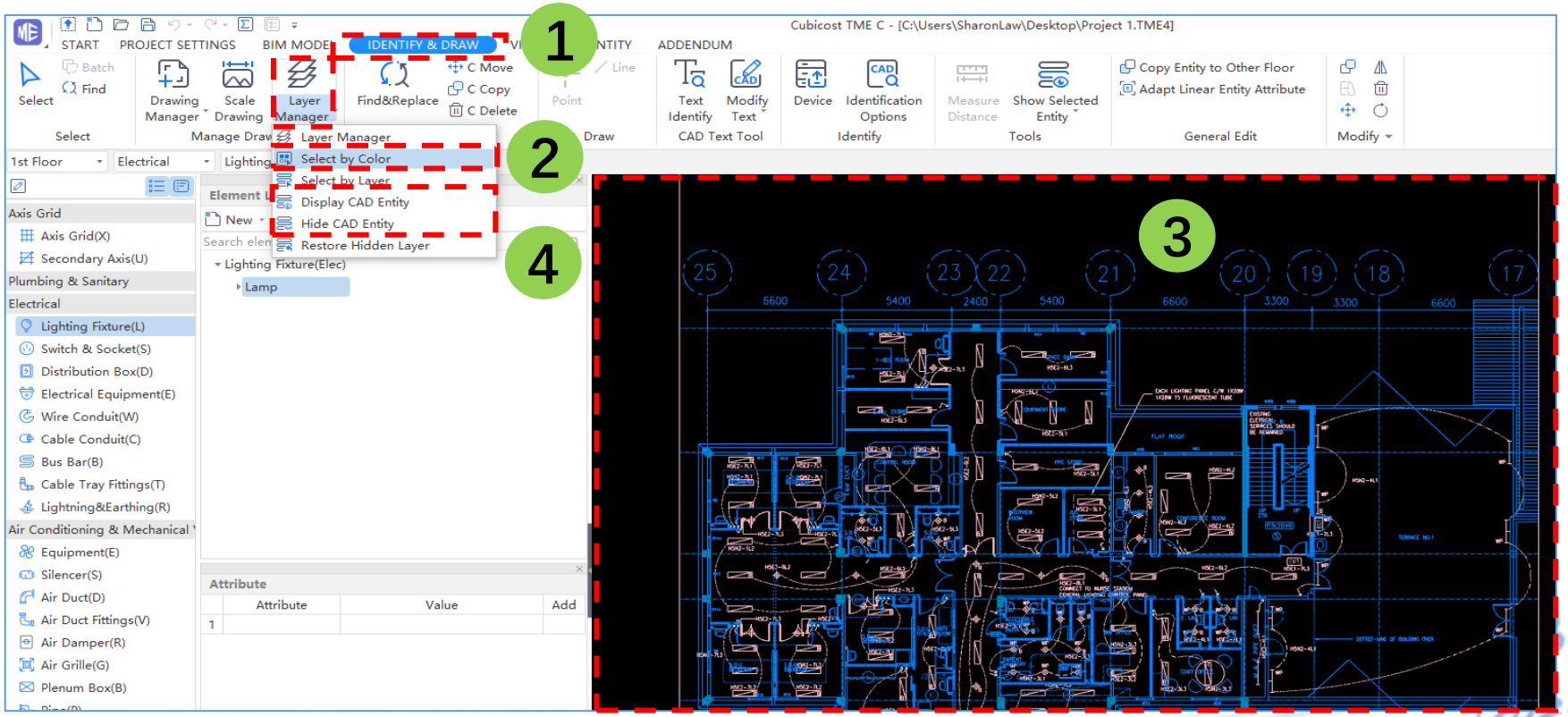
Activate function

Hide Selection	Display Selection
To Hide selected Color/Layer Only	To Show selected Color/Layer Only

3.9 How to Hide Drawings by Colours

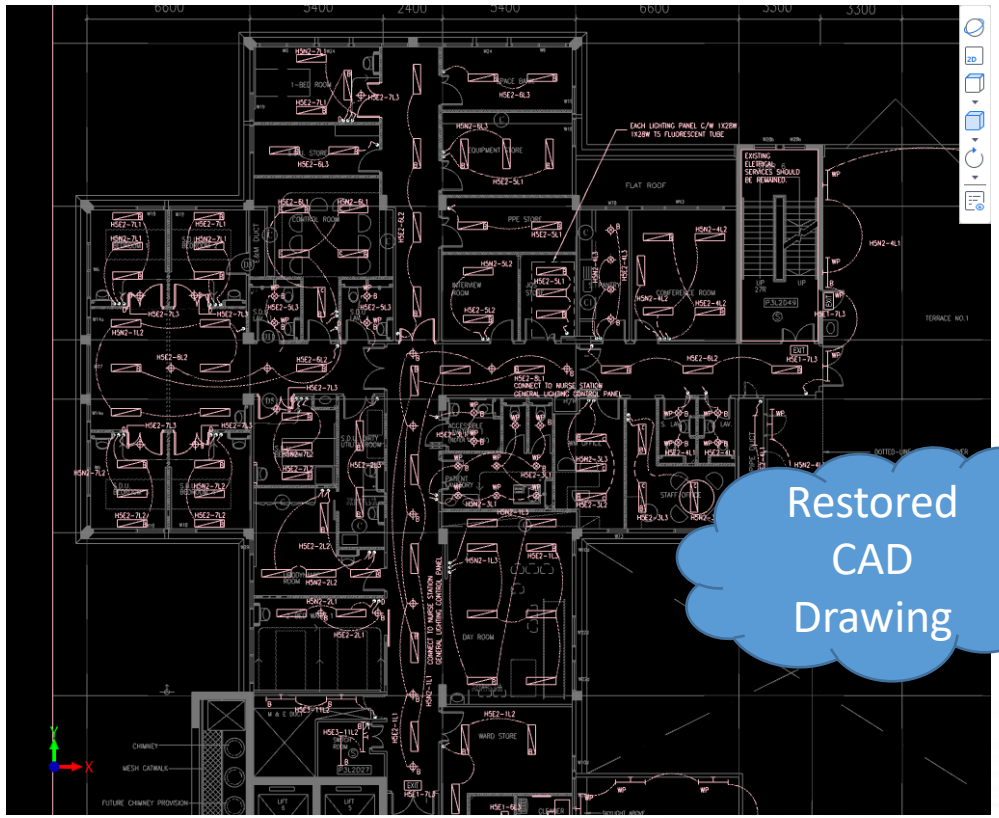
- Step 1: Go to [Identify & Draw], Select [Layer Manager] (Ctrl+L)
- Step 2: In Layer Manager, activate [Select By Colour] (F5)
- Step 3: Select required Colour at Drawing, right click to confirm

- Step 4: (a) Select [Hide CAD Entity] to Hide
  (b) Select [Display CAD Entity] (F6) to Display

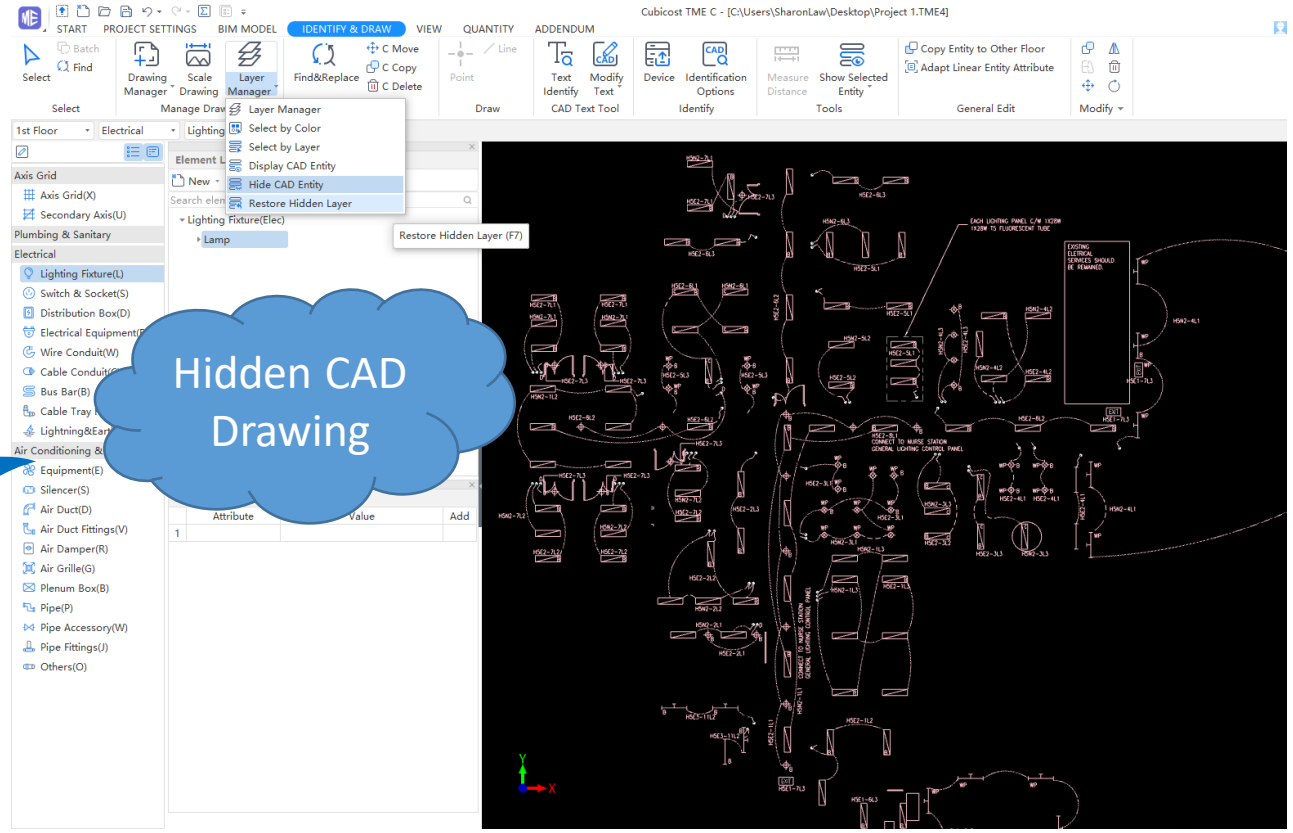


3.10 How to Recover Hidden Layer

- Step 1: Go to [Identify & Draw], Select [Layer Manager] (Ctrl+L)
- Step 2: Layer Manager activate [Restore Hidden Layer] (F7)



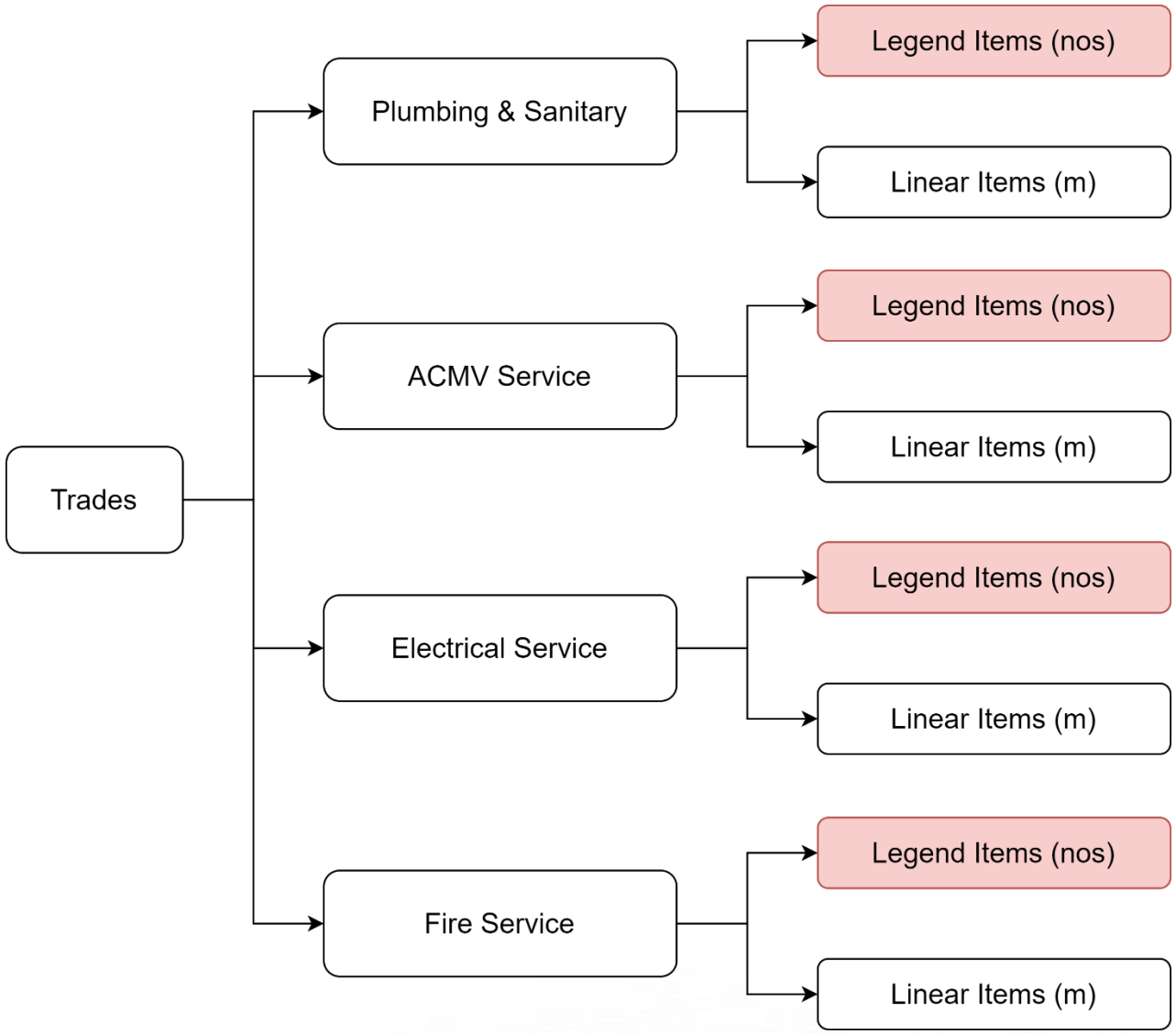
Restored CAD Drawing



Hidden CAD Drawing

Legend Quantification

4.0 Legends Identification



All trades follow the same rule for legend quantification: counting each item by numbers

4.1 Plumbing & Sanitary Items

TOILET

SHOWER SET

HAND WASH BASIN / LAVATORY (US)

SQUAT TOILET

WATER CLOSET

BATHTUB

FLOOR DRAIN

HAND BIDET

URINAL

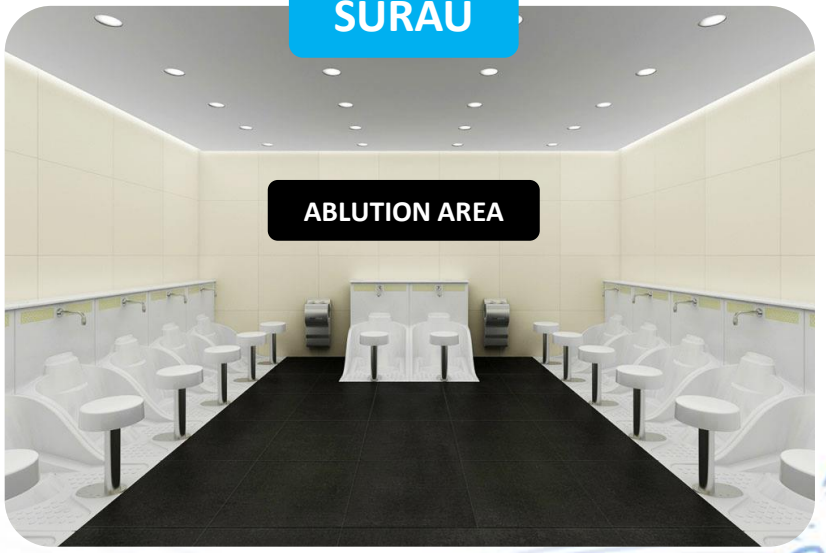
**Sanitary fixtures may also apply to multiple areas / rooms*

KITCHEN

WATER TAP / FAUCET

KITCHEN SINK

SURAU

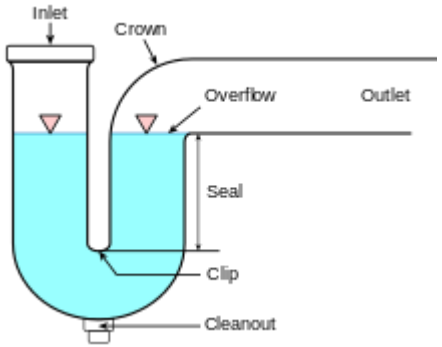


Floor Traps – different types

Gully Trap

P Trap

Q Trap



S Trap

Nahni Trap

Bottle Trap

LEGEND & ABBREVATION

	SYM	DESCRIPTION
FITTING		SLUICE VALVE
		CHECK VALVE
		GATE VALVE
		FLEXIBLE CONNECTION
		STRAINER (T-pot Type)
		PRESSURE GAUGE
		STOP COCK
	S	SURGE ANTICIPATOR

- Always look for **Drawing Notes** or **Legend & Abbreviation List** to identify what kind of items are needed to be identified

LEGEND & ABBREVIATION

CODE	DESCRIPTION	CODE	DESCRIPTION
PWC	PEDESTAL WATER CLOSET	SC	STOPCOCK
U	URINAL BOWL	BV	BALL VALVE
B	BASIN		GATE VALVE
S	SINK	M	ANALOG SUB METER
T	WATER TAP		

	CODE	DESCRIPTION
ABBREVATION	PWC	PEDESTAL WATER CLOSET
	AWC	ASIAN WATER CLOSET
	U	URINAL BOWL
	B	BASIN
	S	SINK
	SS	SERVICE SINK
	T	WATER TAP

Equipment – AHU vs FCU

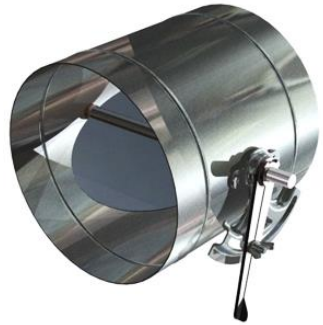
VS

Description	Fan Coil Unit [FCU]	Air Handling Unit [AHU]
Cost	Pretty reasonable	Can be very expensive
Size	Small	Large
Capacity (kW)	Around 12kW max	Over 100kW+
Used for	Directly serving single spaces/rooms	Serves multiple zones
Connected to	Flexible ducting to feeding grilles	Solid ducting serving multiple areas through building
Air Volume	Small	Large

4.2 ACMV Service Items

AIR GRILLE

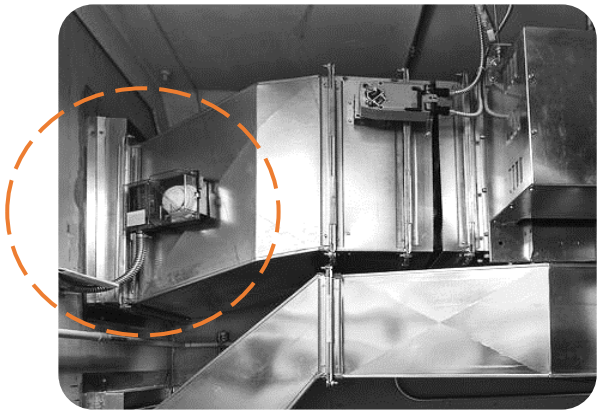
PLENUM BOX



DUCT ACCESS DOOR

DIFFUSER

SILENCER

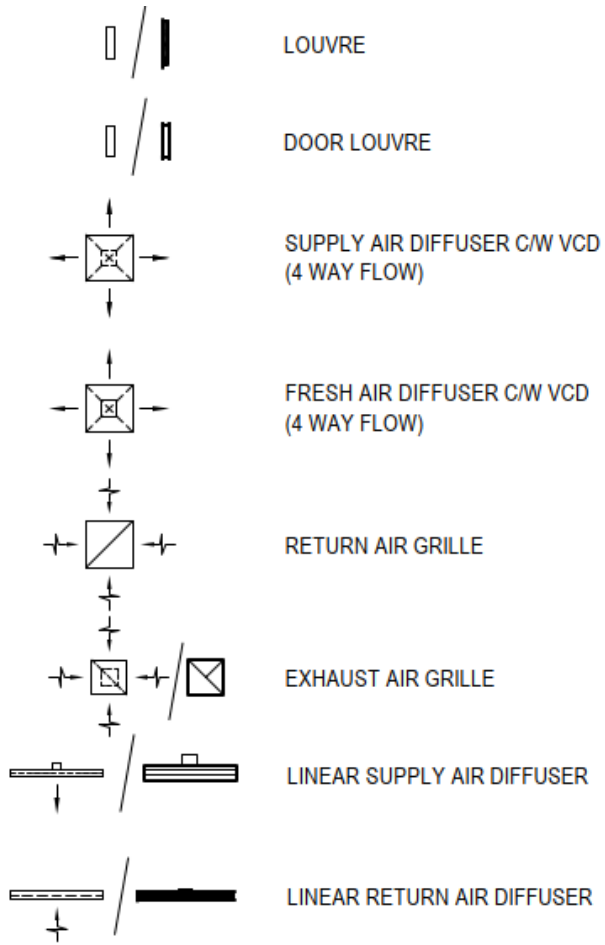


DAMPER

Regulates airflow and redirects it to specific areas

LEGEND

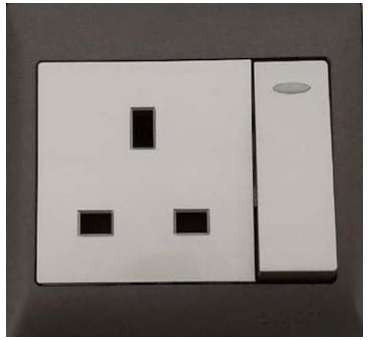
S.A.D.	SUPPLY AIR DIFFUSER
R.A.G.	RETURN AIR GRILLE
LSAD	LINEAR SUPPLY AIR DIFFUSER
LRAG	LINEAR RETURN AIR DIFFUSER
	EGG CRATE RETURN GRILLE
O.A.L.	OUTSIDE AIR LOUVRE
E.A.L.	EXHAUST AIR LOUVRE
E.A.G.	EXHAUST AIR GRILLE
O.A.G	OUTSIDE AIR GRILLE
S.A.G.	SUPPLY AIR GRILLE
T.A.	TRANSFER AIR



- Always look for **Drawing Notes** or **Legend & Abbreviation List** to identify what kind of items are needed to be idenqtified

4.3 Electrical Service Items

SWITCHBOARD



SOCKET OUTLET

CCTV

EARTH INSPECTION CHAMBER

JUNCTION BOX

SWITCHES

LIGHTING FIXTURE

4.3 Electrical Service Items

CODE	SYMBOL	DESCRIPTION
F01		2X28W/835 RECESSED FLUO. T5 LIGHT FITTING (600X1200MM) C/W FUSED TERMINAL BLOCK; RADIO INTERFERENCE SUPPRESOR; HIGH EFFICIENCY ELECTRONIC BALLAST; LOW GLARE SLIM TYPE FULL LOUVRE REFLECTOR (MIN.20 PCS CROSSBLADES) & HE LAMP SIMILAR TO FLUORELITE, SITECO
F02		2X28W/840 SURFACE / WALL MOUNTED FLUO. T5 ALUM BATTEN (1200MM); HIGH EFFICIENCY ELECTRONIC BALLAST; HE LAMP SIMILAR TO AMZ
F03		1X28W/840 SURFACE / WALL MOUNTED FLUO. T5 ALUM BATTEN (1200MM); HIGH EFFICIENCY ELECTRONIC BALLAST; HE LAMP SIMILAR TO AMZ
F04		1X14W/840 SURFACE / WALL MOUNTED FLUO. T5 ALUM BATTEN (600MM); HIGH EFFICIENCY ELECTRONIC BALLAST; HE LAMP SIMILAR TO AMZ
F05		1X28W/840 SURFACE / WALL MOUNTED FLUO. T5 ALUM BATTEN (1200MM) C/W IP65 DAIKON DIFFUSER; HIGH EFFICIENCY ELECTRONIC BALLAST; HE LAMP SIMILAR TO AMZ
F06		2X28W/840 SURFACE / WALL MOUNTED FLUO. T5 ALUM BATTEN (1200MM) C/W ACRYLIC SEMI FROSTED DAIKON DIFFUSER; HIGH EFFICIENCY ELECTRONIC BALLAST; HE LAMP SIMILAR TO AMZ (FOR CAR PARK LOT)
F07		2X28W/840 SURFACE / WALL MOUNTED FLUO. T5 ALUM BATTEN (1200MM) C/W ACRYLIC SEMI FROSTED DAIKON DIFFUSER; HIGH EFFICIENCY ELECTRONIC BALLAST; HE LAMP SIMILAR TO AMZ (FOR CAR PARK DRIVEWAY & WALKWAY)
F08		2X14W/840 SURFACE / WALL MOUNTED FLUO. T5 ALUM BATTEN (600MM) C/W K15 PRIMATIC DIFFUSER; HIGH EFFICIENCY ELECTRONIC BALLAST (FOR STAIRCASE)
D01		8W RECESSED LED MODULE DOWNLIGHT (DIAMETER 4") C/W EXTERNAL HIGH EFFICIENCY ELECTRONIC DRIVER; DIE CAST ALUMINIUM IP 44 HOUSING
D02		20W RECESSED LED MODULE DOWNLIGHT (DIAMETER 5") C/W HIGH EFFICIENCY ELECTRONIC DRIVER; DIE CAST ALUMINIUM IP 20 HOUSING & HEATSINK
D03		9W/830 LED STRIPS FOR COVE CEILING C/W ALUMINIUM PROFILE HEATSINK; CONVERTOR AND NECESSARY MOUNTING ACCESSORIES SIMILAR TO RZB STRIP ECO
D04		25W RECESSED LED MODULE DOWNLIGHT (DIAMETER 10") C/W HIGH EFFICIENCY ELECTRONIC DRIVER; DIE CAST ALUMINIUM IP 20 HOUSING & HEATSINK
D05		30W RECESSED LED MODULE DOWNLIGHT (DIAMETER 10") C/W HIGH EFFICIENCY ELECTRONIC DRIVER; DIE CAST ALUMINIUM IP 20 HOUSING & HEATSINK
D06		112W LED IP65 FLOODLIGHT
D07		100W INCANDESCENT LAMP OR 30W PLCE LIGHT BULB

CODE	SYMBOL	DESCRIPTION
SP01		13A NORMAL SUPPLY S/S/O (1 GANG) MOUNTED AT 300mm HEIGHT FROM FFL
SP02		13A ESSENTIAL SUPPLY S/S/O (1 GANG) MOUNTED AT 300mm HEIGHT FROM FFL
SP03		13A ESSENTIAL SUPPLY S/S/O (1 GANG) METAL CLAD
SP04		13A NORMAL SUPPLY WEATHERPROOF S/S/O (1 GANG)
SP05		13A ESSENTIAL SUPPLY WEATHERPROOF S/S/O (1 GANG) METAL CLAD
SP06		13A NORMAL SUPPLY S/S/O (1 GANG) C/W STAINLESS STEEL COVER
IS01		30A SPN ISOLATOR C/W IP41 METALCLAD ENCLOSURE
IS02		60A TPN ISOLATOR C/W IP65 METALCLAD ENCLOSURE
FM1		FIREMAN SWITCH FOR NORMAL AND ESSENTIAL SUPPLY LOCATED AT ALL STAIRCASE LANDING

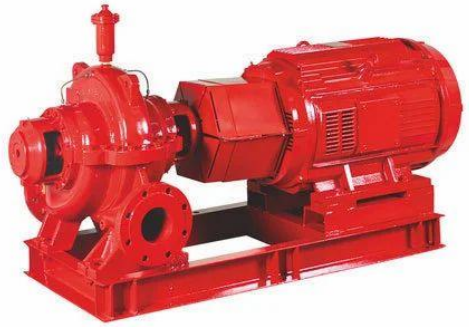
❖ Always look for **Drawing Notes** or **Legend & Abbreviation List** to identify what kind of items are needed to be identified

4.4 Fire Service Items

SPRINKLERS

SMOKE DETECTOR

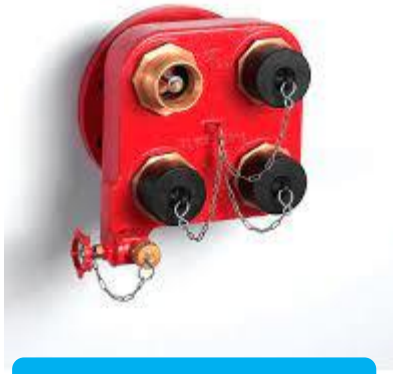
FIRE HYDRANT



FIRE PUMP

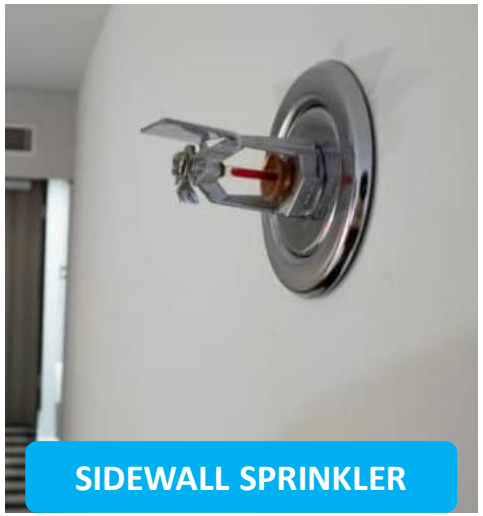
HOSE REEL DRUM

INTERCOM HANDSET

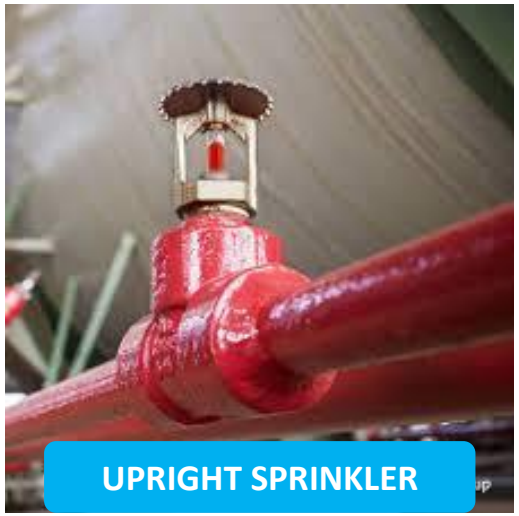


BREECHING INLET

Sprinklers – different types



SIDEWALL SPRINKLER



UPRIGHT SPRINKLER

CONCEALED PENDENT SPRINKLER

PENDENT SPRINKLER

DOUBLE LAYER SPRINKLER

4.4 Fire Service Items

LEGEND


EXPOSED SPRINKLER HEAD (PLAN/SCH)


CONCEALED SPRINKLER HEAD (PLAN/SCH)


CUT-OFF SPRINKLER HEAD


UNDER RAMP BENEATH/ STAIRS/ ESCALATORS/ FAN/ DUCT/ FCU/ BEAM SPRINKLER HEAD


DELUGE HIGH HAZARD SPRINKLER (12mm/min)


HIGH HAZARD SPRINKLER (30mm/min)

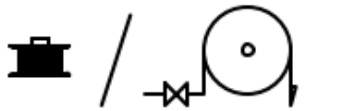

SIDEWALL SPRINKLER HEAD

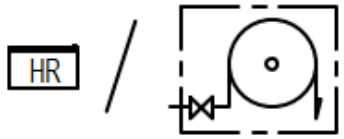
SPRINKLER AT RAISED FLOOR

EXPOSED SPRINKLER HEAD (PLAN)

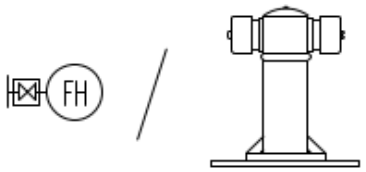
QUICK RESPONED SPRINKLER HEAD (PLAN)


FLUSH TYPE SPRINKLER


HOSEREEL (PLAN/SCH)



HOSEREEL C/W STAINLESS STEEL CABINET (PLAN/SCH)



FIRE HYDRANT (PLAN/SCH)

FLOW SWITCH (PLAN/SCH)


SUBSIDIARY VALVE (MONITORED STOP VALVE) (PLAN/SCH)


'Y' TYPE STRAINER (PLAN/SCH)

❖ Always look for **Drawing Notes** or **Legend & Abbreviation List** to identify what kind of items are needed to be identified

1 **IDENTIFY**

Device

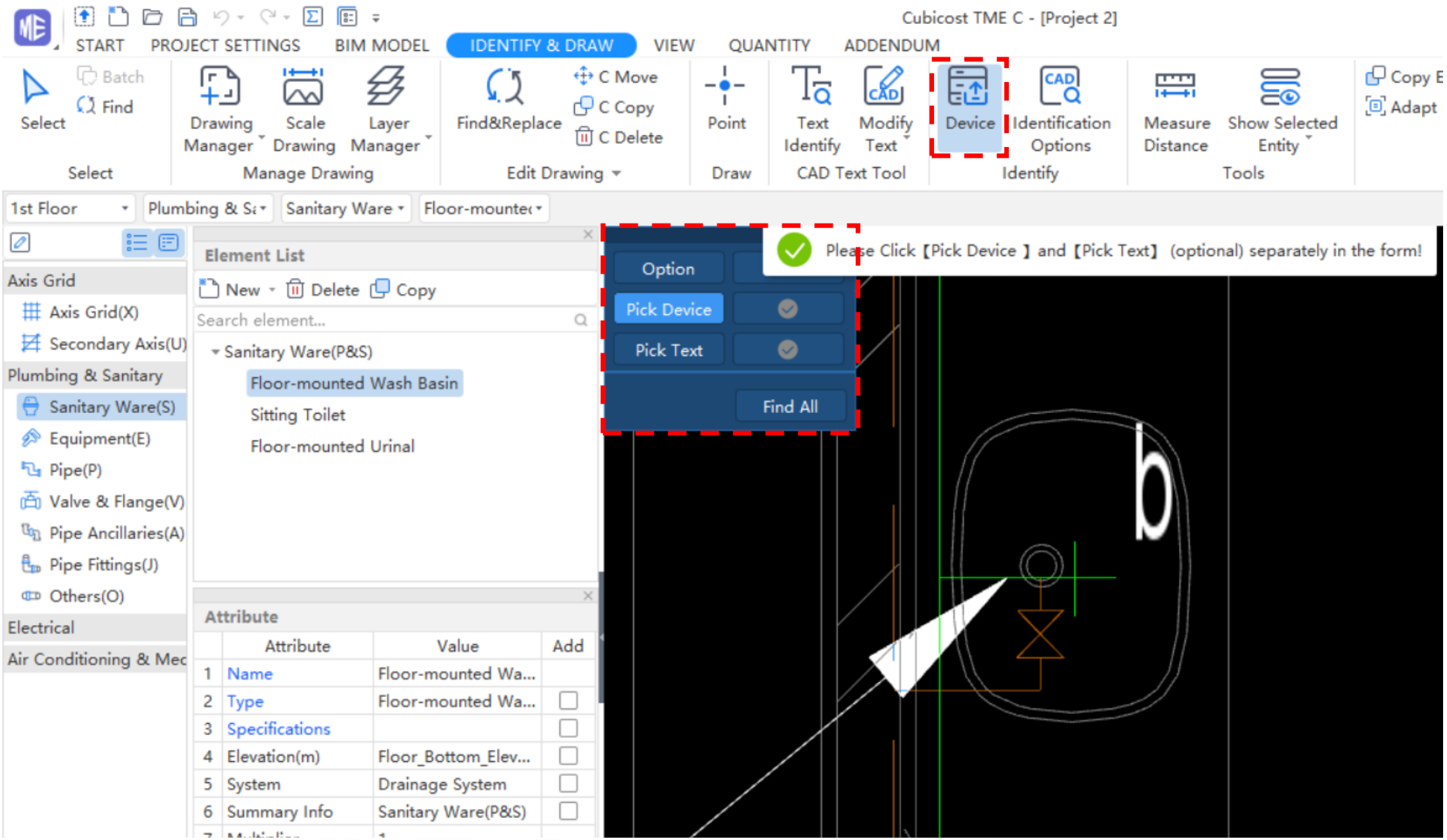
- Device function is used to effectively identify legends (where quantity is required in numbers) in the drawing.

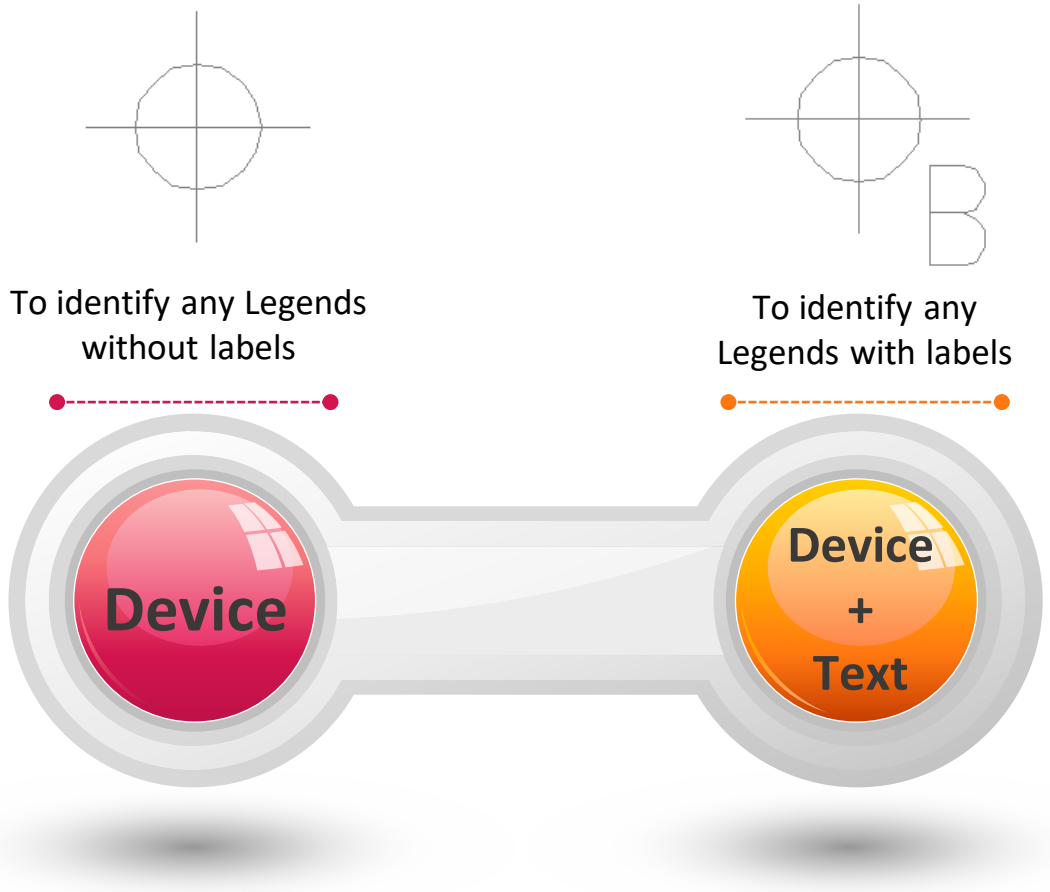
2 **MANUAL**

Point

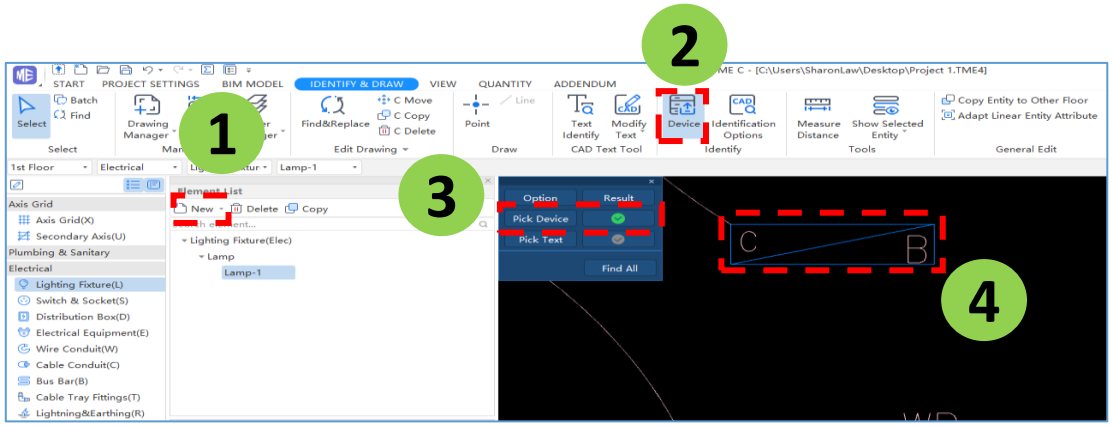
- Point function is used to manually draw all elements (where quantity is required in numbers) in drawing area.

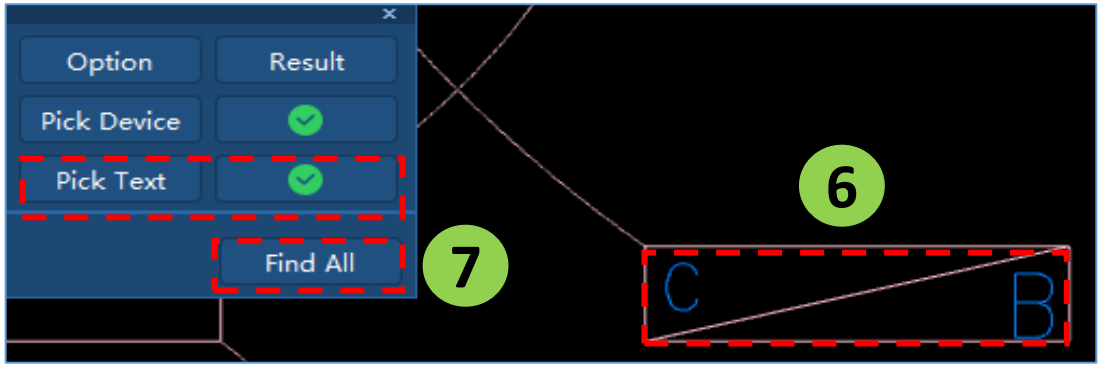
4.6 Device Identification

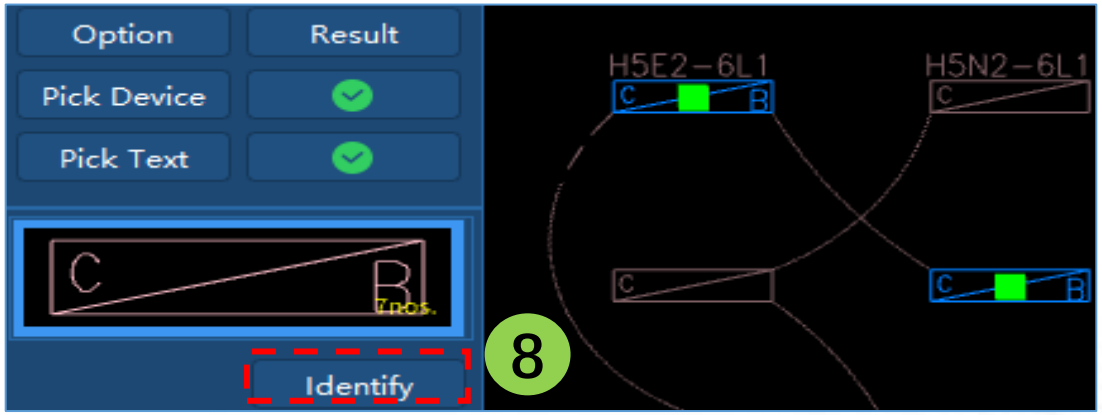



To identify any Legends without labels
To identify any Legends with labels
Device
Device
+
Text

4.8 How to Identify Device

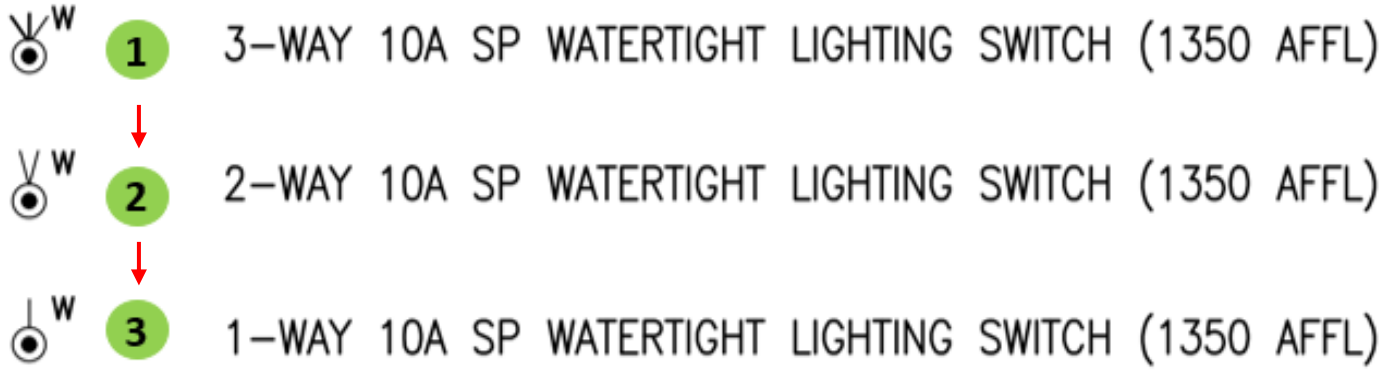


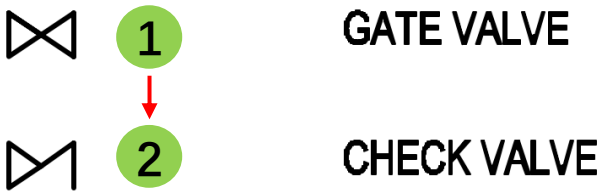




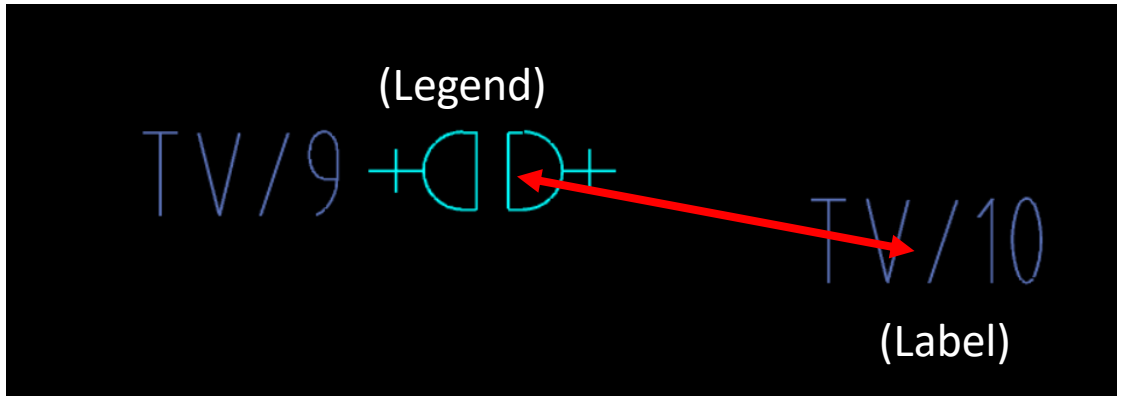
- Step 1: Create a element in [Element List]
- Step 2: Select [Device]
- Step 3: Activate [Pick Device]
- Step 4: Select the legend, Right Click to confirm
- Step 5 (*optional*) : Activate [Pick Text]
- Step 6 (*optional*) : Select the text, Right Click to confirm
- Step 7: Select [Find All]
- Step 8: Select [Identify] and the software will Identify the Entities
- Step 9: Software show a [Prompt] of the Quantity Calculated

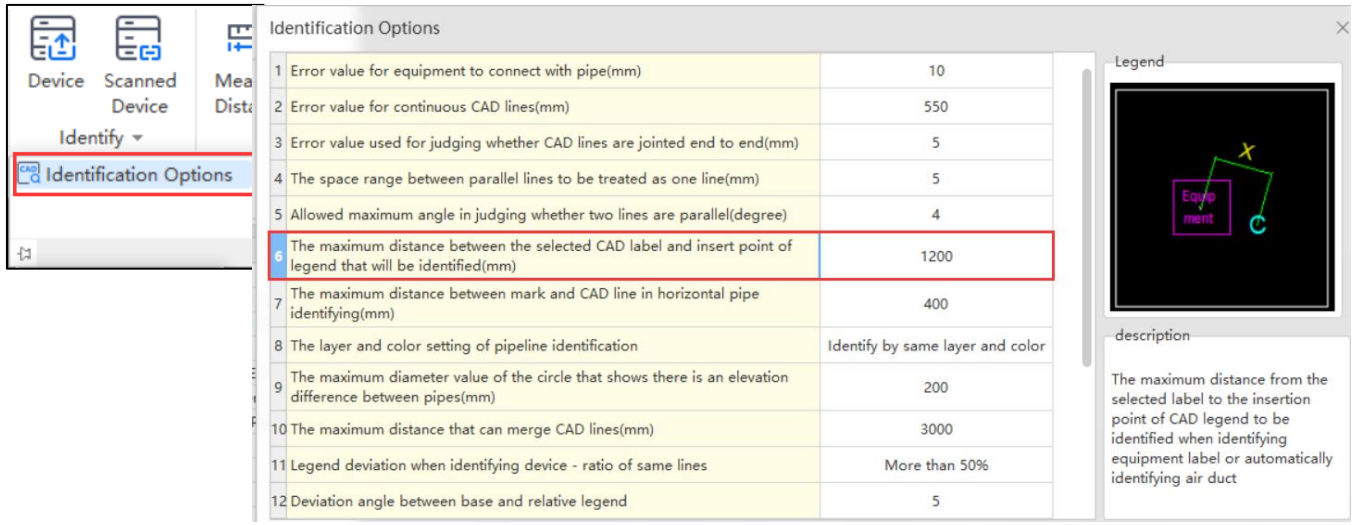
- Follow the **Rule of Thumb**, [Complex > Simple] , identify in Ascending Order as shown below: -





Check the **distance** between legend and label if you're required to identify **both legend and label**



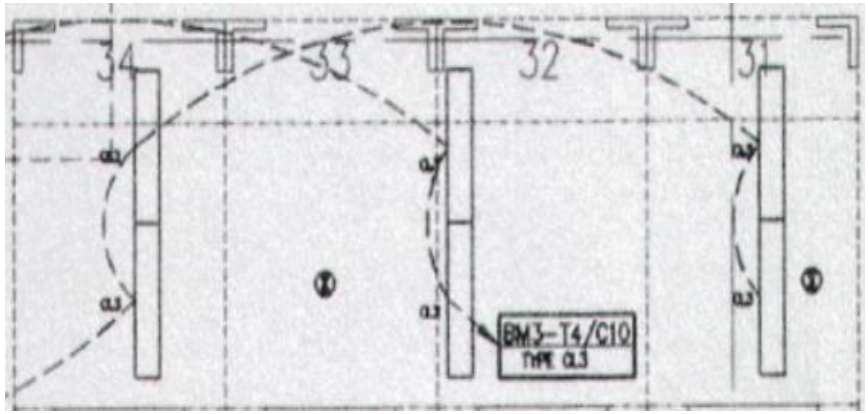


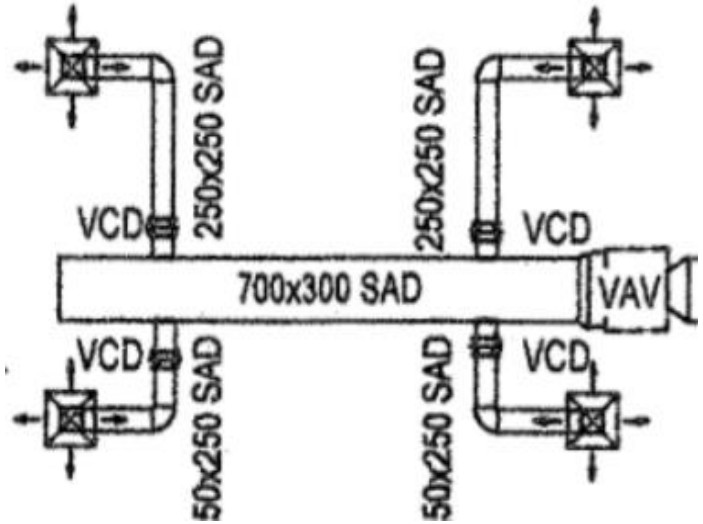
Step 1: Activate [Measure Distance] and measure the distance between legend and label

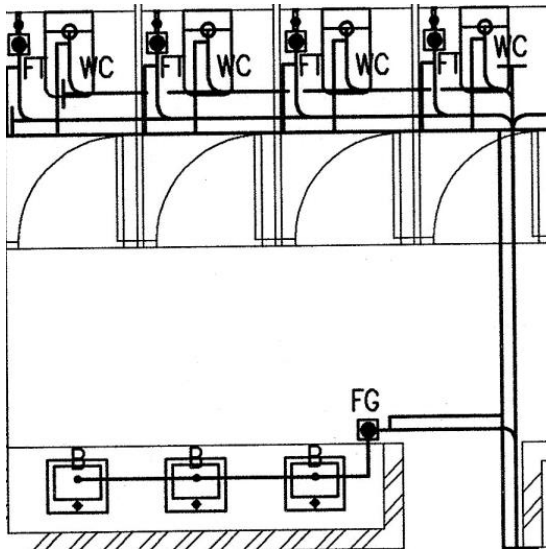
Step 2: Go to [Identification Options] and go to option 6 to check the distance value

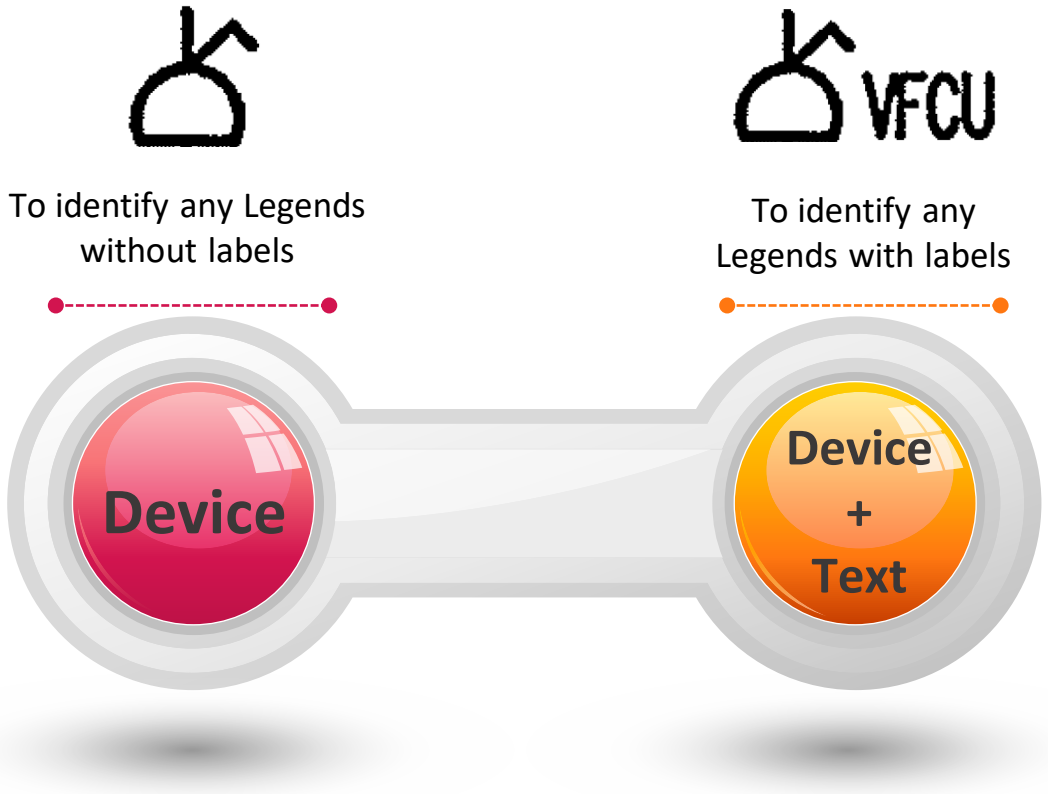
Step 3: Adjust the value so that it is **greater than** the value measured in Step 1

Scanned Device Function allows the identification of legends using Optical Character Recognition (OCR) in scanned PDF drawings

