Quantity Surveying Branch
Architectural Services Department

Building Information Modelling (BIM) Guide for Cost Estimation

(Version 3.0)

Objective

The primary purpose of this Guide is to gather and present factual materials in such a manner that project officers, both professional and technical, could obtain a common reference of the various practices on the adoption of BIM in quantity surveying for building projects undertaken by the Quantity Surveying Branch of the Architectural Services Department.

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Revision No. -	1 (Version 2.0)	Issue Date -	19 Feb 2021
Part	**Revision Details**		
1.2, 1.3, 2.1, 2.3, 2.4, 2.5, 5.1 and 5.2	General revision.		
4.4	Windows and Louvres added.		
4.5	Handrails and Balustrades added.		
6.5	Underground Drainage Works added.		
-	Acknowledgment added.		

Revision No. -	**2 (Version 3.0)**	**Issue Date -**	**30 Sep 2022**
Part	**Revision Details**		
1.1, 1.2, 1.3, 4.3, 4.4, 4.5, 4.11, 5.1 & 5.2	General revision.		
4.1	Architectural Concrete Works added.		
4.2	Partitions and Linings added.		
4.6	Ladders and Stairs added.		
4.7	Curtain Wall and Glass Wall added.		
4.8	Claddings added.		
4.9	Furniture and Fittings added.		
4.10	Finishing added.		
5.3	Structural Steel added.		
7.9	Quantification added.		
-	Acknowledgment updated.		

1. Introduction

1.1 Overview

This Building Information Modelling (BIM) Guide for Cost Estimation documents the general requirements, guidelines and practice for Quantity-Take-Off (QTO) by BIM models in which the quantities extracted comply with the current industry practice as far as possible for building projects managed by Architectural Services Department (ArchSD) in order to achieve the following objectives:

- to stipulate the required settings and configurations of BIM models for cost estimation
- to improve the functionality of BIM models to facilitate the process of QTO
- to achieve consistency of cost estimation by BIM models

This BIM Guide for Cost Estimation (hereinafter called "The Guide") is formulated base on locally recognized BIM standards, guidelines and industry practices. While BIM is under rapid development, this Guide shall be subject to regular review and update to suit the latest development of BIM.

1.2 Reference BIM Standards and Guidelines

This BIM Guide for Cost Estimation shall be read in conjunction with the current versions of the followings issued by Architectural Services Department:

(a) BIM Guide for Architectural Design
(b) BIM Guide for Building Services Installations
(c) BIM Guide for Structural Engineering
(d) BIM Guide for Facilities Upkeep

This Guide has made referenced to the following local standards and guidelines:

(a) Development Bureau Technical Circular (Works) No. 02/2021 - Adoption of Building Information Modelling for Capital Works Projects in Hong Kong
(b) Development Bureau Technical Circular (Works) No. 08/2021 – Building Information Modelling Harmonisation Guidelines for Capital Works Projects in Hong Kong
(c) Hong Kong Standard Method of Measurement of Building Works – Fourth Edition Revised 2018 (SMM4) published by the Hong Kong Institute of Surveyors
(d) Standard Method of Measurement for Building Elements published by the Architectural Services Department
(e) Standard Phraseology for Bills of Quantities for Building Works - 2017 Edition (2nd Revision) published by the Architectural Services Department
(f) CIC Building Information Modelling Standards – General (Version 2.1 –2021) issued by Hong Kong Construction Industry Council.
(g) CIC Building Information Modelling Standards for Architecture and Structural Engineering (Version 2.1 – 2021) issued by Hong Kong Construction Industry Council.
(h) CIC Building Information Modelling Standards for Underground Utilities (Version 2 – 2021) issued by Hong Kong Construction Industry Council.
(i) CIC Building Information Modelling Standards for Mechanical, Electrical and Plumbing (Version 2 - 2021) issued by Hong Kong Construction Industry Council.
(j) CIC Production of BIM Object Guide - General Requirements (Version 2 – 2021) issued by Hong Kong Construction Industry Council.
(k) CIC BIM Dictionary (2021) issued by Hong Kong Construction Industry Council

1.3 Abbreviation and Terminology

The abbreviations and terminology /glossary shall refer to the CIC BIM Dictionary.

2. General Modelling Guidelines

2.1 General

Quantity Surveyor (QS)'s early input in the modelling process is imperative to ensure the BIM models are developed with proper geometry and key information for effective cost planning.

A BIM model contains graphical (2D/3D objects) and non-graphical (object data) information that can be extracted for quantification. The design author needs to create, place and export their models in a way that enables this information to be used for quantification purposes.

There are many BIM authoring software packages in use which produce their own proprietary native file type. Various interoperable file types exist which can be read by different estimating and quantity surveying packages thereby enabling data from BIM files to be leveraged whatever the originating design software. The most common interoperable BIM file types are DWF™, DWFx™ and IFC formats.

The following are some important points to note when creating a BIM model:

a. Project Units
To provide an accurate cumulative total the Project Units need to be set to two or more decimal places to avoid each dimension being rounded off.

b. System Assemblies
Layered elements such as walls, floors, flat roofs, etc. are invariably modelled as assemblies. When exported to a DWFx™ an assembly appears as a composite whole and its component parts are not separately identified. It is very important that the component details are communicated in full by using descriptive Object or Type naming conventions or providing assembly information on detailed 2D sections or schedules. Alternatively, Parts may be used.

c. Parts
The Part function is designed to support aspects of construction workflows such as pour schedules for example, by enabling a slab to be separated into parts based on the pour sequence. However, Parts can also be used to separate System Assemblies into their component elements so that rather than one composite floor slab assembly, say, the DWFx™ will comprise of separate elements for fill, insulation, moisture barrier, structural concrete, and screed.

d. Rooms and Areas
Room and area data is extremely useful for estimating purposes, particularly during the earlier design stages where rates/area are used to develop budget estimates.

e. Shared Parameters
Shared Parameters may be added to enrich the data included in the DWFx™ file with additional information or specific coding, such as element or rate codes, for each object in the model.

If the model contains linked CAD files with multiple instances of a typical object or group of objects, the multiple instances may all have the same ID. These duplicate IDs may affect the quantities included in the exported file provided to the QS. For example, if a typical apartment is repeated twenty times in a model and the IDs are duplicated, the quantities given may only relate to one apartment, not twenty. For this reason, the duplicate IDs in BIM model should be removed before exporting the DWFx™ file.

There are some more general modelling guidelines as follows:

a. Align function is a command in organizing all elements which can ensure the elements to be enclosed and eliminate the gap between different objects.

b. Accurate naming of objects and elements. Object names should be accurately described the makeup, materials and size of the object (e.g. 10mm pbd / 92mm stud / 10mm pbd).

c. Objects/elements are to be modelled as they will be constructed where practical.

d. As there may be elements from the same object without indication of the floor they belong to, each element shall be defined with appropriate levels.

e. For creating structural elements, grid system shall be utilized from the beginning in order to follow the arrangement of structural elements which means the beams and columns shall be placed in grid form with beams between columns.

f. Model should be created in an accurate manners, snap function and key in actual figures is preferable, instead of drafting by visual judgement.

g. Floors and their elevations or floor height should be defined.

h. All model objects can be split between Existing, Temporary Works, Demolition and New Works (including staging if applicable).

i. All instances should be divided floor by floor.

j. Apart from the modelling guidelines as detailed in this document, the structural model should be created to tally with the assumptions for structural design, e.g. load path.

2.2 Objects

The modelling guidelines for Objects are as follows:

a. When available, built-in Objects should be used.

b. When a new Type is created under an Object, the description of the Type should be in a consistent format.

c. Similar to the built-in Objects, some basic dimensions should be included in the description of each Type, i.e. width and depth of beam should be stated in the description of each Type of "M_Concrete-Rectangular Beam".

d. When creating a new element, similar object shall be selected but not creating a new and generic object. The reason is that when creating a new object, the parameter may not be as complete as the similar object, e.g. when creating a tapered beam, architects shall utilize a rectangular beam to modify as a tapered beam.

2.3 Architectural Design Modelling

a. Architectural Concrete Works

   i. For non-structural walls, they shall be created up to the underside of beams or slabs which is different from modelling structural walls.

   ii. Concrete grade should be identified.

   iii. Curved or battering elements should be identified by additional parameters.

b. Partitions & Linings

   i. Type of wall should be identified. (For example: material of wall & bond of blockwall)

   ii. Fire rating should be provided if the wall is a non-concrete wall.

   iii. If additional supporting frame is required conditionally, those partitions with such supporting frame should be identified.

c. Doors, Windows and Louvres

   i. For door, information for ironmongeries should be included (hardware set code could be considered).

   ii. Door marks and window marks should be provided to differentiate the types of door and window.

   iii. Fire rating should be provided.

   iv. Insulation requirement, such as acoustic and thermal insulation, should be provided.

v. Additional features, such as wind guards, fire dampers, mesh covers, etc., should be identified.

d. Handrails, Balustrades, Ladders and Stairs

i. Railing mark should be provided to differentiate the types and material of railing.

ii. The diameter / thickness of railing should be identified.

e. Curtain Wall and Glass Wall, Claddings and Coverings

i. Cladding marks and curtain wall marks should be provided to differentiate the types and material of Cladding and Curtain wall.

ii. Opening and doors for cladding and curtain wall should be identified.

f. Furniture and Fittings

i. Furniture mark should be provided to differentiate the types of furniture.

ii. Material and overall size for furniture should be identified

g. Internal Finishing

i. Use room element (Room Tag) to quantify and schedule the finishes in each room and ensure that the room boundary is set in accordance with the required use. (for Construction Floor Area or Internal Area)

h. Roof

i. Depth of green roof should be stated.

i. Landscaping Works

i. Existing tree marks, name and the tree treatment of the existing trees should be provided.

ii. Tree code for new planting tree should be provided.

iii. When modelling shrubs, bamboos, climbers and like, using “Floor” to indicate the planting area and type of plant should be identified.

2.4 Structural Engineering Modelling

a. Level of Structural Model

i. Once the modelling of existing site terrain provided, the structure elements shall be drawn on the site terrain with actual mPD.

b. Concrete Works

i. When creating concrete works, the concrete grade shall be incorporated as a separate parameter.

ii. For liquid retaining structure, should be specified in separate parameter.

iii. Provide separate parameter for concrete works with curved shape (curved wall and beams), sloping (slab for ramp and inclined beam).

iv. Separate parameter should be added for transfer plate.

c. Structural Steel

i. Type, grade and size of structural steel members should be provided.

ii. When creating the structural steel connections, type, size and length of bolts should be identified as far as practical.

2.5 Building Services Installations Modelling

a. Air Conditioning and Mechanical Ventilation System

i. Reference code and other essential information should be provided for equipment.

ii. Separate 3D views should be created for typical floor/ typical room/ plant room area.

b. Electrical Installation

i. Type, reference code and rated capacity should be provided for equipment.

ii. Type and reference code should be provided for lighting.

c. Fire Service Installation

i. Type and reference code should be provided for equipment.

ii. Type of sprinkler heads should be identified.

iii. Capacity for fire service water tank (excluding RC tank) should be identified.

d. Above ground plumbing and drainage works

   i. Type of surface channel should be identified.

   ii. Width of channel should be provided.

   iii. Finishing of surface channel should be identified.(open channel/ cast-iron/ matching cover)

e. Underground drainage works

   i. All underground drainage BIM model should contain underground drainage elements shown on the drainage layout only. Other building elements are assumed containing in other discipline BIM models.

   ii. Underground drainage elements shall use the Principal Datum level as the reference level. It is not necessary to specify another reference level to place the pipe to minimize the number of reference level and complexity of the model.

   iii. Reference code should be provided for manholes. Inspection chambers, soakways, sealed trapped gully and the like should be identified in the object and type name.

3. Detailed Modelling Guidelines – General

The detailed modelling guidelines divide into three part – Architectural Design, Structural Engineering and Building Services Installations. Each building element would be illustrated into three section (1) Basic information, (2) Modelling approach and (3) Quantity Take-off.

(1) Basic information

This section focuses on the setting out of the Category of building elements, sequence for the modelling and Level of Development of each element (only applicable for those elements not yet defined in other BIM Guide).

(2) Modelling approach

This section demonstrates the most common modelling approach in the industry and specifies the properties required for the elements to facilitate QTO.

(3) Quantity Take-off

This section provides the technique and explanatory notes for QTO from the BIM Model. The methodologies described in this section are based on the modelling approach described in Section (2). Do not follow indiscriminately. Quantity surveyors shall execute their own professional judgment and make necessary adjustments.

Section (1) and (2) focus on the modelling information which are required from models while section (3) is a step-by step guide to assist quantity surveyors to measure quantities from BIM models.

4. Detailed Modelling Guidelines – Architectural Design

4.1 Architectural Concrete Works

This section mainly focuses on the following:
i. Architectural Walls
ii. Ramp

4.1.1 Basic Information

4.1.1.1 Building Element to Model

Modelling elements:

Elements	Object Category
Work Description	Manage/ Settings/ Materials
Architectural Walls/ Curbs/ Partition Walls	Wall: Architectural
Ramps	Ramp: Architectural

4.1.2 Modelling Approach

4.1.2.1 Architectural Walls

4.1.2.1.1 Type Naming

Walls is a built-in name of the system object.

Format:
<Functional Type> - <Originator> - <Descriptor 1> - <Descriptor 2>

Type Name	AWL-ADA-CONCB_100mm_60FRR-__	Descriptions
Functional Type	**AWL**-ADA-CONCB_100mm_60FRR-__	AWL is the short form of the functional type "Architectural Wall"
Originator	AWL-**ADA**-CONCB_100mm_60FRR-__	ADA for architectural discipline of ArchSD
Descriptor 1	AWL-ADA-**CONCB_100mm_60FRR-**__	The wall is made of Concrete Blockwork (material) in 100mm thick with -/60/60 fire resistance rating.
Descriptor 2	AWL-ADA-CONCB_100mm_60FRR-__	2-digit sequential number to distinguish different types, if Descriptor 2 is blank, two underscores (__) should be used.

Functional Type	Descriptions
AWL	Architectural Wall
PAW	Architectural Partition Wall
CUB	Curb
STW	Structural Wall
RTW	Retaining Wall

Descriptor 1	Descriptions
CONC	Concrete
CONCB	Concrete Blockwork
GLASSB	Glass Blockwork

4.1.2.1.2 Sequence of modelling

Early Stage (Before Structural Engineer on board)

- Create structural wall and non-structural wall in architectural (ARC) model with different worksets (for design intention and drawing production)
- Apply wall finishes to the wall as appropriate

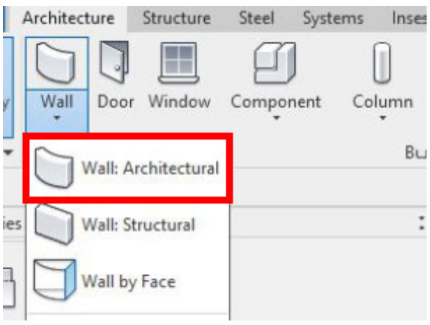
Later Stage (After Structural Engineer on board)

- Create structural wall in structural (STR) model (with loading calculation)
- Link ARC model with STR model
- Keep original structural workset in ARC model as a "hidden workset" *

* Keeping original structural workset in ARC model as "hidden workset" instead of deleting the structural workset in ARC model is preferable as the impact to wall hosted elements can be minimized.

Step 1

Architectural tab → Wall → Wall: Architectural

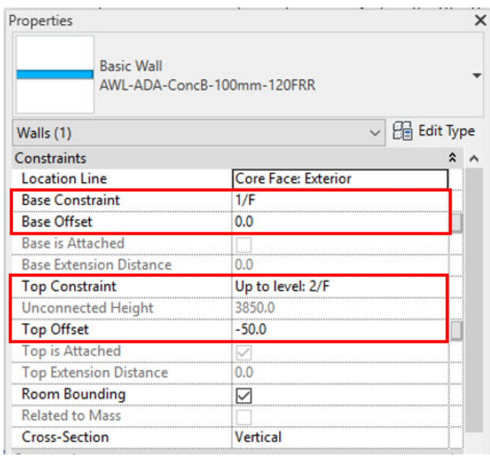


Step 2

Define Base Constraint, Top Constraint, Base Offset and Top Offset

❖ **Base constraints**: should be set to the level where walls are sit on

❖ **Top constraints**: should be set to either the floor level immediately above for full height walls and hanger walls, or unconnected for non-full height walls, parapets and curbs



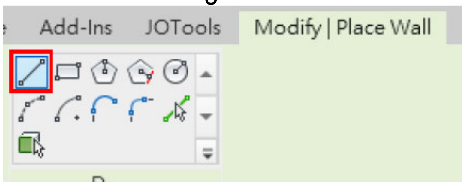
Step 3

In Project Browser, select the floor plan view of "Base Constraint" in step 2 above

(a) Straight Wall / Curved Wall

Step 4

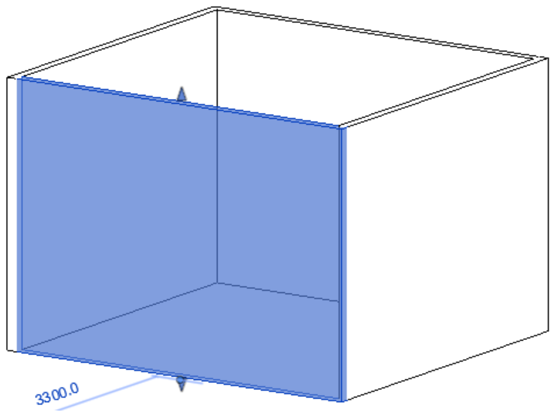
Select the drawing method under “Modify | Place Wall > Draw” and draw on plan

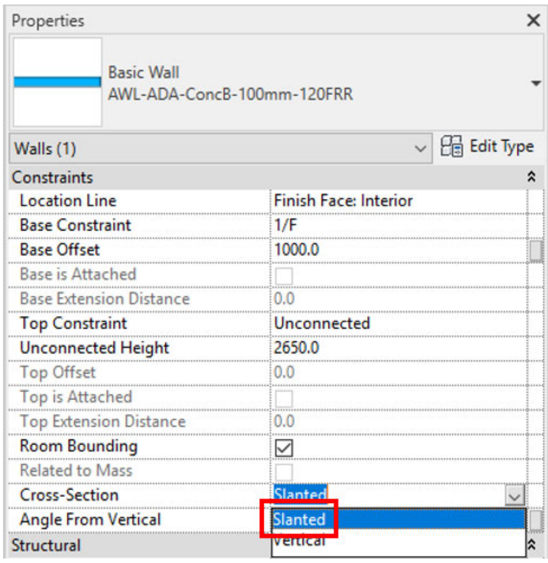


(b) Sloping Wall

Step 5

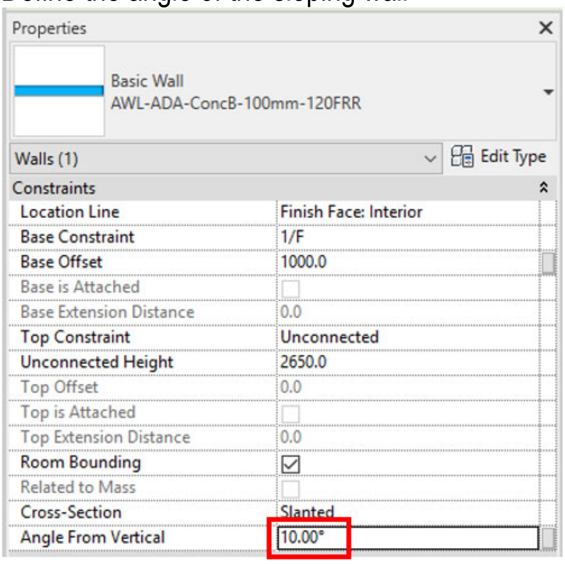
Select the wall that needs to be sloped, in Properties, choose “Slanted” in Cross-Section

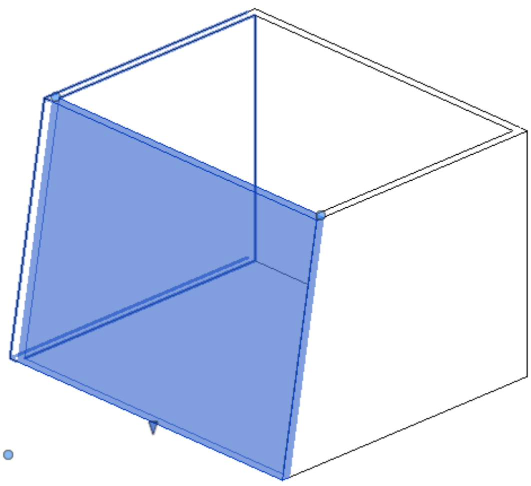




Step 6

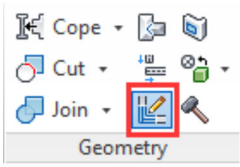
Define the angle of the sloping wall



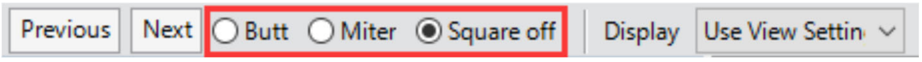


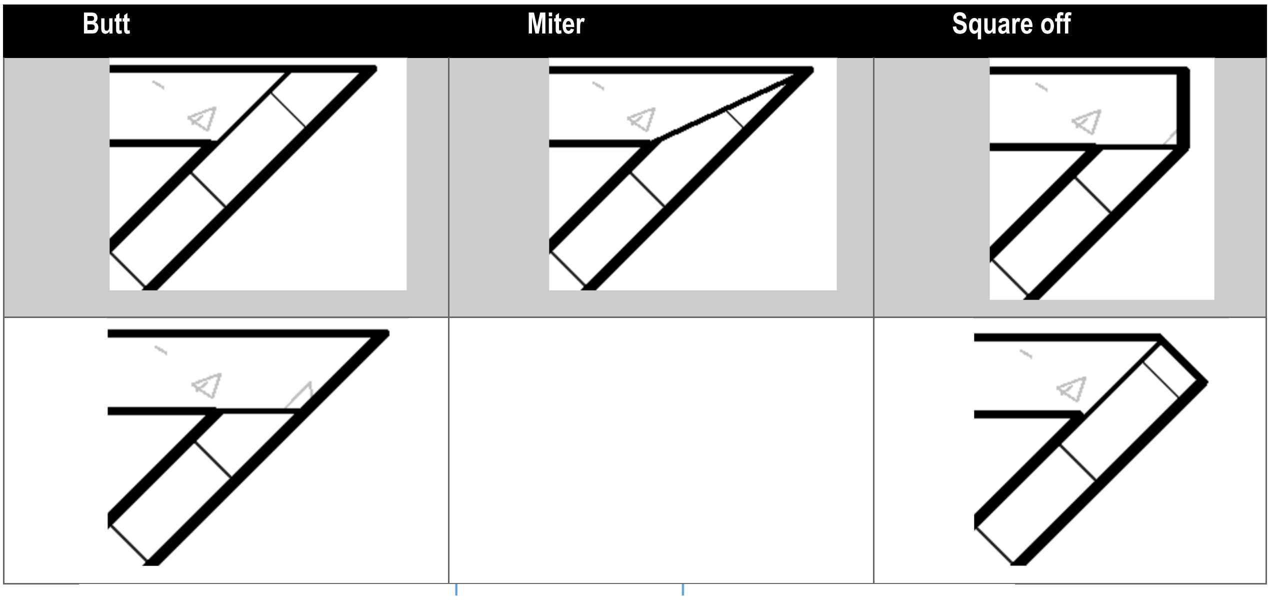
4.1.2.1.3 Wall Joint

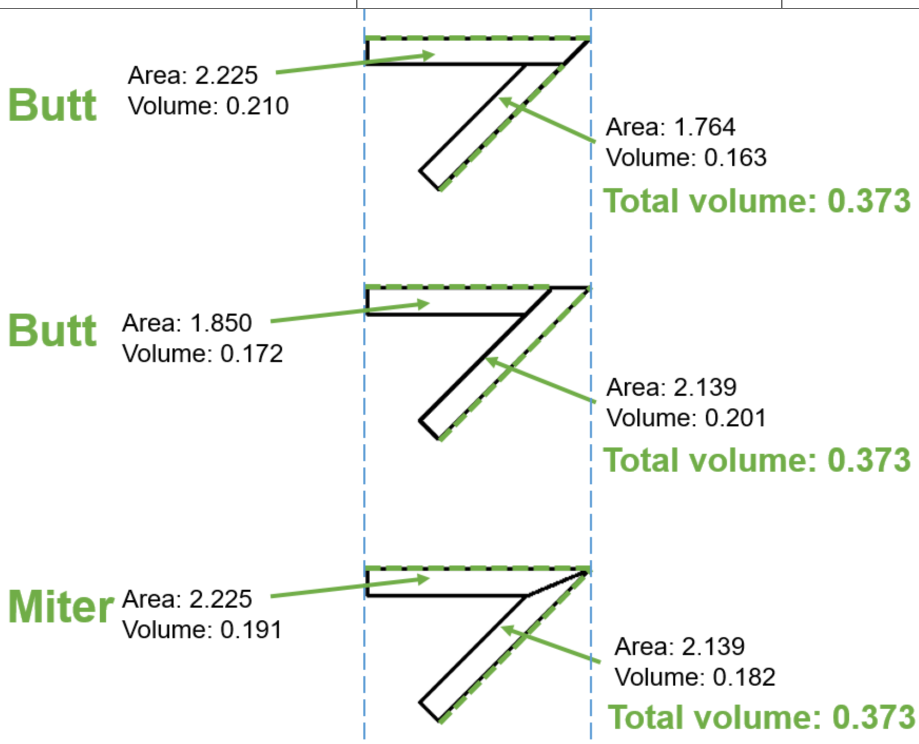
❖ The “Wall Joins” command under Modify > Geometry helps to modify the wall joints method to the appropriate type.



❖ Different types of wall joint could be obtained by selecting among (i) Butt, (ii) Miter or (iii) Square off.







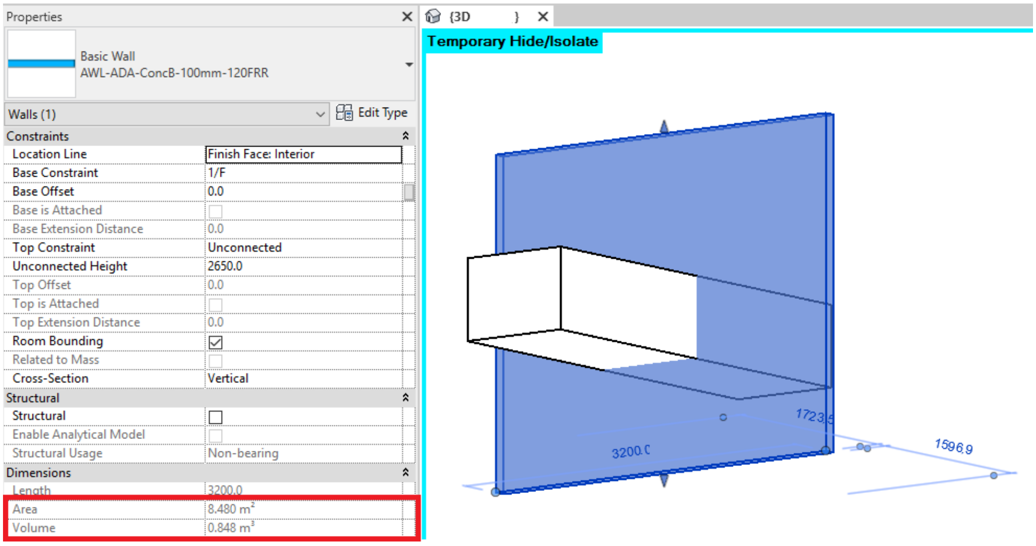
- Despite the fact that different types of wall joint will affect the area and the volume of the wall, it should be noted that for quantity take-off purpose, different wall joint methods do not affect or do not have significant impact on the total volumes. The “Area” shown in the program and above are the wall surface area of the outer sides, as marked in green dotted lines.

- For “Area”, the program’s built-in definition appears to be calculated from the product of length and height of the wall reference line, for a standard rectangular standalone wall, i.e., this will be the wall surface area of one face only instead of both faces. Where two walls are joined and there are different surface areas for two faces, the area also represents either one side of the face only, depends on the wall joint method being applied. Users should be aware of the systematic difference if extracting the area data for QTO or other purposes.

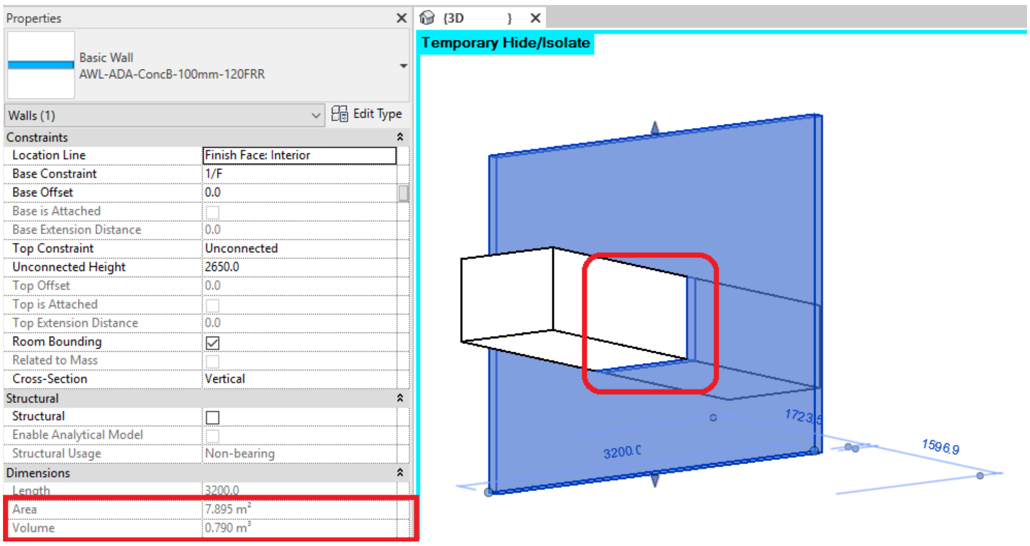
4.1.2.1.4 Joint Geometry

Joint Geometry is one of the essential commands between joined elements, although from elevation of these 2 walls seems no difference, but the actual geometry and the schedule shows the difference between the un-joined wall and the joined wall.

<u>Un-joined Wall:</u>



<u>Joined Wall:</u>



4.1.2.2 Ramp

4.1.2.2.1 Type Naming

Ramp is a built-in name of the system object.

Format:
<Functional Type> - <Originator> - <Descriptor 1> - <Descriptor 2>

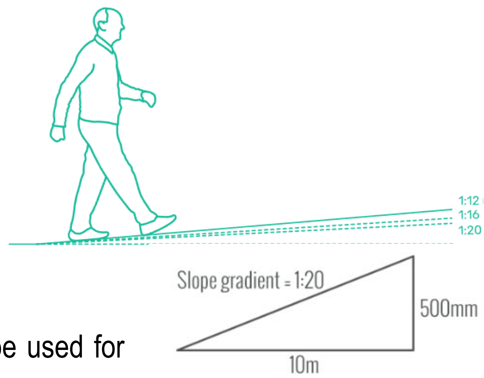
Type Name	**RAP-ADA-CONC_12-__**	**Descriptions**
Functional Type	**RAP**-ADA-CONC_12-__	RAP is the short form of the functional type "Ramp".
Originator	RAP-**ADA**-CONC_12-__	ADA for architectural discipline of ArchSD.
Descriptor 1	RAP-ADA-**CONC_12**-__	The ramp is made of Concrete with 1:12 slope for disabled access.
Descriptor 2	RAP-ADA-CONC_12-__	2-digit sequential number to distinguish different types, if Descriptor 2 is blank, two underscores (__) should be used.

Functional Type	**Descriptions**
RAP	Ramp
ARF	Architectural Ramp Finishes
ASR	Architectural Finishes + Structural Ramp

Descriptor 1	**Descriptions**
STL	The ramp is made of steel.
Material	Material of ramp finishes, e.g. porcelain tiles.

4.1.2.2.2 Sequence of modelling

Ramp consists of architectural finishes and structural ramp. Architect is required to create structural ramp at early stage (Before Structural Engineer on board) of the project. After structural (STR) model is linked with architectural (ARC) model, original structural ramp modelled by architect could be modified to architectural ramp finishes by changing the Ramp Type setting (including thickness, base offset, top offset, etc.).



If the gradient of a slope is greater than 1:21, ramp should be used for modelling.

Early Stage (Before Structural Engineer on board)

- Create structural ramp/mass concrete fill ramp in ARC model (for design intention and drawing production)

Later Stage (After Structural Engineer on board)

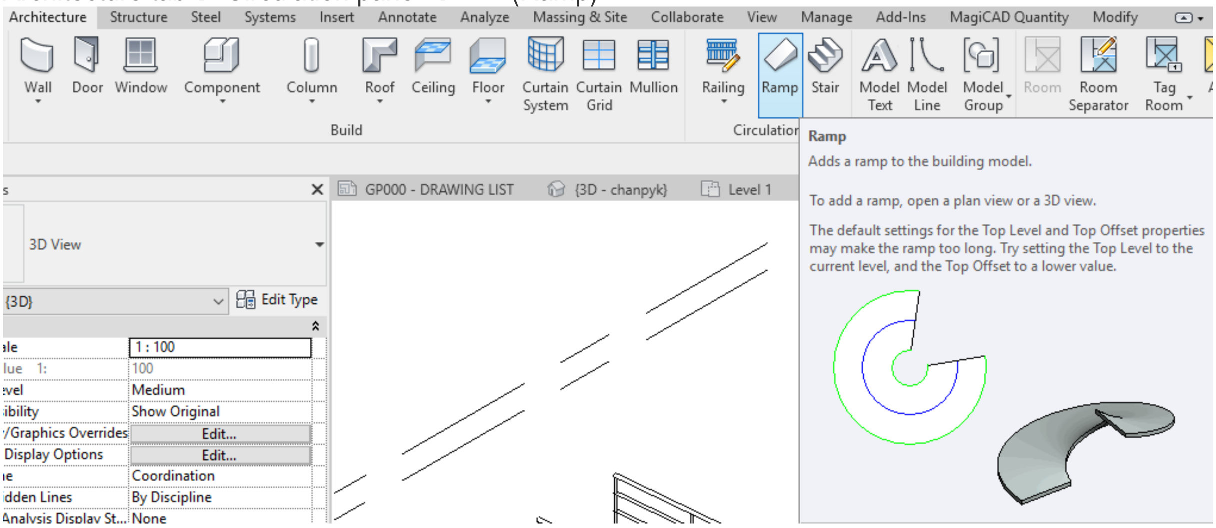
- Create structural ramp in STR model (with loading calculation)
- Link ARC model with STR model
- Modify original structural ramp in ARC model to ramp finishes on top of the linked structural ramp or apply ramp finishes to mass concrete fill ramp

4.1.2.2.3 Setting of creating Ramp

Create a ramp in a plan or 3D view by sketching the run of the ramp or by sketching boundary lines.

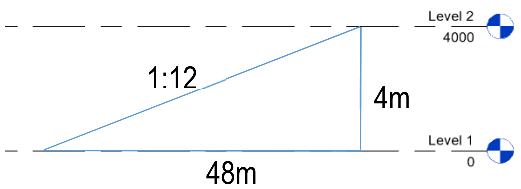
<u>Step 1</u>

Architecture tab→ Circulation panel → (Ramp).

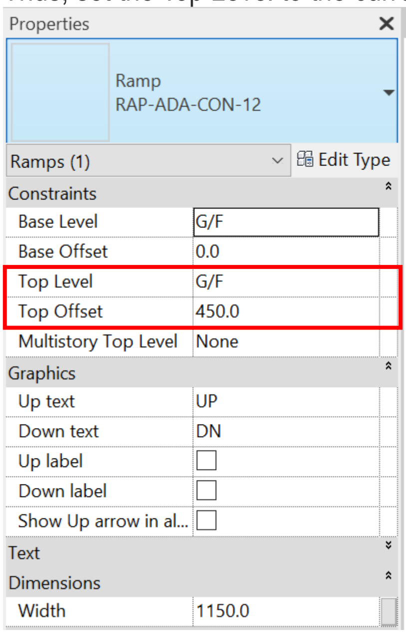


<u>Step 2</u>

The default settings for the ramp (Top Level = Upper Level) may make the ramp too long.
e.g. 1:12 ramp, the length of ramp will be 48m

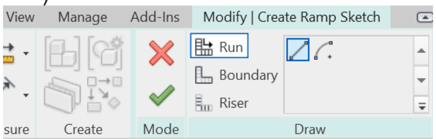


Thus, set the Top Level to the current level, and the Top Offset to the offset distance from top level.

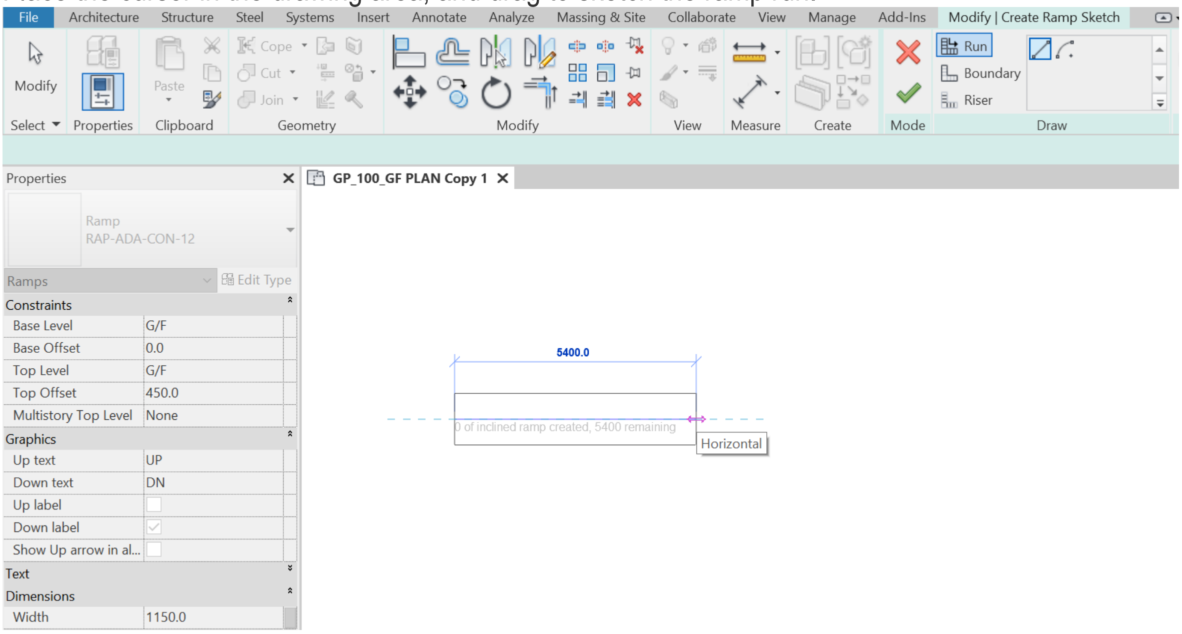


Step 3

Click Modify | Create Ramp Sketch tab→ Draw panel, and select either (Line) or (Center-ends Arc).

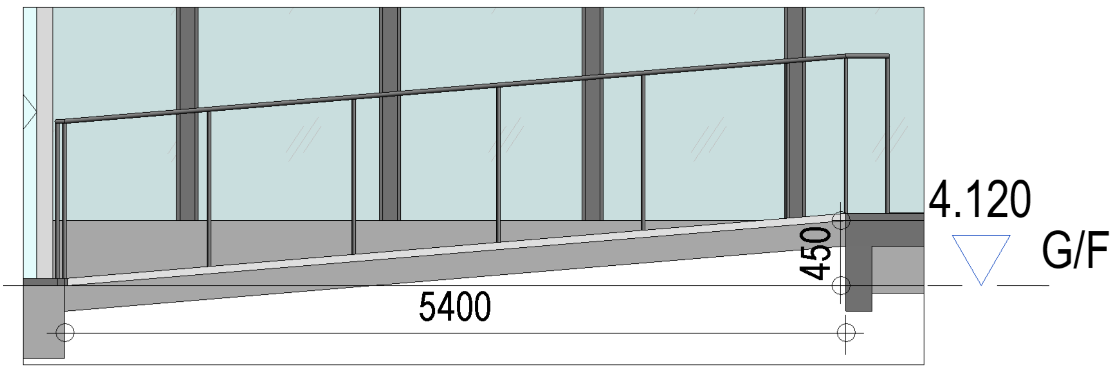


Place the cursor in the drawing area, and drag to sketch the ramp run.



Step 4

Click (Finish Edit Mode).



Step 5

The following typical parameters shall be set:

Under **Properties> Dimensions**

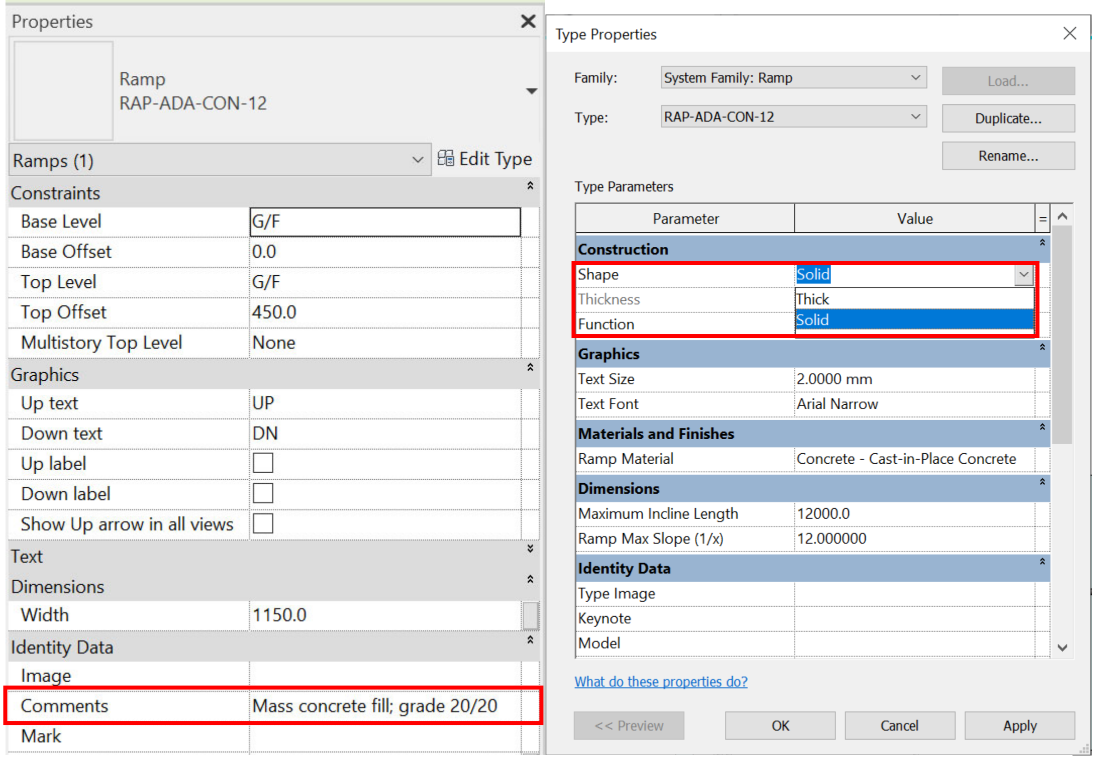
Parameter	Type / Instance	Description
Width	Instance	Be aware of width whether including or not including handrails.

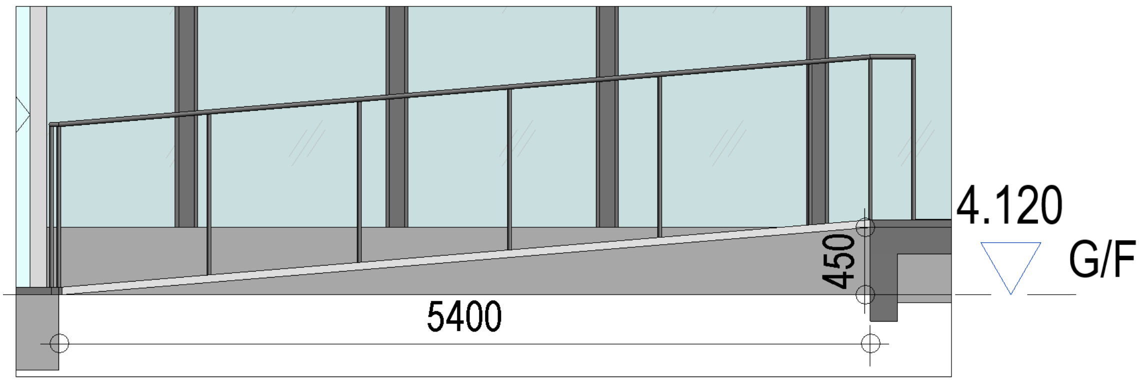
Under **Type Parameters > Materials and Finishes**

Parameter	Type / Instance	Description
Ramp Material	Type	

Step 6

The following parameters shall be set in a mass concrete fill ramp.



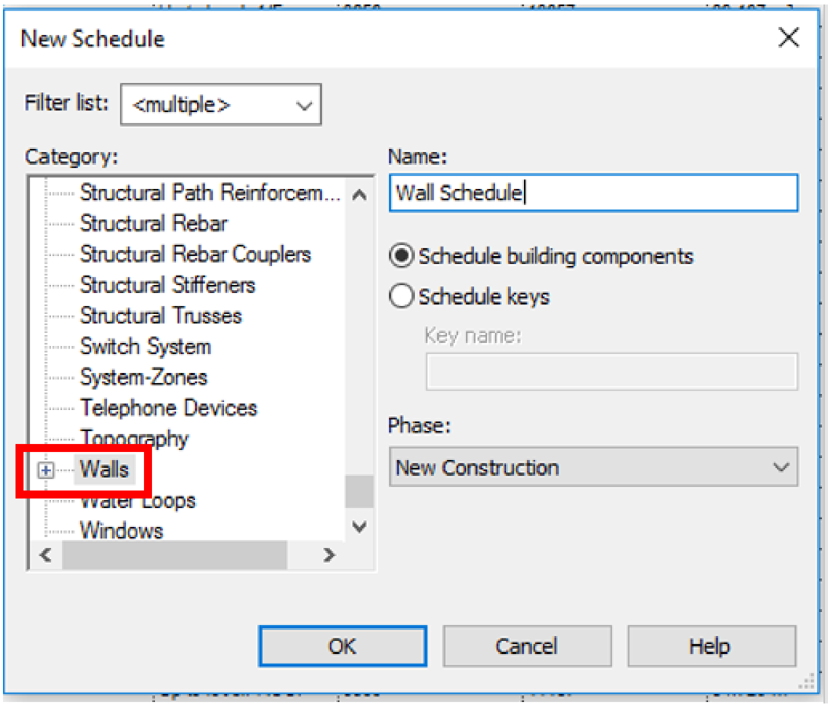


4.1.3 Quantity Take-off

4.1.3.1 Architectural Walls

<u>**Step 1**</u>

Create a new **Walls** Schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.



<u>Sample of Wall Schedule</u>

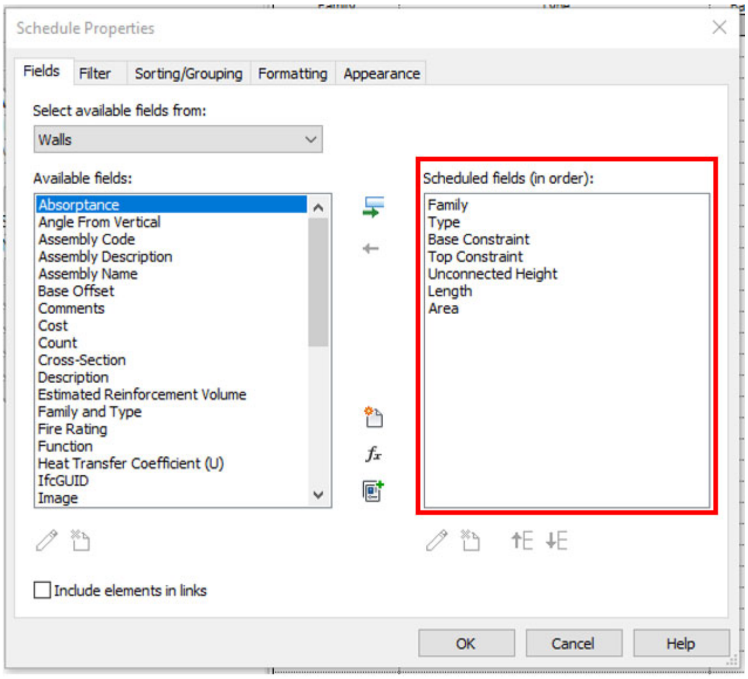
<Wall Schedule>

A	B	C	D	E	F	G
Family	Type	Base Constraint	Top Constraint	Unconnected Height	Length	Area
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: 1/F	3500	4050	11.948 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: 1/F	3650	2550	8.797 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: 2/F	7550	2450	18.008 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: 1/F	3650	13057	39.107 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: ROOF	11450	600	6.298 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: 1/F	4650	8850	26.783 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: ROOF	11450	725	6.297 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: ROOF	11450	725	6.298 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: 1/F	3450	6450	18.244 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: 1/F	3350	1545	2.690 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: 1/F	4650	6700	19.049 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: ROOF	11450	725	6.298 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: ROOF	11450	725	6.298 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: ROOF	11450	725	6.298 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: 1/F	3650	2325	7.245 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: 1/F	3650	2175	7.073 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	G/F	Up to level: 1/F	3950	750	2.063 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	1/F	Up to level: 2/F	3900	1150	4.070 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	1/F	Up to level: 2/F	3900	4950	16.087 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	1/F	Up to level: 2/F	3850	13955	45.147 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	1/F	Up to level: 2/F	3900	6900	25.530 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	1/F	Up to level: 2/F	3900	13905	48.963 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	1/F	Up to level: 2/F	3900	1750	6.475 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	1/F	Up to level: 2/F	3900	1600	5.580 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	1/F	Up to level: 2/F	3900	6900	25.160 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	2/F	Up to level: ROOF	3300	11187	34.720 m²
Basic Wall	AWL-ADA-ConcB-100mm-120FRR	2/F	Up to level: ROOF	3300	4775	10.976 m²

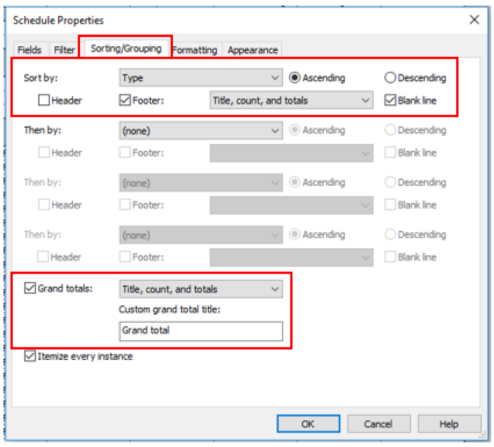
Step 2

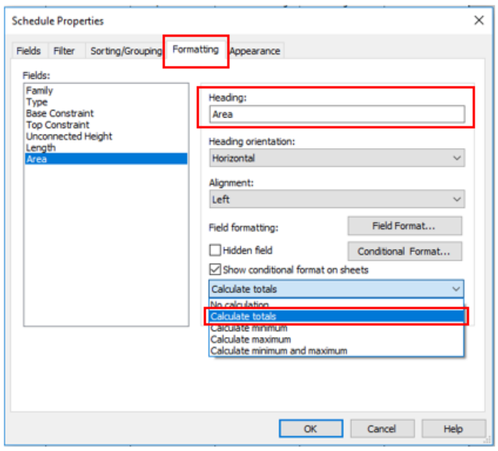
Schedule Properties and Setting

❖ Fields



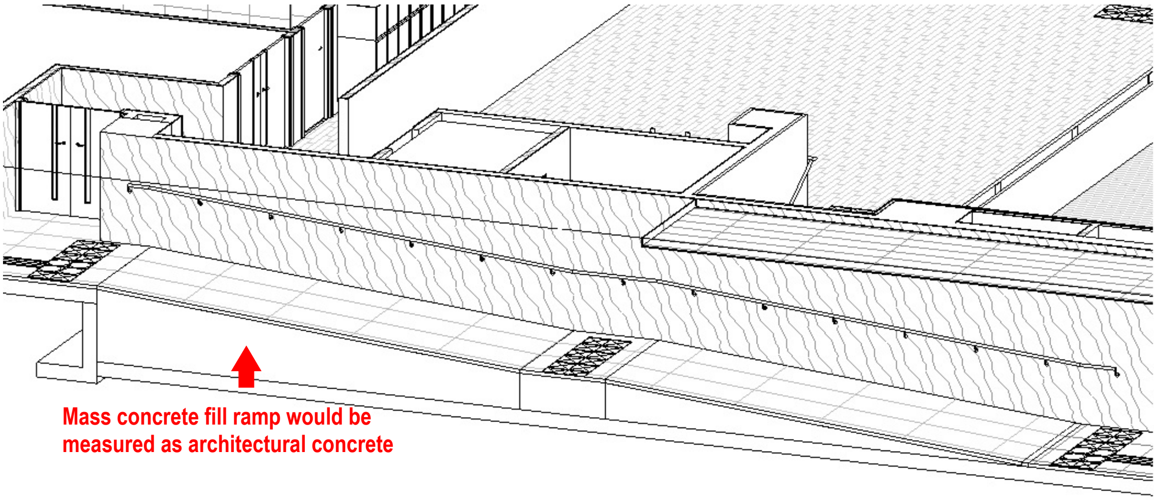
❖ Sorting/Grouping



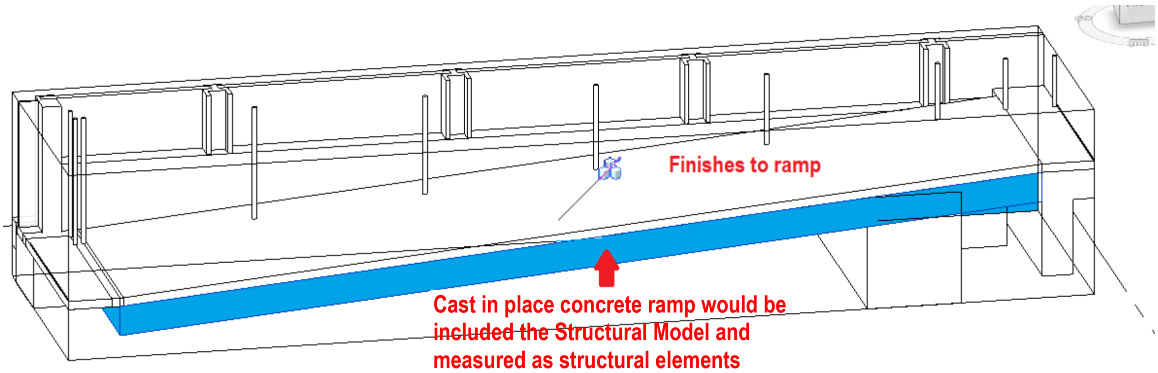


4.1.3.2 Ramp

4.1.3.2.1 Mass concrete fill to form ramp

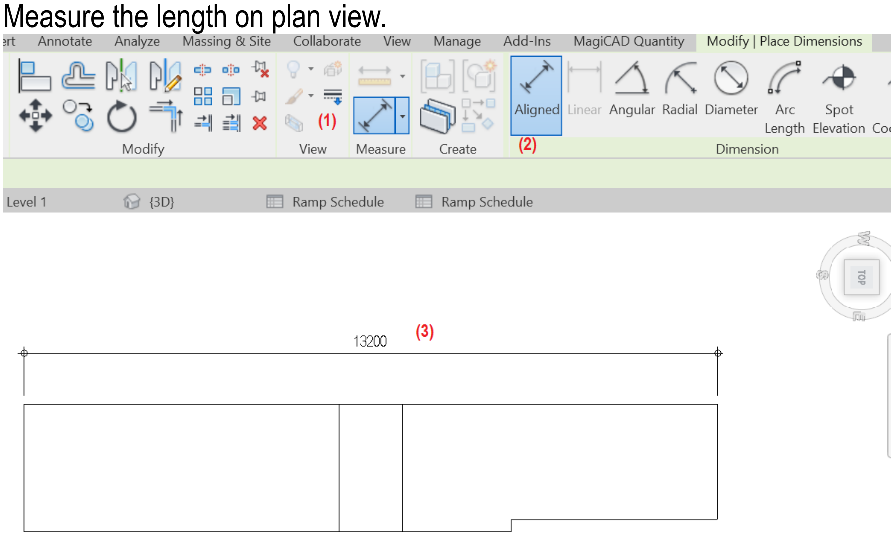


4.1.3.2.2 Floor slab to form ramp



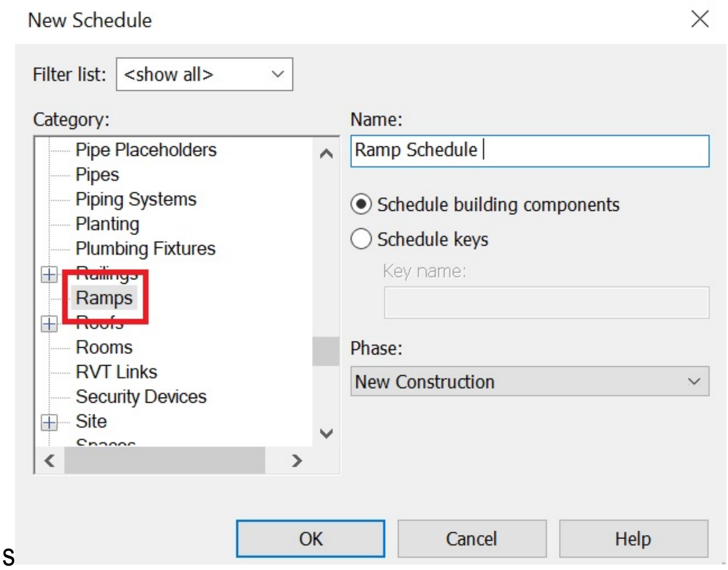
Step 1

Measure the length on plan view.



Step 2

Create a new **Ramps** schedule, refer to Part 7 Techniques for QTO – 7.4 Schedule/ Material Take-off.



s

Sample of Ramp Schedule

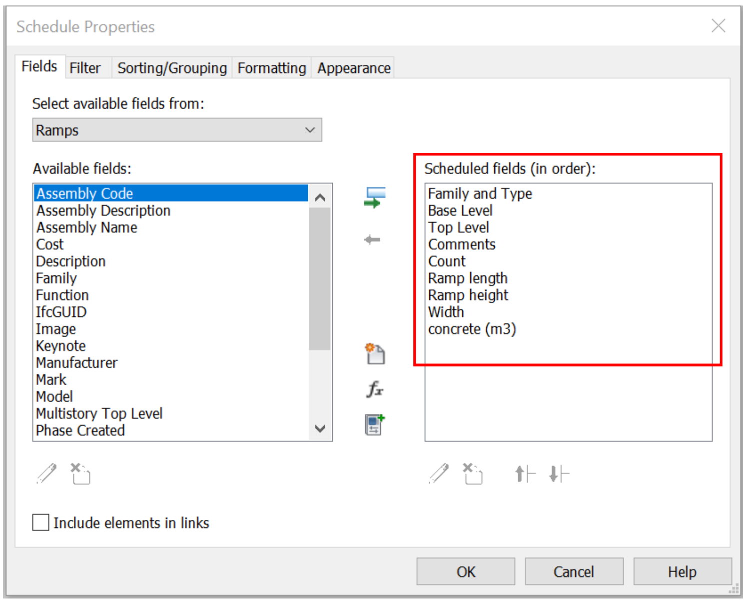
<Ramp Schedule>								
A	B	C	D	E	F	G	H	I
Family and Type	Base Level	Top Level	Comments	Count	Ramp length	Ramp height	Width	concrete (m3)
Ramp: RAP-ADA-CON-20	G/F	G/F	Mass concrete fill; grade 20/20	1	3750	150	1000	0.28 m³
Ramp: RAP-ADA-CON-12	G/F	G/F	Mass concrete fill; grade 20/20	1	13200	1000	1400	9.24 m³

Input manually

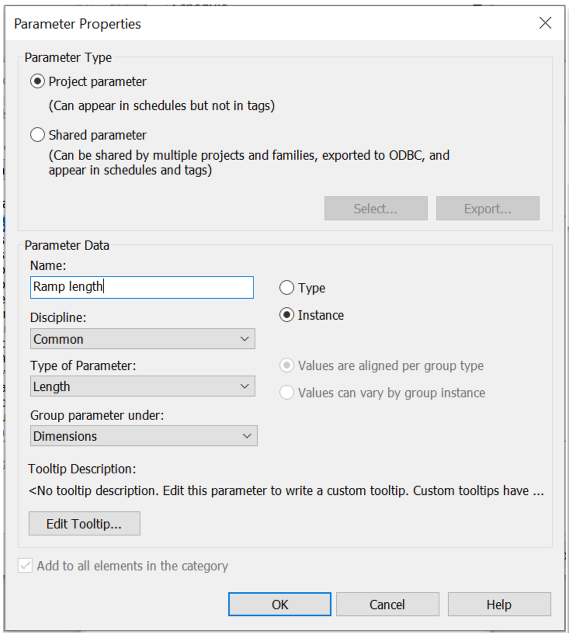
Step 3

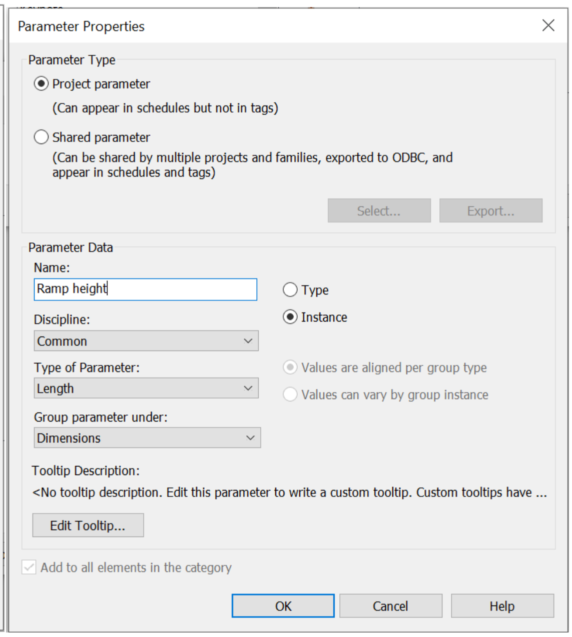
Schedule Properties and Setting

❖ Fields



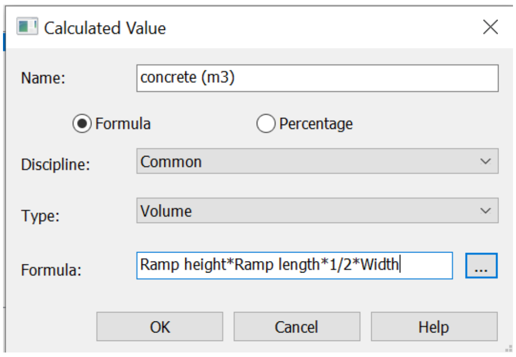
❖ Add new parameters to schedule.



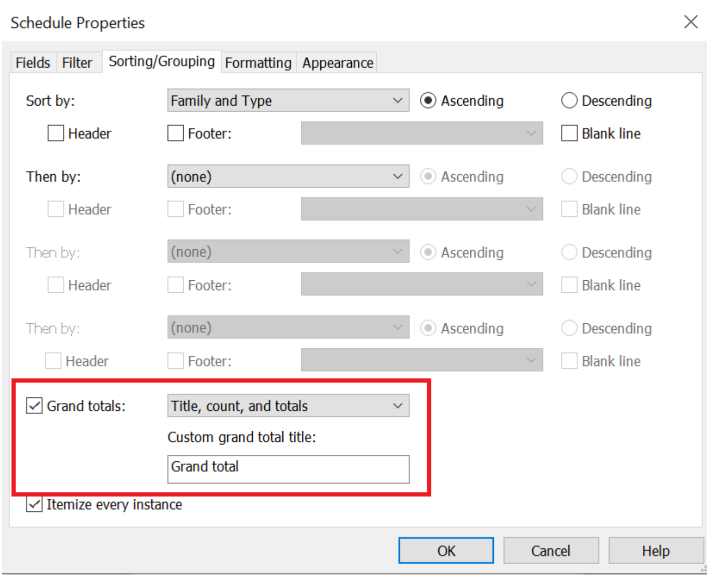


❖ Calculated Value

Set formula for the parameter.



❖ Sorting/Grouping



4.2 Partitions & Linings

This section mainly focuses on the following partitions:

i. Brickwork and Blockwork (covered under Part 4 Detailed Modelling Guidelines – Architectural Design – 4.1 Architectural Concrete Works)
ii. Sliding and Folding Partitions (covered under Part 4 Detailed Modelling Guidelines – Architectural Design – 4.3 Doors)
iii. Toilet and Shower Cubical Partitions
iv. Fixed and Demountable Partitions

4.2.1 Basic Information

4.2.1.1 Building Element to Model

Modelling elements:

Elements	Object Category
Work Description	Manage/ Settings/ Materials
Toilet and Shower Cubical Partitions	Component: Generic Models: Plumbing Fixtures
Fixed and Demountable Partitions	Component: Generic Models: Furniture Systems

4.2.2 Modelling Approach

4.2.2.1 Toilet and Shower Cubical Partitions

4.2.2.1.1 Object Naming

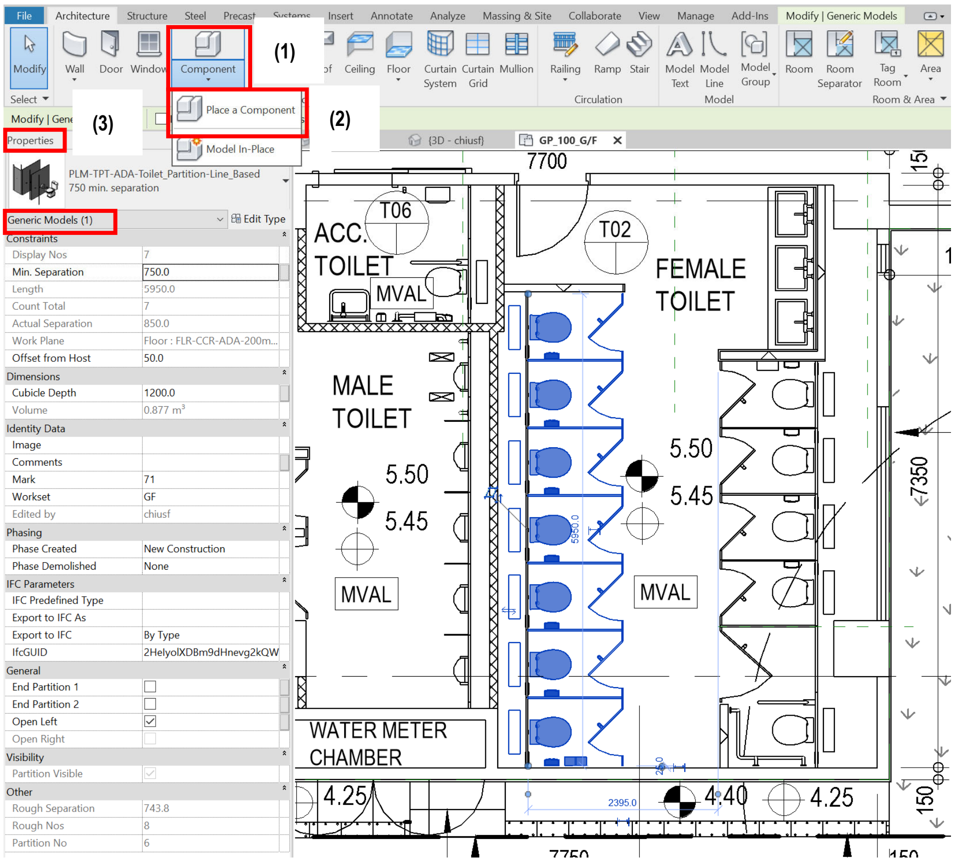
Toilet and Shower Cubical Partitions can be created with generic models template and categorized in Plumbing Fixture.

Format:
<Category> - <Functional Type> - <Originator> - <Descriptor 1>- <Descriptor 2>

Object Name	PLM-TPT-ADA-ToiletPartition-01	Descriptions
Category	**PLM**-TPT-ADA-ToiletPartition-01	PLM is the short form of the Category type “Plumbing Fixture”
Functional Type	PLM-**TPT**-ADA-ToiletPartition-01	TPT is the short from of “Toilet Partition”
Originator	PLM-TPT-**ADA**-ToiletPartition-01	ADA for architectural discipline of ArchSD
Descriptor 1	PLM-TPT-ADA-**ToiletPartition**-01	A fixture of toilet partition.
Descriptor 2	PLM-TPT-ADA-ToiletPartition-**01**	2-digit sequential number to distinguish different types. Type 1 of the toilet partition

4.2.2.1.2 Sequence of modelling

<u>The sequence of modelling:</u>
Architectural tab → (1) Component → (2) Place a Component → (3) Choose the partition type in Properties → (4) Draw the path on plan



4.2.2.2 Fixed and Demountable Partitions

4.2.2.2.1 Object Naming

Fixed and Demountable Partitions can be created with generic models template and categorized in Furniture Systems.

Format:
<Category> - <Functional Type> - <Originator> - <Descriptor 1> - <Descriptor 2>

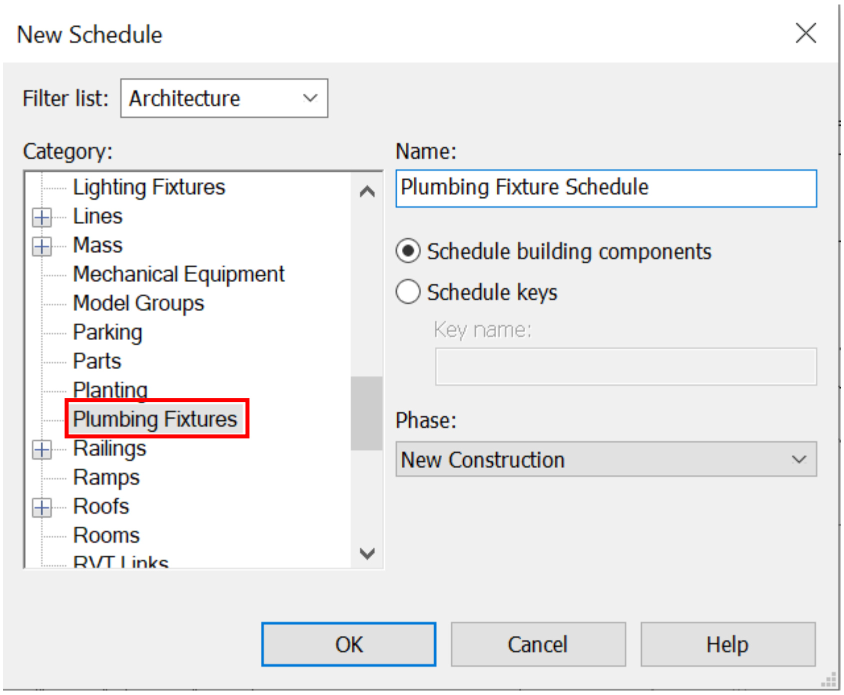
Object Name	FNY-PRT-ADA-FixedPartition-01	Descriptions
Category	**FNY**-PRT-ADA-FixedPartition-01	FNY is the short form of the category type “Furniture Systems”
Functional Type	FNY-**PRT**-ADA-FixedPartition-01	Partition is the short from the functional type of “Partition”
Originator	FNY-PRT-**ADA**-FixedPartition-01	ADA for architectural discipline of ArchSD
Descriptor 1	FNY-PRT-ADA-**FixedPartition**-01	A fixture of fixed partition.
Descriptor 2	FNY-PRT-ADA-FixedPartition-**01**	2-digit sequential number to distinguish different types. Type 1 of the fixed partition.

4.2.3 Quantity Take-off

4.2.3.1 Toilet and Shower Cubical Partitions

Step 1

Create a new **Plumbing Fixtures** Schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.



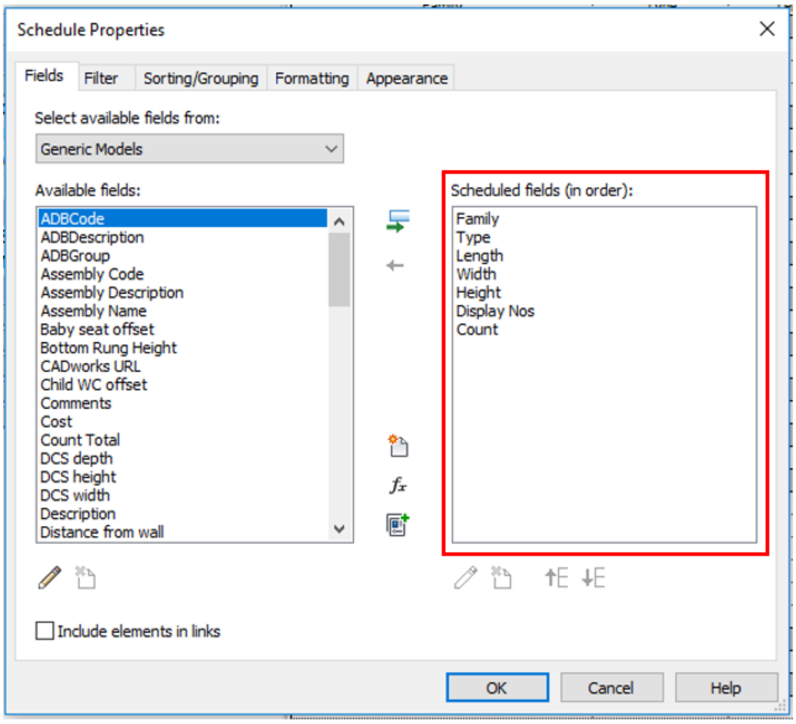
Sample of Plumbing Fixtures Schedule

<Generic Model Schedule>						
A	B	C	D	E	F	G
Family	Type	Length	Width	Height	Display Nos	Count
PLM-TPT-ADA-Toilet_Partition	M_Sanfit_WC	5950	1200	2600	7	1
PLM-TPT-ADA-Toilet_Partition	M_Sanfit_WC	4300	1200	2600	4	1
PLM-TPT-ADA-Toilet_Partition	M_Sanfit_WC	1585	850	2600	2	1
PLM-TPT-ADA-Toilet_Partition: 3						

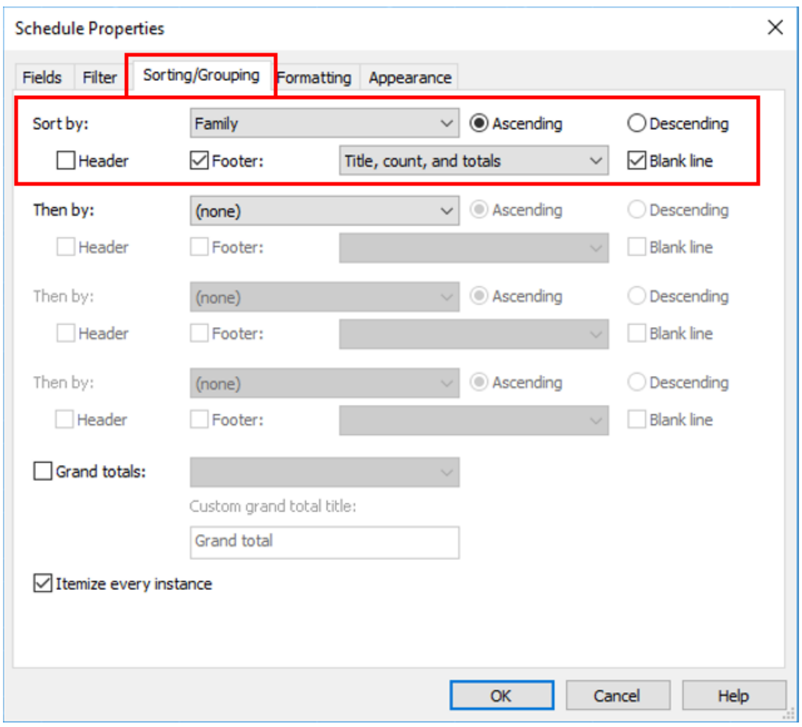
<u>Step 2</u>

<u>Schedule Properties and Setting</u>

❖ Fields



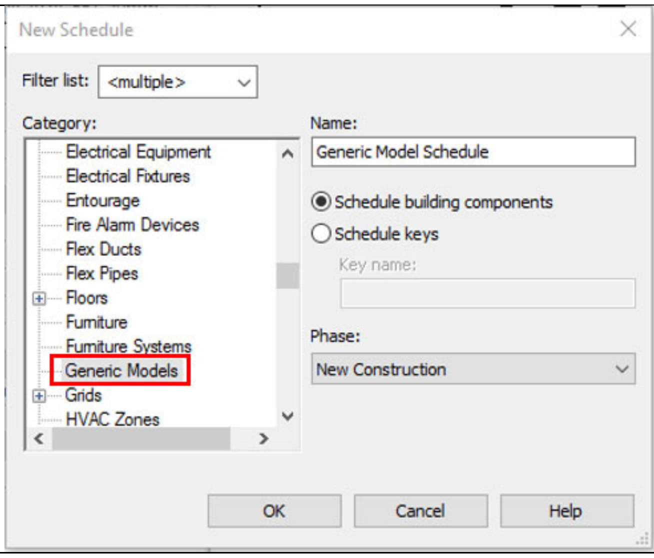
❖ Sorting/Grouping



4.2.3.2 Fixed and Demountable Partitions

Step 1

Create a new **Generic Models** Schedule, refer to Part 7 Techniques for QTO **-** 7.4 Schedule/ Material Take-off.

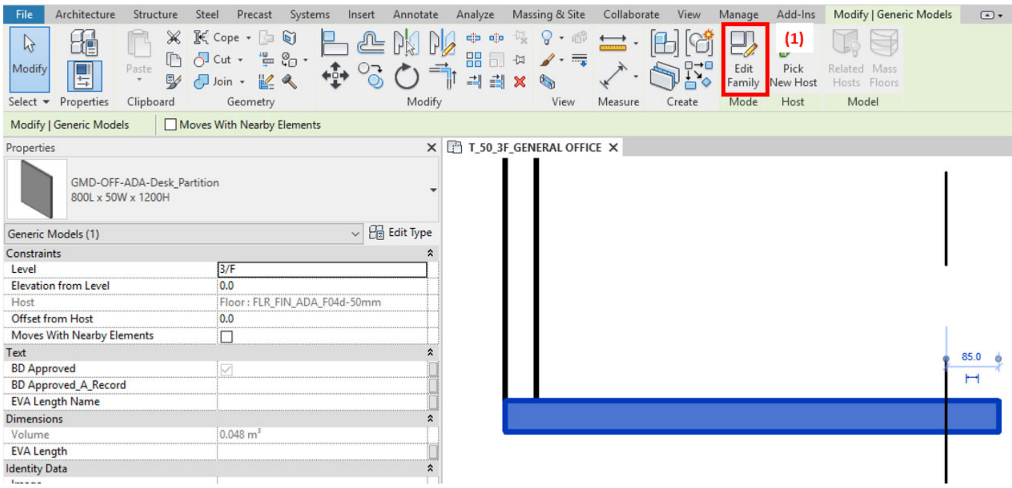


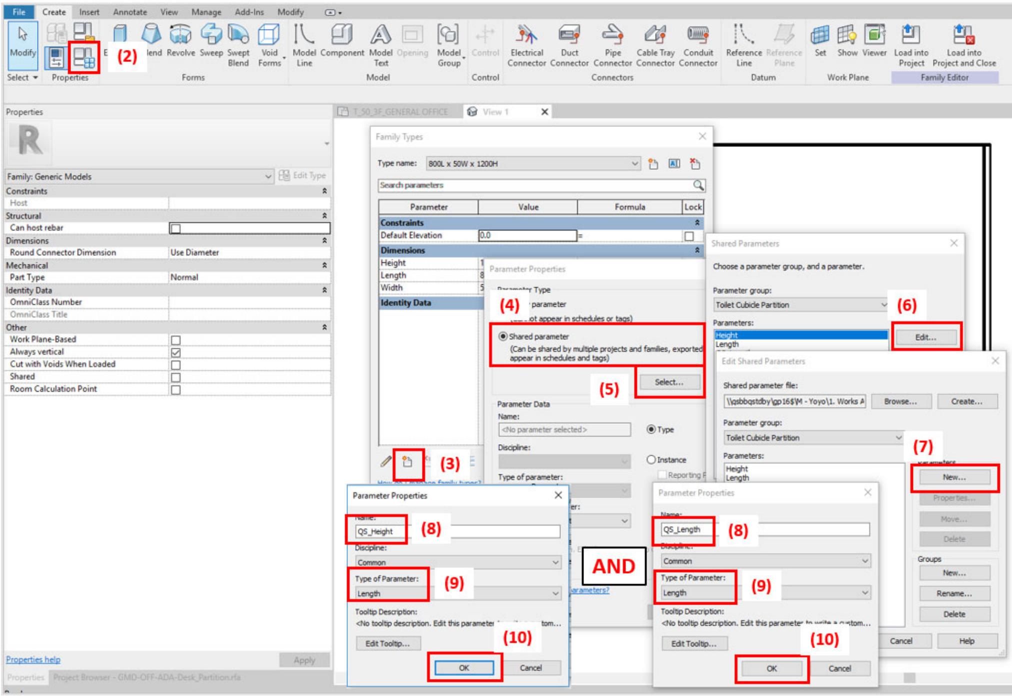
Sample of Generic Model Schedule

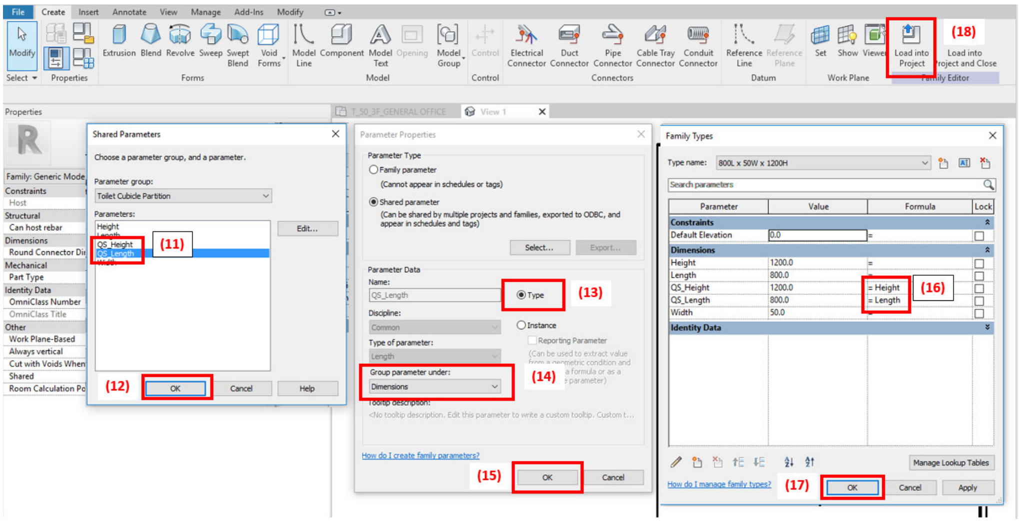
<Generic Model Schedule>					
A	B	C	D	E	F
Family	Level	Type	Count	QS_Height	QS_Length
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1700L x 50W x 1200H	1	1200	1700
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1700L x 50W x 1200H	1	1200	1700
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1700L x 50W x 1200H	1	1200	1700
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1700L x 50W x 1200H	1	1200	1700
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1700L x 50W x 1200H	1	1200	1700
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1350L x 50W x 1200H	1	1200	1350
GMD-OFF-ADA-Desk_Partition	3/F	1700L x 50W x 1200H	1	1200	1700
GMD-OFF-ADA-Desk_Partition	3/F	1200L x 50W x 1200H 2	1	1200	1200
GMD-OFF-ADA-Desk_Partition	3/F	1700L x 50W x 1200H	1	1200	1700
GMD-OFF-ADA-Desk_Partition	3/F	1200L x 50W x 1200H 2	1	1200	1200
GMD-OFF-ADA-Desk_Partition	3/F	800L x 50W x 1200H	1	1200	800
GMD-OFF-ADA-Desk_Partition	3/F	800L x 50W x 1200H	1	1200	800
GMD-OFF-ADA-Desk_Partition	3/F	800L x 50W x 1200H	1	1200	800
GMD-OFF-ADA-Desk_Partition	3/F	800L x 50W x 1200H	1	1200	800
GMD-OFF-ADA-Desk_Partition	3/F	800L x 50W x 1200H	1	1200	800
GMD-OFF-ADA-Desk_Partition	3/F	800L x 50W x 1200H	1	1200	800
GMD-OFF-ADA-Desk_Partition	3/F	800L x 50W x 1200H	1	1200	800
1200: 34			34		44550

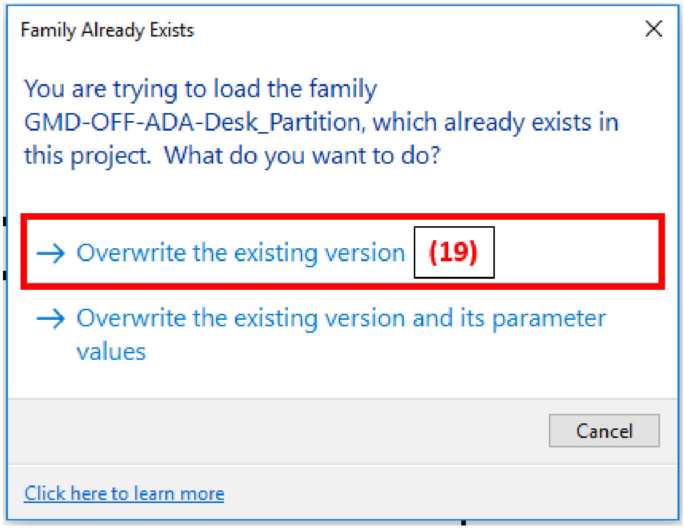
Step 3

Edit Family





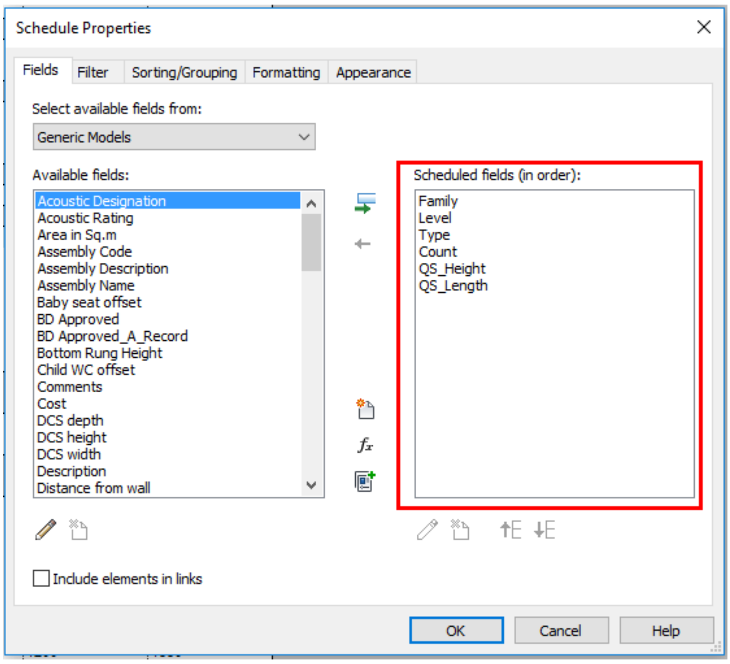

(11)
(12)
(13)
(14)
(15)
(16)
(17)
(18)


Family Already Exists
You are trying to load the family GMD-OFF-ADA-Desk_Partition, which already exists in this project. What do you want to do?
Overwrite the existing version
(19)
Overwrite the existing version and its parameter values
Cancel
Click here to learn more

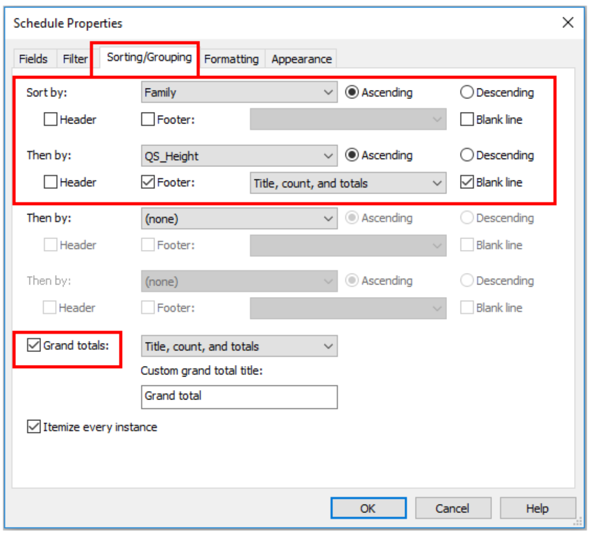
Step 3

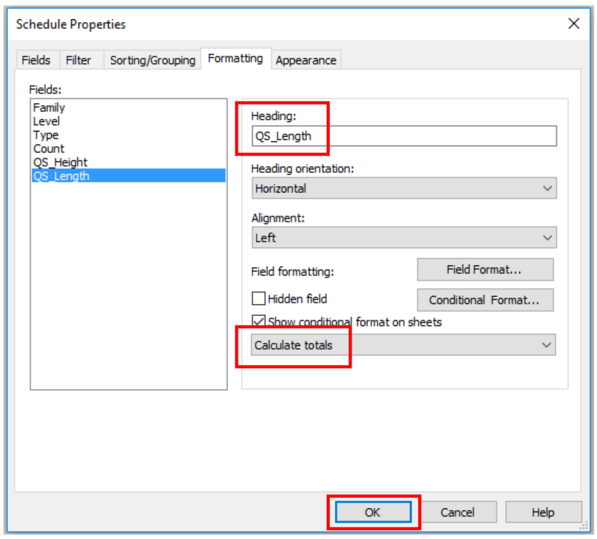
Schedule Properties and Setting

❖ Fields



❖ Sorting/Grouping





4.3 Doors

This section mainly focuses on the following doors:
i. Timber Door
ii. Metal Door

4.3.1 Basic Information

4.3.1.1 Building Element to Model

Modelling elements:

Elements	Object Category
Work Description	Manage/ Settings/ Materials
Door	Door

4.3.1.2 Sequence of modelling

The sequence of modelling:

Create new object → Door → Add Parameters → Create wall in Project

→ Load into Project → Add door

- Door is a wall host component;
- Door in a curtain wall shall be created from curtain panel;

4.3.2 Modelling Approach

4.3.2.1 Object Naming

Details of naming convention shall refer to Section 4.9.2 of BIM Guide for Architectural Design issued by Architectural Branch, Architectural Services Department.

Format:
<Category> - < Functional Type> - <Originator> - <Descriptor 1> - <Descriptor 2>

Object Name	DOR-SGL-ADA-WD-01	Descriptions
Category	**DOR**-SGL-ADA-WD-01	A Door, DOR is the short form of the Category type "door"
Functional Type	DOR-**SGL**-ADA-WD-01	A Single Door, SGL is the short form of the functional type "single"
Originator	DOR-SGL-**ADA**-WD-01	ADA for architectural discipline of ArchSD
Descriptor 1	DOR-SGL-ADA-**WD**-01	A door is made of Wood (WD) (material).
Descriptor 2	DOR-SGL-ADA-WD-**01**	Type 1 of the wood door.

Functional Type	Descriptions
SGL	Single Door
DBL	Double Door
SLD	Sliding Door
SDL	Sidelight Door

4.3.2.2 Type Naming

Format

<Width>mm x <Height>mm

Single Swing Door:

Type Name	Descriptions
850mm x 2150mm	850mm Door Width 2150mm Door Height

Double Swing Door:

Type Name	Descriptions
1500mm x 2150mm	1500mm Door Width 2150mm Door Height
600/800mm x 2350mm	600mm Left Door Width 800mm Right Door Width 2350mm Door Height

4.3.2.3 Setting of creating a Door

Door shall be modelled to its designed size with suitable parameters to allow computation of the size of structural opening, door leaf and door frame. The following parameters shall be set in Door objects:

Under **Construction**

Description	Parameter	Timber Door	Metal Door
Interior/ Exterior	**Function**	✓	✓
Number of door panels (for sliding partition only)	**No. of door panels**	✓	✓

Under **Materials and Finishes**

Description	Parameter	Timber Door	Metal Door
Material of Door leaf	**Door Panel Material#**	✓	✓
Material of Vision panel	**Vision panel Material#**	✓	✓
Material of Door Frame	**Door Frame Material#**	✓	✓
Material of Louvre	**Louvre Material#**	✓	✓

The information inserted in the parameter **Material** is for rendering purpose only, please refer to door details for the type of material.

Under **Dimension**

Description	Parameter	Timber Door	Metal Door
Door leaf width	**Primary Door Width**	✓	✓
2nd Door leaf width for double leaves door	**Secondary Door Width**	✓	✓
Each door panel width (for sliding partition only)	**Door panel width**	✓	✓
Door leaf height	**Door Height**	✓	✓
Door leaf thickness	**Door Panel Thickness**	✓	✓
Structural opening width	**Structural opening width (by formula)**	✓	✓
Structural opening height	**Structural opening height (by formula)**	✓	✓
Overall vision panel width including frame	**Vision panel width**	✓	✓
Overall vision panel height including frame	**Vision panel height**	✓	✓
Louvre width	**Louvre width**	✓	✓
Louvre height	**Louvre height**	✓	✓

4.3.2.3 Setting of creating a Door (Cont'd)

Under **Fire Protection**

Description	Parameter	Timber Door	Metal Door
Fire Rating of Fire-Rated door	**Fire-Rated door**	✓	✓

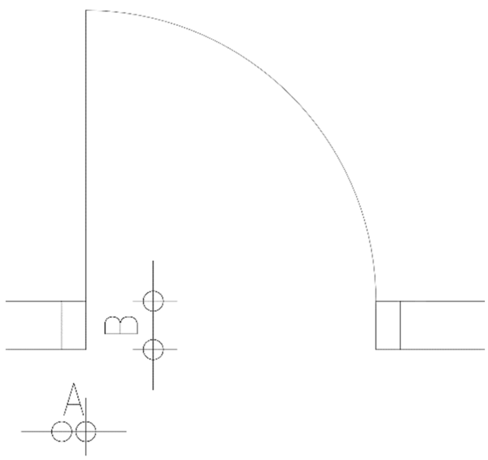
Under **Identity Data**

Description	Parameter	Timber Door	Metal Door
Ironmongery set mark (Detail refer to Ironmongery Schedule)	**Ironmongery set**	✓	✓
Door type mark	**Type Mark** (Built-in Parameter)	✓	✓

Note:

1. Models for architraves, door frame, thickness of visual panel, louvre blades and ironmongery are for geometrical indication only, please refer Detailed Drawings for actual dimension
2. A parameter **Door Mark for SCCU Submission** under **Fire Protection** are for statutory submission only, door mark shall refer the instance built-in parameter **Mark** for each door.
3. Formula for Structural opening:

Parameter	Calculate Formula
Structural opening width@	= **Door Width** + 2*(**Door Frame and Rough Filling Width**)
Structural opening height@	= **Door Height** + **Door Frame and Rough Filling Width** + **Floor Finish Thickness**
Clear Width (for reference)	= **Primary Door Width – Door Panel Thickness**



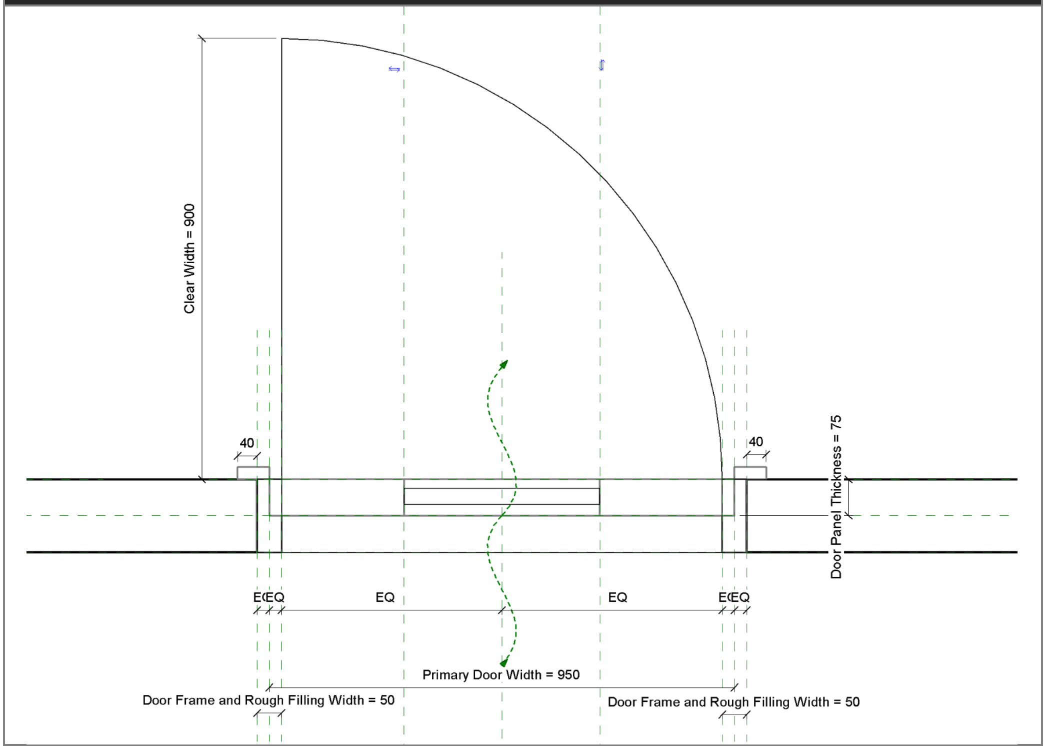
Parameter	Default Dimension
Door Frame and Rough Filling Width (A)	= 75mm
Door Frame Thickness (B)	Aligned with wall thickness

@ The formula subject to adjust where the door frame is not regular shape in model.