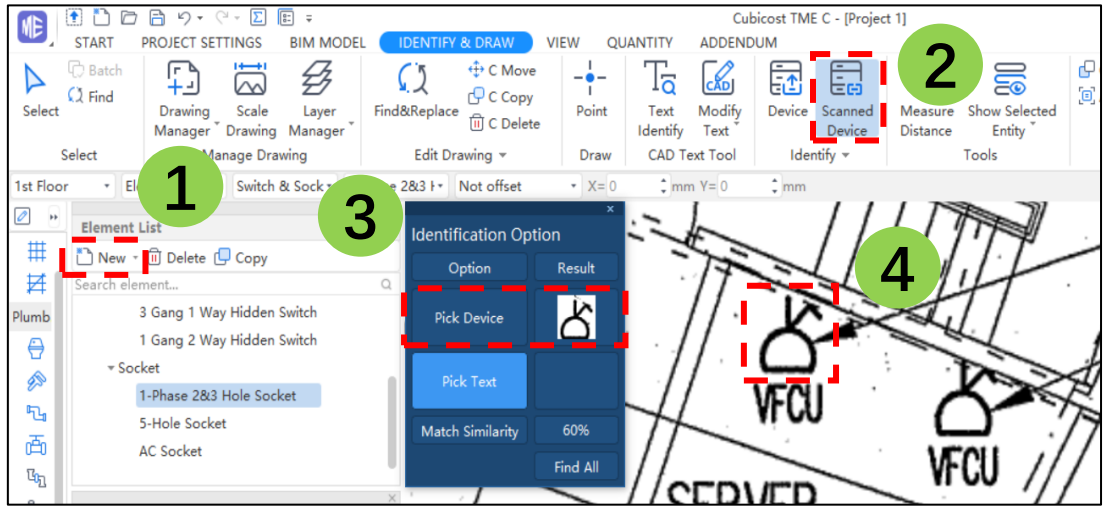


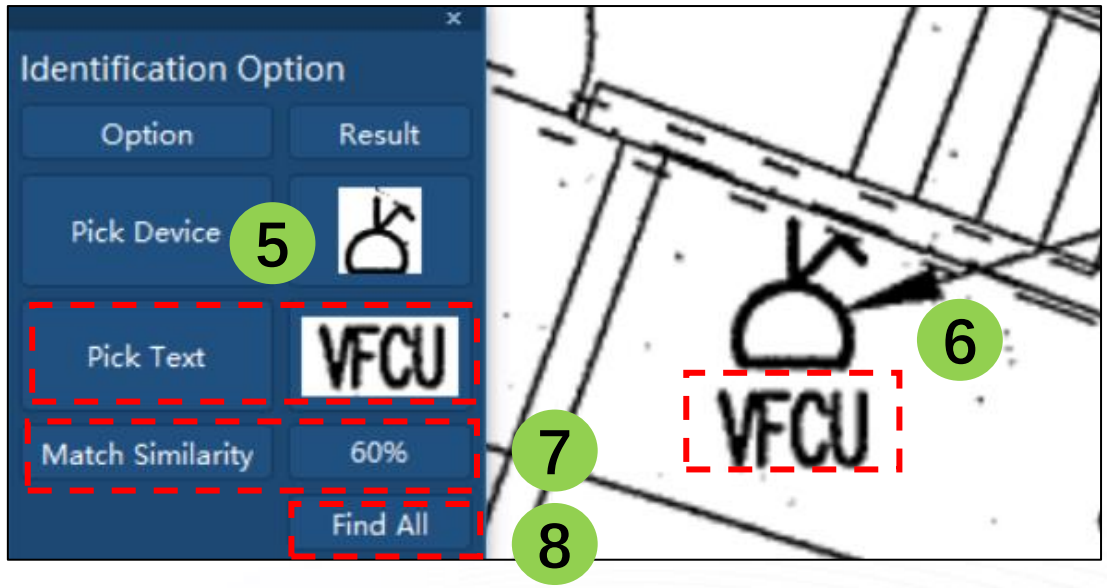





VFCU
To identify any Legends without labels
To identify any Legends with labels
Device
Device + Text

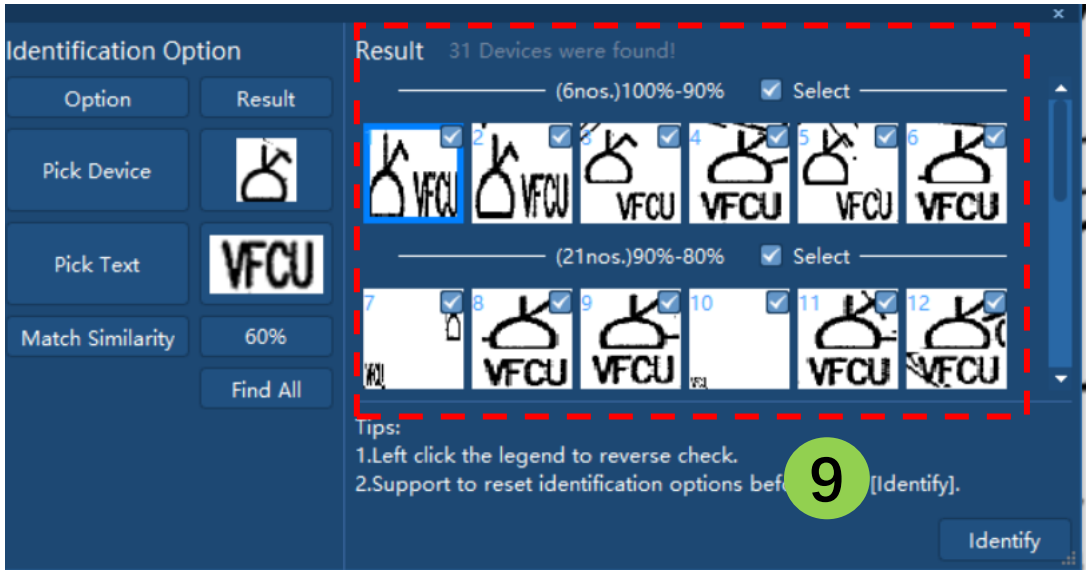
4.12 How to Identify Scanned Device

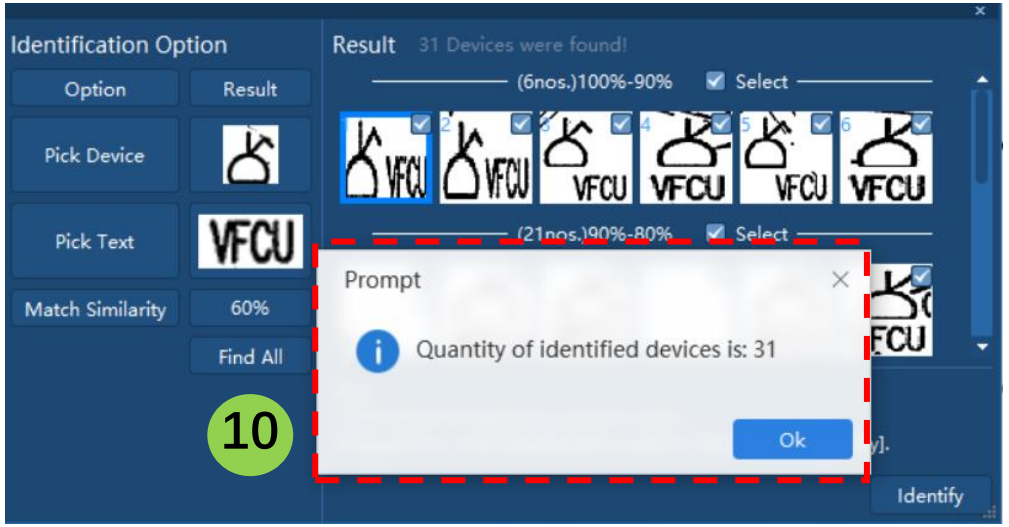




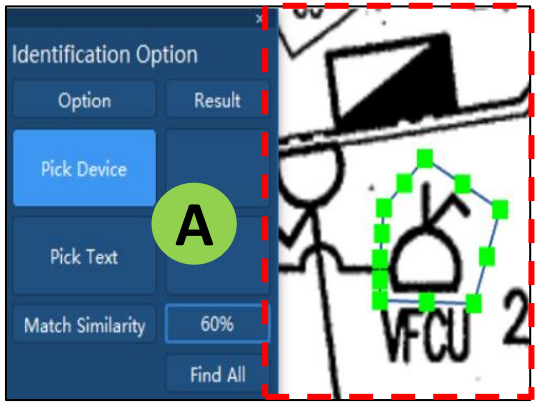
- Step 1: Create a element in [Element List]
- Step 2: Select [Scanned Device]
- Step 3: Activate [Pick Device]
- Step 4: Select the legend, Right Click to confirm
- Step 5 (*optional*) : Activate [Pick Text]
- Step 6 (*optional*) : Select the text, Right Click to confirm
- Step 7: Input Similarity Level in [Match Similarity]
  (available range is 40% ~ 100%)
- Step 8: Select [Find All]

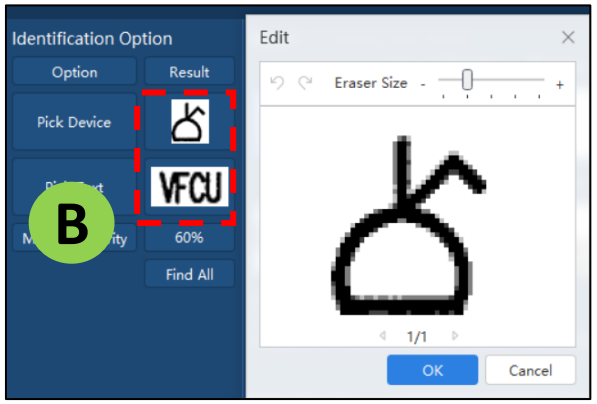
4.13 How to Identify Scanned Device (continued)





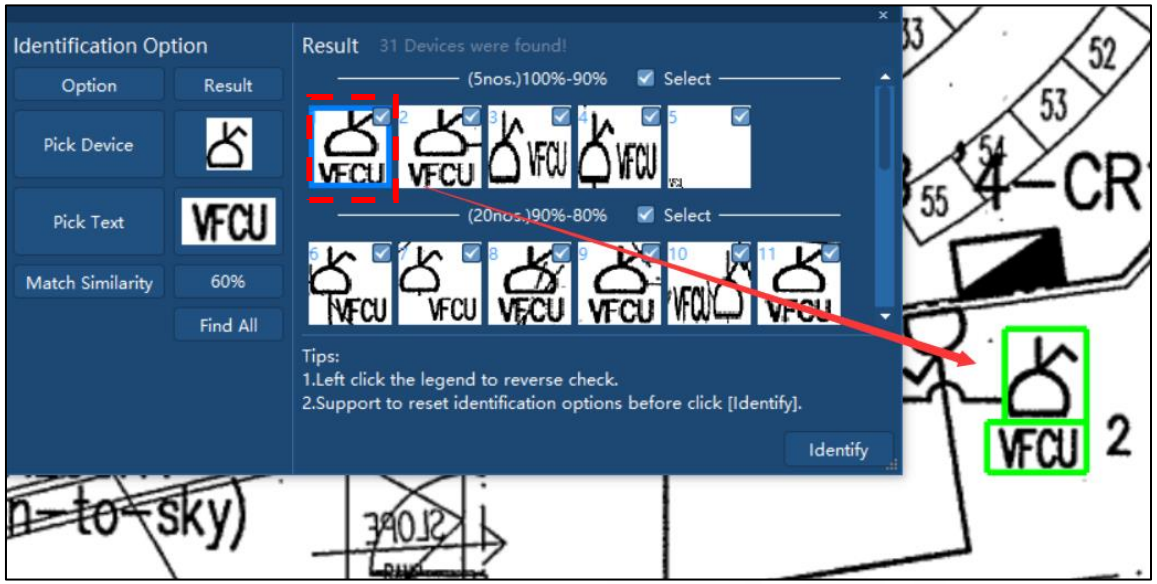
- Step 9: Select / Unselect legends to be identified in the [Results Window]
- Step 10: Software show a [Prompt] of the Quantity Calculated





Selection Modification

- Modification of legend selection area is allowed by adjusting green points [A]
- Left Click on legend identified to enable the Eraser tool for further modification [B]



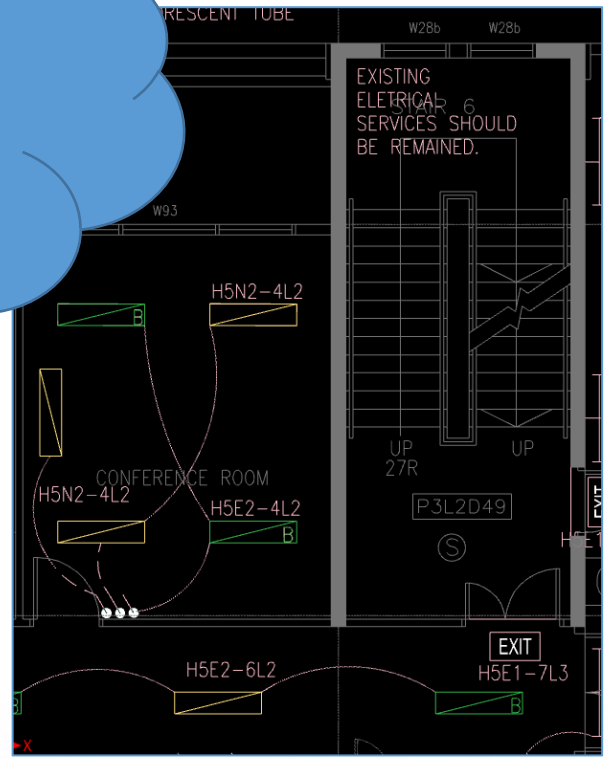
Reverse-Checking

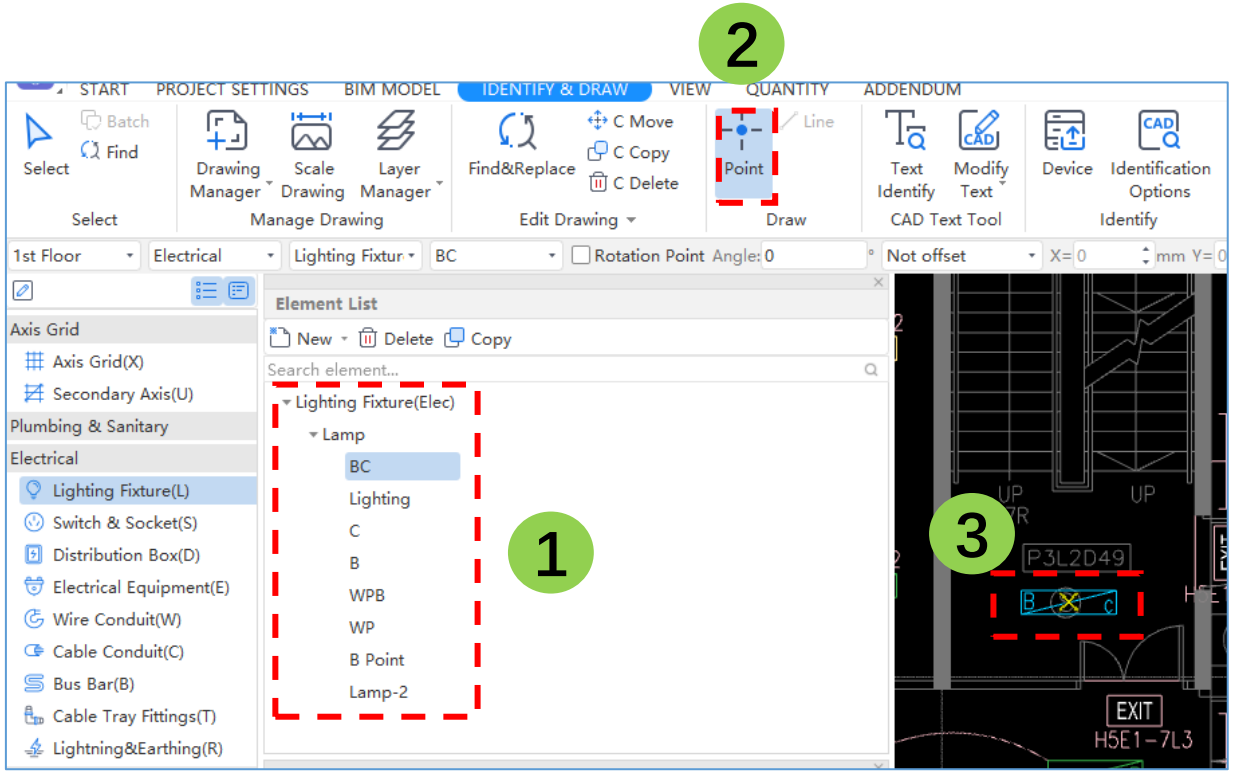
- Left Click on the legends in the [Results Window] to reverse check the entity identified in the drawing area.

4.15 Point Function (PO)

- Step 1: Select Element at [Element List]
- Step 2: Select [Point] function,
- Step 3: Point in the Entity

There is lighting at stairs but wasn't drawn in the drawing. How?





4.16 Ways to Check Identified/ Drawn Entities

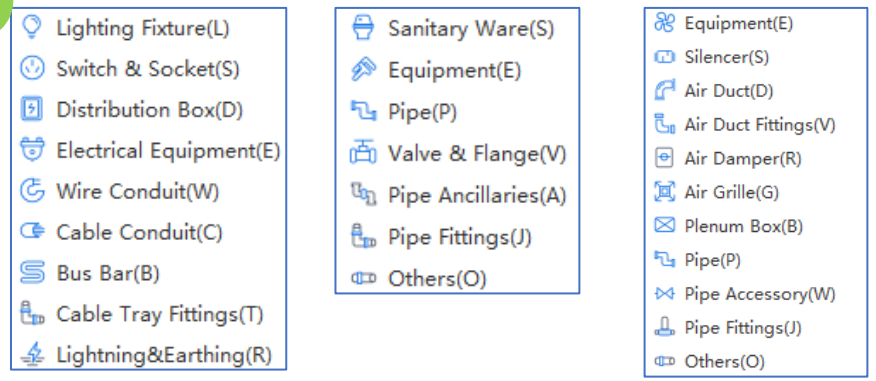
1. Display or Hide Entity

- Click [Element Code] on keyboard.

For example: To hide Lighting Fixture entity at drawing area, click on (L) key on keyboard.

(Each element has its individual code, refer to Module Navigation Bar, the bracket letters beside the elements are the element code)

1

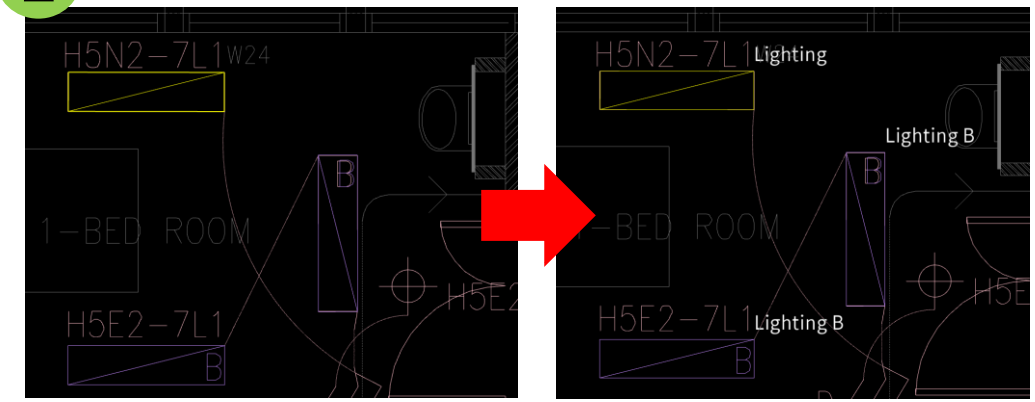


2. Display or Hide Entity Name

- Hold [Shift + Element Code] on keyboard

For example: To show Lighting Fixture entity name at drawing area, hold on (Shift + L) key on keyboard.

2



3. Adjust Brightness of Drawing

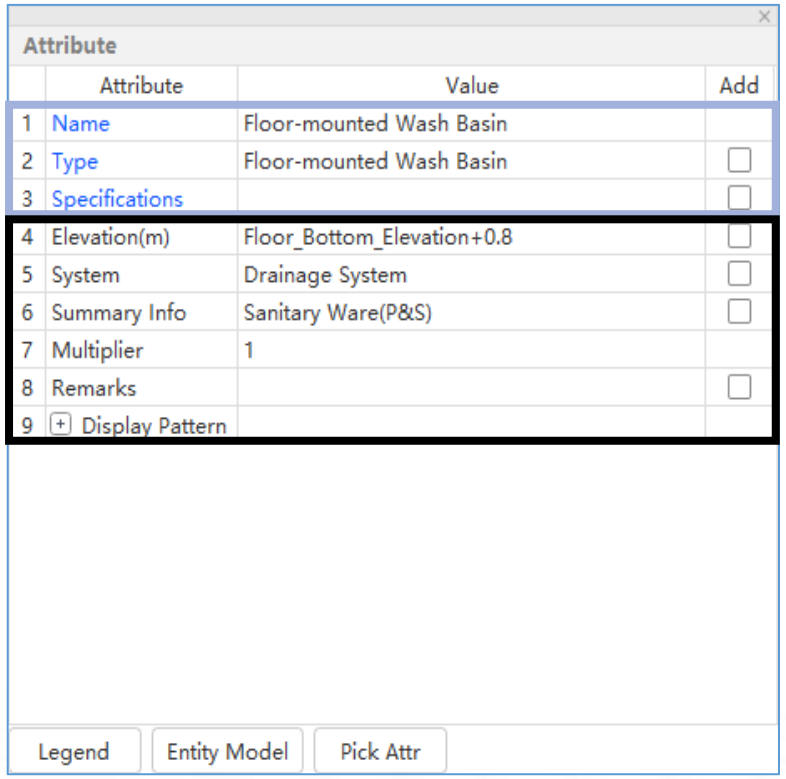
- At status bar (locate at most bottom of software), click + or – to adjust the brightness of drawing

3

Public: **WITHOUT SELECTION,** The changes apply to all the same name entities

Private: The changes will only take effect with the items/Model/entity being **SELECTED (MUST)**, otherwise the modification will be invalid

Public



Private

Length Quantification

Glodon

Draw

- Line
- 3 Point Arc

Identify

- Single Line
- Double Line
- Trade Specific Functions

Vertical

- Vertical Riser

Display Settings

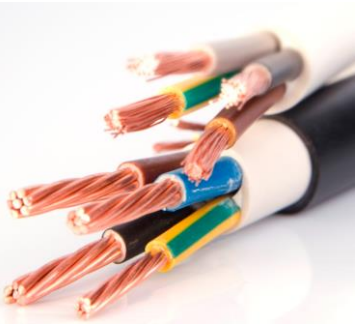
- Floor Display
- Entity Display

5.0 Length Quantification – Items To Calculate

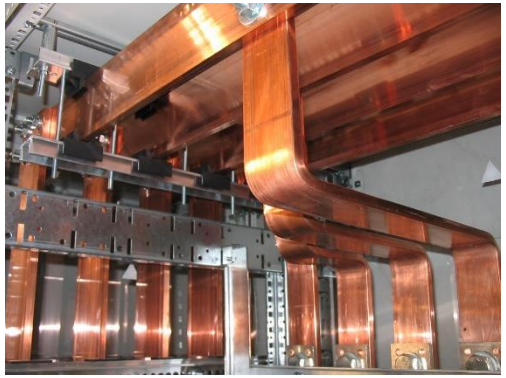
Cable Conduits

Cable Trunking

Cable Tray

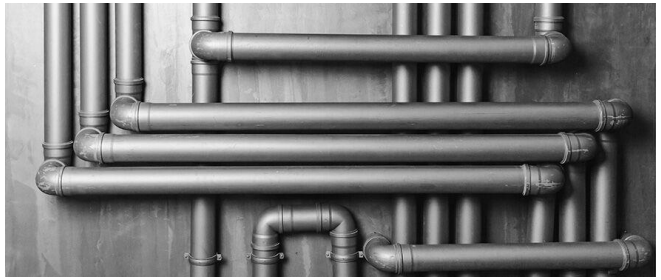


Cable/Wire

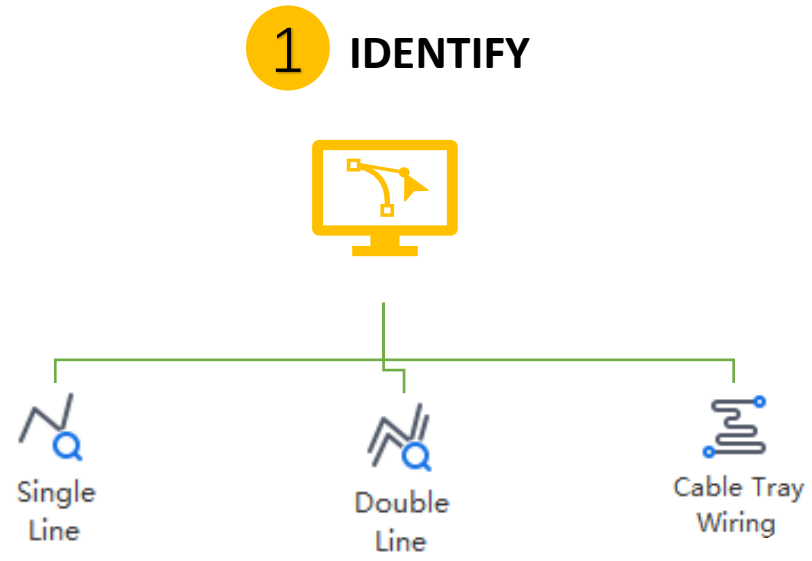


Bus Bars

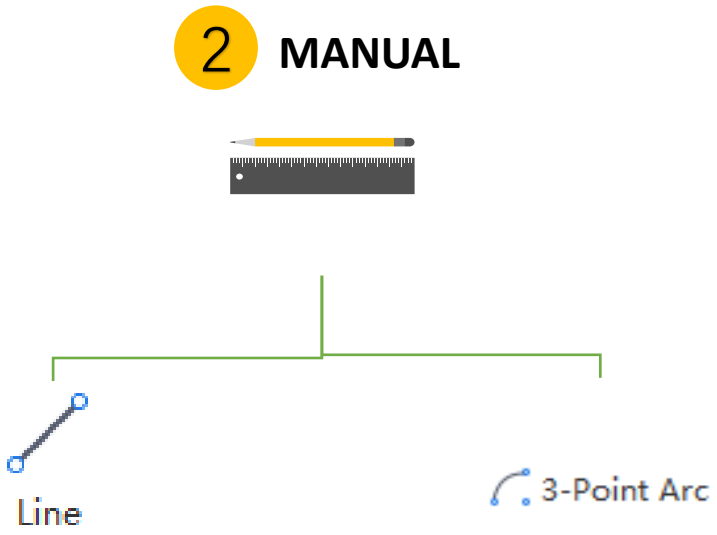
Air Ducts



Pipes



- Single Line, Double Line and Cable Tray Wiring function is used to identify linear type element in the drawing.



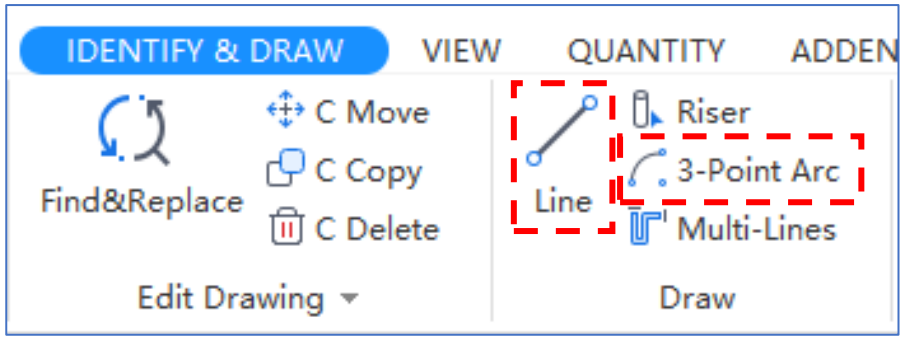
- Line and 3-Point Arc function is used to manually draw elements (where quantity is required in linear) in drawing area.

5.2 Summary of Linear Type Services Taking-Off Method

SERVICES	ELEMENT		IDENTIFY FUNCTION	MANUAL FUNCTION
Plumbing & Sanitary	Pipe		Single Line Double Line	Line 3-Point Arc
Electrical	Cable Tray / Trunking		-	
	Wire/Cable Conduit	Conduit	Single Line Cable Tray Wiring	
		Electric Wire/ Cable		
	Bus Bar		Single Line	
ACMV	Air Duct		Duct System Identify/Identify Fittings Single Line Double Line	
	Pipe		Single Line Double Line	
Fire Protection	Pipe		Identify Pipe/Generate End-Pipe Single Line Double Line	
	Cable Tray / Trunking		-	
	Wire/Cable Conduit	Conduit	Single Line Cable Tray Wiring	
		Electric Wire/ Cable		

Trade Specific Functions

Line & Three Point Arc



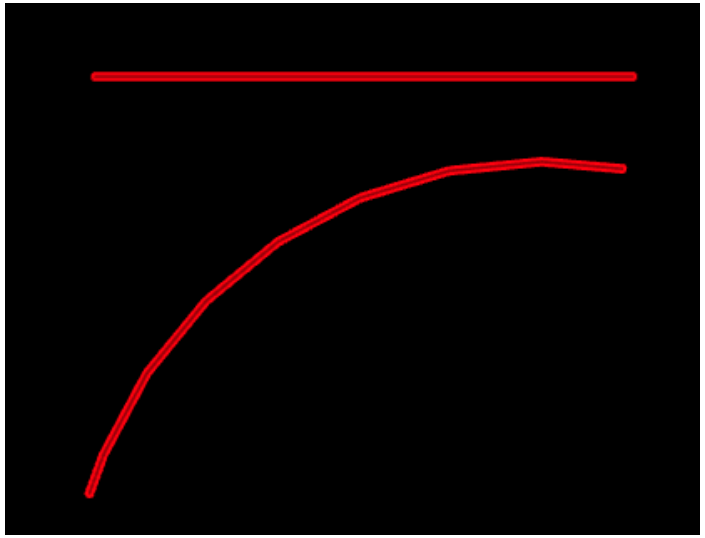
Line (Ctrl +D)

1. Draw Manually or Trace in the drawing

Three Point Arc

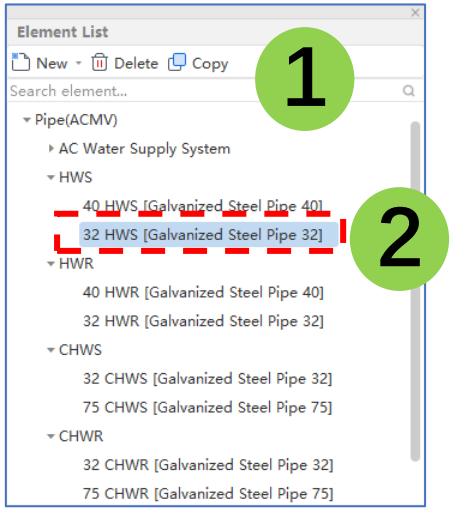
1. For Curve Length Entities
2. Define three points to have a curve length model

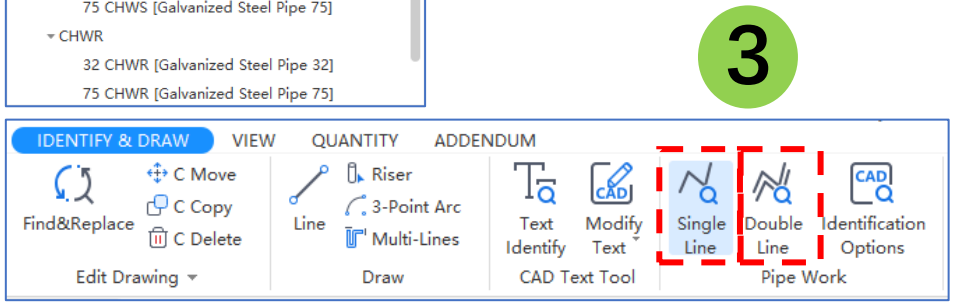
*Second Point can be any point within the arc

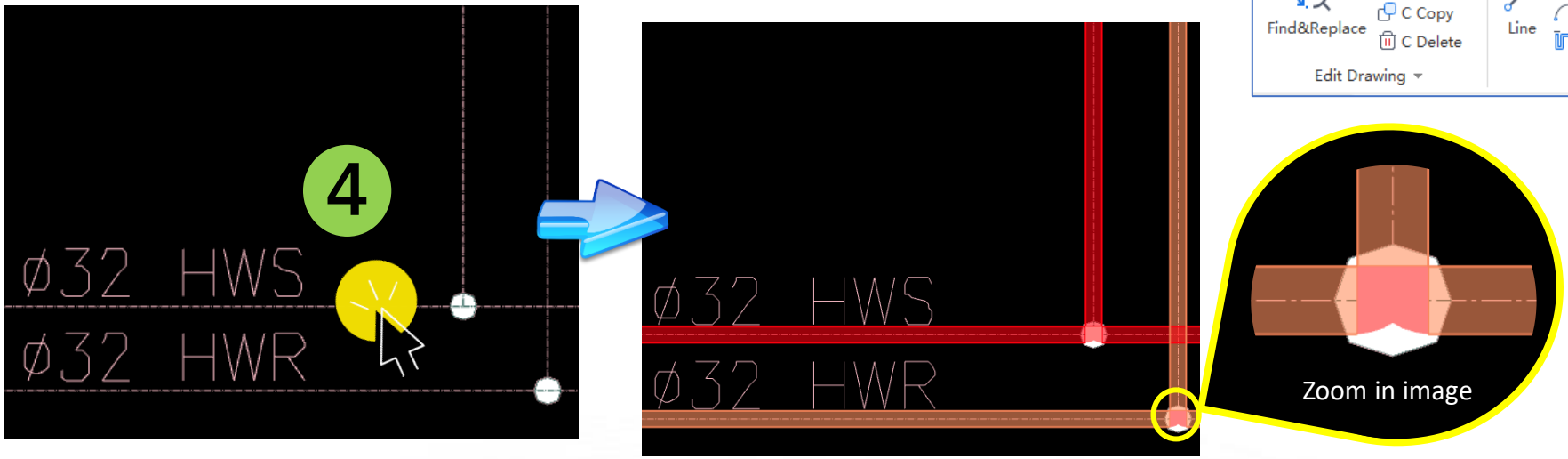


5.4 Method 2 – Identify Line Entities

- Step 1: Have the elements created
- Step 2: Select the element from Element List
- Step 3: Tab [Identify & Draw] > Single Line or Double Line
- Step 4: "**Left Click/Drag Select**" the line to have the element generate directly on the line in the drawing



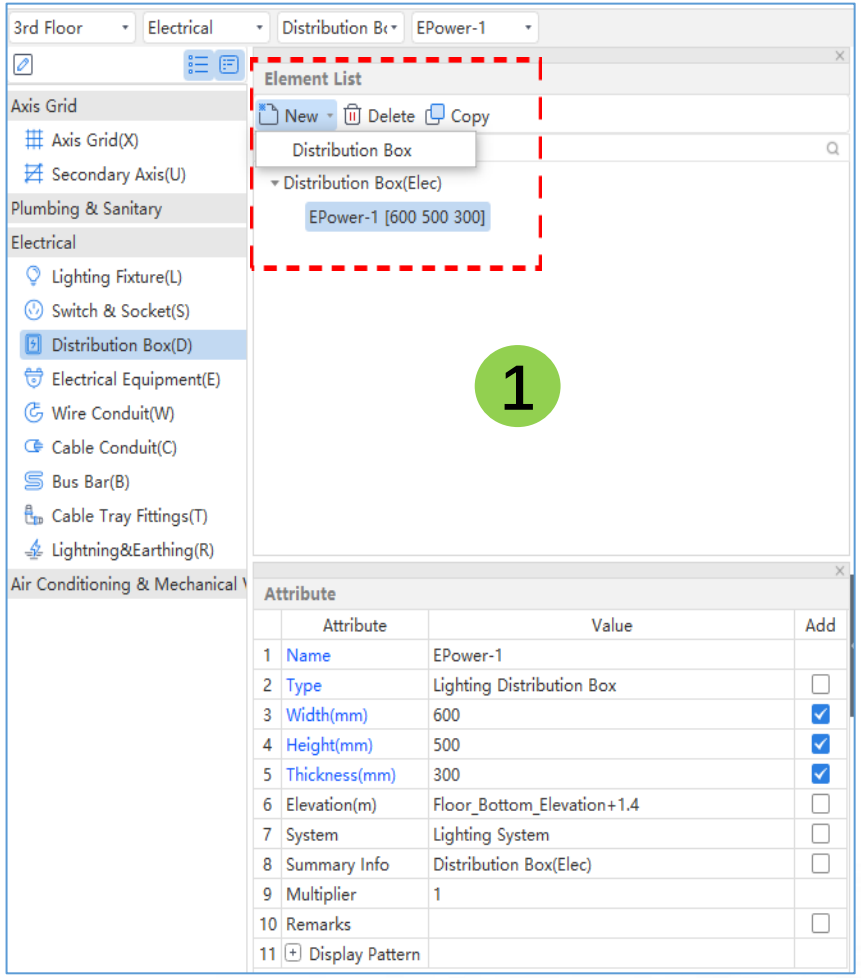


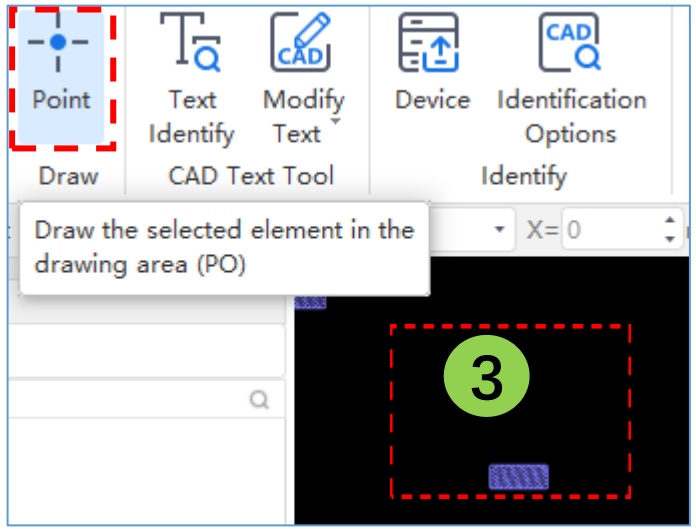


* Pipe fittings is automatically generated

5.5 Trade Specific Function – Cable Tray Wiring (Electrical)

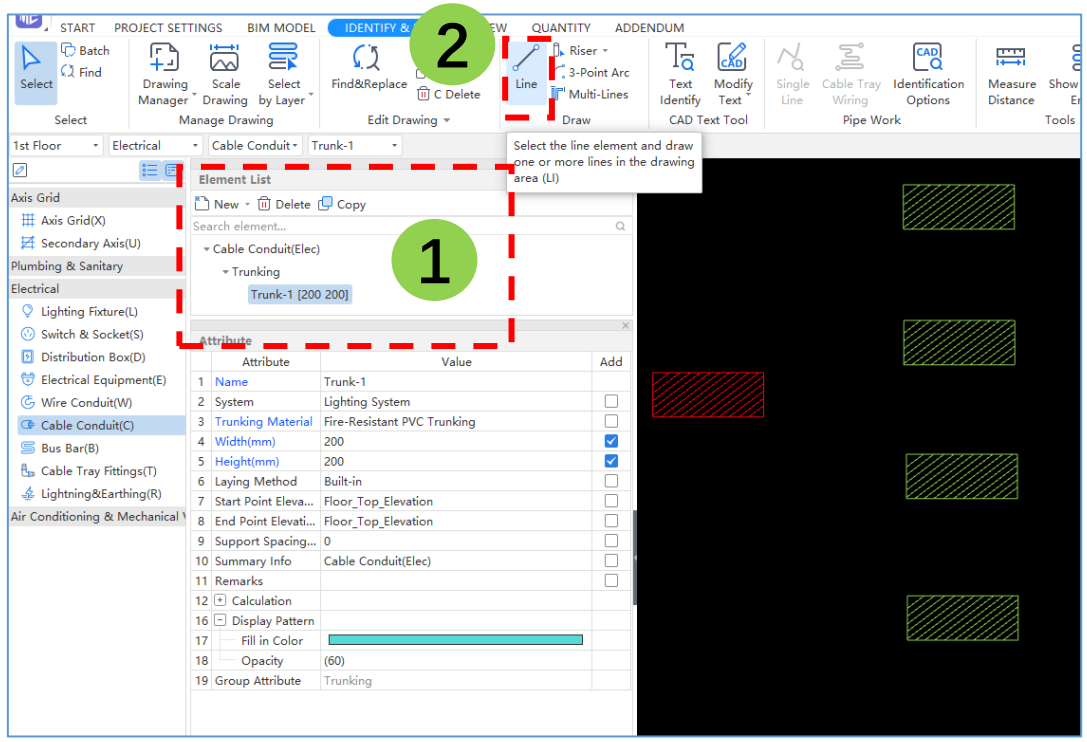
PART 1: Point In distribution boxes in the drawing area first

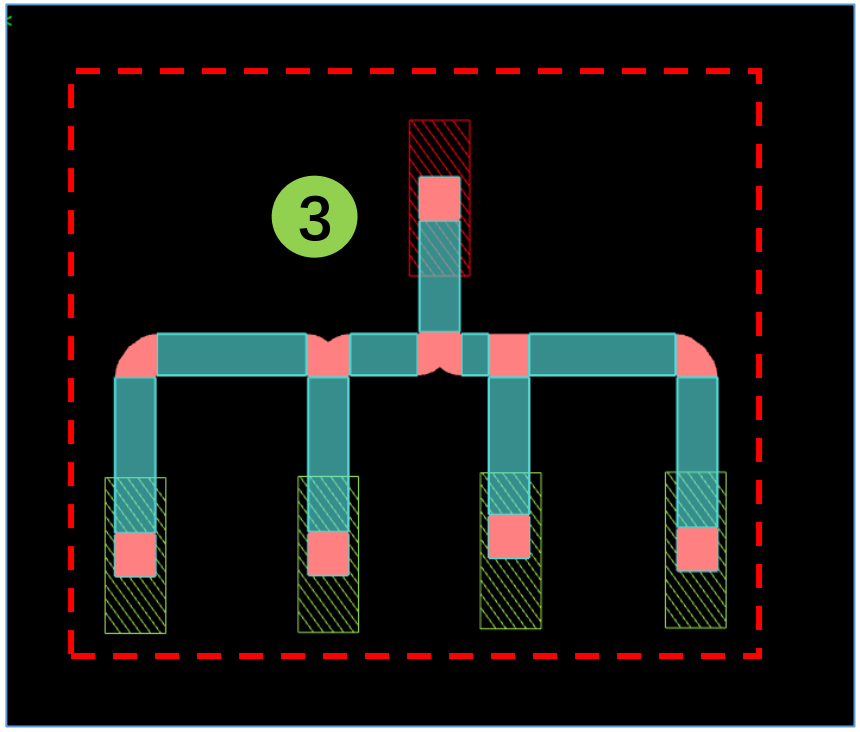




- Step 1: Create distribution boxes in [Element List], Adjust accordingly in the [Name Attribute] to create a Main Distribution Box and a few Sub Distribution Boxes
- Step 2: Activate [Point Function (PO)]
- Step 3: Point the Entity

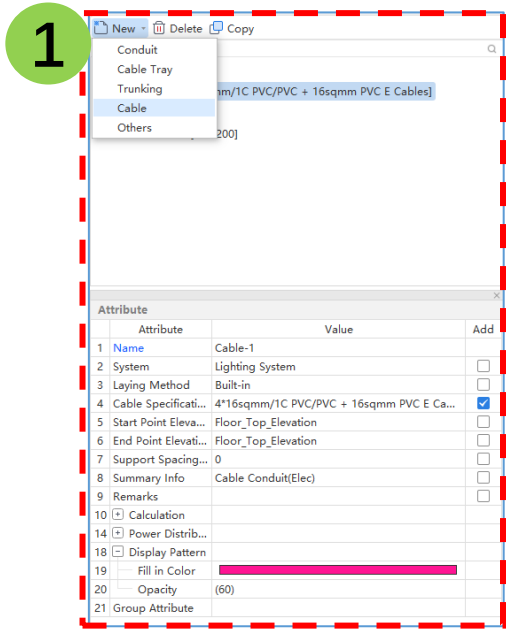
PART 2: Join the distribution boxes together using cable tray/trunking

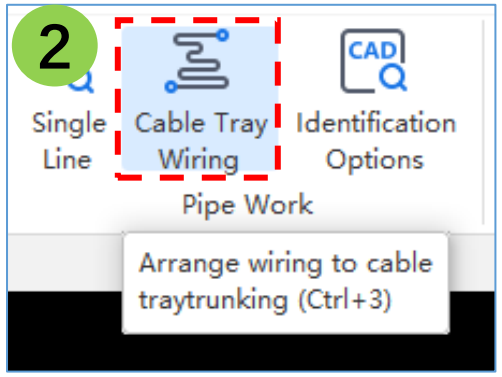


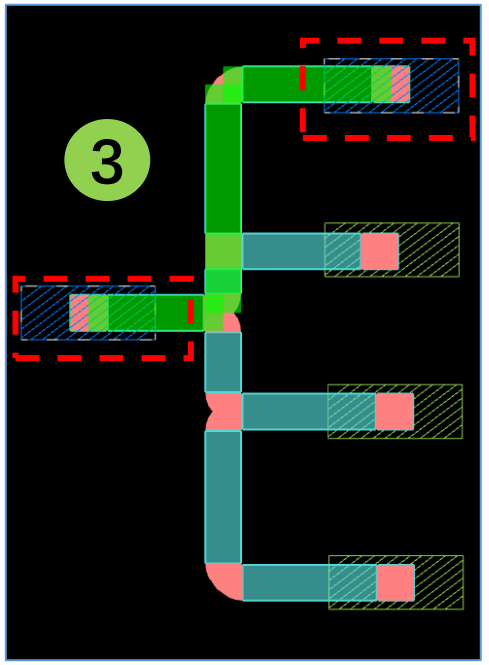


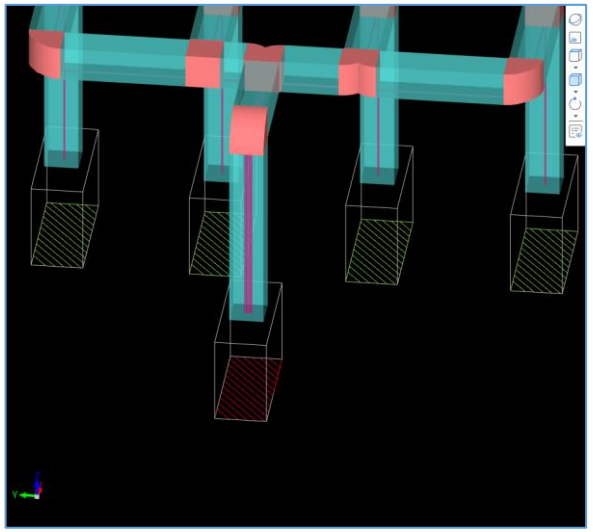
- Step 1: Create a element [Element List], Adjust accordingly in the [Attribute Box]
- Step 2: Activate [Line Function (LI)]
- Step 3: Trace the Line

PART 3: Use Cable Tray Wiring function to insert cables/wires into the cable tray/trunking



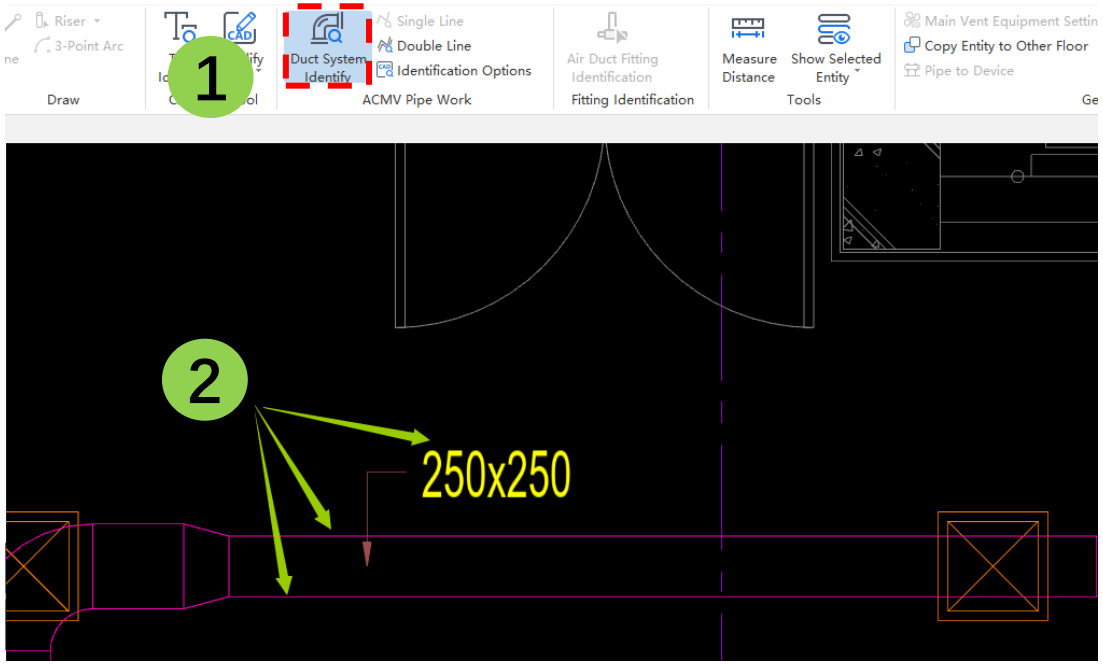


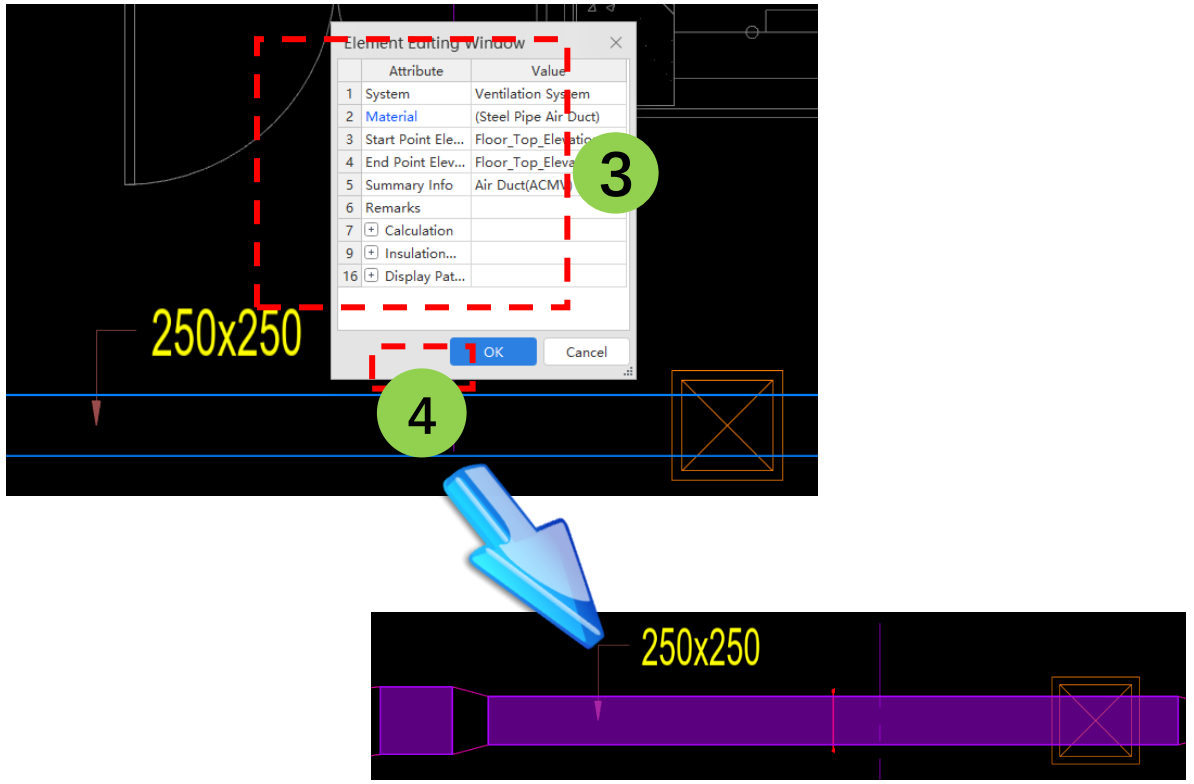




- Step 1: Create element in [Element List], Adjust accordingly in the [Attribute Box]
- Step 2: Activate [Cabling Tray Wiring]
- Step 3: Select Main Distribution Box then Sub Distribution Box, Right Click to confirm

5.6 Trade Specific Function – Duct System Identify (ACMV)

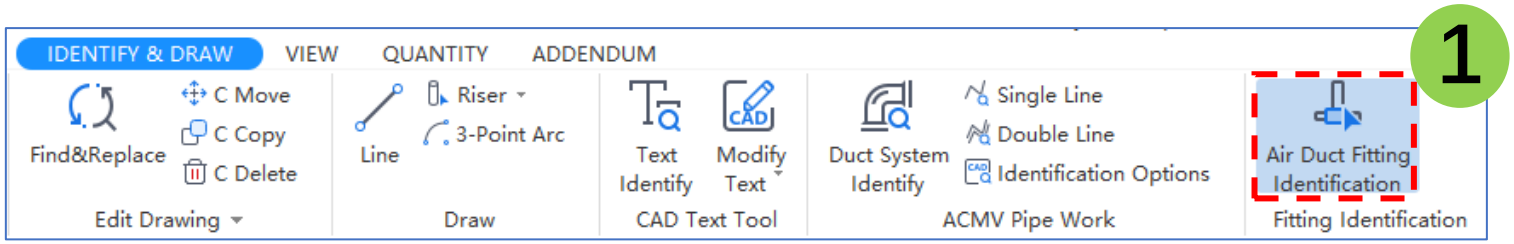


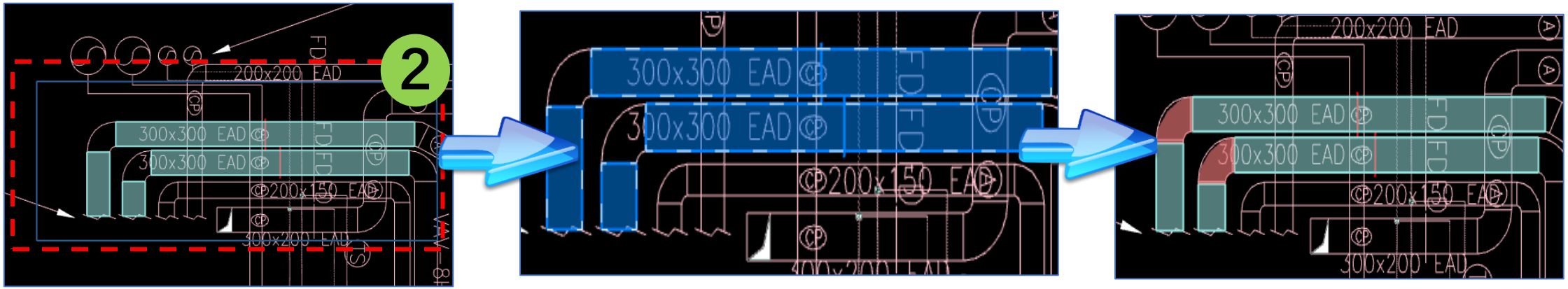


- Step 1: Activate [Duct System Identify]
- Step 2: Left Click to select 2 Parallel Ducting Lines and the Label
- Step 3: Input the attributes in the element editing window
- Step 4: Click [OK] to confirm

5.6 Trade Specific Function – Duct Fitting Identification (ACMV)

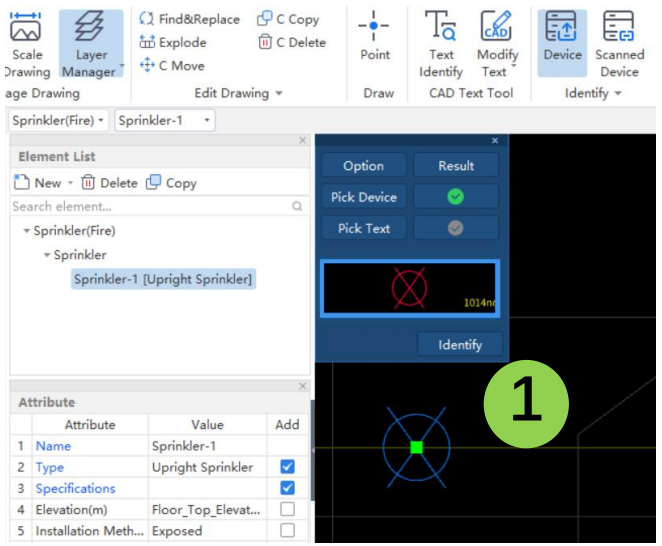
- Step 1: Tab [Identify & Draw] > Air Duct Fitting Identification
- Step 2: "**Left Click/Drag Select**" the air ducts which need to generate fittings > right click