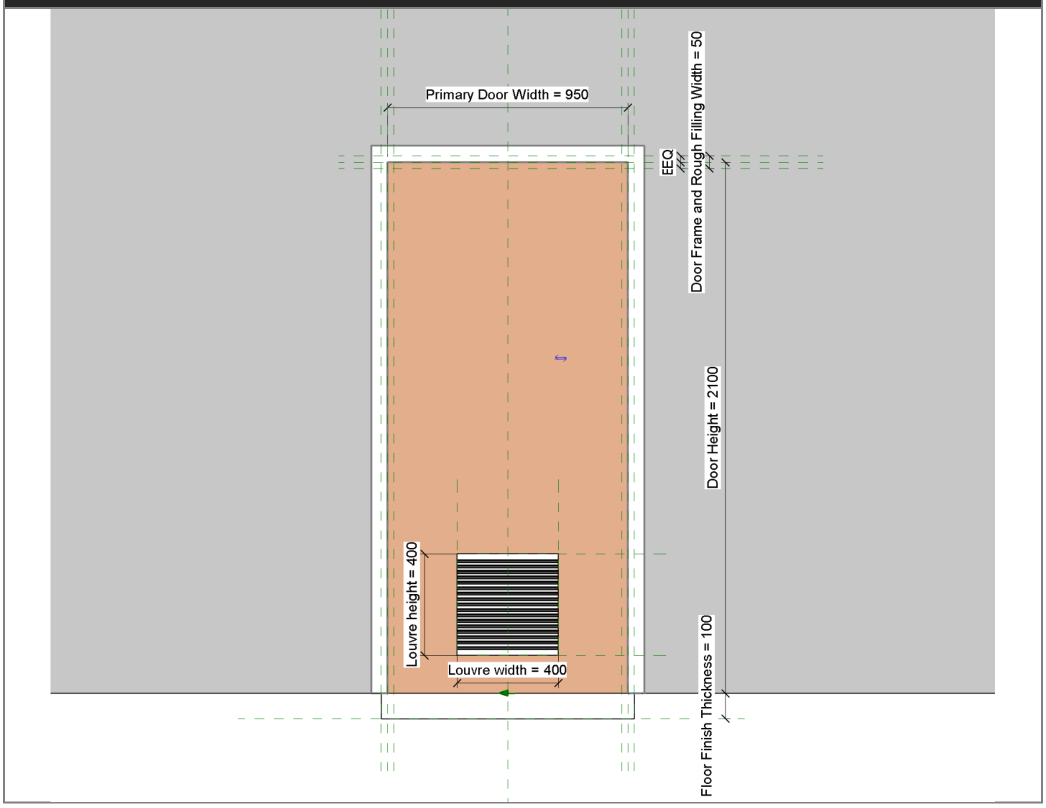
4.3.2.4 Door Object

(1) Timber Door

Model View: PLAN

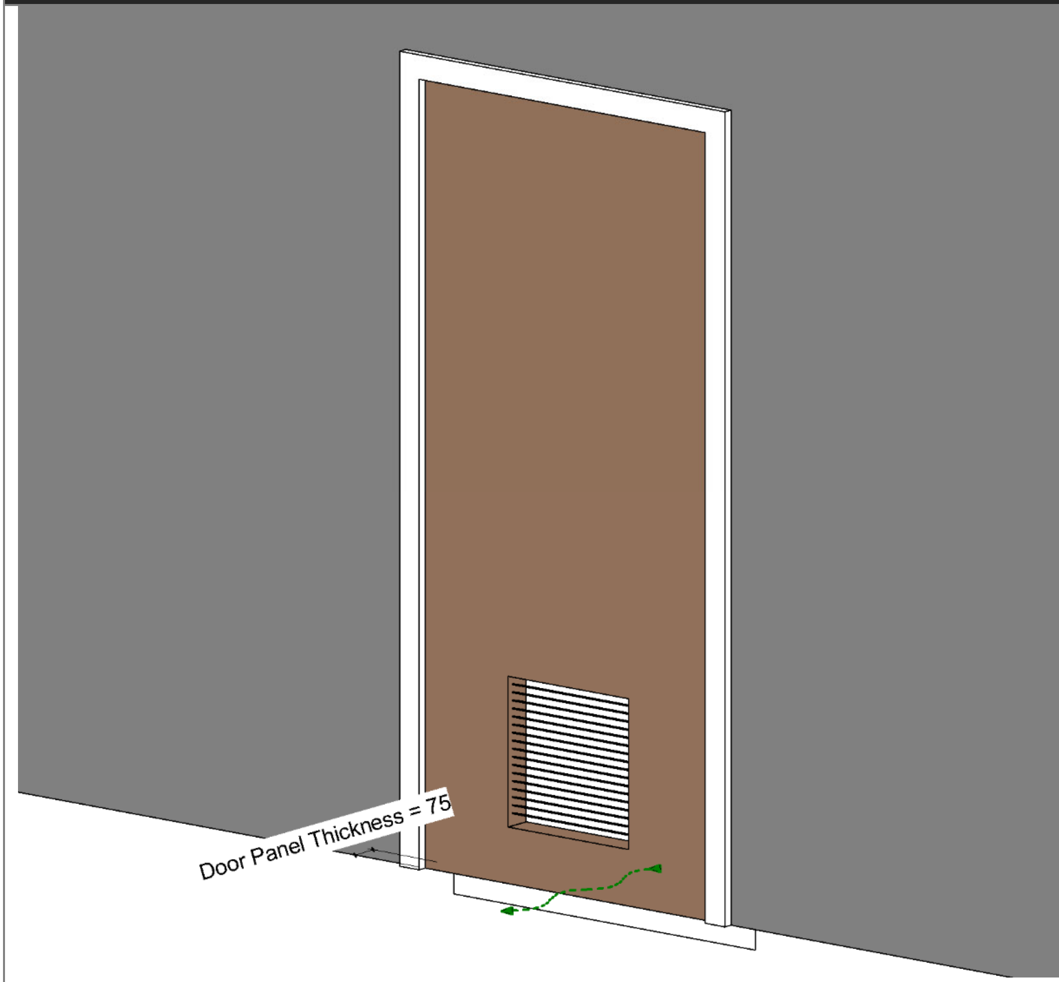


Model View: ELEVATION



(1) Timber Door (Cont'd)

Model View: 3D VIEW



(1) Timber Door (Cont'd)

Object View: PARAMETER

Family Types

Type name: 950mmx2100mm_Timber

Search parameters

Parameter	Value	Formula
Construction		
Construction Type		=
Function	Interior	=
Wall Closure	By host	=
Materials and Finishes		
Door Frame Material	Wood Door Frame	=
Door Panel Material	Wood	=
Louvre Material	Stainless Steel, Polished	=
Dimensions		
Primary Door Width	950.0	=
Door Height	2100.0	=
Door Panel Thickness	75.0	=
Structural Opening Width	1000.0	=Clear Width + Door Frame and Rough Filling Width * 2
Structural Opening Height	2250.0	=Door Height + Door Frame and Rough Filling Width + Floor Finish Thickness
Door Frame and Rough Filling Width	50.0	=
Floor Finish Thickness	100.0	=
Clear Width	900.0	=Primary Door Width - Door Frame and Rough Filling Width
Louvre width	400.0	=
Louvre height	400.0	=
Louvre offset from bottom	150.0	=
Louvre offset from edge	250.0	=
Analytical Properties		
IFC Parameters		
Fire Protection		
Door Mark for SCCU Submission		=
Fail-safe (default)	☑	=
Fire-rated door	☐	=
Fire-rated door F.R.R. -/120/120	☐	=
Fire-rated door F.R.R. -/30/30	☐	=
Fire-rated door F.R.R. -/60/60	☐	=
Readily open without use of a key (default)	☑	=
Identity Data		
Assembly Code		=
Cost		=
Description		=
Fire Rating		=
Ironmongery Set (default)	TC1	=
Keynote		=
Manufacturer		=
Model		=
Type Comments		=
Type Image		=
Type Mark	2	=
URL		=

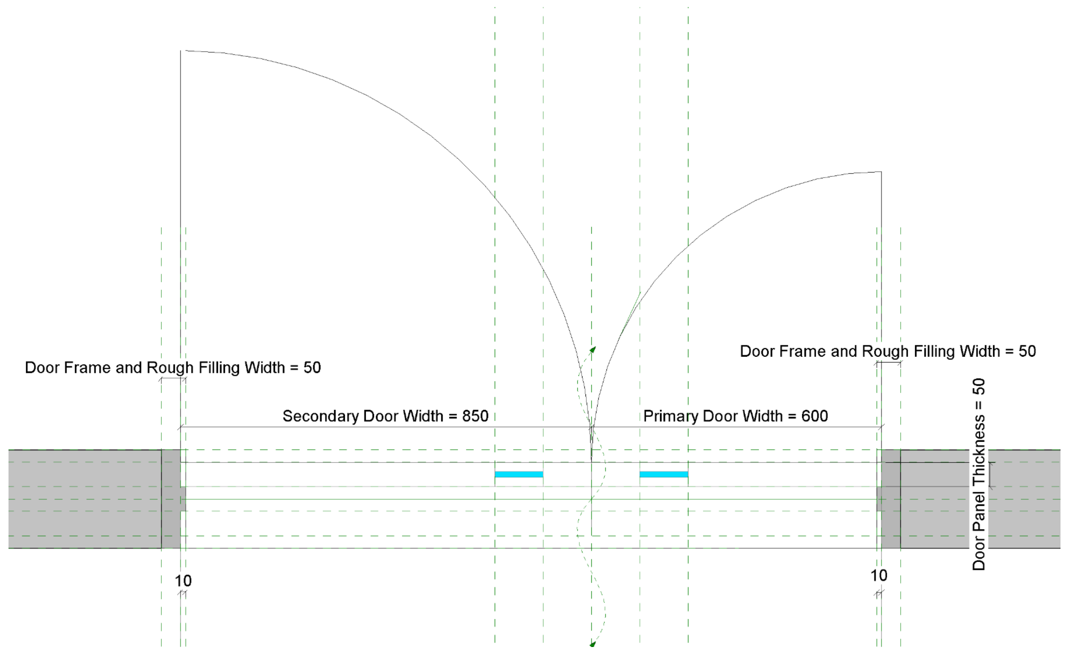
Manage Lookup Tables

How do I manage family types?

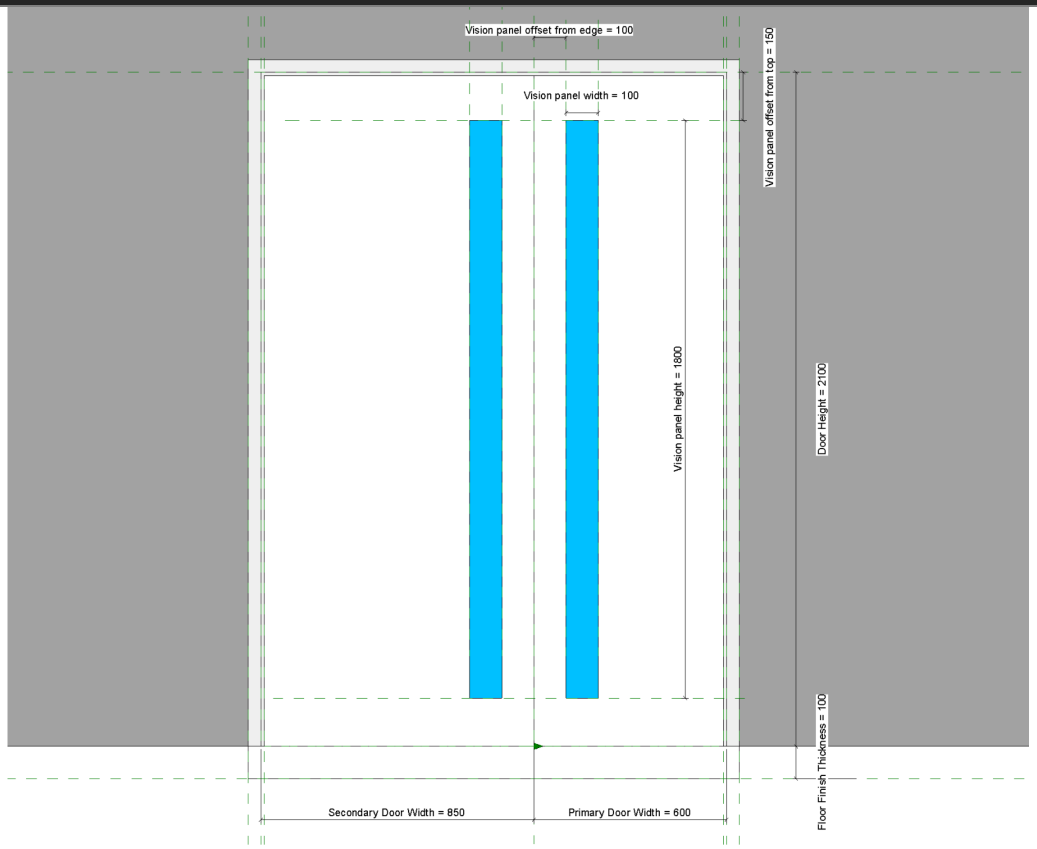
OK Cancel Apply

(2) Metal Door

Model View: PLAN

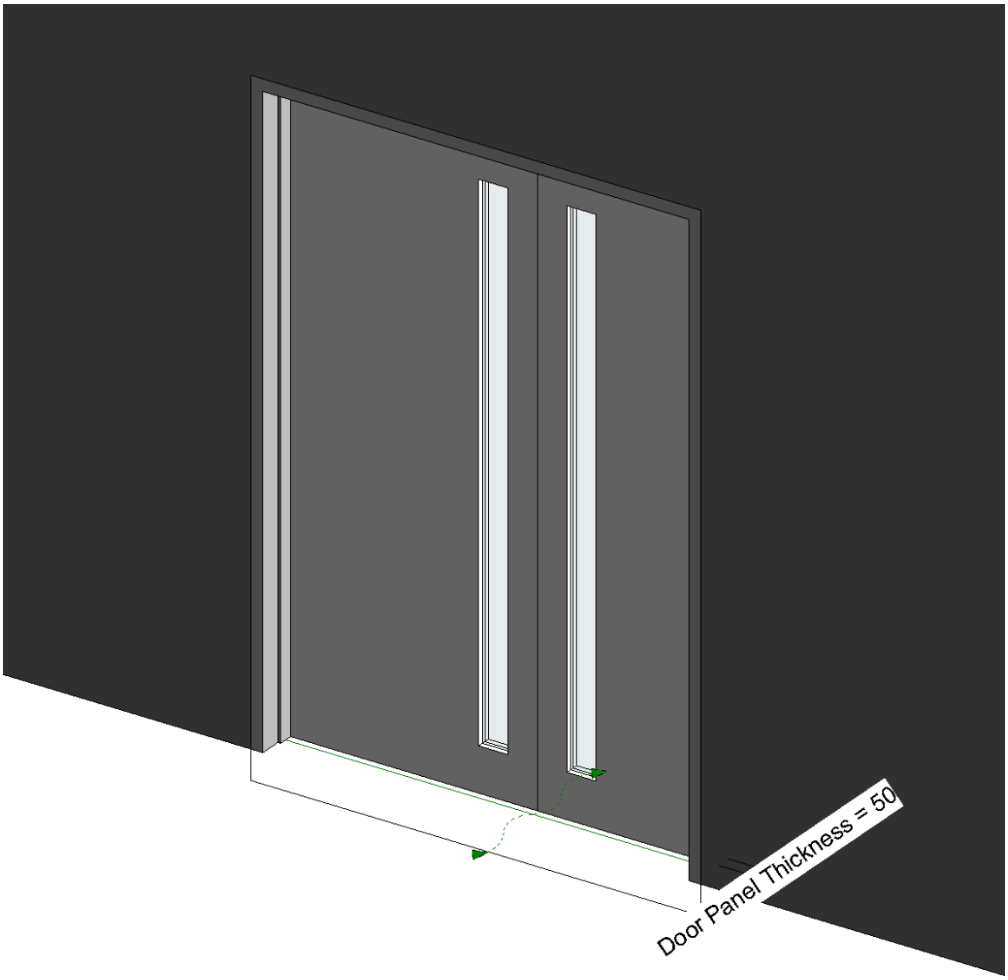


Model View: ELEVATION



(2) Metal Door (Cont'd)

Model View: 3D VIEW



(2) Metal Door (Cont'd)

Object View: PARAMETER

Family Types

Type name: 850+600mmx2100mm_Timber_60minFRR

Search parameters

Parameter	Value	Formula
Construction		
Construction Type		=
Function	Interior	=
Wall Closure	By host	=
Double action	☐	=
Normal Open (default)	☑	=if([Opening degree >90], 1 > 2, 2 > 1)
Opening degree >90 (default)	☐	=
Materials and Finishes		
Door Frame Material	Metal Door Frame	=
Door Panel Material	Metal Door Leaf	=
Vision Panel Material	Glass	=
Dimensions		
Primary Door Width	600.0	=
Secondary Door Width	850.0	=
Door Height	2100.0	=
Door Panel Thickness	50.0	=
Structural Opening Width	1530.0	=Clear Width + Door Frame and Rough Filling Width * 2
Structural Opening Height	2240.0	=Door Height + Door Frame and Rough Filling Width - (10 mm) + Floor Finish Thickness
Door Frame and Rough Filling Width	50.0	=
Floor Finish Thickness	100.0	=
Clear Width	1430.0	=Primary Door Width + Secondary Door Width - (20 mm)
Vision panel width	100.0	=
Vision panel height	1800.0	=
Vision panel offset from edge	100.0	=
Vision panel offset from top	150.0	=
Analytical Properties		
IFC Parameters		
Fire Protection		
Door Mark for SCCU Submission		=
Fail-safe (default)	☑	=
Fire-rated door	☑	=
Fire-rated door F.R.R. -/30/30	☐	=
Fire-rated door F.R.R. -/60/60	☑	=
Fire-rated door F.R.R. -/120/120	☐	=
Readily open without use of a key (default)	☐	=
Readily open without use of a key (1) (default)	☐	=if([Readily open without use of a key Opening degree >90], 1 > 2, Readily open without us
Readily open without use of a key Opening degree >90 (default)	☐	=if(and([Opening degree >90], Readily open without use of a key), 2 > 1, 1 > 2)
Smoke seal (default)	☑	=
Identity Data		
Assembly Code		=
Cost		=
Description		=
Fire Rating		=
Ironmongery Set (default)	TE1	=
Keynote		=
Manufacturer		=
Model		=
Type Comments		=
Type Image		=
Type Mark	1	=
URL		=

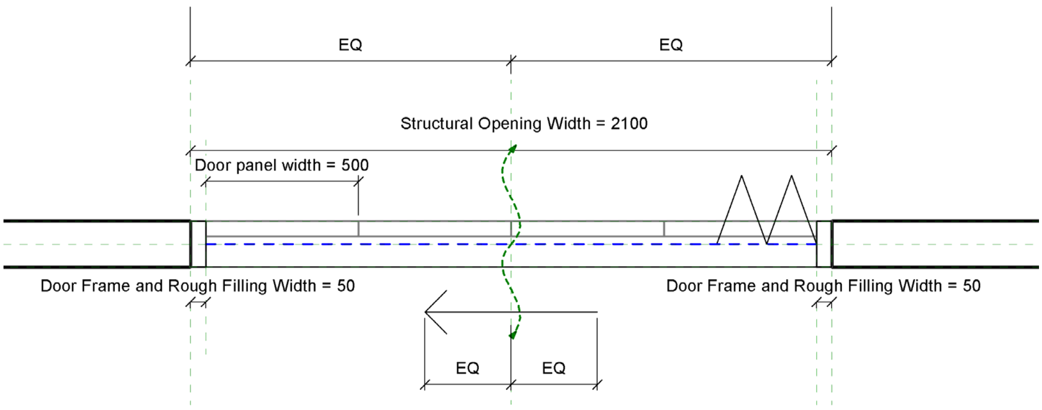
Manage Lookup Tables

How do I manage family types?

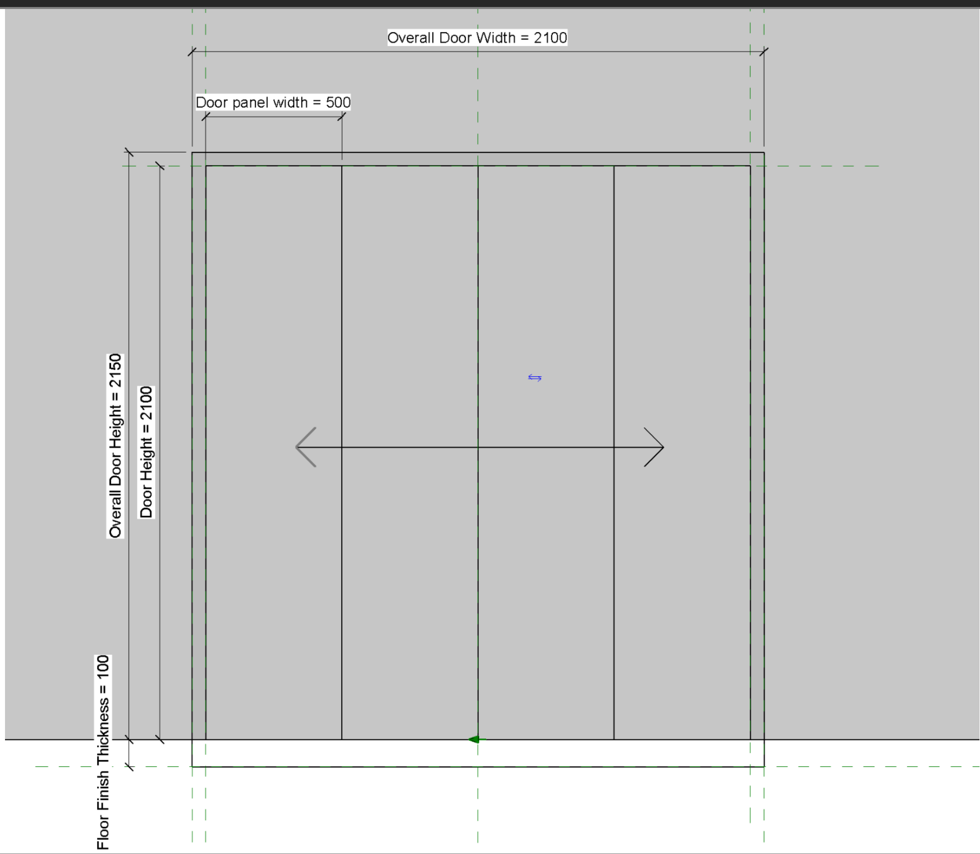
OK Cancel Apply

(3) Sliding Folding Partition

Model View: PLAN

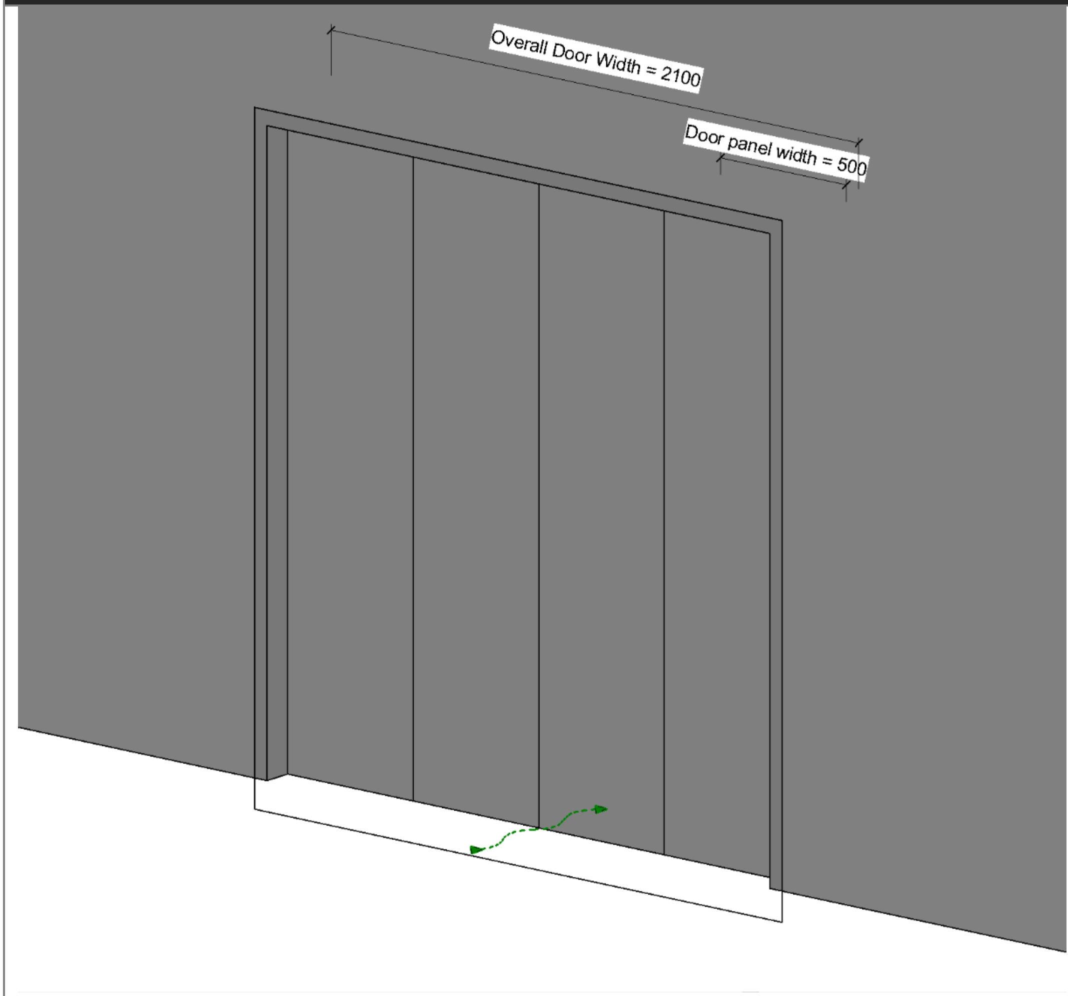


Model View: ELEVATION



(3) Sliding Folding Partition (Cont'd)

Model View: **3D VIEW**



(3) Sliding Folding Partition (Cont'd)

Object View: PARAMETER

Family Types

Type name: Meatl Frame

Search parameters

Parameter	Value	Formula
Construction		
Construction Type		=
Function	Interior	=
No. of door panels (default)	4	=
Wall Closure	By host	=
Materials and Finishes		
Door Frame Material	Metal Door Frame	=
Door Panel Material	Glass	=
Dimensions		
Overall Door Width	2100.0	=Structural Opening Width
Overall Door Height	2150.0	=Door Height + Door Frame and Rough Filling Width
Door panel width (default)	500.0	=Clear Width / No. of door panels
Door Height	2100.0	=
Door Frame and Rough Filling Width	50.0	=
Structural Opening Width (default)	2100.0	=
Structural Opening Height	2250.0	=Door Height + Door Frame and Rough Filling Width + Floor Finish Thickness
Floor Finish Thickness	100.0	=
Clear Width (default)	2000.0	=Overall Door Width - Door Frame and Rough Filling Width * 2
Passage Width (default)	2000.0	=Clear Width
Analytical Properties		
IFC Parameters		
Fire Protection		
Door Mark for SCCU Submission		=
Readily open without use of a key	☑	=
Identity Data		
Assembly Code		=
Cost		=
Description		=
Fire Rating		=
Ironmongery Set (default)		=
Keynote		=
Manufacturer		=
Model		=
Type Comments		=
Type Image		=
URL		=

How do I manage family types?

4.3.3 Quantity Take-off

4.3.3.1 Door Schedule

<u>Step 1</u>

Create a new **Door** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

Sample of Door Schedule

<Door Schedule>

A	B	C	D	E	F	G	H	I	J	K	L	M	N
						Door leaf				Sliding folding partition			
Family	Type	Function	Level	Mark	Type Mark	Primary Door Width	Secondary Door Width	Door Height	Door Panel Thickness	No. of door panels	Door panel width	Overall Door Width	Overall Door Height
DOR-SGL-ADA-w. Louver	950mmx2100mm_Timber	Interior	Level 1	D01	2	950		2100	75				
DOR-SGL-ADA-w. Louver	950mmx2100mm_Timber	Interior	Level 1	D01	2	950		2100	75				
D01: 2													
DOR-DBL-ADA-w. glass panel	850+600mmx2100mm_Timber_30minFRR	Interior	Level 1	D02	1	600	850	2100	50				
D02: 1													
DOR-DBL-ADA-w. glass panel	750+750mmx2100mm_Timber_60minFRR	Interior	Level 1	D03	3	750	750	2100	50				
DOR-DBL-ADA-w. glass panel	750+750mmx2100mm_Timber_60minFRR	Interior	Level 1	D03	3	750	750	2100	50				
D03: 2													
DOR-BFD-ADA-EndHung	2100mm x 2150mm_metal frame	Interior	Level 1	D04				2100		4	500	2100	2150
D04: 1													
Grand total: 6													

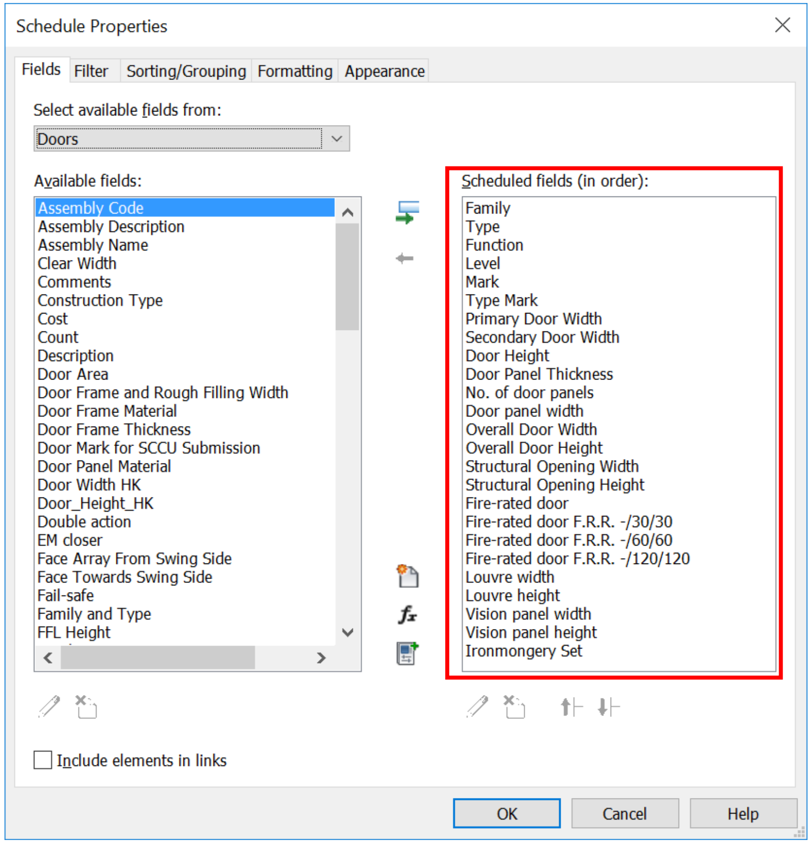
Q	R	S	T	U	V	W	X	Y
	Fire-rating			Louvre		Vision Panel		
Fire-rated door	Fire-rated door F.R.R. -/30/30	Fire-rated door F.R.R. -/60/60	Fire-rated door F.R.R. -/120/120	Louvre width	Louvre height	Vision panel width	Vision panel height	Ironmongery Set
☐	☐	☐	☐	400	400			TC1
☐	☐	☐	☐	400	400			TE1
☑	☑	☐	☐			100	1800	TJ2
☑	☐	☑	☐			100	1800	TJ1
☑	☐	☑	☐			100	1800	TJ1

4.3.3.1 Door Schedule (Cont'd)

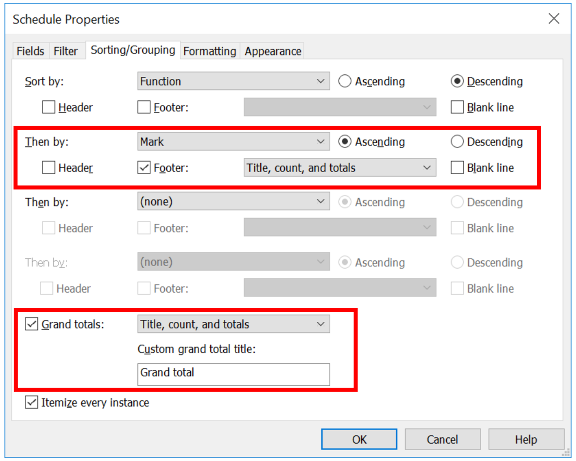
Step 2

Schedule Properties and Setting

- Fields



- Sorting/Grouping



4.4 Windows and Louvres

This section mainly focuses on the following windows and louvres:
i. Windows
ii. Louvres

4.4.1 Basic Information

4.4.1.1 Building Element to Model

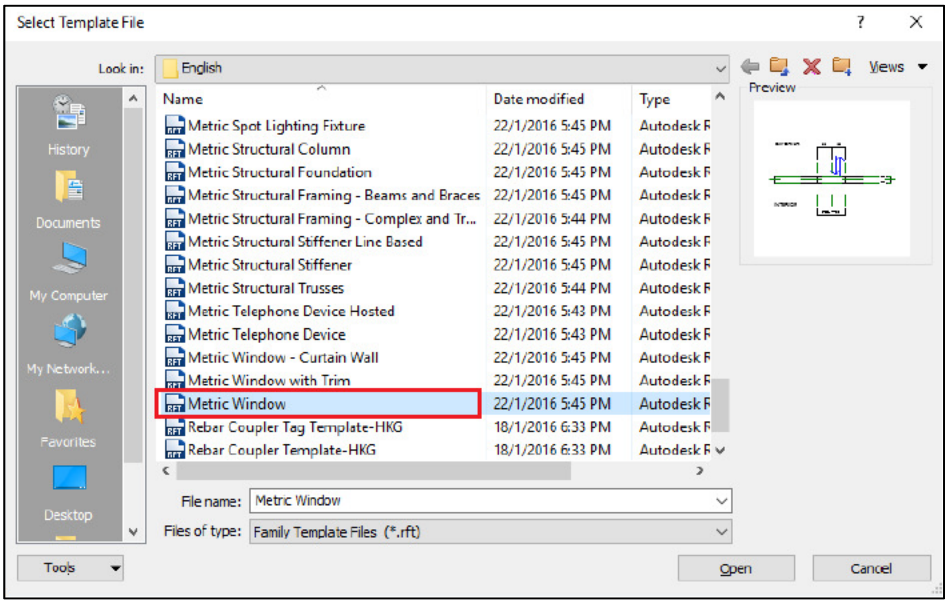
<u>Modelling elements:</u>

Elements	Object Category
Work Description	Manage/ Settings/ Materials
Window	Window

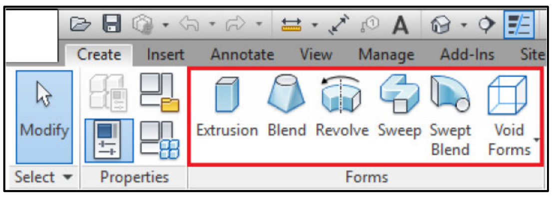
4.4.1.2 Sequence of modelling

<u>The sequence of modelling:</u>

Create new object → (1) Window (e.g. Metric Window) → (2) Use the tools of Form panel to draw the window frame or glazing →Add Parameters → Create wall in Project → Load into Project → Add window



(1)



(2)

- Window/ Louvre is a wall host component;
- Window/ Louvre in a curtain wall shall be created from curtain panel.

4.4.2 Modelling Approach

4.4.2.1 Object Naming

Details of naming convention shall refer to Section 4.9.2 of BIM Guide for Architectural Design issued by Architectural Branch, Architectural Services Department.

Format:
<Category> - <Functional Type> - <Originator> - <Descriptor 1> - <Descriptor 2>

Object Name	WDW-SGH-ADA-ALU-01	Descriptions
Category	**WDW**-SGH-ADA-ALU-01	A window, WDW is the short form of the Category type “Window”
Functional Type	WDW-**SGH**-ADA-ALU-01	A single hung window, SGH is the short form of the functional type “single hung window”
Originator	WDW-SGH-**ADA**-ALU-01	ADA for architectural discipline of ArchSD
Descriptor 1	WDW-SGH-ADA-**ALU**-01	A window frame is made of aluminium (material).
Descriptor 2	WDW-SGH-ADA-ALU-**01**	Type 1 of the single hung window.

Functional Type	Descriptions
SGH	Single Hung Window
DBH	Double Hung Window
SLD	Sliding Window
FXD	Fixed Window
AWN	Awning Window
COW	Composite Windows
CWD	Composite Windows and Doors
LVR	Louvre
OTR	Other

4.4.2.2 Type Naming

Format

<Width>mm x <Height>mm (Input actual overall size of window/ louvre, reference to 4.4.2.3 Note 2)

Window/ Louvre:

Type Name	Descriptions
800mm x 500mm	800mm Window Width 500mm Window Height
1200mm x 300mm	1200mm Window Width 300mm Window Height

4.4.2.3 Setting of creating a Window/ Louvre

Window shall be modelled to its designed size with suitable parameters to allow computation of the size of structural opening. The following parameters shall be set in Window/ Louvre objects:

Under **Properties> Constraints**

Description	Parameter	Metal Window	Metal Louvre
Floor level	**Level** (Built-in Parameter)	✓	✓

Under **Materials and Finishes**

Description	Parameter	Metal Window	Metal Louvre
Material of Window Frame	**Frame Exterior/ Interior Material#**	✓	
Material of Glass	**Glazing Type/** **Glass Panel Material#**	✓	
Material of Window Sash	**Sash Material#**	✓	
Material of Louvre	**Louvre Material#**		✓

\# The information inserted in the parameter **Material** is for rendering purpose only, please refer to Window details for the type of material.

Under **Dimension**

Description	Parameter	Metal Window	Metal Louvre
Structural opening width	**Width**	✓	✓
Structural opening height	**Height**	✓	✓
Window/ Louvre frame width	**Window Frame**	✓	✓

Under **Identity Data**

Description	Parameter	Metal Window	Metal Louvre
Window/ Louvre type mark	**Type Mark** (Built-in Parameter)	✓	✓

Under **General**

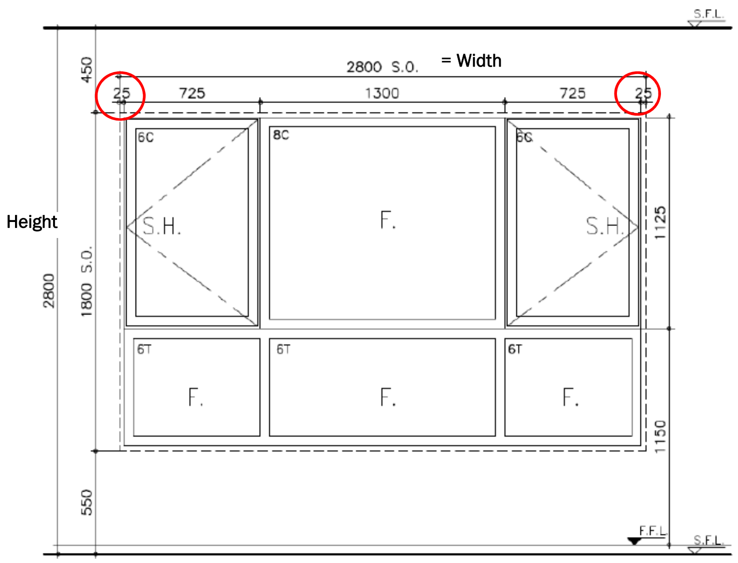
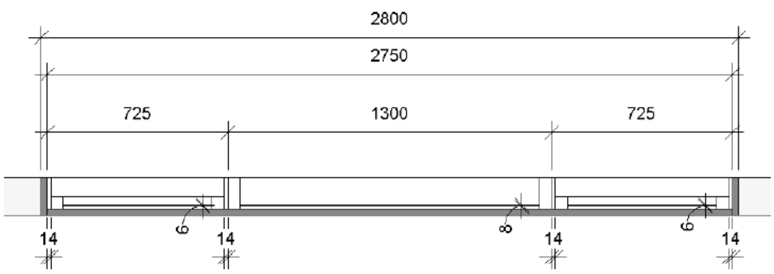
Description	Parameter	Metal Window	Metal Louvre
Number and type of Lights	**Number and type of Lights**	✓	
Window/ Louvre classification	**Window classification**	✓	✓
Window/ Louvre type mark	**Window/ Louvre mark** (if **Type Mark** not used)	✓	✓
Window/ Louvre size	**Window size**	✓	✓

4.4.2.3 Setting of creating a Window/ Louvre (Cont'd)

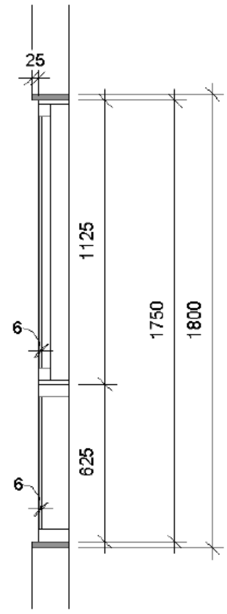
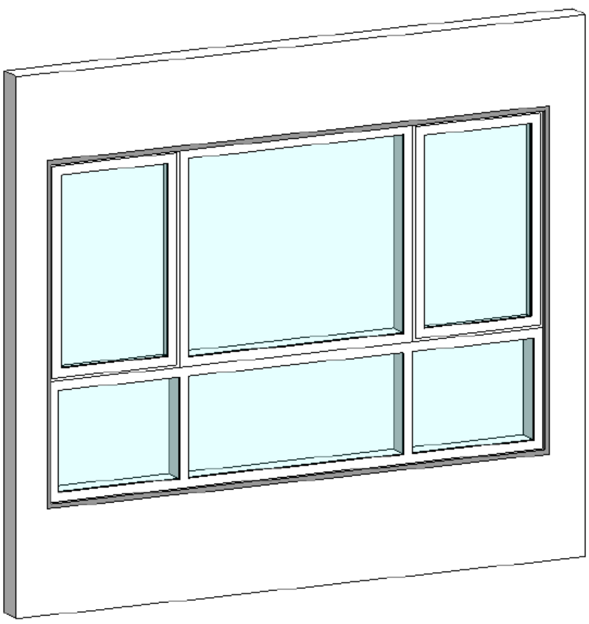
<u>Note:</u>

1. Models for window frame, glass pane and louvre blades are for geometrical indication only, please refer Detailed Drawings for actual dimension.
2. Window/ Louvre size calculation, reference to the window schedule:

   e.g. Window W1 = (**Width** – 25 x 2) x (**Height** – 25 x 2) = 2750 x 1750

<table>
<tr><th colspan="2">Window</th></tr>
<tr><td>Window Schedule</td><td>
</td></tr>
<tr><td>Plan View</td><td>
</td></tr>
</table>

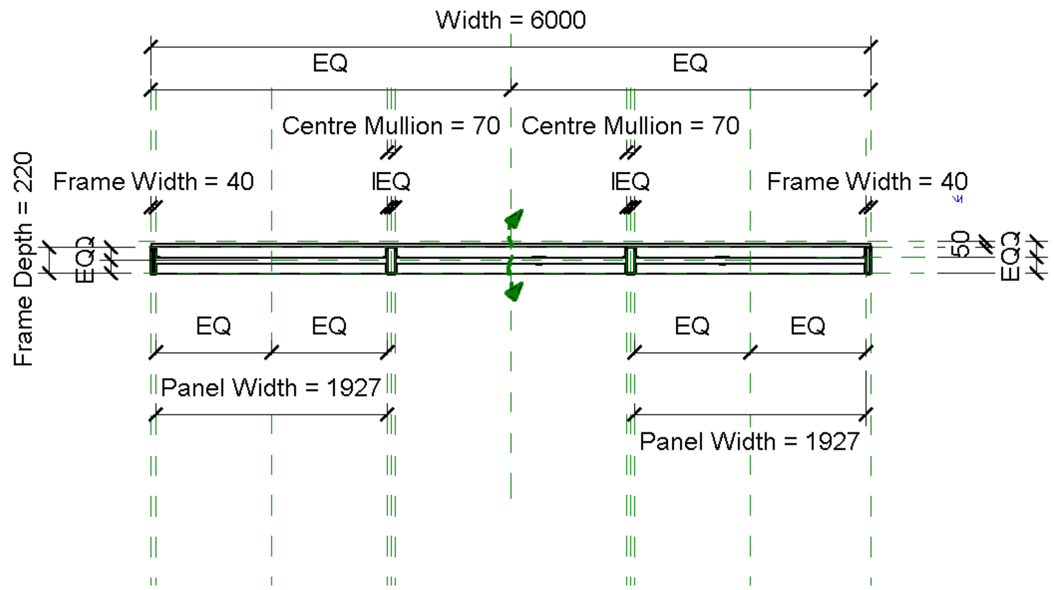
4.4.2.3 Setting of creating a Window/ Louvre (Cont'd)

Section View	
3D View	

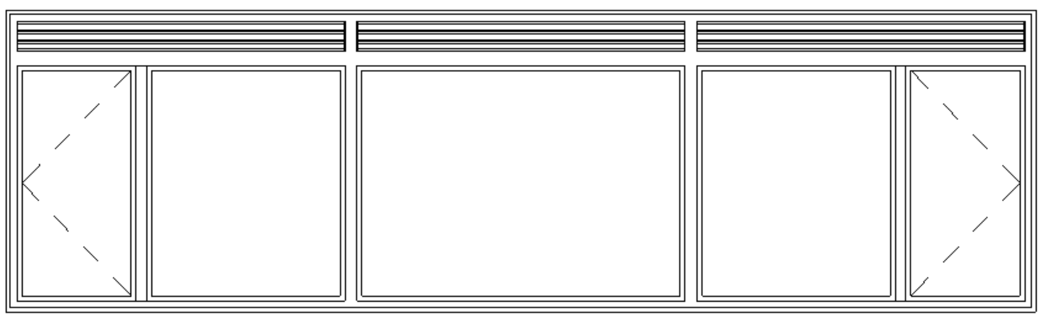
4.4.2.4 Window/ Louvre Object

(1) Window

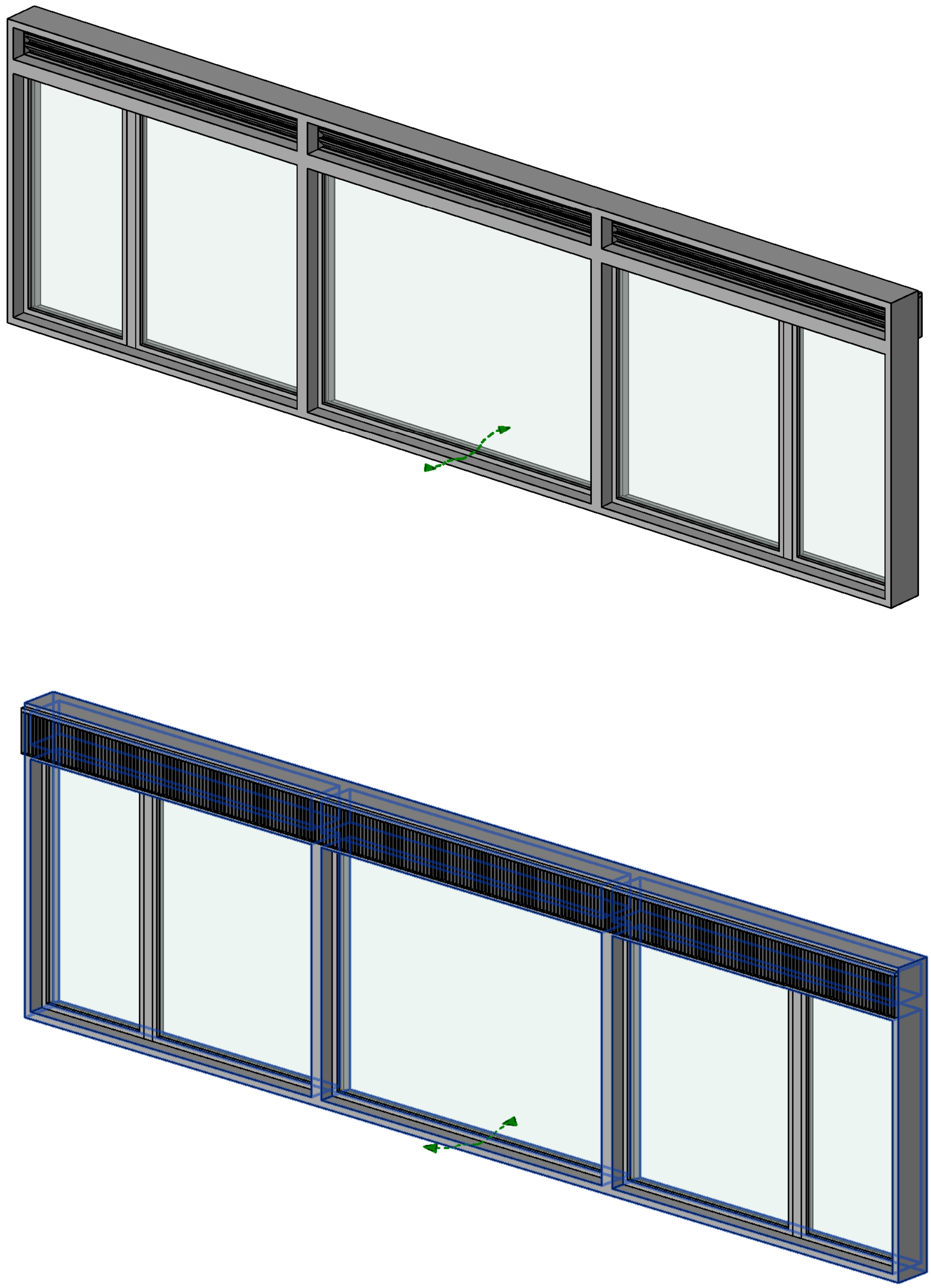
Model View: PLAN



Model View: ELEVATION



(1) Window (Cont'd)

Model View: **3D VIEW**


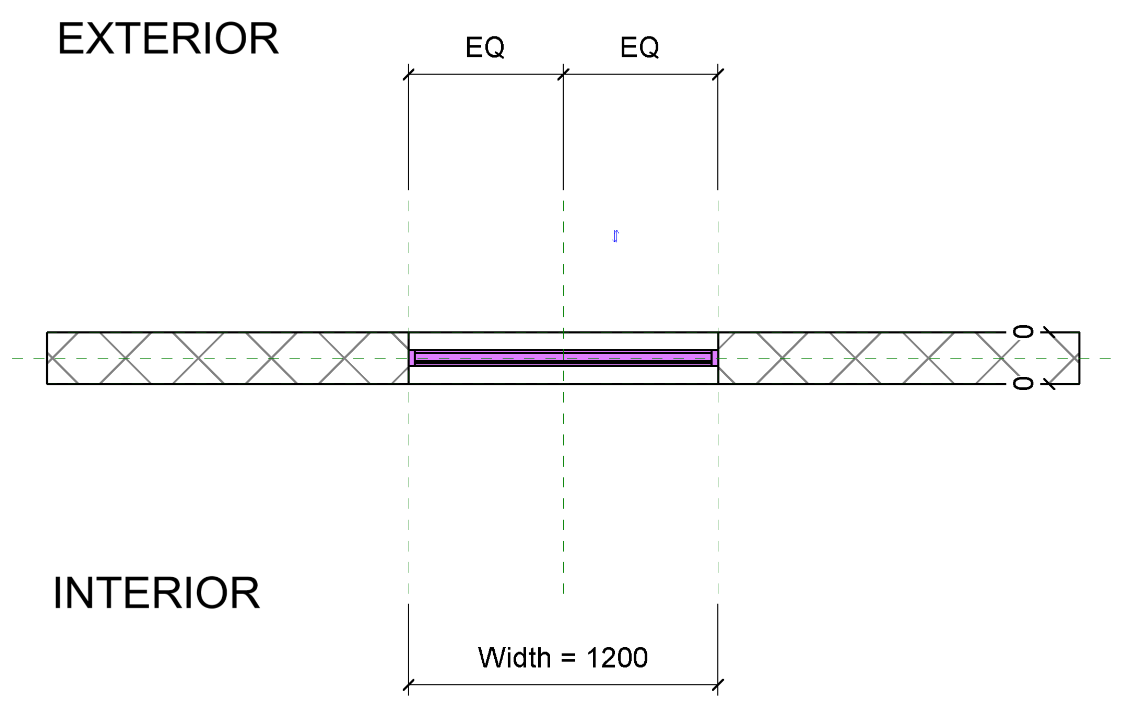
(1) Window (Cont'd)

Object View: PARAMETER

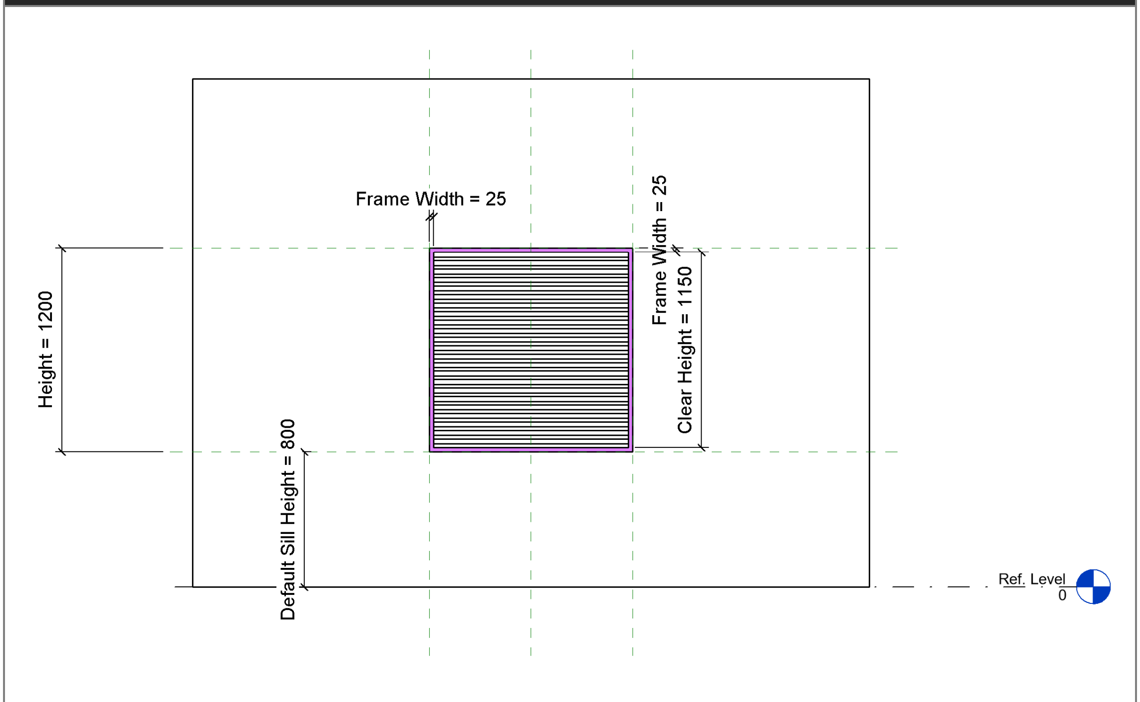
Parameter	Value	
Construction		
Construction Type		=
Structural		
Structural Opening	25.0	=
Dimensions		
Centre Mullion	70.0	=
Frame Depth (default)	220.0	=
Grille Height (default)	250.0	=Tra
Grille Thickness	0.0	=
Width (default)	6000.0	=
Height (default)	1725.0	=
Louvre Height (default)	180.0	=Tra
Mullion Width	60.0	=
Panel Height (default)	1385.0	=He
Panel Width (default)	1926.7	=(W
Rough Height		=
Rough Width		=
Transom Height	300.0	=
Transom Width	80.0	=
Frame Width (default)	40.0	=
Analytical Properties		
IFC Parameters		
General		
Number and type of Lights	3 F., 2 S.H. and top L	=
Windowmark	W1	=
Window classification	Composite Windows	=
Window size	6000 x 1725	=
Other		
Identity Data		

(2) Louvre

Model View: PLAN

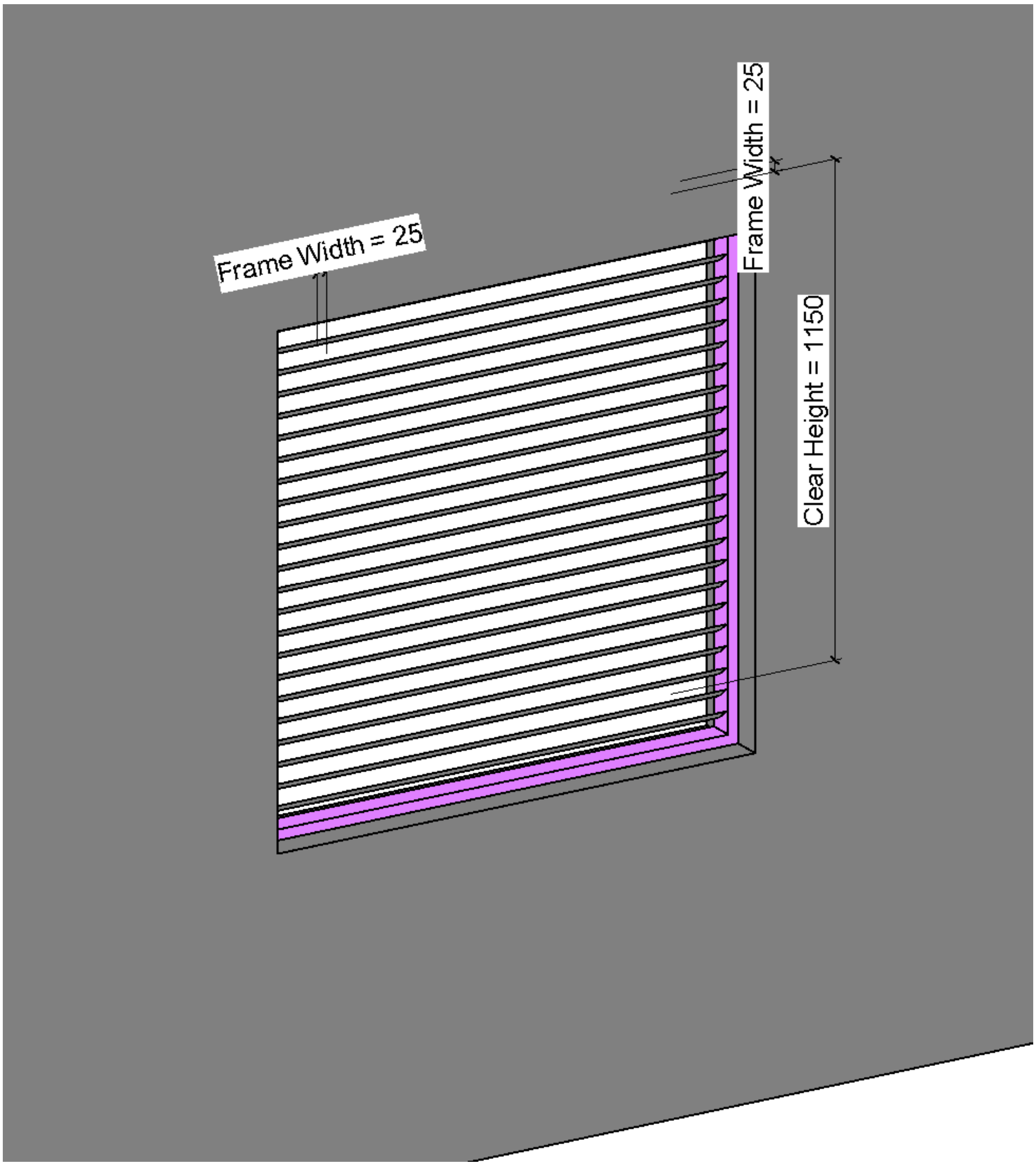


Model View: ELEVATION



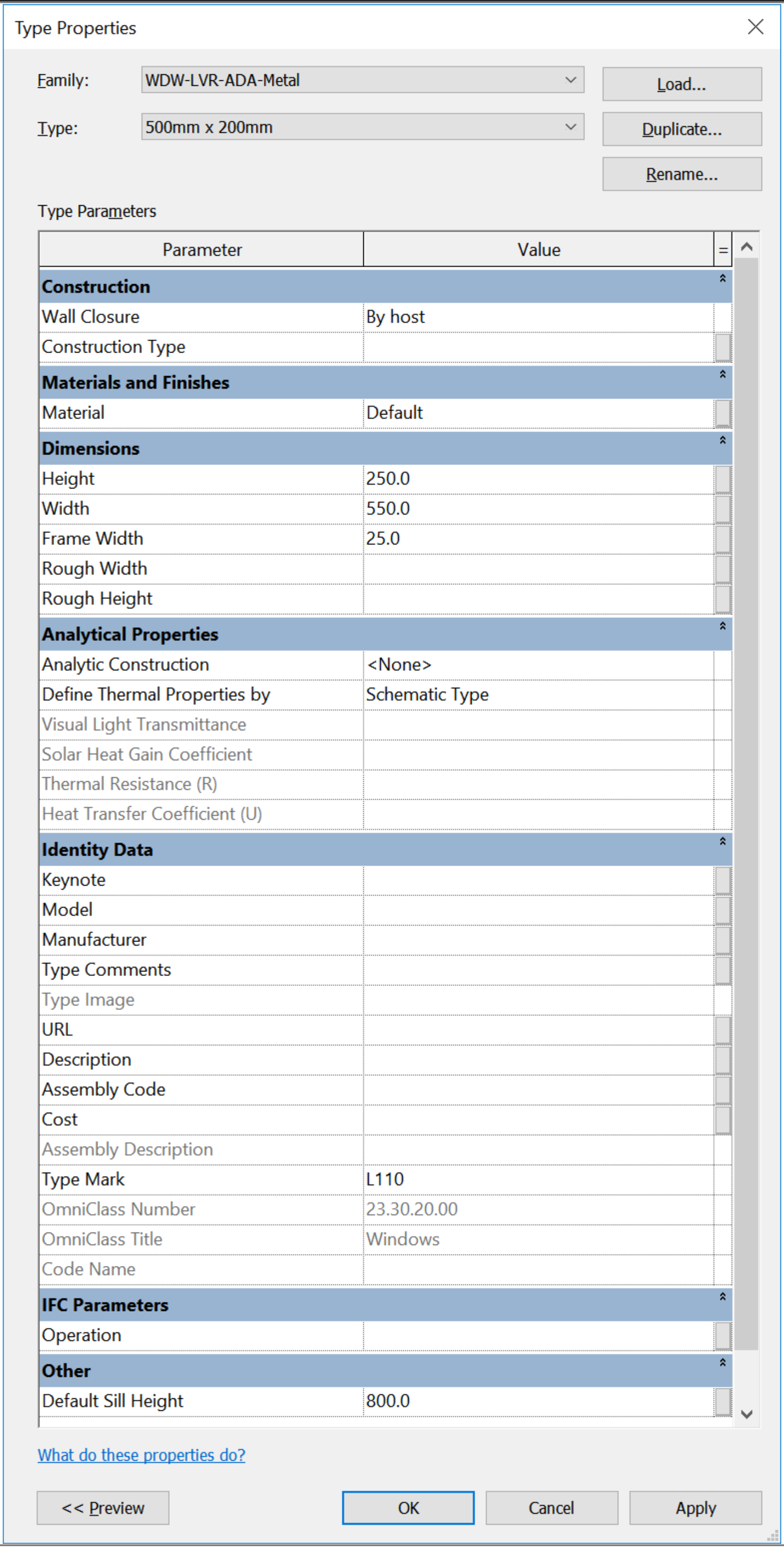
(2) Louvre (Cont'd)

Model View: 3D VIEW



(2) Louvre (Cont'd)

Object View: PARAMETER


Type Properties

Family: WDW-LVR-ADA-Metal

Type: 500mm x 200mm

Load...