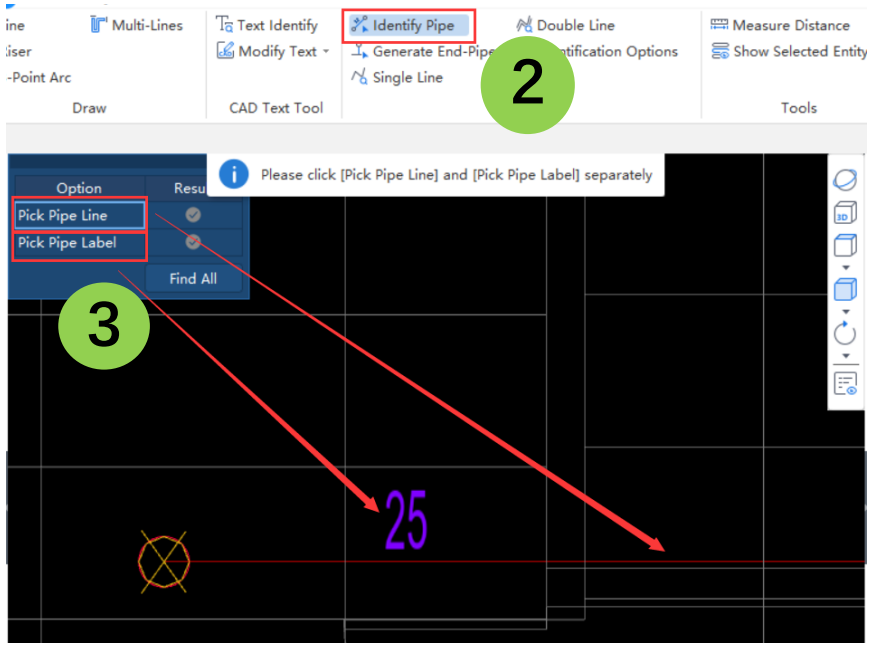


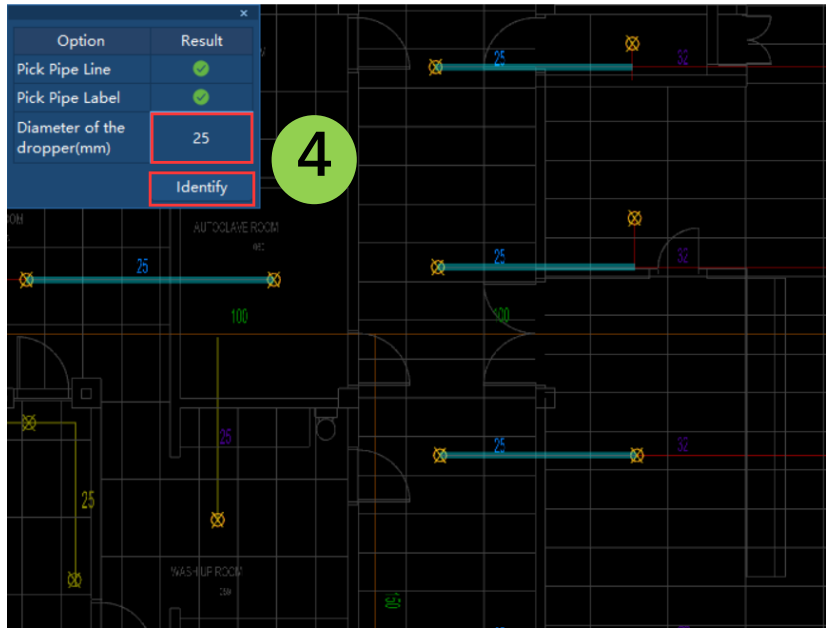


* Selected air ducts will appear in blue colour

5.7 Trade Specific Function – Identify Pipe (Fire)



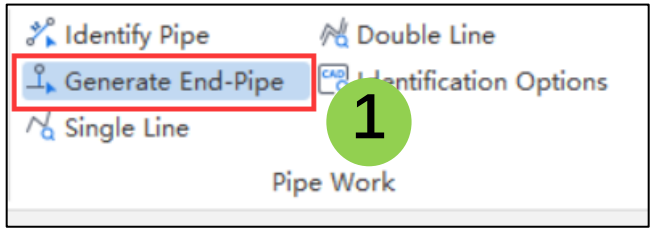


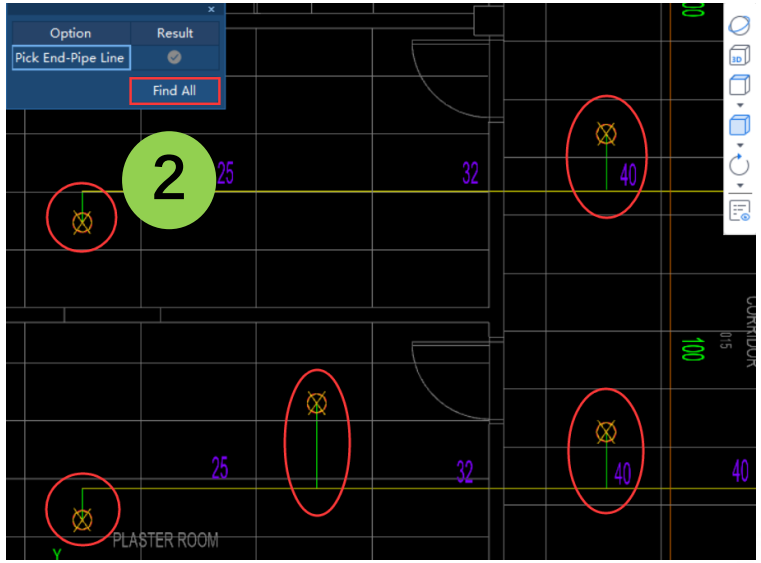


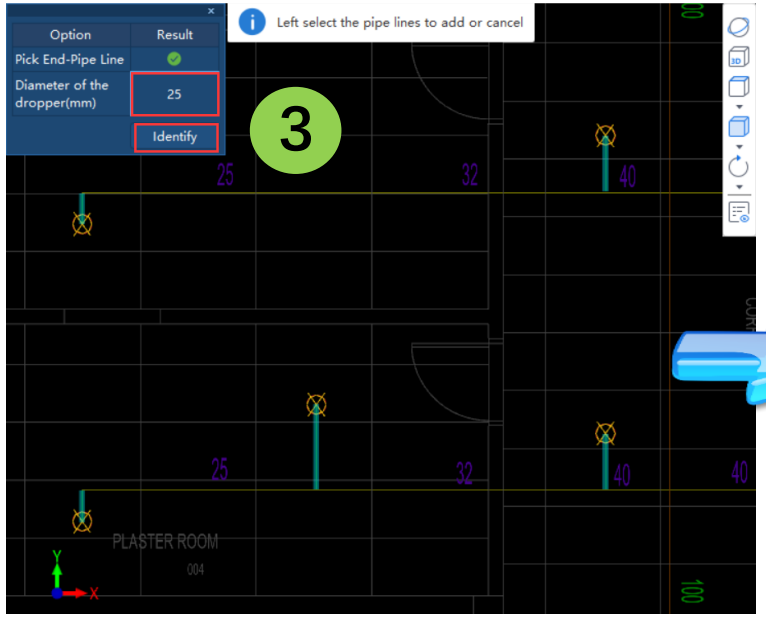
- Step 1: Identify all sprinkler points in layout using [Device Identification] *Make Sure This Step Is Completed First*
- Step 2: Activate [Identify Pipe]
- Step 3: Left Click to select the Pipe Line and Pipe Label, Right Click to confirm, and then click Find All
- Step 4: Adjust the dropper size and click [Identify]

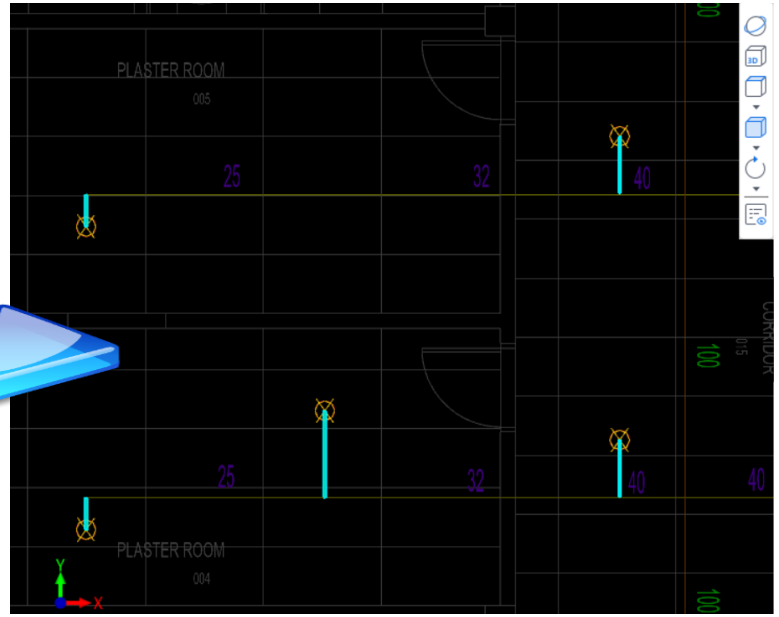
During **Step 4**, you can left click on the pipe lines to **add or delete** the pipes before confirming the identification

- Step 1: Activate [Generate End-Pipe]
- Step 2: Left Click on **ANY** of the end pipe lines in the drawing, Right Click to confirm and the click Find All
- Step 3: Adjust the dropper size and click [Identify]





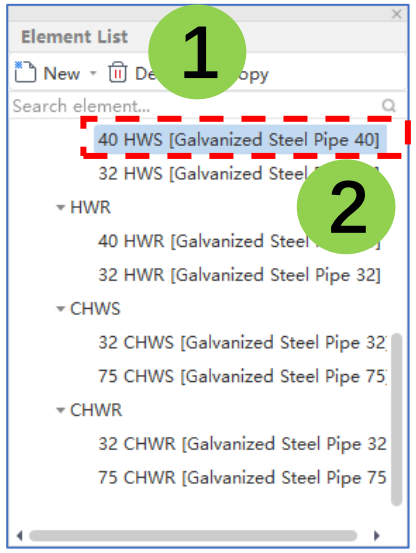


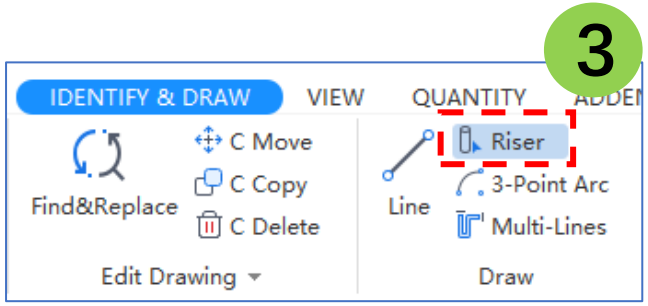


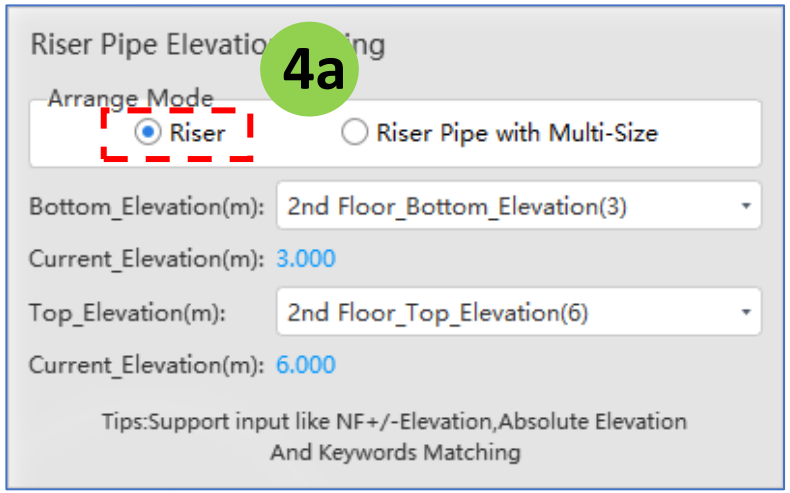
5.8 Vertical Length Entity (Vertical Riser, Pipe, Trunking, Ducting & etc…)

- Step 1: Create element in Element List
- Step 2: Select the element from the Element List
- Step 3: Tab [Identify & Draw] tab > Riser
- Step 4: (a) For same riser pipe size → in "Riser Pipe Elevation Setting" window, select **Riser** and adjust the Elevation of the vertical component

(cont'd.... Step 4(b)-5 refer to next slide)

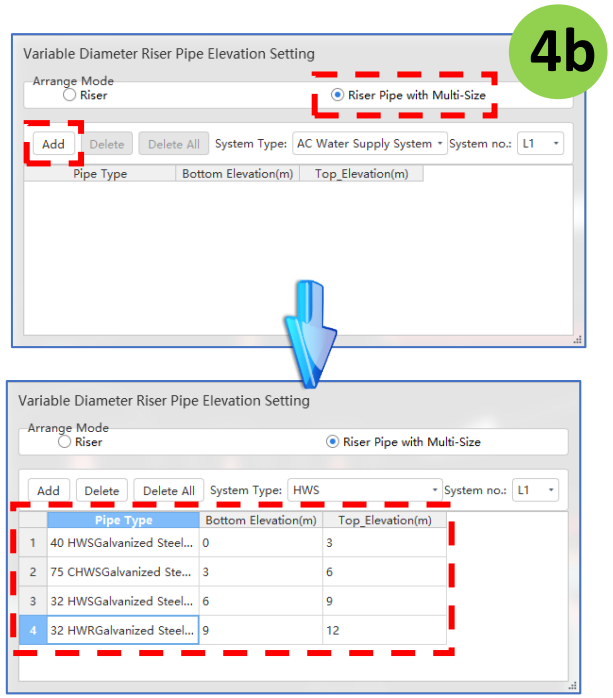


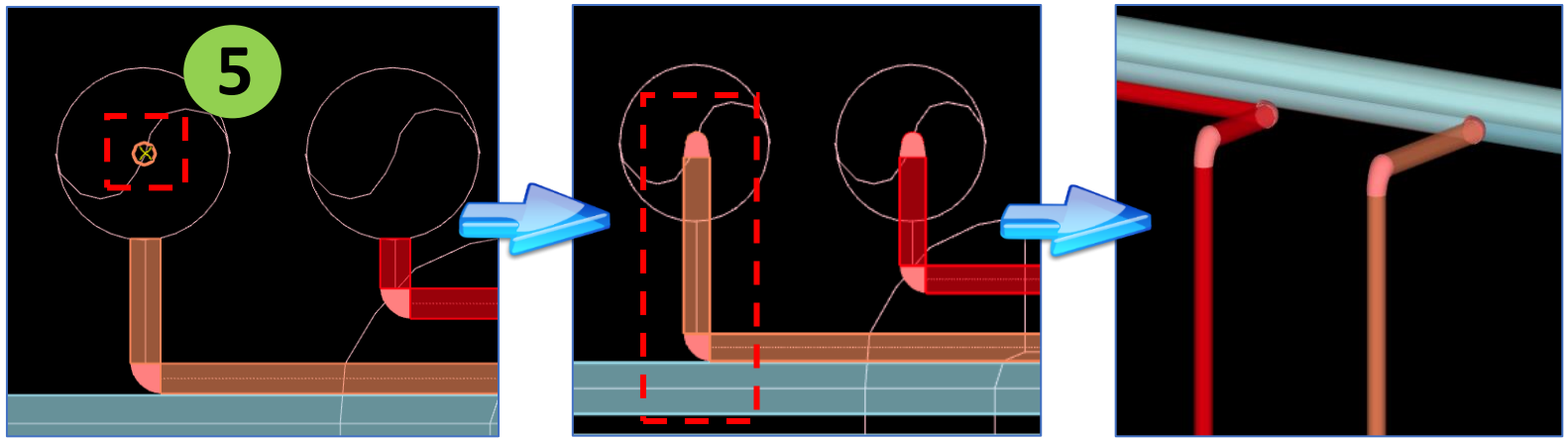




(…. Step 1-4(a) refer previous slide)

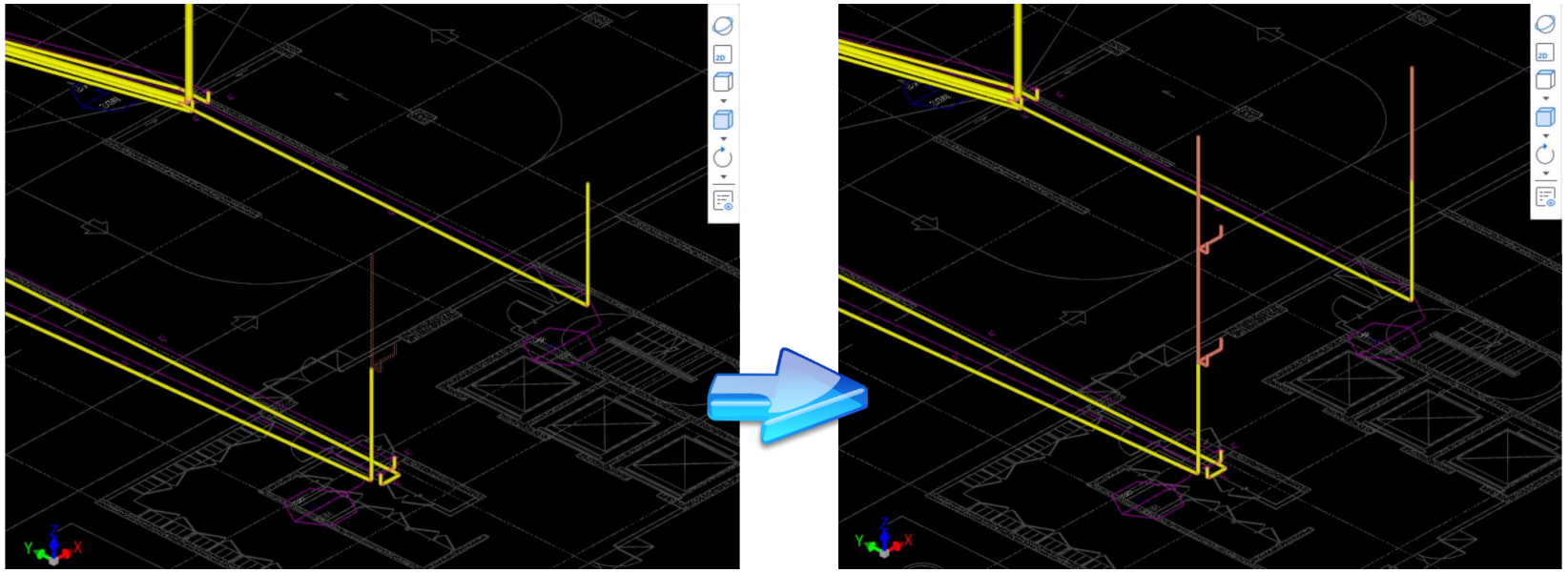
- Step 4: (b) For multiple riser pipe size/type → in “Variable Diameter Riser Pipe Elevation Setting” window, select **Riser Pipe with Multi-Size**, click **Add** to add multiple vertical pipe size and type, and adjust elevation of the vertical component
- Step 5: Point in location of the Vertical Pipe on the Drawing

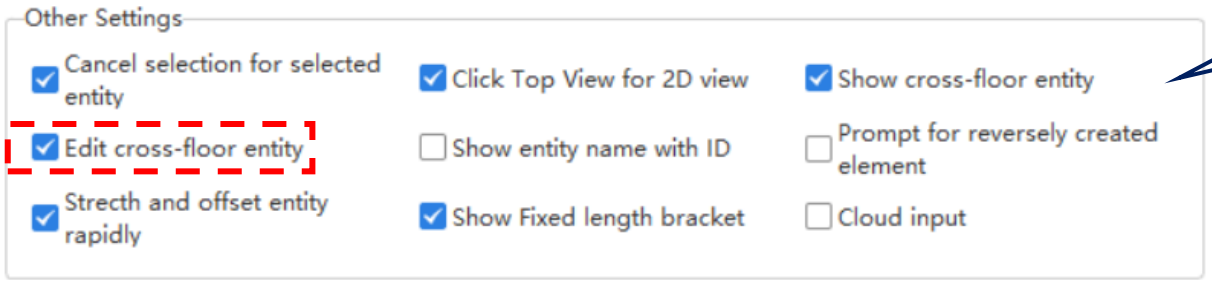




* 3D view of vertical riser

Adjust Floor Display to Check & Edit Cross Floor Elements

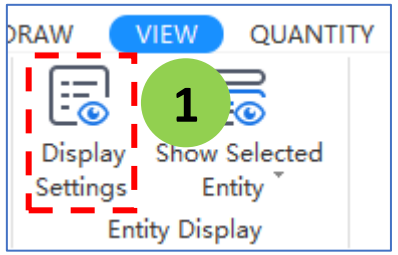


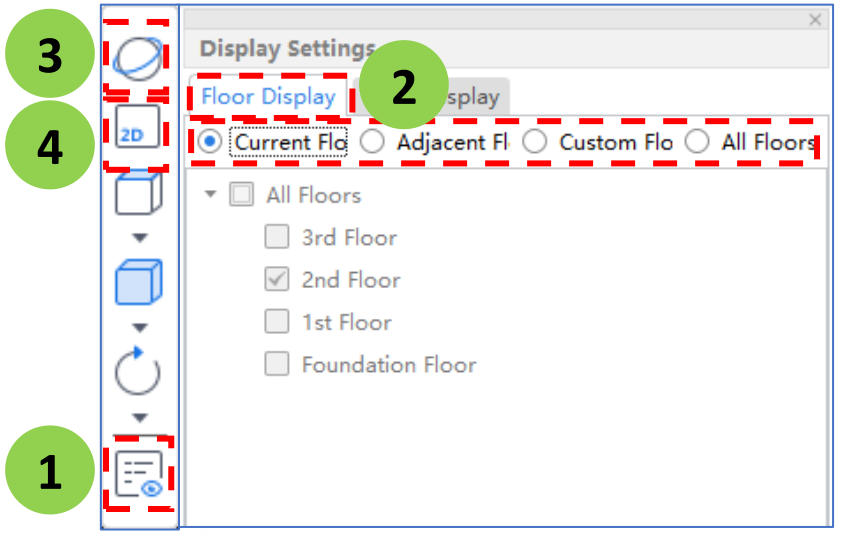


Go to **Project Settings** -> **Options** -> **Others** to enable **Edit Cross-Floor Entity**

Floor Display

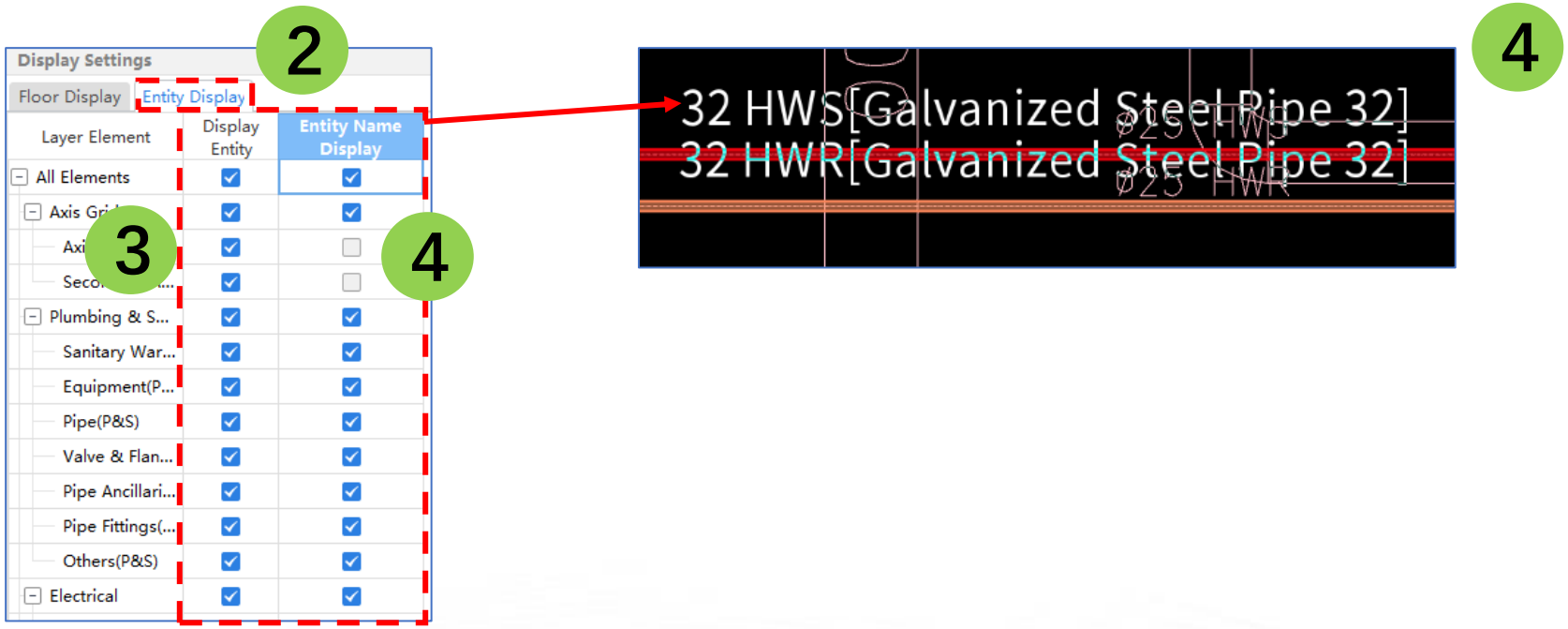
- Step 1: Tab [View] > Display Settings or click **F12** on keyboard
- Step 2: Select **Floor Display** and choose the type of display
  - **Current Floor**: Display only the selected floor
  - **Adjacent Floor**: Display floors that are below and above the current selected floor
  - **Custom Floor**: Display floors according to selection
  - **All Floors**: Display all floors
- Step 3: Select **Dynamic View** to view Model in 3D
- Step 4: Select **2D** to return to top/plan view



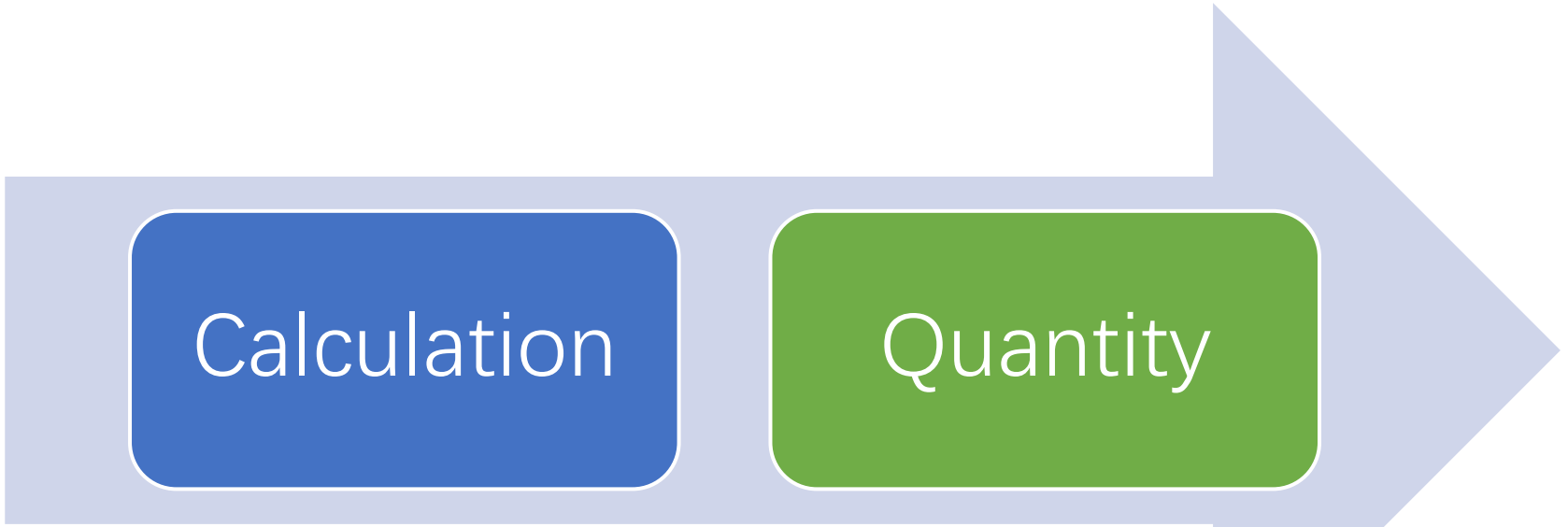


Entity Display

- Step 1: Tab [View] > Display Settings or click **F12** on keyboard
- Step 2: Select **Entity Display**
- Step 3: (Display Entity) Tick or untick to show or hide Entity
- Step 4: (Entity Name Display) Tick or untick to show or hide Entity Name

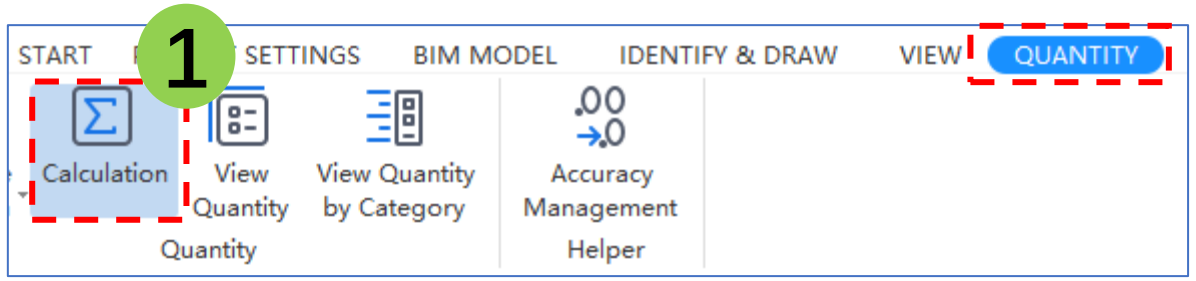


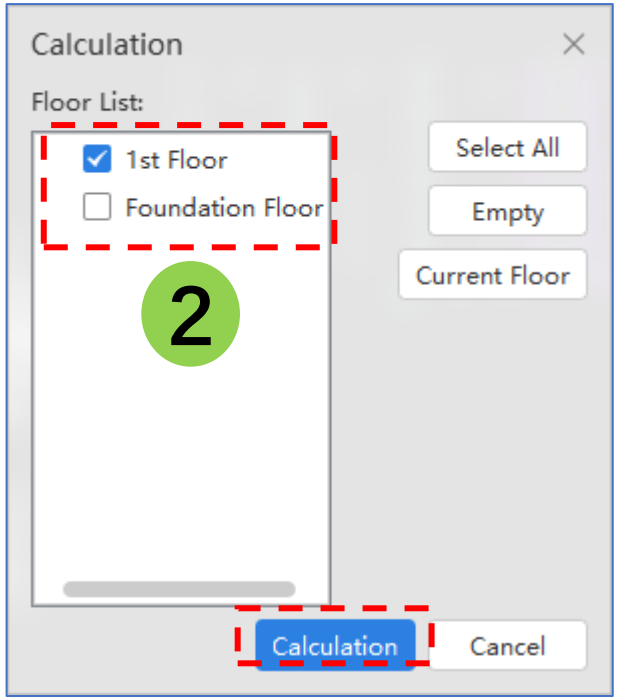
Quantity Report



- View Quantity (F11)
- View Quantity by Category (F10)

- Step 1: Tab [Quantity], Select Calculation *Tips: F9 to calculate
- Step 2: Select the floors to calculate, click Calculation

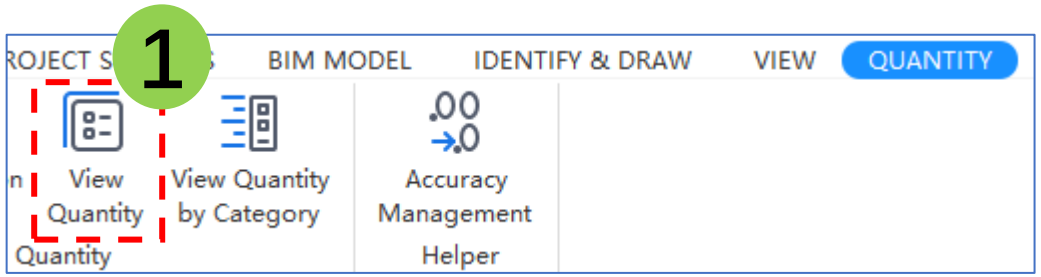


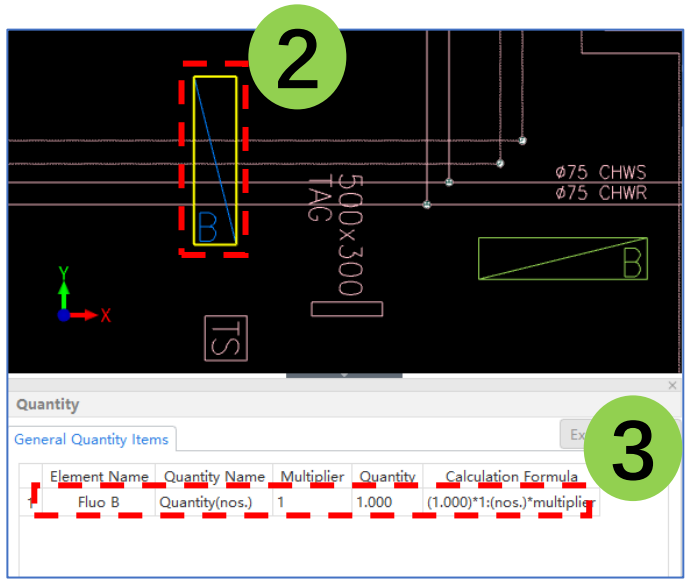


6.2 View Quantity (F11)

- Step 1: Tab [Quantity], Select View Quantity
- Step 2: Select the entity to check
- Step 3: Quantity calculation of selected entity will appear at window below

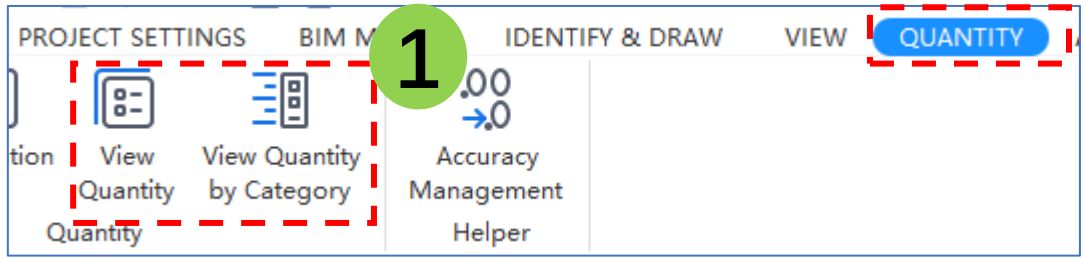
*Tips: F11 to view quantity

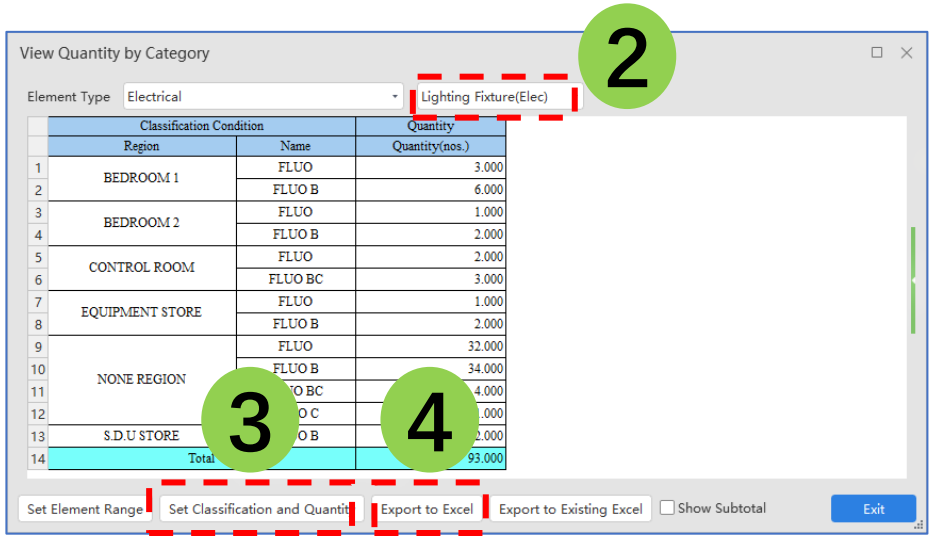




6.3 View Quantity by Category (F10)

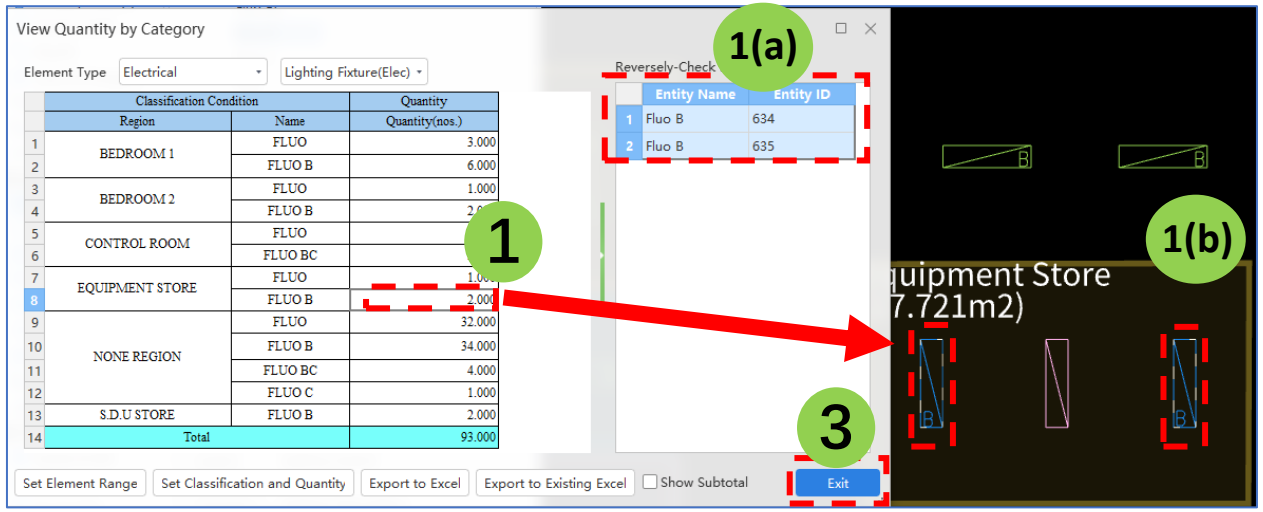
- Step 1: Tab [Quantity], Select View Quantity by Category *Tips: F10 to view quantity by category
- Step 2: Different Elements quantity can be viewed by selecting in the Drop-down list
- Step 3: Tabulation can be customized by selecting Set Classification and Quantity
- Step 4: Tabulation can be exported using Export to Excel

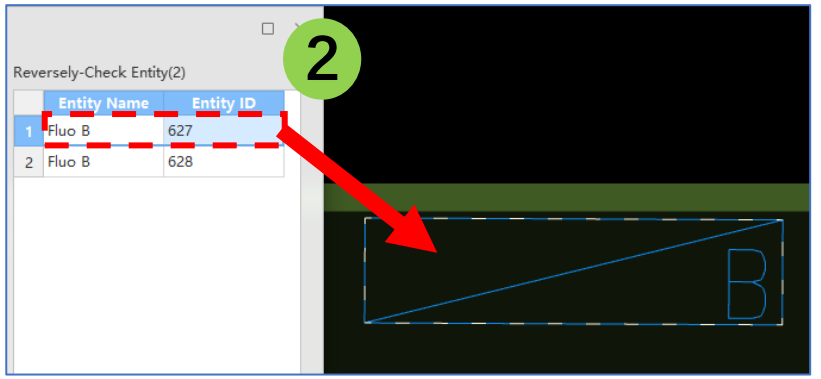




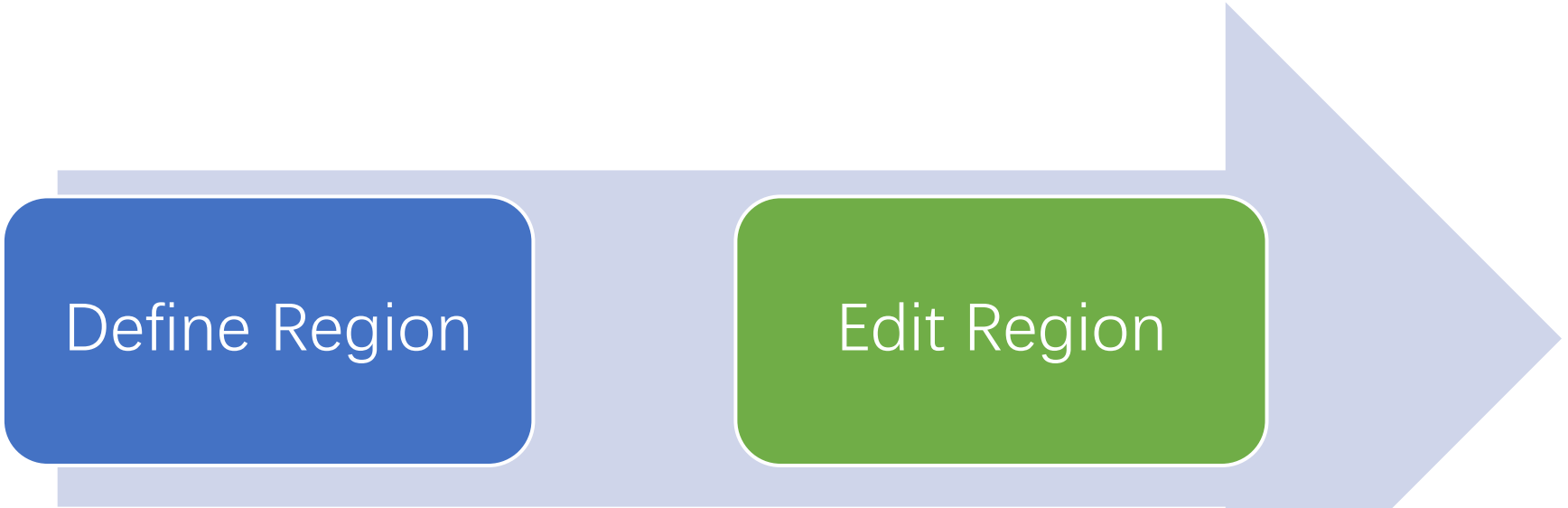
6.3 View Quantity by Category – Reverse Checking

- Step 1: Quantity can be double checked in Model by simply **Double-click** any quantity in the table.
  - (a) A breakdown quantity table will be generated at the right side
  - (b) Entities of the selected quantity will be highlighted in blue colour
- Step 2: To check entities one-by-one, click on Entity Name/ ID
  (selected entity will be zoomed in and highlighted in blue colour)
- Step 3: After finished checking, **Exit** to close the window





Define Region

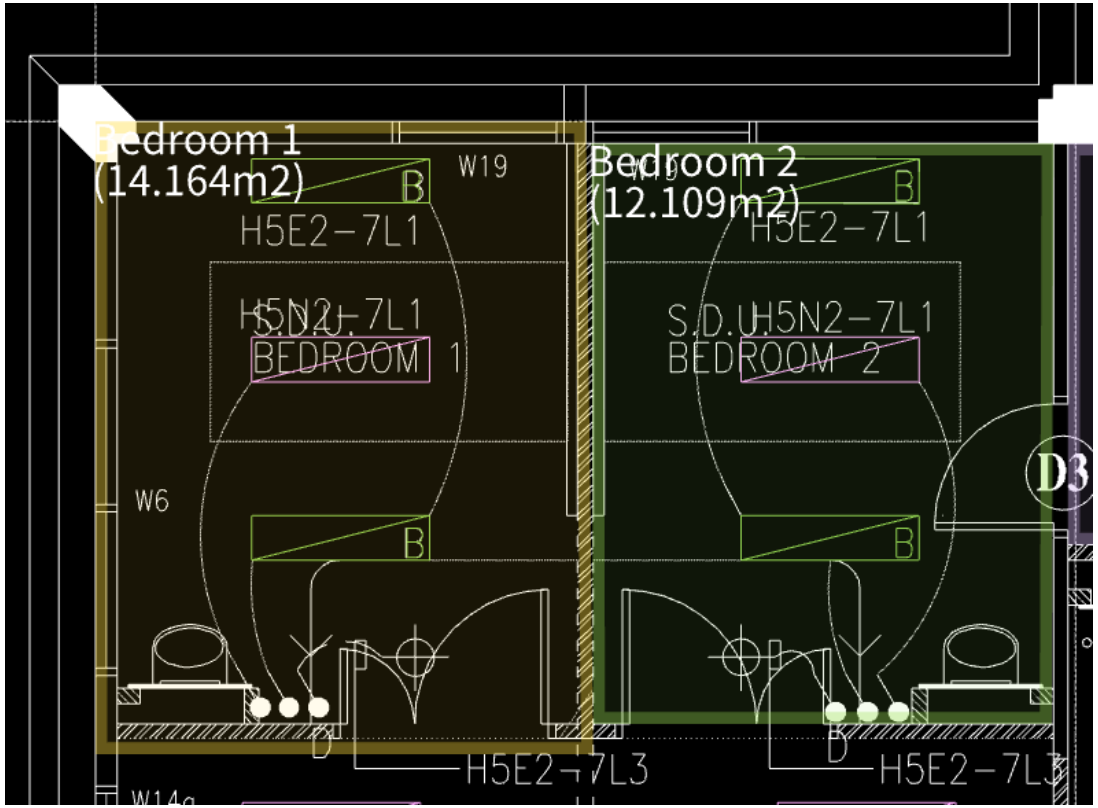


- Draw
- Calculate
- View Quantity by Category

- Edit region attributes
- Copy region
- Delete region
- Adjust region size

7.1 Define Region

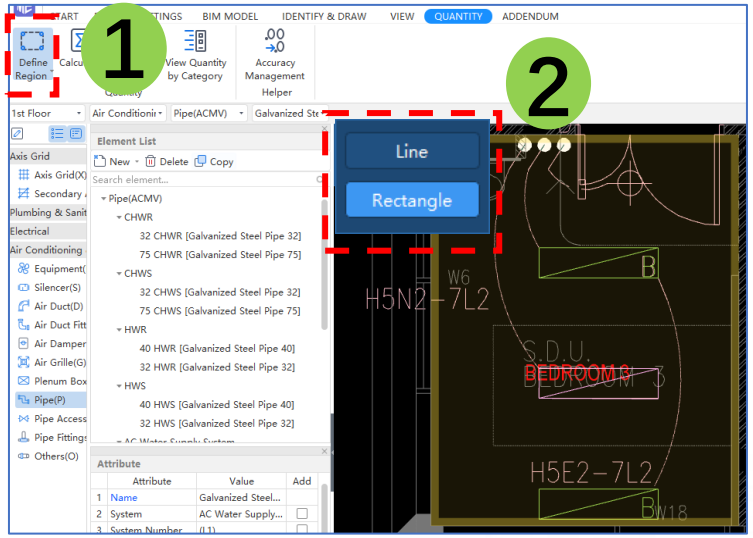
- Define Region is to create a zone/group for segregating of quantities based on following:
  - Zone/Group
  - Construction Stages
  - Room Name
  - Typical Room
- Define region can show the generated region area (m2)

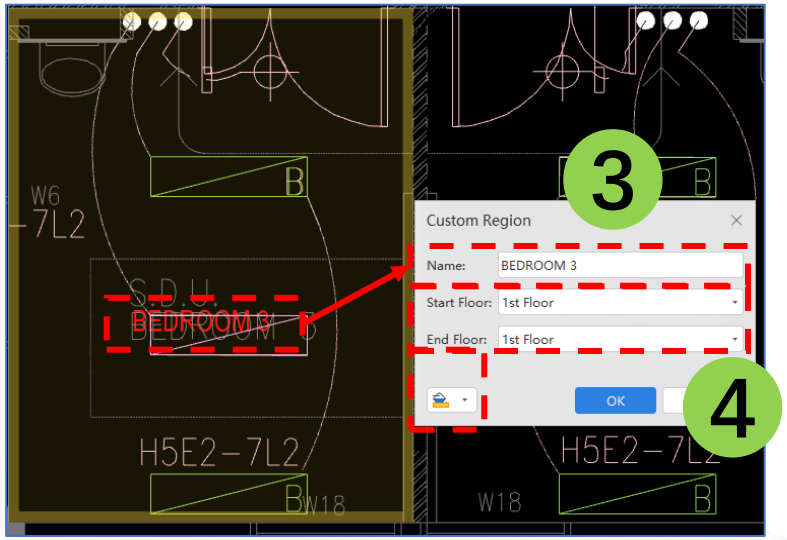


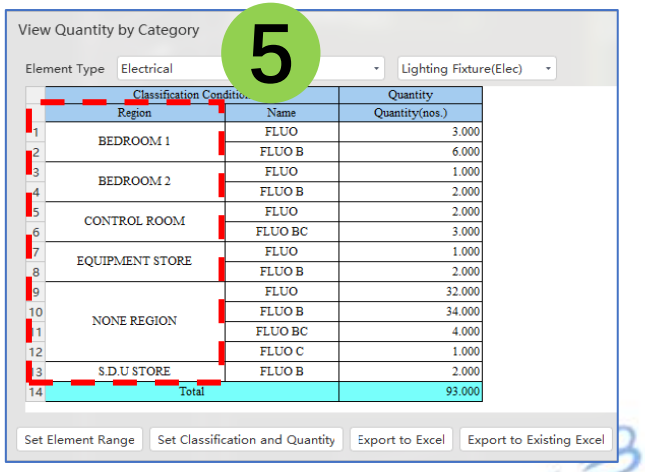
7.1 Define Region (continued)

To draw, calculate and view quantity by region

- Step 1: Tab [Quantity] Select Define Region
- Step 2: Select **Line** or **Rectangle** to draw the area of region
- Step 3: **Right Click** to end draw and enter Region Name
- Step 4: Options (1) to apply same region to multiple floors
  (2) to set colour for region
- Step 5: Calculate (F9) and View Quantity by Category (F10) (Tick Region in Set Classification and Quantity)

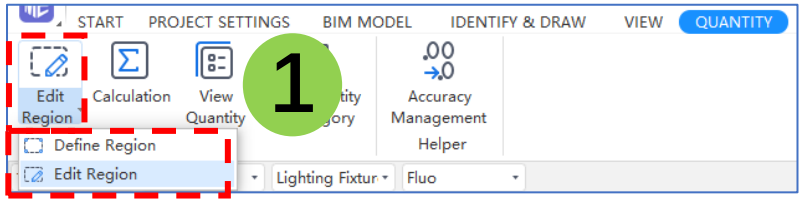


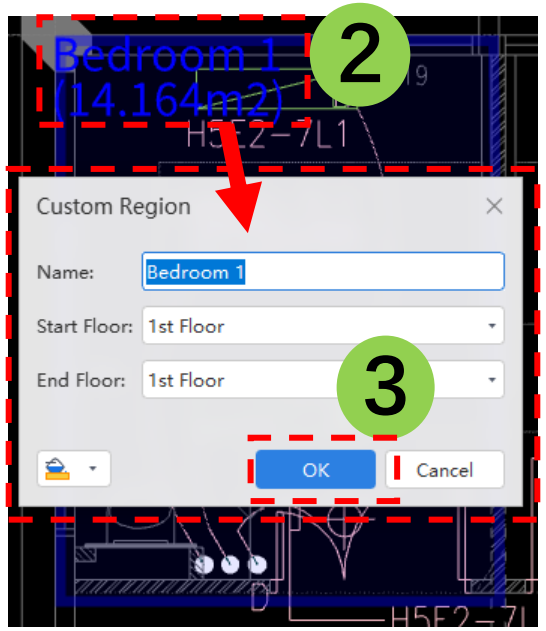




7.2(a) Edit Region Attributes

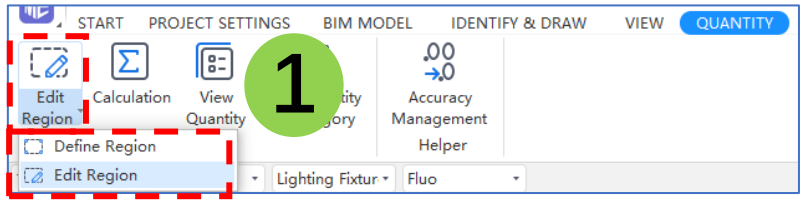
- Step 1: At [Quantity] tab, Select Edit Region
- Step 2: **Left Click** on the region name to modify its attributes
- Step 3: Click **OK** after finish editing region attribute

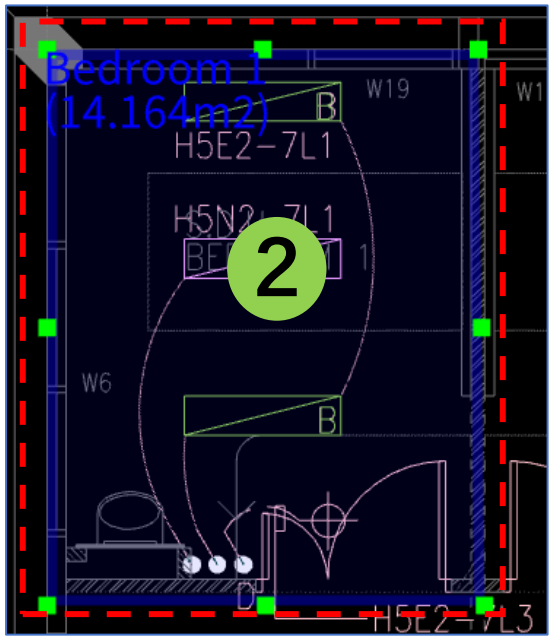


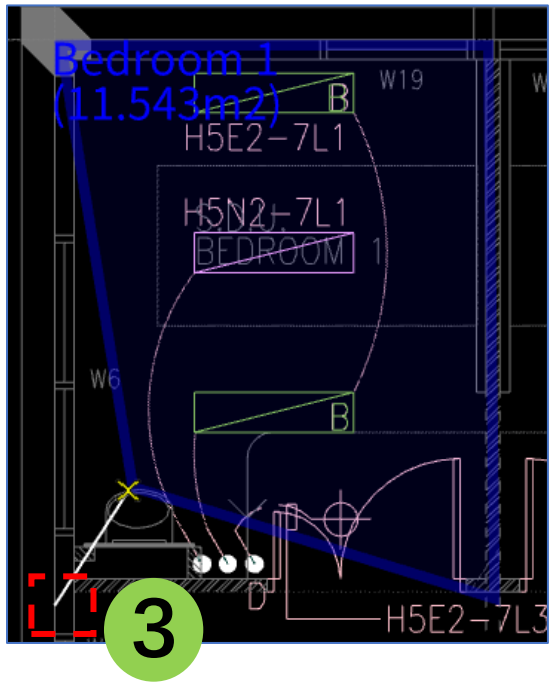


7.2(b) Adjust Region Area

- Step 1: Tab [Quantity], Select Edit Region
- Step 2: **Left Click** to select region to edit
- Step 3: **Left Click** to drag the base point (green point) to adjust region size

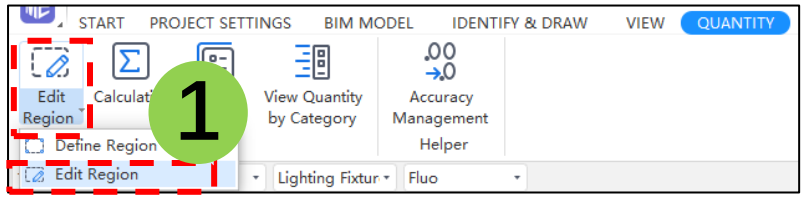


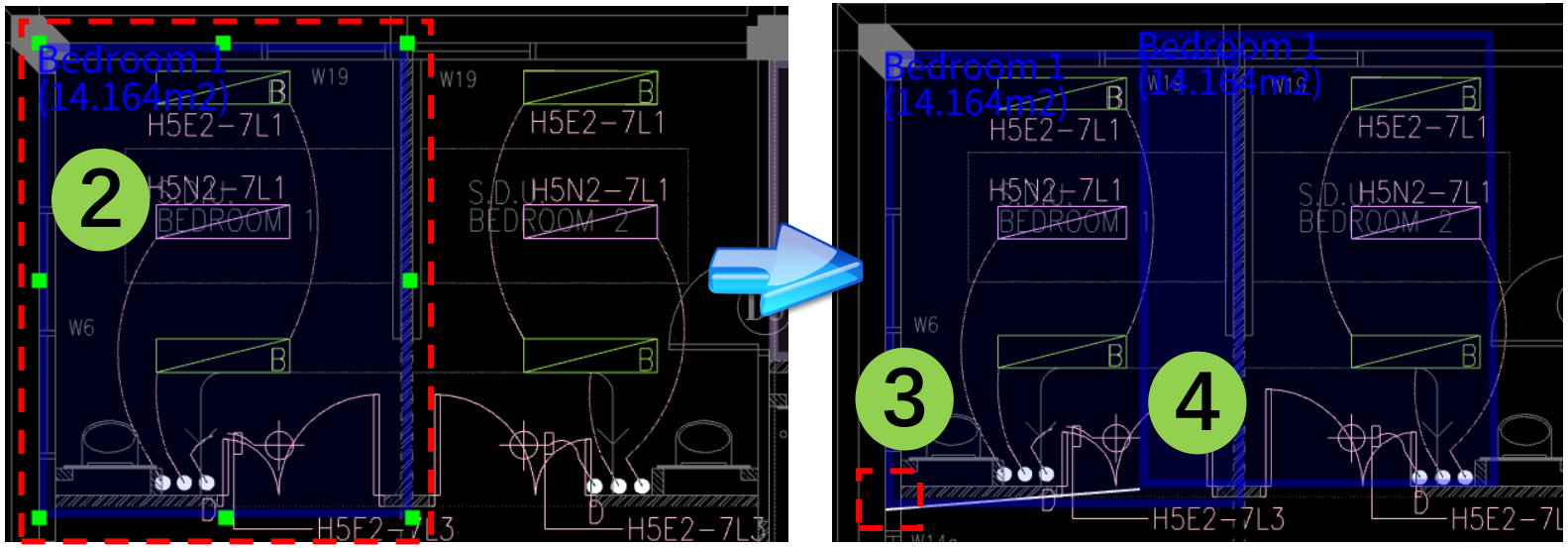




7.2(c) Copy Region

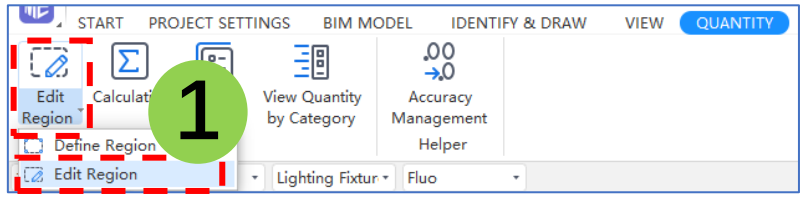
- Step 1: Tab [Quantity], Select Edit Region
- Step 2: **Left Click** to select region to edit
- Step 3: **Ctrl+C** to copy selected region
- Step 4: **Left Click** to specify start point, **Left Click** to specify target point

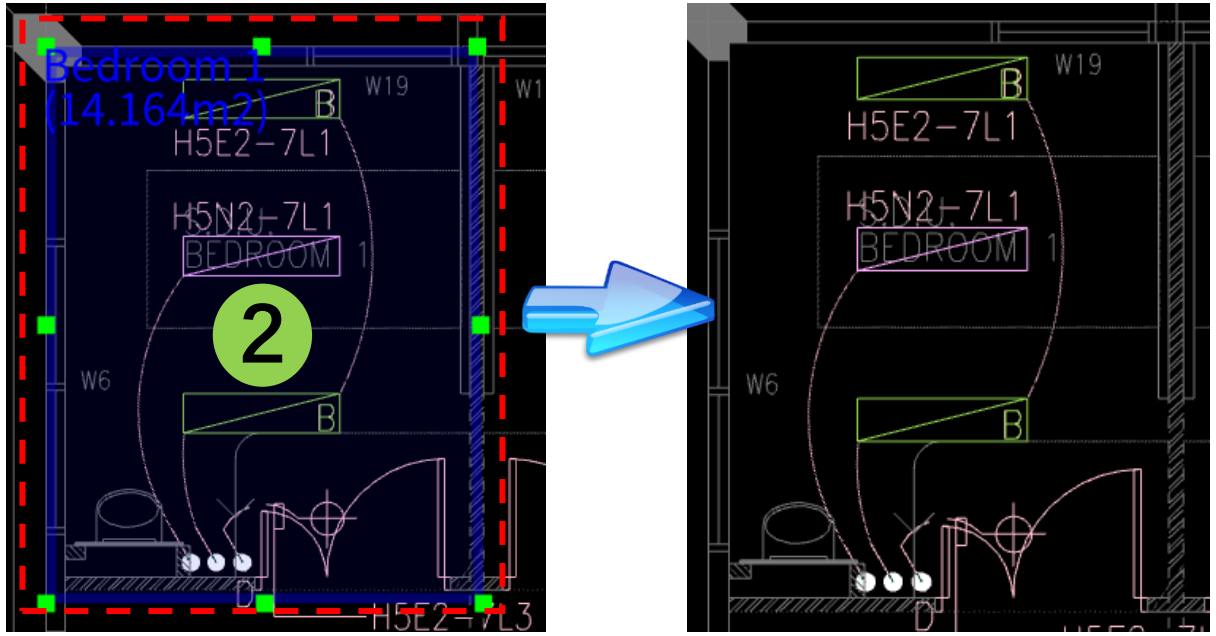




7.2(d) Delete Region

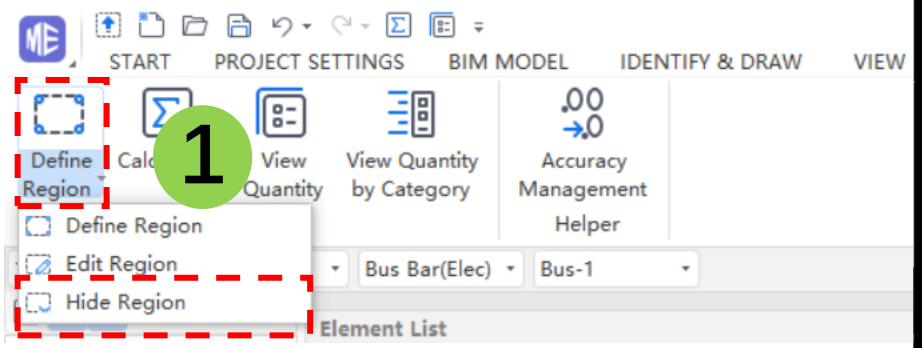
- Step 1: Tab [Quantity], Select Edit Region
- Step 2: **Left Click** to select region to delete, click **Delete** on keyboard

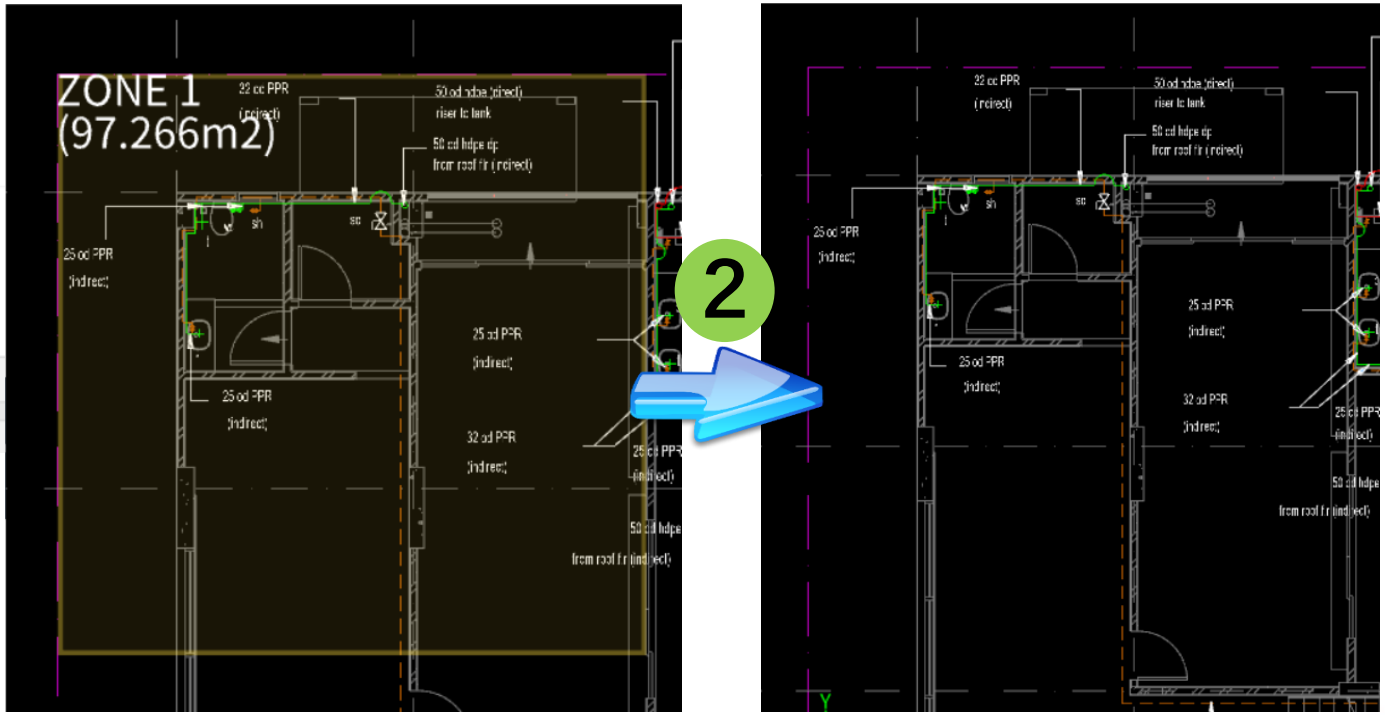




7.2(e) Hide Region

- Step 1: Tab [Quantity], Select Define Region
- Step 2: Select Hide Region to hide drawn region
- Step 3: Select Display Region to unhide drawn region





8.0 Addendum

Compare old and new drawings

Step 1: Click 'ADDENDUM' button, then will show tab [CONTRAST]

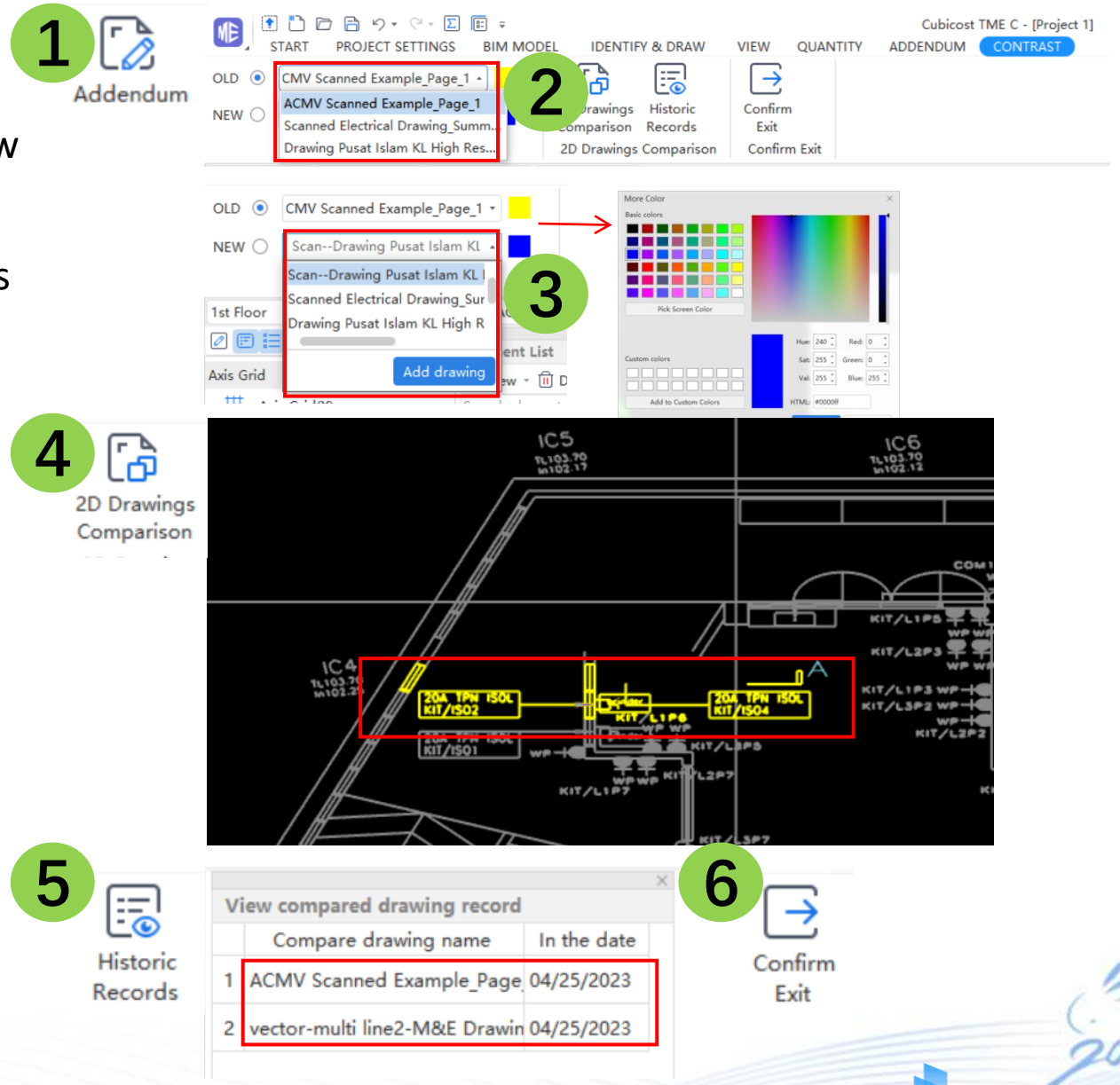
Step 2: Select the old drawing, the list is same as Drawing Manager

Step 3: Select the new drawings, except from D&M, can add drawing from file folder also (Compare color can be adjust)

Step 4: Select the '2D Drawings Comparison' to check the result, the difference will be show in color

Step 5: Select the 'Historic Records' to view the recording

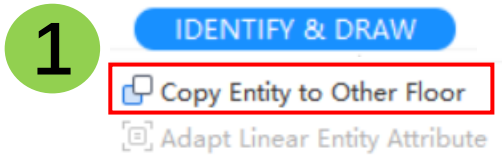
Step 6: 'Confirm Exit' to finish the comparison



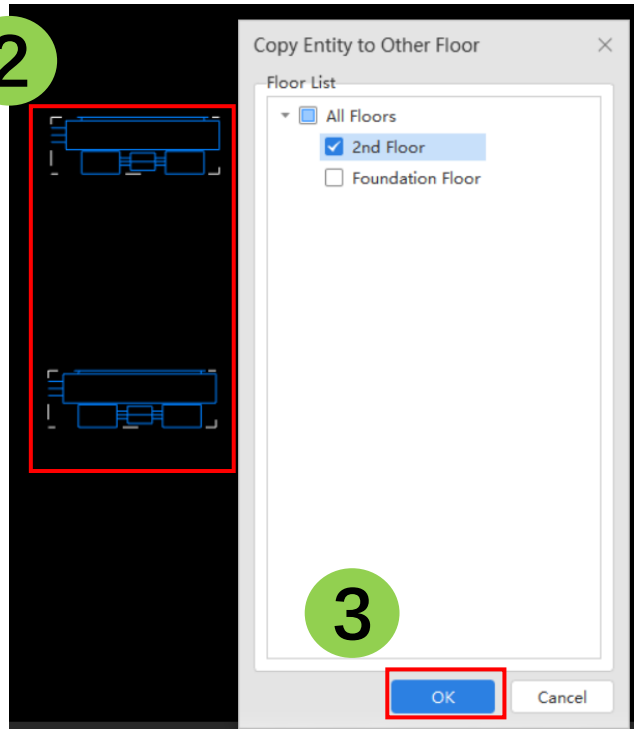
General Edit

Copy Entity to Other Floor

1. Click Copy Entity to Other Floor
2. Drag-Select or Pick Element, right click to confirm
3. Select the target floor and OK to confirm



General Edit



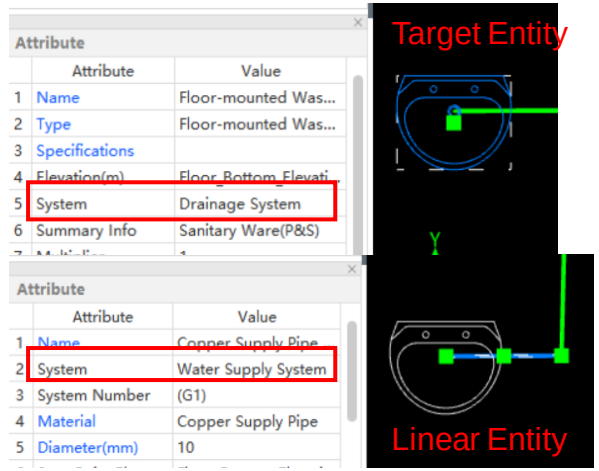
Adapt Linear Entity Attribute

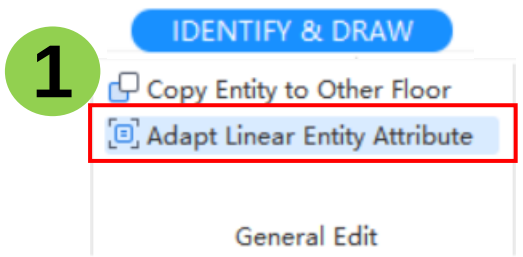
Step 1: Click 'Adapt Linear Entity Attribute'

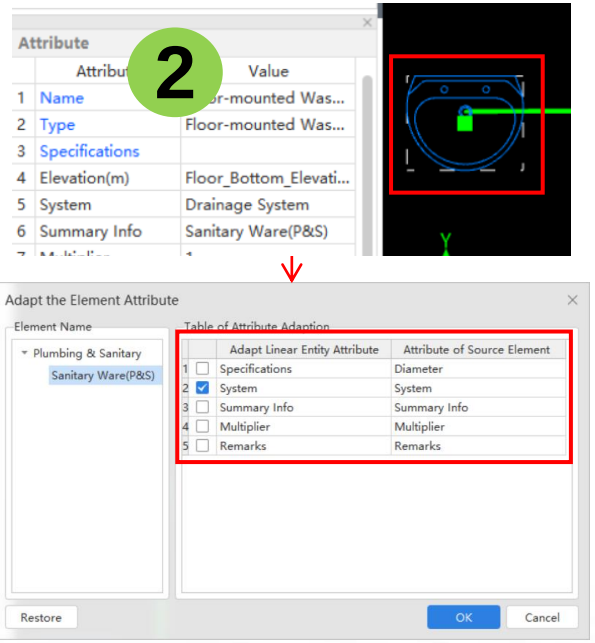
Step 2: Select the Point Entity, right click to confirm and select the Attribute that want to sync

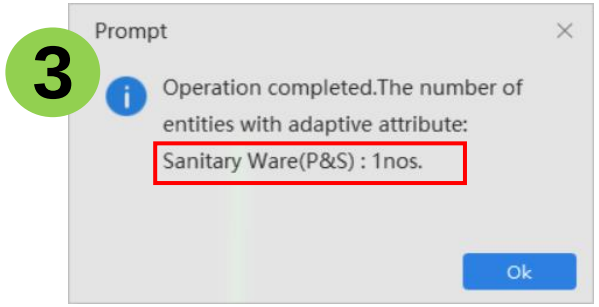
Step 3: Get the prompt about the adapt number

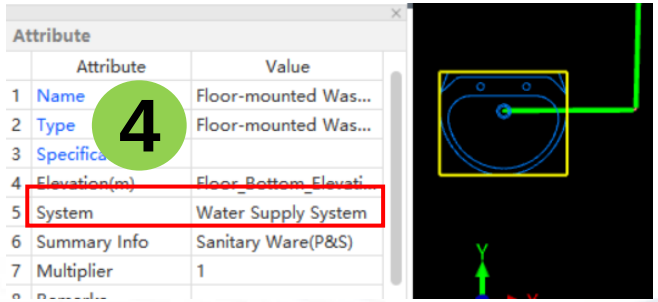
Step 4: The attribute of Point Entity will be adapted











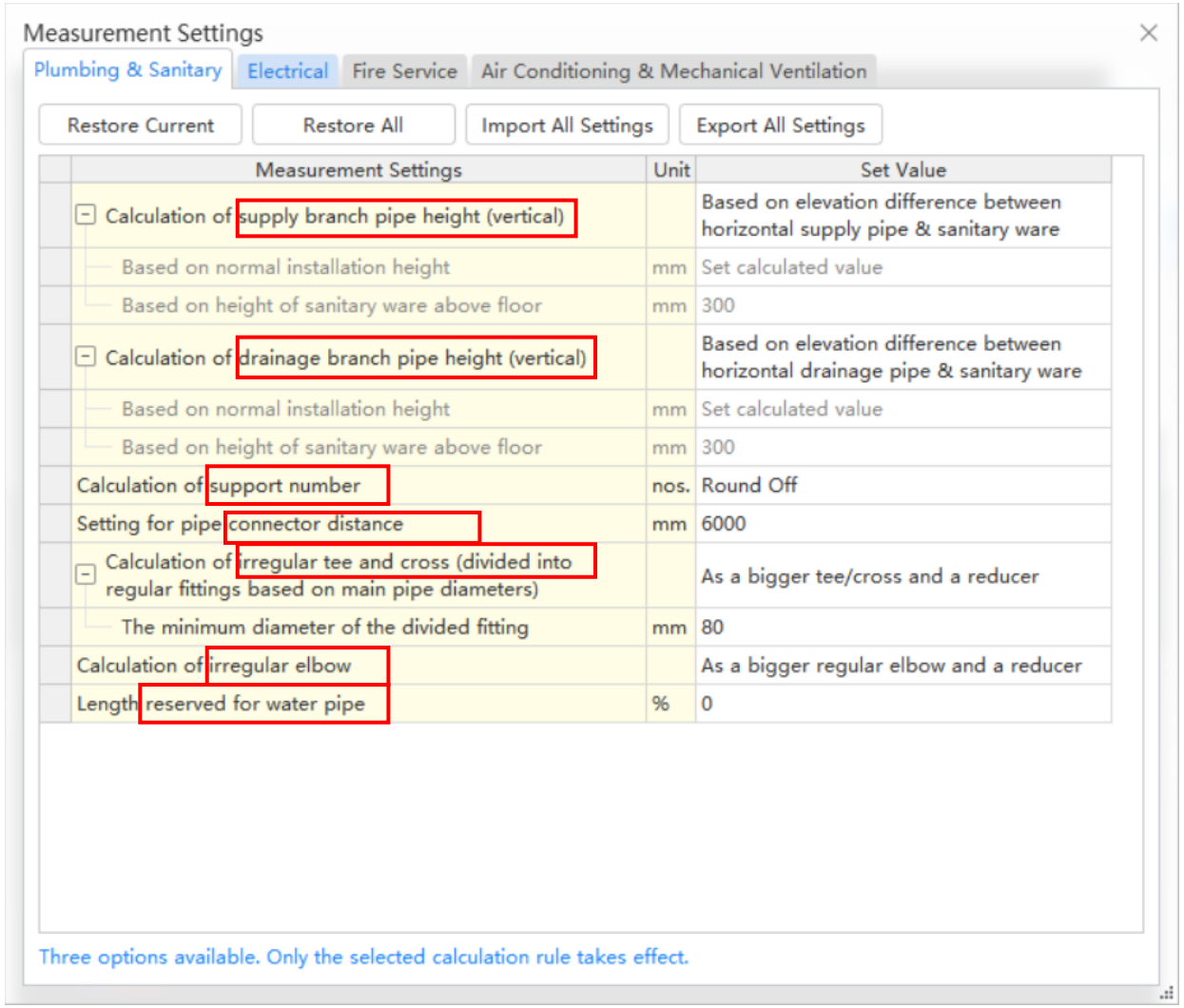
Project Settings

10.1 Project Settings - Measure Setting

P & S

1. How to calculate the height of supply/drainage branch pipe
2. Rounding method
3. Pipe connector distance
4. Calculation of irregular tee, cross and elbow
5. Reserved length for water pipe

* Can be adjusted via the drop-down box AND the notes is presented in blue font

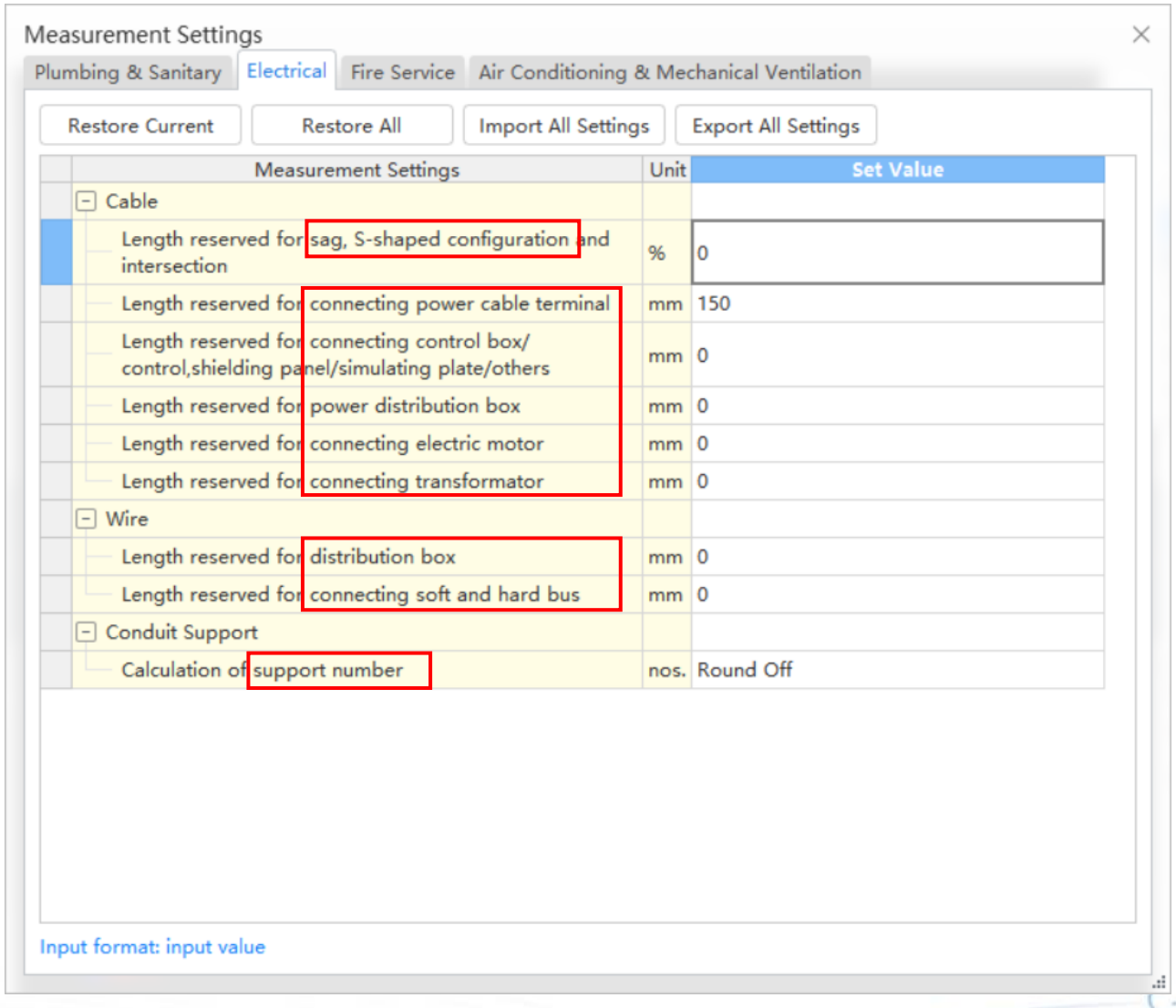


10.1 Project Settings - Measure Setting

Electrical

Length reserved for Cable, Wire and Conduit support

* Can be adjusted via the drop-down box AND the notes is presented in blue font

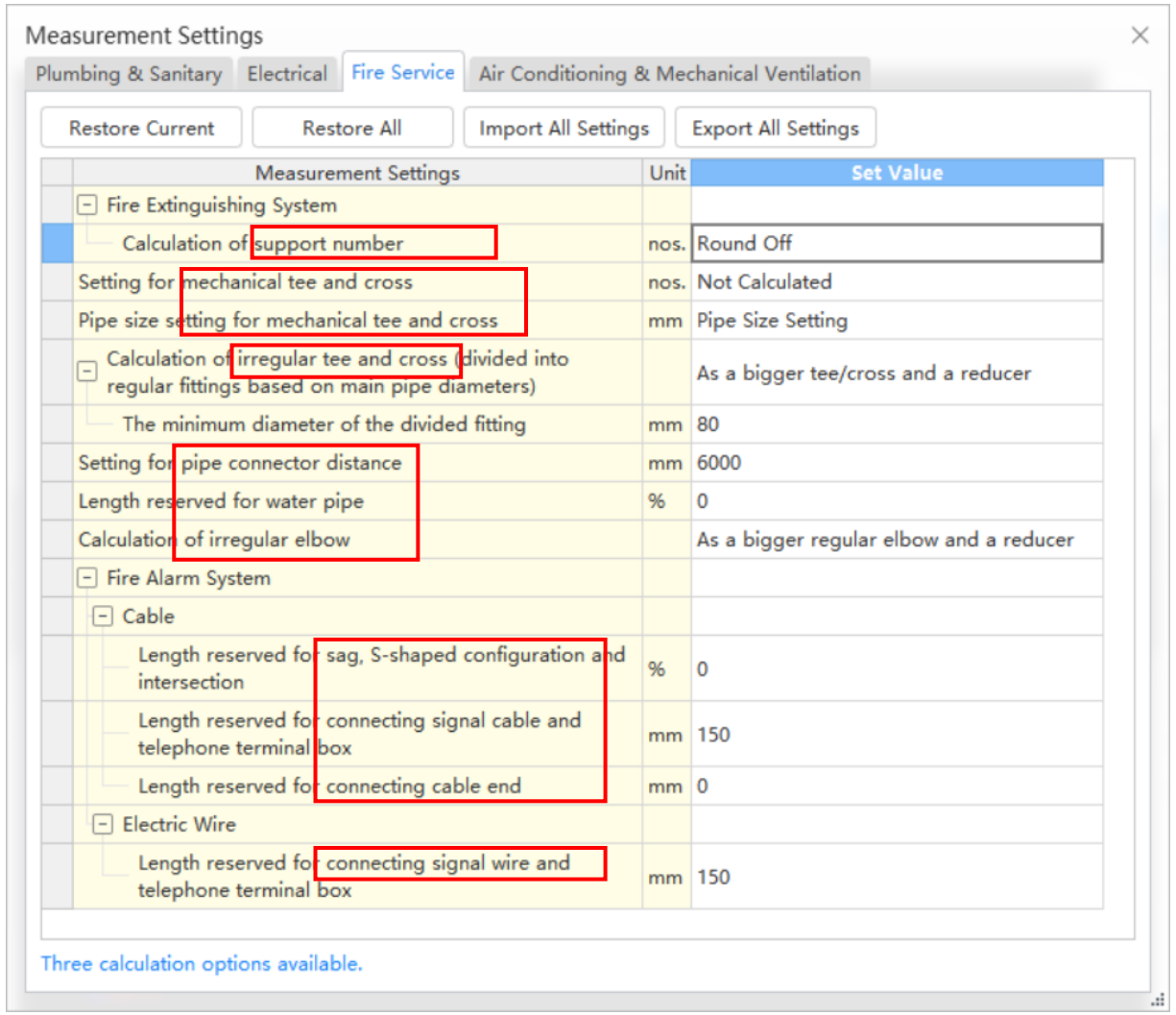


10.1 Project Settings - Measure Setting

Fire Service

1. Whether calculate the mechanical tee and cross
2. How to calculation the irrgular tee, cross and elbow
3. The distance of pipe connector
4. Length reserved for water pipe
5. How to calculate the Cable and Electric Wire of Fire Alarm System

* Can be adjusted via the drop-down box AND the notes is presented in blue font

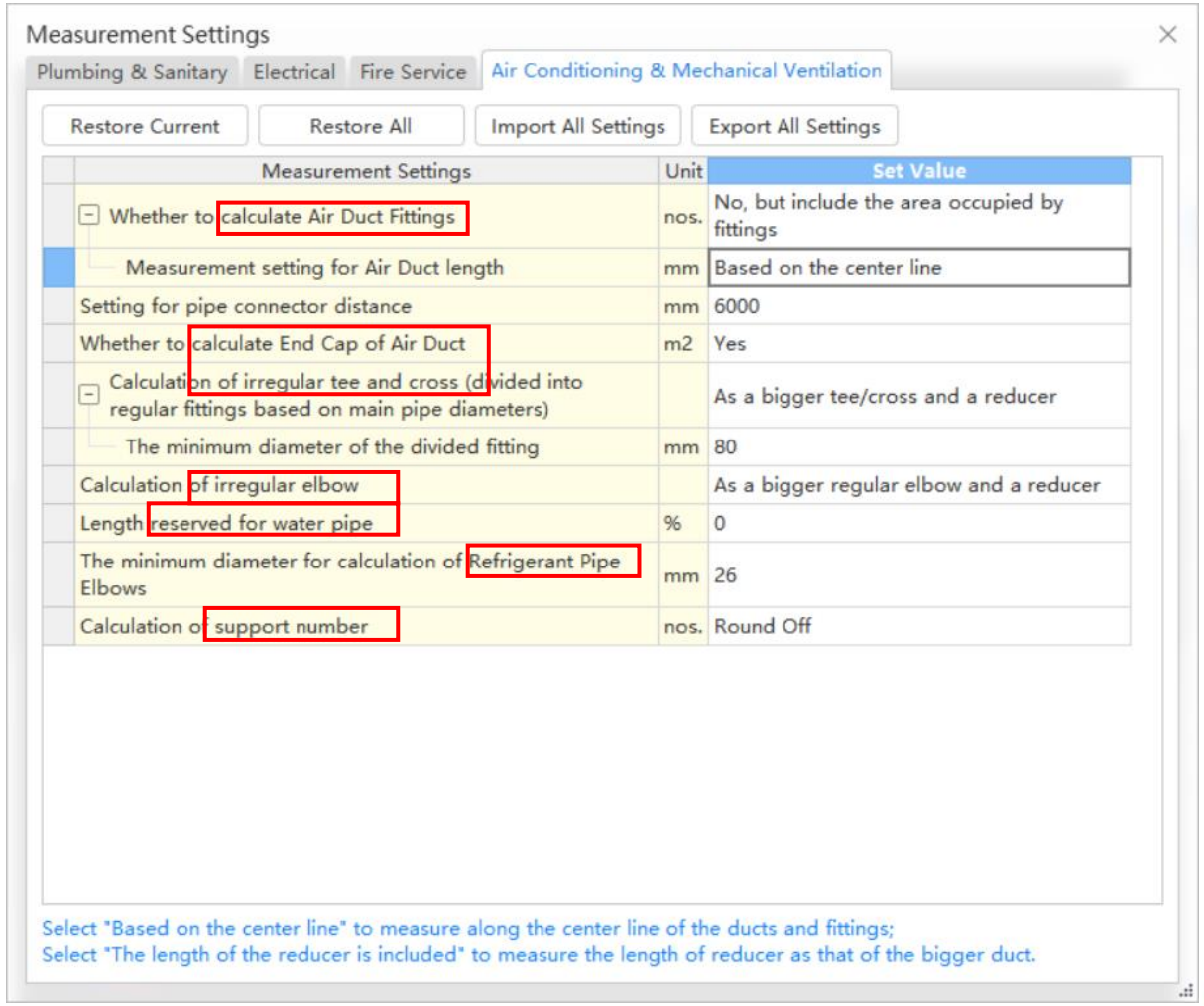


10.1 Project Settings - Measure Setting

ACMV

1. Whether calculate the Air Duct Fittings, End Cap of Air Duct
2. How to calculation the irrgular tee, cross and elbow
3. The distance of pipe connector
4. Length reserved for water pipe
5. How to calculate the support number

* Can be adjusted via the drop-down box AND the notes is presented in blue font

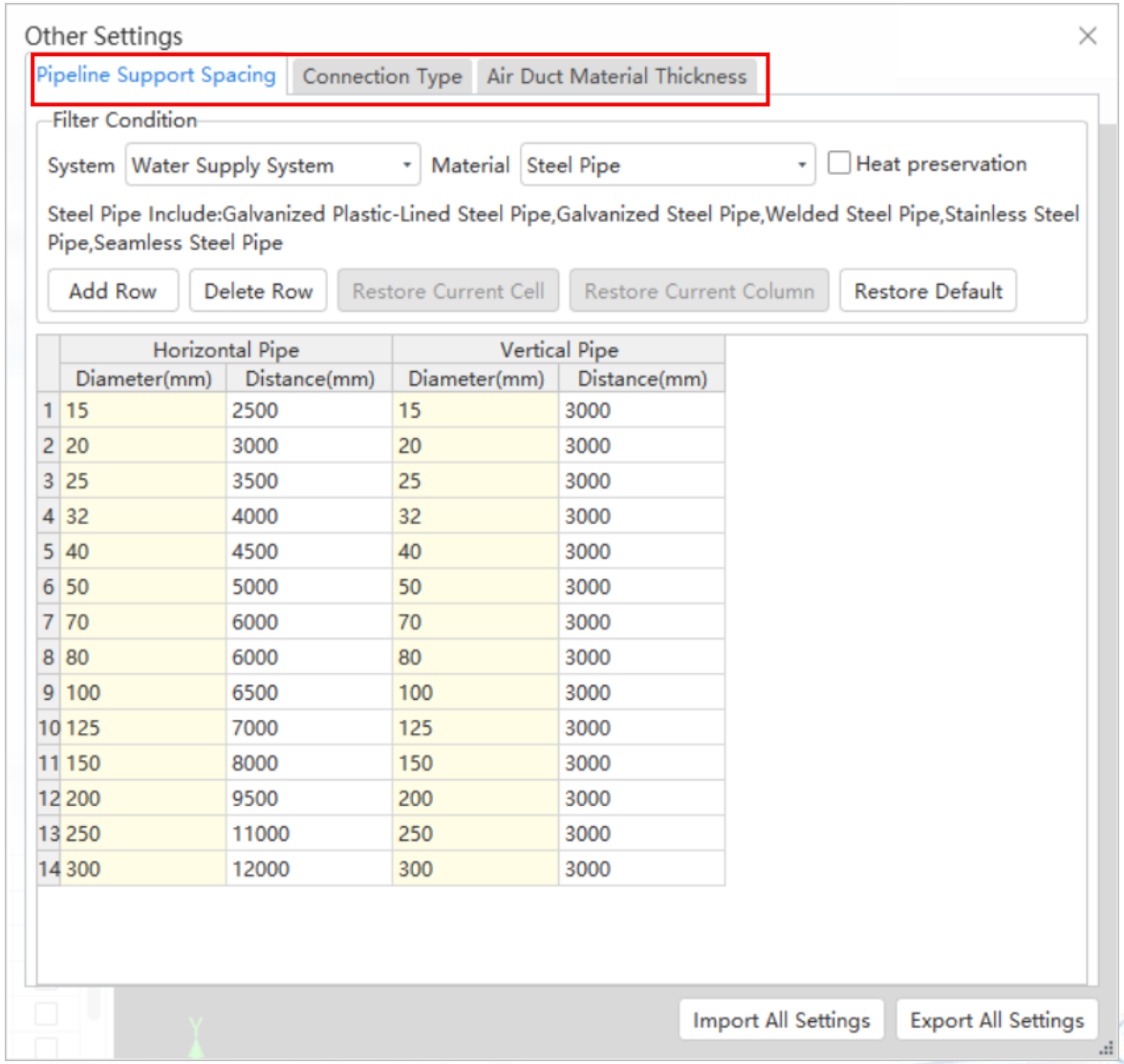


10.2 Project Settings - Other Settings

Some data can be customized:

1. How to calculation the 'Pipeline Supporting Spacing'
2. The 'Connection Type' for P&S, Fire System and ACMV
3. The default 'Air Duct Thickness' and can be custom adjusted

* Can be adjusted via the drop-down box AND the notes is presented in blue font

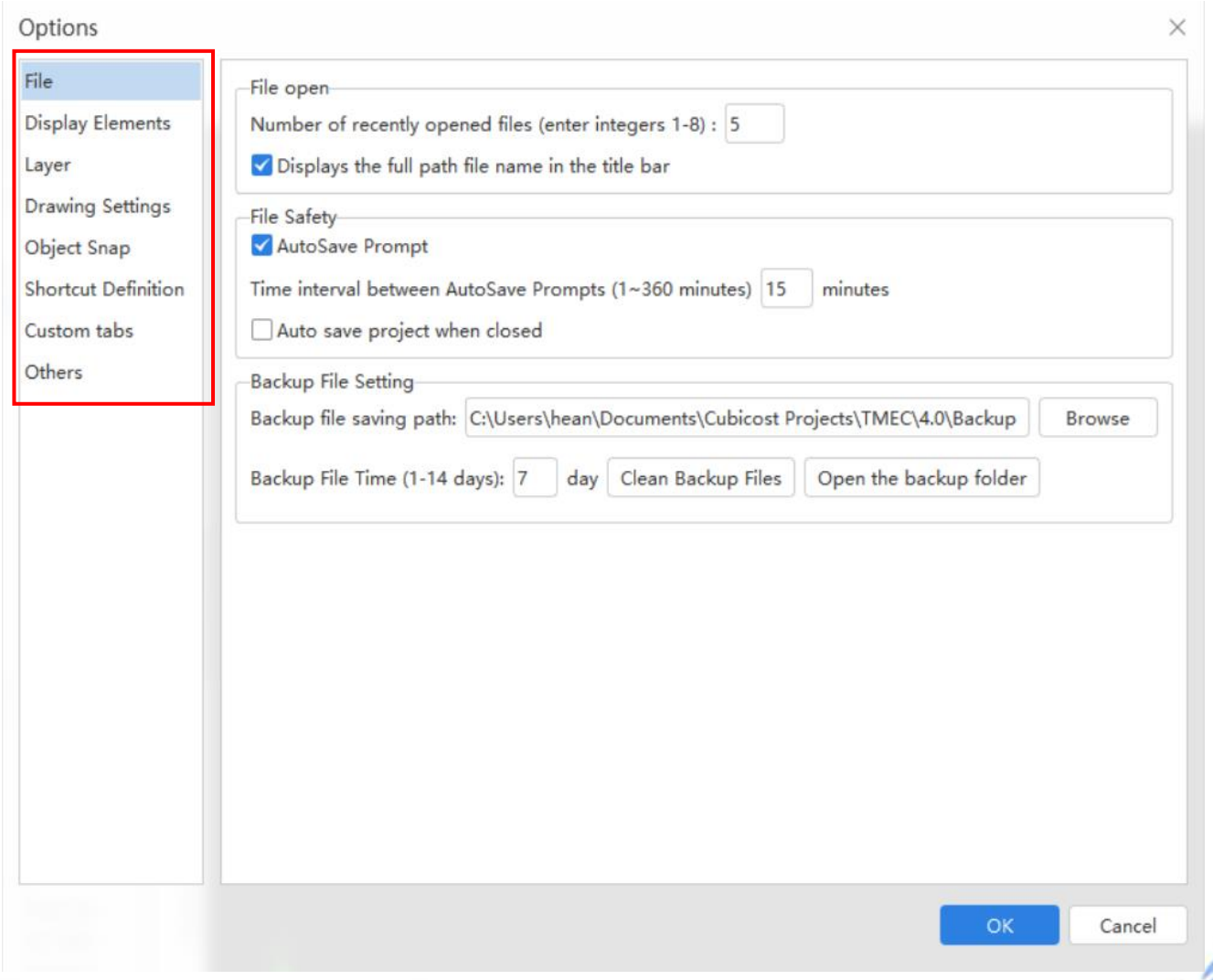


	Horizontal Pipe		Vertical Pipe	
	Diameter(mm)	Distance(mm)	Diameter(mm)	Distance(mm)
1	15	2500	15	3000
2	20	3000	20	3000
3	25	3500	25	3000
4	32	4000	32	3000
5	40	4500	40	3000
6	50	5000	50	3000
7	70	6000	70	3000
8	80	6000	80	3000
9	100	6500	100	3000
10	125	7000	125	3000
11	150	8000	150	3000
12	200	9500	200	3000
13	250	11000	250	3000
14	300	12000	300	3000

10.3 Project Settings - Options

Any other options for adjustment:

1. Recently opened file dispaly
2. The color of the Elements display
3. Elements display in layer
4. Pice-box size adjust and background dispaly color
5. Object snap method
6. Shortcut definition
7. Customize the tab display
8. Other settings



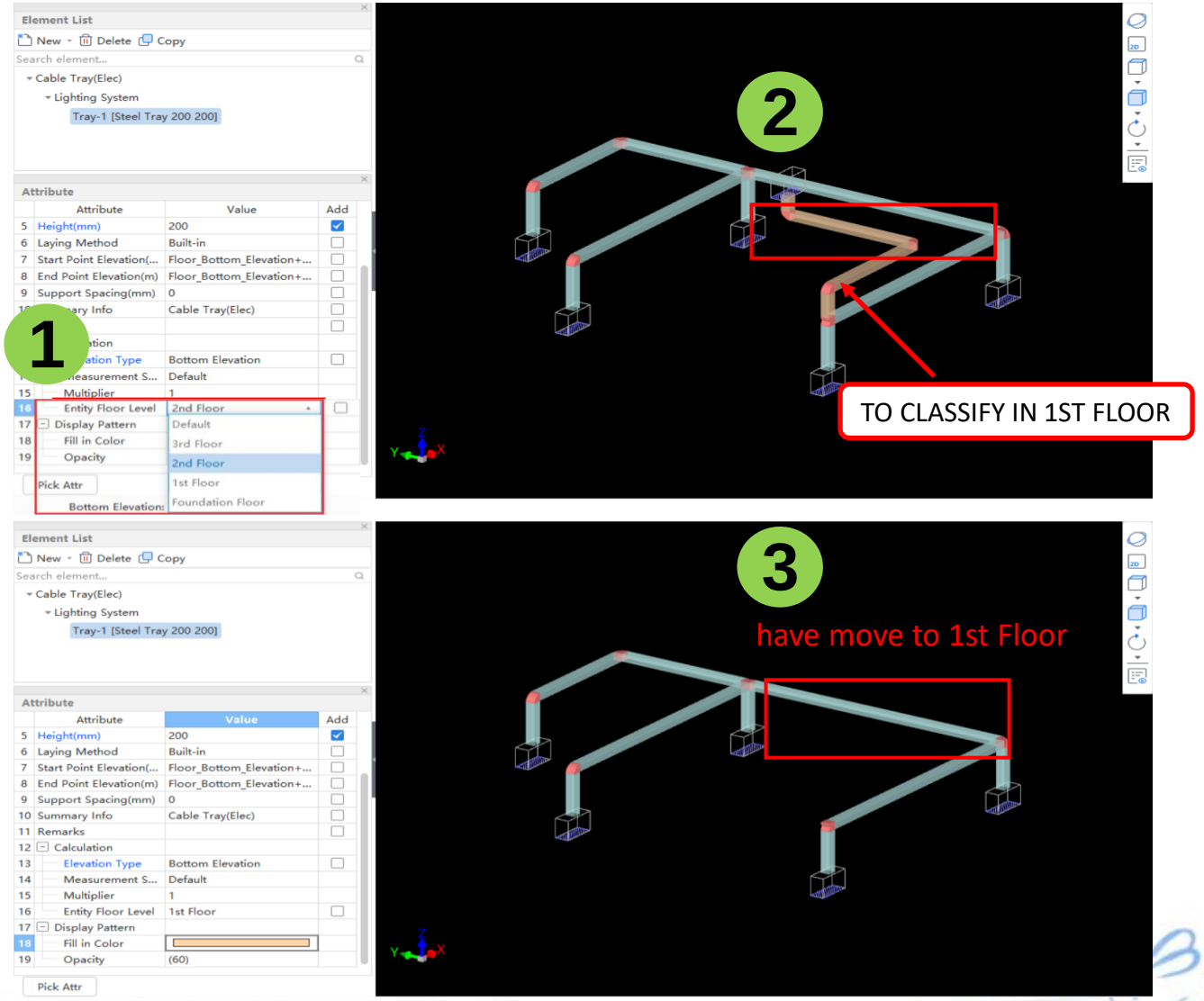
New Updates

11.1 New Update: Entity Floor Attribute

Step 1: Select the entity in Drawing Area which want to adjust the floor

Step 2: Find the Entity Floor Level in Attribute, and adjust the floor level to 1st, ‘enter’ to confirm

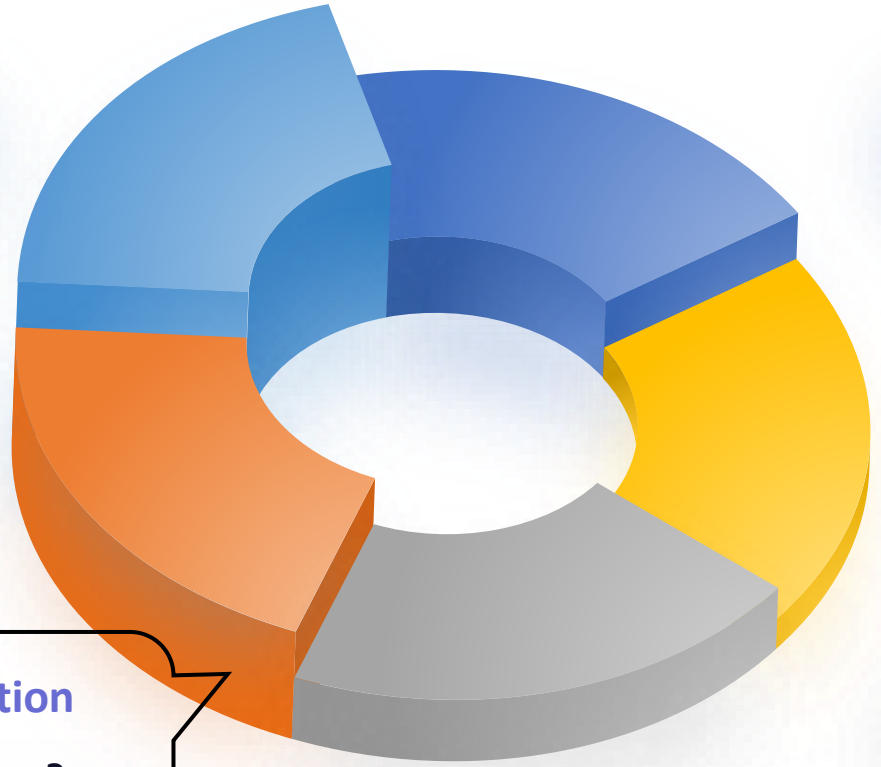
Step 3: The floor level of the entity will be change to 1st Floor from 2nd Floor



11.2 New Update: Clash Detection

Reduce Cost Overrun

Faster Construction



Better Coordination Between Trades

Less Variation Orders (VO)

Improved Quality – No Band-aids

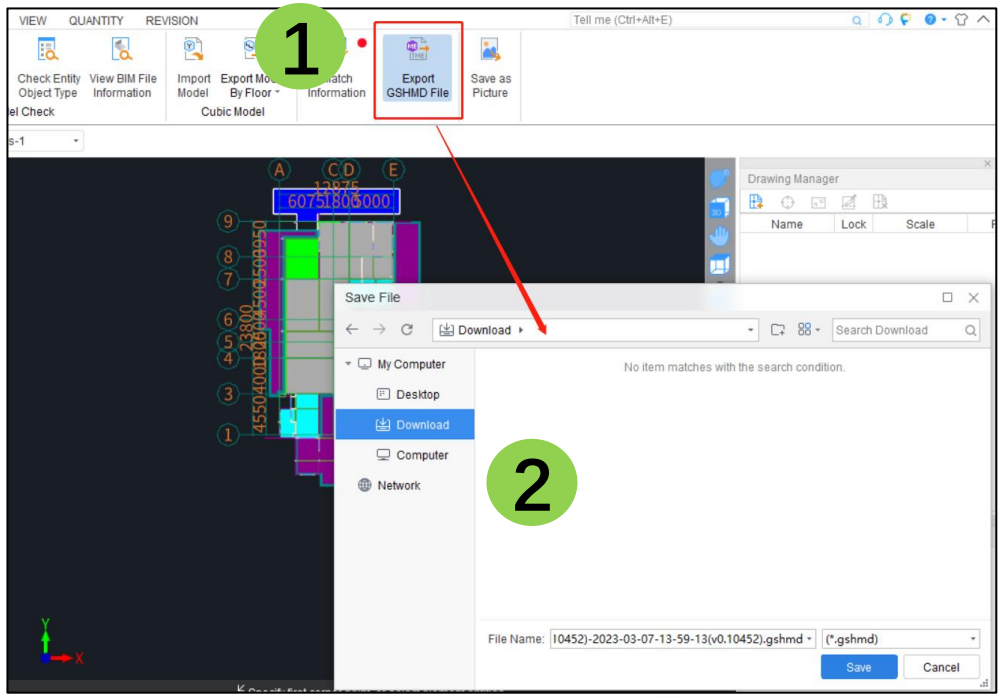
Benefits of Clash Detection

Why perform clash detection?

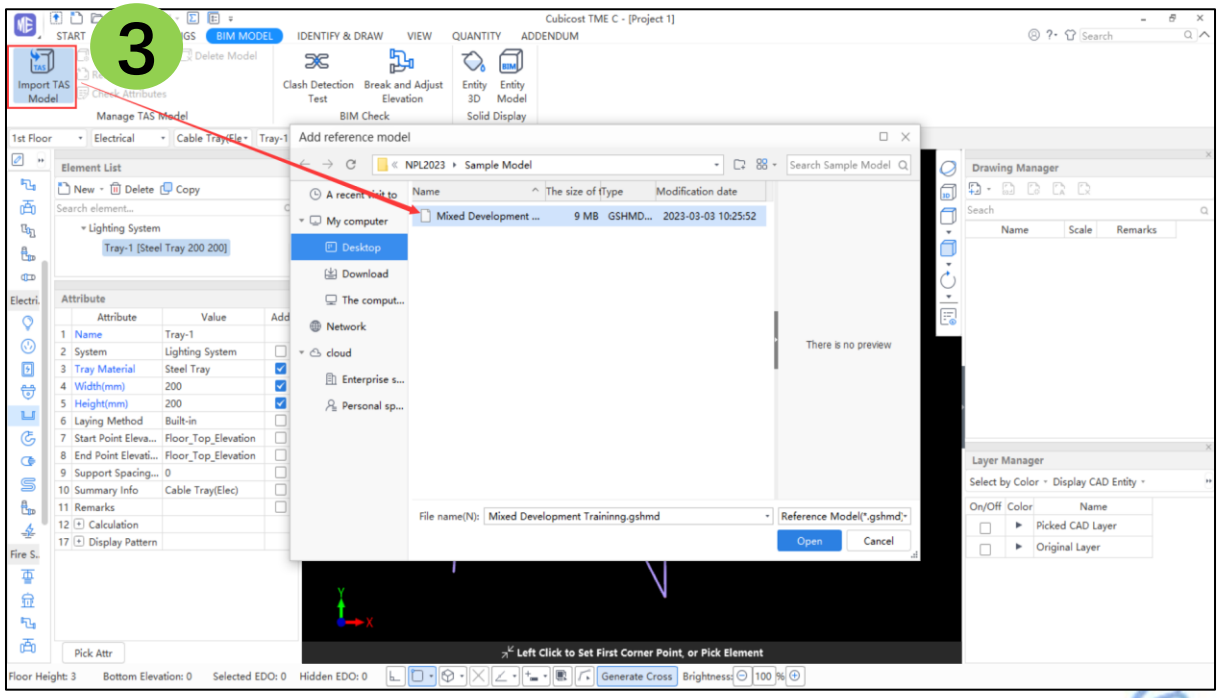
Step 1: IN TASC, click Export GSHMD File to export the the TAS model

Step 2: Select the folder and confirm

Step 3: IN TMEC, click Import TAS Model, and follow the steps on the next page



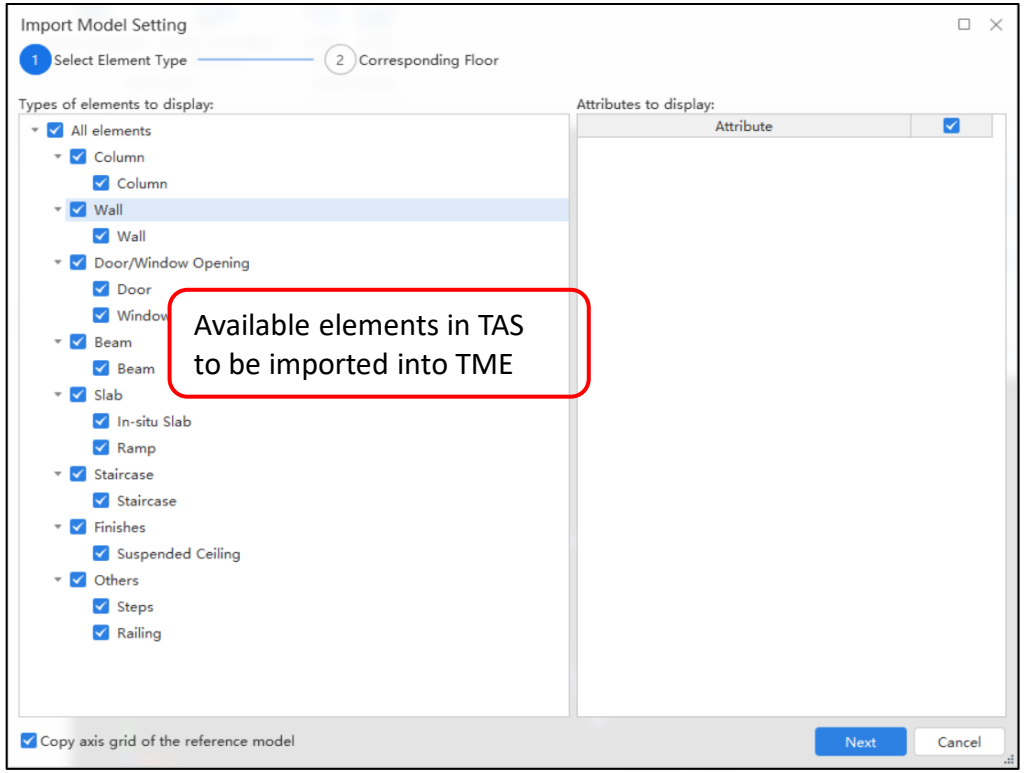
Export TAS Model in TAS

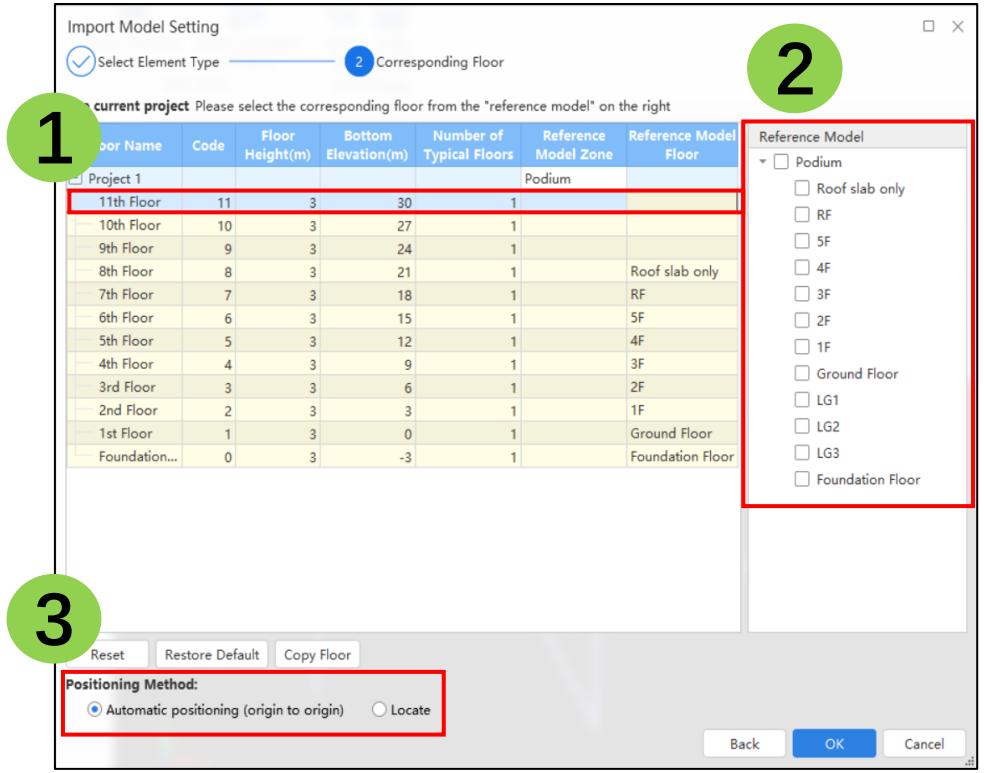


Import TAS Model in TME

11.2 Clash Detection: Import TAS Model

Step 1: Select current project floor level
Step 2: Select the corresponding floor level in the reference model (TAS model)
Step 3: Select positioning method (automatic or locate manually)





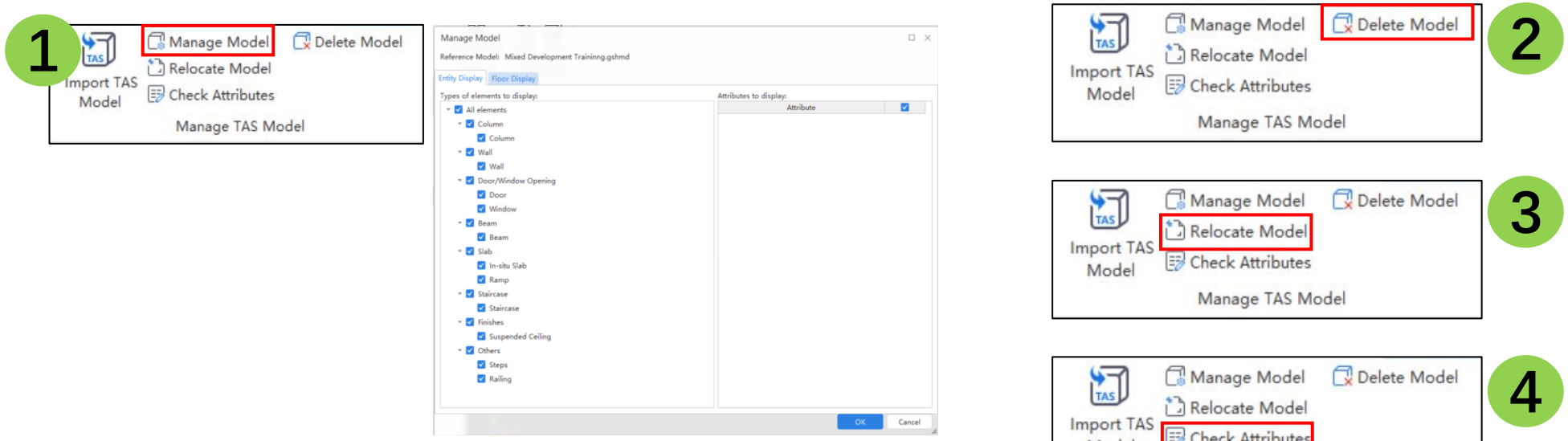
11.2 Clash Detection: Manage TAS Model

Step 1: Click ‘Manage Model’ to show/hide TAS entities and floor levels

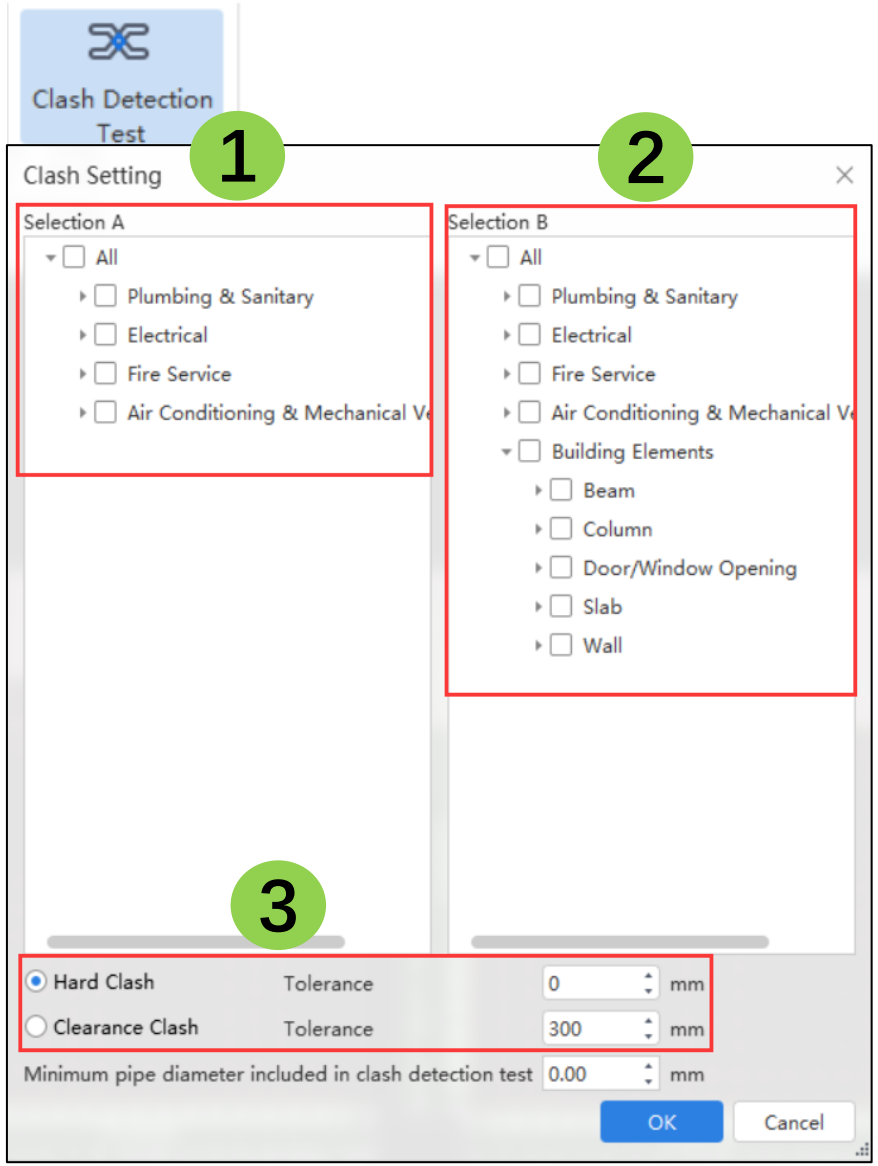
Step 2: Can click ‘Delete Model’ to delete the imported TAS model

Step 3: Click ‘Relocate Model’ to relocate the model to another position in the drawing area

Step 4: Click ‘Check Attributes’ to check the attributes of the TAS entities at the model



11.2 Clash Detection: Running The Test



Step 1: Select entities to clash from selection A

Step 2: Select entities to clash from selection B

Step 3: Select the clashing method (hard clash or clearance clash)

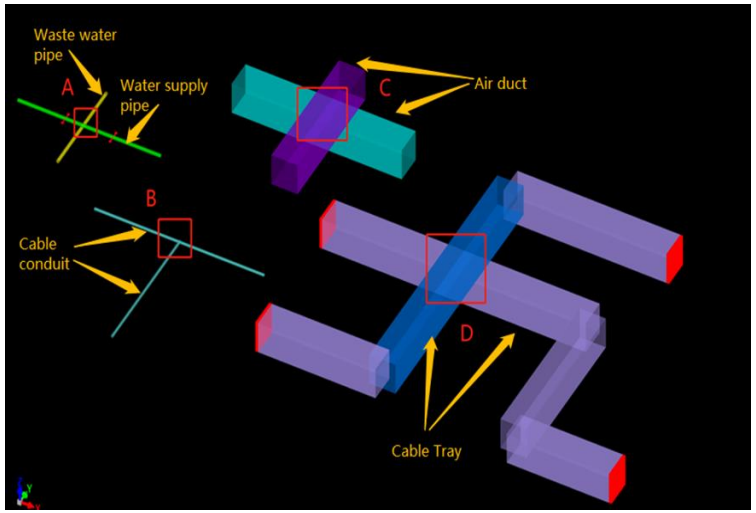
Difference between Hard Clash & Clearance Clash:

1. **Hard Clash**: Entities that clashes with each other within the tolerance value is considered as a clash.