Duplicate...

Rename...

Type Parameters

Parameter	Value
Construction	
Wall Closure	By host
Construction Type	
Materials and Finishes	
Material	Default
Dimensions	
Height	250.0
Width	550.0
Frame Width	25.0
Rough Width	
Rough Height	
Analytical Properties	
Analytic Construction	<None>
Define Thermal Properties by	Schematic Type
Visual Light Transmittance	
Solar Heat Gain Coefficient	
Thermal Resistance (R)	
Heat Transfer Coefficient (U)	
Identity Data	
Keynote	
Model	
Manufacturer	
Type Comments	
Type Image	
URL	
Description	
Assembly Code	
Cost	
Assembly Description	
Type Mark	L110
OmniClass Number	23.30.20.00
OmniClass Title	Windows
Code Name	
IFC Parameters	
Operation	
Other	
Default Sill Height	800.0

What do these properties do?

<< Preview | OK | Cancel | Apply

4.4.3 Quantity Take-off

4.4.3.1 Window Schedule

- Number of Windows/ louvre/ access panel (if any) can be measured in Window Schedule under Window/ Wall Category.

<u>Step 1</u>

Create a new **Windows** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

<u>Sample of Window Schedule</u>

<Window Schedule>

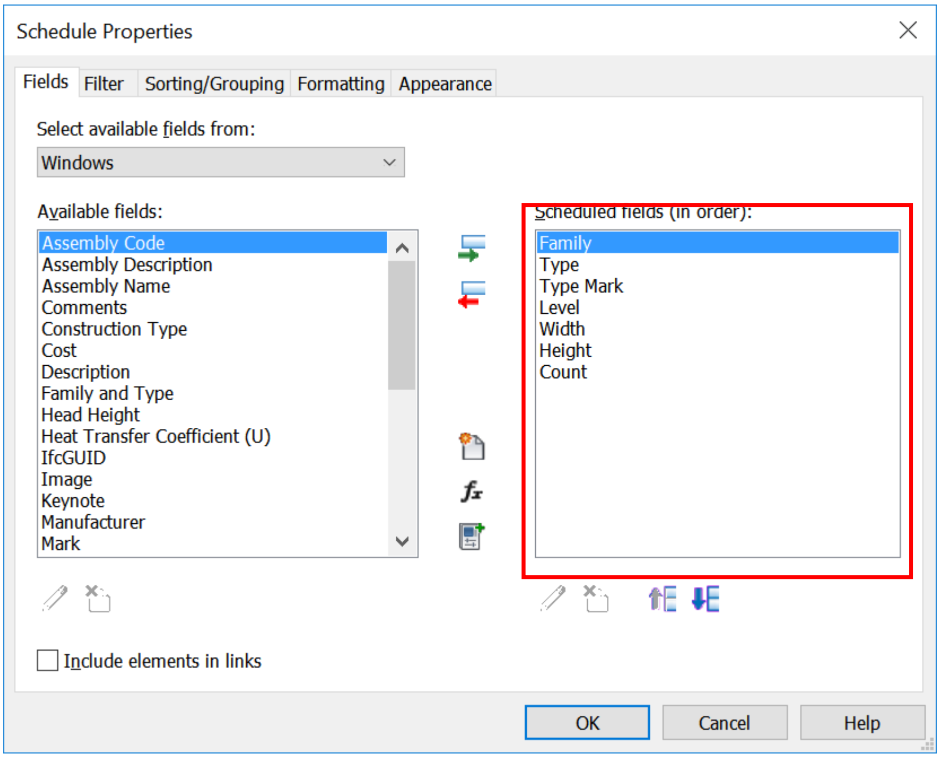
A	B	C	D	E	F	G
Family	Type	Type Mark	Level	Width	Height	Count
WDW-LVR-ADA-Metal	400mm x 100mm	L103	1/F	450	150	1
WDW-LVR-ADA-Metal	400mm x 100mm	L103	2/F	450	150	1
WDW-LVR-ADA-Metal	400mm x 100mm	L103	ROOF	450	150	1
L103: 3						
WDW-LVR-ADA-Metal	300mm x 200mm	L104	G/F	350	250	1
L104: 1						
WDW-LVR-ADA-Metal	2700mm x 300mm	L105	G/F	2700	350	1
L105: 1						
WDW-LVR-ADA-Metal	800mm x 500mm	L106	1/F	850	550	1
WDW-LVR-ADA-Metal	800mm x 500mm	L106	1/F	850	550	1
WDW-LVR-ADA-Metal	800mm x 500mm	L106	ROOF	850	550	1
L106: 3						
WDW-LVR-ADA-Metal	450mm x 300mm	L107	ROOF	500	350	1
L107: 1						
WDW-LVR-ADA-Metal	1200mm x 300mm	L108	1/F	1200	350	1
L108: 1						
WDW-LVR-ADA-Metal	400mm x 150mm	L109	1/F	450	200	1
L109: 1						
WDW-LVR-ADA-Metal	500mm x 200mm	L110	G/F	550	250	1
WDW-LVR-ADA-Metal	500mm x 200mm	L110	1/F	550	250	1
WDW-LVR-ADA-Metal	500mm x 200mm	L110	2/F	550	250	1
WDW-LVR-ADA-Metal	500mm x 200mm	L110	ROOF	550	250	1
L110: 4						
WDW-LVR-ADA-Metal	1100mm x 500mm	L111	2/F	1150	550	1
WDW-LVR-ADA-Metal	1100mm x 500mm	L111	ROOF	1150	550	1
L111: 2						
WDW-LVR-ADA-Metal	900mm x 300mm	L112	2/F	950	350	1
WDW-LVR-ADA-Metal	900mm x 300mm	L112	2/F	950	350	1
L112: 2						
WDW-LVR-ADA-Metal	2000mm x 800mm	L113	2/F	2050	850	1
L113: 1						
WDW-LVR-ADA-Metal	900mm x 500mm	L114	2/F	950	550	1
L114: 1						
WDW-LVR-ADA-Metal	2200mm x 1000mm	L115	2/F	2250	1050	1
WDW-LVR-ADA-Metal	2200mm x 1000mm	L115	2/F	2250	1050	1
L115: 2						
WDW-LVR-ADA-Metal	2000mm x 1000mm	L116	2/F	2050	1050	1
L116: 1						
WDW-LVR-ADA-Metal	800mm x 300mm	L117	2/F	850	350	1
L117: 1						
WDW-LVR-ADA-Metal	450mm x 200mm	L119	2/F	500	250	1
L119: 1						
WDW-LVR-ADA-Metal	950mm x 500mm	L120	ROOF	1000	550	1
L120: 1						
WDW-LVR-ADA-Metal	1400mm x 500mm	L121	ROOF	1450	550	1
L121: 1						
WDW-SGL-ADA-Side_Hung	400 x 2000mm	W001	G/F	450	2050	1
WDW-SGL-ADA-Side_Hung	400 x 2000mm	W001	G/F	450	2050	1
W001: 2						
WDW-LVR-ADA-Metal	1000mm x 800mm	W002	G/F	1000	800	1
W002: 1						
WDW-LVR-ADA-Metal	1000mm x 300mm	W96	2/F	1050	350	1
W96: 1						
WDW-LVR-ADA-Metal	550mm x 300mm	W100	G/F	550	300	1
WDW-LVR-ADA-Metal	550mm x 300mm	W100	UPPER ROOF	550	300	1
WDW-LVR-ADA-Metal	550mm x 300mm	W100	UPPER ROOF	550	300	1
W100: 3						
Grand total: 35						

4.4.3.1 Window Schedule (Cont'd)

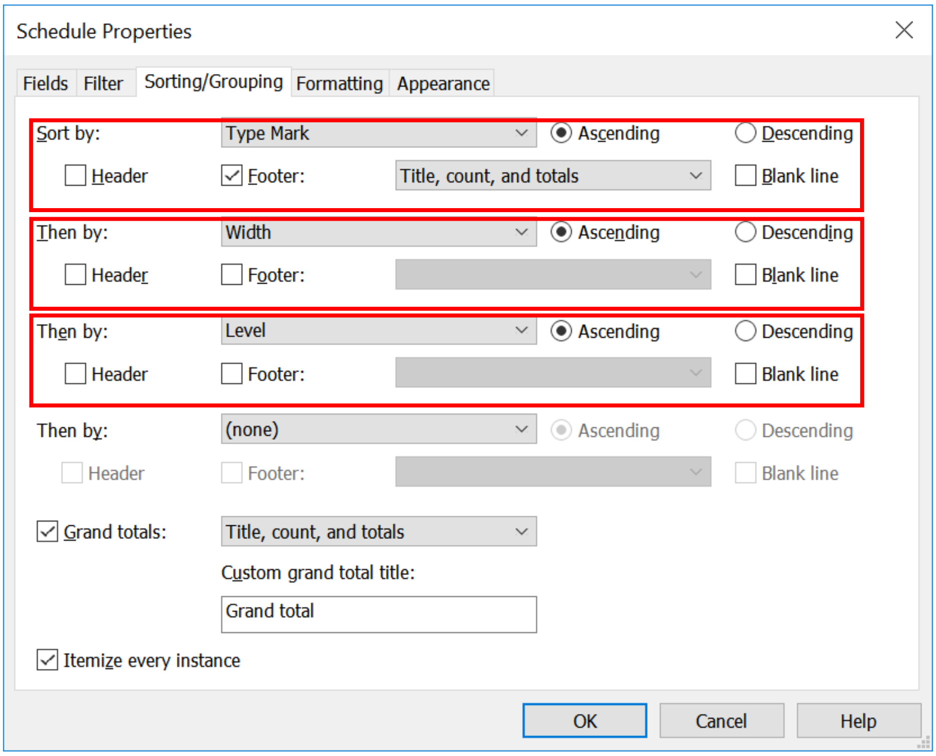
Step 2

Schedule Properties and Setting

❖ Fields



❖ Sorting/Grouping



4.5 Handrails and Balustrades

4.5.1 Basic Information

4.5.1.1 Building Element to Model

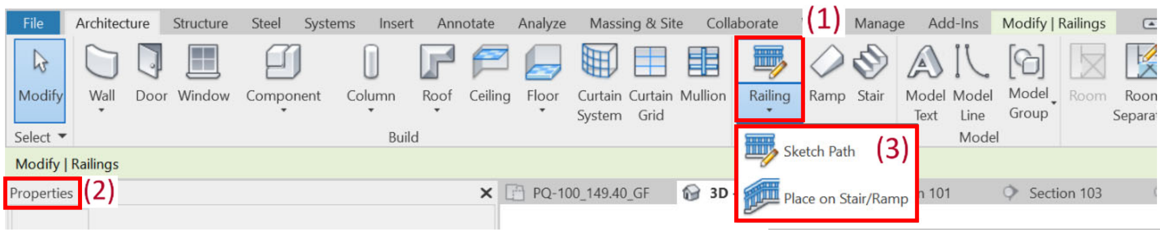
Modelling elements:

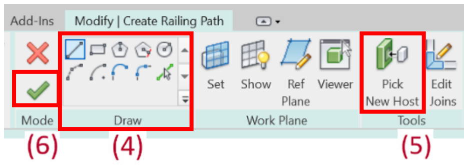
Elements	Object Category
Work Description	Manage/ Settings/ Materials
Railing	Railing

4.5.1.2 Sequence of modelling

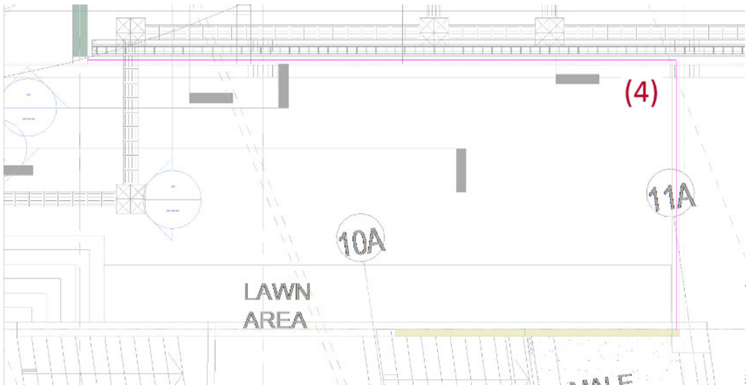
The sequence of modelling:

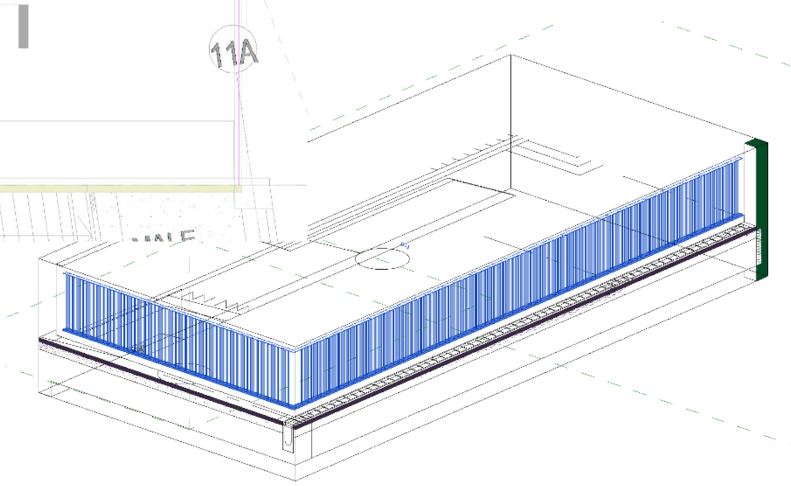
Architecture tab → (1) Railing → (2) Choose the railing type in Properties → (3) Select Sketch on Path / Place on Stair/Ramp → (4) Draw the path on plan → (5) Pick new host → (6) Click the ✓ to confirm





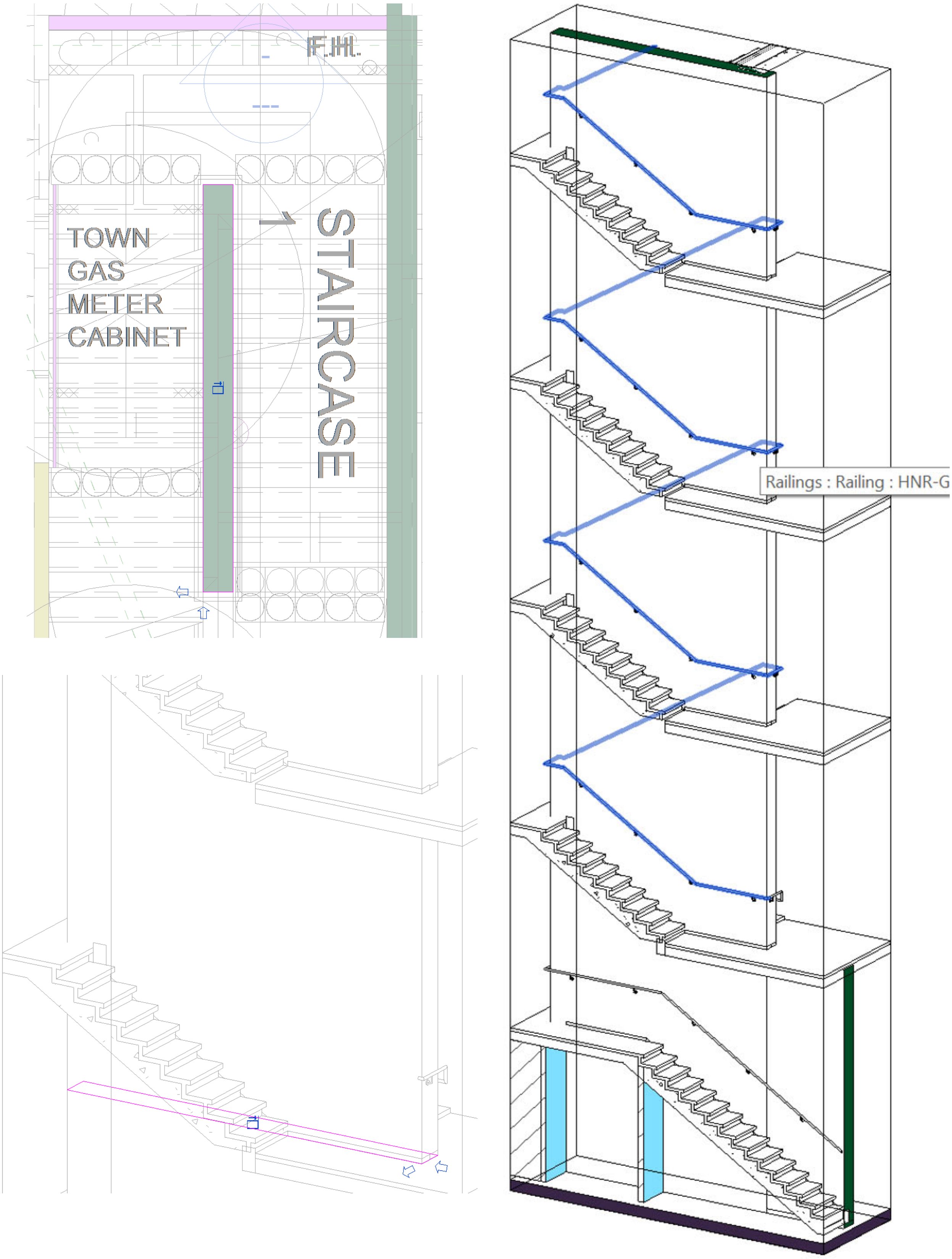
- Railing on sketch path;
- Railing place on stair / ramp





Example 1

4.5.1.2 Sequence of modelling (Cont'd)



Example 2

4.5.2 Modelling Approach

4.5.2.1 Type Naming

Railing is a built-in name of the system object.

Format:
<Functional Type> - <Originator> - <Descriptor 1> - <Descriptor 2>

Type Name	HRL-ADA-GMS_900mm-01	Descriptions
Functional Type	**HRL**-ADA-GMS_900mm-01	A railing, RAL is the short form of the functional type "Railing"
Originator	HRL-ADA-**GMS_900mm-**01	ADA for architectural discipline of ArchSD
Descriptor 1	HRL-ADA-**GMS_900mm**-01	A railing is made of "Galvanized Mild Steel" with 900mm height. GMS is the short form of the "Galvanized Mild Steel".
Descriptor 2	HRL-ADA-GMS_900mm-**01**	Type 1 of the handrail

Functional Type	Descriptions
HRL	Handrail
BAL	Baluster
PNL	Panel
OTR	Other

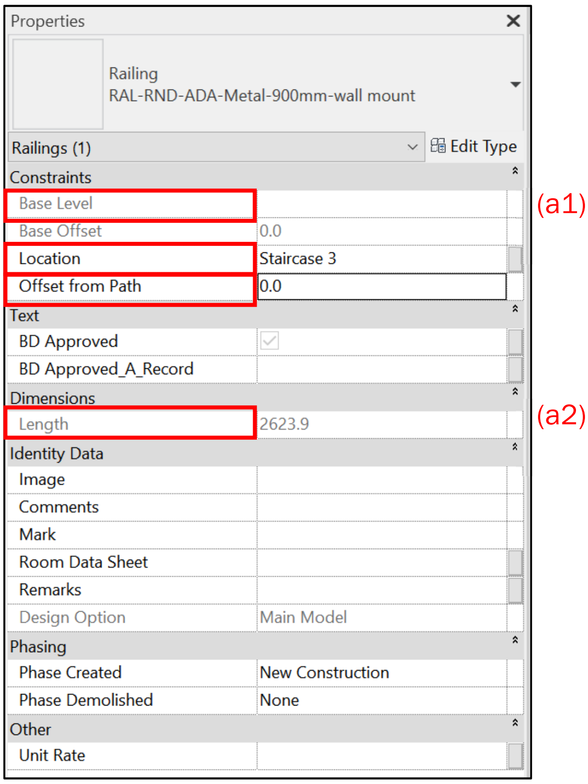
Descriptor 1	Descriptions
GMS	Galvanized mild steel handrail
CCR	Concrete railing
SST	Stainless steel railing

4.5.2.2 Setting of creating a Railing

Railing shall be modelled to its true size with parameters to allow full flexibility to retrieve the quantities.

The following parameters shall be set in a Railing:

a. Properties



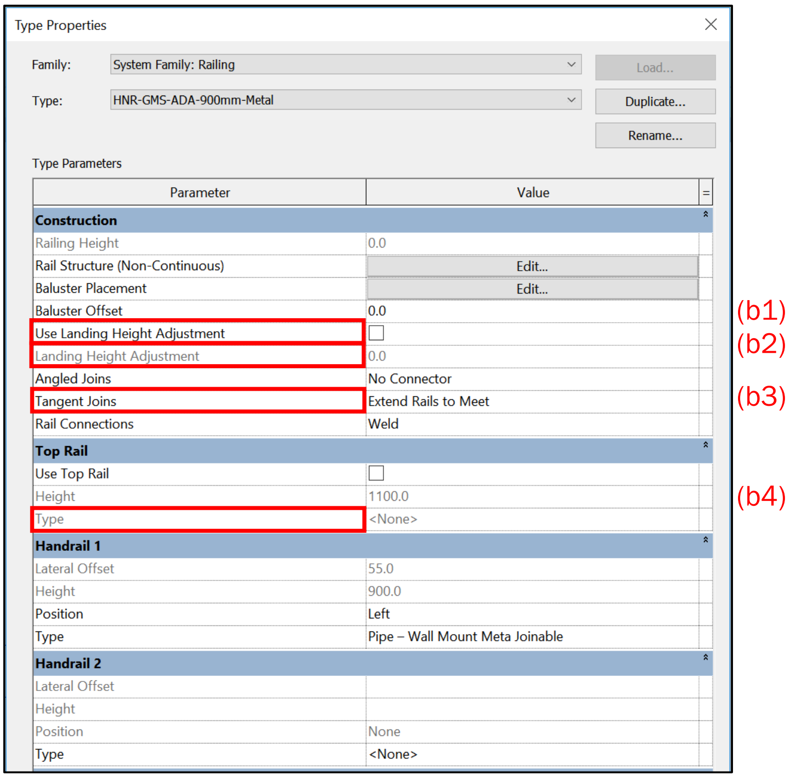
<u>Under **Constraint**</u> **(a1)**

Parameter	**Remark**
Base Level/ Location	Identify the base level/ location, e.g. input Staircase <number>
Offset from Path	Input + / - values, set the railing offset from the edge of treads, stringers, or paths on other hosts.

<u>Under **Dimensions**</u> **(a2)**

Parameter	**Remark**
Length	Total length of the railing but <u>**not**</u> including any extension length, lateral offset in the intermediate connection, beginning and ends.

b. Edit Type > Type Properties



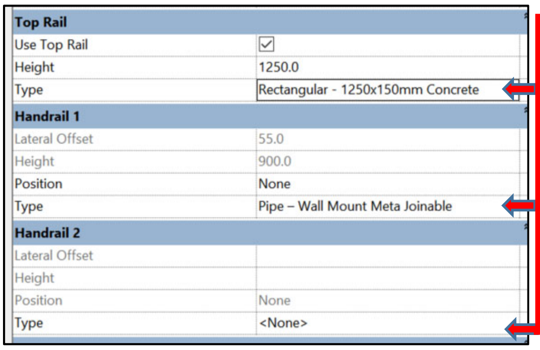
Under **Construction** (b1)

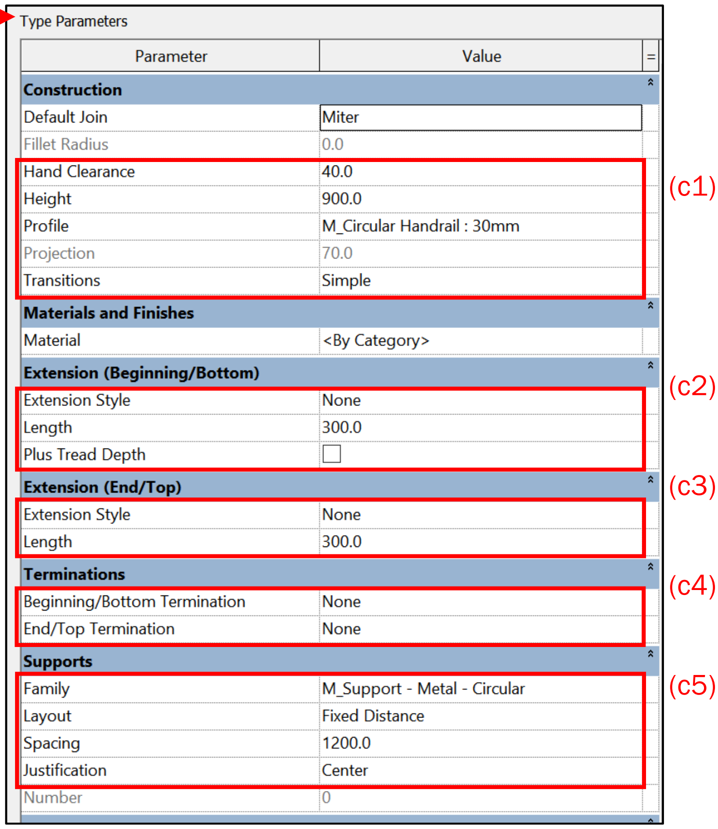
Parameter	Remark
Use Landing Height Adjustment	Controls the height of railing at landings
Landing Height Adjustment	For balustrades only
Tangent Joins	Vertical/ Horizontal segments/ No connector/ Extend Rails to Meet Railing design and its length will be updated when option “Extend Rails to Meet” is selected.

Under **Top Rail** (b2)

Parameter	Remark
Type	There are a number of parameters which can be adjusted to change the geometry and length of railing. These parameters are listed under the Type Parameters table:

c. Top Rail/ Handrail 1/ Handrail 2 > Type >Type Parameters





<u>Under **Construction**</u> **(c1)**

Parameter	**Remark**
Hand Clearance	The distance from the outside edge of the handrail to the wall, post, or column
Height	The height of the top of the handrail from the floor, tread, stringer, ramp, or other host surface.
Profile	Select the shape or Create the custom profile
Transitions	None / Gooseneck / Simple

<u>Under **Extension (Beginning/Bottom)**</u> **(c2)**

Parameter	**Remark**
Extension Style	None / Wall / Floor / Post
Length	The length of the extension. The extension length should be adjusted in the Railing Schedule.
Plug Tread Depth	Option to add one tread depth to the length of the extension.

<u>Under **Extension (End/Top)**</u> **(c3)**

Parameter	**Remark**
Extension Style	None / Wall / Floor / Post
Length	The length of the extension. The extension length should be adjusted in the Railing Schedule.

Under **Terminations** (c4)

Parameter	Remark
Beginning/Bottom Termination	Set the type of termination
End/Top Termination	Set the type of termination

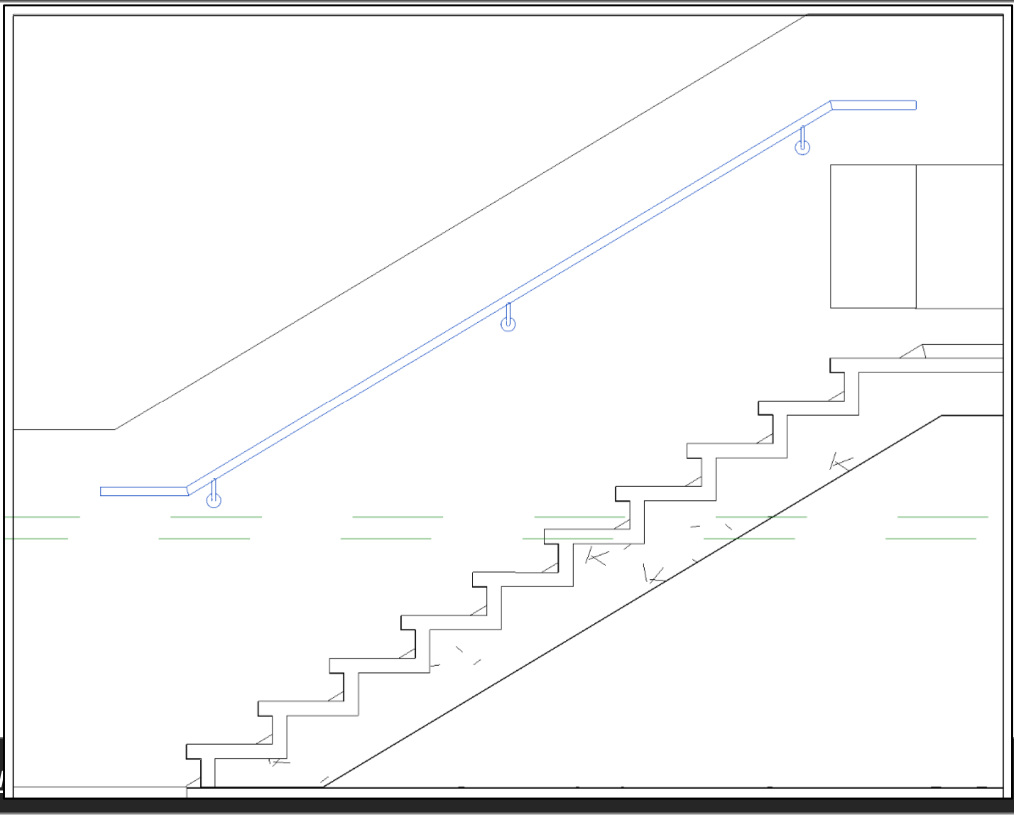
Under **Supports** (c5)

Parameter	Remark
Family	Select the type of the supports
Layout	None/ Fixed Distance/ Align With Posts/ Fixed Number/ Maximum Spacing/ Minimum Spacing
Spacing	Set the center-to-center distance of the supports
Justification	Begin/ Center/ End