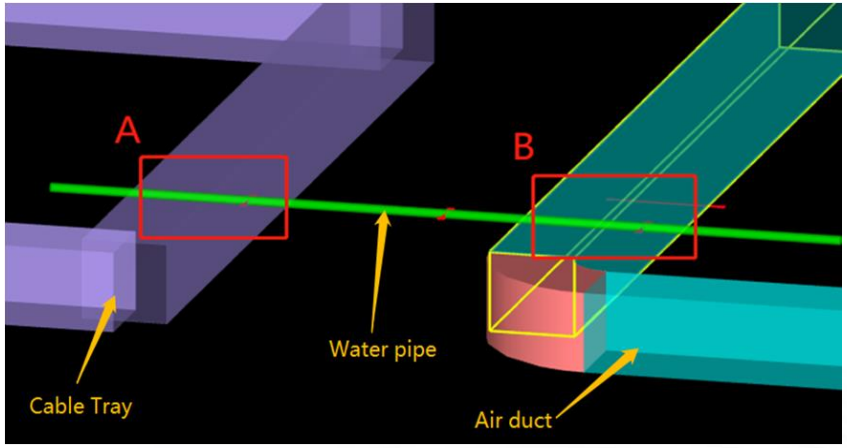
2. **Clearance Clash**: Entities selected must have a clearance/space between each other. Once the distance between both selected entities are within the tolerance value, it will be considered as a clash.

11.2 Clash Detection: Types of Available Clashes

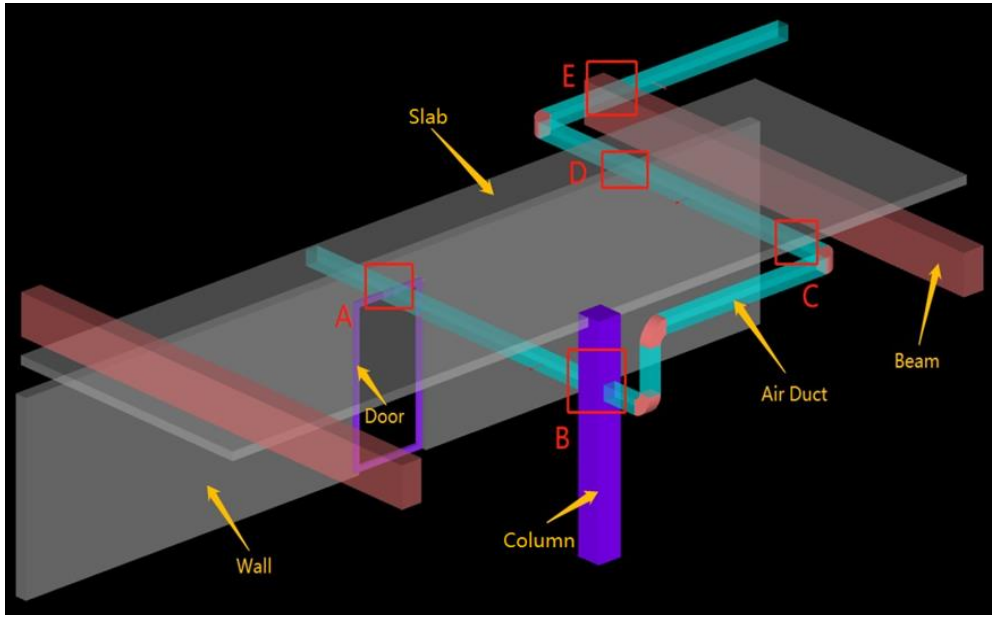
1. Clashes within a single trade



2. Clashes with multiple trades



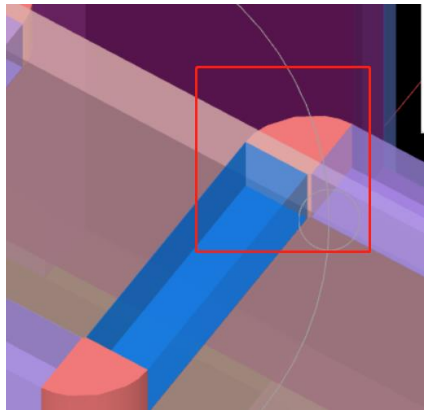
3. Clashes with building elements

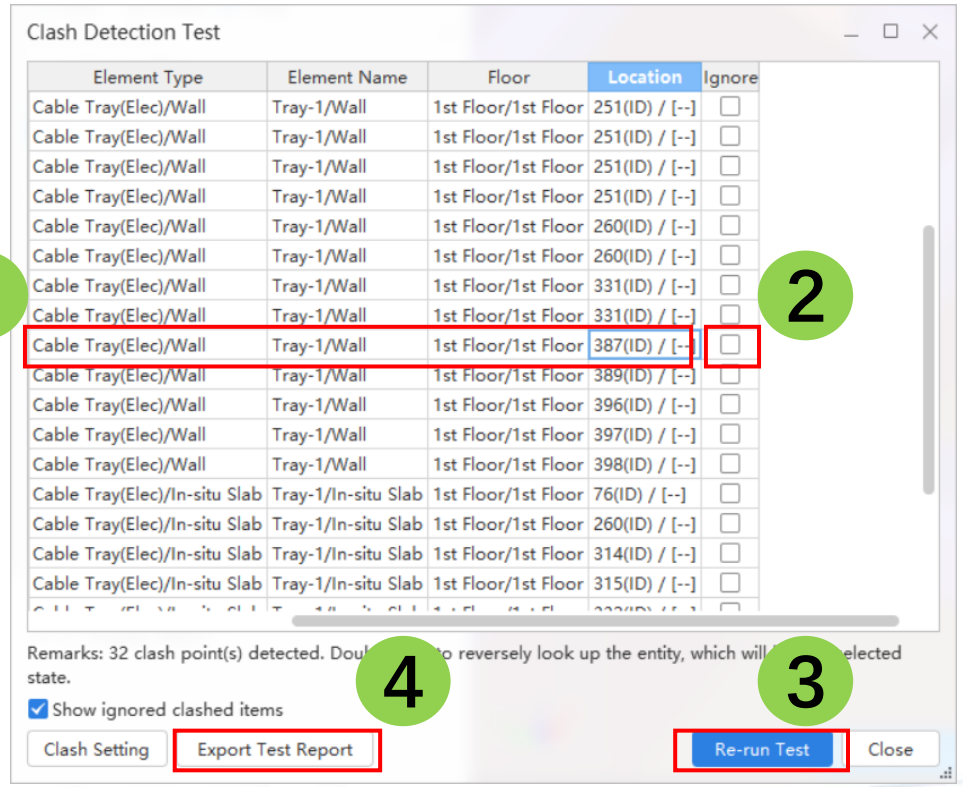


11.2 Clash Detection: After Running The Test

After running the test, there are a few options available to proceed with:

Step 1: Double click the clash item to reversely-check at the model area
Step 2: Click “ignore” to ignore the clash item
Step 3: Re-run the test after adjusting clash setting
Step 4: Export test report



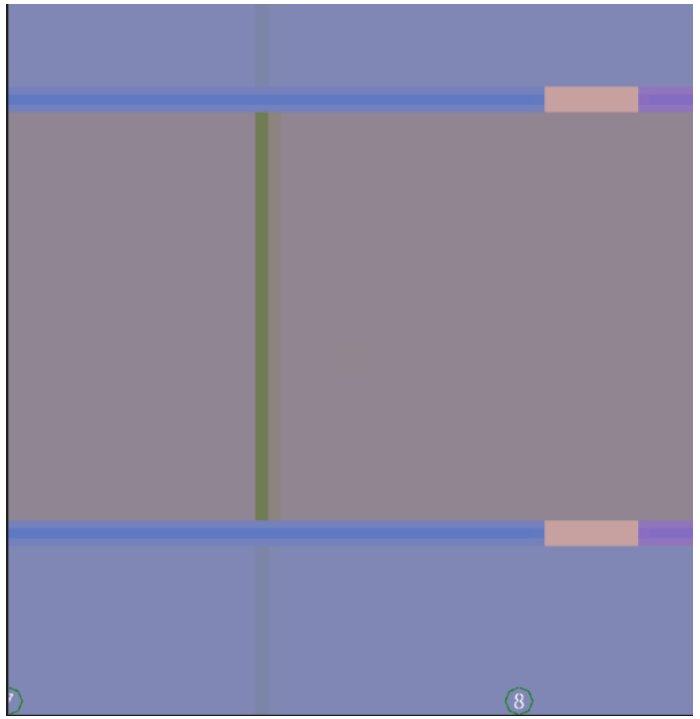


11.2 Clash Detection: Clash Detection Report

Clash Detection Report shows the summary of all clash items

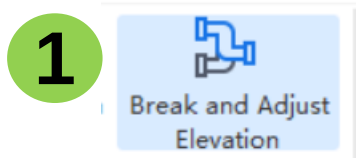
*Picture of clashes are stored in a separate file to be cross-referenced

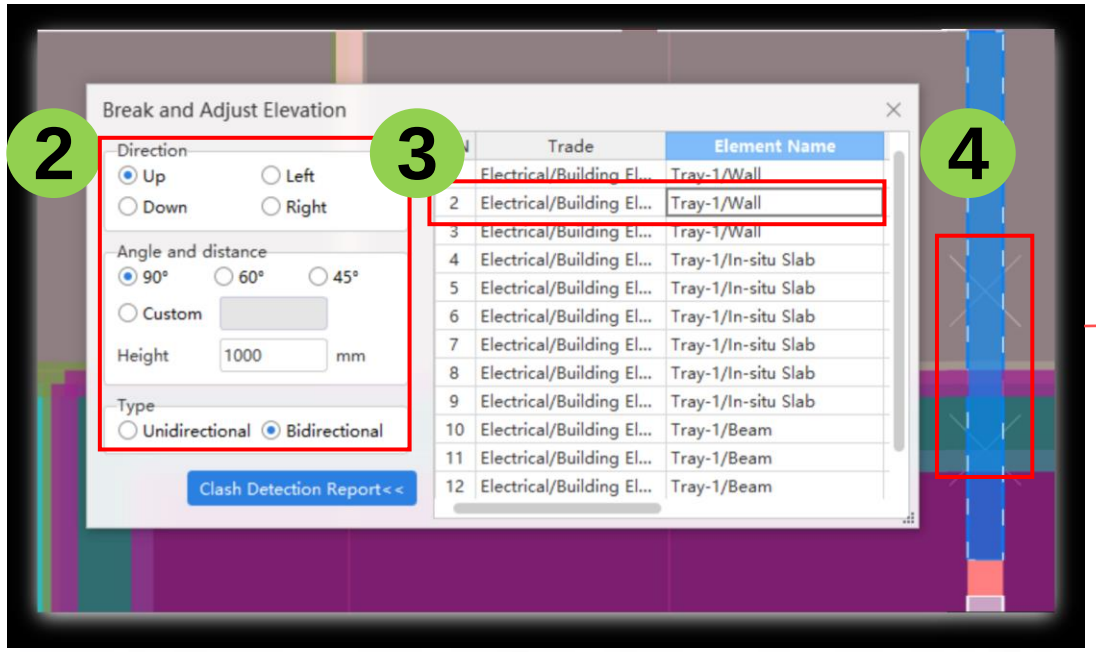
S/N	Trade	Element Type	Element Name	Floor	Location	Clash View
1	Electrical/Electrical	Cable Tray(Elec)/Cable Tray(Elec)	Tray-1/Tray-1	1st Floor/1st Floor	461(ID) / 462(ID)	1.png
2	Electrical/Building Elements	Lighting Fixture(Elec)/Wall	Lamp-1/Wall	1st Floor/1st Floor	48(ID) / [--]	2.png
3	Electrical/Building Elements	Lighting Fixture(Elec)/Beam	Lamp-1/Beam	1st Floor/1st Floor	48(ID) / [--]	3.png
4	Electrical/Building Elements	Electrical Equipment(Elec)/In-situ Slab	EEqui-1/In-situ Slab	1st Floor/1st Floor	58(ID) / [--]	4.png
5	Electrical/Building Elements	Electrical Equipment(Elec)/In-situ Slab	EEqui-1/In-situ Slab	1st Floor/1st Floor	180(ID) / [--]	5.png
6	Electrical/Building Elements	Cable Tray(Elec)/In-situ Slab	Tray-1/In-situ Slab	1st Floor/1st Floor	75(ID) / [--]	6.png
7	Electrical/Building Elements	Cable Tray(Elec)/In-situ Slab	Tray-1/In-situ Slab	1st Floor/1st Floor	75(ID) / [--]	7.png
8	Electrical/Building Elements	Cable Tray(Elec)/In-situ Slab	Tray-1/In-situ Slab	1st Floor/1st Floor	77(ID) / [--]	8.png
9	Electrical/Building Elements	Cable Tray(Elec)/In-situ Slab	Tray-1/In-situ Slab	1st Floor/1st Floor	77(ID) / [--]	9.png
10	Electrical/Building Elements	Cable Tray(Elec)/In-situ Slab	Tray-1/In-situ Slab	1st Floor/1st Floor	77(ID) / [--]	10.png
11	Electrical/Building Elements	Cable Tray(Elec)/In-situ Slab	Tray-1/In-situ Slab	1st Floor/1st Floor	188(ID) / [--]	11.png
12	Electrical/Building Elements	Cable Tray(Elec)/In-situ Slab	Tray-1/In-situ Slab	1st Floor/1st Floor	188(ID) / [--]	12.png
13	Electrical/Building Elements	Cable Tray(Elec)/In-situ Slab	Tray-1/In-situ Slab	1st Floor/1st Floor	188(ID) / [--]	13.png
14	Electrical/Building Elements	Cable Tray(Elec)/In-situ Slab	Tray-1/In-situ Slab	1st Floor/1st Floor	189(ID) / [--]	14.png
15	Electrical/Building Elements	Cable Tray(Elec)/In-situ Slab	Tray-1/In-situ Slab	1st Floor/1st Floor	189(ID) / [--]	15.png
16	Electrical/Building Elements	Cable Tray(Elec)/In-situ Slab	Tray-1/In-situ Slab	1st Floor/1st Floor	189(ID) / [--]	16.png

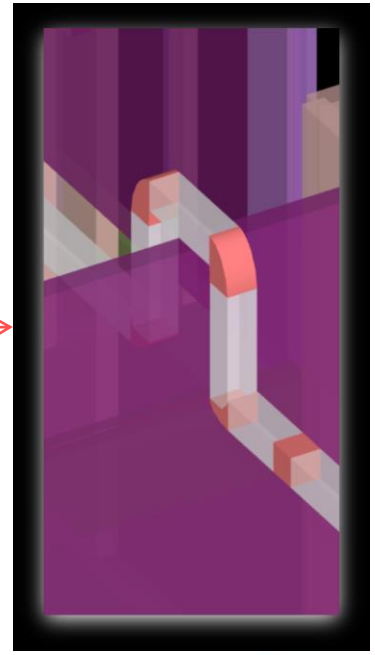


How to adjust the height of the entity based on the collision point?

Step 1: Click Break and Adjust Elevation to editing the entity based on the clash point
Step 2: Double click on the clash point in the report to reversely check the clashed entities
Step 3: Define the Direction, Angle and distance and Type according to the clash
(Left click on the entity to make adjustments 0
Step 4: Left click to select 2 bending points from the entity, right click to confirm







P&S Walkthrough

1. Introduction to P&S
2. Overview of P&S Systems
3. Drawing Knowledge
4. Software Walkthrough

INTRODUCTION TO PLUMBING SYSTEM

- The art and science of creating and maintaining sanitary conditions in building used by humans.
- It is also defined as the art and science of installing, repairing and servicing the pipes, fixtures and accessories necessary for bringing in water supply and removing liquid and water-borne wastes.

TYPES OF P&S SYSTEMS

- COLD WATER SERVICES SYSTEM
- SANITARY PLUMBING SYSTEM
- RAINWATER SYSTEM

COLD WATER AND SANITARY PLUMBING SYSTEM

Cold Water System is a water supply from the mains to the point of use i.e. water tap either directly or indirectly

Sanitary System is a system of piping within the premises that channels the sewage water or other liquid or soil waste to a location of disposal

Main components of Cold Water and Sanitary Plumbing System:

- Pipes - m
- Plumbing Fixtures - nr
- Valves - nr
- Pumps - nr
- Tanks - nr
- Floor Traps - nr

PLUMBING & SANITARY SYSTEM

PIPES

The pipes selection shall be in accordance with local standards and technical specification of the project

COLD WATER PIPES

- Ductile Iron
- High-density Polyethylene (HDPE)
- Stainless Steel 304
- Polypropylene Blend (POB)
- Polypropylene Random (PPR)

SANITARY PIPES

- Galvanised Iron
- Ductile Iron
- Unplasticised Poly Vinyl Chloride (uPVC)
- Cast Iron
- Vitrified Clay Pipe (VCP)

The pipework shall consider pipe ancillaries such as valves, gauge cocks, strainers, pressure gauge, sleeves, joints, anchors, gaskets, connectors, air inlets, expansion loops, etc.

**The pipe materials stated are typically used for each of the system. It may varies depending on local standards and engineer's design*

PLUMBING & SANITARY SYSTEM

PLUMBING FIXTURES

TOILET

SHOWER SET

HAND WASH BASIN / LAVATORY (US)

SQUAT TOILET

WATER CLOSET

BATHTUB

FLOOR DRAIN

HAND BIDET

URINAL

**Sanitary fixtures may also apply to multiple areas / rooms*

KITCHEN

WATER TAP / FAUCET

KITCHEN SINK

SURAU

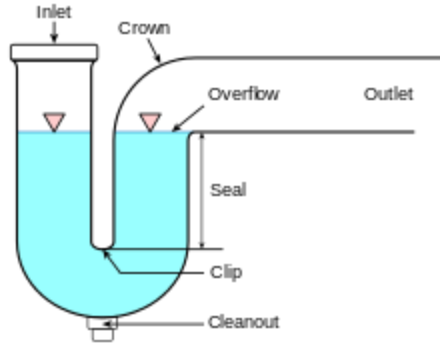
PLUMBING & SANITARY SYSTEM

Traps

Gully Trap

P Trap

Q Trap



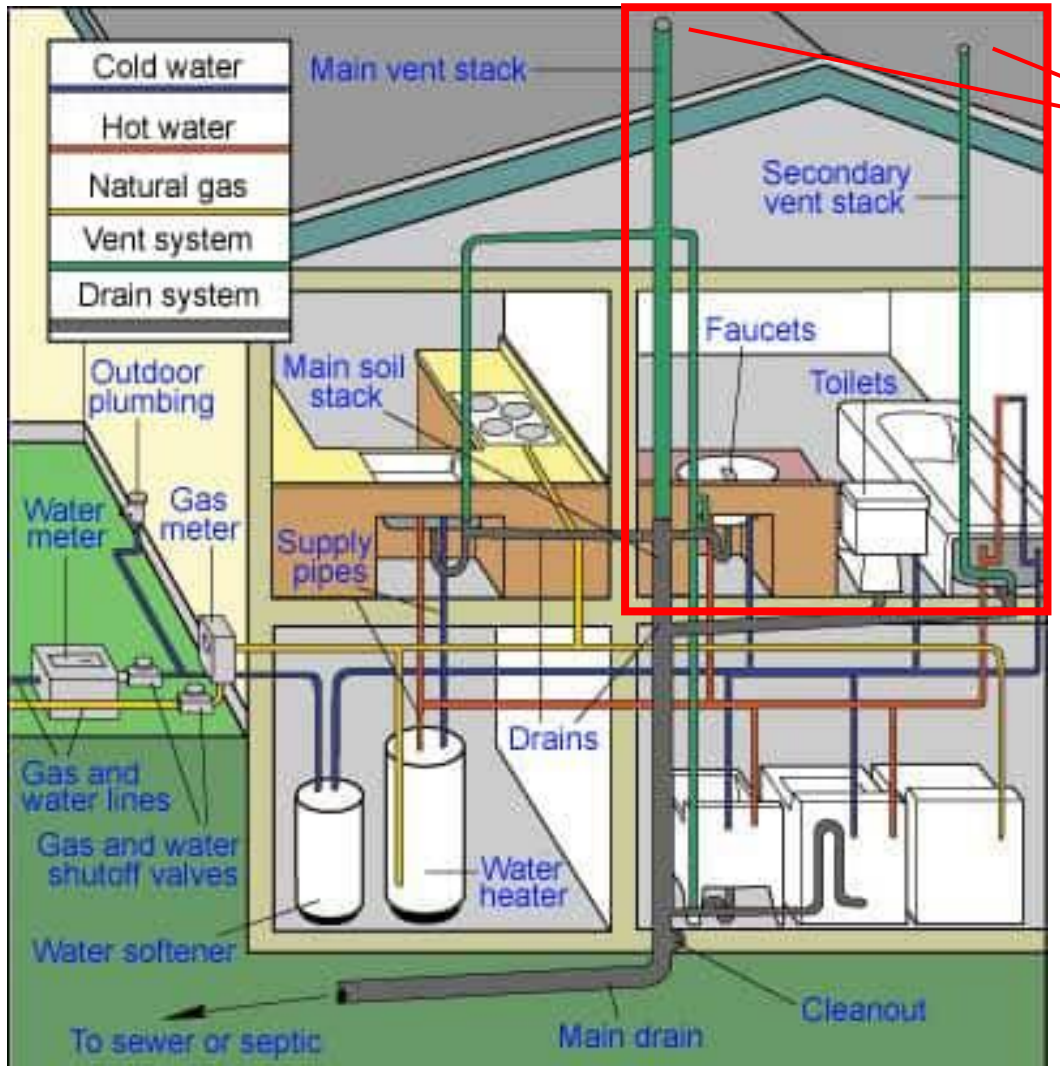
S Trap

Nahni Trap

Bottle Trap

PLUMBING & SANITARY SYSTEM

Vents



Roof Vent Cowl

PLUMBING & SANITARY SYSTEM

PUMPS

The pump is mechanical device used to move liquids, slurries, gases, or air using pressure to the designated point

COLD WATER PUMPS

Transfer Pump – The pump is designed to transfer water **from low level to high level** water storage tank. The pump is typically installed at the connection point between the low level water and the high level water storage tank

Booster Pump – The pump is designed to boost water in a right pressure where the flows are highly variable. This type of pump is **installed at the connection point between the main water supply pipe and the end point of use** (after the storage tank) and the water usage point / point of use

SANITARY PLUMBING SYSTEM

PUMPS

SEWARAGE PUMPS

Drainage Sump Pump – The pump is designed to discharge rainwater to perimeter drains and open drain. Usually the pump is a submersible type

Sewage Ejector Pump – The pump is designed to move waste out of the building through the plumbing system's sewage line to the septic tank or sewerage treatment plant

RAINWATER SYSTEM

Rainwater System is a conveyance system that channels rainwater from the collection surface into a rainwater tank *(optional)* and then discharges the excess rainwater to the drainage system

Main components of Rainwater System:

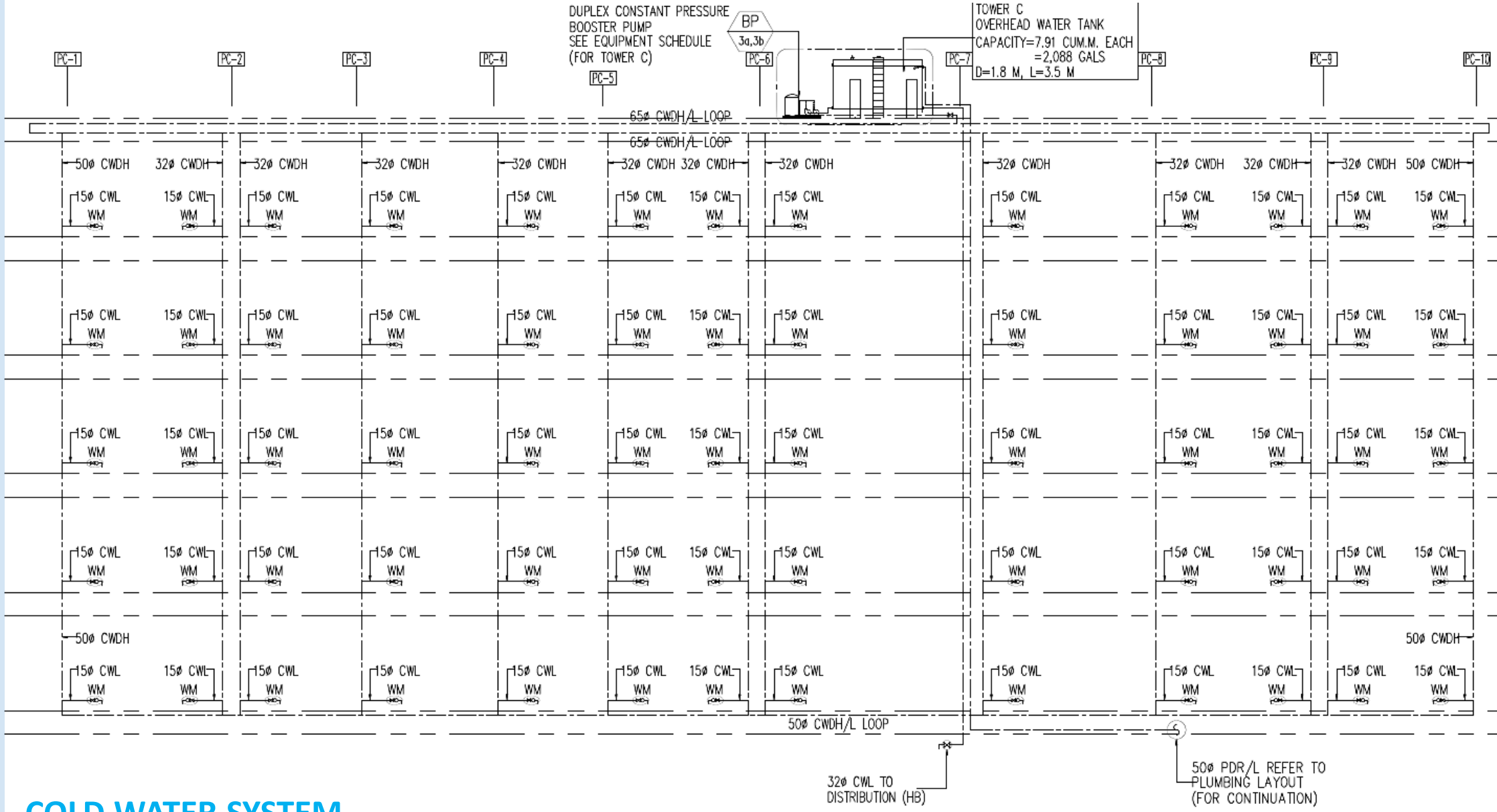
- Rainwater Down Pipes – m
- Roof Gutter - m
- Plumbing Fixtures - nr
- Pumps - nr
- Rainwater Tanks - nr
- Floor Traps - nr

DRAWING KNOWLEDGE

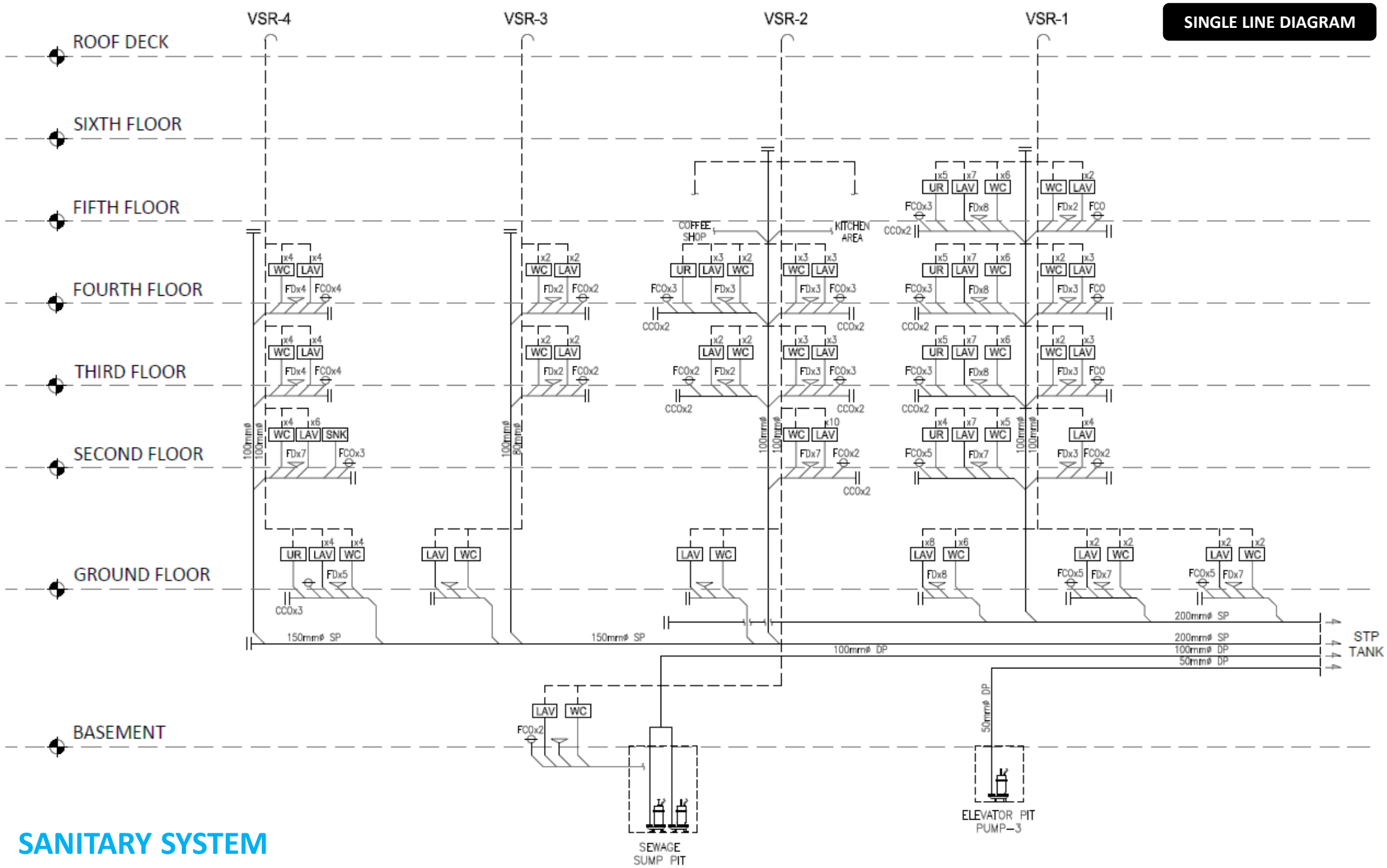
Commonly Used Drawings

- Floor plan layouts (Cold Water / Sanitary Plumbing/ Rainwater)
- Schematics
- Section views and Detail diagrams

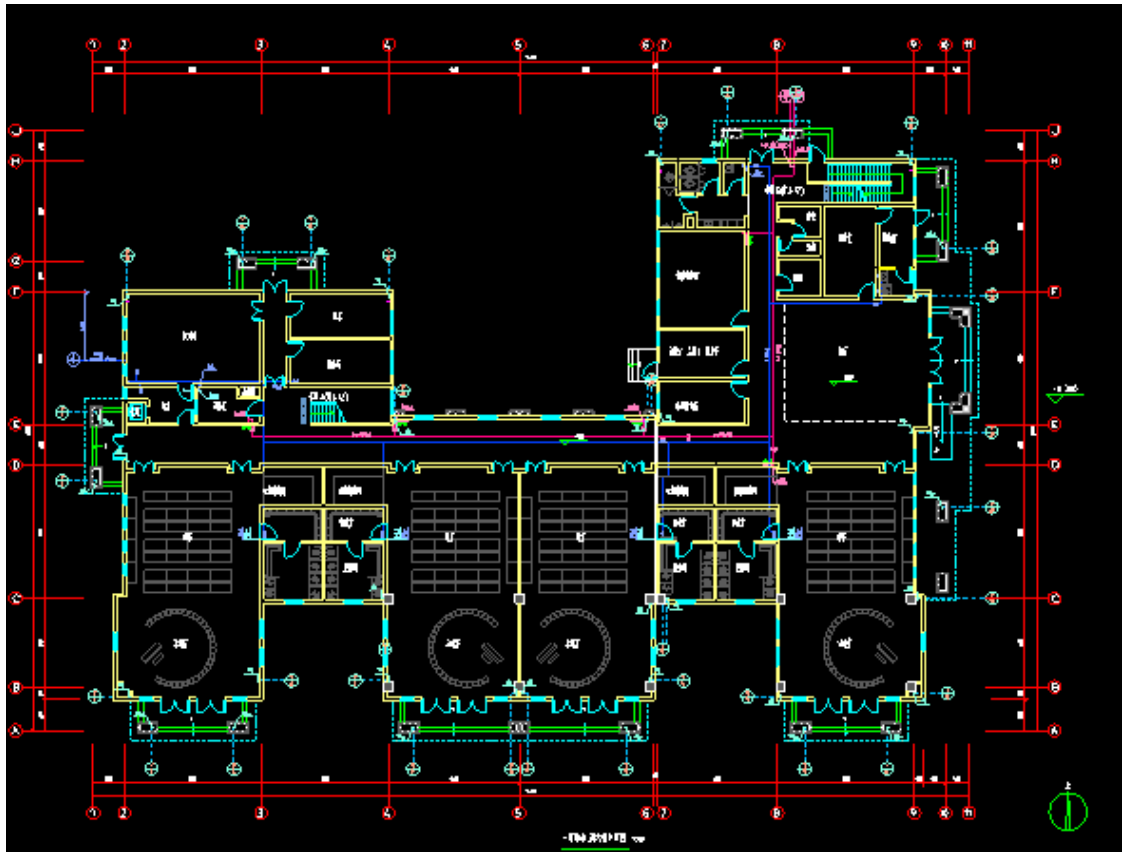
SINGLE LINE DIAGRAM

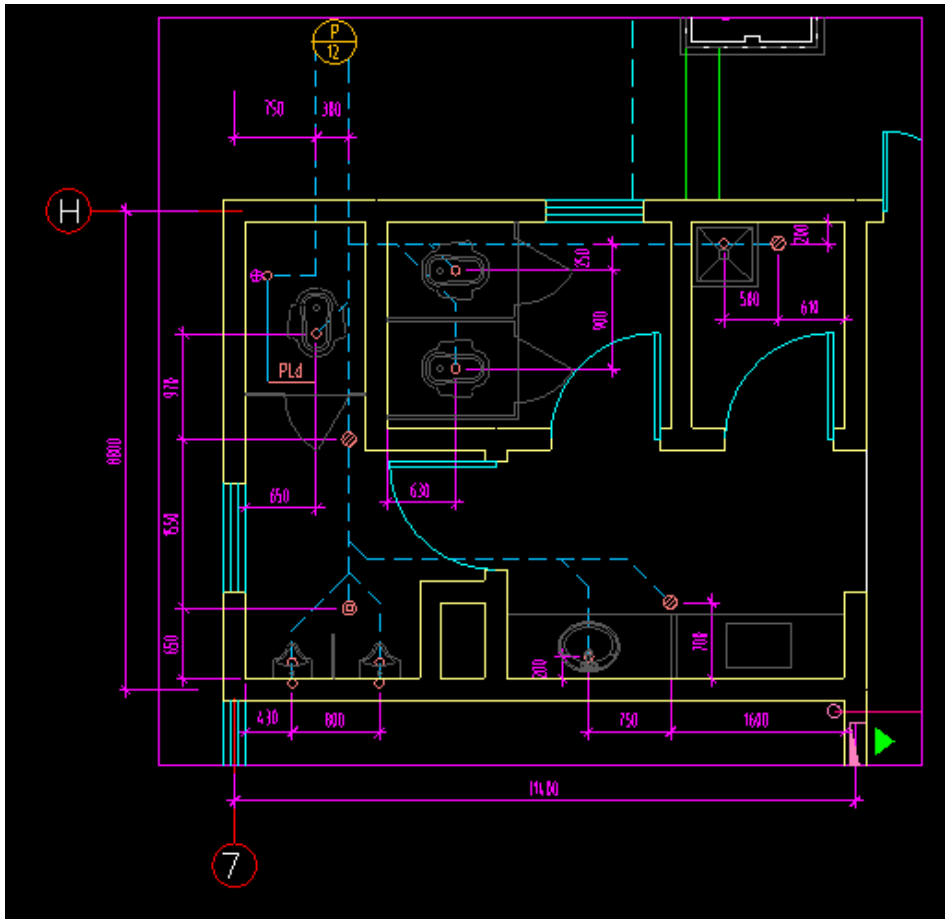


COLD WATER SYSTEM



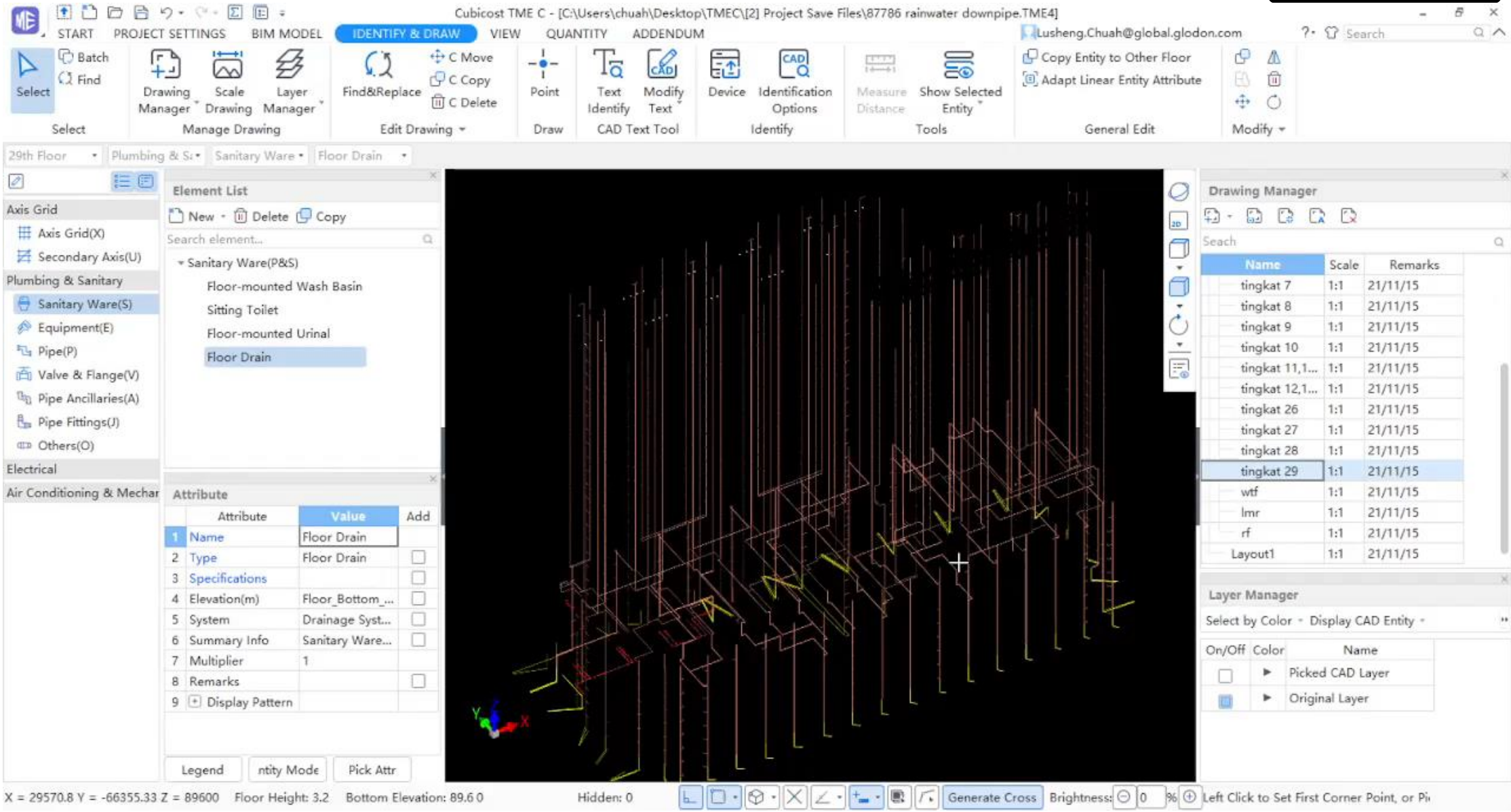
SANITARY SYSTEM





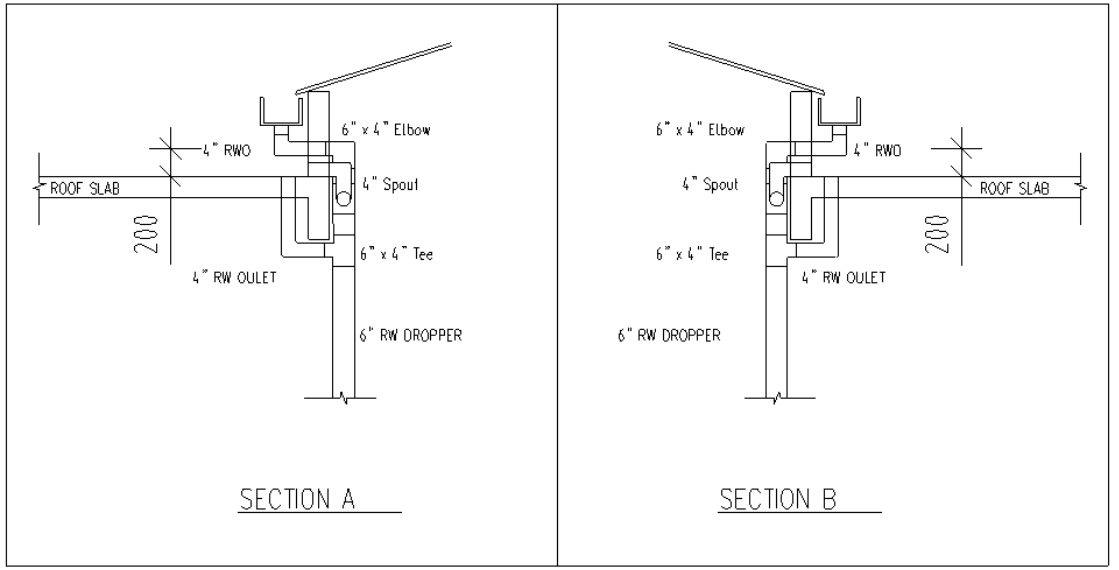
COLD WATER SYSTEM

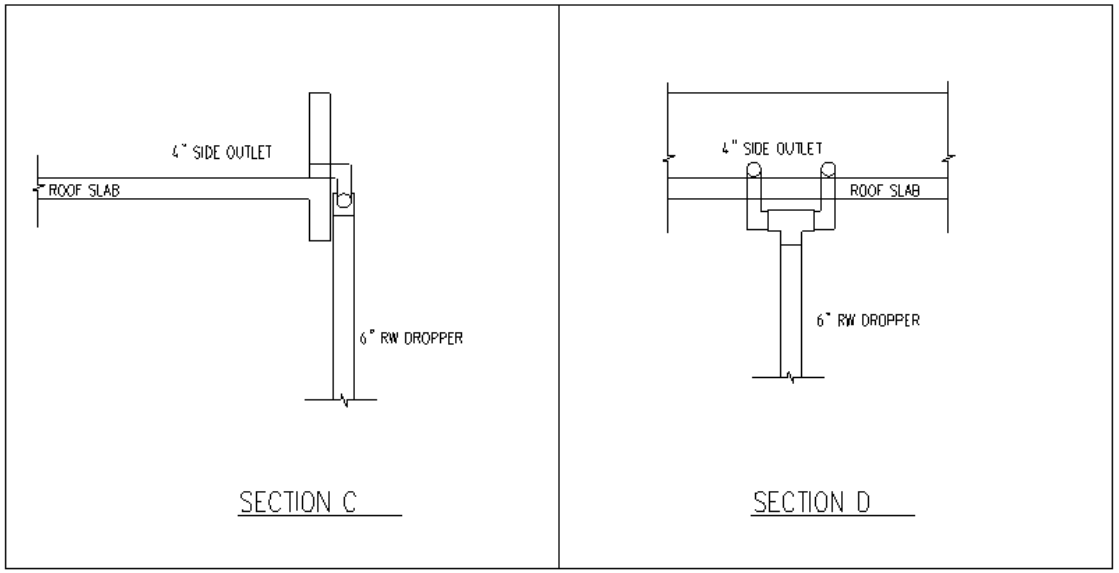
3D MODEL



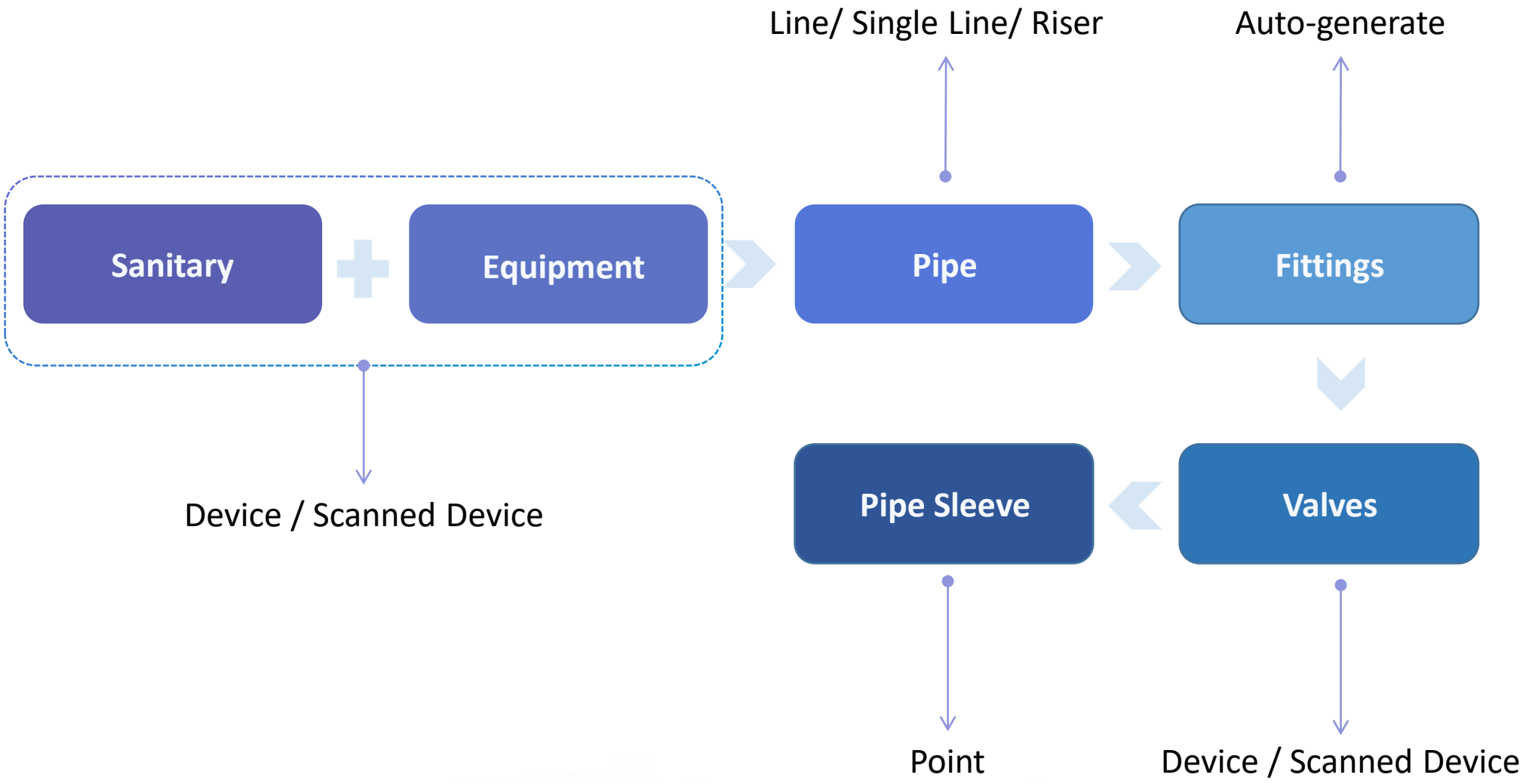
RAINWATER DOWNPIPE SYSTEM

SECTION VIEW &
DETAIL DIAGRAM



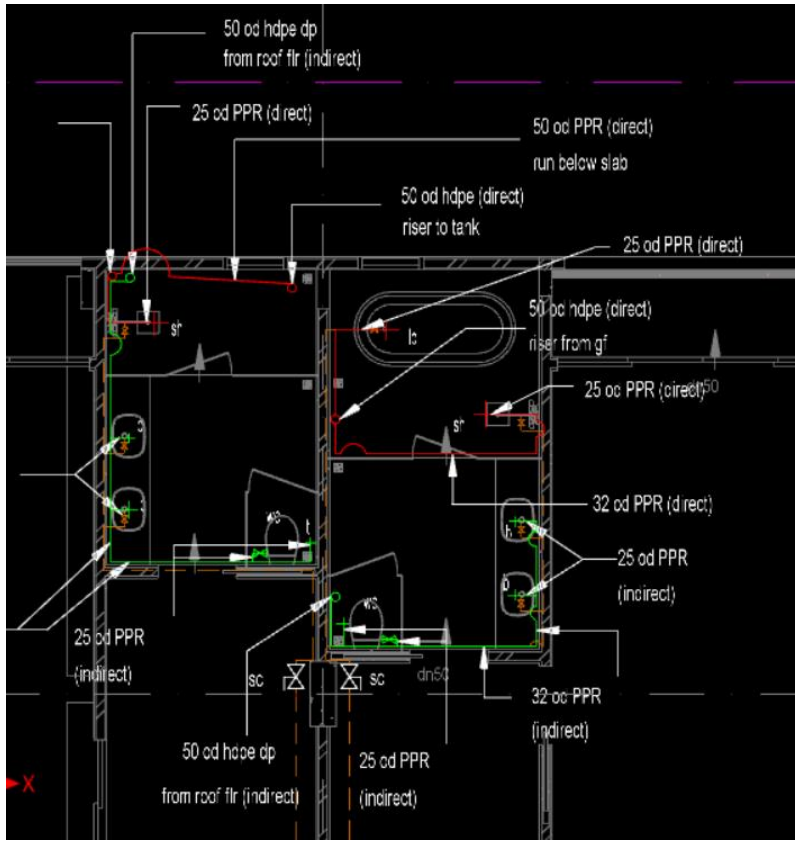


RAINWATER DOWNPIPE SYSTEM


Line/ Single Line/ Riser
Auto-generate
Sanitary
Equipment
Pipe
Fittings
Device / Scanned Device
Pipe Sleeve
Valves
Point
Device / Scanned Device

Key Learnings

- Device Identification of Sanitary Ware & Equipment
- Lay Horizontal Pipes with Different Elevation
- Lay Slanted Pipes
- Lay Vertical Pipes / Risers
- Device Identification of Valves
- Lay Pipe Sleeves
- BQ Generation
- Quantity Segregation According to Region



ACMV Walkthrough

1. Introduction to ACMV
2. Air-Conditioning Systems
3. Air Distribution in a Building
4. Mechanical Ventilation System
5. Software Walkthrough

AIR-CONDITIONING SYSTEM

Air Conditioning System is a cooling and heating combined process that conditions and transports the air to the conditioned space with desired comfort, temperature, humidity, air movement, air cleanliness, sound level, and pressure.

Main components of Air Conditioning System:

- Air-conditioning Unit - nr
- Pipes - m
- Ducts – m / m2

AIR-CONDITIONING SYSTEM

COMMON STANDARDS

- American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
- Air-Conditioning, Heating, and Refrigeration Institute (AHRI / ARI)
- Safety aspects: ASME, UL, CSA, local standards, etc.