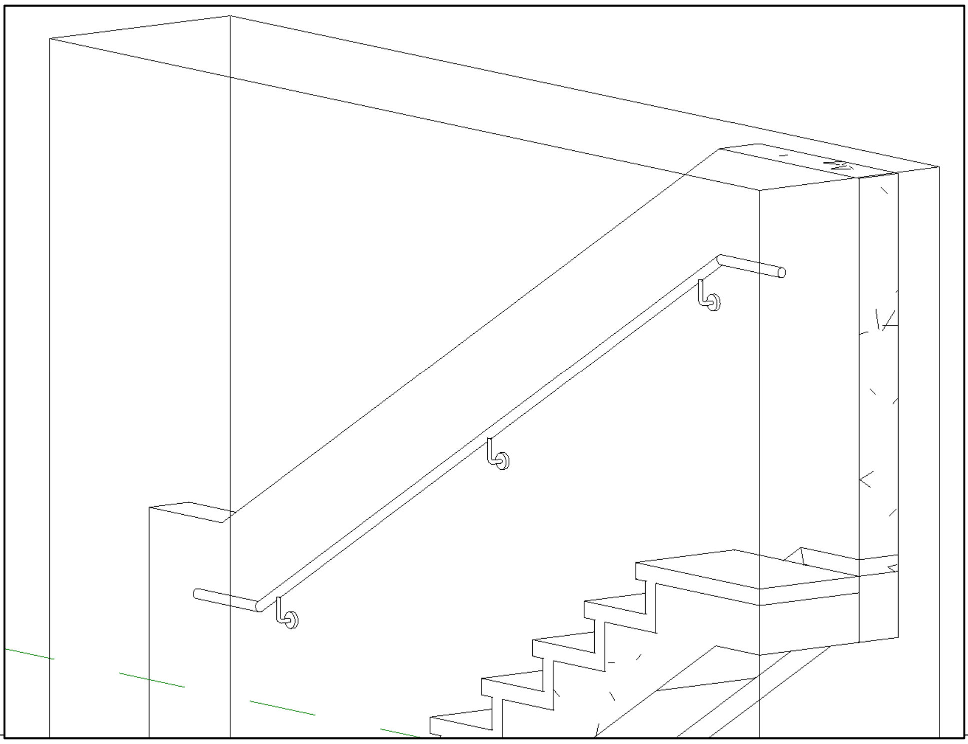
4.5.2.3 Railing Object

(1) Handrail

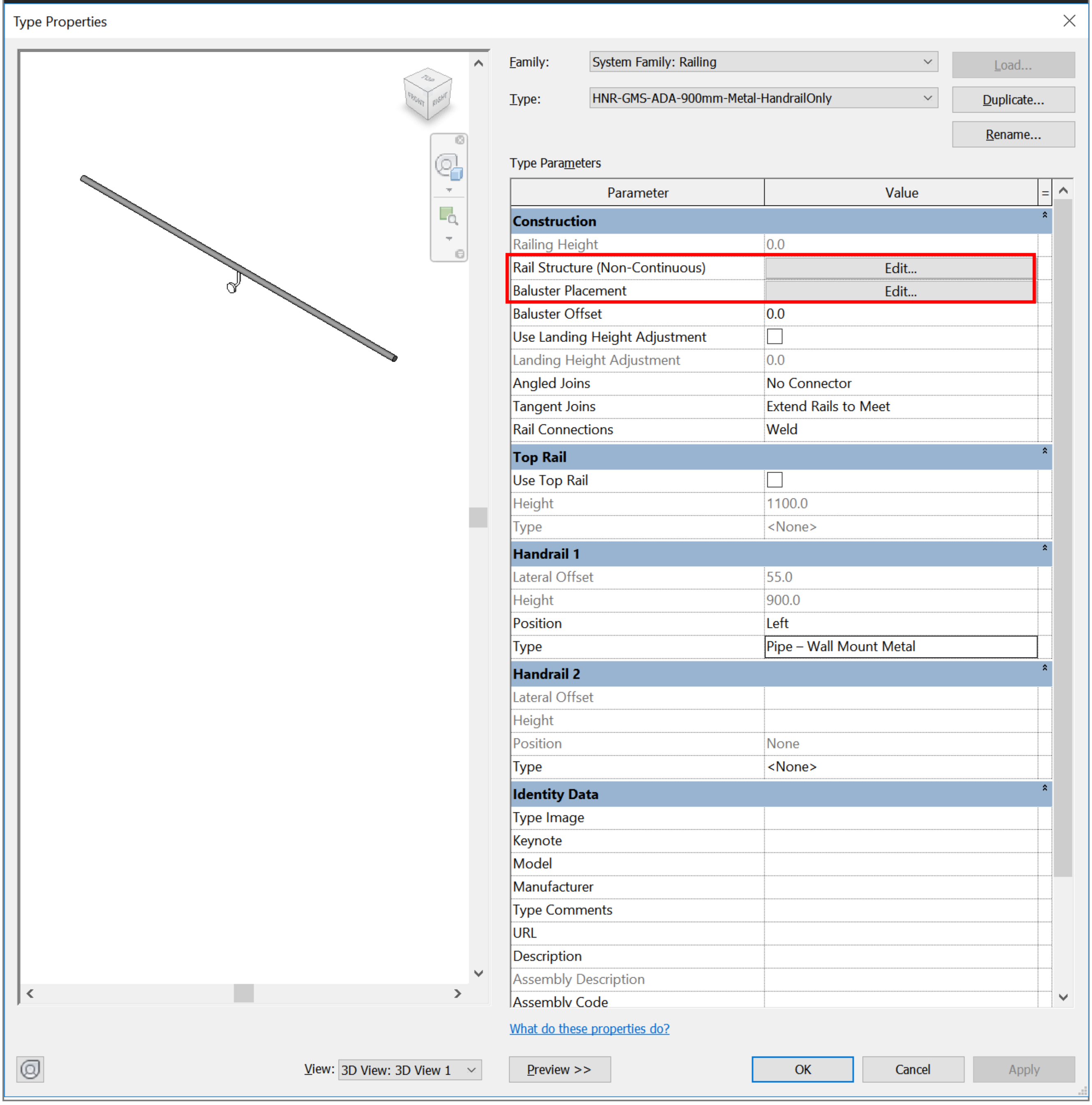
Section View



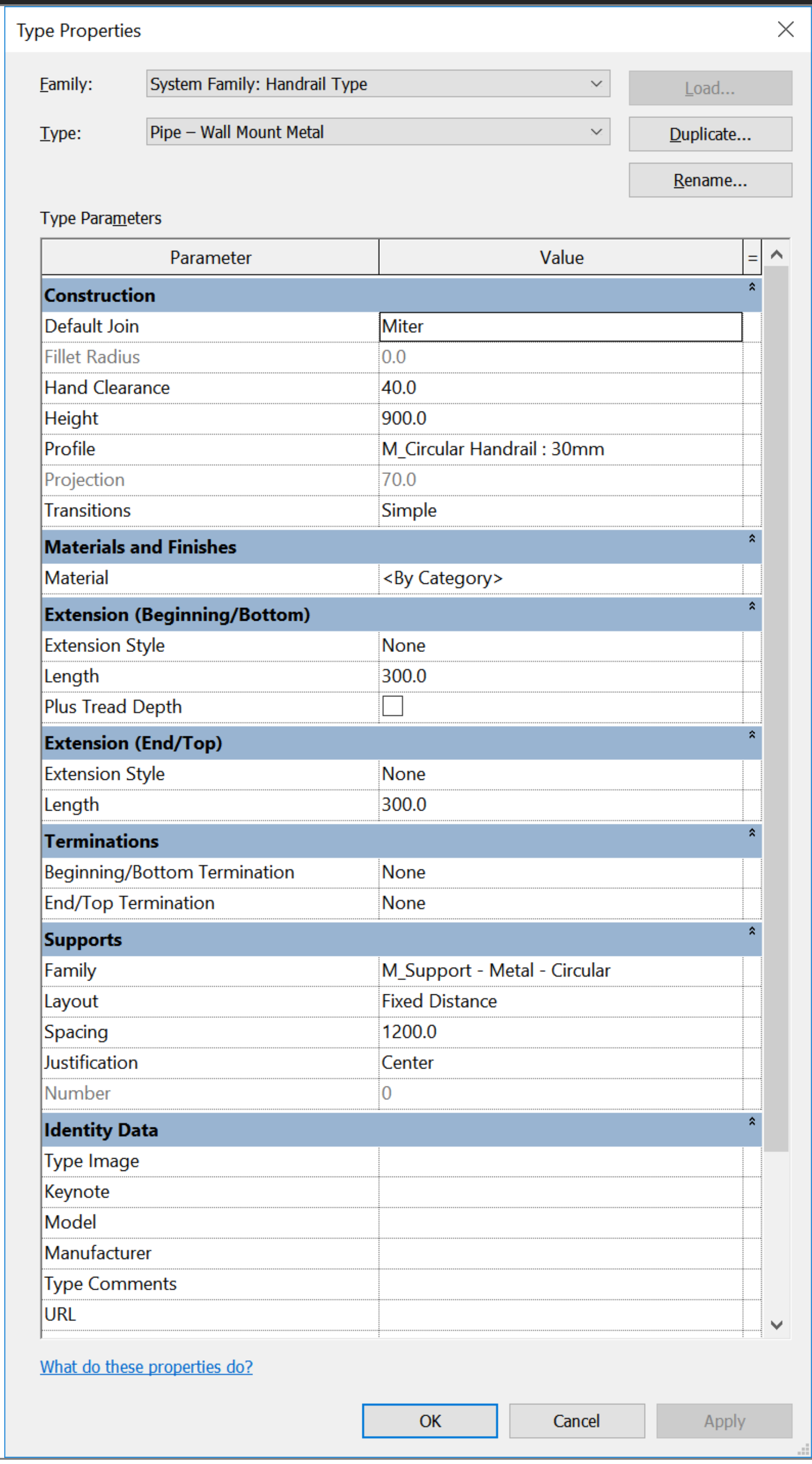
3D View



Object View: PARAMETER

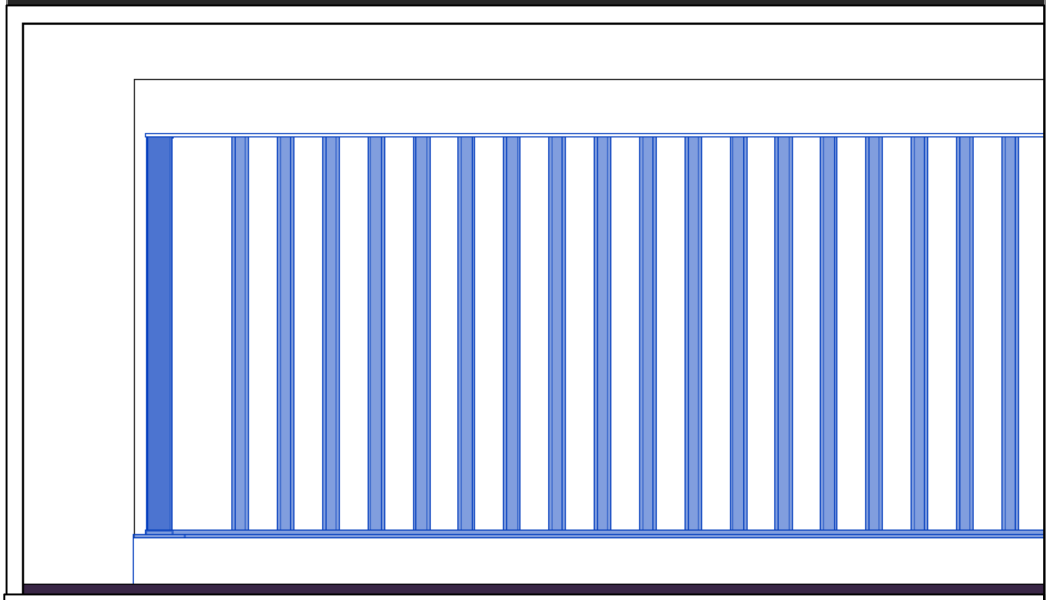


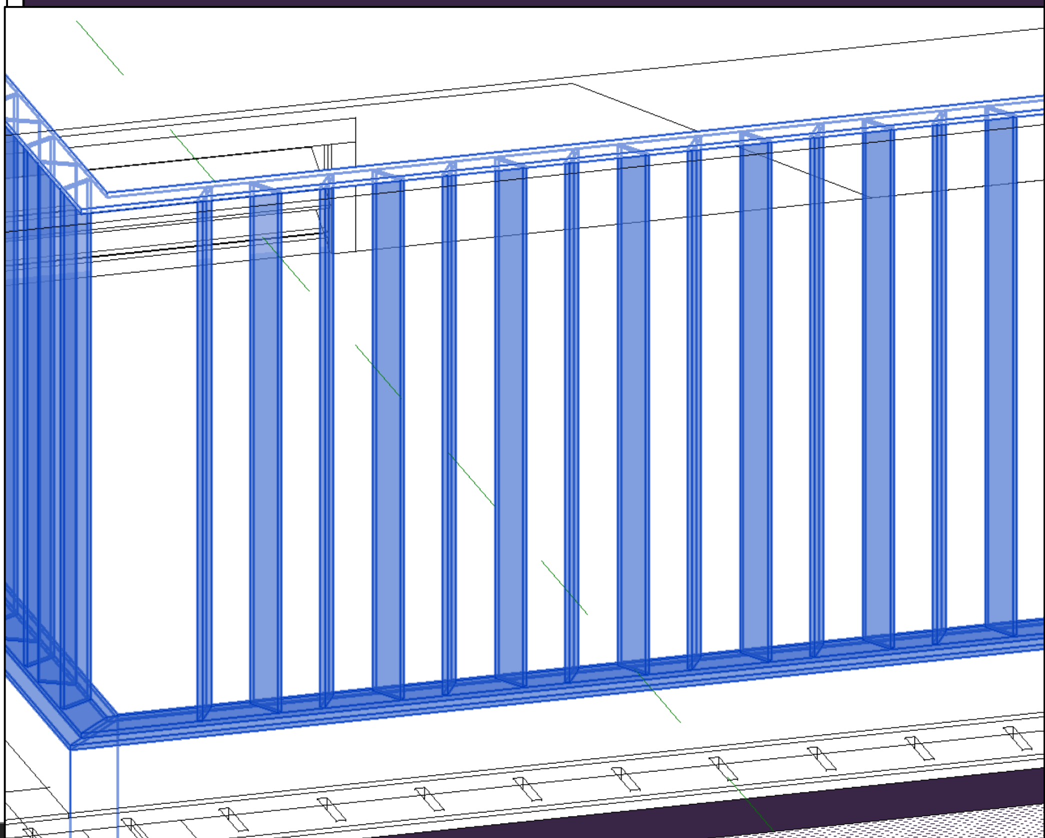
Object View: PARAMETER



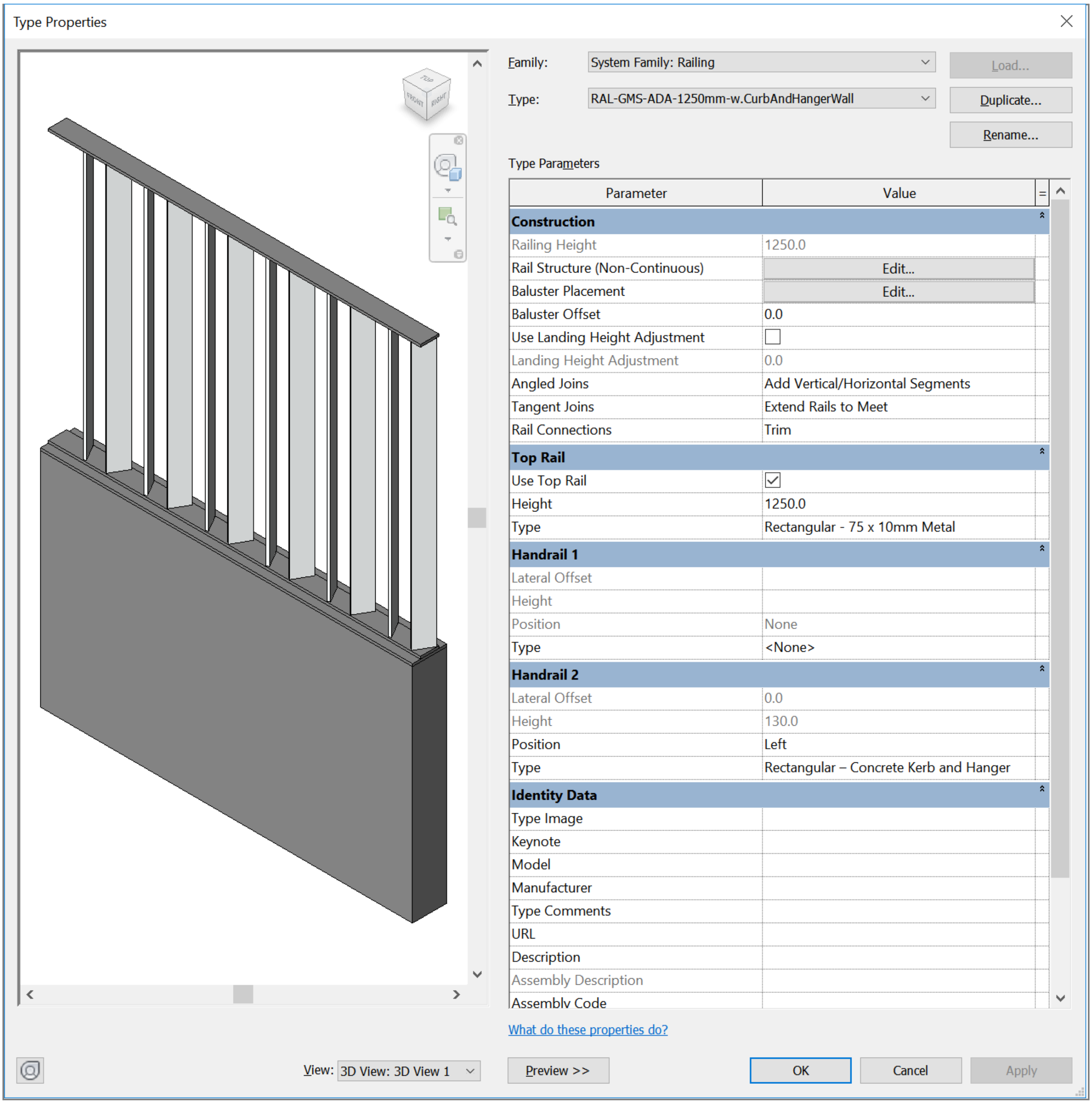
(2) Baluster

Section View

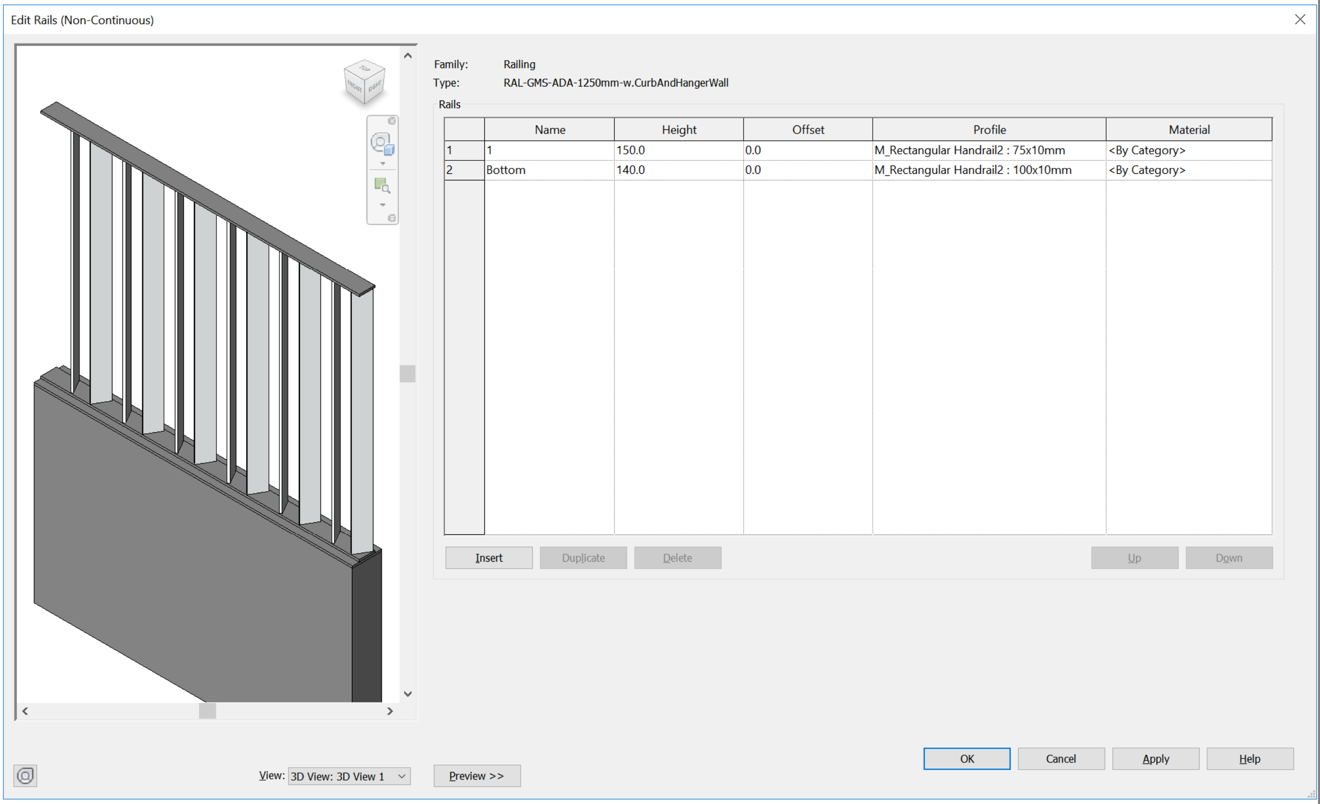




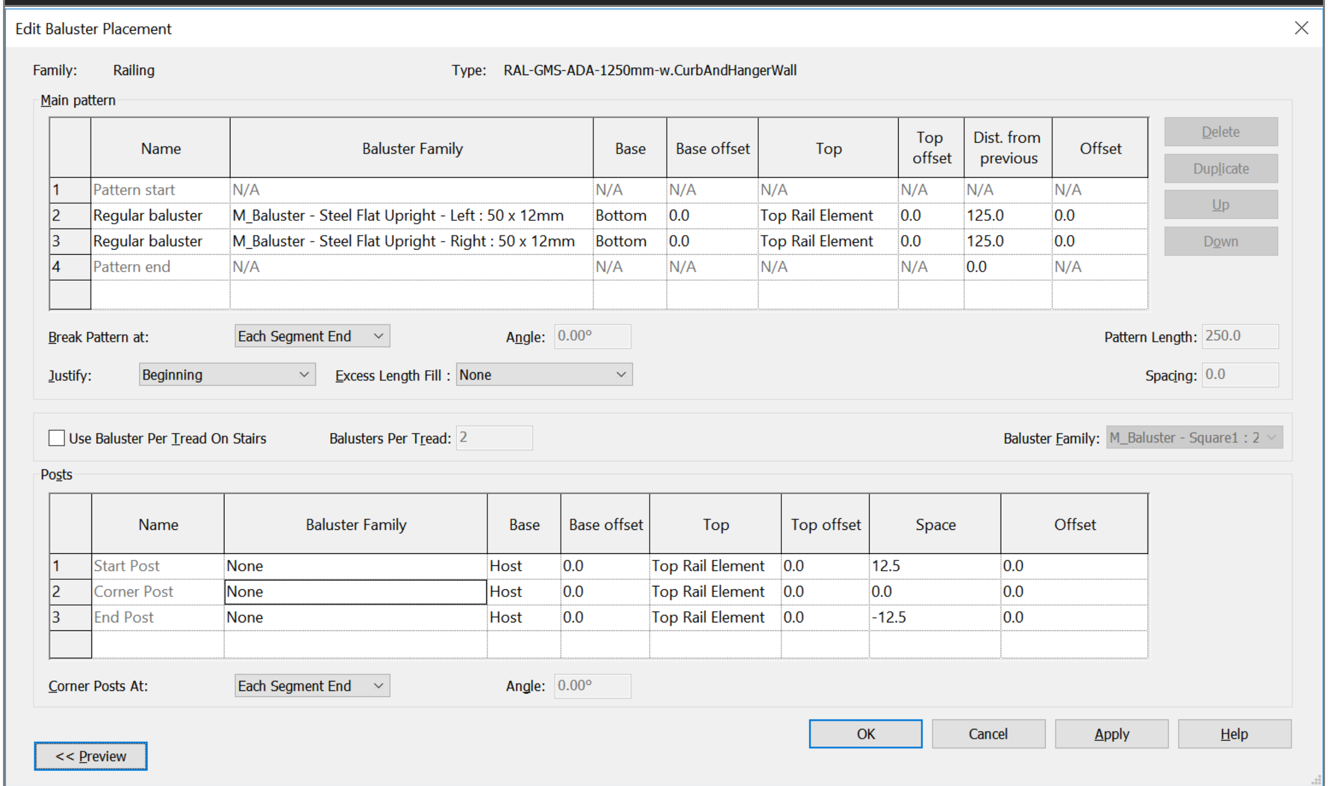
Object View: PARAMETER


Type Properties
Family: System Family: Railing
Type: RAL-GMS-ADA-1250mm-w.CurbAndHangerWall
Load...
Duplicate...
Rename...
Type Parameters
Parameter
Value
Construction
Railing Height 1250.0
Rail Structure (Non-Continuous) Edit...
Baluster Placement Edit...
Baluster Offset 0.0
Use Landing Height Adjustment
Landing Height Adjustment 0.0
Angled Joins Add Vertical/Horizontal Segments
Tangent Joins Extend Rails to Meet
Rail Connections Trim
Top Rail
Use Top Rail
Height 1250.0
Type Rectangular - 75 x 10mm Metal
Handrail 1
Lateral Offset
Height
Position None
Type <None>
Handrail 2
Lateral Offset 0.0
Height 130.0
Position Left
Type Rectangular – Concrete Kerb and Hanger
Identity Data
Type Image
Keynote
Model
Manufacturer
Type Comments
URL
Description
Assembly Description
Assembly Code
What do these properties do?
View: 3D View: 3D View 1
Preview >>
OK
Cancel
Apply

Object View: PARAMETER - Rail Structure (Non-Continuous)



Object View: PARAMETER - Baluster Placement



4.5.3 Quantity Take-off

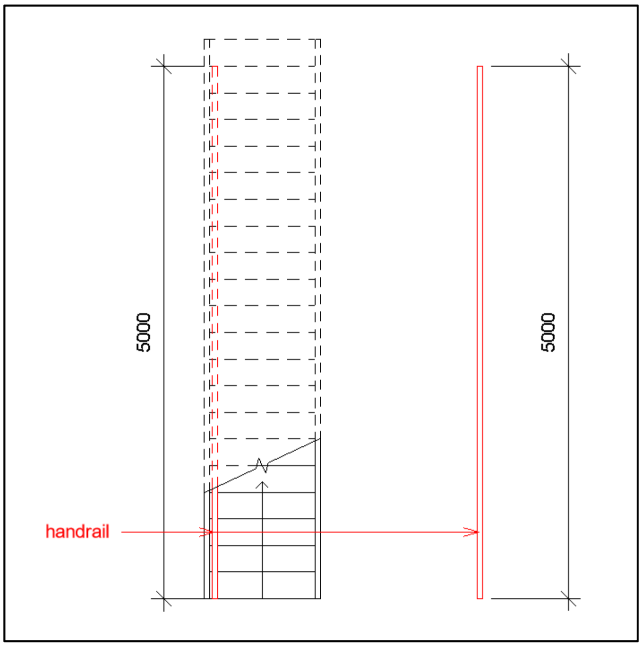
4.5.3.1 Railing Schedule

Railing category is not available for detail quantity take-off, regular schedule can be used to extract the length of rails and number of supports. However, quantities of other railing members including balusters, posts, brackets and plates cannot be retrievable due to software limitation.

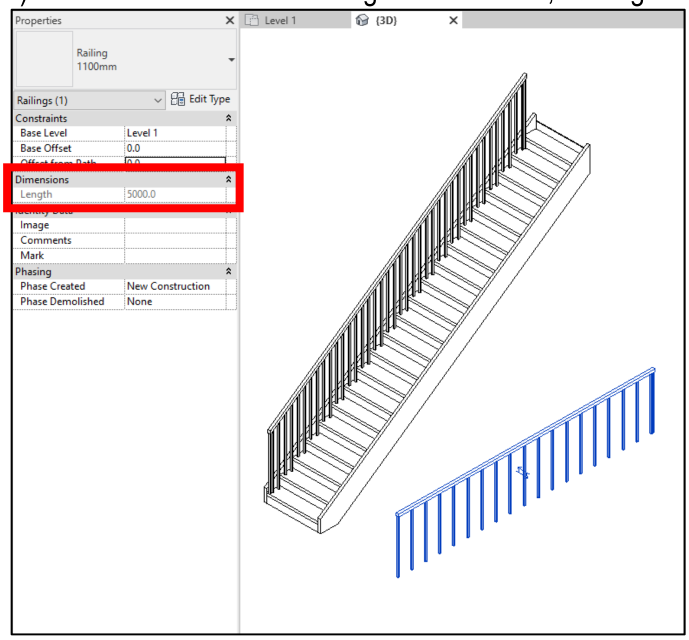
a. Railings placed horizontally can be measured on plan.

b. Length will be updated automatically when parameter of railing is changed. However, it is found that definition of length provided by the system may not be fully in line with actual measurement.

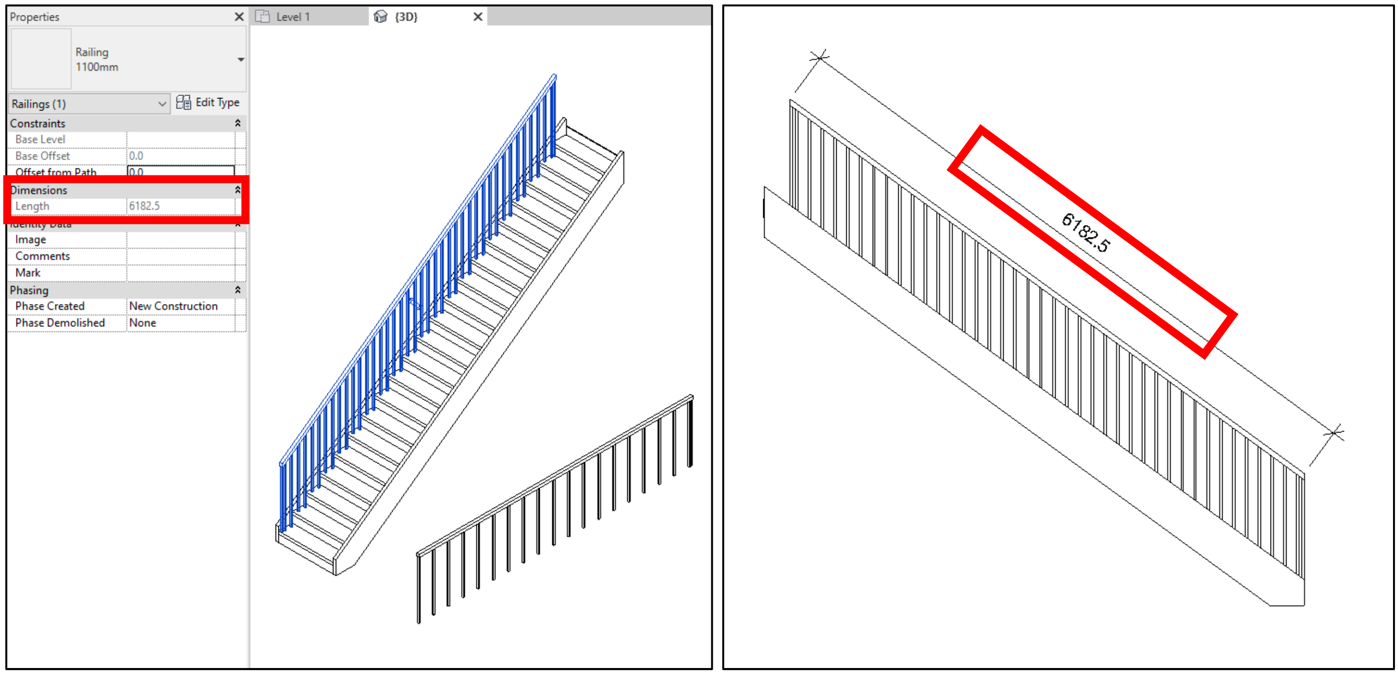
   i) For example, two handrails highlighted in red, both are 5000mm long when measured on plan.



   ii) The above handrail on right is horizontal, its length is 5000mm.

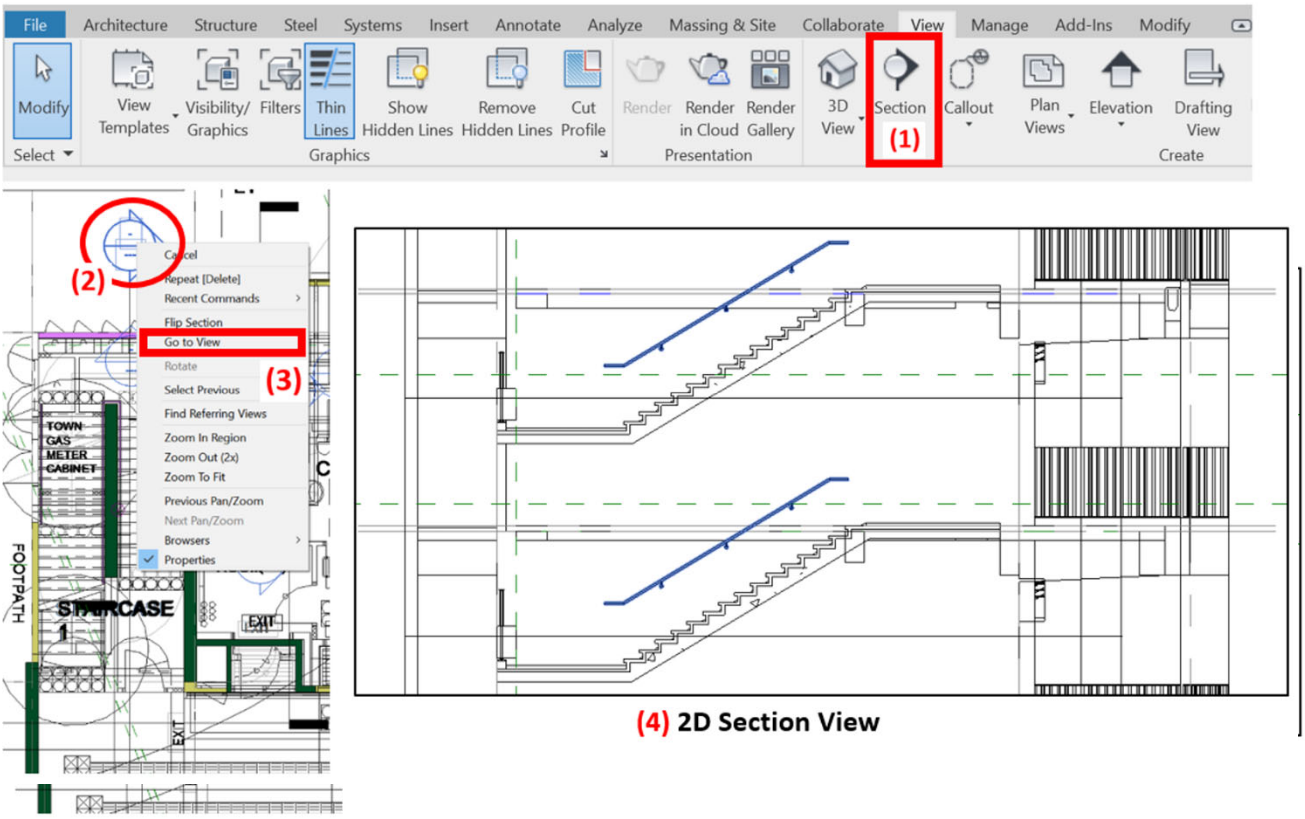


iii) The above handrail on left is mounted to a staircase, its length reported by the program as highlighted in red is 6182.5mm, which is fully in line with direct measurement on elevation



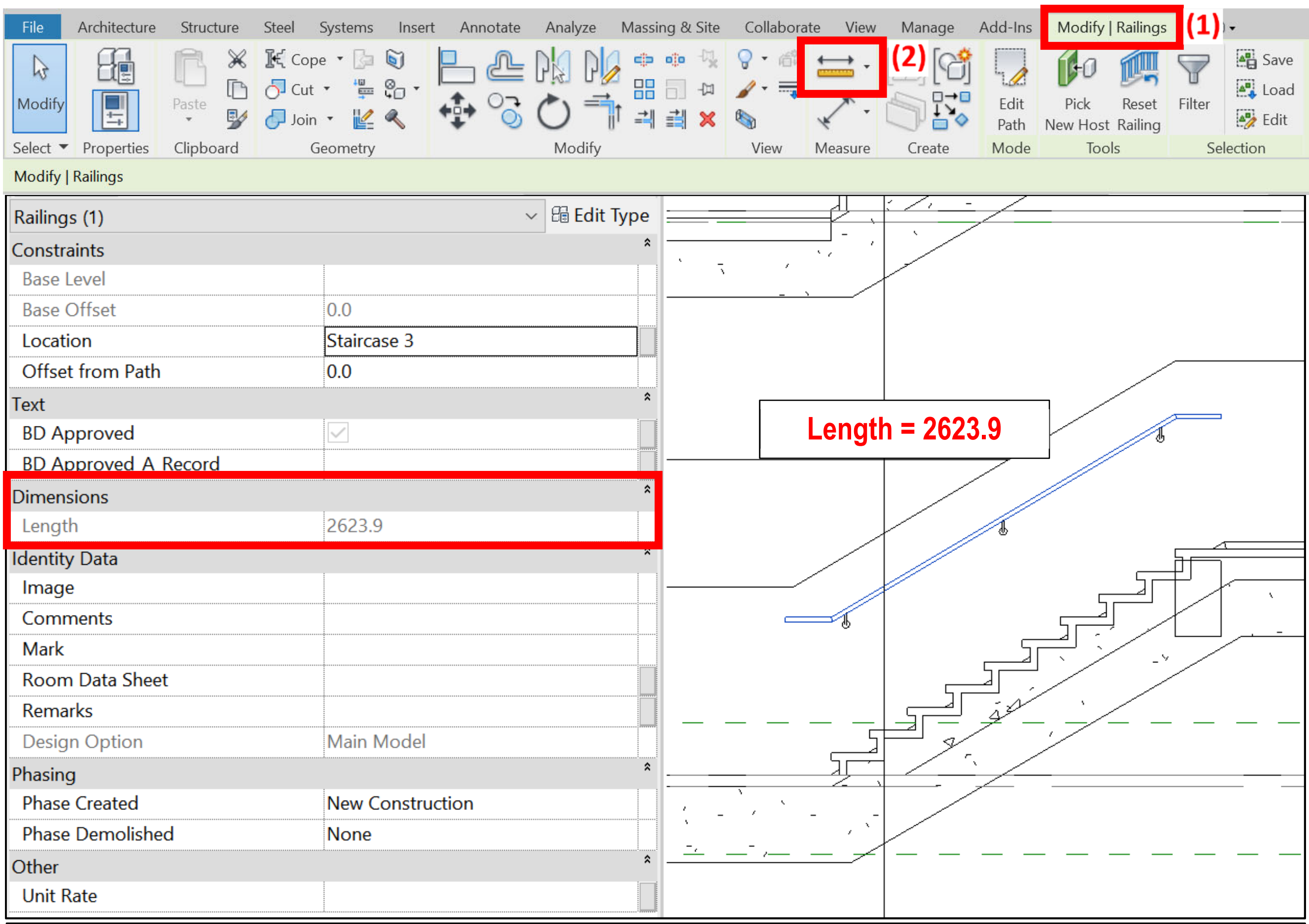
iv) Definition of length can be reflected when the railing is changed in 2D Section View.*

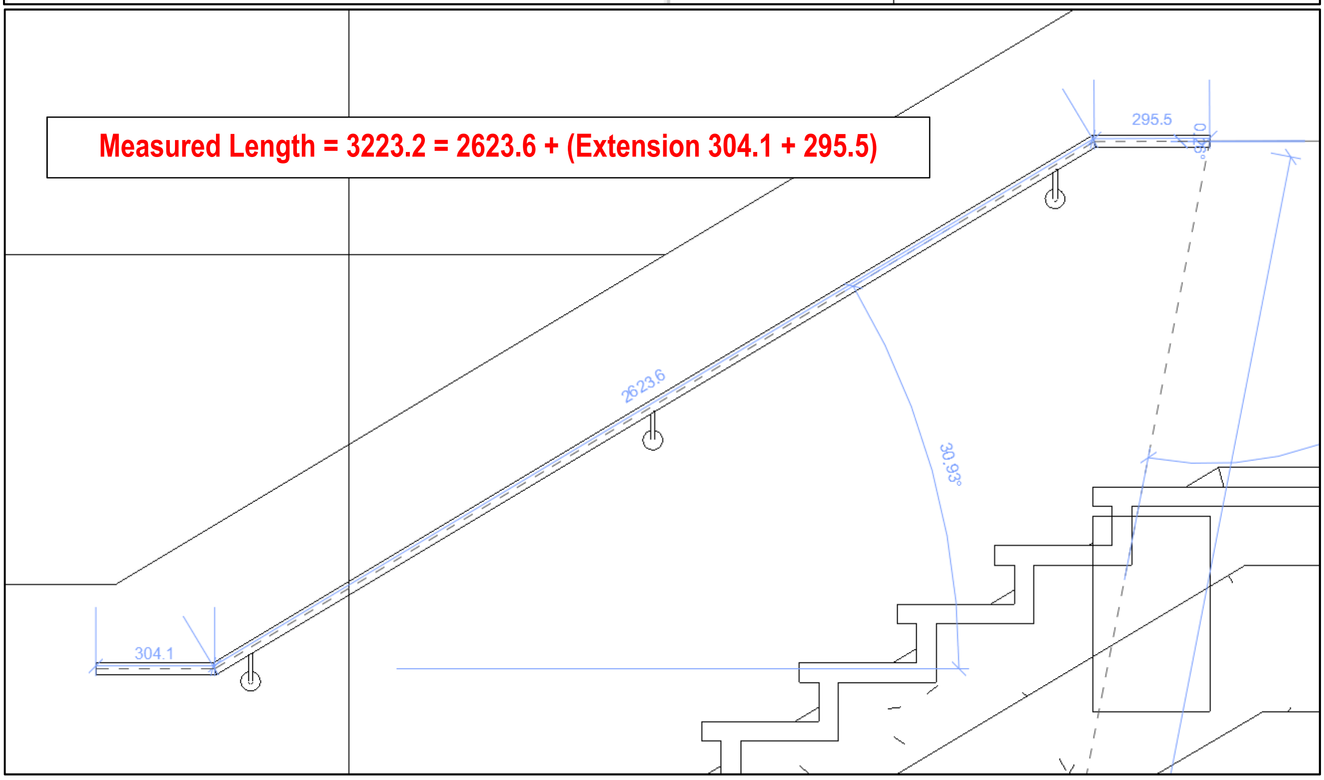
- **View > (1) Section** – to create a custom 2D Section View
- **(2) Right click the mouse over the Section Arrow > (3) Go to View**
- **(4) 2D Section View will be opened**



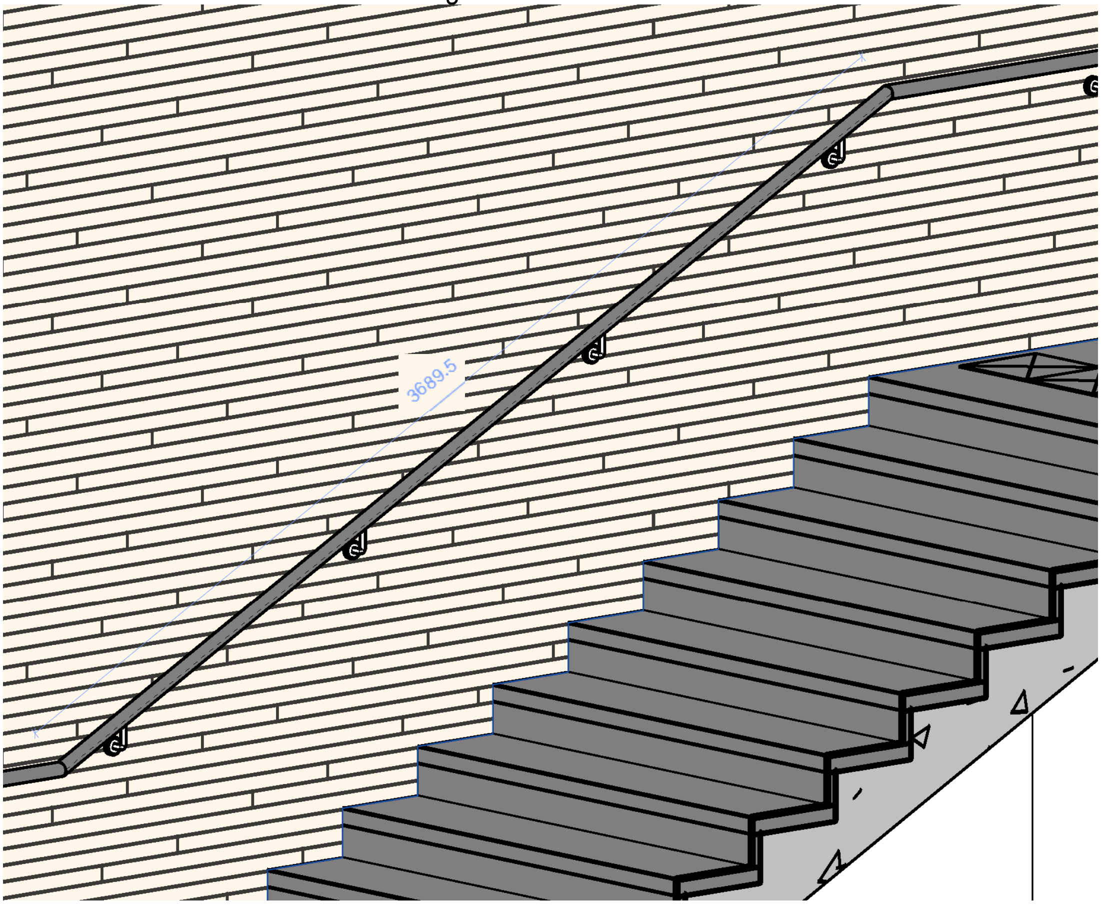
v) Use the measure tools to check the actual length.

- Select the railing > **(1) Modify Railings** > **(2) Measure**



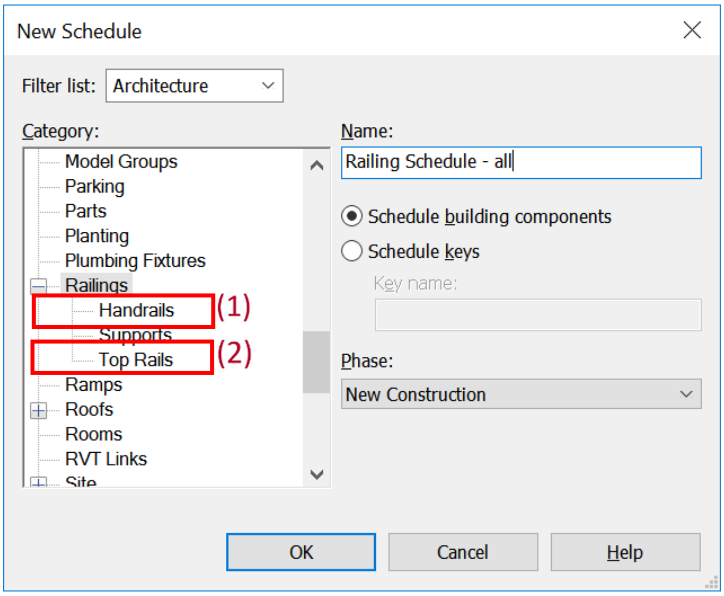


* Alternative measurement tool for railing in 3D view is also available in software 2023 version.



Step 1

Create a new (1) **Railing /** (2) **Supports** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.



Sample of Railing Schedule *

<Railing Schedule - all>				
A	B	C	D	E
Family	Type	Base Level *	Location *	Length (m)
Railing	RAL-GMS-ADA-900mm_Handrail	Modeller should input the base level (if any).	Staircase 2	8.29
Railing	RAL-GMS-ADA-900mm_Handrail		Staircase 2	15.42
Railing	RAL-GMS-ADA-900mm_Handrail		Staircase 2	7.12
Railing	RAL-GMS-ADA-900mm_Handrail		Staircase 2	14.05
Staircase 2: 4				44.87
Railing	RAL-GMS-ADA-900mm_Handrail		Staircase 5	4.40
Railing	RAL-GMS-ADA-900mm_Handrail		Staircase 5	6.84
Railing	RAL-GMS-ADA-900mm_Handrail		Staircase 5	6.01
Railing	RAL-GMS-ADA-900mm_Handrail		Staircase 5	6.01
Railing	RAL-GMS-ADA-900mm_Handrail		Staircase 5	12.87
Railing	RAL-GMS-ADA-900mm_Handrail		Staircase 5	6.01
Railing	RAL-GMS-ADA-900mm_Handrail		Staircase 5	6.48
Staircase 5: 7				48.61

Notes:

i) The Length does **not** include any extension length and lateral offset in the intermediate connection, beginning and ends. Officers should check and adjust the quantities in the 2D Section. See Figure 1.

ii) Supports are deemed to be included as the method of measurement adopted here.

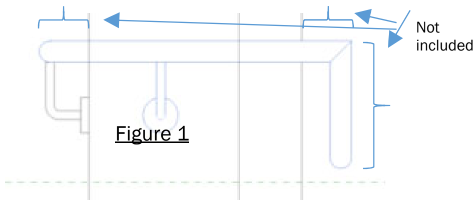


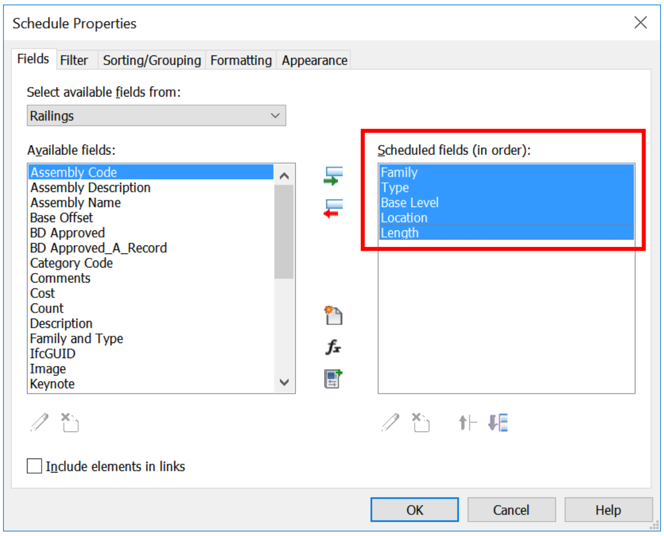
Figure 1

* Base level/ Location should be input by the Modeller.

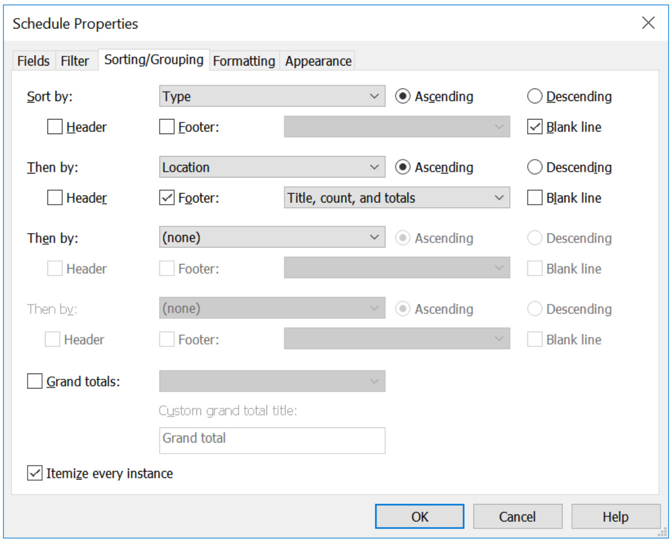
Step 2

Schedule Properties and Setting

❖ Fields



❖



4.6 Ladders and Stairs

This section mainly focuses on the following:

i. Cat Ladders
ii. Metal Stairs
iii. Suspended Walkways
iv. Metal Platforms

4.6.1 Basic Information

4.6.1.1 Building Element to Model

Modelling elements:

Elements	Object Category
Work Description	Manage/ Settings/ Materials
Cat Ladders	Specialty Equipment
Metal Stairs	Stairs
Suspended Walkways	Railings
Metal Platforms	Generic Model

4.6.2 Modelling Approach

4.6.2.1 Cat Ladder

4.6.2.1.1 Object Naming

Cat ladder should be a loadable object and can be created with Specialty Equipment wall based Template.

Object Format:
<Category> - <Functional Type> - <Originator> - <Descriptor 1> - <Descriptor 2>

Object Name	SPQ-LAD-ADA-CatLadder-01	Descriptions
Category	**SPQ**-LAD-ADA-CatLadder-01	SPQ is the short form of the Category type “Specially Equipment”
Functional Type	SPQ-**LAD**-ADA-CatLadder-01	LAD is the short form of the functional type “Ladder”
Originator	SPQ-LAD-**ADA**-CatLadder-01	ADA for architectural discipline of ArchSD
Descriptor 1	SPQ-LAD-ADA-**CatLadder**-01	A descriptive text, i.e. Cat Ladder
Descriptor 2	SPQ-LAD-ADA-CatLadder-**01**	Type 1 of the cat ladder

4.6.2.1.2 Setting of creating a Cat Ladder

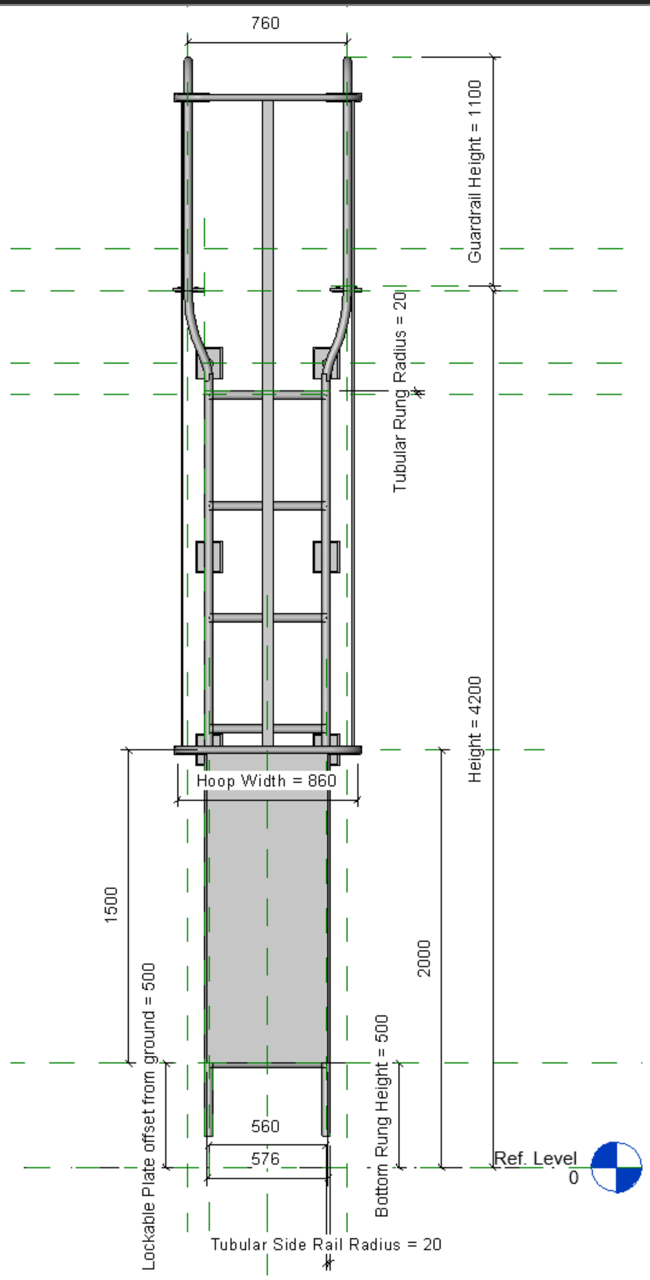
Under **Properties> Identity Data**

Parameter	Remark
Fixing method	Input the cat ladder fixing method
Location	Input the cat ladder location
Overall size	Input the cat ladder overall size
Mark	Input the cat ladder mark

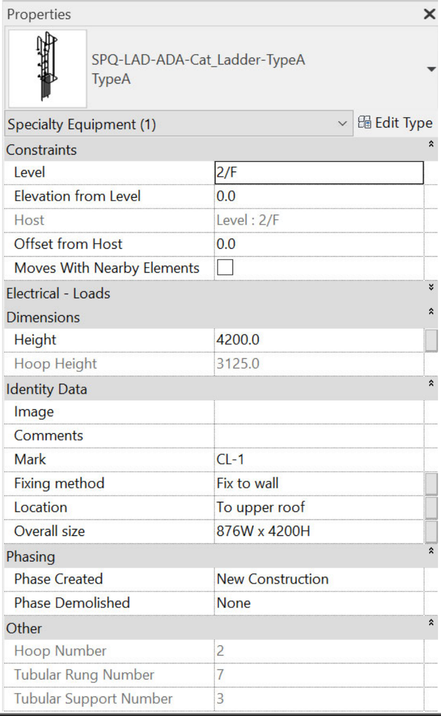
4.6.2.1.3 Cat Ladder Object

(1) Cat Ladder with safety hoop and lockable plate

Elevation View



Properties, Plan View and 3D View

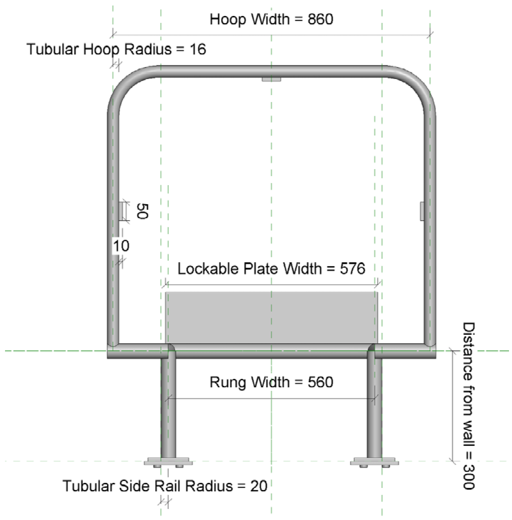


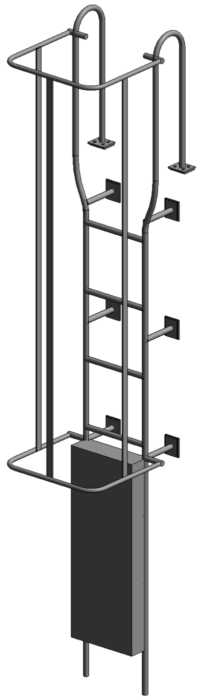
Properties

SPQ-LAD-ADA-Cat_Ladder-TypeA
TypeA

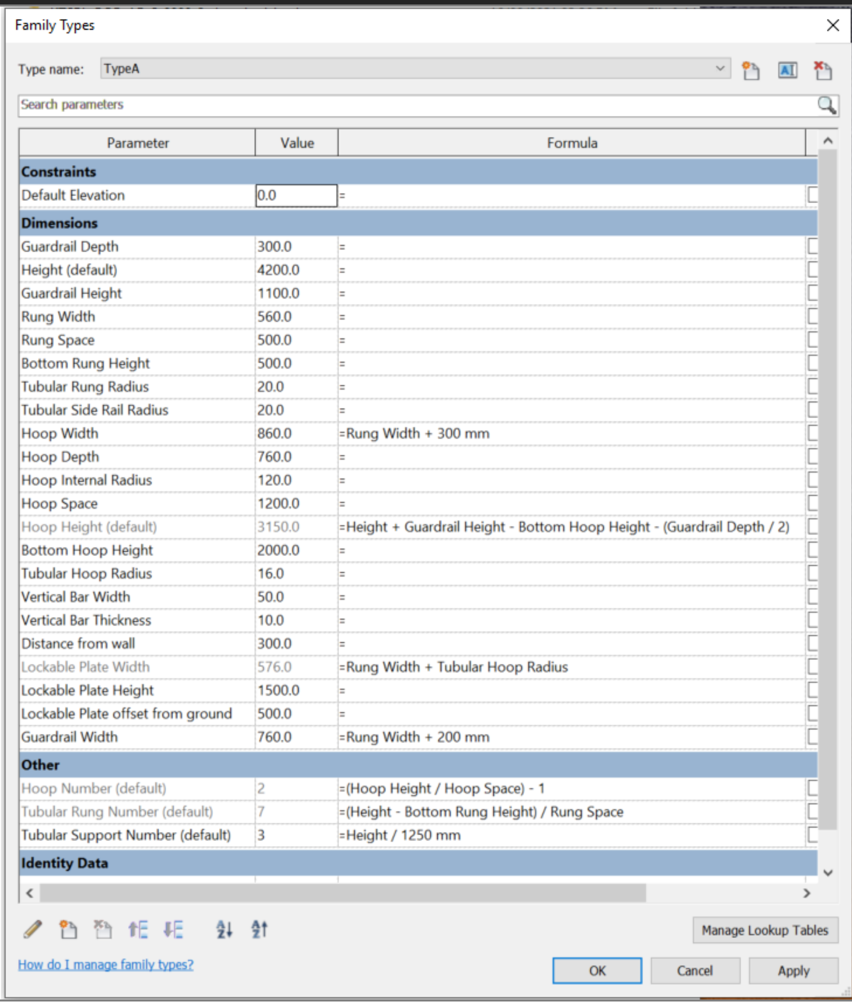
Specialty Equipment (1) | Edit Type

Constraints	
Level	2/F
Elevation from Level	0.0
Host	Level : 2/F
Offset from Host	0.0
Moves With Nearby Elements	☐
Electrical - Loads	
Dimensions	
Height	4200.0
Hoop Height	3125.0
Identity Data	
Image	
Comments	
Mark	CL-1
Fixing method	Fix to wall
Location	To upper roof
Overall size	876W x 4200H
Phasing	
Phase Created	New Construction
Phase Demolished	None
Other	
Hoop Number	2
Tubular Rung Number	7
Tubular Support Number	3





Object Types



Family Types

Type name: TypeA

Search parameters

Parameter	Value	Formula
Constraints		
Default Elevation	0.0	=
Dimensions		
Guardrail Depth	300.0	=
Height (default)	4200.0	=
Guardrail Height	1100.0	=
Rung Width	560.0	=
Rung Space	500.0	=
Bottom Rung Height	500.0	=
Tubular Rung Radius	20.0	=
Tubular Side Rail Radius	20.0	=
Hoop Width	860.0	=Rung Width + 300 mm
Hoop Depth	760.0	=
Hoop Internal Radius	120.0	=
Hoop Space	1200.0	=
Hoop Height (default)	3150.0	=Height + Guardrail Height - Bottom Hoop Height - (Guardrail Depth / 2)
Bottom Hoop Height	2000.0	=
Tubular Hoop Radius	16.0	=
Vertical Bar Width	50.0	=
Vertical Bar Thickness	10.0	=
Distance from wall	300.0	=
Lockable Plate Width	576.0	=Rung Width + Tubular Hoop Radius
Lockable Plate Height	1500.0	=
Lockable Plate offset from ground	500.0	=
Guardrail Width	760.0	=Rung Width + 200 mm
Other		
Hoop Number (default)	2	=(Hoop Height / Hoop Space) - 1
Tubular Rung Number (default)	7	=(Height - Bottom Rung Height) / Rung Space
Tubular Support Number (default)	3	=Height / 1250 mm
Identity Data		

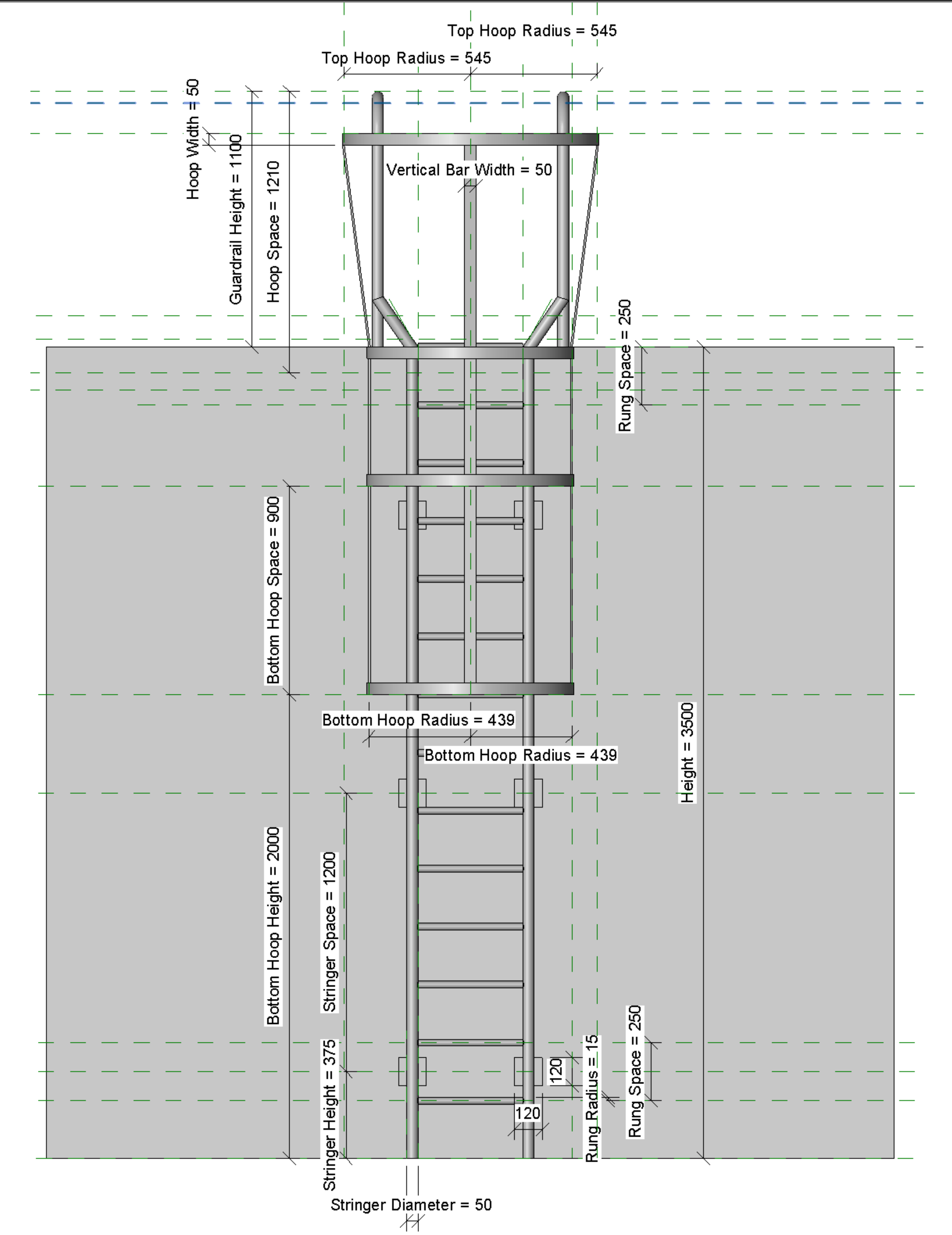
Manage Lookup Tables

How do I manage family types?