AIR-CONDITIONING SYSTEM

Basic Systems (Most Commonly Used in Residential Buildings)

1. Split Unit System (One-to-one system)
2. Multi Splits System
3. Variable Refrigerant Flow System

AIR-CONDITIONING SYSTEM

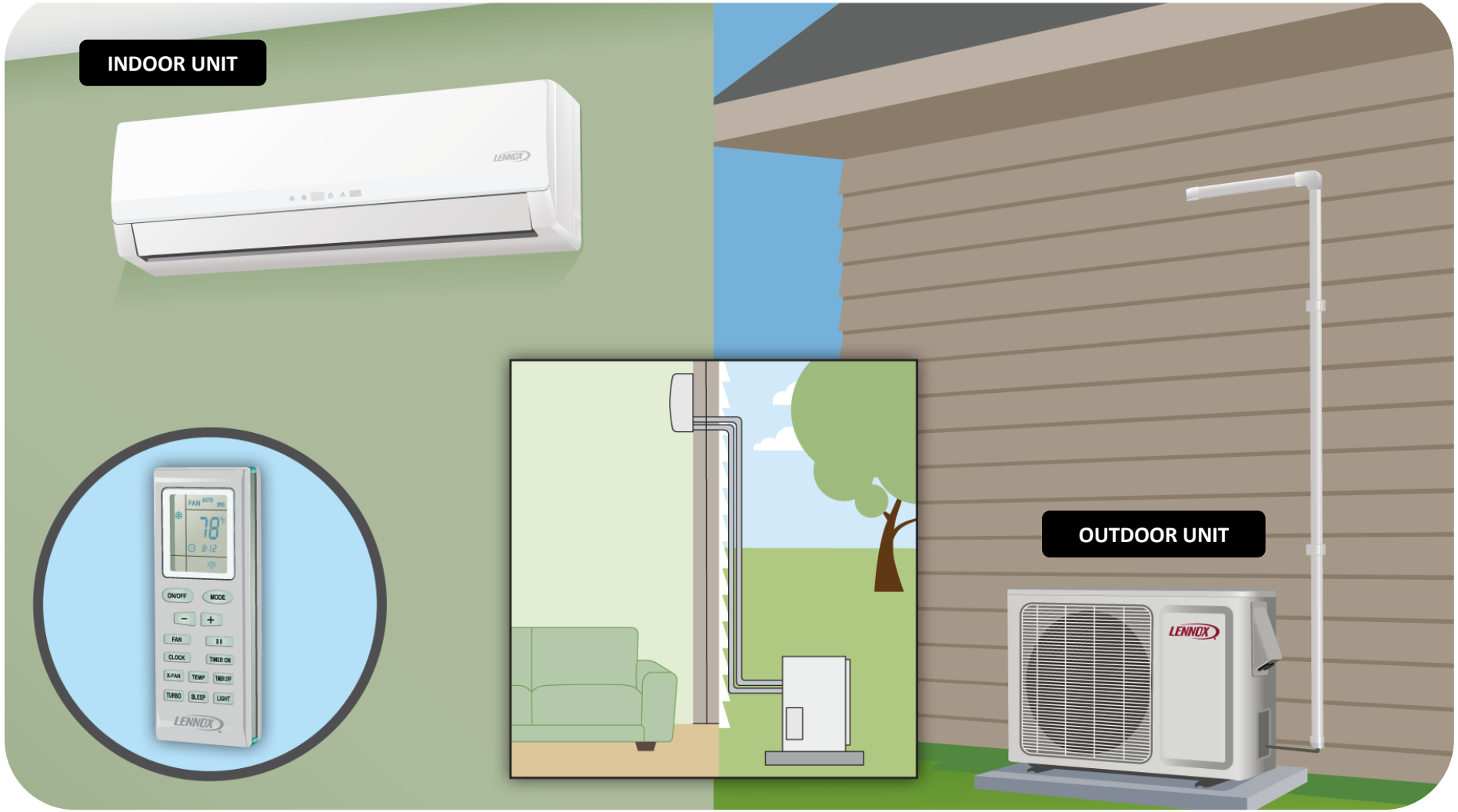
1. SPLIT UNIT SYSTEM

Split type air conditioning systems are **one-to-one system** consisting of one indoor unit (evaporator / fan coil) connected to an outdoor condensing unit.

Both the indoor and outdoor unit are connected through copper tubing and electrical cabling.

AIR-CONDITIONING SYSTEM

1. SPLIT UNIT SYSTEM



AIR-CONDITIONING SYSTEM

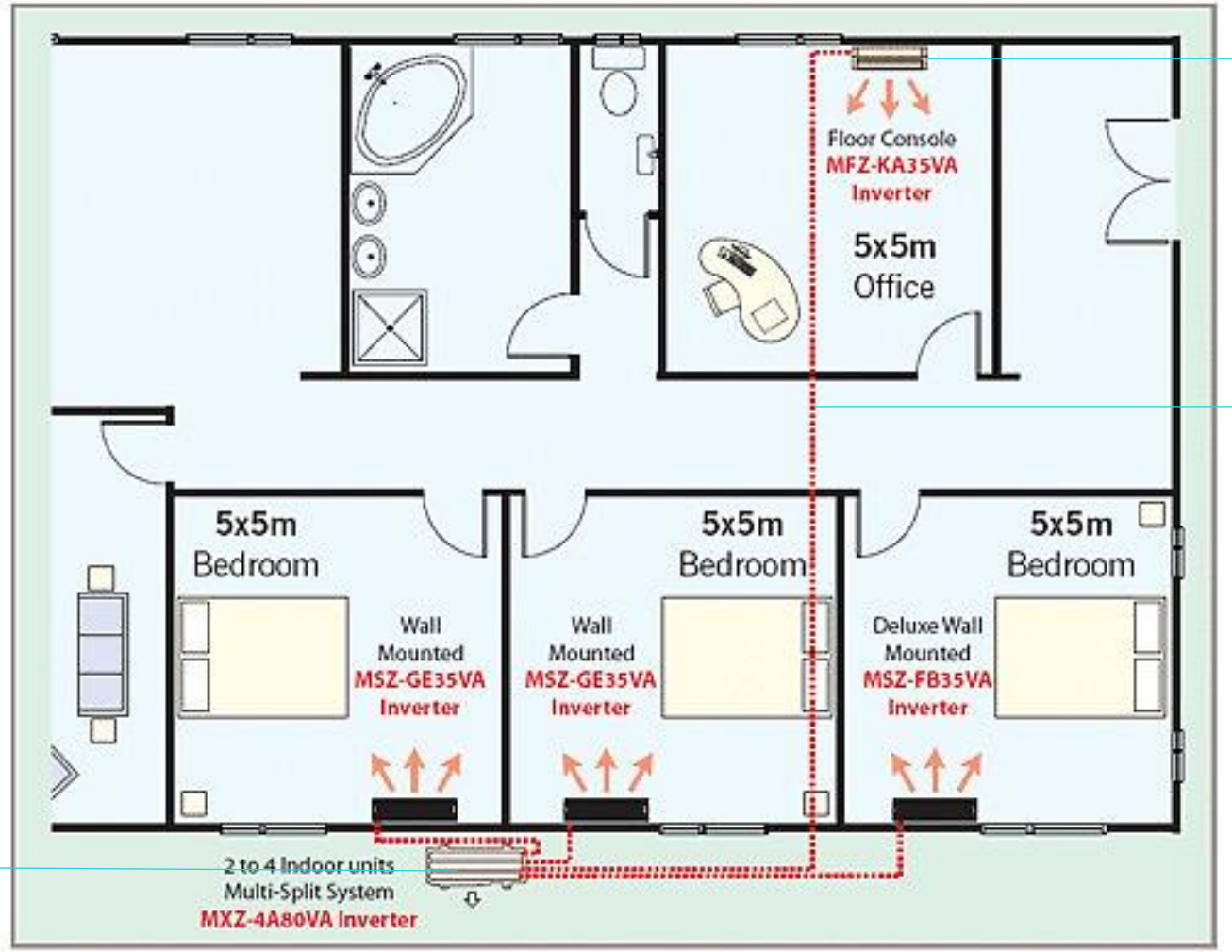
2. MULTI SPLITS SYSTEM

A multi splits air conditioning system operates on the same principles as a split type air conditioning system, but there are **‘multiple’ indoor units** connected to one outdoor condensing unit.

There is no need for ductwork installation but, major disadvantage of this system that its **inability to provide individual control.**

AIR-CONDITIONING SYSTEM

2. MULTI SPLITS SYSTEM



INDOOR UNIT

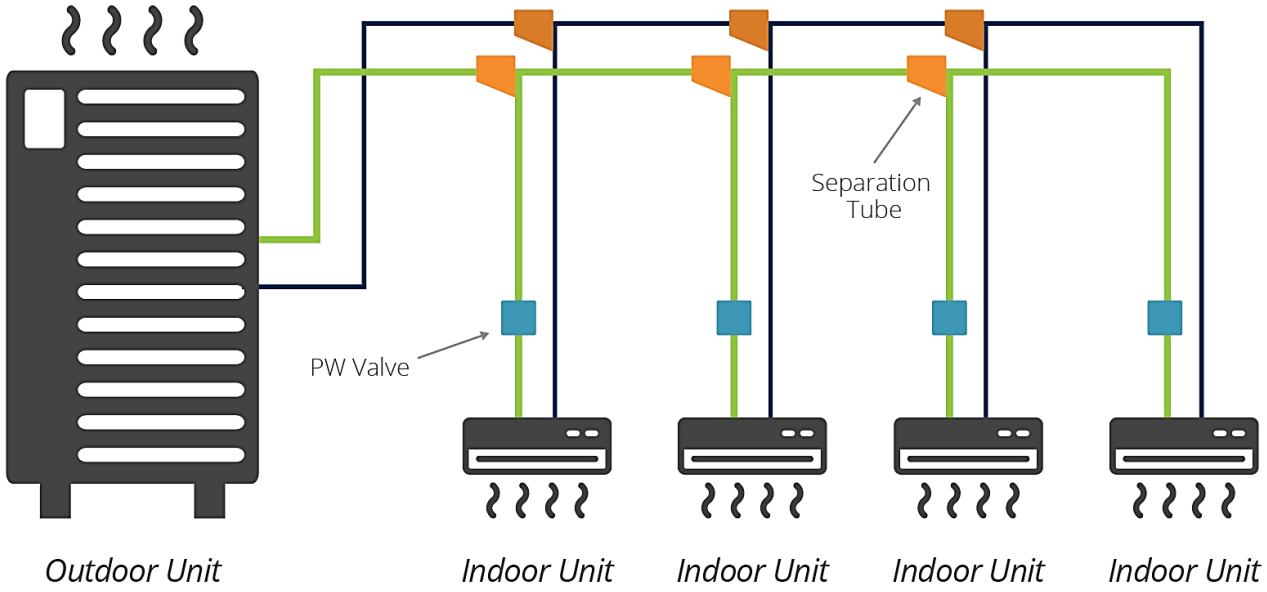
PIPEWORKS

OUTDOOR UNIT

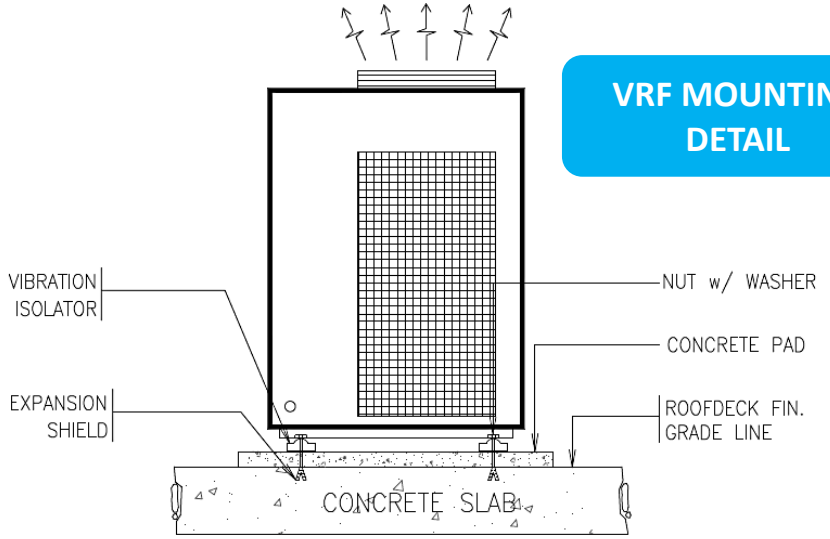
AIR-CONDITIONING SYSTEM

3. VARIABLE REFRIGERANT FLOW (VRF) SYSTEM

VRF system is similar to the multi-split systems, which connect one outdoor unit to several indoor units.



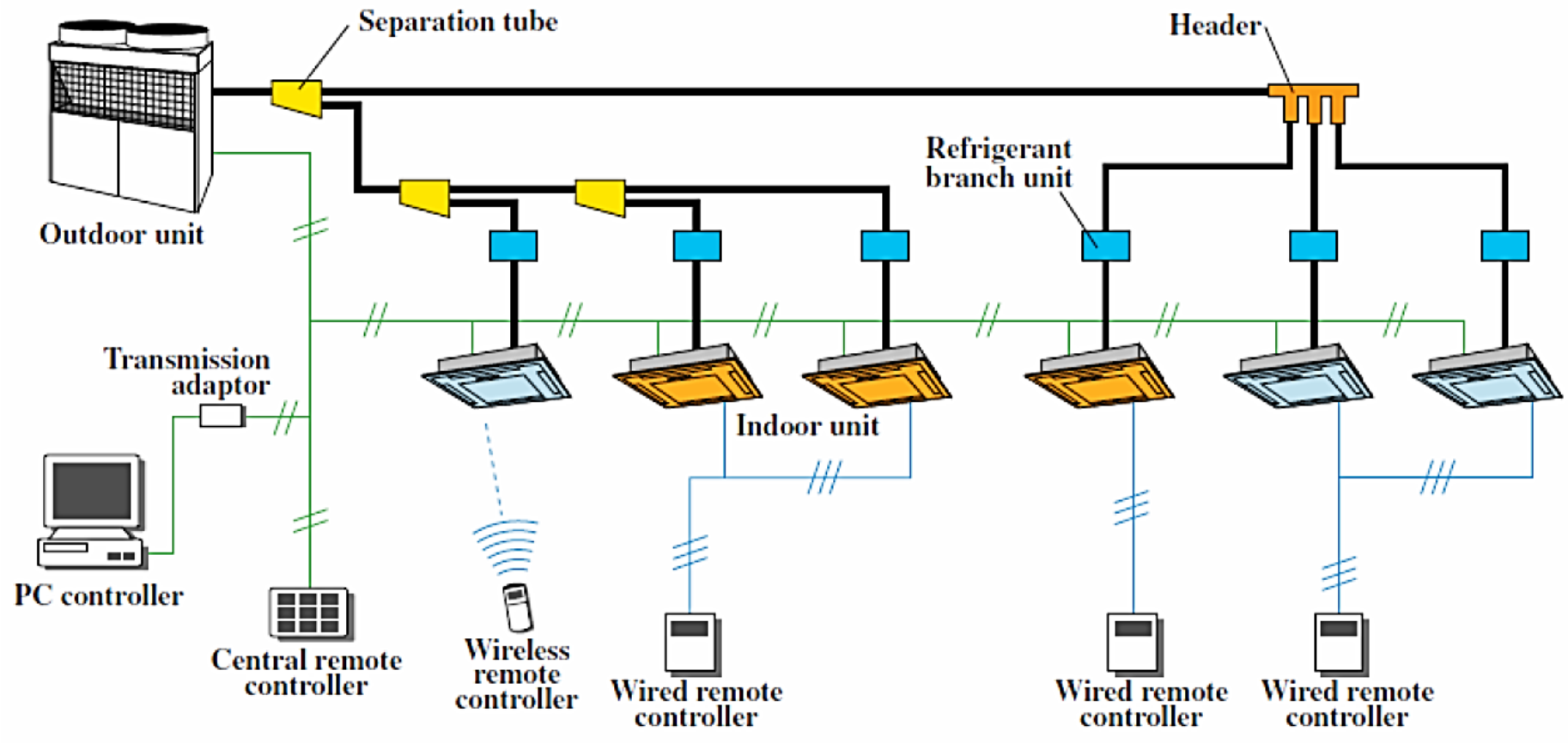
VRF MOUNTING DETAIL



However, multi-split systems turn OFF or ON completely in response to one master controller, **whereas VRF systems continually adjust the flow of refrigerant to each indoor units**.

AIR-CONDITIONING SYSTEM

3. VARIABLE REFRIGERANT FLOW (VRF) SYSTEM



Source: Fujitsu

AIR-CONDITIONING SYSTEM

Complex Systems (Most Commonly Used in Commercial/Industrial Buildings)

1. Air-Cooled System

Use ambient air as the condensing medium and fan to move the air over the coil

2. Chilled Water System

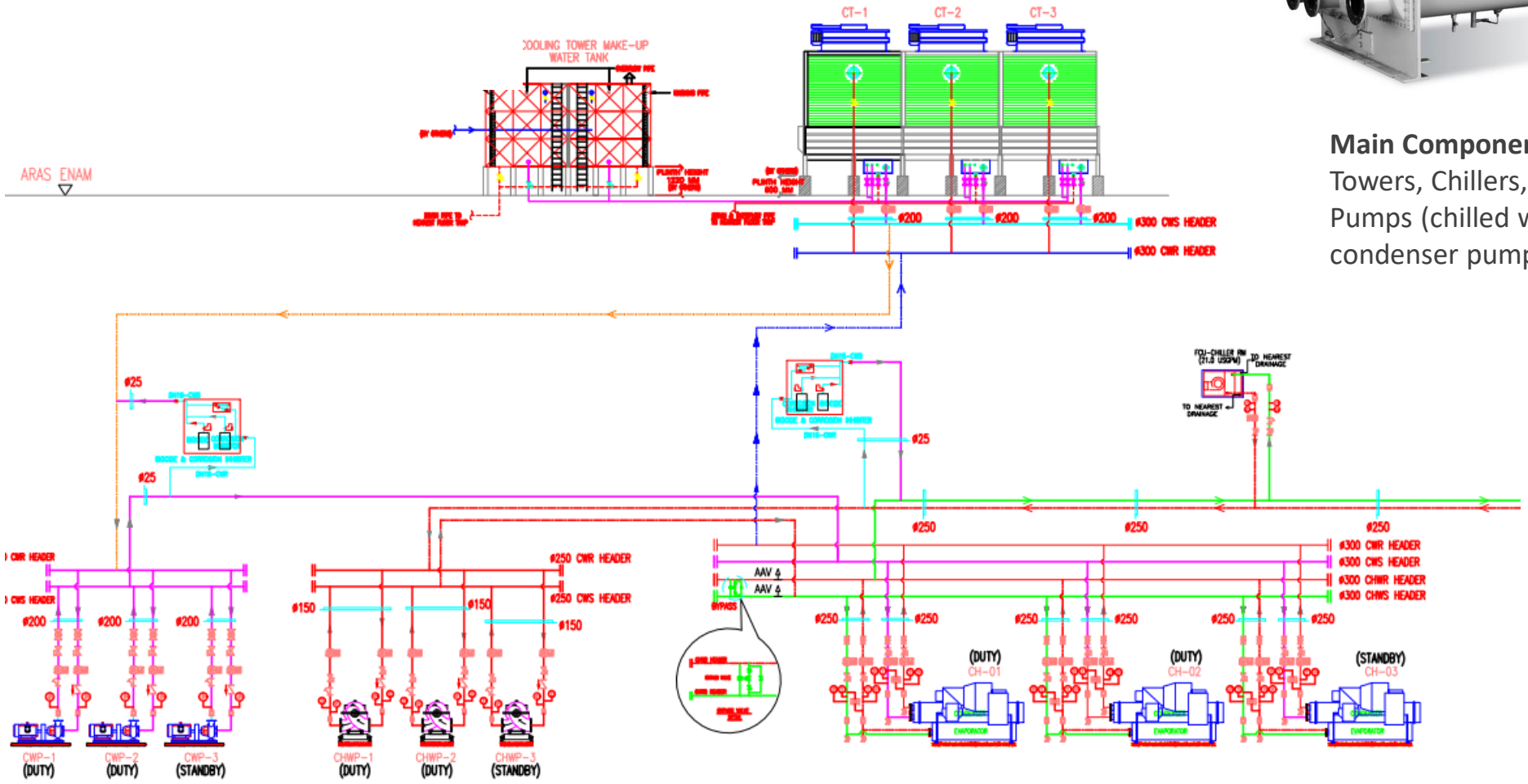
Use water as the condensing medium and a pump to circulate the water through the condenser and out to a cooling tower that rejects the heat to the atmosphere.

Air-Cooled System

Main Components: Indoor Unit (Evaporator), Condenser, Compressor, Expansion Device

Chilled-Water System

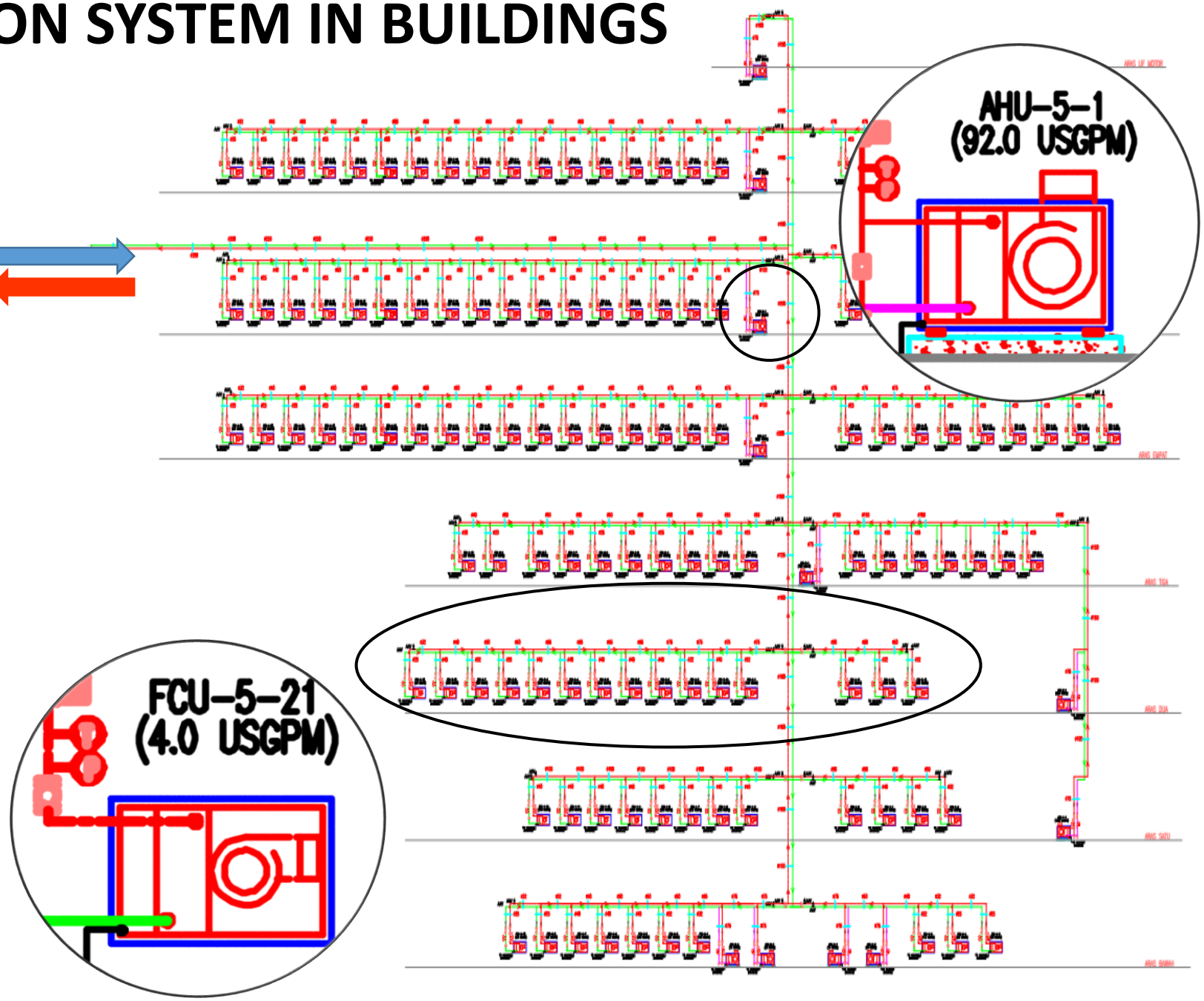
Main Components: Cooling Towers, Chillers, Distribution Pumps (chilled water pumps & condenser pumps)



AIR DISTRIBUTION SYSTEM IN BUILDINGS

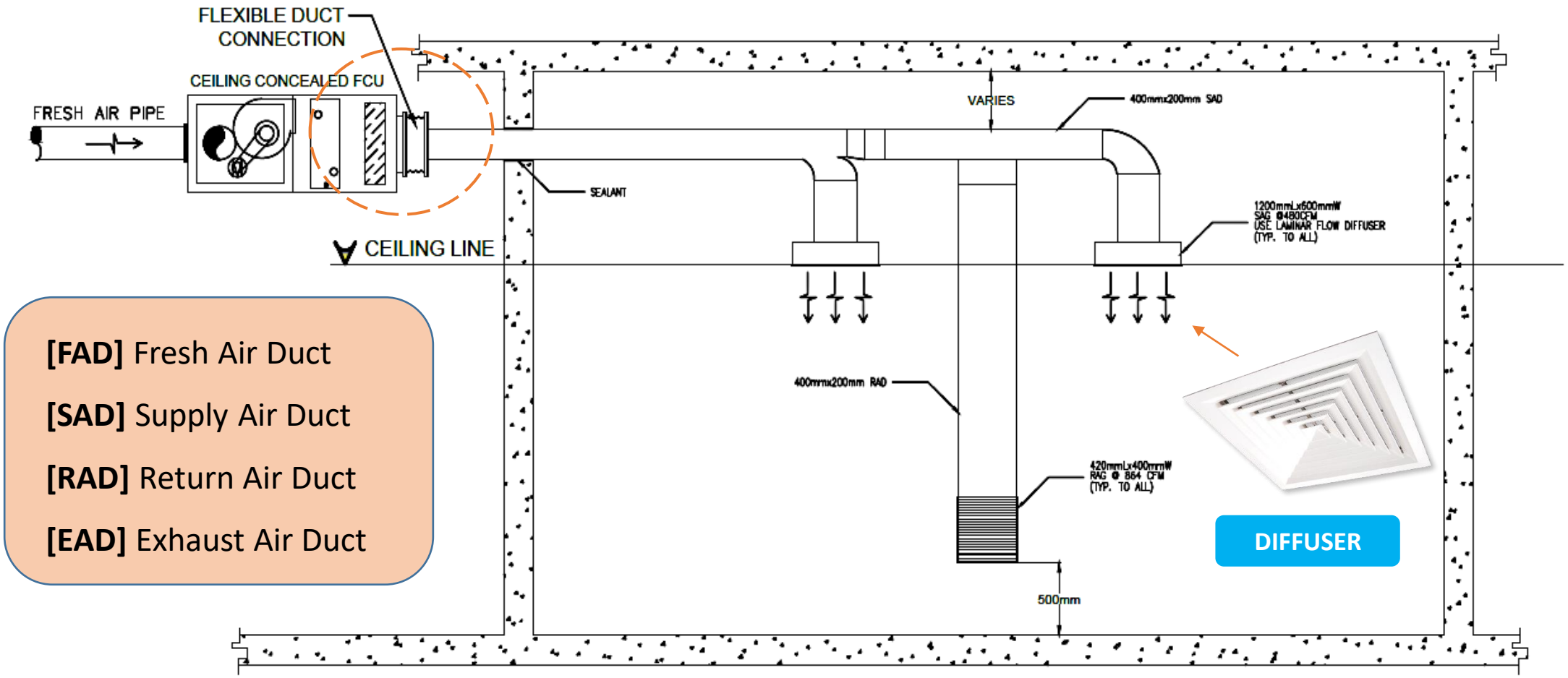
Chilled Air/Water from Air Cooled System or Water Chilled System

Return Air/Water from all FCU and AHU units



So, where is the DUCT?

DUCTWORK



[FAD] Fresh Air Duct

[SAD] Supply Air Duct

[RAD] Return Air Duct

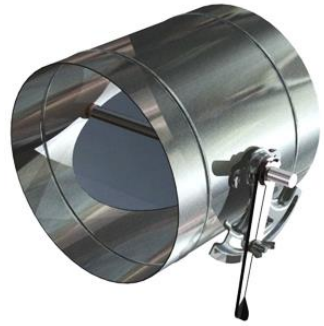
[EAD] Exhaust Air Duct

DUCTWORKS

DUCT ACCESSORIES / ANCILLARIES

AIR GRILLE

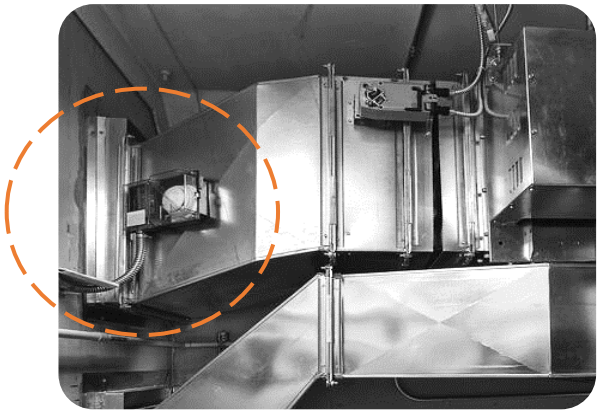
PLENUM BOX



DUCT ACCESS DOOR

DIFFUSER

SILENCER

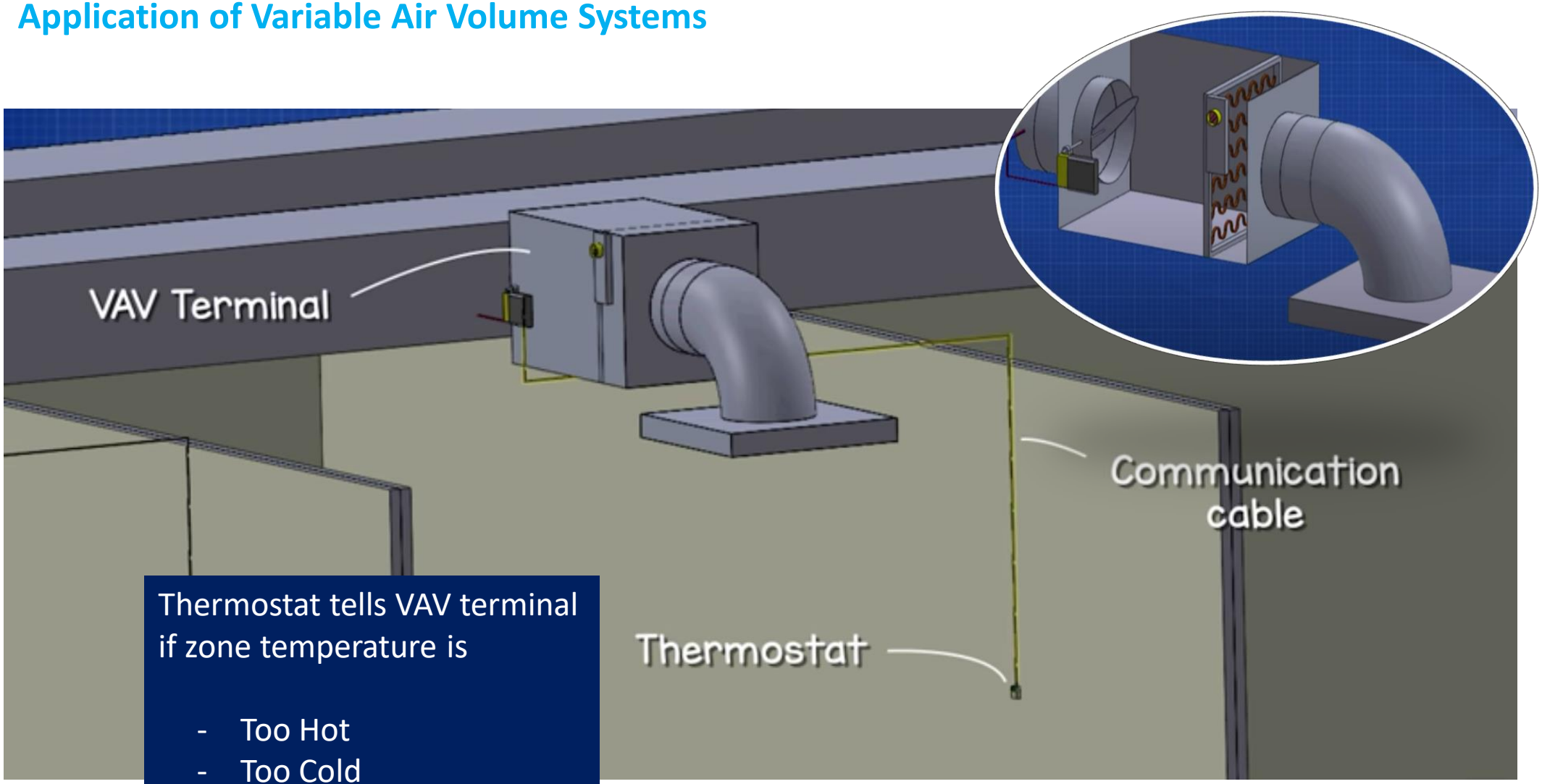


DAMPER

Regulates airflow and redirects it to specific areas

How do we regulate room temperature?

Application of Variable Air Volume Systems

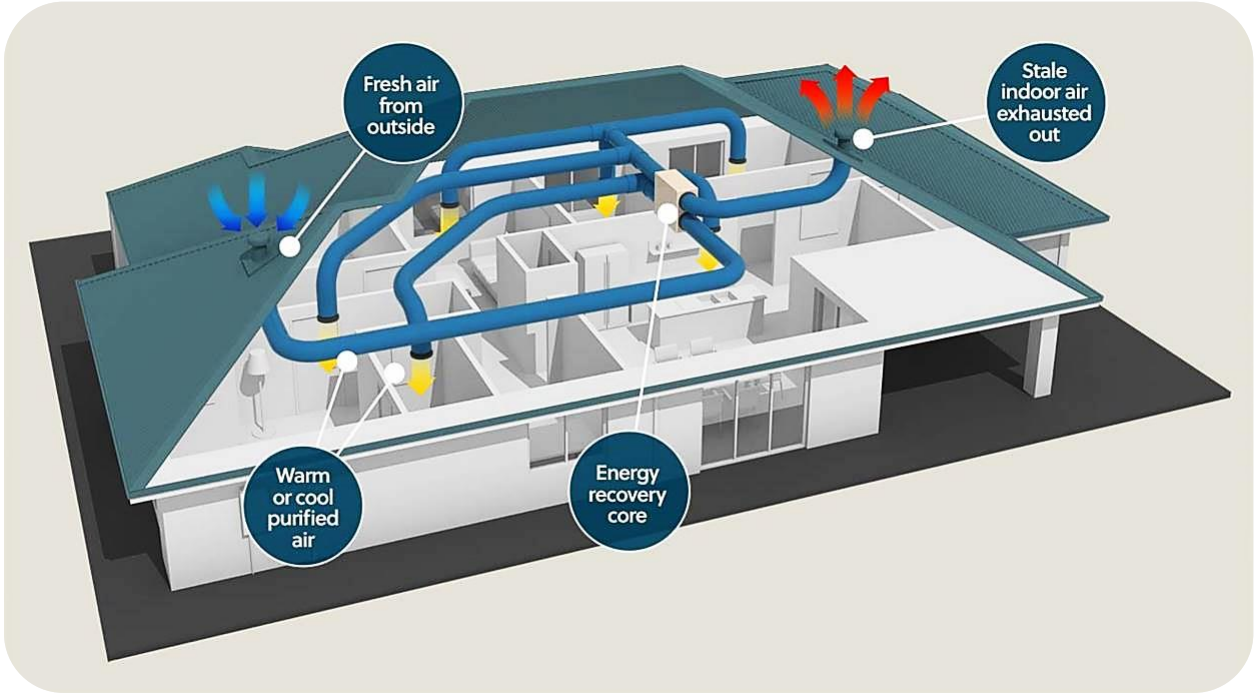


Thermostat tells VAV terminal if zone temperature is

- Too Hot
- Too Cold
- Just Right

MECHANICAL VENTILATION SYSTEM

Mechanical ventilation systems are used to **circulate fresh air** or **extracting stale air** for better indoor air quality. It can also provide filtration, dehumidification, and conditioning of the incoming outside air.



Main components of Mechanical Ventilation System:

- Fan - nr
- Ducts – m / m2
- Control Panel - nr

MECHANICAL VENTILATION SYSTEM

COMMON STANDARDS

- American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
- Air-Conditioning, Heating, and Refrigeration Institute (AHRI / ARI)
- The Institute of Electrical and Electronics Engineers (IEEE)
- Australian Standards 1668
- Others: ASME, UL, CSA, local fire department requirements, etc.

MECHANICAL VENTILATION SYSTEM

TYPE OF SYSTEM

1. Exhaust Fan
2. Smoke Spill System
3. Pressurisation Fan System
4. Jet Fan

MECHANICAL VENTILATION SYSTEM

1. EXHAUST FAN

Exhaust fan is used to **pull excess moisture** and **unwanted odors out** of a particular room or area.

INDUSTRIAL EXHAUST FAN

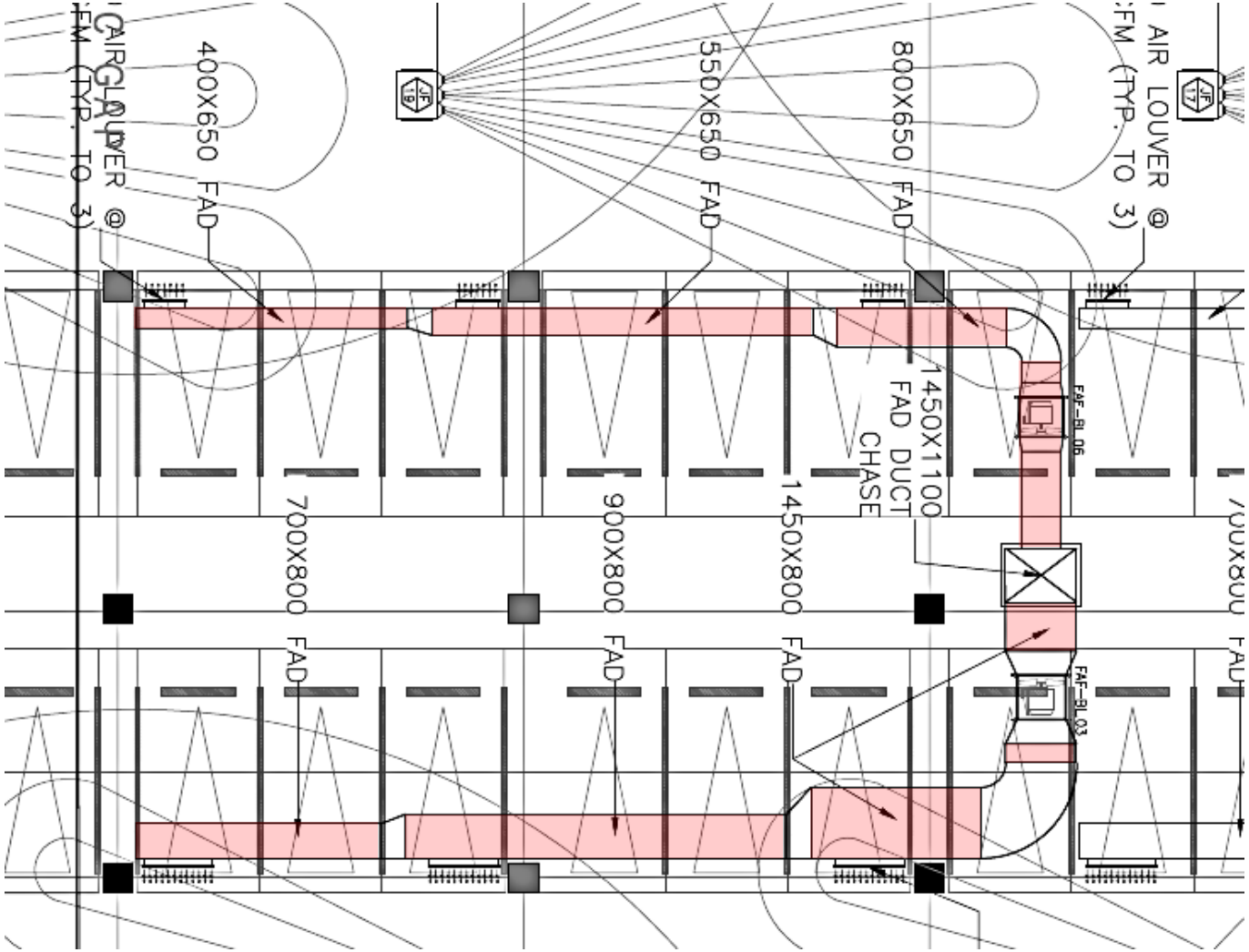
MECHANICAL VENTILATION SYSTEM

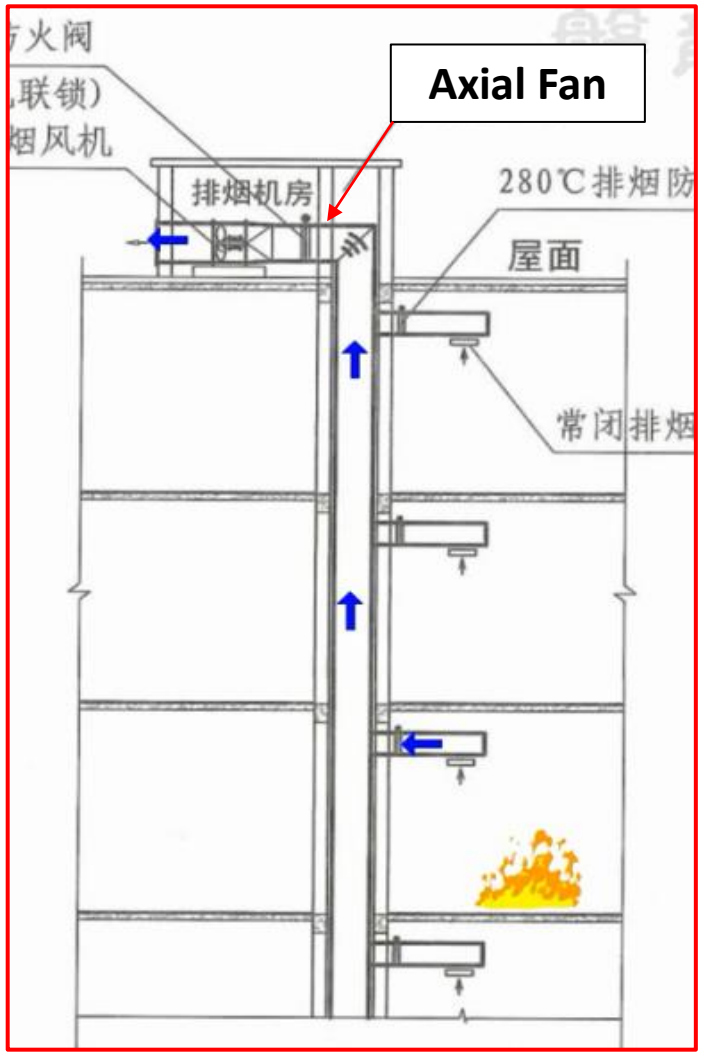
2. SMOKE SPILL SYSTEM

Smoke spill system / smoke ventilation system is designed to **control the movement of smoke during a fire** and must conform to strict standards. These fans must be capable of withstanding high temperatures for short periods of time.

AXIAL FAN

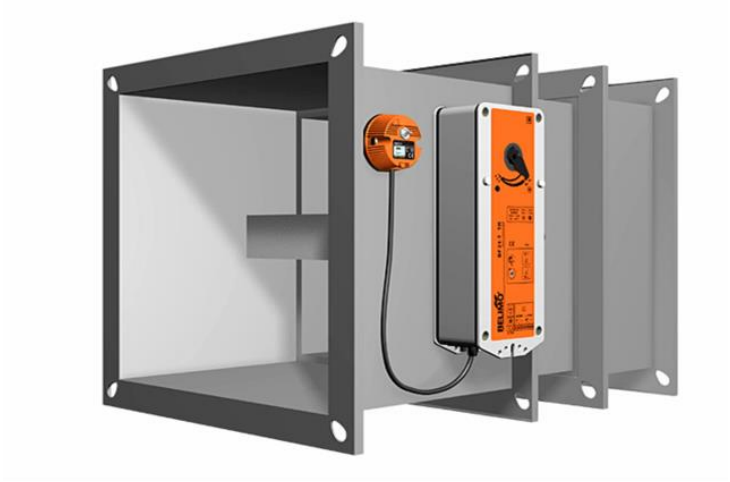
The system shall be **activated by smoke detectors** located in the smoke control zone or **operate automatically** upon detection of smoke. Use of smoke detectors for activation must be carefully designed so that accidental or premature activation of smoke detectors on a non-fire zone due to smoke spills.





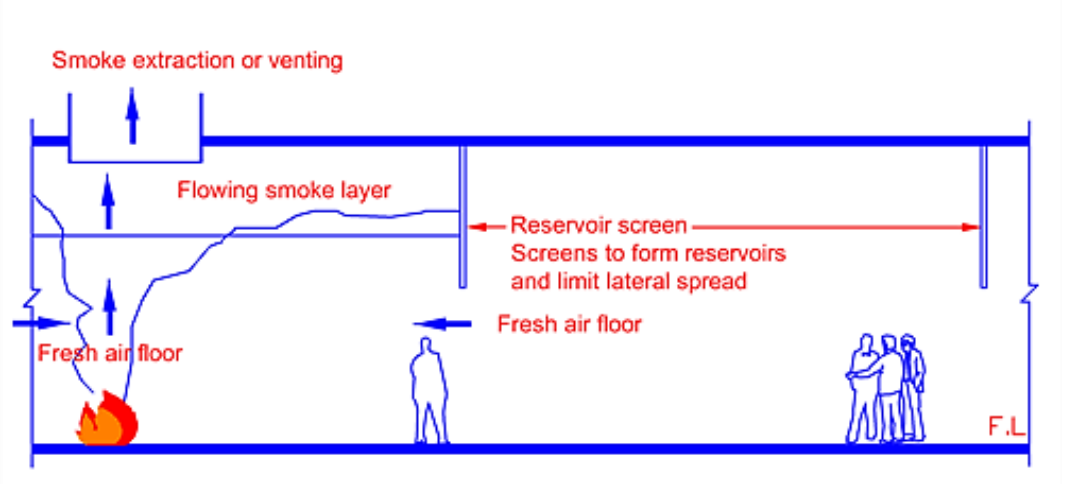
MECHANICAL VENTILATION SYSTEM

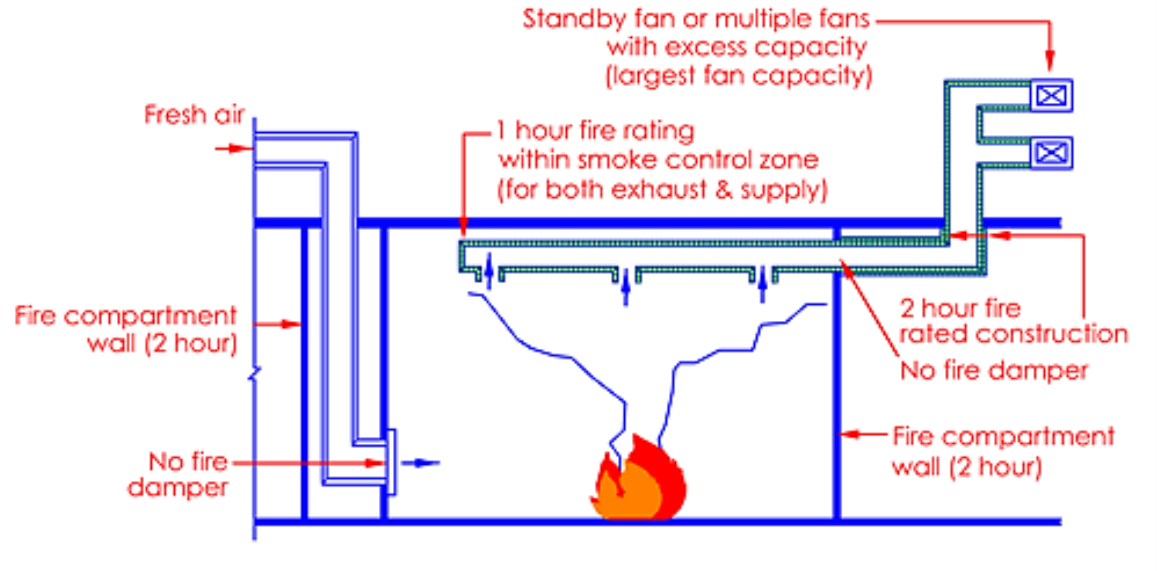
2. SMOKE SPILL SYSTEM



FIRE DAMPER

Prevents the spread of fire through HVAC ducts, which helps to stop a fire from spreading throughout the rest of areas. It also helps to prevent smoke from traveling through the building's ductwork in the event of fire.





**Source: Singapore Civil Defence Force (SCDF)*

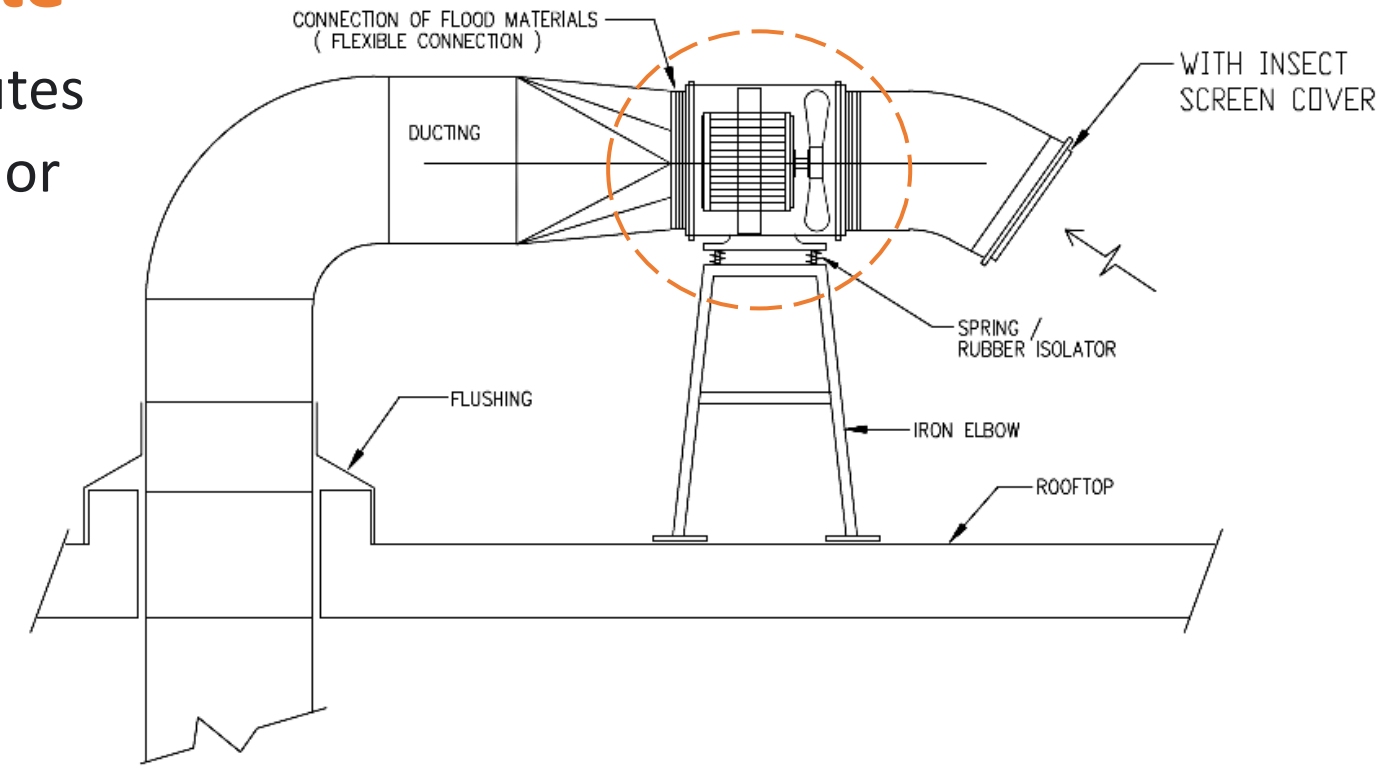
MECHANICAL VENTILATION SYSTEM

3. PRESSURISATION FAN SYSTEM

A **pressurisation system** is intended to prevent smoke leaking through closed doors / **create smoke free escape** routes through stairs, elevator shaft or any designated shaft.

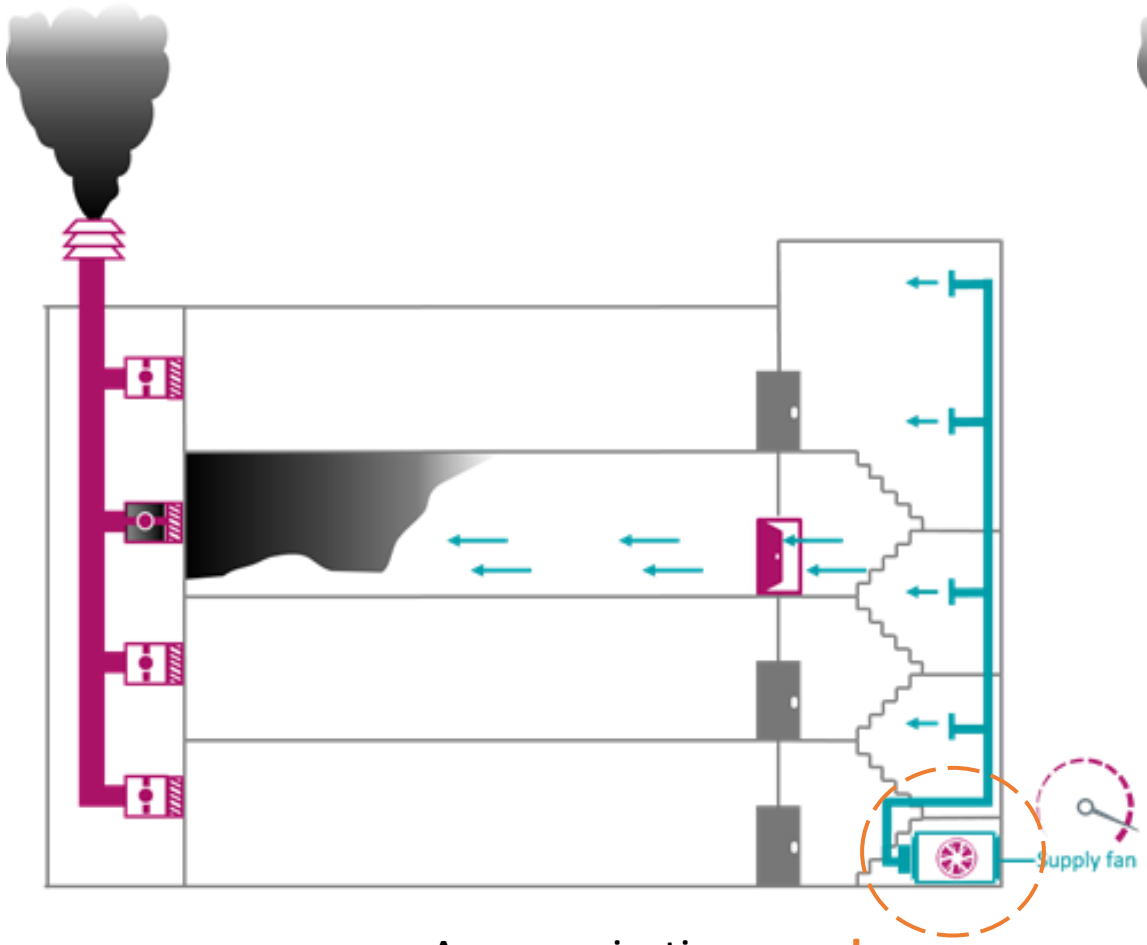
PRESSURISATION FAN

Tube Axial Fan connected with ductwork



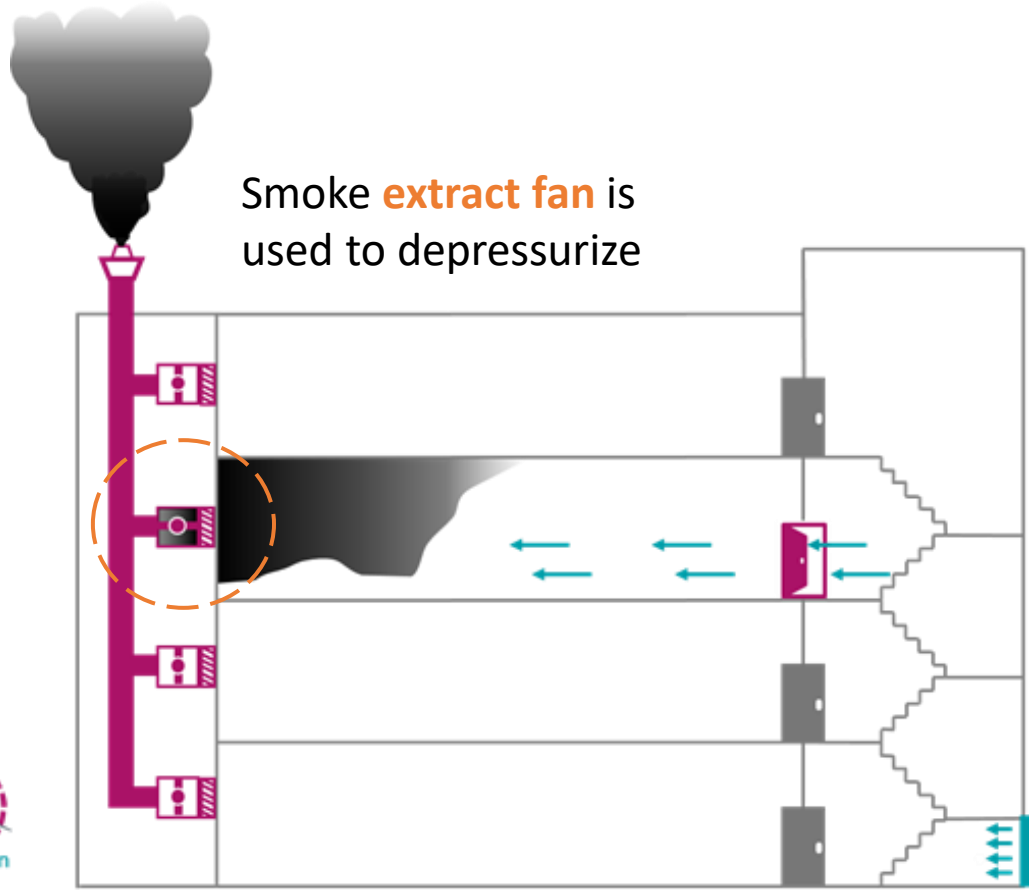
MECHANICAL VENTILATION SYSTEM

3. PRESSURISATION FAN SYSTEM



A pressurisation **supply fan** is used to pressurize the protected space

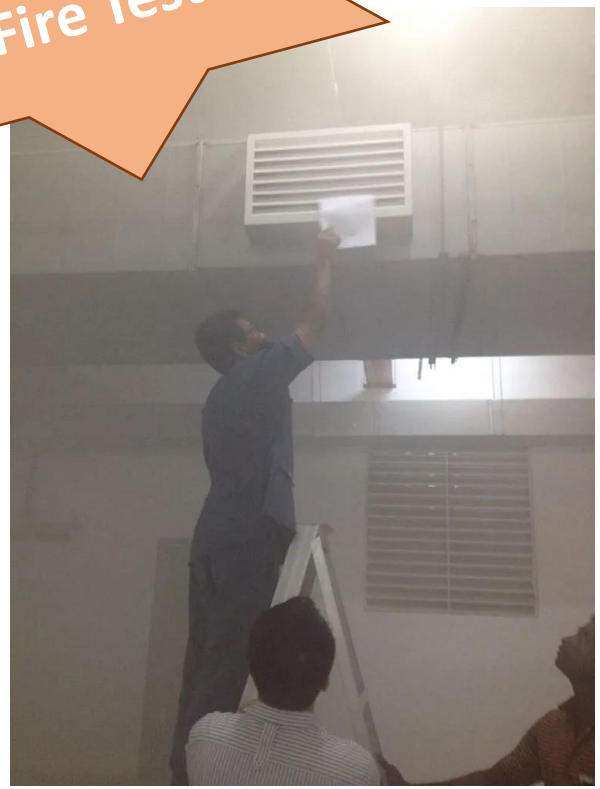
Smoke **extract fan** is used to depressurize



**Source: Novenco*

MECHANICAL VENTILATION SYSTEM

SMOKE SPILL & PRESSURIZATION FAN SYSTEM



Fire Test

Strict compliance required

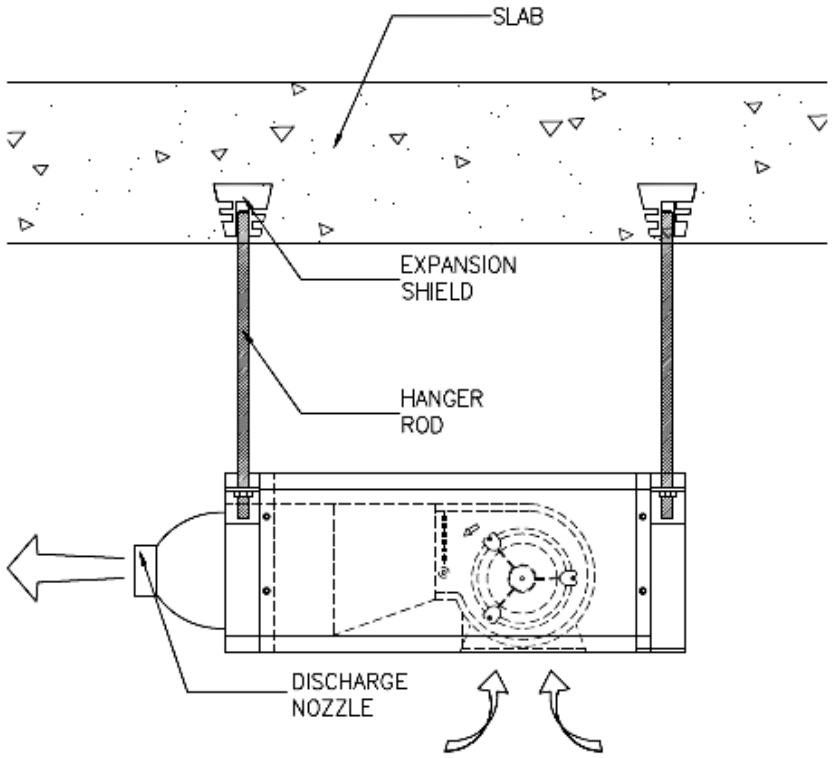
- Fire-rated fan motors
- Fire-rated power cables
- Fire-rated smoke spill duct
- Fire-rated dampers

MECHANICAL VENTILATION SYSTEM

4. JET FAN

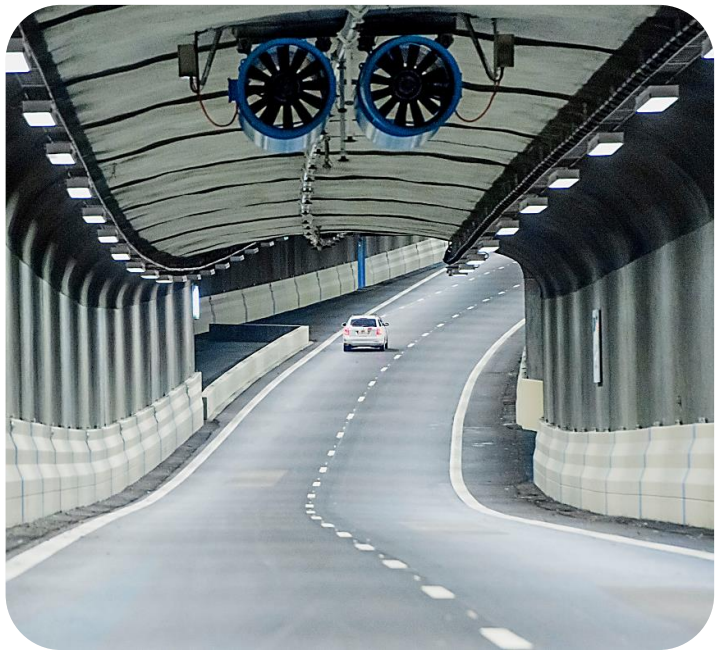
Jet fan support the natural flow between the supply air and extract air zones. They **provide motion** in regions with low air speeds, thus guaranteeing the daily ventilation requirement for all areas.