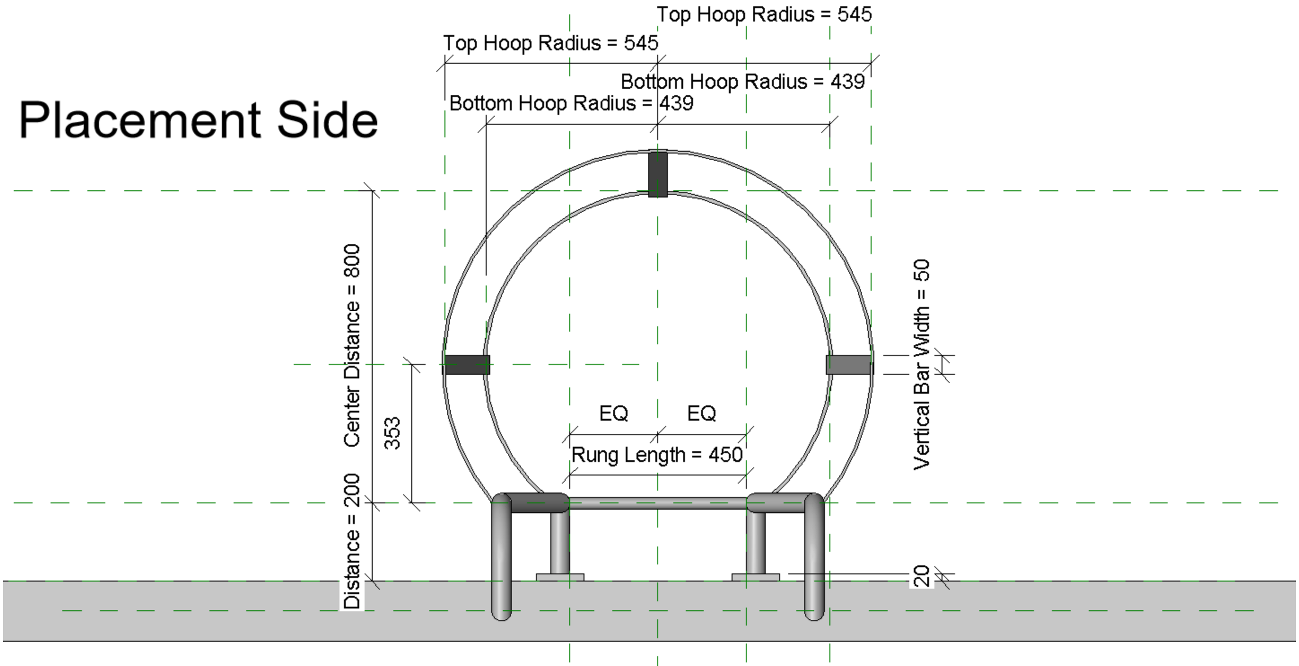
OK | Cancel | Apply

(2) Cat ladder with safety hoop

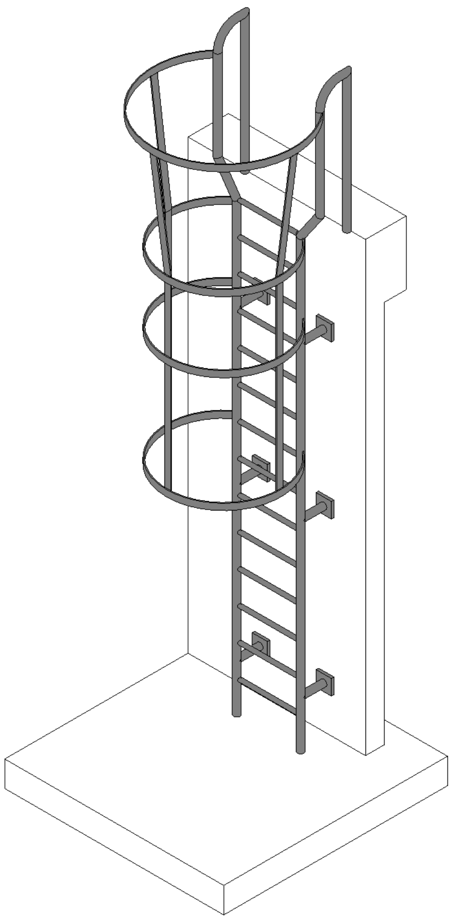
Elevation View



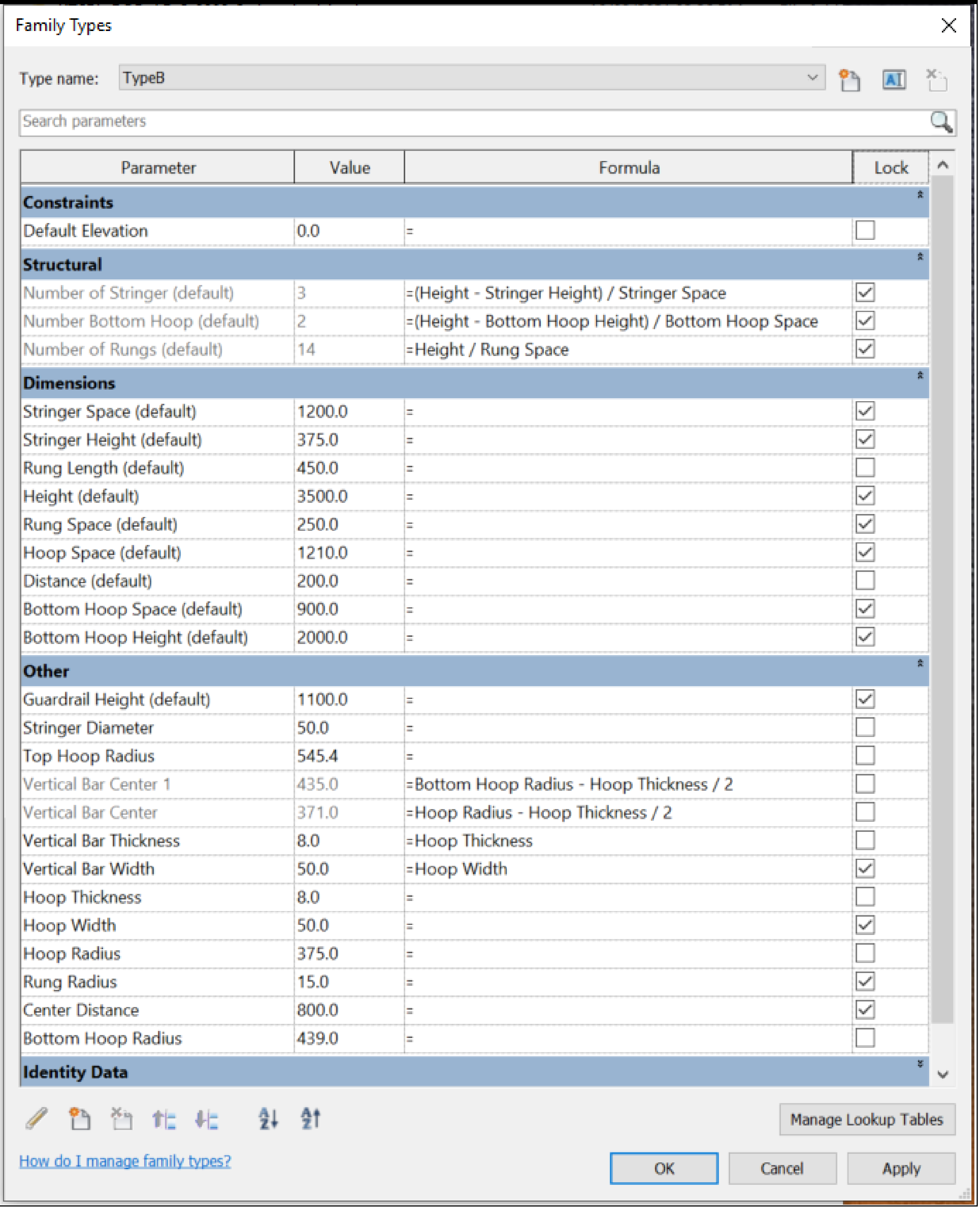
Plan View



3D View



Object View: PARAMETER



Family Types

Type name: TypeB

Search parameters

Parameter	Value	Formula	Lock
Constraints			
Default Elevation	0.0	=	☐
Structural			
Number of Stringer (default)	3	=(Height - Stringer Height) / Stringer Space	☑
Number Bottom Hoop (default)	2	=(Height - Bottom Hoop Height) / Bottom Hoop Space	☑
Number of Rungs (default)	14	=Height / Rung Space	☑
Dimensions			
Stringer Space (default)	1200.0	=	☑
Stringer Height (default)	375.0	=	☑
Rung Length (default)	450.0	=	☐
Height (default)	3500.0	=	☑
Rung Space (default)	250.0	=	☑
Hoop Space (default)	1210.0	=	☑
Distance (default)	200.0	=	☐
Bottom Hoop Space (default)	900.0	=	☑
Bottom Hoop Height (default)	2000.0	=	☑
Other			
Guardrail Height (default)	1100.0	=	☑
Stringer Diameter	50.0	=	☐
Top Hoop Radius	545.4	=	☐
Vertical Bar Center 1	435.0	=Bottom Hoop Radius - Hoop Thickness / 2	☐
Vertical Bar Center	371.0	=Hoop Radius - Hoop Thickness / 2	☐
Vertical Bar Thickness	8.0	=Hoop Thickness	☐
Vertical Bar Width	50.0	=Hoop Width	☑
Hoop Thickness	8.0	=	☐
Hoop Width	50.0	=	☑
Hoop Radius	375.0	=	☐
Rung Radius	15.0	=	☑
Center Distance	800.0	=	☑
Bottom Hoop Radius	439.0	=	☐
Identity Data			

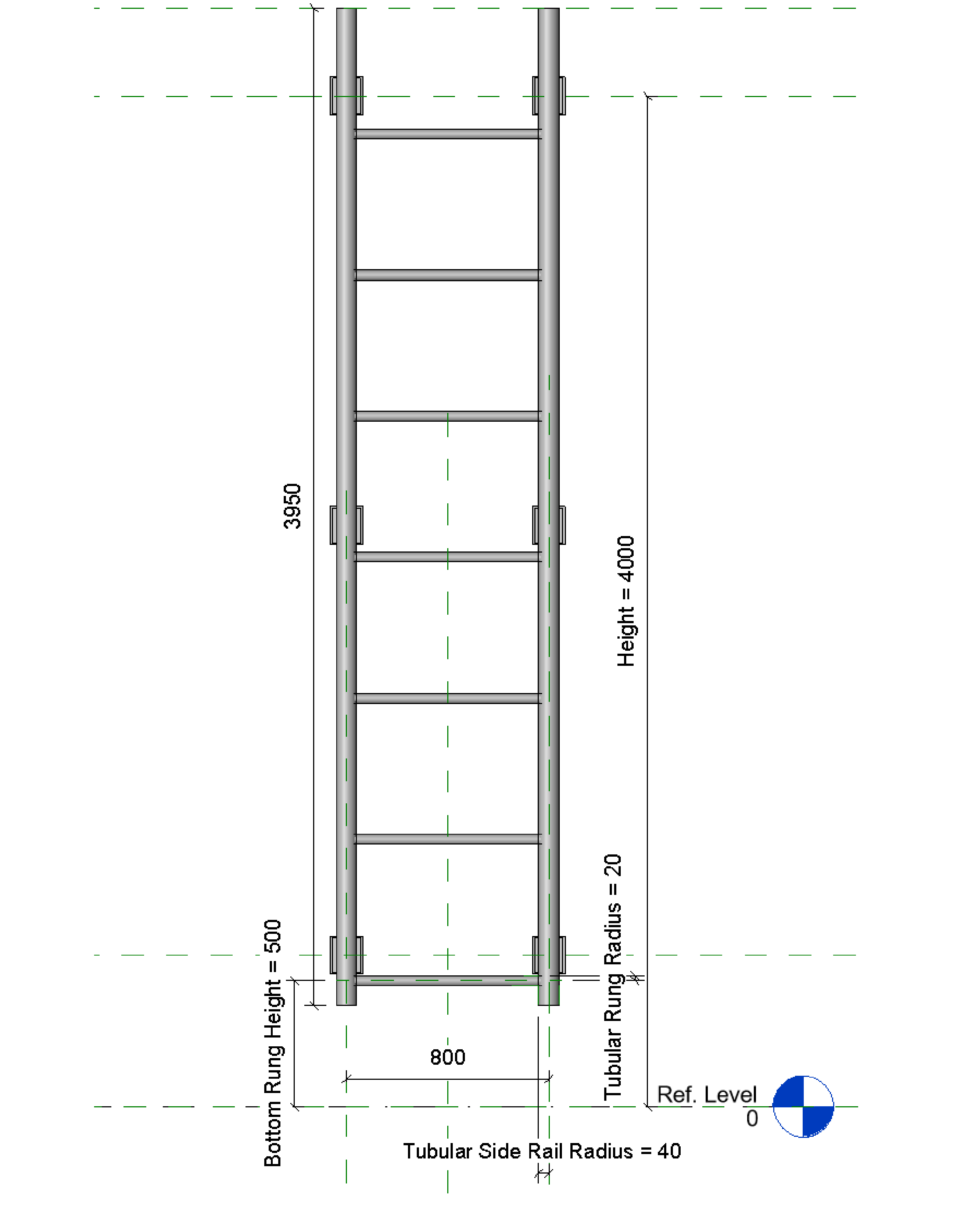
Manage Lookup Tables

How do I manage family types?

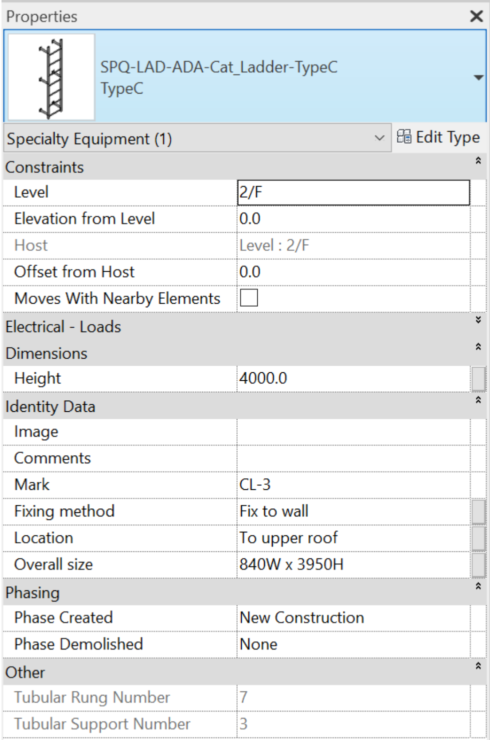
OK Cancel Apply

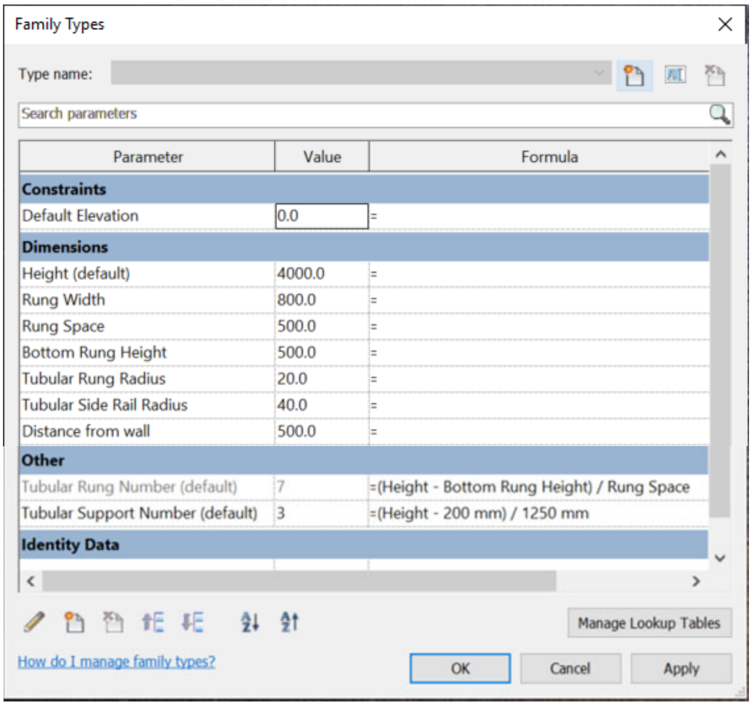
(3) Cat Ladder

Elevation View

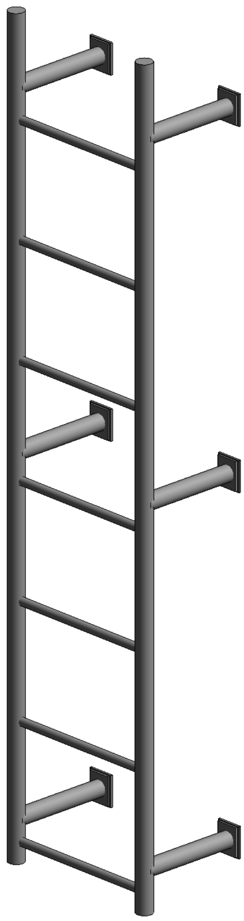


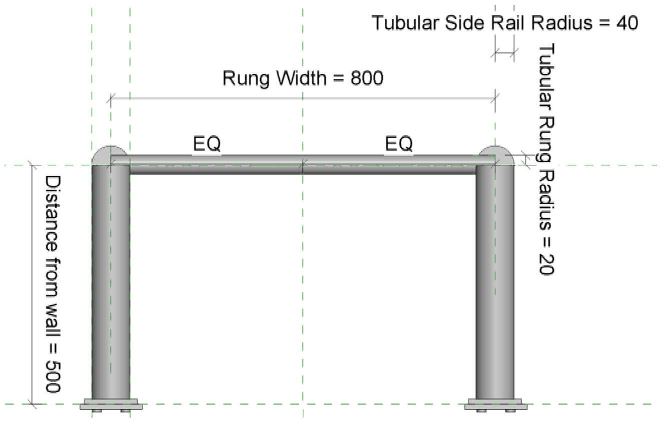
Properties and Object Types





3D View and Plan View





4.6.2.2 Metal Stair

4.6.2.2.1 Type Naming

Metal stair should be based on the stairs template, a system object type for assembled stair is created by sketching the alignment of the stair from the base level (stair base) to top level (stair top). The relevant dimensions can be extracted from the parameters such as the actual number of riser, actual riser height, actual tread depth, etc.

Type Format:
<Function Type> **-** <Originator> **-** <Descriptor 1> **-** <Descriptor 2>

Type Name	STS-ADA-Maint_1360mmW-__	Descriptions
Function Type	**STS**-ADA-Maint_1360mmW-__	STS is the short form of the function type "Steel Stair"
Originator	STS-**ADA**-Maint_1360mmW-__	ADA for architectural discipline of ArchSD
Descriptor 1	STS-ADA-**Maint_1360mmW-__**	A descriptive text, i.e. Maintenance Stair with overall 1360mm wide
Descriptor 2	STS-ADA-Maint_1360mmW-__	2-digit sequential number to distinguish different types, if Descriptor 2 is blank, two underscores (__) should be used.

4.6.2.2.2 Setting of creating Metal Stair

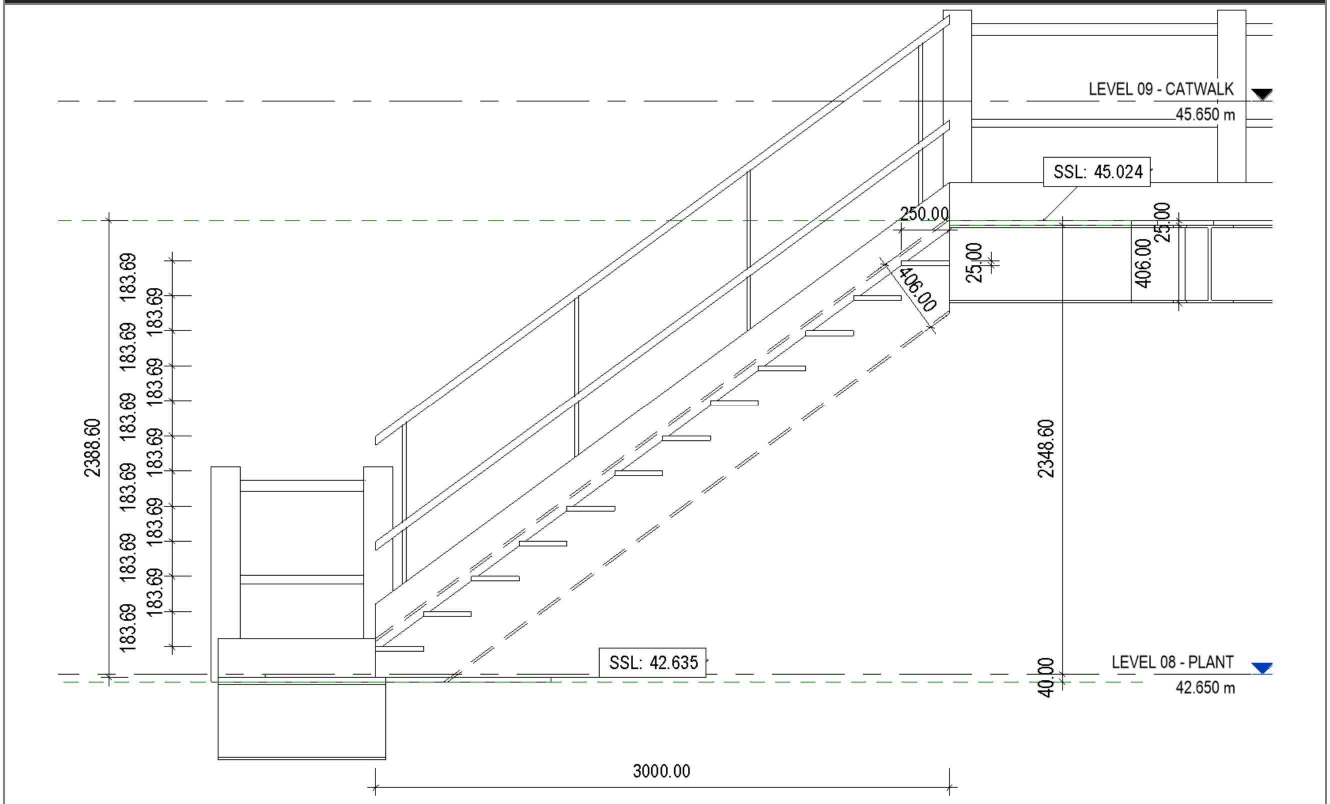
Under **Identity Data**

Parameter	Remark
Location	Input the metal stair location
Mark	Input the metal stair mark
Type	Input the metal stair type

4.6.2.2.3 Metal Stair Object

(1) Metal stair with 1 flight (suspended walkway in both end)

Section View



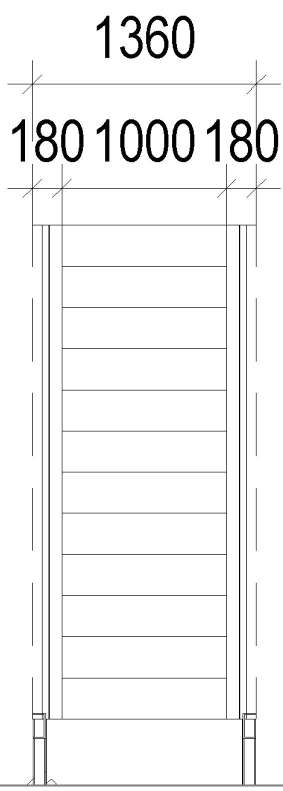
Properties, Plan View and 3D View

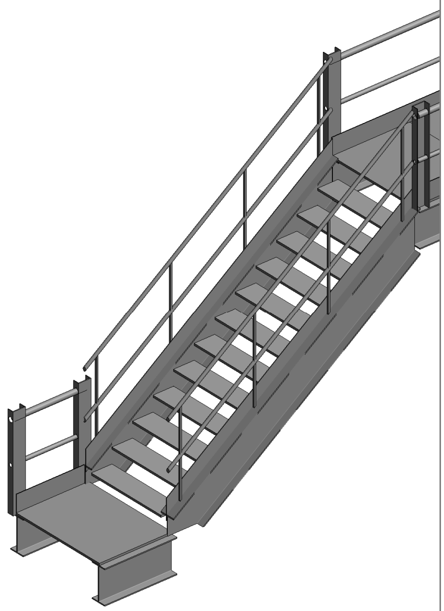
Properties

Assembled Stair
STS-ADA-Maintenance_Stair-1360wide

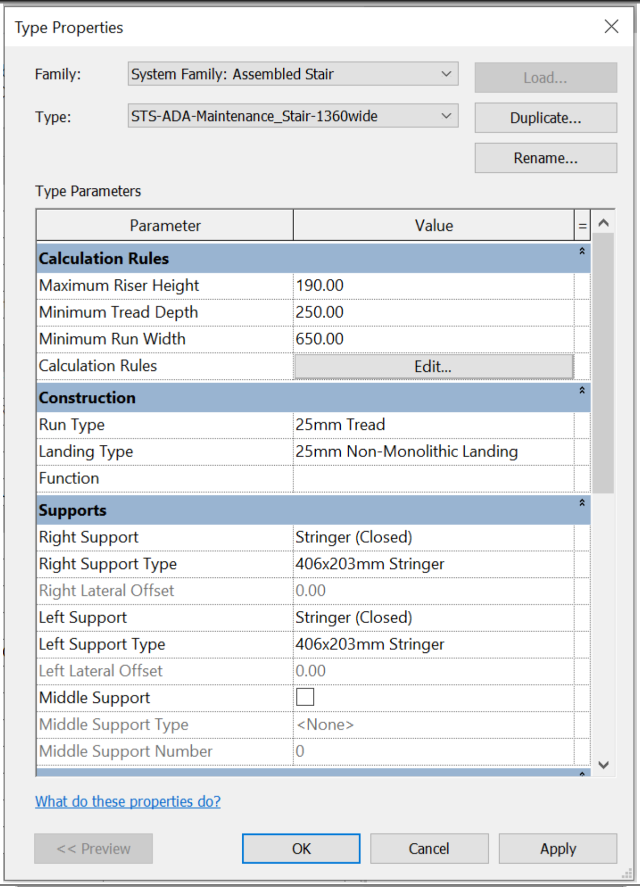
Stairs (1) — Edit Type

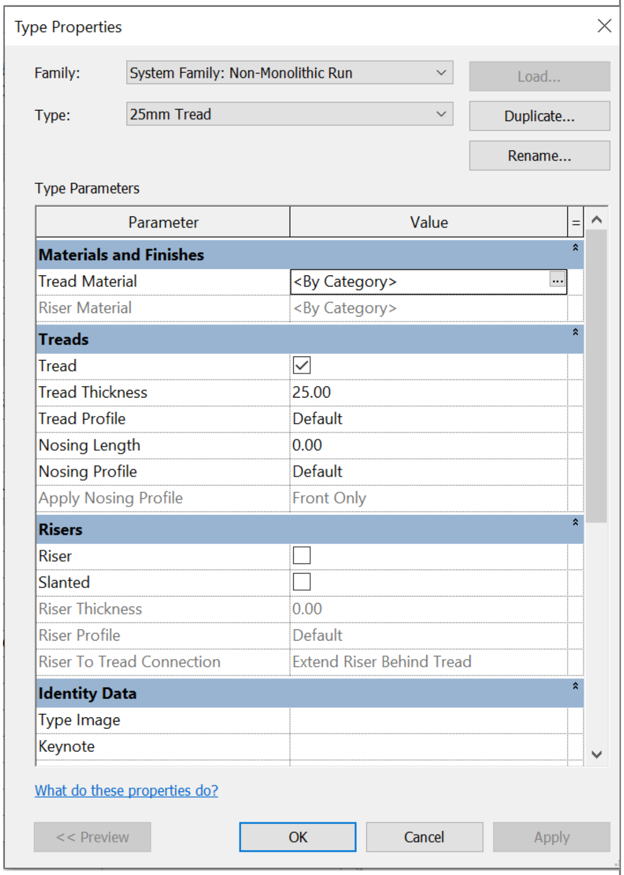
Constraints	
Base Level	LEVEL 08 - PLANT
Base Offset	-40.00
Top Level	LEVEL 08 - PLANT
Top Offset	2348.00
Desired Stair Height	2388.00
Location	To maintenance platform
Dimensions	
Desired Number of Risers	13
Actual Number of Risers	13
Actual Riser Height	183.69
Actual Tread Depth	250.00
Tread/Riser Start Number	1
Identity Data	
Image	
Comments	
Mark	MS1
TYPE	1 flight

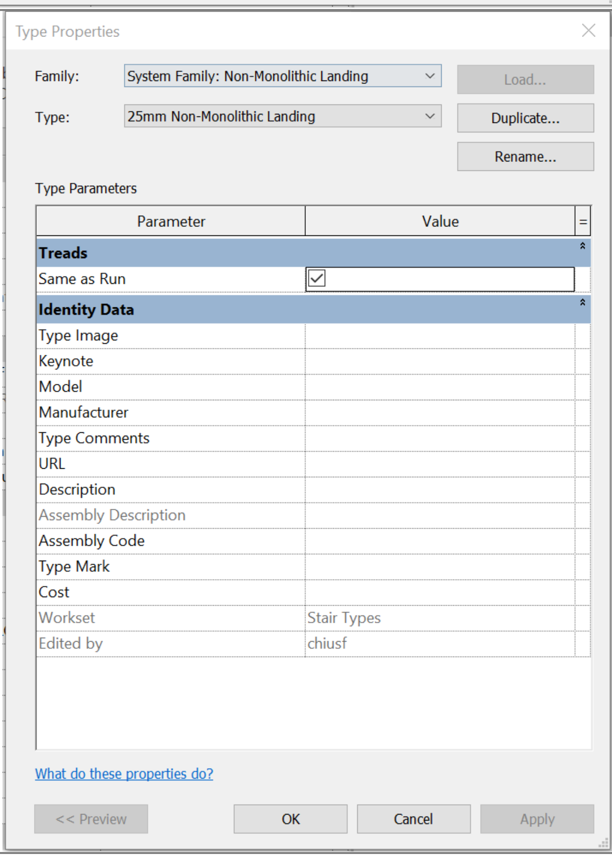


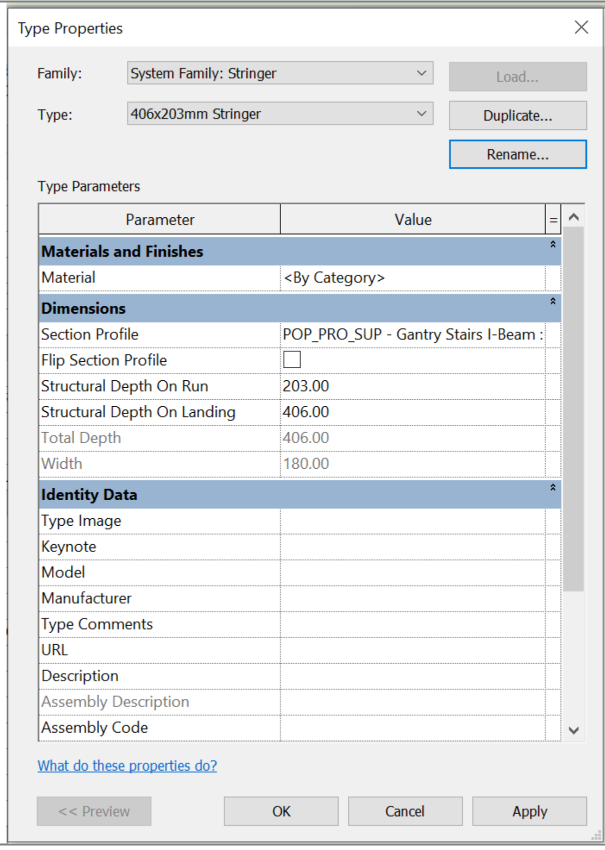


Types Properties



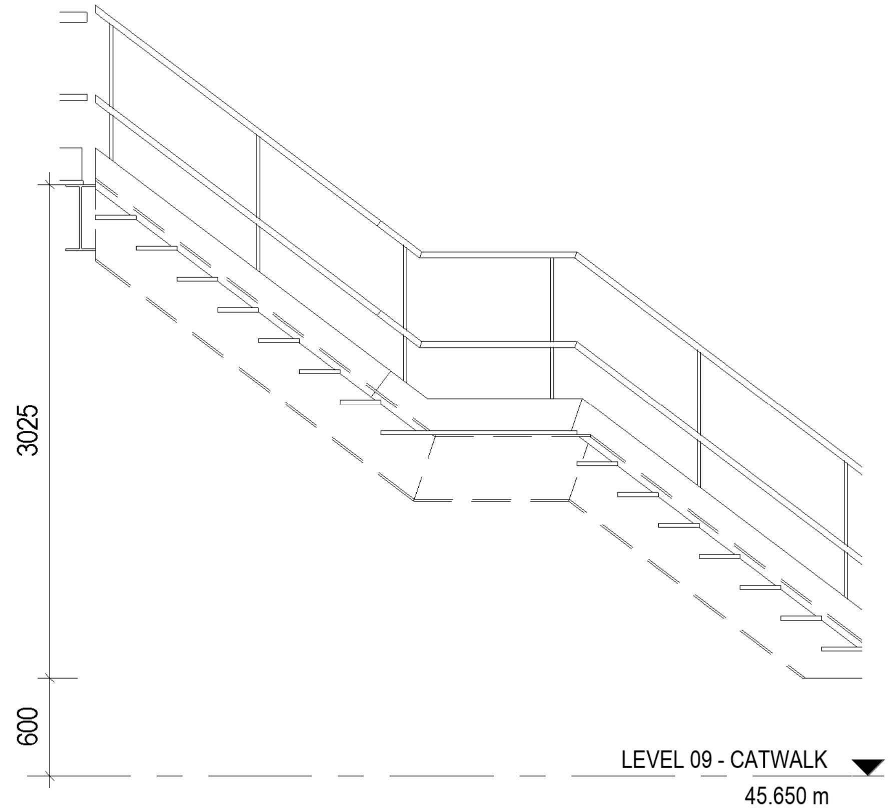


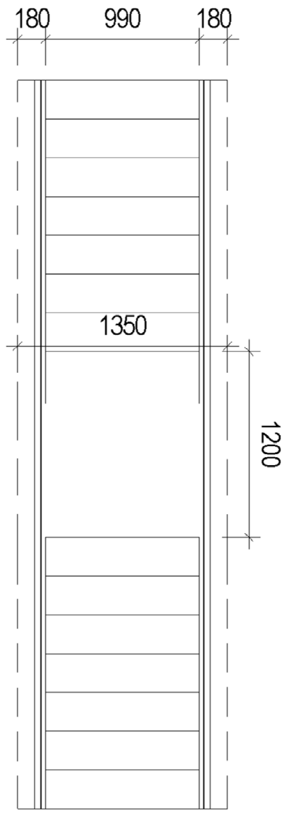




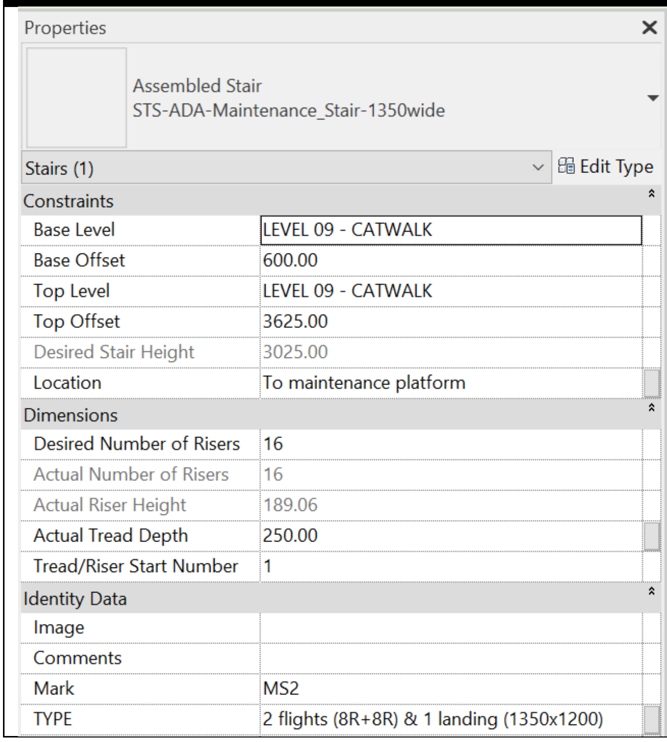
(2) Metal stair with 2 flights and 1 landing (suspended walkway in both end)

Section View and Plan View





Properties and 3D View

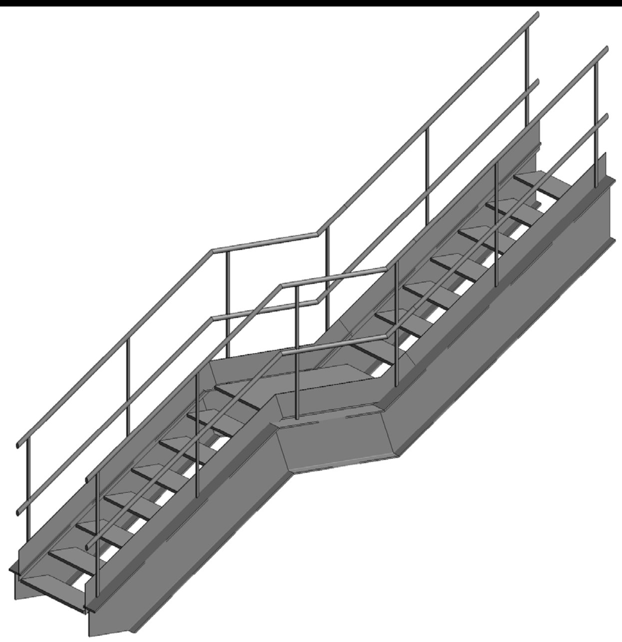


Properties

Assembled Stair
STS-ADA-Maintenance_Stair-1350wide

Stairs (1) — Edit Type

Constraints	
Base Level	LEVEL 09 - CATWALK
Base Offset	600.00
Top Level	LEVEL 09 - CATWALK
Top Offset	3625.00
Desired Stair Height	3025.00
Location	To maintenance platform
Dimensions	
Desired Number of Risers	16
Actual Number of Risers	16
Actual Riser Height	189.06
Actual Tread Depth	250.00
Tread/Riser Start Number	1
Identity Data	
Image	
Comments	
Mark	MS2
TYPE	2 flights (8R+8R) & 1 landing (1350x1200)



4.6.2.3 Suspended Walkway

4.6.2.3.1 Object Naming

Suspended Walkway should be based on the generic model template, a loadable object type for suspended walkway is created by placing the object to desired location.

Object Format:
<Category> - <Functional Type> - <Originator> - <Descriptor 1> - <Descriptor 2>

Object Name	GMD-MTL-ADA-SUSPD_Walkway-01	Descriptions
Category	**GMD**-MTL-ADA-SUSPD_Walkway-01	GMD is the short form of the Category type "Generic Models"
Functional Type	GMD-**MTL**-ADA-SUSPD_Walkway-01	MTL is the short form of the functional type "Metal"
Originator	GMD-MTL-**ADA**-SUSPD_Walkway-01	ADA for architectural discipline of ArchSD
Descriptor 1	GMD-MTL-ADA-**SUSPD_Walkway**-01	A descriptive text, i.e. Suspended Walkway
Descriptor 2	GMD-MTL-ADA-SUSPD_Walkway-**01**	Type 1 of the suspended walkway

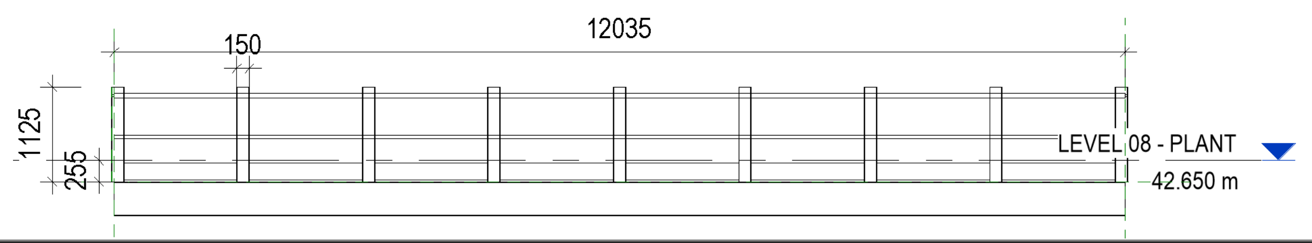
4.6.2.3.2 Setting of creating a Suspended Walkway

Under **Identity Data**

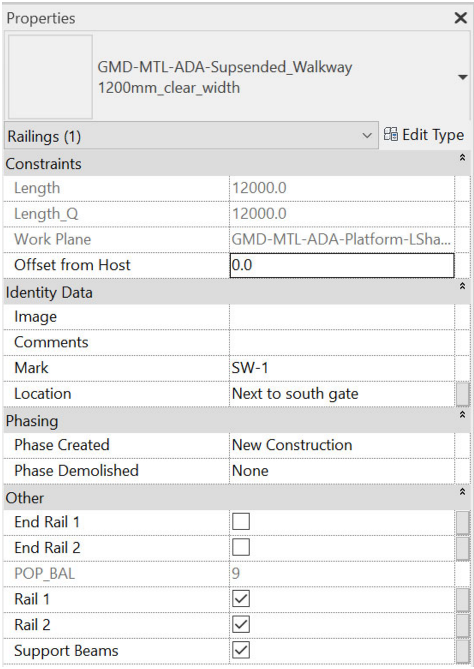
Parameter	Remark
Location	Input the suspended walkway location
Mark	Input the suspended walkway mark

4.6.2.3.3 Suspended Walkway Object

Elevation View



Properties and Section View

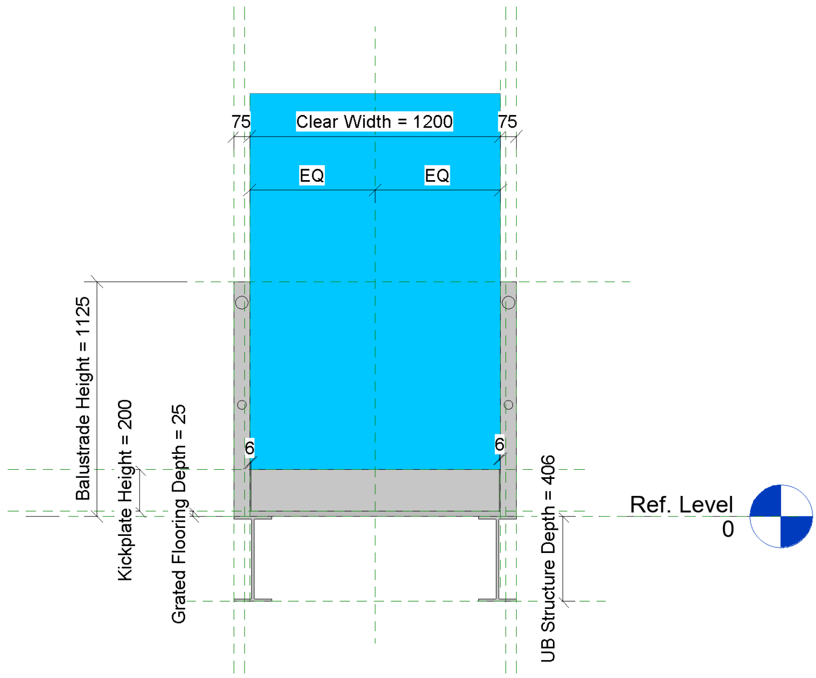


Properties

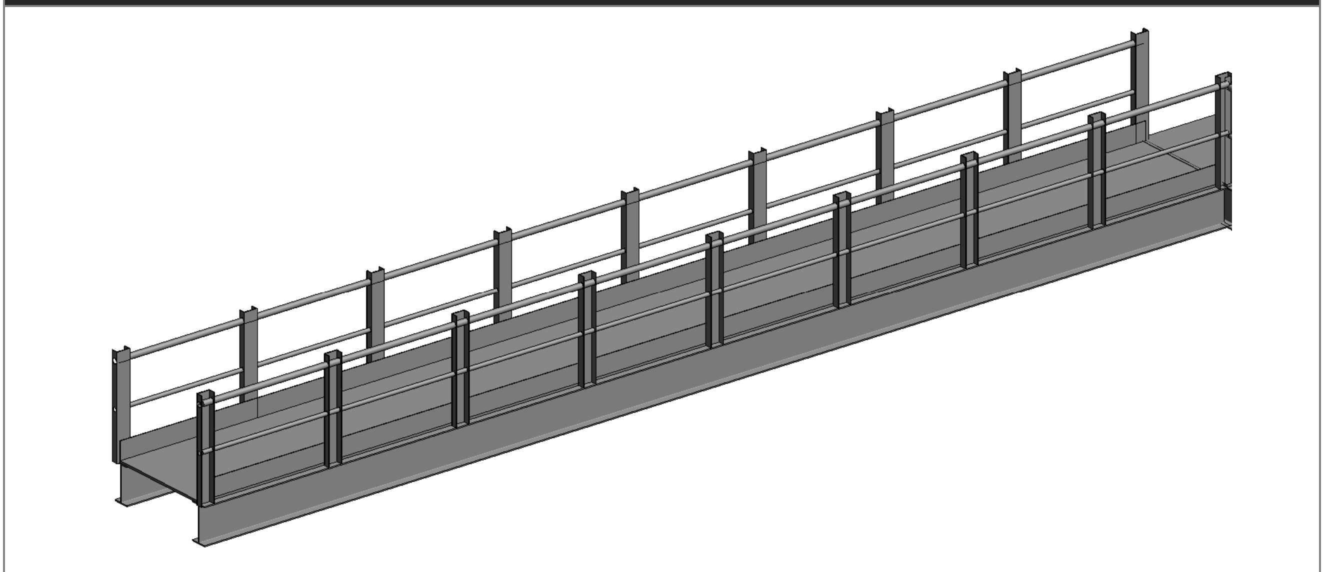
GMD-MTL-ADA-Supsended_Walkway
1200mm_clear_width

Railings (1) Edit Type

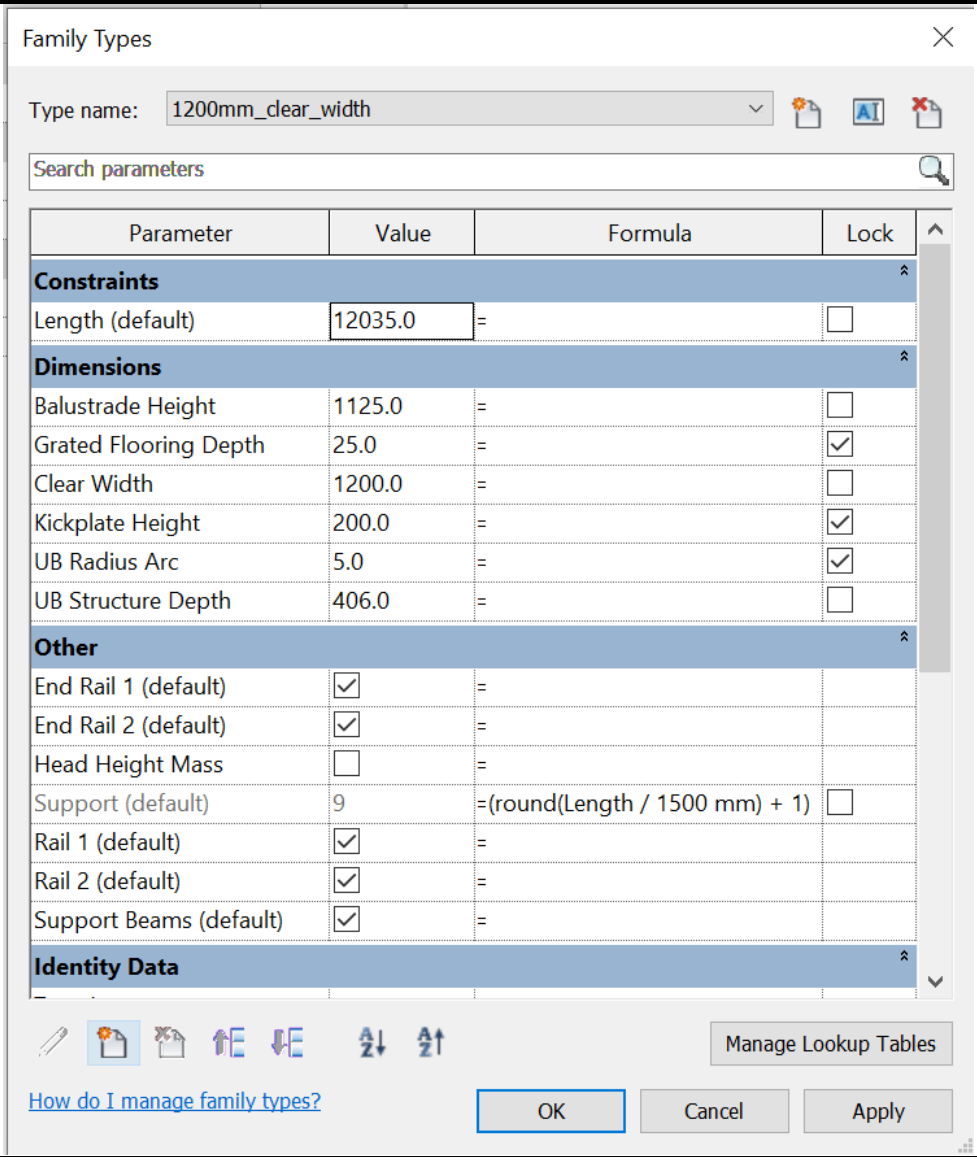
Constraints	
Length	12000.0
Length_Q	12000.0
Work Plane	GMD-MTL-ADA-Platform-LSha...
Offset from Host	0.0
Identity Data	
Image	
Comments	
Mark	SW-1
Location	Next to south gate
Phasing	
Phase Created	New Construction
Phase Demolished	None
Other	
End Rail 1	☐
End Rail 2	☐
POP_BAL	9
Rail 1	☑
Rail 2	☑
Support Beams	☑



3D View



Object Types



4.6.2.4 Metal Platform

4.6.2.4.1 Object Naming

Metal Platform should be based on the generic model template, a loadable object type for platform is created by placing the object to desired location.