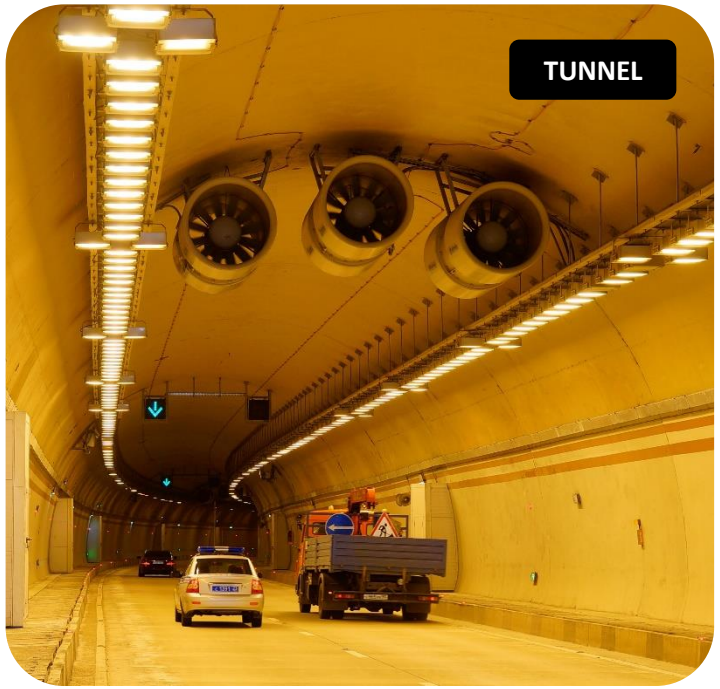
DETAIL INSTALLATION

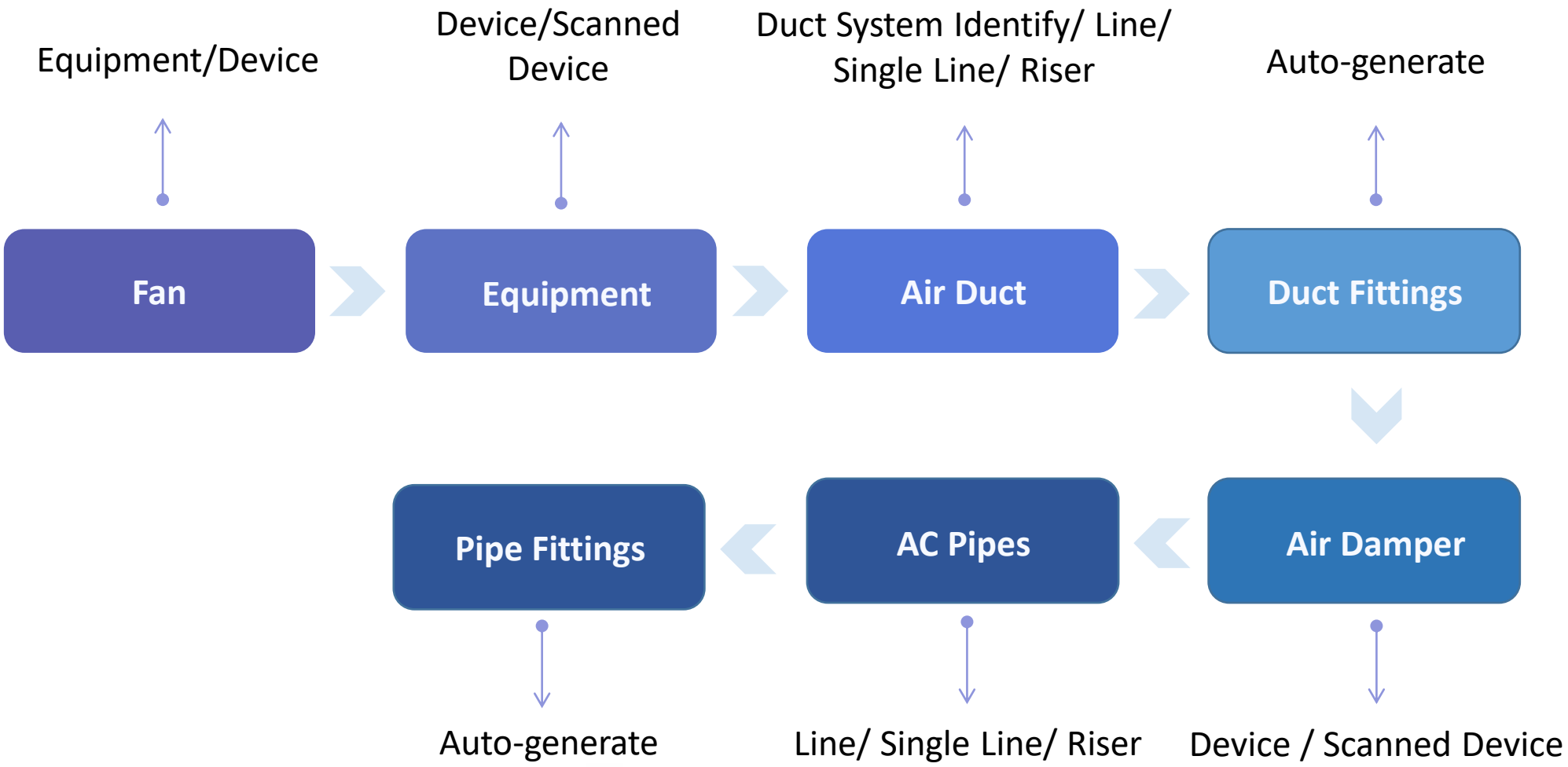


Typically, it can be found at the indoor or **underground car parks**, **tunnels**, subway, etc.


INDOOR CAR PARK
Store Entrance



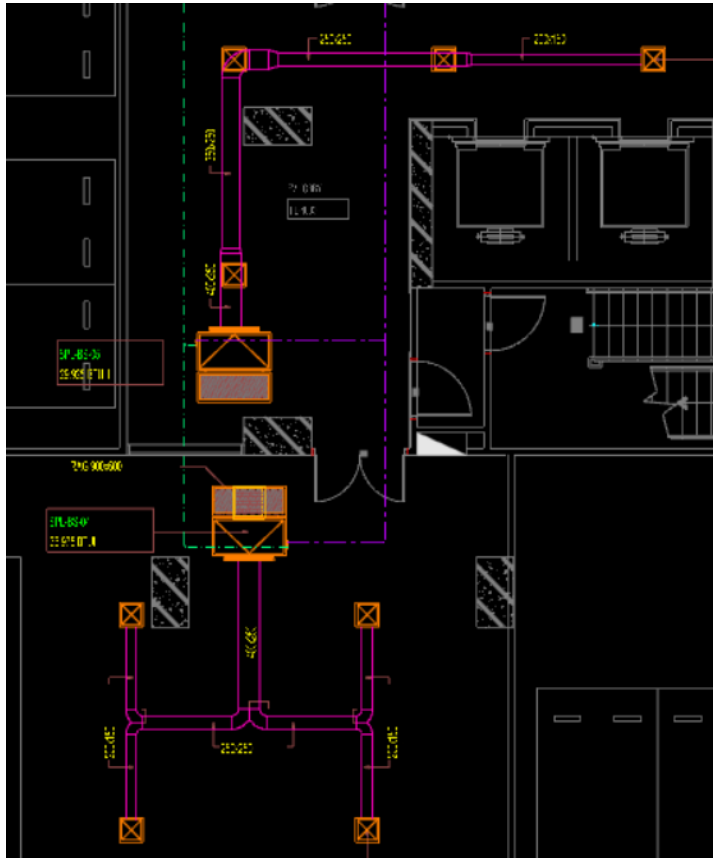

TUNNEL


Equipment/Device
Device/Scanned Device
Duct System Identify/ Line/ Single Line/ Riser
Auto-generate
Fan
Equipment
Air Duct
Duct Fittings
Air Damper
AC Pipes
Pipe Fittings
Auto-generate
Line/ Single Line/ Riser
Device / Scanned Device

Key Learnings

- Equipment Identification – Identify Same Fan Sequence
- Device Identification of Equipment without Sequence
- Air Duct System Identification
- Identify Air Dampers
- Lay AC Pipes

- BQ Generation
- Separate Air Duct Quantity According to Vent Equipment

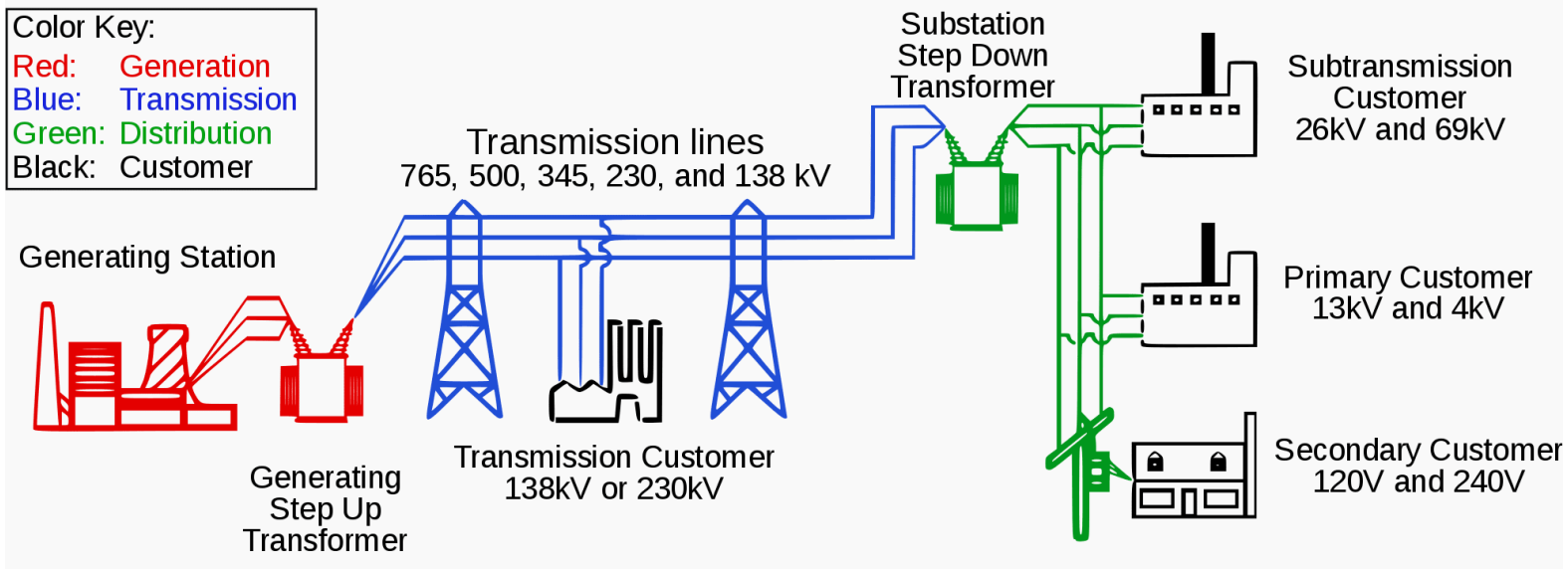


Electrical Walkthrough

1. Electrical Power Systems
2. Cable Management
3. Drawing Knowledge
4. Lightning Protection & Grounding
5. Software Walkthrough

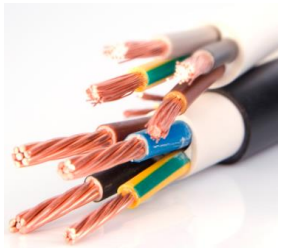
Electric Power System

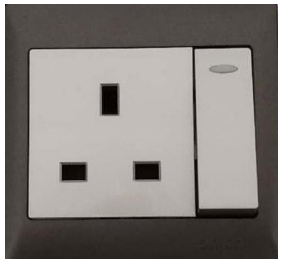
An **Electric Power System** is a network of electrical components deployed to supply, transfer, and use electric power. An example of a power system is the ”electrical grid” that provides power to homes and industry within an extended area. The electrical grid can be broadly divided into the ”generators” that supply the power, the ”transmission system” that carries the power from the generating centers to the load centers, and the ”distribution system” that feeds the power to nearby homes and industries. Smaller power systems are also found in industry, hospitals, commercial buildings and homes. The majority of these systems rely upon ”three-phase AC power” the standard for large-scale power transmission and distribution across the modern world. Specialized power systems that do not always rely upon three-phase AC power are found in aircraft, electric rail systems, ocean liners, submarines and automobiles.

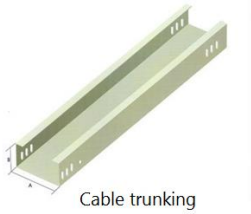


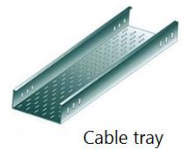
Main Components

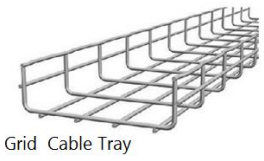
- Transformers – Nr (Capacity)
- Generators – Nr (Capacity)
- Switch Gears – Nr (Capacity)
- Switch Boards (MSB,SSB,DB) – Nr (Size & Capacity)
- Power Sockets – Nr
- Switches - Nr
- Fixtures – Nr
- Tray/Trunk/Ladder/Bus Duct – Meters
- Conduits – Meters
- Cable/Wire – Meters





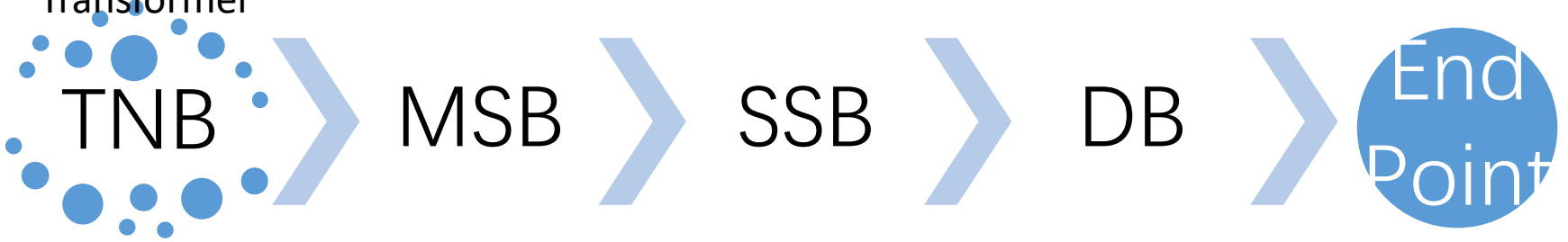






General Arrangement

- Switch Gear
- Transformer



(Power Sub-Station)

- SSO/Equipment
- Lighting Fixtures

Electrical Outdoor

Installation/Laying Methods

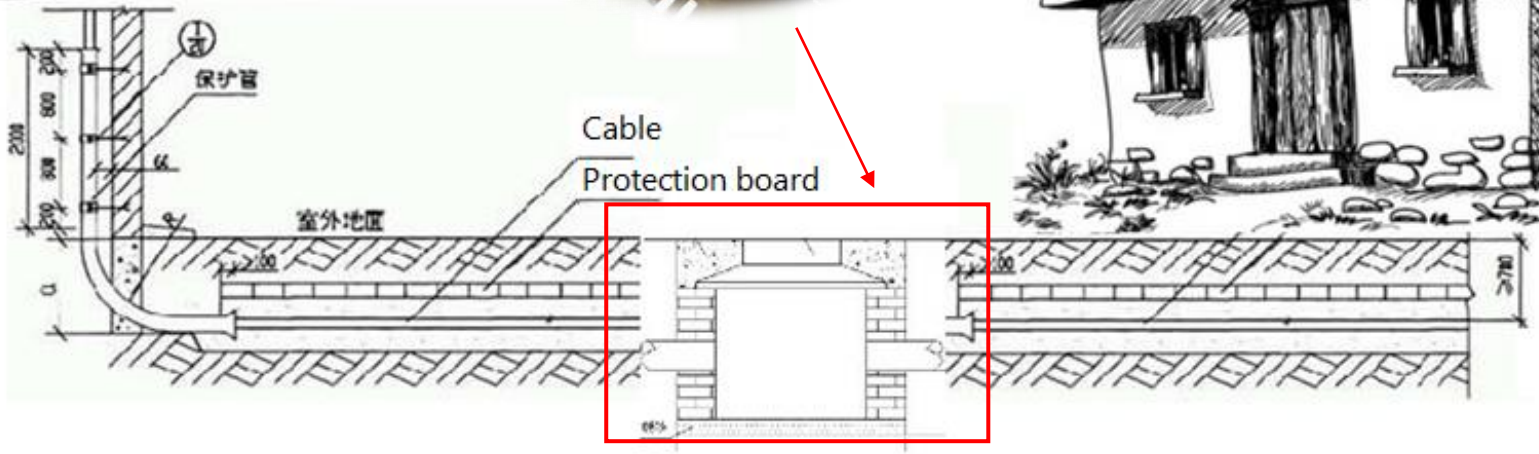
Underground Cable

Overhead Cable

Electrical Outdoor

Installation/Laying Methods

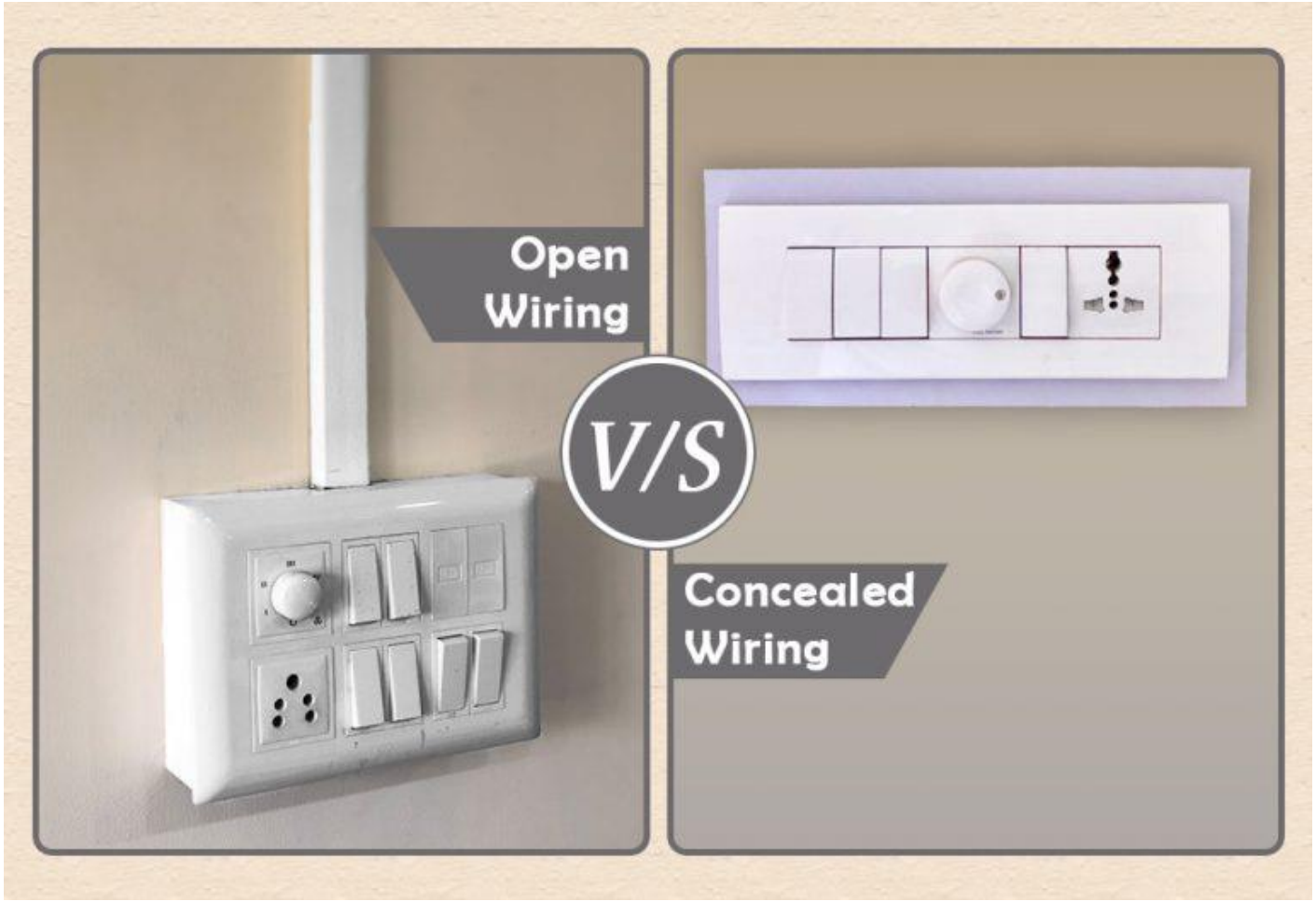
Box-type substation



Electricity shaft

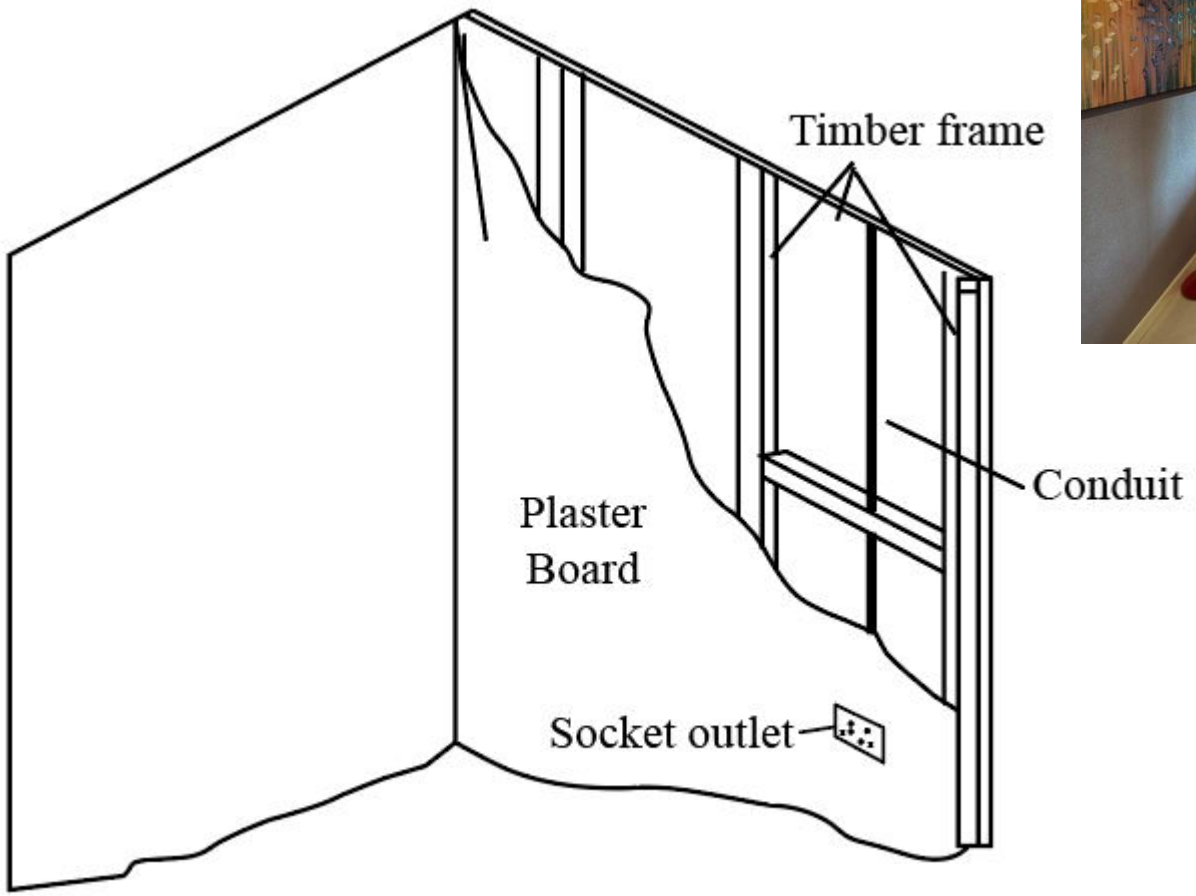
Electrical Indoor

Installation/Laying Methods



Electrical Indoor

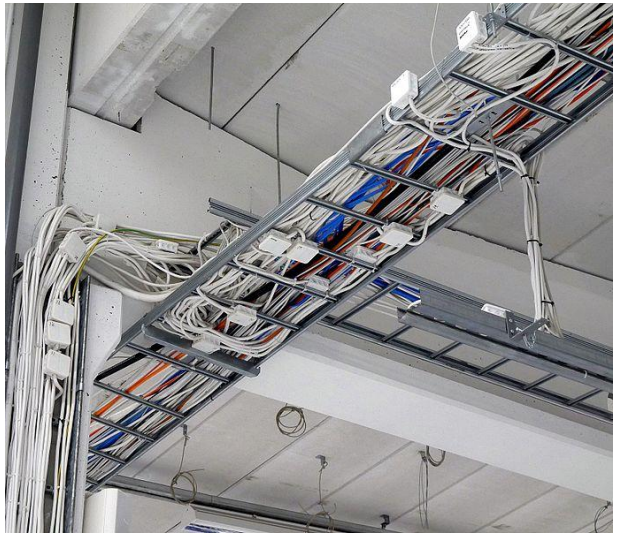
Concealed Wiring



Cable Management

Cable Supports/Fixtures

Conduit



Cable Tray

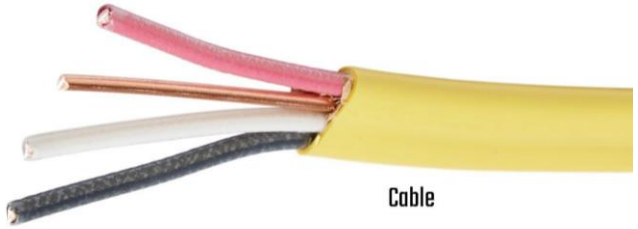
Trunking

Cable Management

Cable vs Wires

Electrical Cables

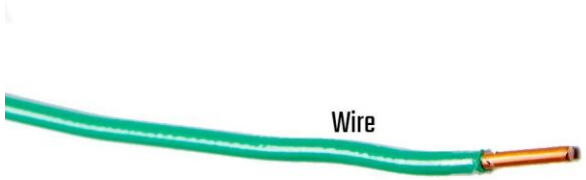
- Quantity of Electrical Cables are calculated as **one cable packet** as the length drawn.



4-core cable

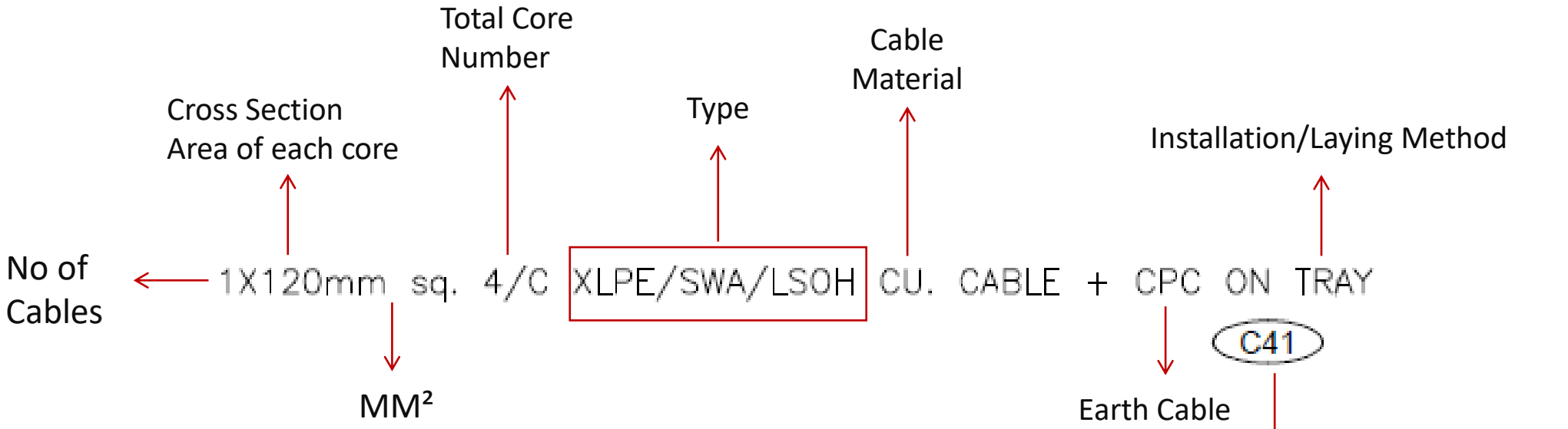
Electrical Wires

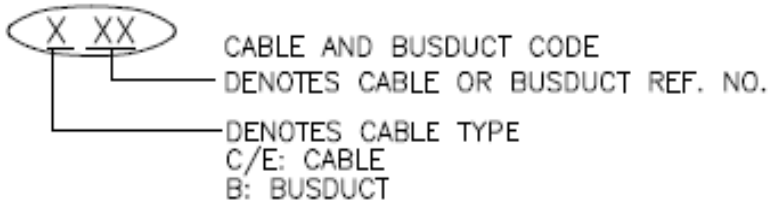
- Quantity of Electrical Wires are calculated according to the quantity of **each wire** specified in the wire specification



Drawing Knowledge

Cable Specification





Drawing Knowledge

Wire Specification

Cross Section Area

Type

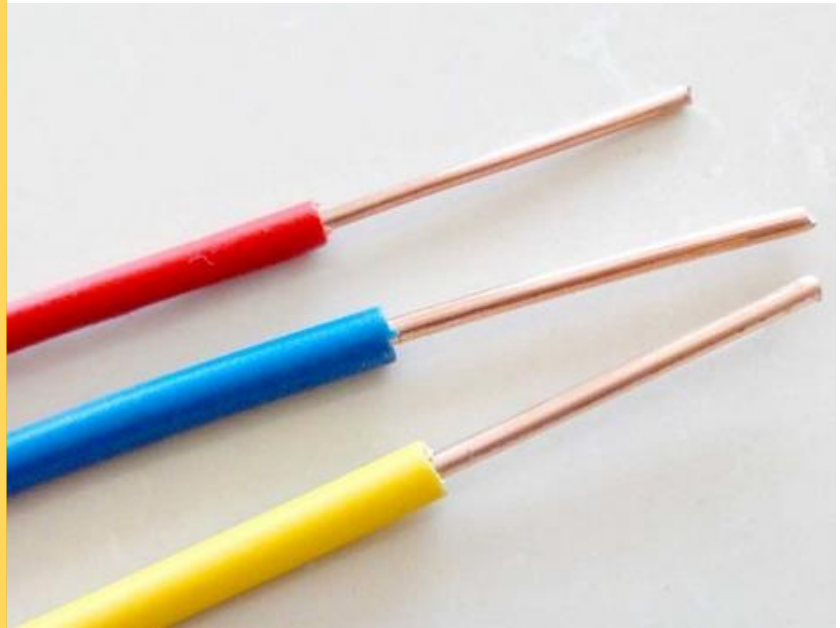
Material

Core/number of wires

2X2.5mm sq. 1/C F.R. CU. CABLE
+ CPC IN CONDUIT/TRUNKING

Earth Wire

Installation/Laying Method



Drawing Knowledge

Design Standards

- IEC 60364
- BS 7671 (CIBSE)
- MS IEC 60364/MS 1979
- NFPA (for Electrical room Design)
- JKR Standards for Installation

Drawing Knowledge

Commonly Used Drawings

- Floor plan layouts (Power and Lighting etc.)
- Schematics/Single Line Diagram
- Section views and Detail diagrams

Drawing Knowledge

Layout Drawings

	LIGHTING LAYOUT	
1	PKSB/2020/E/LTG-301	PELAN ARAS BASEMENT 3
2	PKSB/2020/E/LTG-302	PELAN ARAS BASEMENT 2
3	PKSB/2020/E/LTG-303	PELAN ARAS BASEMENT 1

	SMALL POWER, EV CHARGER & DB LOCATION/ZONING LAYOUT	
1	PKSB/2020/E/SP-401	PELAN ARAS BASEMENT 3
2	PKSB/2020/E/SP-402	PELAN ARAS BASEMENT 2
3	PKSB/2020/E/SP-403	PELAN ARAS BASEMENT 1

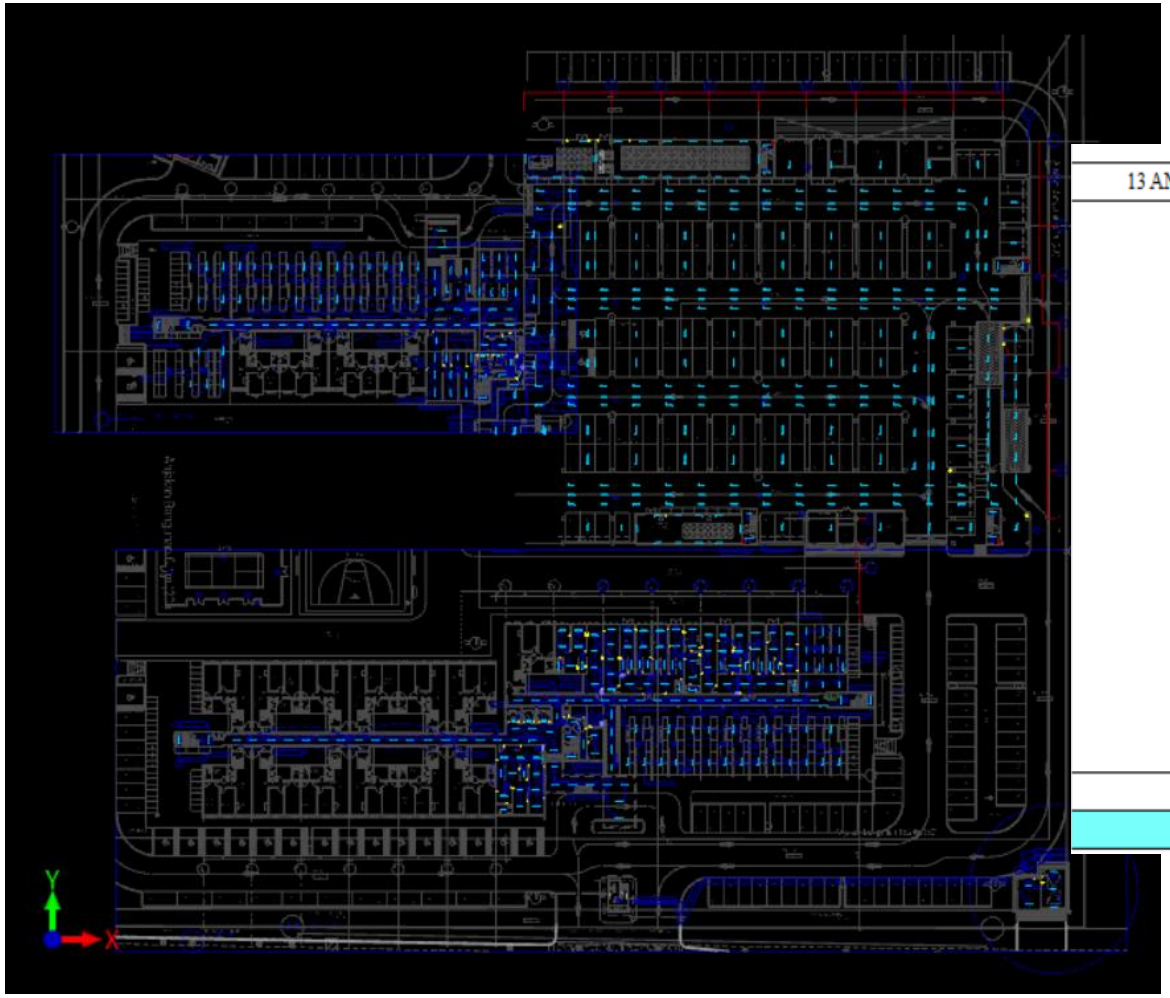
	EARTHING & LIGHTNING PROTECTION SYSTEM LAYOUT	
1	PKSB/2020/E/L&E-500	BASEMENT 3
2	PKSB/2020/E/L&E-501	BASEMENT 3 - TNB ROOM
3	PKSB/2020/E/L&E-502	BASEMENT 2

	TNB & GENSET LAYOUT	
1	PKSB/2020/E/TNB-100	PROPOSED LOCATION TNB 33kV SSU - SHOWING LOCATION OF TNB 33kV SSU ROOM - PIPE SLEEVE ROUTE & MANHOLE LAYOUT
2	PKSB/2020/E/TNB-101	SHOWING LOCATION OF TNB 33kV SSU ROOM
3	PKSB/2020/E/TNB-102	SHOWING LOCATION OF TNB 33kV CABLE CELLAR

	TEL. INFRASTRUCTURE, SDF LAYOUT & DETAILS	
1	PKSB/2020/E/TM-100	- SHOWING LOCATION OF TELEKOM TM SDF ROOM - PIPE SLEEVE ROUTE & MANHOLE LAYOUT
2	PKSB/2020/E/TM-101	SHOWING LOCATION TM SDF ROOM AT BASEMENT 2 FLOOR PLAN

Drawing Knowledge

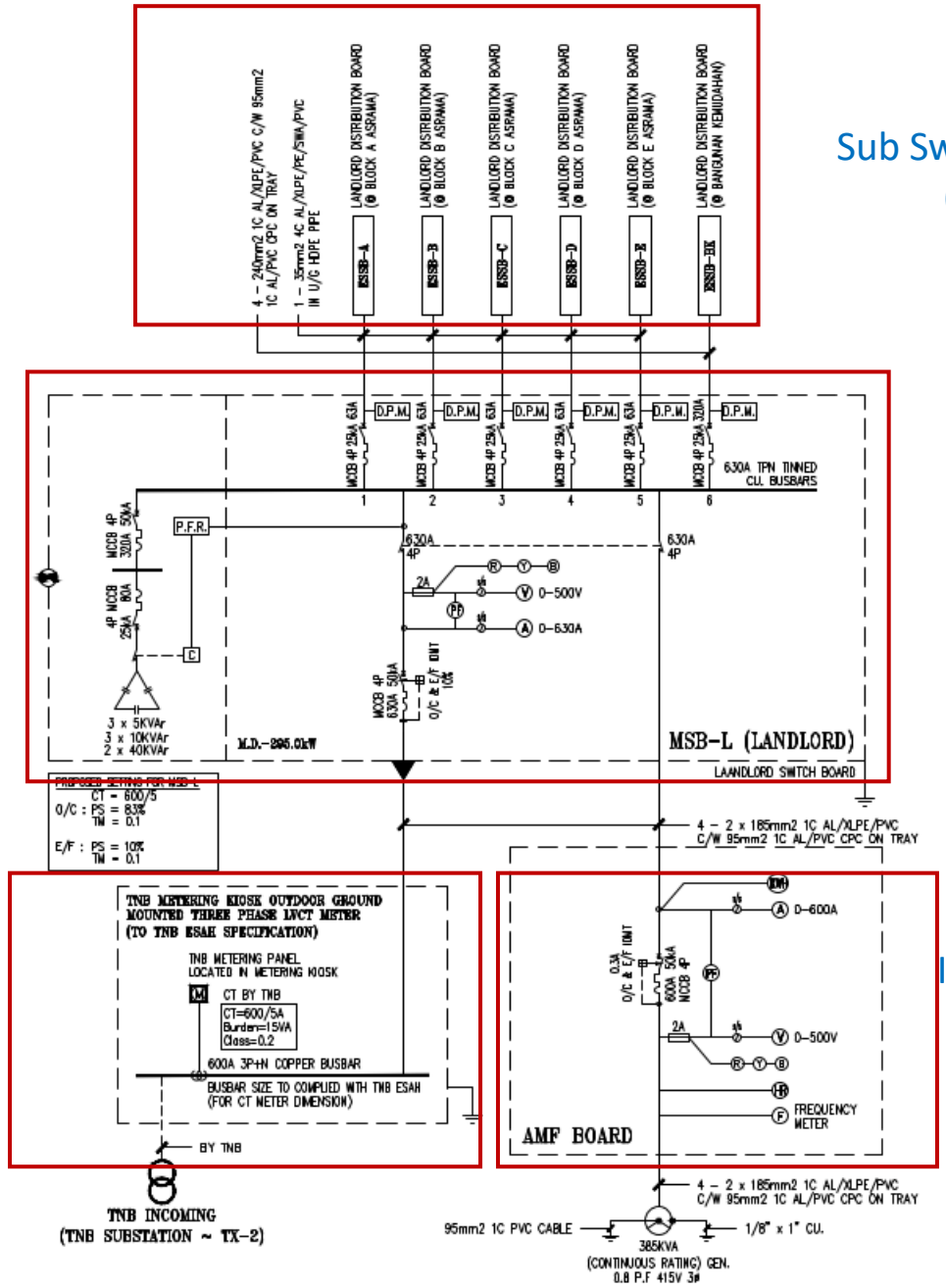
Layout Drawings



13 AMP UNSWITCH SOCKET OUTLET (CEILING MOUNTED TYPE)	GF	4.000
5A 1 GANG 1 WAY PLATE SWITCHES	17F	10.000
	16F	11.000
	15F	11.000
	14F	11.000
	13F	11.000
	12F	11.000
	11F	11.000
	10F	11.000
	9F	11.000
	8F	11.000
	7F	11.000
	5F	12.000
	2F	11.000
	1F	11.000
	GF	60.000
THREE PHASE SUPPLY ISOLATOR	GF	2.000
Total		336.000

Drawing Knowledge

Schematics



Sub Switchboards (SSB)

Main Switchboard (MSB)

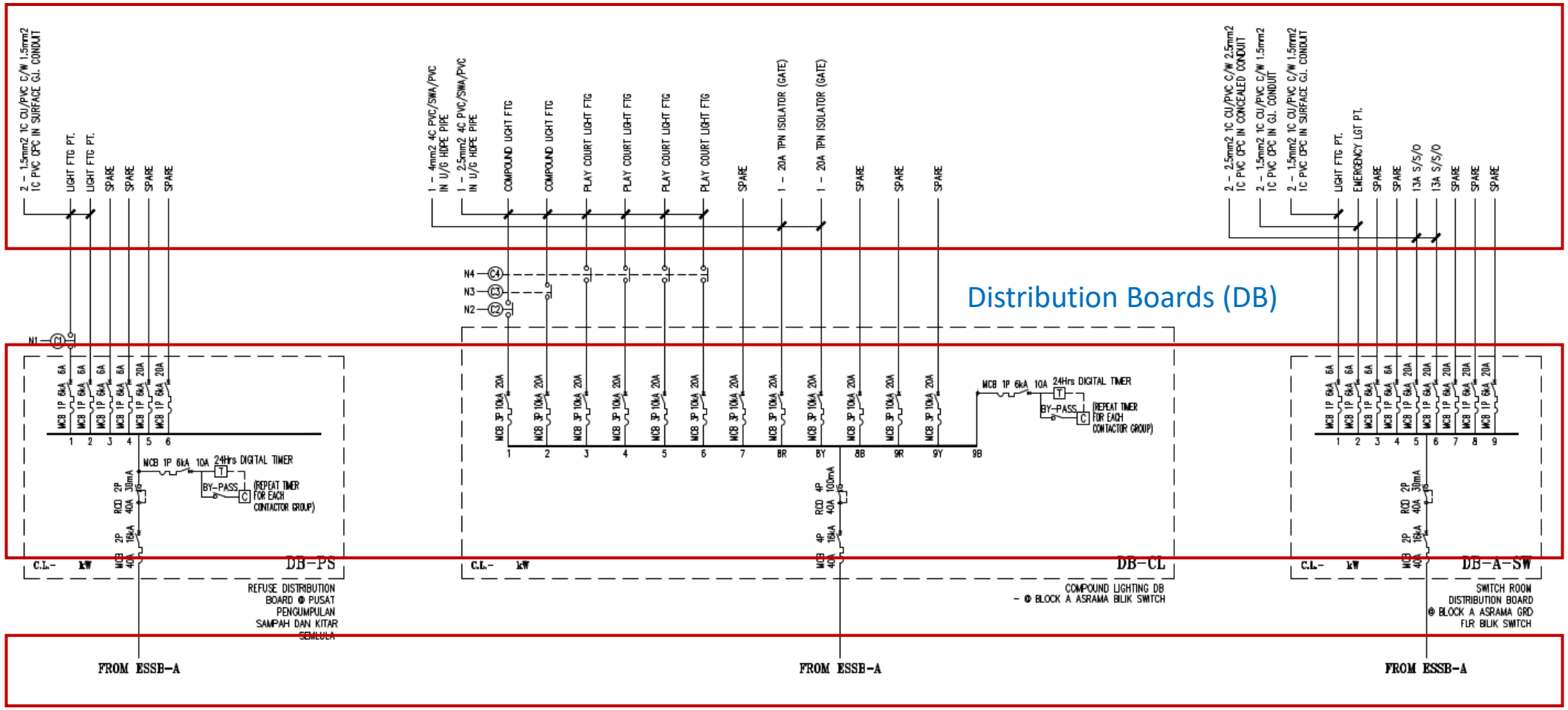
Incoming Power from Substation

Incoming Power from Genset (backup power)

Drawing Knowledge

Schematics

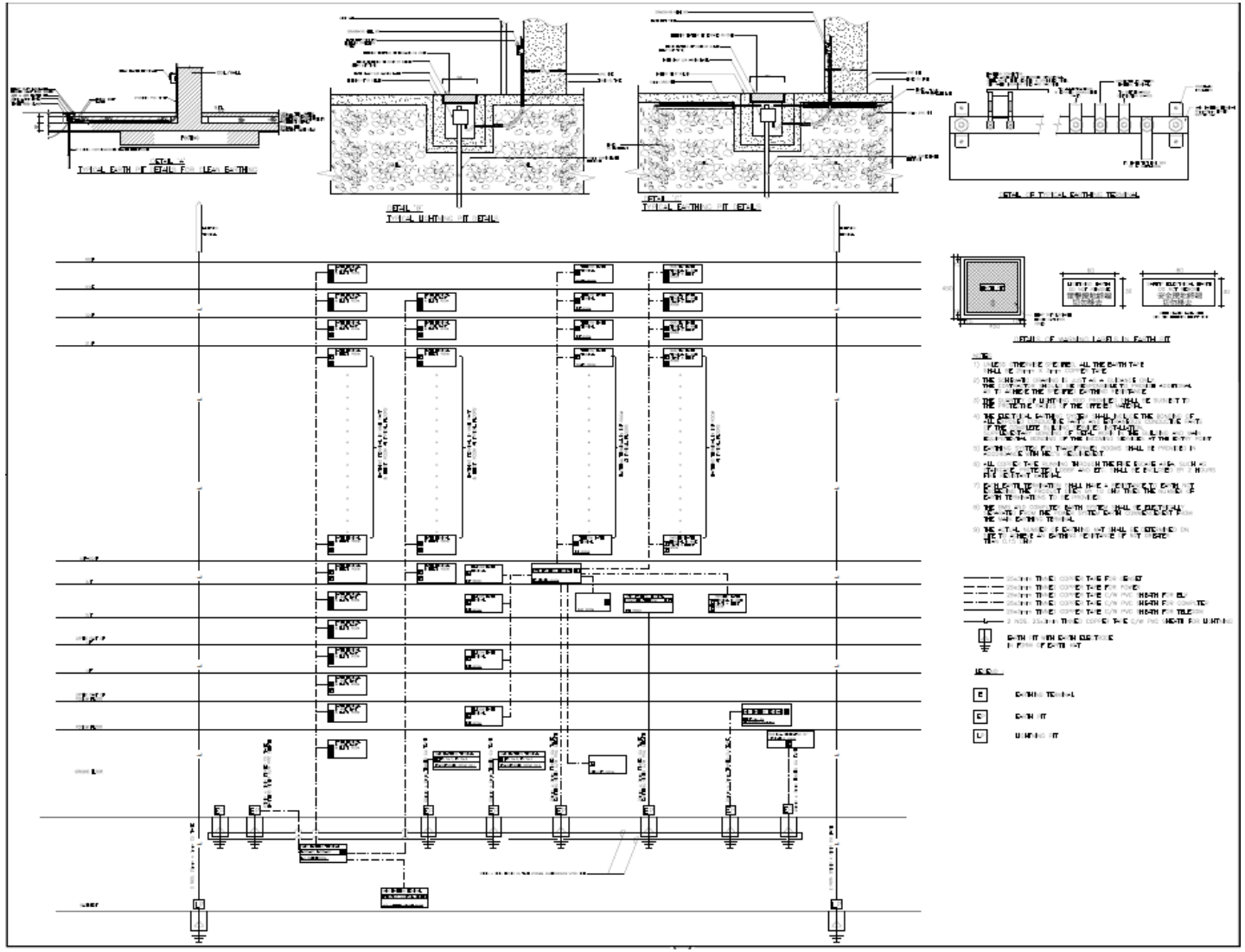
End Point Devices (Lighting, Power Outlet etc.)



Sub Switchboard A

Drawing Knowledge

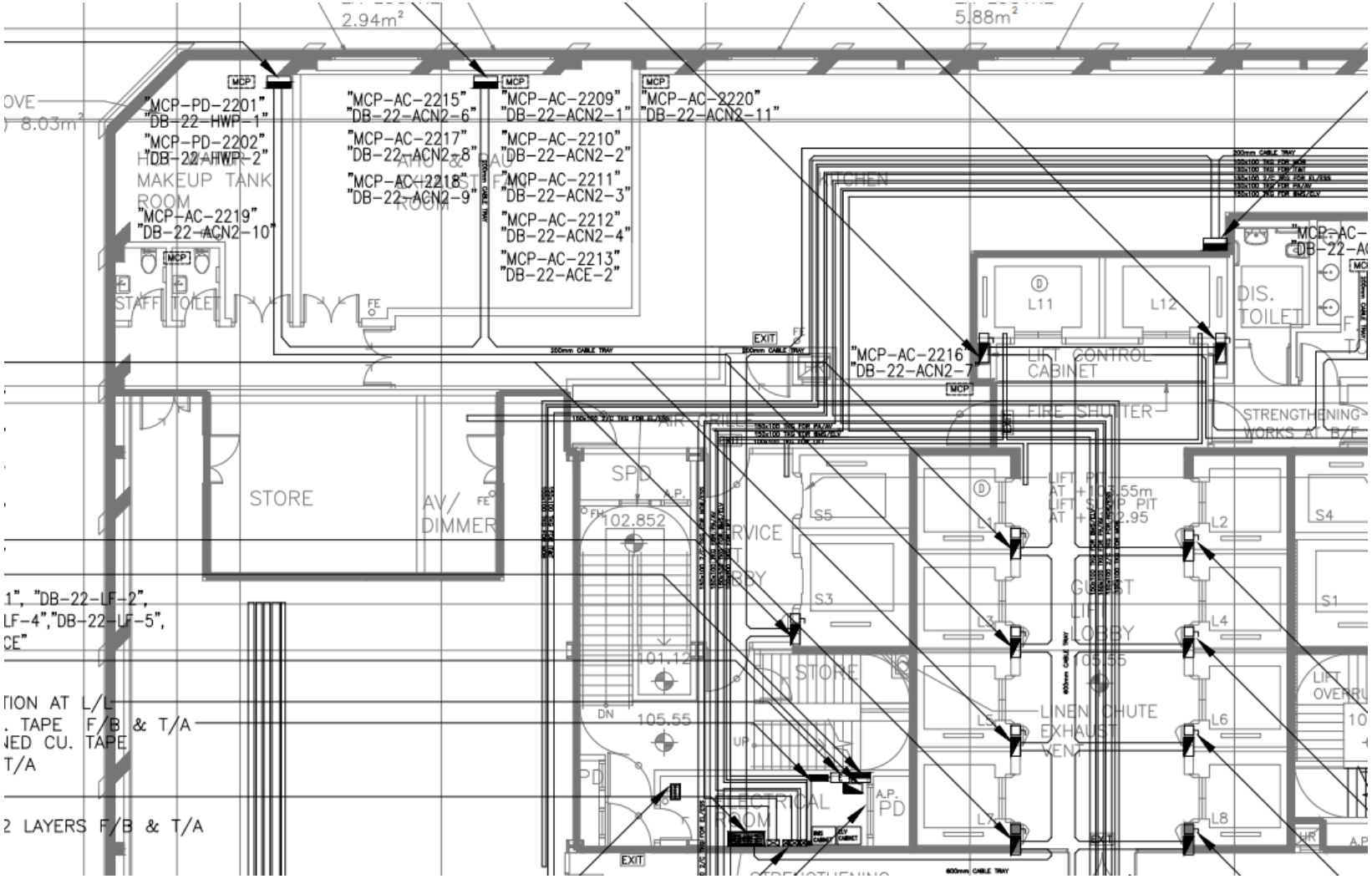
Schematics



Main Riser Diagram

Drawing Knowledge

Routing Layout

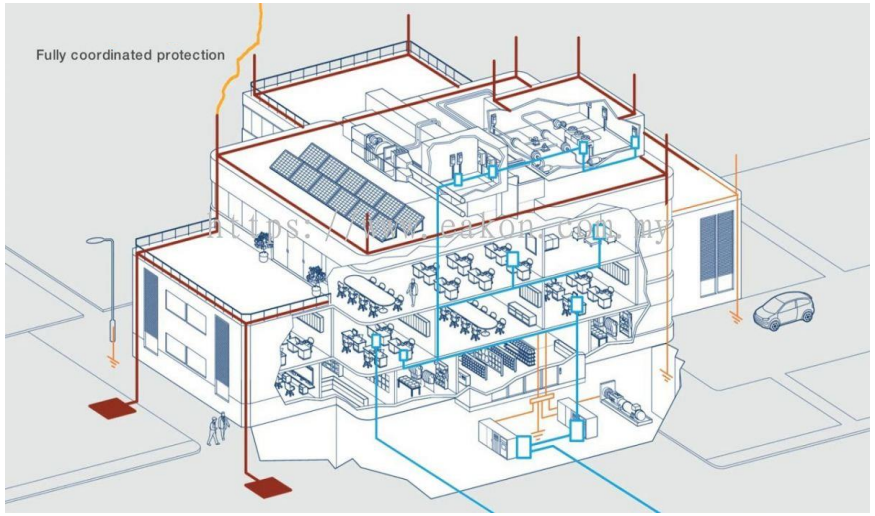


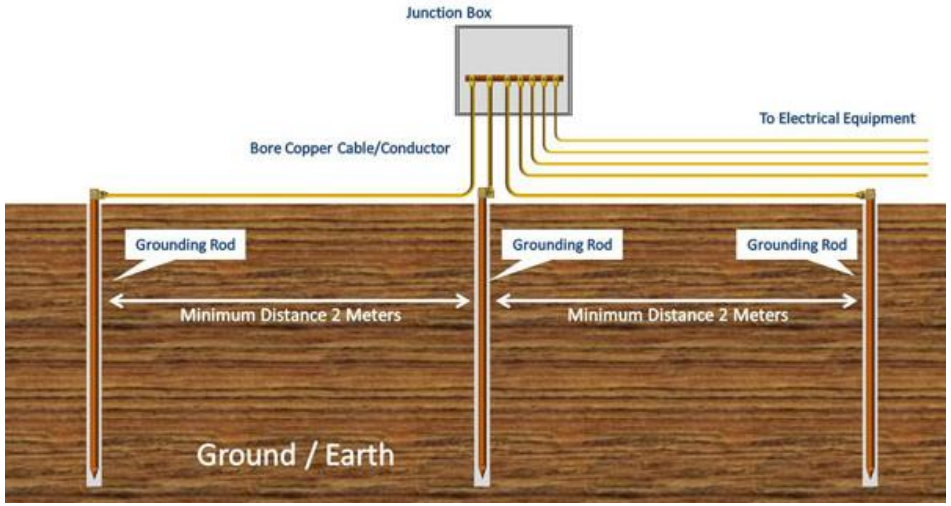
Cable/Trunking Routing Layout

Lightning Protection & Earthing System

A **lightning protection system** is designed to protect a structure from damage due to lightning strikes by intercepting such strikes and safely passing their extremely high currents to ground. A lightning protection system includes a network of air terminals, bonding conductors, and ground electrodes designed to provide a low impedance path to ground for potential strikes.