Object Format:
<Category> - <Functional Type> - <Originator> - <Descriptor 1> - <Descriptor 2>

Object Name	GMD-MTL-ADA-Platform_LShape-01	Descriptions
Category	**GMD**-MTL-ADA-Platform_LShape-01	GMD is the short form of the Category type “Generic Models”
Functional Type	GMD-**MTL**-ADA-Platform_LShape-01	MTL is the short form of the functional type “Metal”
Originator	GMD-MTL-**ADA**-Platform_LShape-01	ADA for architectural discipline of ArchSD
Descriptor 1	GMD-MTL-ADA-**Platform_LShape**-01	A descriptive text, i.e. Platform in L-shape
Descriptor 2	GMD-MTL-ADA-Platform_LShape-**01**	Type 1 of the metal platform

4.6.2.4.2 Setting of creating a Metal Platform

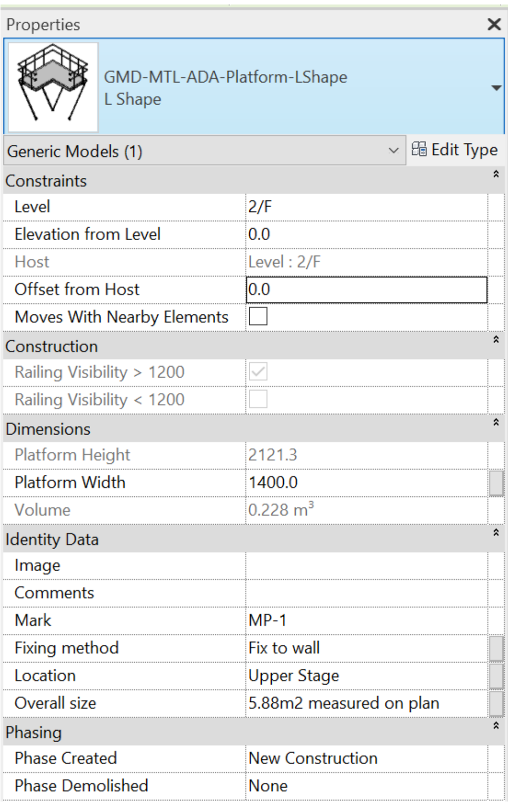
Under **Identity Data**

Parameter	Remark
Location	Input the metal platform location
Fixing method	Input the metal platform fixing method
Mark	Input the metal platform mark
Overall size	Input the metal platform overall size

4.6.2.4.3 Platform Object

(1) Platform in L-Shaped on plan

Elevation View

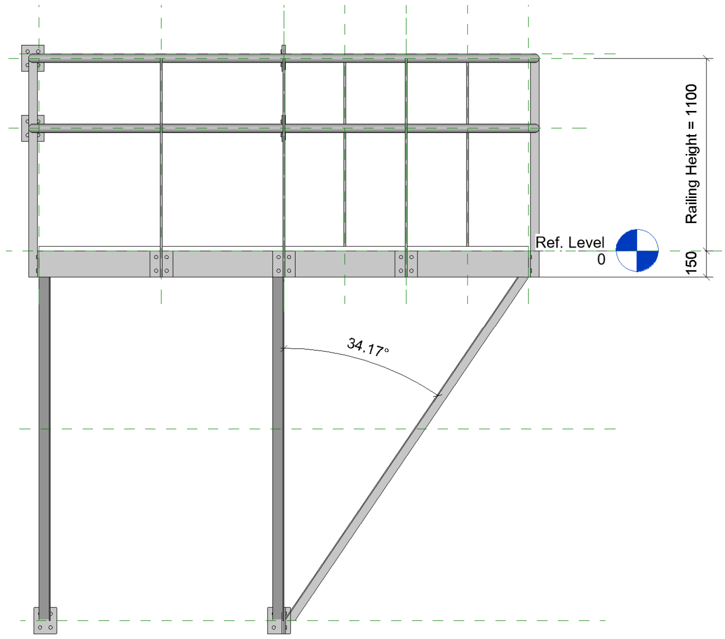


Properties

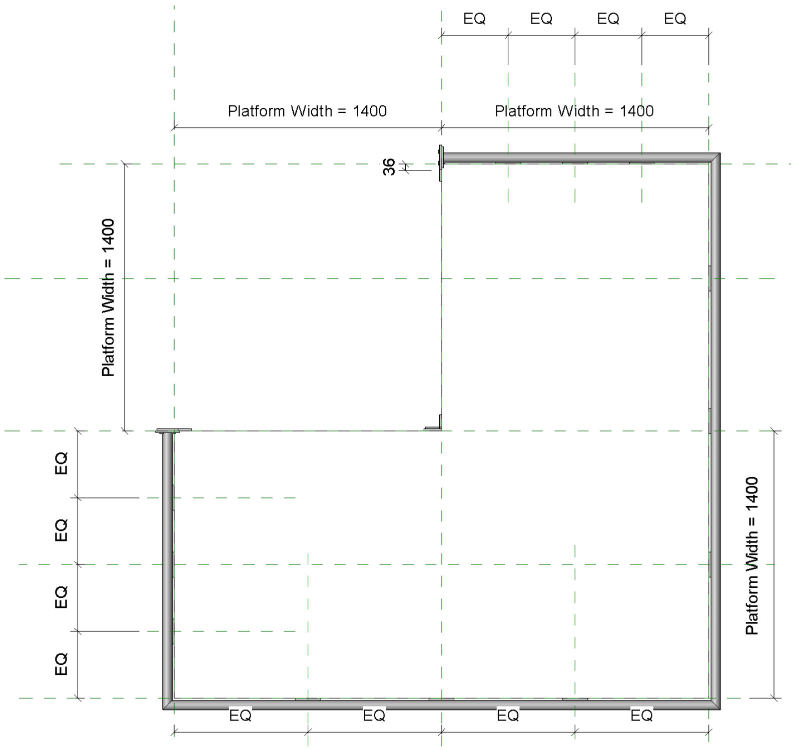
GMD-MTL-ADA-Platform-LShape
L Shape

Generic Models (1) — Edit Type

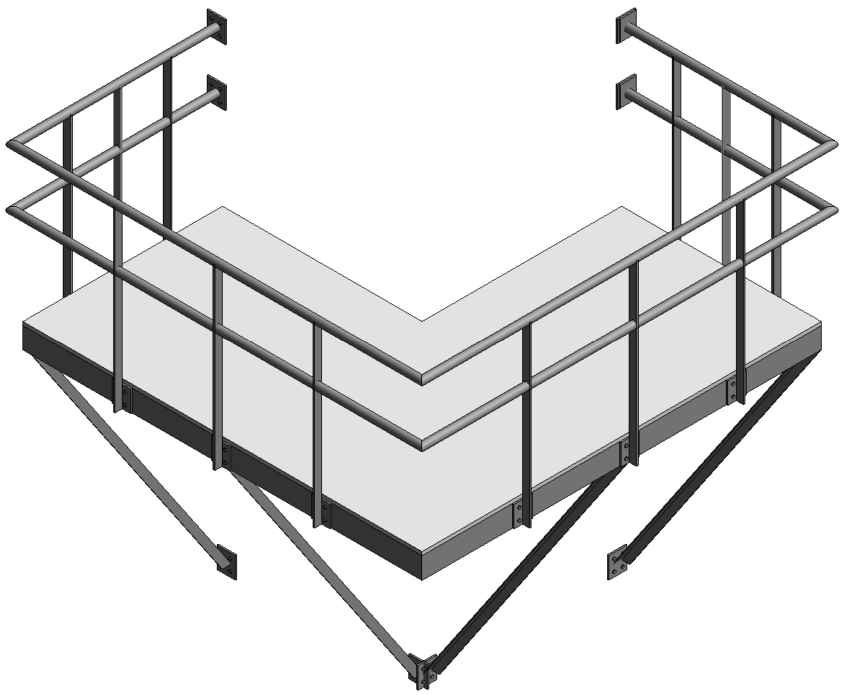
Constraints	
Level	2/F
Elevation from Level	0.0
Host	Level : 2/F
Offset from Host	0.0
Moves With Nearby Elements	
Construction	
Railing Visibility > 1200	
Railing Visibility < 1200	
Dimensions	
Platform Height	2121.3
Platform Width	1400.0
Volume	0.228 m³
Identity Data	
Image	
Comments	
Mark	MP-1
Fixing method	Fix to wall
Location	Upper Stage
Overall size	5.88m2 measured on plan
Phasing	
Phase Created	New Construction
Phase Demolished	None



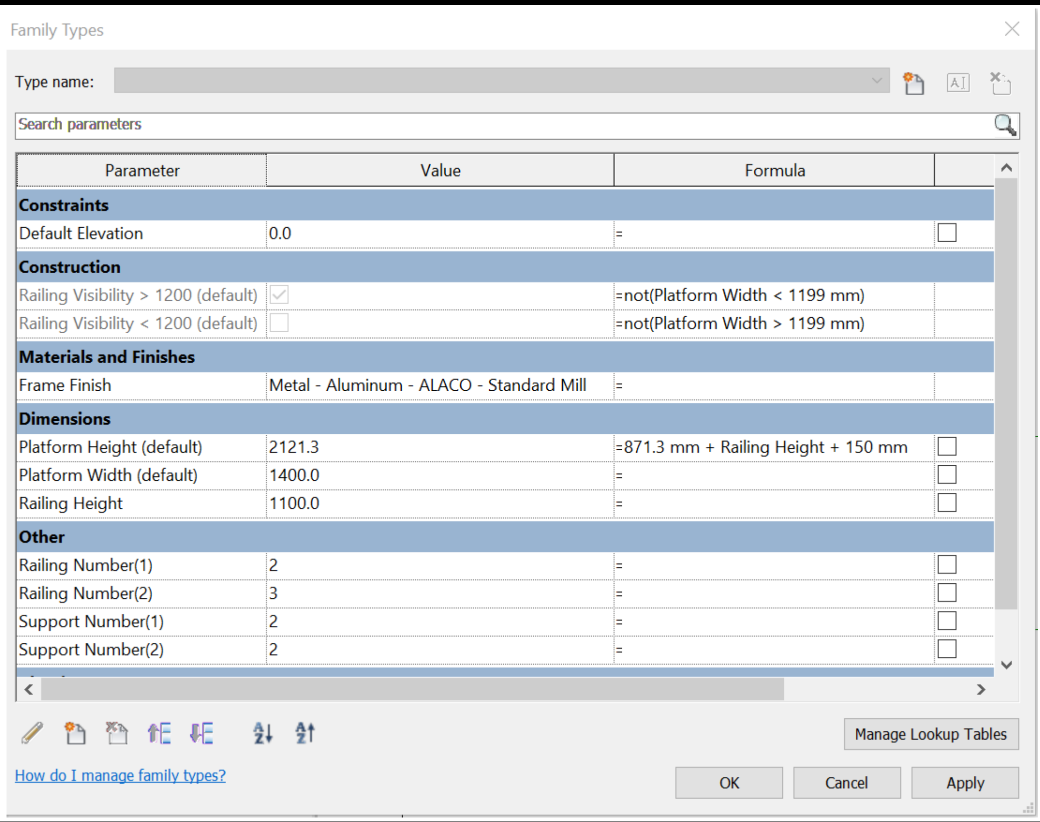
Plan View



3D View



Object Types



Family Types

Type name:

Search parameters

Parameter	Value	Formula	
Constraints			
Default Elevation	0.0	=	☐
Construction			
Railing Visibility > 1200 (default)	☑	=not(Platform Width < 1199 mm)	
Railing Visibility < 1200 (default)	☐	=not(Platform Width > 1199 mm)	
Materials and Finishes			
Frame Finish	Metal - Aluminum - ALACO - Standard Mill	=	
Dimensions			
Platform Height (default)	2121.3	=871.3 mm + Railing Height + 150 mm	☐
Platform Width (default)	1400.0	=	☐
Railing Height	1100.0	=	☐
Other			
Railing Number(1)	2	=	☐
Railing Number(2)	3	=	☐
Support Number(1)	2	=	☐
Support Number(2)	2	=	☐

Manage Lookup Tables

How do I manage family types?

OK Cancel Apply

4.6.3 Quantity Take-off

4.6.3.1 Cat Ladder Schedule

Step 1

Create a new **Specialty Equipment** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

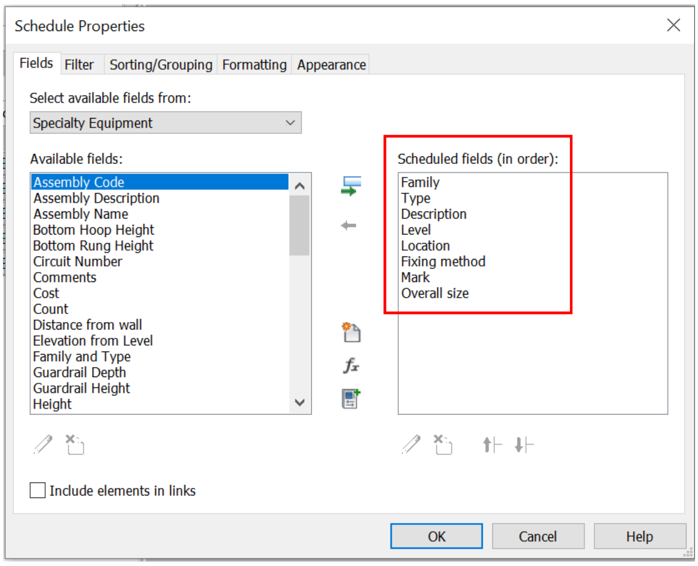
Sample of Cat Ladder Schedule

<Cat Ladder Schedule>							
A	B	C	D	E	F	G	H
Family	Type	Description	Level	Location	Fixing method	Mark	Overall size
SPQ-LAD-ADA-Cat_Ladder-TypeA	TypeA	GMS Cat ladder with safety hoop and lockable plate	2/F	To upper roof	Fix to wall	CL-1	876W x 4200H
SPQ-LAD-ADA-Cat_Ladder-TypeB	TypeB	316 S.S. Cat ladder with safety hoop	2/F	To upper roof	Fix to wall	CL-2	1098W x 4600H
SPQ-LAD-ADA-Cat_Ladder-TypeC	TypeC	GMS Cat ladder	2/F	To upper roof	Fix to wall	CL-3	840W x 3950H

Step 2

Schedule Properties and Setting

- Fields



Note:

Cat Ladders are measured in number including stringers, rungs, guardrails, lockable plates, fixing brackets and other necessary components.

4.6.3.2 Metal Stair Schedule

Step 1

Create a new **Stairs** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

Sample of Metal Stair Schedule

<Metal Stair Schedule>

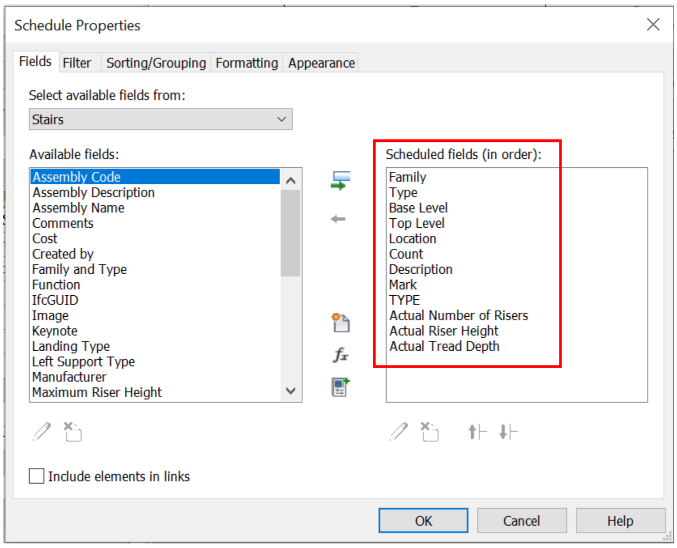
A	B	C	D	E	F	G
Family	Type	Base Level	Top Level	Location	Count	Description
Assembled Stair	STS-ADA-Maintenance_Stair-1350wide	LEVEL 09 - CATWALK	LEVEL 09 - CATWALK	To maintenance platform	1	1350mm wide GMS stair
1350mm wide GMS stair: 1						
Assembled Stair	STS-ADA-Maintenance_Stair-1360wide	LEVEL 08 - PLANT	LEVEL 08 - PLANT	To maintenance platform	1	1360mm wide GMS stair
1360mm wide GMS stair: 1						
Grand total: 2						

H	I	J	K	L
Mark	TYPE	Actual Number of Risers	Actual Riser Height	Actual Tread Depth
MS2	2 flight (8R+8R) & 1 landing (1350x1200)	16	189.06	250
MS1	1 flight	13	183.69	250

Step 2

Schedule Properties and Setting

❖ Fields



Notes:

i) Metal stairs are measured in number including all component parts of stairs including treads, risers, stringers, landing platforms and supporting beams and columns.

ii) Handrails and balustrades are measured separately from metal stairs.

4.6.3.3 Suspended Walkway Schedule

<u>Step 1</u>

Create a new **Railings** schedule for suspended walkways, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

<u>Sample of Suspended Walkway Schedule</u>

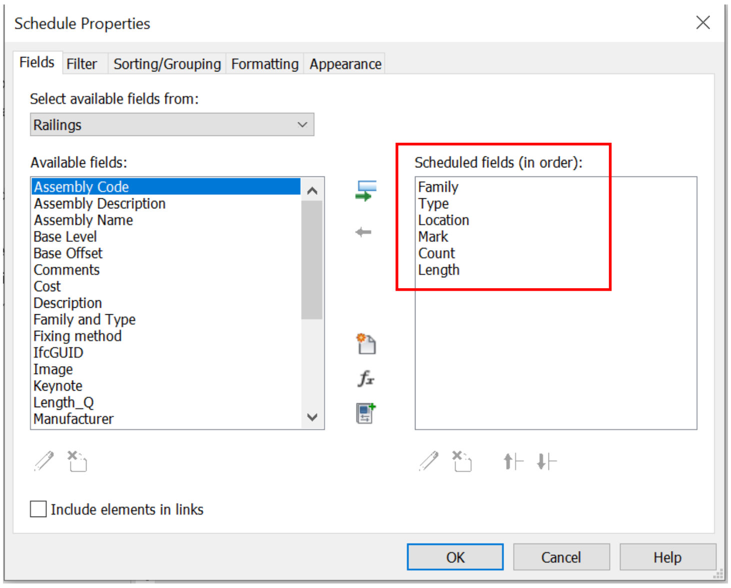
<Suspended Walkway Schedule>

A	B	C	D	E	F
Family	Type	Location	Mark	Count	Length
GMD-MTL-ADA-Supsended_Walkway	1200mm_clear_width	Next to south gate	SW-1	1	12.00 m
GMD-MTL-ADA-Supsended_Walkway	1200mm_clear_width	Next to south gate	SW-2	1	6.70 m
Grand total: 2					18.70 m

<u>Step 2</u>

<u>Schedule Properties and Setting</u>

❖ Fields



<u>Notes:</u>

i) Suspended Walkway are measured in meter run including all component parts of walkways including rails, toeboards, pans and all necessary accessories.

ii) Identify any fire resistant coating (if required).

4.6.3.4 Metal Platform Schedule

Step 1

Create a new **Generic Models** schedule for platform, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

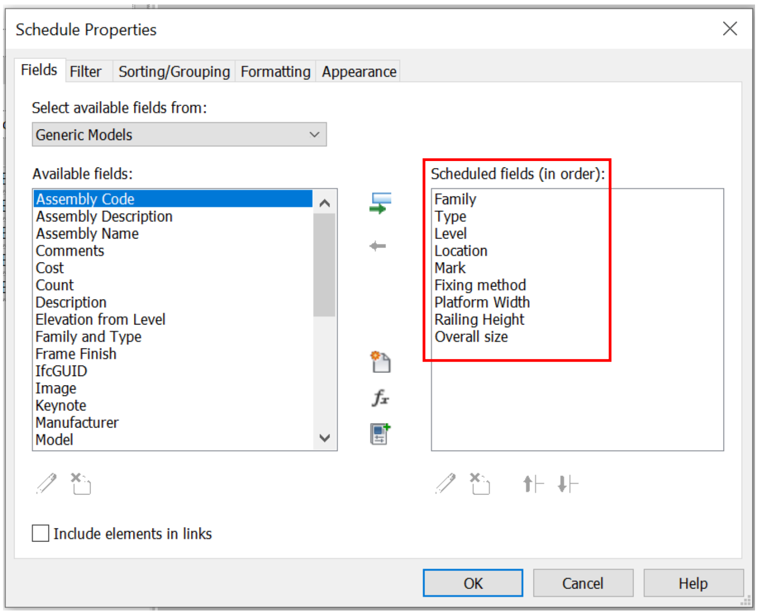
Sample of Metal Platform Schedule

<Metal Platform Schedule>								
A	B	C	D	E	F	G	H	I
Family	Type	Level	Location	Mark	Fixing method	Platform Width	Railing Height	Overall size
GMD-MTL-ADA-Platform-LShape	L Shape	2/F	Upper Stage	MP-1	Fix to wall	1400	1100	5.88m2 measured on plan

Step 2

Schedule Properties and Setting

❖ Fields



Notes:

i) Platform are measured in meter square including all component parts of platform including rails, toeboards, pans and all necessary accessories.

ii) Identify any fire resistant coating (if required).

4.7 Curtain Wall and Glass Wall

This section mainly focuses on curtain wall and glass wall.

4.7.1 Basic Information

4.7.1.1 Building Element to Model

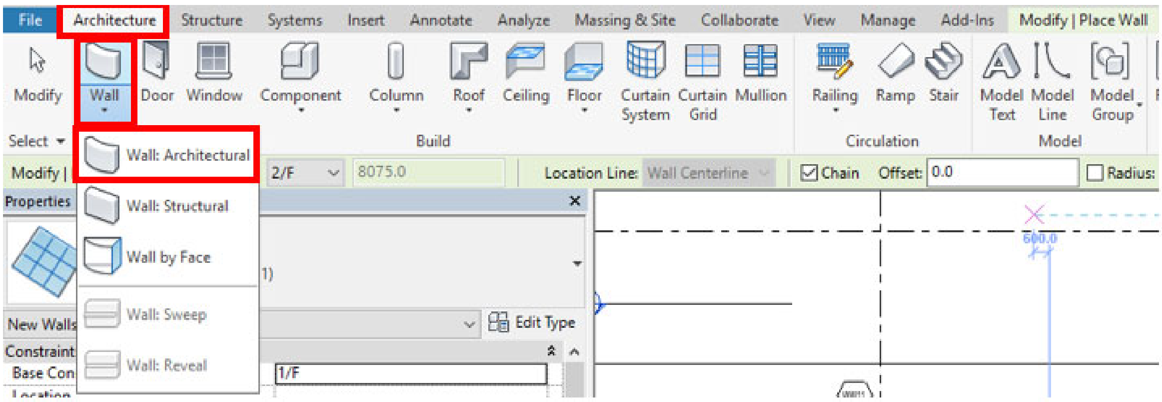
<u>Modelling elements:</u>

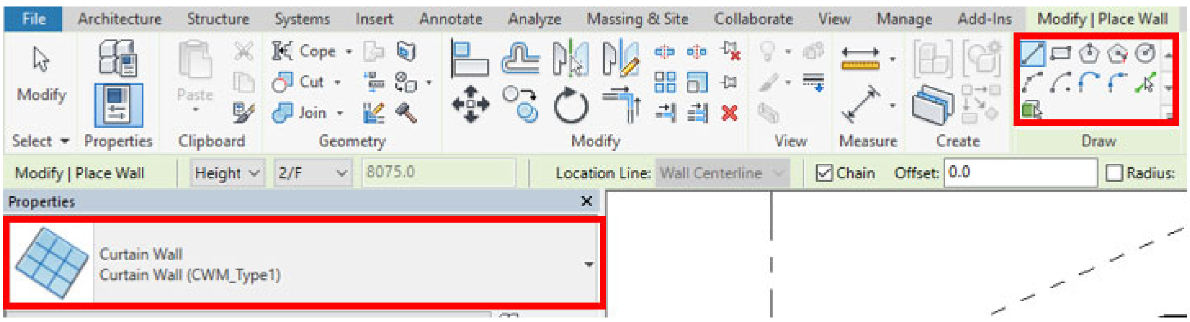
Elements	Object Category
Work Description	Manage/ Settings/ Materials
Curtain Wall/ Glass Wall/ Window Wall	Curtain Wall: Wall: Architectural
Curtain Systems	Curtain Systems

4.7.1.2 Sequence of modelling

<u>The sequence of modelling:</u>

Architecture tab → (1) Wall: Architectural → (2) Select a curtain wall type → (3) Create a curtain wall or glass wall by drawing line, picking lines or picking faces. An example is as follows:





4.7.2 Modelling Approach

4.7.2.1 Type Naming

Curtain wall is a system object of wall and the default Type includes: curtain wall, exterior glazing and storefront. **Curtain System** can be created by select a mass face.

Format:
<Functional Type> **-** <Originator> **-** <Descriptor 1> **-** <Descriptor 2>

Type Name	CUW-ADA-1200x600mm-01	Descriptions
Functional Type	**CUW-**ADA-1200x600mm-01	A curtain wall, CUW is the short form of the functional type “curtain wall”
Originator	CUW-**ADA**-1200x600mm-01	ADA for architectural discipline of ArchSD
Descriptor 1	CUW-ADA-**1200x600mm**-01	Curtain wall typical vertical x horizontal grid distance
Descriptor 2	CUW-ADA-1200x600mm-**01**	Type 1 of the curtain wall

Functional Type	Descriptions
CUW	Curtain Wall
GLW	Glass Wall
WDW	Window Wall
LVW	Louvre Wall

4.7.2.2 Setting of creating Curtain Wall/ Glass Wall

Curtain Wall/ Glass Wall shall be modelled to its designed size with suitable parameters to allow computation and categorisation of the wall area. The following parameters shall be set:

Under **Properties> Constraints**

Parameter	Remark
Base Constraint	Input the value for base level
Top Constraint	Input the value for top level

Under **Properties> Dimensions**

Parameter	Remark
Area	Built-in parameter

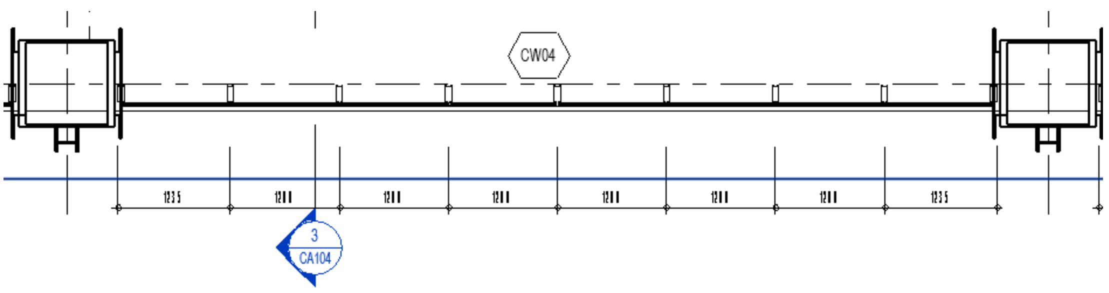
Under **Type Properties> Identity Data**

Parameter	Remark
Type Mark	Input the Type Mark for categorisation

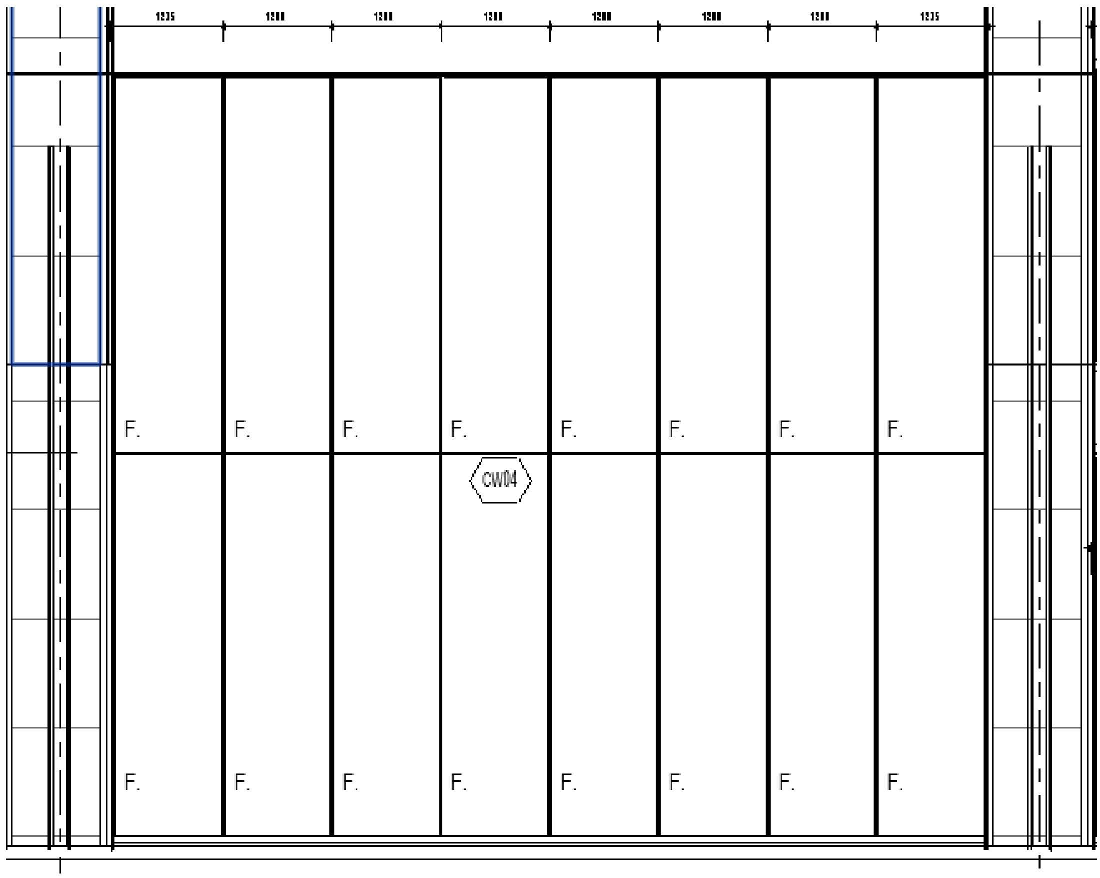
The measurement of the plane area for curtain wall/ glass wall is deemed to include all framing members and vision panels at perimeters. Where different types of curtain walling are included in the same plane, the measurement of the plane area for each type is measured from center line of the mullion and transom or vision panel at the junction as appropriate.

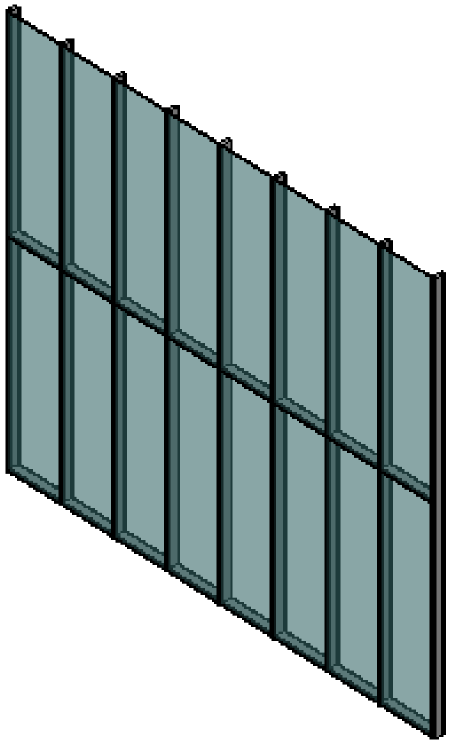
4.7.2.3 Curtain Wall/ Glass Wall Object

Model View: PLAN



Model View: ELEVATION



Model View: 3D VIEW


Object View: PARAMETER

Parameter	Value
Construction	
Function	Exterior
Automatically Embed	☑
Curtain Panel	CWP-CUR-ADA-Insulated_Glass : CWP-CUR-ADA-In
Join Condition	Not Defined
Materials and Finishes	
Structural Material	
Vertical Grid	
Layout	None
Spacing	1200.0
Adjust for Mullion Size	☑
Horizontal Grid	
Layout	None
Spacing	
Adjust for Mullion Size	☐
Vertical Mullions	
Interior Type	Rectangular Mullion : CWM_Type 1
Border 1 Type	Rectangular Mullion : CWM_Type 1
Border 2 Type	Rectangular Mullion : CWM_Type 1
Horizontal Mullions	
Interior Type	Rectangular Mullion : CWM_Type 1
Border 1 Type	Rectangular Mullion : CWM_Type 1
Border 2 Type	Rectangular Mullion : CWM_Type 1
Identity Data	
Type Image	
Keynote	
Model	
Manufacturer	
Type Comments	BD_Glass
URL	
Description	
Assembly Description	
Assembly Code	
Type Mark	Type 1
Fire Rating	
Cost	
Acoustic Rating	
Workset	Curtain Wall Types
Edited by	

4.7.3 Quantity Take-off

4.7.3.1 Curtain Wall/ Glass Wall Schedule

-Area of curtain wall/ glass wall can be measured in the Wall Schedule under Walls category.

<u>Step 1</u>

Create a new **Walls** Schedule, refer to Part 7 Techniques for QTO – 7.4 Schedule/ Material Take-off. Filter can be used for grouping of various types of curtain wall based on the Type Mark in the Wall Schedule.

Sample of Wall Schedule for curtain wall:

<Wall Schedule (Curtain Wall)>

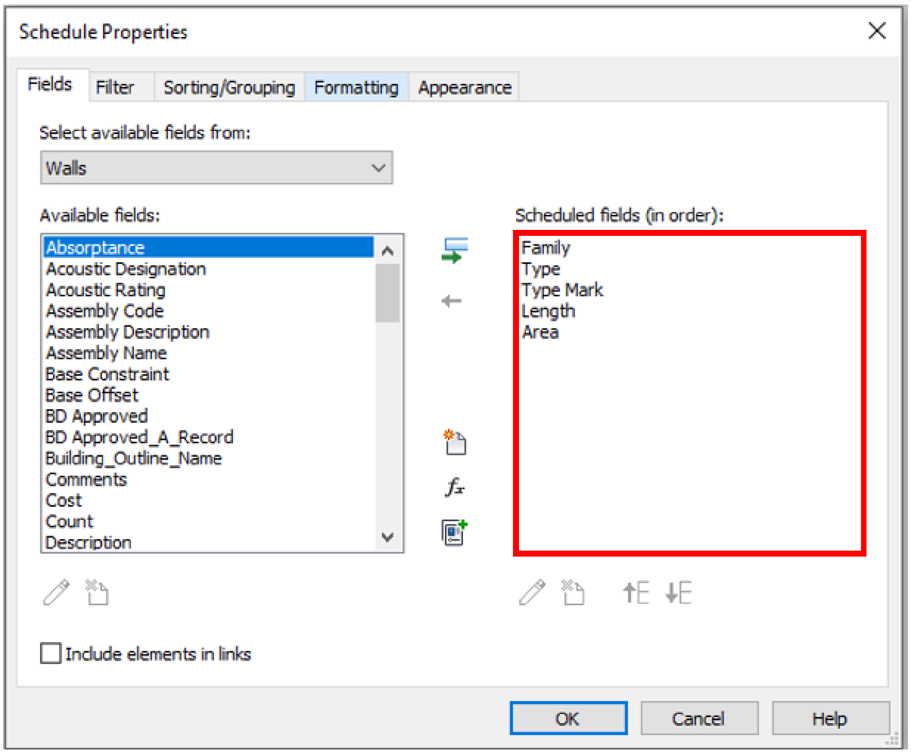
A	B	C	D	E
Family	Type	Type Mark	Length	Area
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	9670	60.82 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	2262	9.04 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	2262	9.78 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	9670	81.95 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	9670	41.15 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	3670	31.10 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	9670	32.64 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	9660	98.73 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	9670	50.04 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	9635	32.52 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	4526	17.67 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	1122	4.48 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	1337	4.81 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	1337	4.49 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	56420	70.95 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	9670	40.42 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	10210	40.85 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	17200	138.89 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	15700	126.78 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	29981	242.09 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	5798	46.82 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	8712	70.35 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	6000	48.45 m^2
Curtain Wall	Curtain Wall (CWM_Type1)	Type 1	7225	58.34 m^2
Type 1				1363.17 m^2
Curtain Wall	Curtain Wall (CWM_Type2)	Type 2	1480	25.46 m^2
Type 2				25.46 m^2
Curtain Wall	Curtain Wall (CWM_Type3)	Type 3	1120	4.84 m^2
Curtain Wall	Curtain Wall (CWM_Type3)	Type 3	6070	58.36 m^2
Curtain Wall	Curtain Wall (CWM_Type3)	Type 3	6070	29.56 m^2
Curtain Wall	Curtain Wall (CWM_Type3)	Type 3	8470	120.36 m^2
Curtain Wall	Curtain Wall (CWM_Type3)	Type 3	8470	80.00 m^2
Curtain Wall	Curtain Wall (CWM_Type3)	Type 3	6070	25.04 m^2
Type 3				318.16 m^2

4.7.3.1 Curtain Wall/ Glass Wall Schedule (Cont'd)

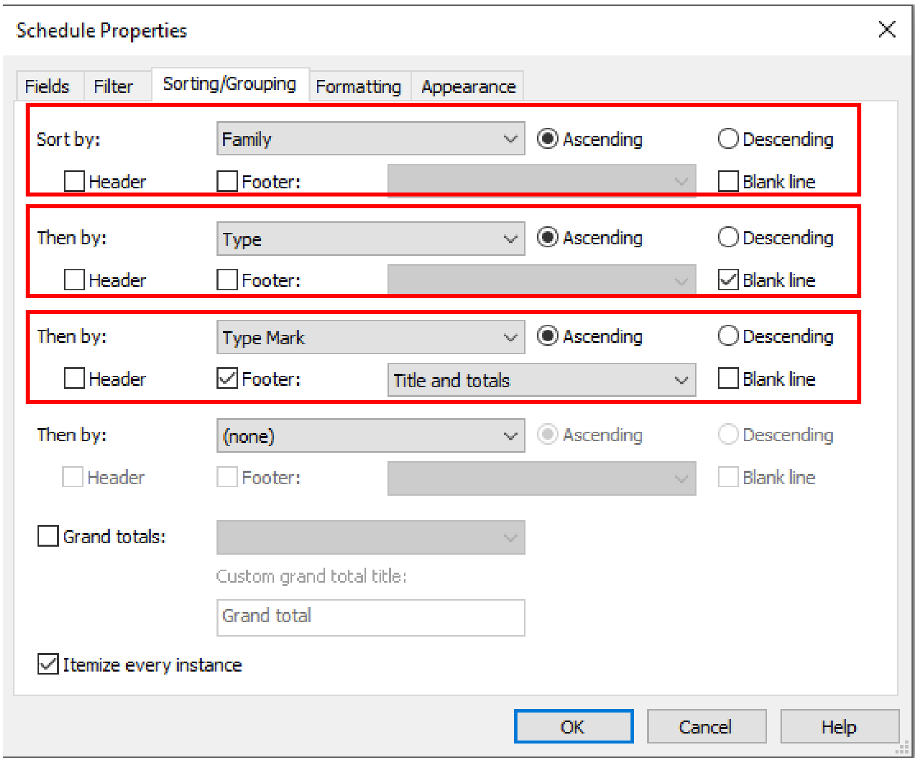
Step 2

Schedule Properties and Setting

- Fields



- Sorting/Grouping



4.8 Claddings

This section mainly focuses on wall cladding.

4.8.1 Basic Information

4.8.1.1 Building Element to Model

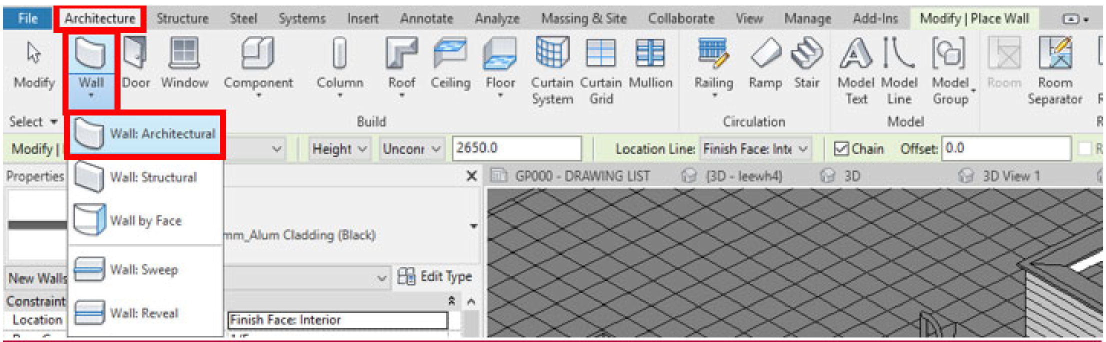
Modelling elements:

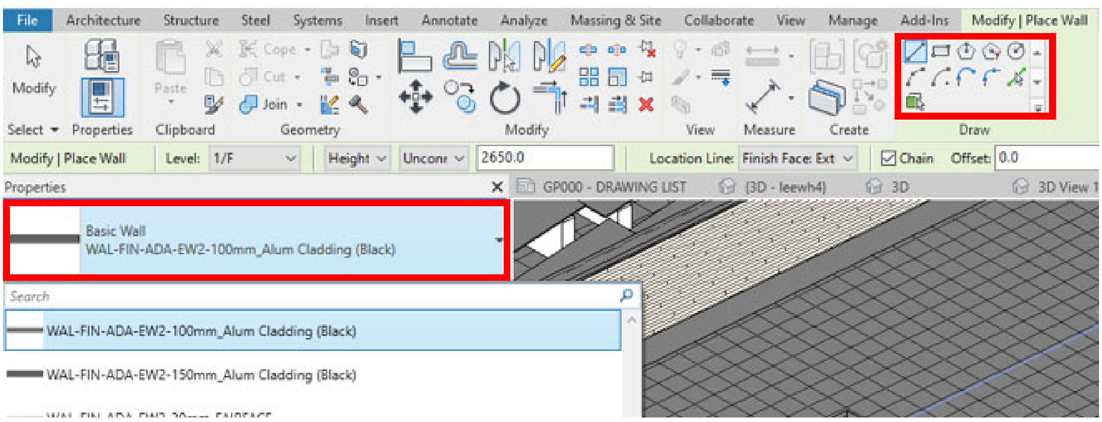
Elements	Object Category
Work Description	Manage/ Settings/ Materials
Wall **Cladding**	Wall : Architectural

4.8.1.2 Sequence of modelling

The sequence of modelling:

Architecture tab → (1) Wall: Architectural → (2) Select a wall type for cladding → (3) Create cladding by drawing line, picking lines or picking faces. An example is as follows:





4.8.2 Modelling Approach

4.8.2.1 Type Naming

Format:

<Functional Type> - <Originator> - <Descriptor 1> - <Descriptor 2>

Type Name	CLD-ADA-ALU_3mm-01	Descriptions
Functional Type	**CLD**-ADA-ALU_3mm-01	A wall cladding, CLD is the short form of the functional type "cladding"
Originator	CLD-**ADA**-ALU_3mm-01	ADA for architectural discipline of ArchSD
Descriptor 1	CLD-ADA-**ALU_3mm**-01	An aluminium wall cladding with 3mm thick panel.
Descriptor 2	CLD-ADA-ALU_3mm-**01**	Type 1 of the aluminium wall cladding.

4.8.2.2 Setting of creating Cladding

Cladding shall be modelled to its designed size with suitable parameters to allow computation and categorisation of the wall area. The following parameters shall be set:

Under **Properties> Constraints**

Parameter	Remark
Base Constraint	Input the value for base level
Top Constraint	Input the value for top level

Under **Properties> Dimensions**

Parameter	Remark
Length	Built-in parameter
Area	Built-in parameter

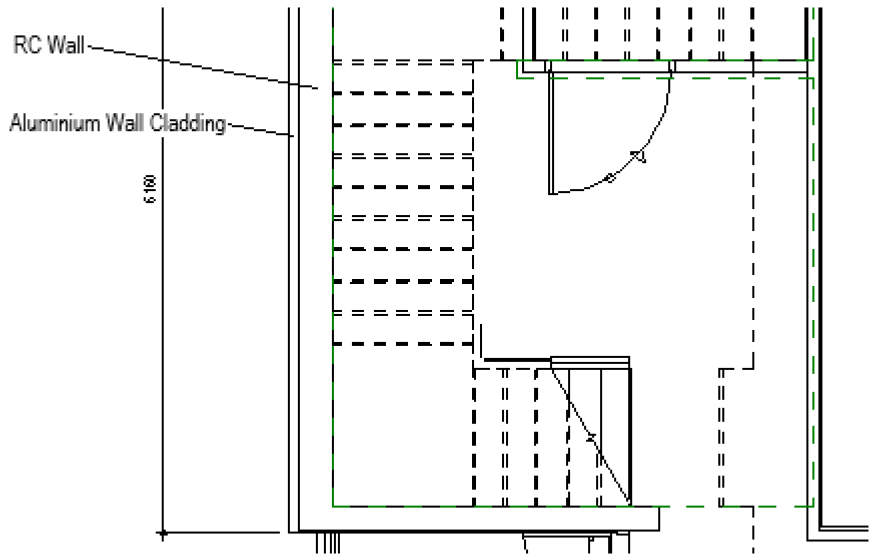
Under **Type Properties> Identity Data**

Parameter	Remark
Type Mark	Input the Type Mark for categorisation

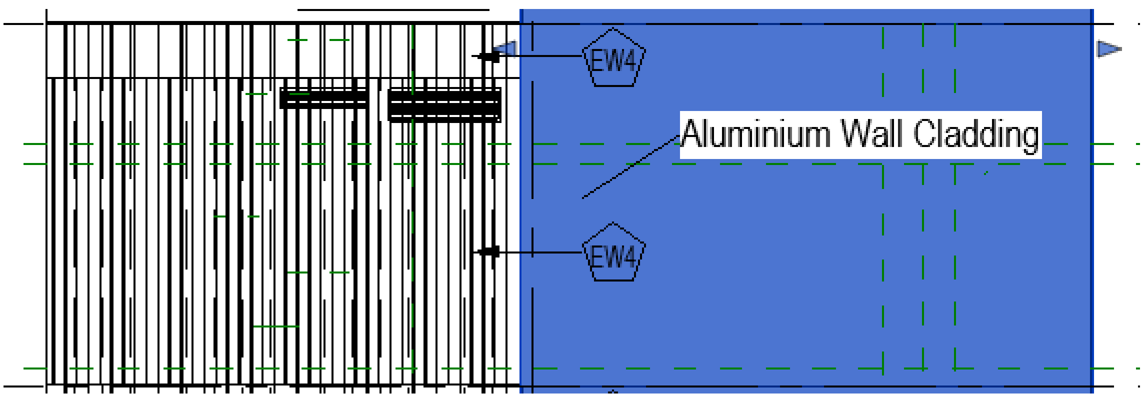
The measurement of the plane area for wall cladding is deemed to include the exposed face and boundary works at perimeters. Where different types of wall cladding are included in the same plane, each type of wall claddings is measured separately.

4.8.2.3 Cladding Object

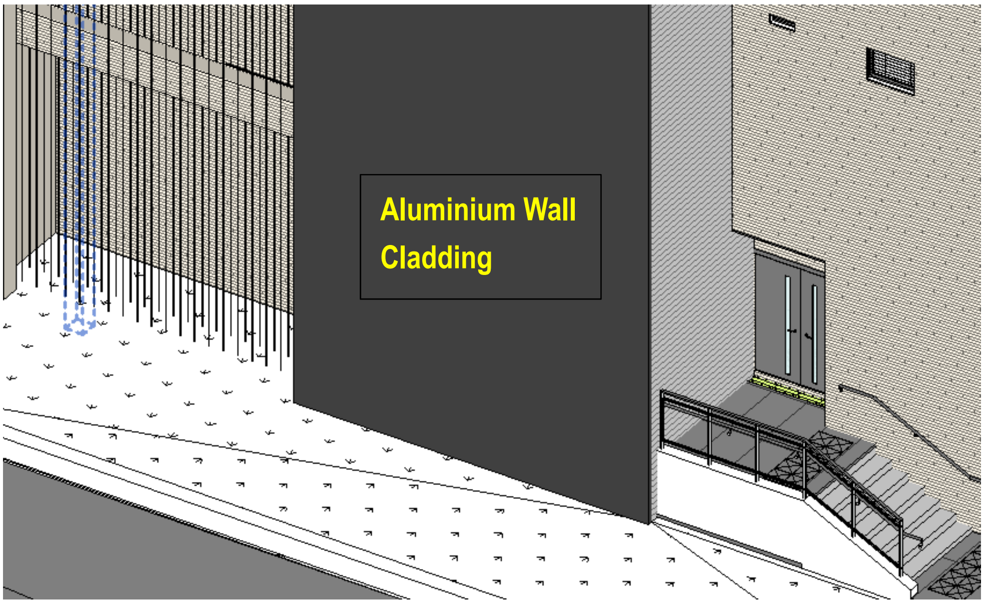
Model View: PLAN



Model View: ELEVATION



Model View: 3D VIEW



Object View: PARAMETER

Parameter	Value
Construction	
Structure	Edit...
Wrapping at Inserts	Exterior
Wrapping at Ends	Exterior
Width	100.0
Function	Exterior
Graphics	
Materials and Finishes	
Analytical Properties	
Identity Data	
Type Image	
Keynote	EW2
Model	
Manufacturer	
Type Comments	
URL	
Description	
Assembly Description	
Assembly Code	
Type Mark	Type 1
Fire Rating	
Cost	
Workset	Wall Types

4.8.3 Quantity Take-off

4.8.3.1 Wall Cladding

-Area of wall cladding can be measured in the Wall Schedule under Walls category.

Step 1

Create a new Wall Schedule, refer to Part 7 Techniques for QTO – 7.4 Schedule/ Material Take-off. Filter can be used for grouping of various types of cladding based on the Type Mark in the Wall Schedule.