An **earthing system** (UK) or **grounding system** (US) connects specific parts of an electric power system with the ground, typically the Earth's conductive surface, for safety and functional purposes.[1] The choice of earthing system can affect the safety and electromagnetic compatibility of the isnstallation. Regulations for earthing systems vary considerably among countries, though most follow the recommendations of the International Electrotechnical Commission. Regulations may identify special cases for earthing in mines, in patient care areas, or in hazardous areas of industrial plants.



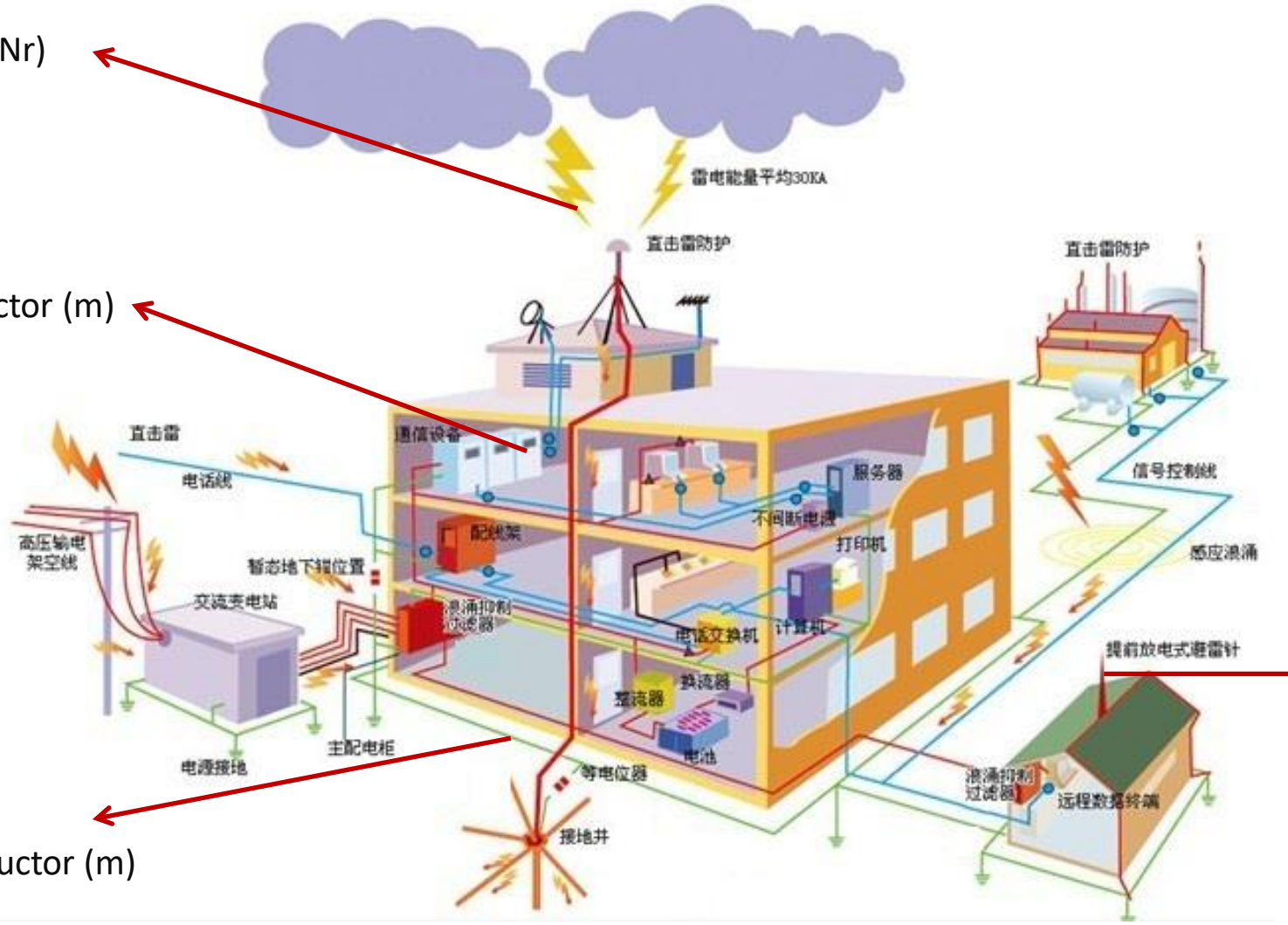


Lightning Protection & Earthing System

Lightning Rod (Nr)

Lightning Conductor (m)

Grounding Conductor (m)



Lightning Rod

Lightning Protection & Earthing System

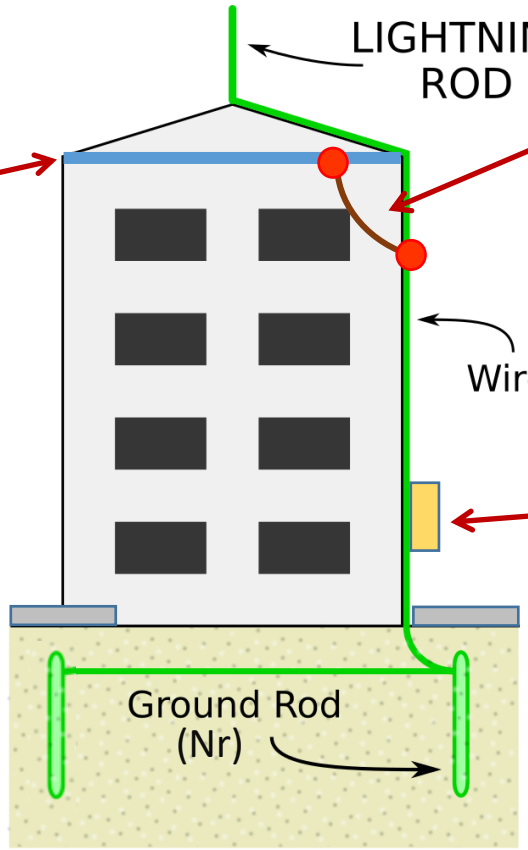
Don't want to be being hit?

Lightning Rod

Lightning Strip

Earthing System

Bonding Point (Nr)



Grounding
Terminal Box (Nr)

Earth Inspection
Chamber (Nr)

Drawing Knowledge

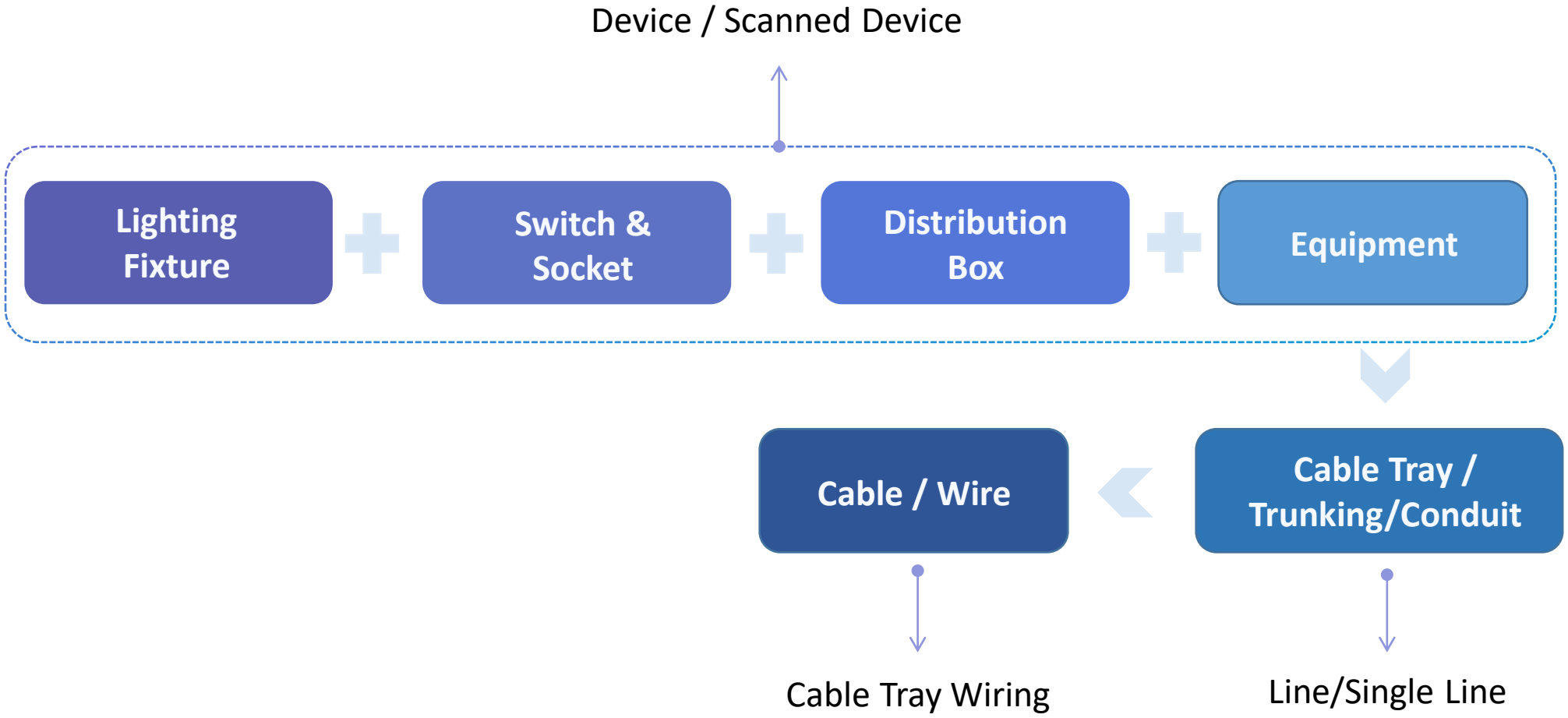
Design Standards

- **NFPA-780**: "Standard for the Installation of Lightning Protection Systems" (2014)
- **UL standards** for lightning protection
- **IEC standards**
  - EN 61000-4-5/IEC 61000-4-5: "Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test"
  - EN 62305/IEC 62305: "Protection against lightning"
  - EN 62561/IEC 62561: "Lightning Protection System Components (LPSC)"
- **IEEE** standards for grounding

Drawing Knowledge

Commonly Used Drawings

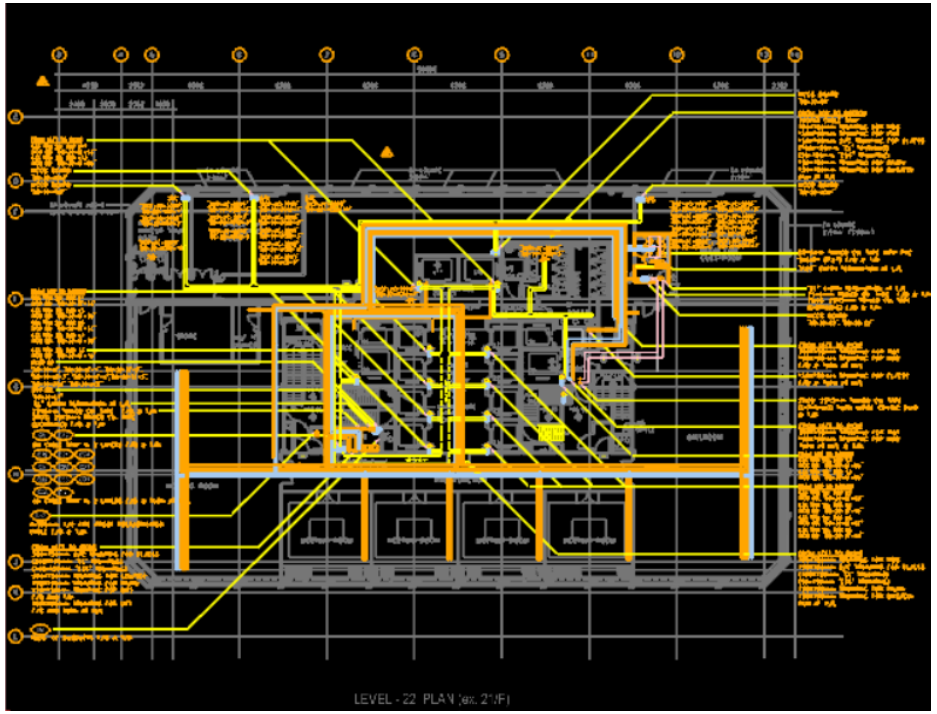
- Schematics
- Layout Drawings (Lightning & Earthing)
- Section views and Detail diagrams


Device / Scanned Device
Lighting Fixture
Switch & Socket
Distribution Box
Equipment
Cable / Wire
Cable Tray / Trunking/Conduit
Cable Tray Wiring
Line/Single Line

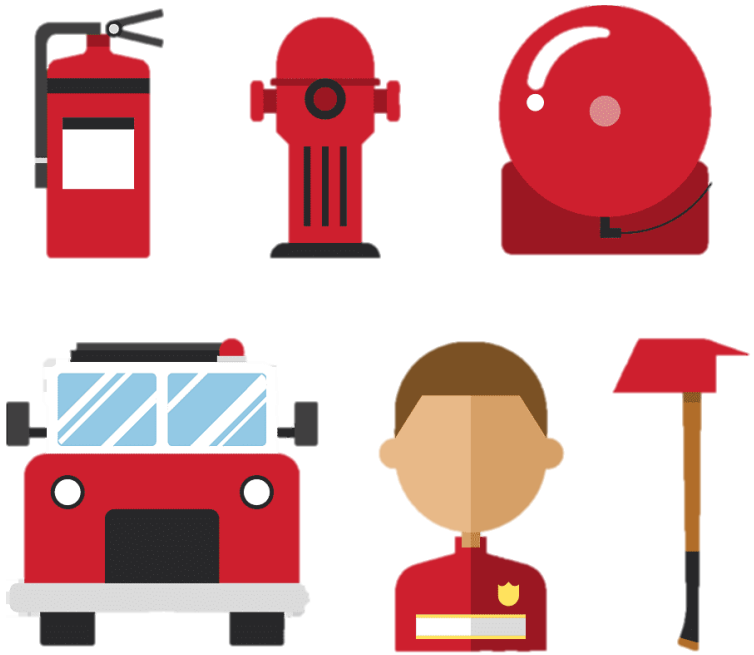
Key Learnings

- Device Identification of Electrical Devices
- Lay Cable / Wire Supports
- Cable / Wire Routing

- BQ Generation



Fire Service Walkthrough



1. Introduction to Fire Service
2. Overview of FS Systems
3. Drawing Knowledge
4. Software Walkthrough

Introduction

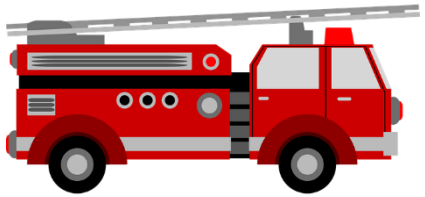
A **fire protection system** is a collection of components and processes designed to detect and control fires. The system's main objective is to minimize property damage, save lives, and prevent the spread of fire.

Fire protection systems can vary depending on the size and function of the building or facility they protect, but they generally consist of several key components, including:

(1) Fire alarms systems: These are systems using devices that detect smoke, heat, or flames and sound an alarm to alert occupants of a building that a fire is occurring.

(2) Fire suppression systems: These are systems that use water, foam, or other materials to extinguish fires. They can include sprinklers, fire extinguishers, and special suppression systems for hazardous materials.

(3) Fireproofing: This involves using materials that are resistant to fire, such as fire-retardant coatings and insulation, to slow down the spread of flames and limit damage.



Common Devices In Use:

- Pipe fittings- nr
- Sprinklers-nr
- Valves-nr
- Pumps-nr
- Hose reel-nr
- Hydrants-nr
- Landing Valves-nr
- Break Glass-nr
- Alarm Bell- nr
- Smoke detectors-nr
- Heat detectors-nr
- Panels -nr
- Nozzles -nr
- Light indicators –nr
- Fire Extinguishers-nr
- Pipes-metre
- Conduits-metre
- Cable/Wires-metre

Fire Suppression Systems

Fire suppression systems are used to extinguish or prevent the spread of fire in a building. Suppression systems use a combination of dry chemicals or wet agents to suppress the fires.

Common Fire Suppression Systems

Water based

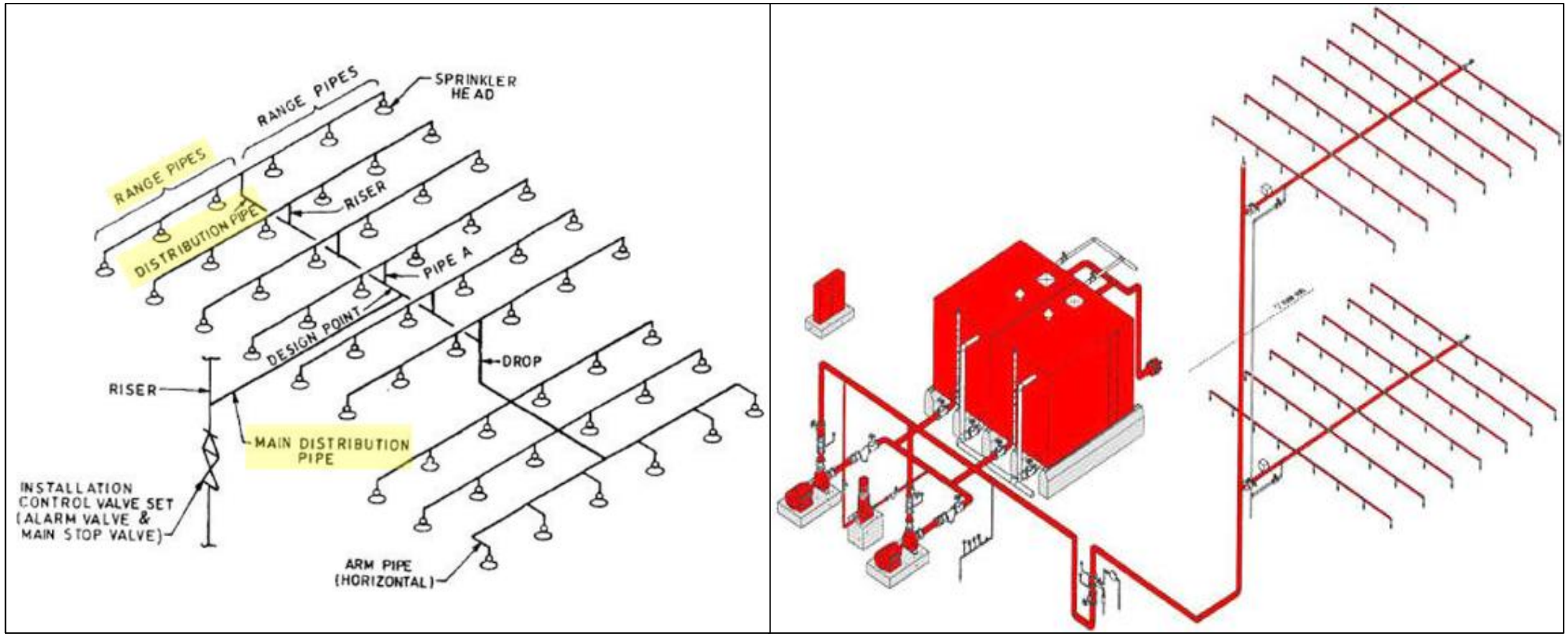
- Hydrant System
- Hose Reel System
- Wet/Dry Riser Systems
- Dry Riser
- Sprinkler System
- Deluge System

Gas based /Chemical

- Co2 System
- Inergen System
- FM200 Systems
- Wet Chemical
- Dry Powder/C02 Extinguishers
- Other Gas Systems….

System Overview

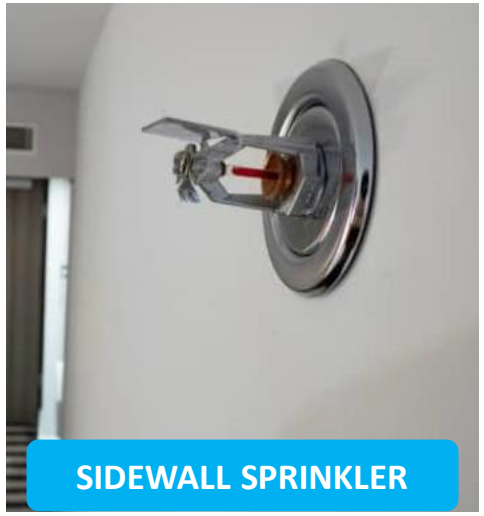
Sprinkler System



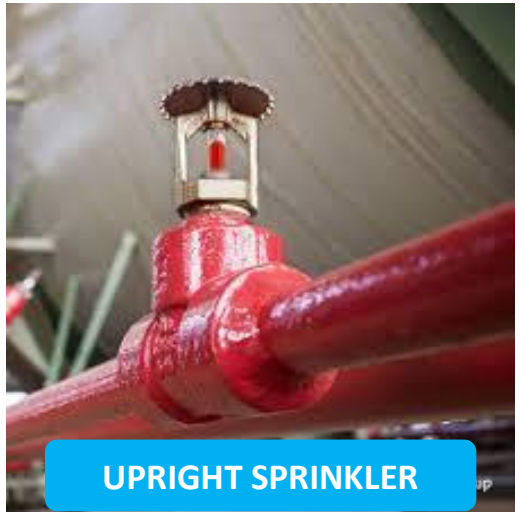
Typical Arrangement of Sprinkler System

System Overview

Types of Sprinklers



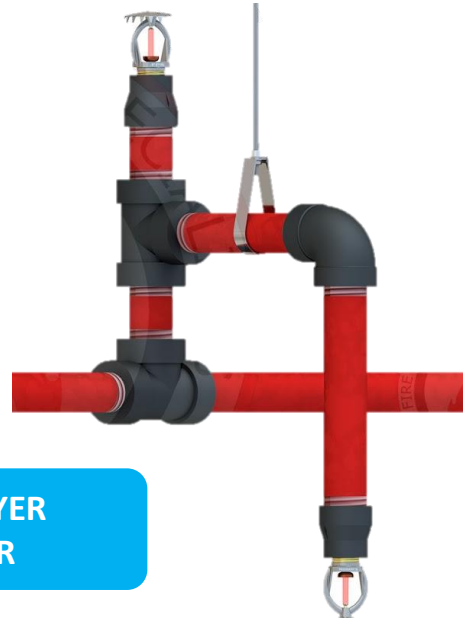
SIDEWALL SPRINKLER



UPRIGHT SPRINKLER

CONCEALED PENDENT SPRINKLER

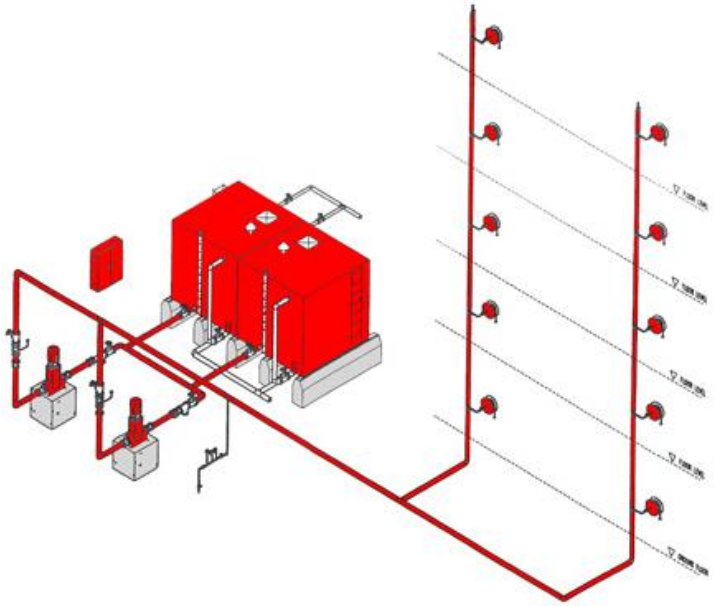
PENDENT SPRINKLER



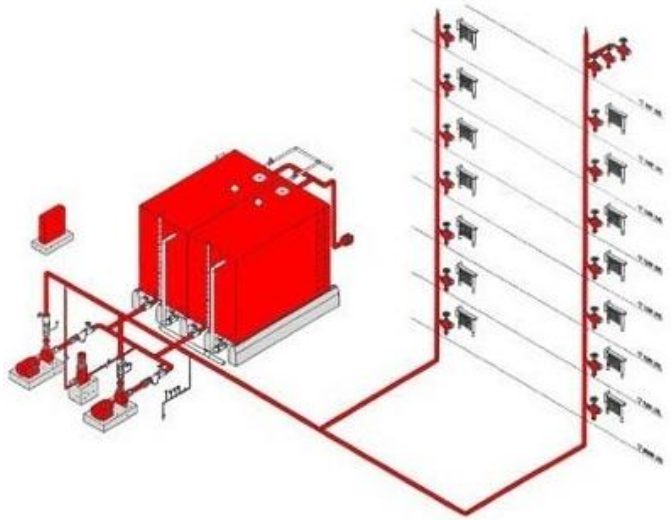
DOUBLE LAYER SPRINKLER

System Overview

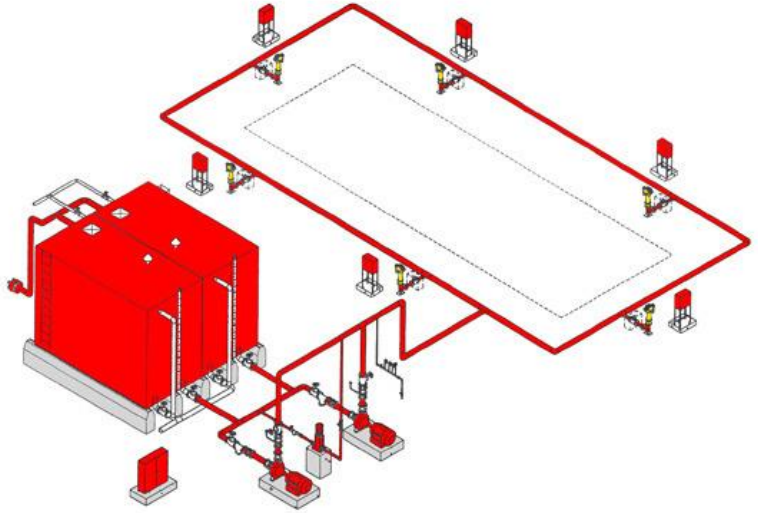
Other Piping Systems



Typical Arrangement of Hose Reel System



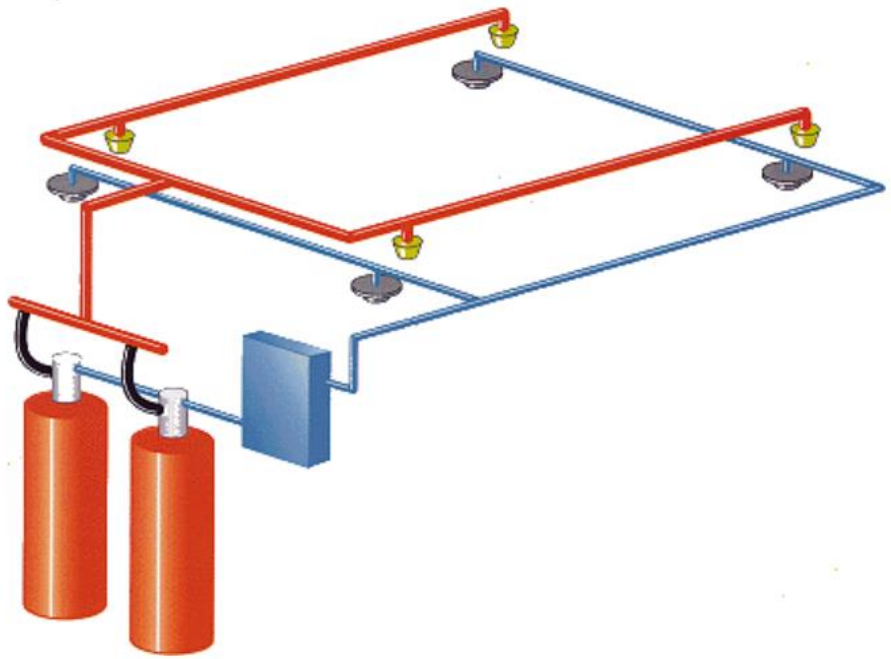
Typical Arrangement of Wet Riser System



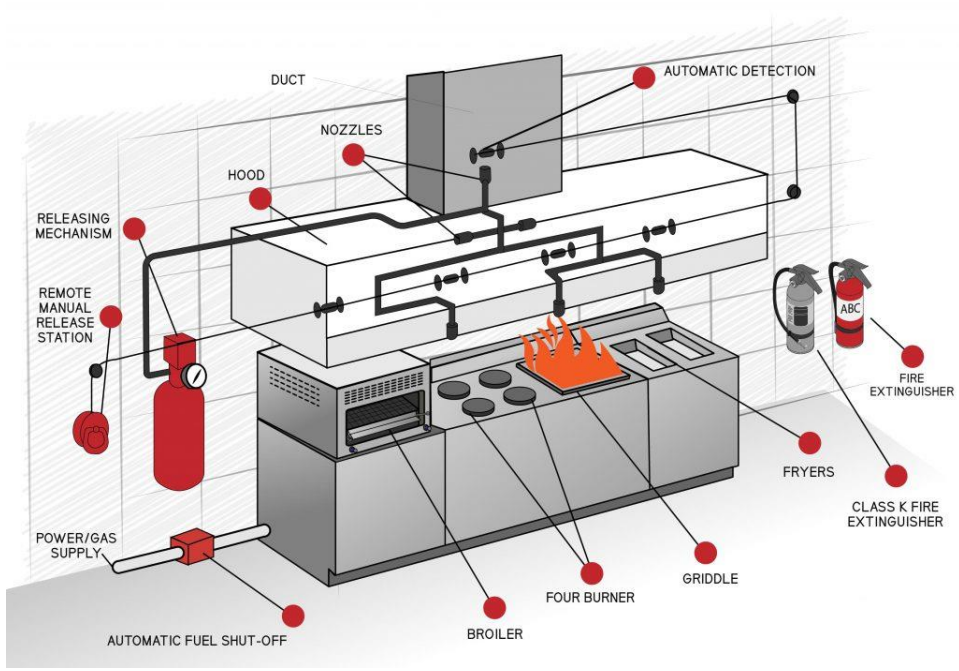
Typical Arrangement of Hydrant System

System Overview

Other Piping Systems



Typical Arrangement of Gas Suppression System



Typical Arrangement of Kitchen Hood System

Common Pipe Connections

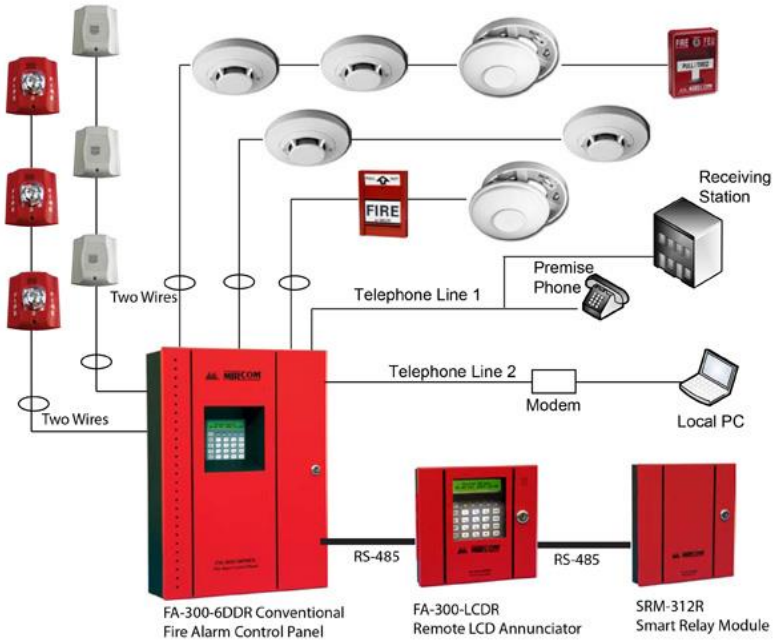
2.1 PIPING SCHEDULE

1. Material shall conform to the service requirements as specified herein and shall be basically conforming to the service pressure encountered:

SERVICE	NOMINAL SIZE	PIPE	FITTINGS
Dry Riser Installation	65mm to 150mm	Galvanised Mild Steel to BS 1387 Class C	Grooved Mechanical Coupling Fittings to A234 Gr WPB
	50mm and below	Galvanised Mild Steel to BS 1387 Class C	Screwed Malleable Iron to BS 143 & BS 1256
Hose Reel Installation	80mm and below	Galvanised Steel to BS 1387 Class "C"	Screwed Malleable Iron to BS 143 & BS 1256
Sprinkler Installation (Pipe above ground)	50mm and below	Galvanised Steel to BS 1387 Class B	Screwed malleable Iron to BS 143
	65 to 150mm	Galvanised Steel to BS 1387 Class B	Rolled Groove Mechanical Coupling Fittings UL / FM / LPC approved
	200mm to 300mm	Galvanised Steel to BS 3601 Class B	Rolled Grooved Mechanical Coupling Fittings UL/FM/LPC approved.

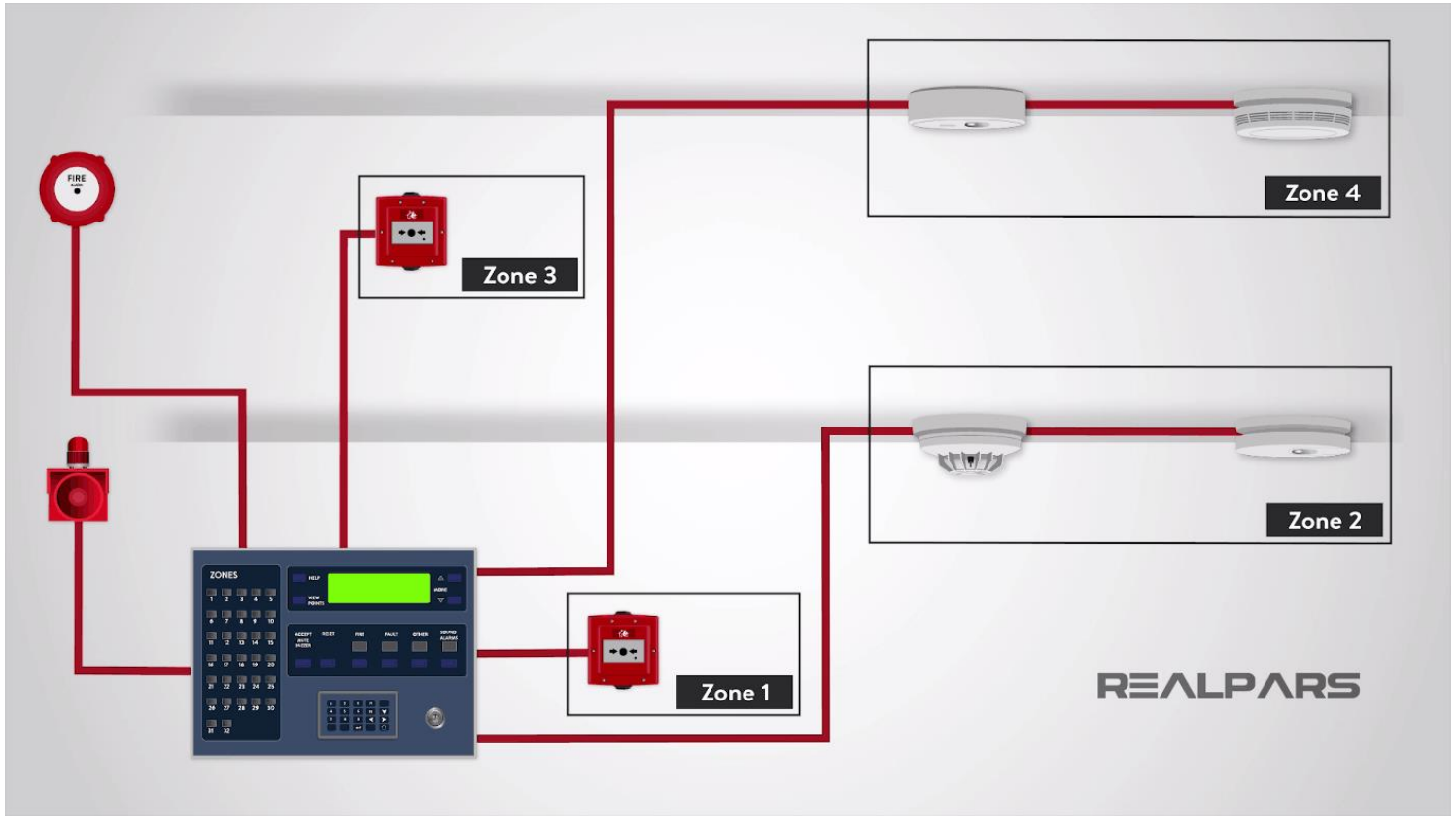
Fire Alarm System

Fire alarm system has a number of devices working together to detect and warn people through visual and audio appliances when smoke, fire, carbon monoxide or other emergencies are present. These alarms may be activated automatically from smoke detectors, and heat detectors or may also be activated via manual fire alarm activation devices such as manual call points or pull stations



System Overview

Types of Fire Alarm Systems



Typical Arrangement of Fire Alarm System

Type:

1. Conventional
2. Addressable
3. Wireless

Drawing Knowledge

Design Standards

- NFPA (American)
- BS EN 12845:2015
- MS 1910:2006 (Malaysia)
- Singapore Standard CP52:2004
- SNI 03-1745-2000 (Indonesia)

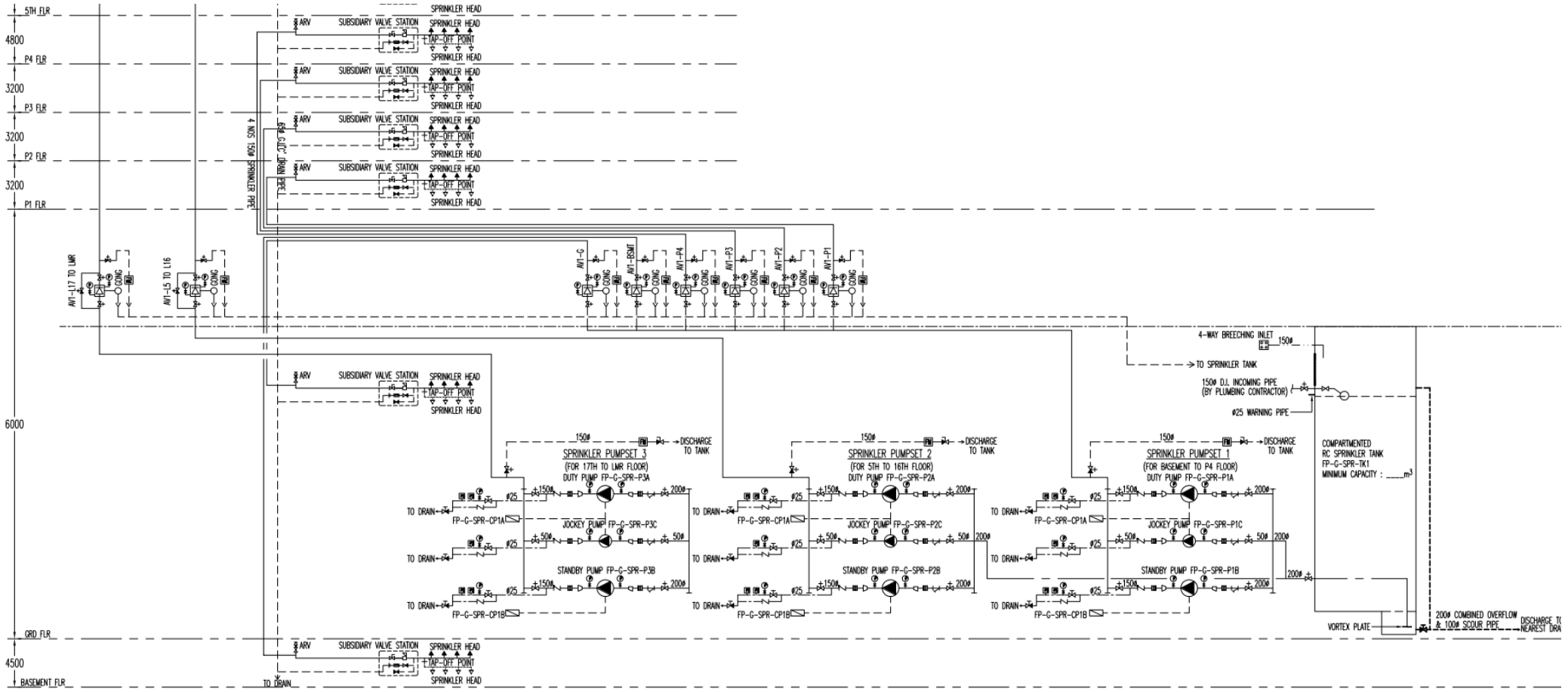
Drawing Knowledge

Commonly Used Drawings

- Schematics
- Floor plan layouts
- Section views and detail diagrams

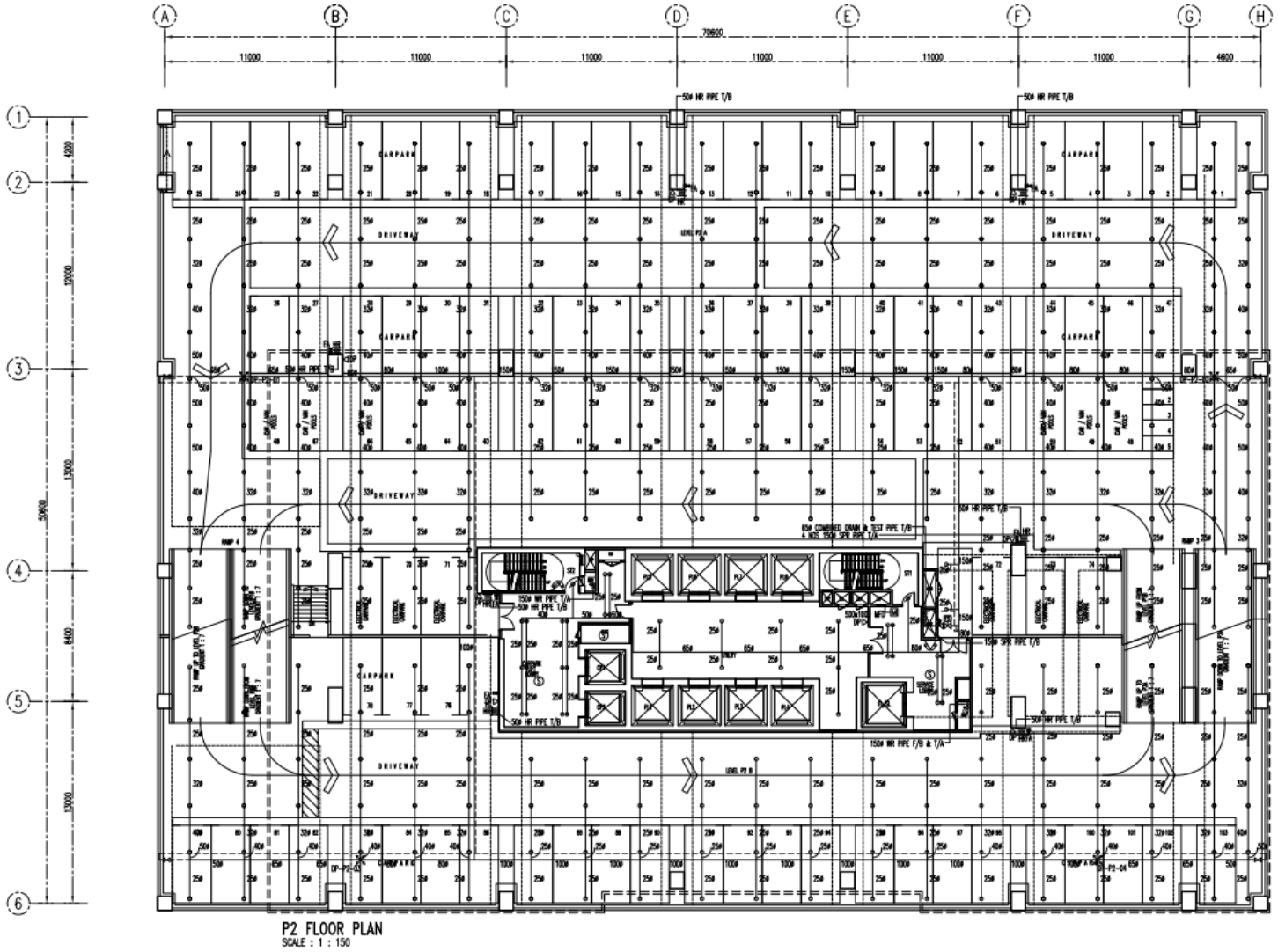
Drawing Knowledge

Schematics



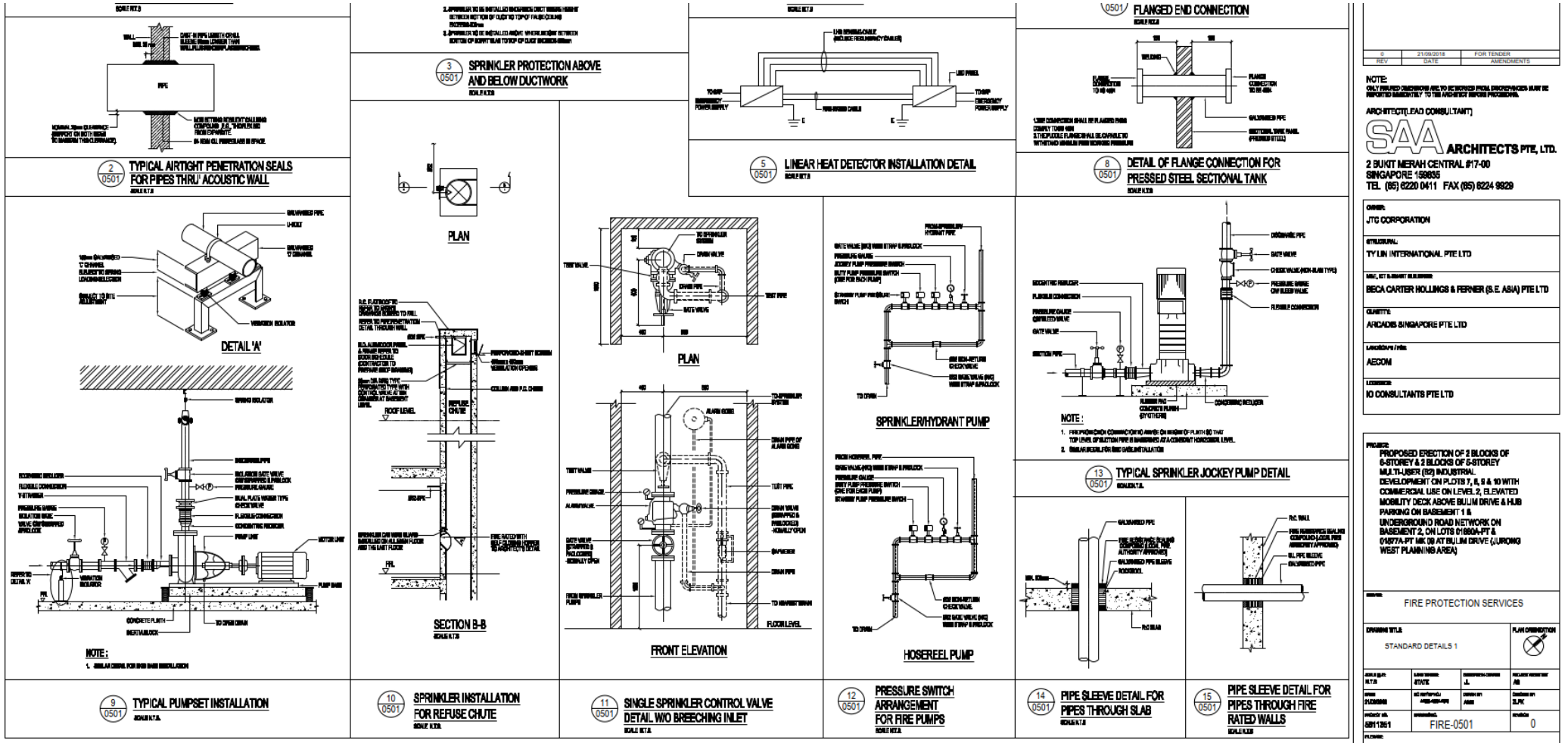
Drawing Knowledge

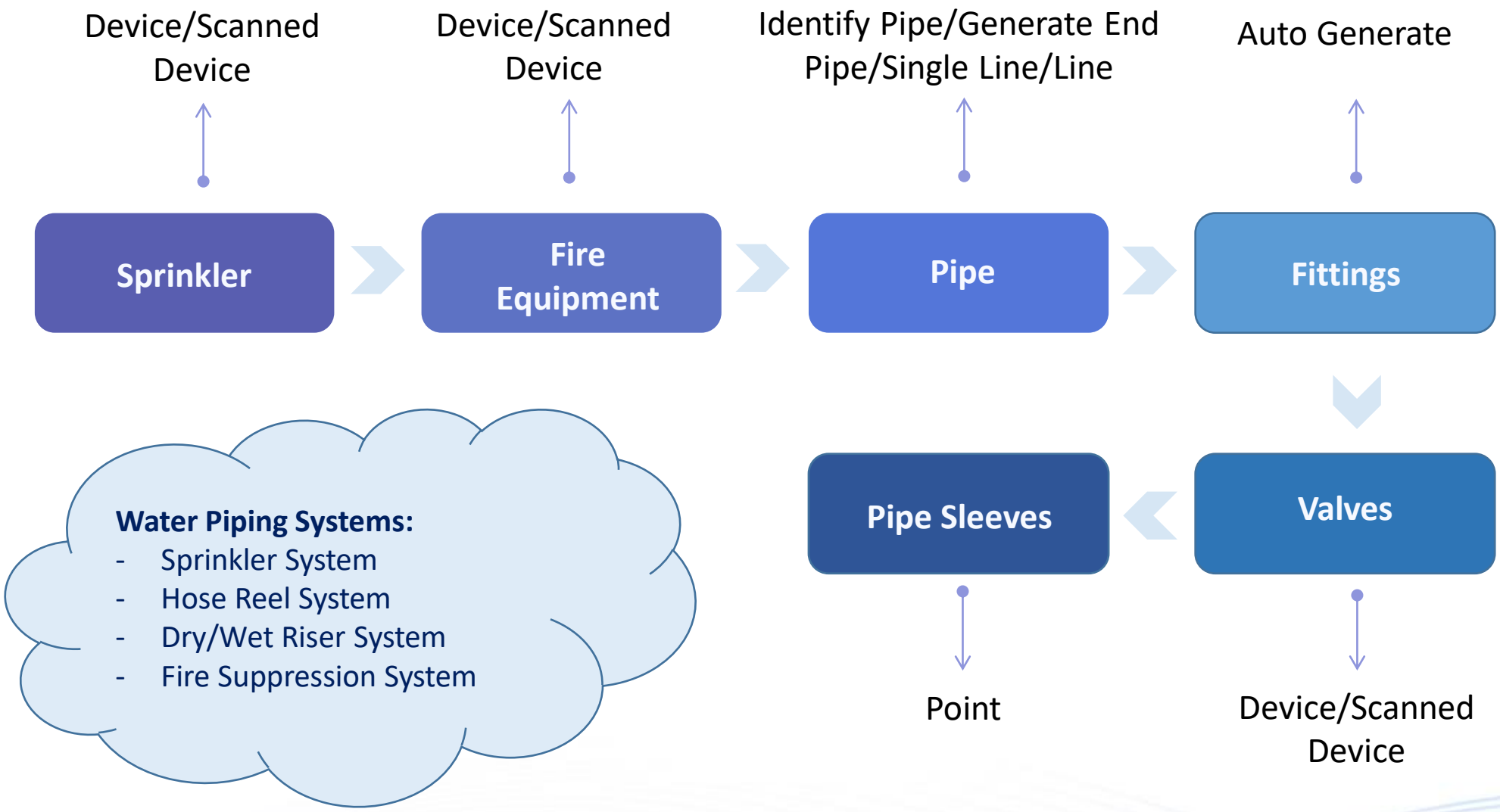
Layout Drawings



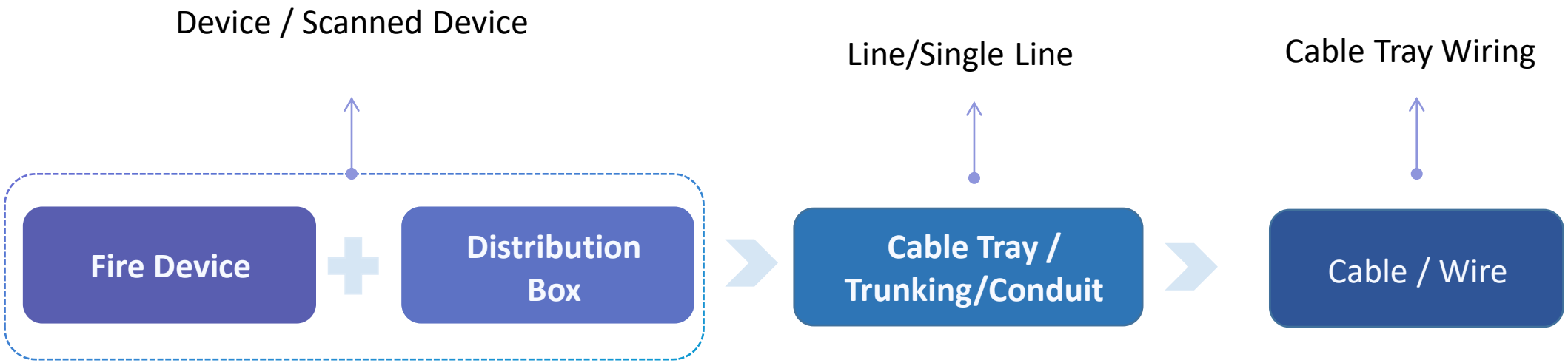
Drawing Knowledge

Section Views & Detail Diagrams




Device/Scanned Device
Device/Scanned Device
Identify Pipe/Generate End Pipe/Single Line/Line
Auto Generate
Sprinkler
Fire Equipment
Pipe
Fittings
Valves
Pipe Sleeves
Point
Device/Scanned Device
Water Piping Systems:
- Sprinkler System
- Hose Reel System
- Dry/Wet Riser System
- Fire Suppression System

Fire Service Walkthrough (Electrical)



Electrical Systems:

- Fire Alarm System
- Fireman Intercom System

Key Learnings

- Device Identification of Sprinklers, Smoke Detector etc.
- Pipe Identify & Generate End Pipe
- Cable / Wire Routing
- BQ Generation

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Helping Every Practitioner Have Achievements

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