Sample of Wall Schedule for Wall Cladding:

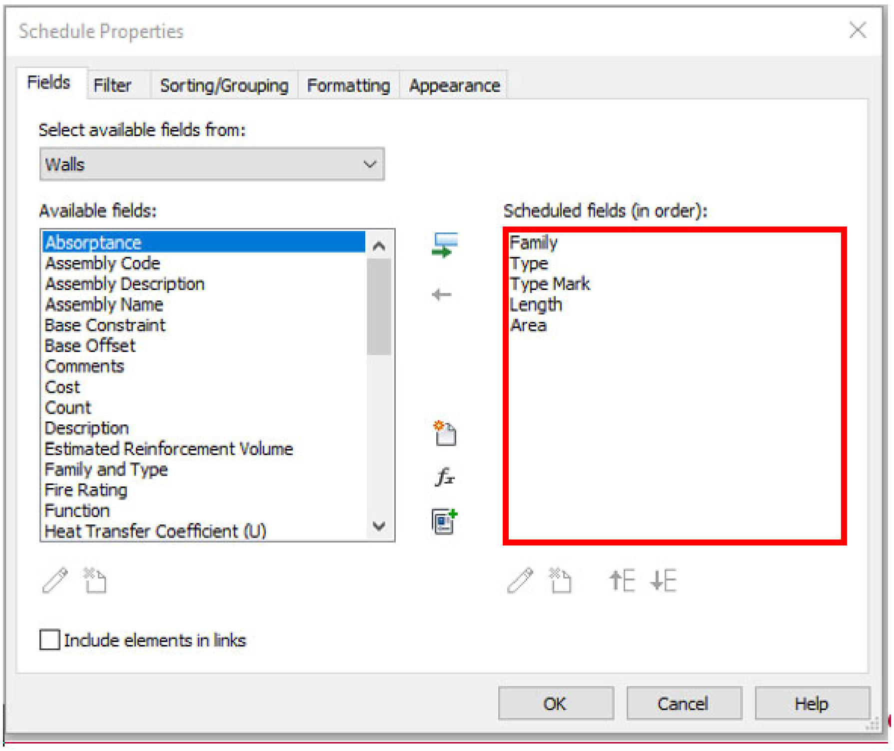
<Wall Schedule (Wall Cladding)>				
A	B	C	D	E
Family	Type	Type Mark	Length	Area
Basic Wall	WAL-FIN-ADA-EW2-100mm_Alum Cladding (Black)	Type 1	26030	144.02 m²
Basic Wall	WAL-FIN-ADA-EW2-100mm_Alum Cladding (Black)	Type 1	500	2.65 m²
Basic Wall	WAL-FIN-ADA-EW2-100mm_Alum Cladding (Black)	Type 1	500	4.47 m²
Basic Wall	WAL-FIN-ADA-EW2-100mm_Alum Cladding (Black)	Type 1	500	2.65 m²
Basic Wall	WAL-FIN-ADA-EW2-100mm_Alum Cladding (Black)	Type 1	625	0.85 m²
Basic Wall	WAL-FIN-ADA-EW2-100mm_Alum Cladding (Black)	Type 1	500	0.85 m²
Basic Wall	WAL-FIN-ADA-EW2-100mm_Alum Cladding (Black)	Type 1	300	1.17 m²
Basic Wall	WAL-FIN-ADA-EW2-100mm_Alum Cladding (Black)	Type 1		0.17 m²
Basic Wall	WAL-FIN-ADA-EW2-100mm_Alum Cladding (Black)	Type 1	6160	95.79 m²
Type 1				252.62 m²
Basic Wall	WAL-FIN-ADA-EW2-150mm_Alum Cladding (Black)	Type 2	25985	120.77 m²
Type 2				120.77 m²

4.8.3.1 Curtain Wall/ Glass Wall Schedule (Cont'd)

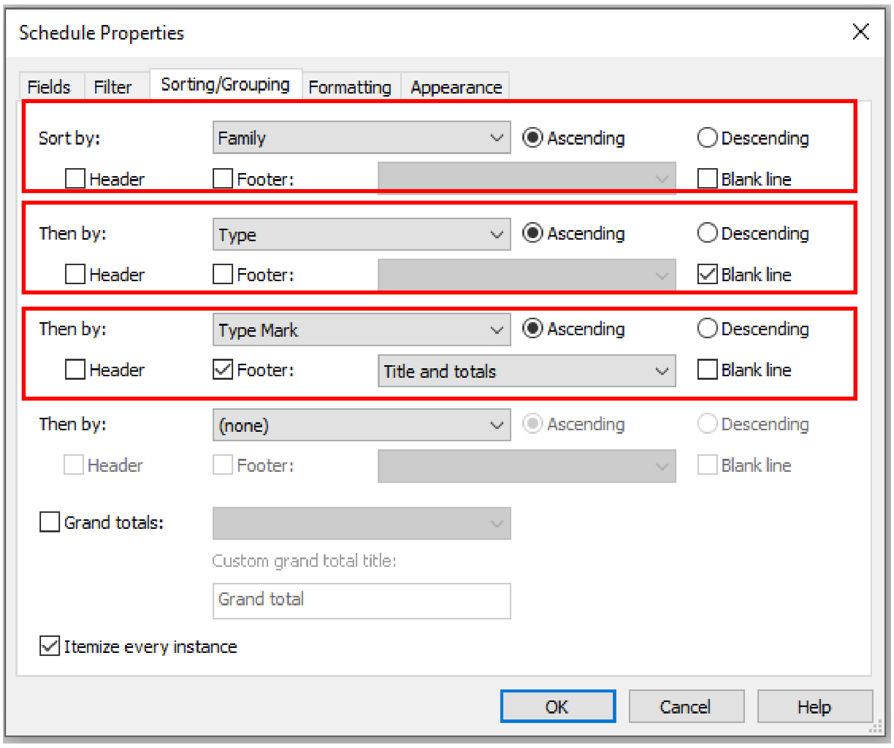
Step 2

Schedule Properties and Setting

- Fields



- Sorting/Grouping



4.9 Furniture and Fittings

4.9.1 Basic Information

4.9.1.1 Building Element to Model

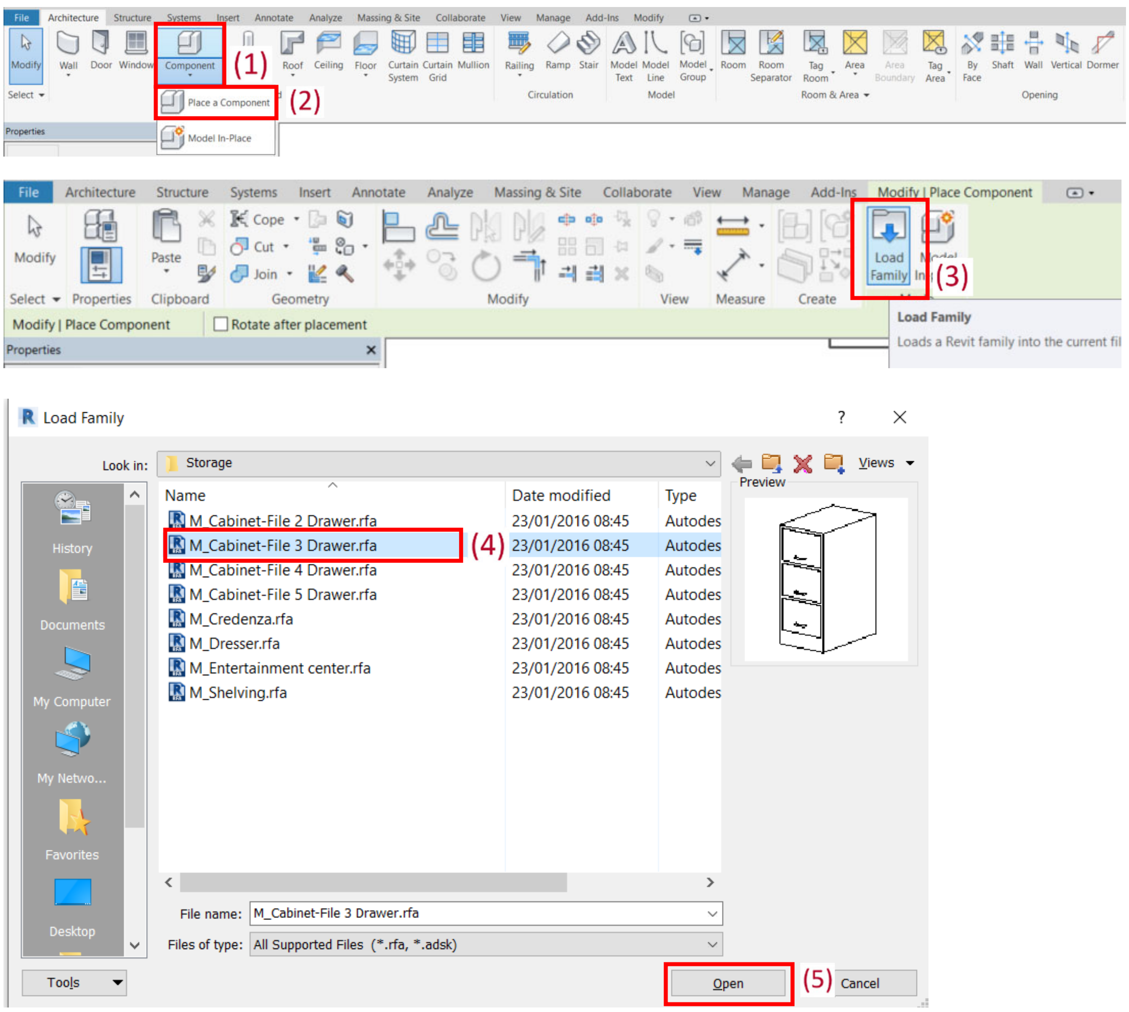
Modelling elements:

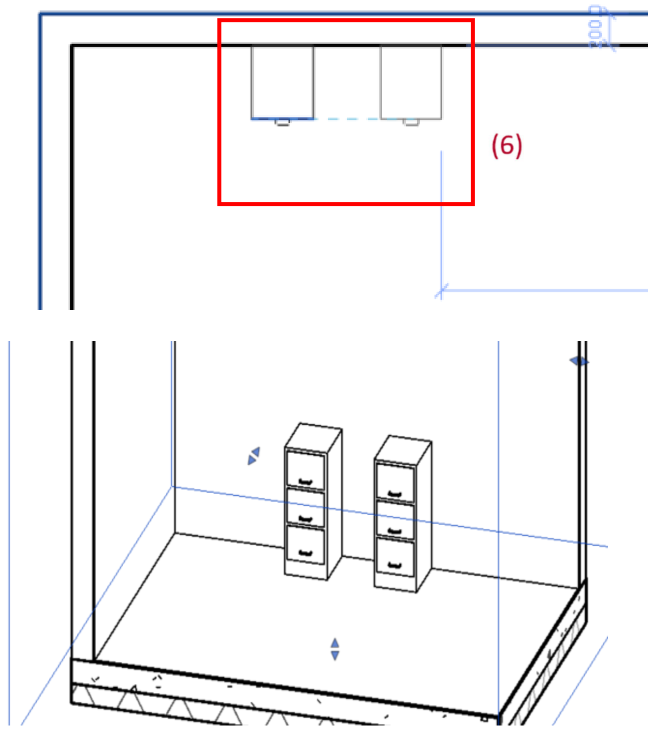
Elements	Object Category
Work Description	Manage/ Settings/ Materials
Furniture	Generic Models: Furniture
Casework	Generic Models: Casework

4.9.1.2 Sequence of modelling

The sequence of modelling:

Architecture tab → (1) Component → (2) Place a Component → (3) Load Object → (4) Choose the type for Furniture (Furniture / Casework) → (5) Click open → (6) Place the Furniture





Example 1

4.9.2 Modelling Approach

4.9.2.1 Object Naming

Furniture can be created with generic models template and categorized in Furniture/ Furniture Systems.

Format:

<Category> - <Functional Type> - <Originator> - <Descriptor 1> - <Descriptor 2>

Object Name	FUR-STG-ADA-Cupb_w_3Drawers-01	Descriptions
Category	**FUR**-STG-ADA-Cupb_w_3Drawers-01	A furniture, FUR is the short form of the Category type "Furniture"
Functional Type	FUR-**STG**-ADA-Cupb_w_3Drawers-01	STG is the short form of the functional type "Storage"
Originator	FUR-STG-**ADA**-Cupb_w_3Drawers-01	ADA for architectural discipline of ArchSD
Descriptor 1	FUR-STG-ADA-**Cupb_w_3Drawers**-01	This text describes the type of furniture. The type of storage is cupboard with 3 drawers
Descriptor 2	FUR-STG-ADA-Cupb_w_3Drawers-**01**	Type 1 of the cupboard

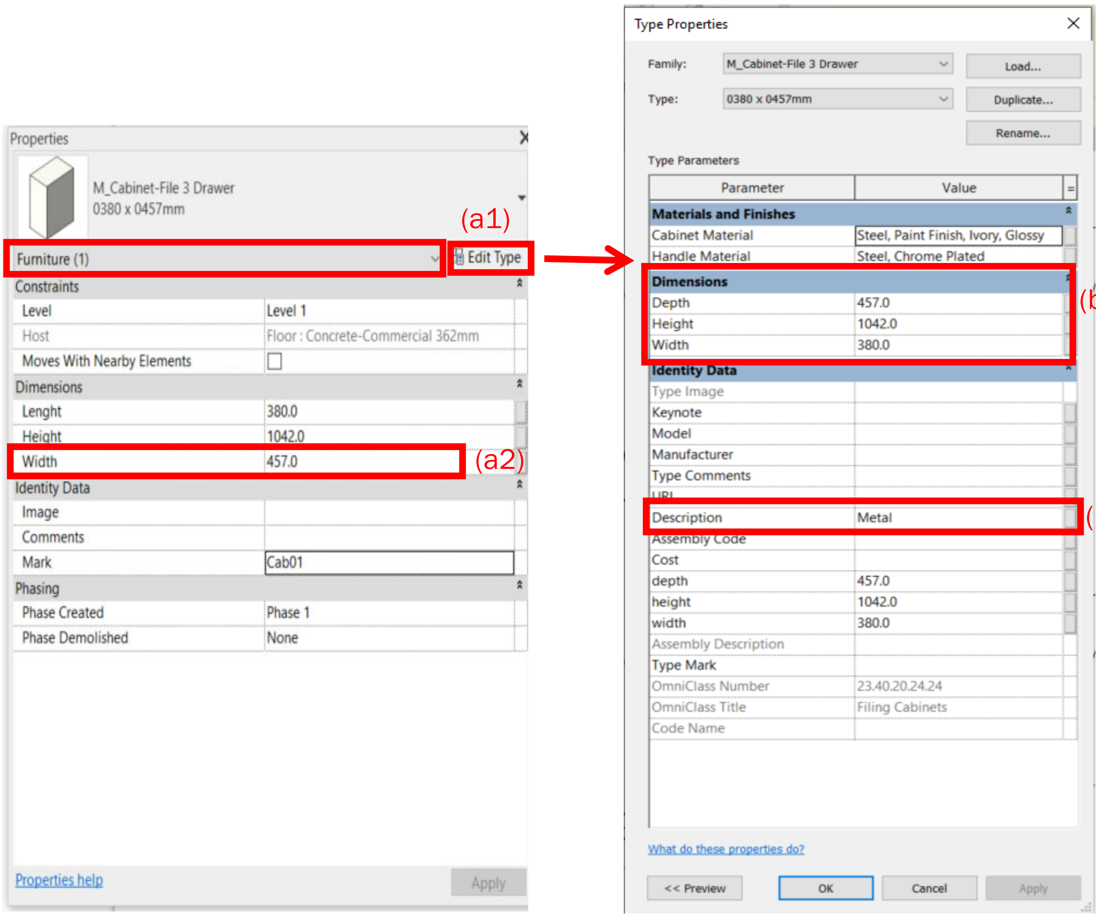
Category	Descriptions
FUR	Furniture
FNY	Furniture Systems
CWK	Casework

Functional Type	Descriptions	Descriptor 1	
STG	Storage	Cabinet / Cab Cupboard / Cupb Locker Shelf	FillUp withoutDR w_NrDrawer / w_NrDWR
DSK	Desk	Classroom / Classrm Office	w_Drawer LShape
SIT	Seating	OfficeChair Stool TaskChair Bench ConferenceChair / CONFChair	w_Armrest w_ChaiseLongue
TBL	Table	Conference / CONF Dinning Laboratory Rectangular Round	w_Chairs
CBN	Cabinet	Cabinet/ Cab Cupboard / Cupb	FillUp withoutDR w_Nr_Drawer / w_Nr_DWR
CTT	Counter Top	CounterTop	w_Sink w_Nr_Sink
OTR	Other	-	-

4.9.2.2 Setting of creating a Furniture

Furniture shall be modelled to its designed size with parameters to allow full flexibility to retrieve the quantities.

The following parameters shall be set in a Furniture:



a. Properties

<u>Under **Constraint**</u> **(a1)**

Parameter	**Remark**
Base Level/ Location	Identify the base level/ location, e.g. input Room number

<u>Under **Identity Data**</u> **(a2)**

Parameter	**Remark**
Mark	Identify the type of Furniture.

b. Edit Type > Type Properties

Under **Construction** (b1)

Parameter	Remark
Depth	Overall depth for the Furniture
Height	Overall height for the Furniture
Width	Overall width for the Furniture

Under **Identity Data** (b2)

Parameter	Remark
Description	Identify the main material for Furniture.(Wood / Metal)

4.9.3 Quantity Take-off

4.9.3.1 Furniture Schedule

<u>Step 1</u>

Create a new **Furniture** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

<u>Sample of Furniture Schedule</u>

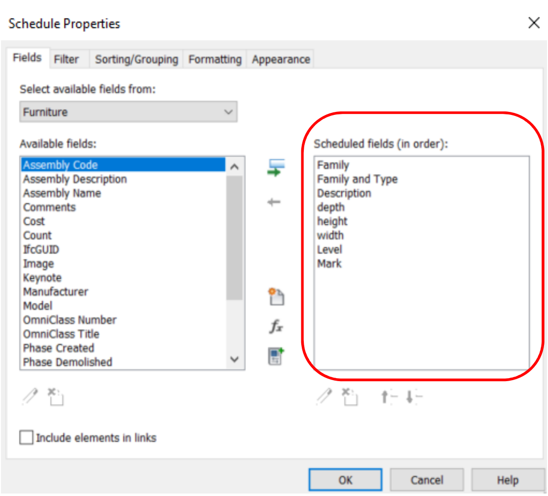
<Furniture Schedule>

A	B	C	D	E	F	G	H
Family	Family and Type	Description	depth	height	width	Level	Mark
Cab01							
M_Cabinet-File 3 Drawer	M_Cabinet-File 3 Drawer: 0380 x 0457mm	Metal	457	1042	380	Level 1	Cab01
M_Cabinet-File 3 Drawer	M_Cabinet-File 3 Drawer: 0380 x 0457mm	Metal	457	1042	380	Level 1	Cab01
Cab01: 2							
Cab02							
M_Cabinet-File 3 Drawer	M_Cabinet-File 3 Drawer: 0380 x 0734mm	Wood	734	1042	380	Level 1	Cab02
Cab02: 1							
Cab03							
M_Cabinet-File 3 Drawer	M_Cabinet-File 3 Drawer: 0457 x 0734mm	Wood	734	1042	457	Level 1	Cab03
Cab03: 1							
Grand total: 4							

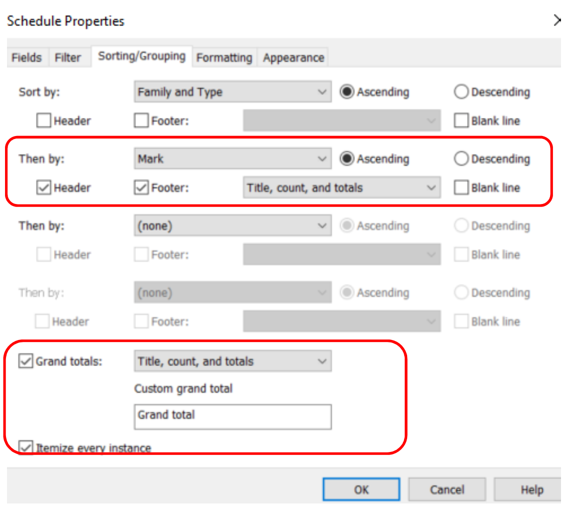
<u>Step 2</u>

<u>Schedule Properties and Setting</u>

❖ Fields



❖ Sorting/Grouping



4.10 Finishing

This section mainly focuses on the surface finishes.

i. Floor
ii. Wall
iii. Ceiling

4.10.1 Basic Information

4.10.1.1 Building Element to Model

<u>Modelling elements</u>

Elements	Object Category
Floor	Floor Architectural
Wall	Wall Architectural
Ceiling	Ceiling

4.10.1.2 Sequence of modelling

The Sequence of modelling:
Step 1: Room
Step 2: Floor/ Wall/ Ceiling Finishes layer if Room is not applicable.
Step 3: Paint

Room; Paint and Finishes layers should be modelled in BIM models for LOIN300 or above, but not limited to:

- Room for each room
- Finishing schedule
- Finishing mark for each location
- Finishes layer for screeds, tiles, carpet, waterproofing, tactile, painting, suspended ceiling etc.

4.10.2 Modelling Approach

4.10.2.1 Type Naming

Format:

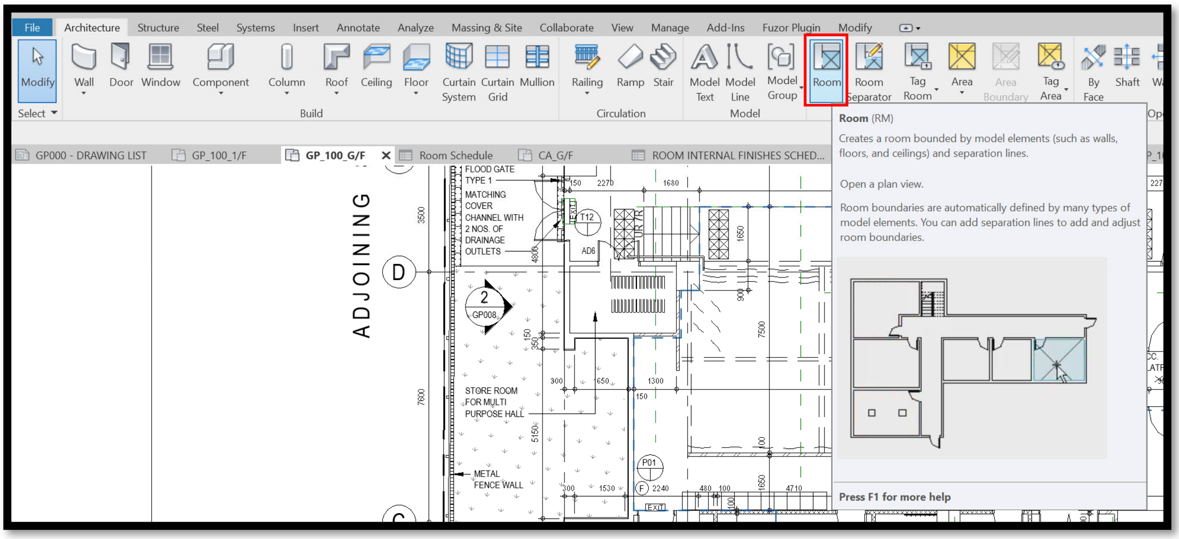
<Functional Type> - <Originator> - <Descriptor 1> - <Descriptor 2>

Type Name	Descriptions		
	Floor	Wall	Ceiling
Functional Type	AFF – Floor finishes	AWF – Wall finishes	CEL - Ceiling
Originator	ADA – for architectural discipline of ArchSD		
Descriptor 1	Tile – Floor Tile WD – Wood PT – Paint ST – Stone	Tile Render Paint	Metal Timber Gypsum
	_50mm _300x300mm	_10mm	_600x600mm _600x1200mm
Descriptor 2 (type number ; 2-digit sequential number)	01	01	01

4.10.2.2 Modelling

Room

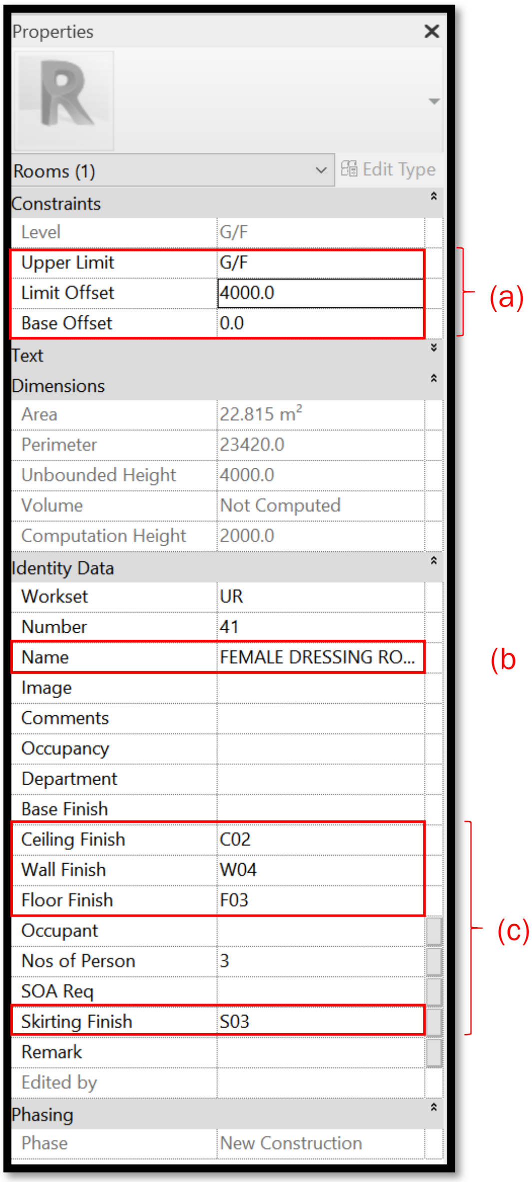
Architecture > Room (RM)

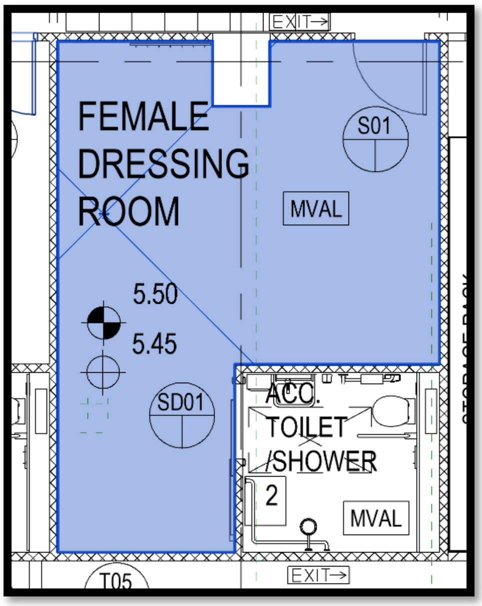


a. Modeller should input the following essential room parameter.

b. (a) Upper Limit, Limit Offset, Base Offset, (b) Name, (c) Finishing marks

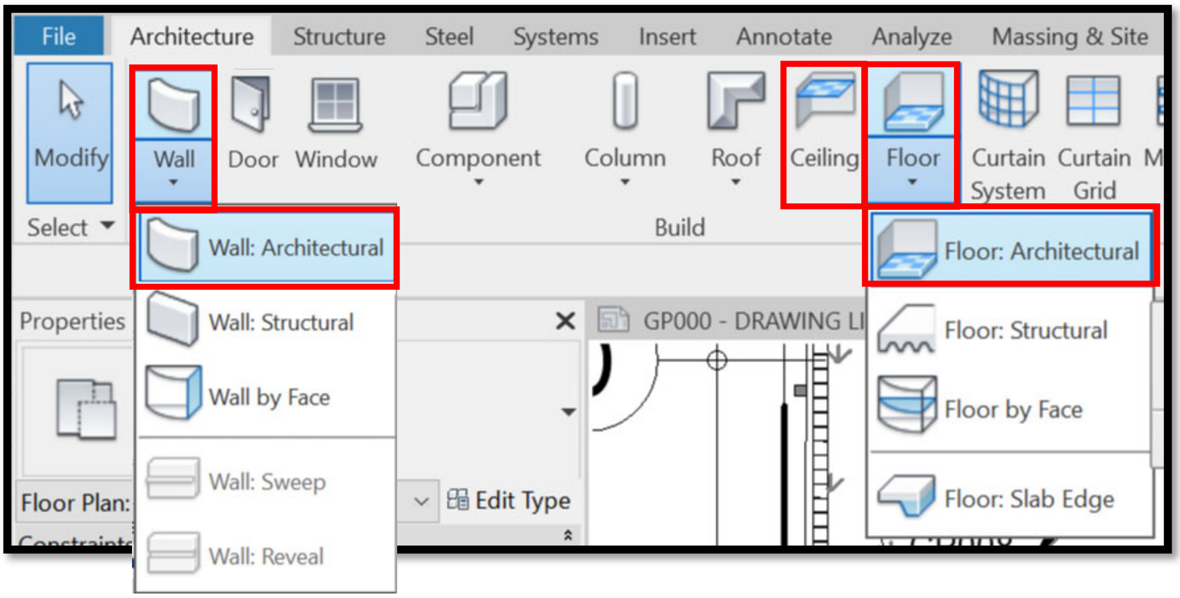
c. Unbounded Height, Area and Perimeter will be generated.





Finishes layers

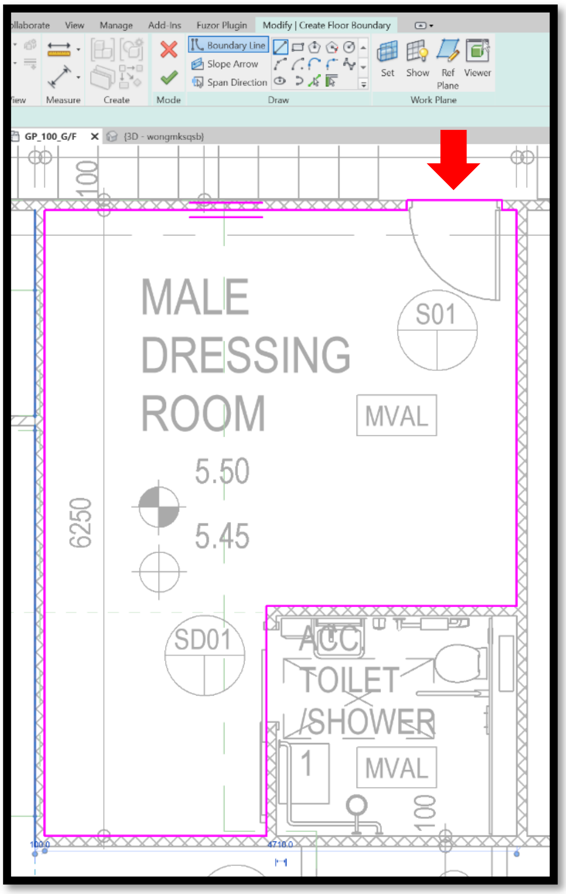
Architecture > (1) Floor: Architectural/ (2) Wall: Architectural/ (3) Ceiling



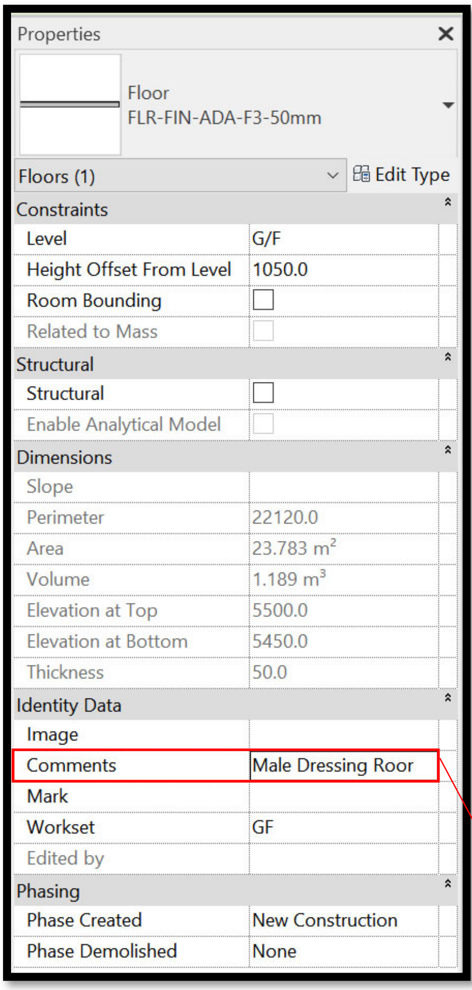
a. Floor finishes should be modelled on the architectural floor slab.

b. Finishes boundary of each room should be defined one by one.

c. Area under the door leafs should be bounded for the same materials.



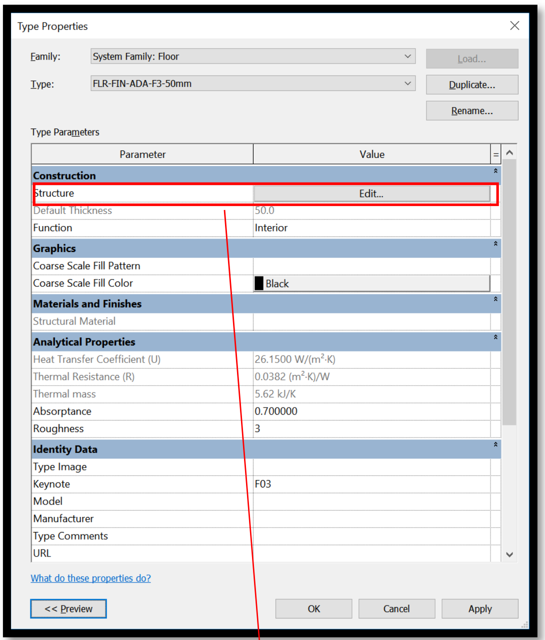
d. Modeller should insert the room name in the new shared/ available parameter (e.g. Comments) for location identification.

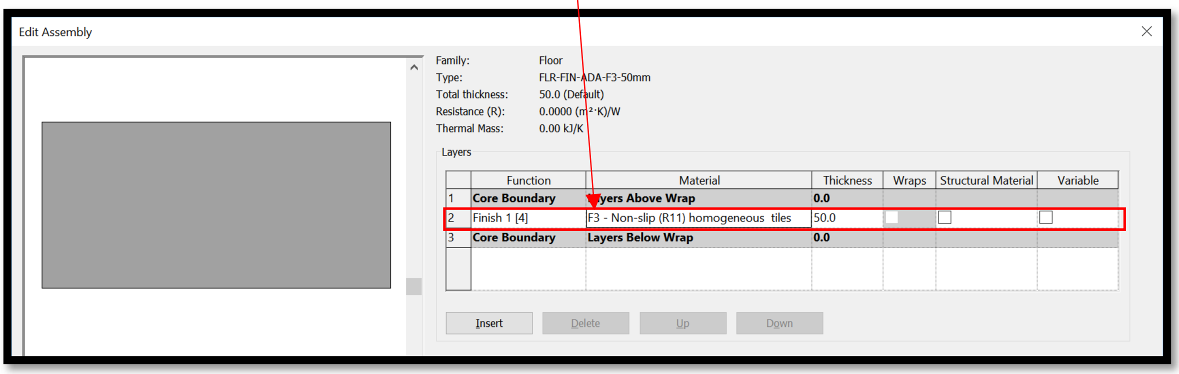


<Floor Material Takeoff>

A	B	C	D	E	F
Family and Type	Level	Height Offset From Level	Material: Name	Material: Area	Comments
Floor: FLR-FIN-ADA-F3-50mm	G/F	1050	F3 - Non-slip (R11) homogeneous tiles w	19.563 m²	
Floor: FLR-FIN-ADA-F3-50mm	G/F	1050	F3 - Non-slip (R11) homogeneous tiles w	26.991 m²	
Floor: FLR-FIN-ADA-F3-50mm	G/F	1050	F3 - Non-slip (R11) homogeneous tiles w	27.545 m²	
Floor: FLR-FIN-ADA-F3-50mm	G/F	1050	F3 - Non-slip (R11) homogeneous tiles w	3.631 m²	
Floor: FLR-FIN-ADA-F3-50mm	G/F	1050	F3 - Non-slip (R11) homogeneous tiles w	23.783 m²	Male Dressing Room
Floor: FLR-FIN-ADA-F3-50mm	1/F	50	F3 - Non-slip (R11) homogeneous tiles w	5.429 m²	

e. Each layer of finishes should be inserted under the Structure parameter.





f. Wall finishes should be modelled on the floor finishes and extend 100mm (minimum) above the bottom level of suspended ceiling. General settings of wall finishes are similar to the floor finishes.

g. Overlapping between finishes should be avoided.

h. General finishes under soffits should be included in the ceiling finishing mark.

i. Suspended ceiling should be built in a separate work set for better coordination.

4.10.3 Quantity Take-off

Surface finishes can be measured by i) Material Takeoff Schedule, ii) Room Schedule and iii) Paint function. However, adjustment of finishes to suit measurement rules are required due to limitation of the BIM software.

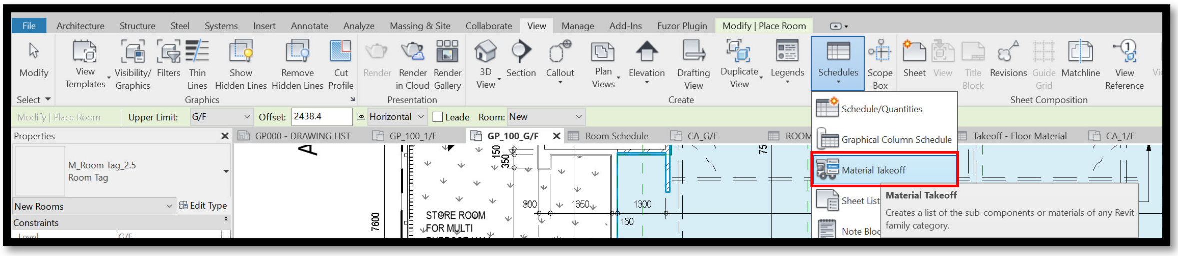
Adjustment of finishes for

- Dividing strips between different finishing materials
- Finishes under the door leafs
- Window sills
- Opening adjustments
- Sides of beams and columns
- Height of soffit for finishes
- Depth of suspension for suspended ceilings
- Intersection between elements

4.10.3.1 Material Takeoff Schedule

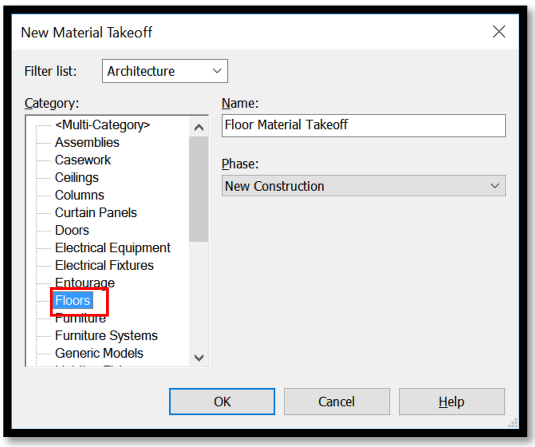
Measure the modelled finishes layer direct in the BIM model.

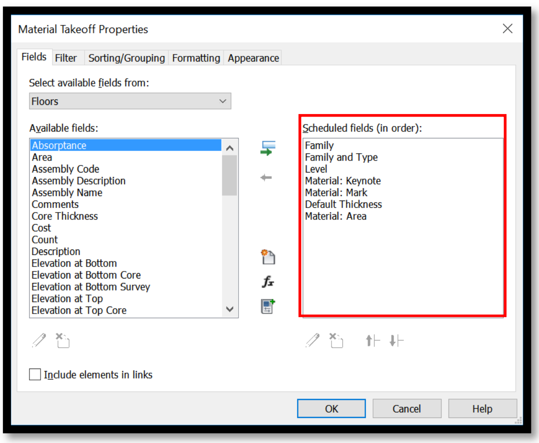
View > Schedules > Material Takeoff



Create a new **Floors/ Walls/ Ceilings** Material Takeoff Schedule

Select the required fields as below





<u>Material Takeoff Schedule</u>

<Floor Material Takeoff>

A	B	C	D	E	F	G
Family	Family and Type	Level	Material: Keynote	Material: Mark	Default Thickness	Material: Area
Floor	Floor: FLR-FIN-ADA-F1-50mm	G/F	F01		50	338.325 m²
Floor	Floor: FLR-FIN-ADA-F1-50mm	G/F	F01		50	131.892 m²
Floor	Floor: FLR-FIN-ADA-F1-50mm	G/F	F01		50	82.880 m²
Floor	Floor: FLR-FIN-ADA-F1-50mm	G/F	F01		50	5.750 m²
Floor	Floor: FLR-FIN-ADA-F3-150mm	G/F	F01		50	16.924 m²
Floor	Floor: FLR-FIN-ADA-F1-50mm	1/F	F01		50	42.363 m²
F01: 6						
Floor	Floor: FLR-FIN-ADA-F2-50mm	G/F	F02		50	14.811 m²
Floor	Floor: FLR-FIN-ADA-F2-50mm	G/F	F02		50	44.315 m²
Floor	Floor: FLR-FIN-ADA-F2-50mm	G/F	F02		50	31.714 m²
Floor	Floor: FLR-FIN-ADA-F2-50mm	G/F	F02		50	2.952 m²
Floor	Floor: FLR-FIN-ADA-F2-50mm	G/F	F02		50	13.787 m²
Floor	Floor: FLR-FIN-ADA-F2-50mm	1/F	F02		50	68.109 m²
Floor	Floor: FLR-FIN-ADA-F2-50mm	1/F	F02		50	25.541 m²
Floor	Floor: FLR-FIN-ADA-F2-50mm	1/F	F02		50	11.717 m²
Floor	Floor: FLR-FIN-ADA-F2-50mm	1/F	F02		50	47.188 m²
Floor	Floor: FLR-FIN-ADA-F2-50mm	2/F	F02		50	10.235 m²
F02: 10						

Notes:

i) If a separate shared parameter for location should be added into the schedule.

ii) Finishing adjustment is required for openings.

iii) Different layer of finishes should be billed.

4.10.3.2 Rooms

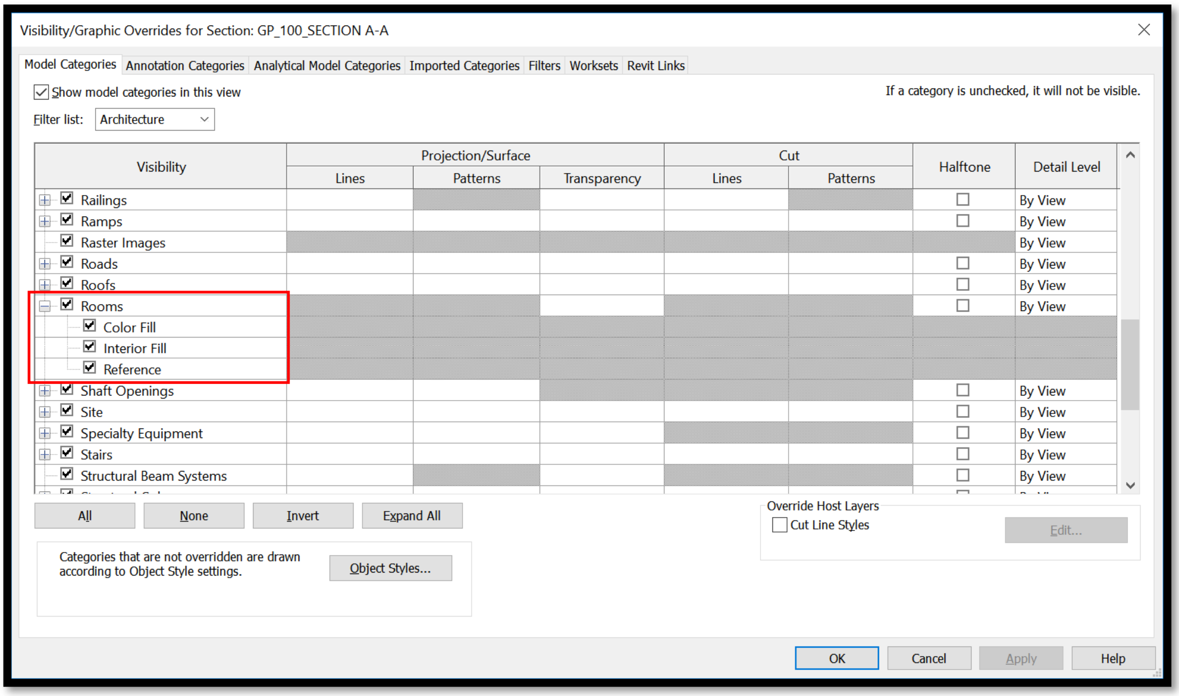
Measure the overall floor/ceiling area and perimeter by Room Schedule.

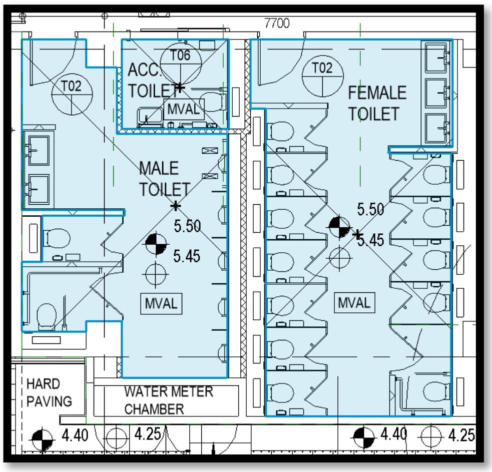
Limitation of Room:

- Only applicable to the room bounded by the model elements.
- Room is visible in plan and section only but not in 3D view.
- Openings will not be deducted in the total area and perimeter.

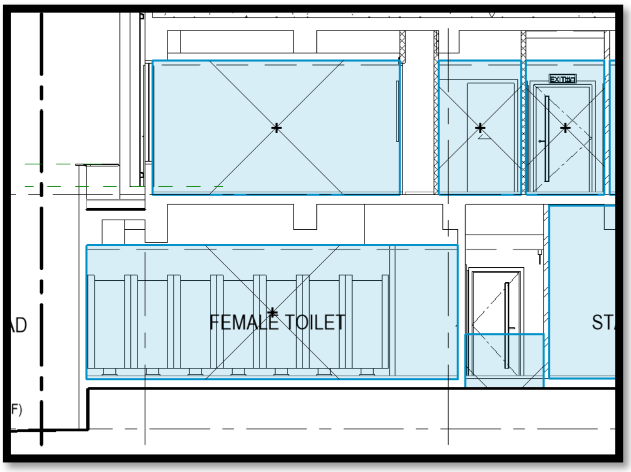
<u>View the Rooms in the plan/ section</u>

"✓" the Rooms under the Visibility/Graphic (VV) to make the Rooms visible





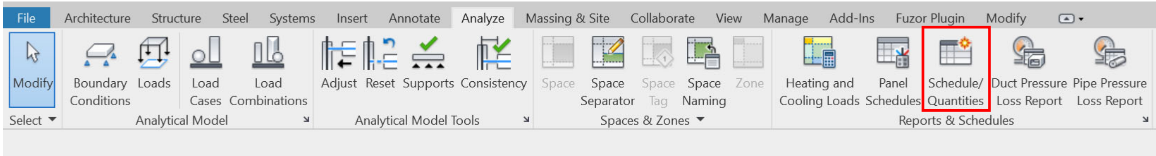
Plan



Section

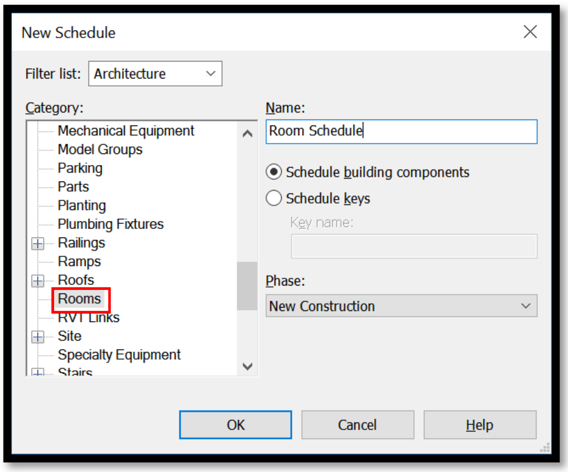
Room Schedule

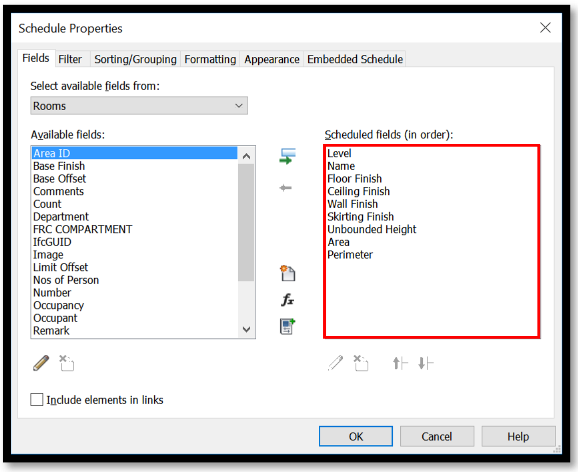
Analyze > Schedule/Quantities

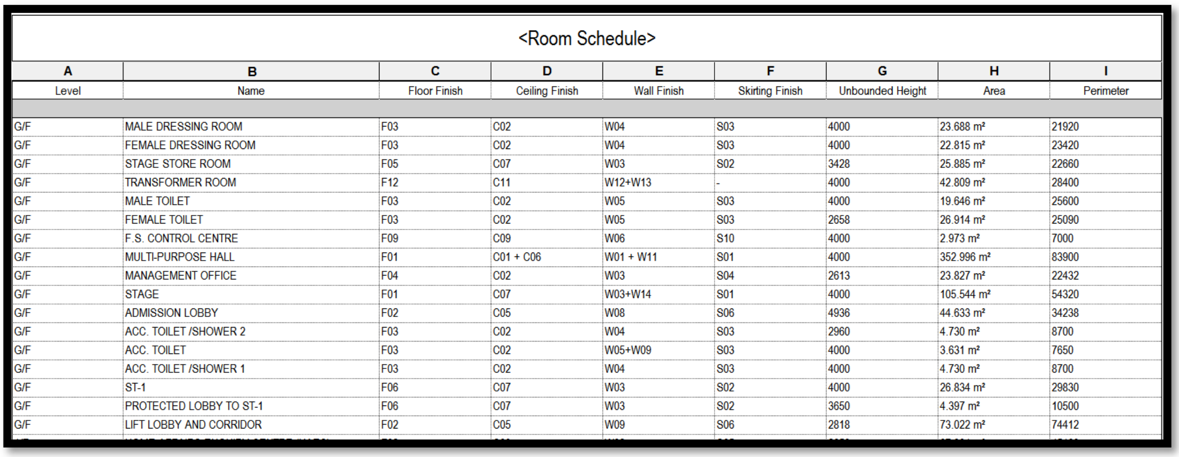


a. Create a new **Room** Schedule

b. Select the required fields as below







<Room Schedule>

A	B	C	D	E	F	G	H	I
Level	Name	Floor Finish	Ceiling Finish	Wall Finish	Skirting Finish	Unbounded Height	Area	Perimeter
G/F	MALE DRESSING ROOM	F03	C02	W04	S03	4000	23.688 m^2	21920
G/F	FEMALE DRESSING ROOM	F03	C02	W04	S03	4000	22.815 m^2	23420
G/F	STAGE STORE ROOM	F05	C07	W03	S02	3428	25.885 m^2	22660
G/F	TRANSFORMER ROOM	F12	C11	W12+W13	-	4000	42.809 m^2	28400
G/F	MALE TOILET	F03	C02	W05	S03	4000	19.646 m^2	25600
G/F	FEMALE TOILET	F03	C02	W05	S03	2658	26.914 m^2	25090
G/F	F.S. CONTROL CENTRE	F09	C09	W06	S10	4000	2.973 m^2	7000
G/F	MULTI-PURPOSE HALL	F01	C01 + C06	W01 + W11	S01	4000	352.996 m^2	83900
G/F	MANAGEMENT OFFICE	F04	C02	W03	S04	2613	23.827 m^2	22432
G/F	STAGE	F01	C07	W03+W14	S01	4000	105.544 m^2	54320
G/F	ADMISSION LOBBY	F02	C05	W08	S06	4936	44.633 m^2	34238
G/F	ACC. TOILET /SHOWER 2	F03	C02	W04	S03	2960	4.730 m^2	8700
G/F	ACC. TOILET	F03	C02	W05+W09	S03	4000	3.631 m^2	7650
G/F	ACC. TOILET /SHOWER 1	F03	C02	W04	S03	4000	4.730 m^2	8700
G/F	ST-1	F06	C07	W03	S02	4000	26.834 m^2	29830
G/F	PROTECTED LOBBY TO ST-1	F06	C07	W03	S02	3650	4.397 m^2	10500
G/F	LIFT LOBBY AND CORRIDOR	F02	C05	W09	S06	2818	73.022 m^2	74412

Notes:

i) Unbounded height = Limit Offset – Base Offset

ii) When you selected a room, you may click the “section box” to isolate the room in 3D view.

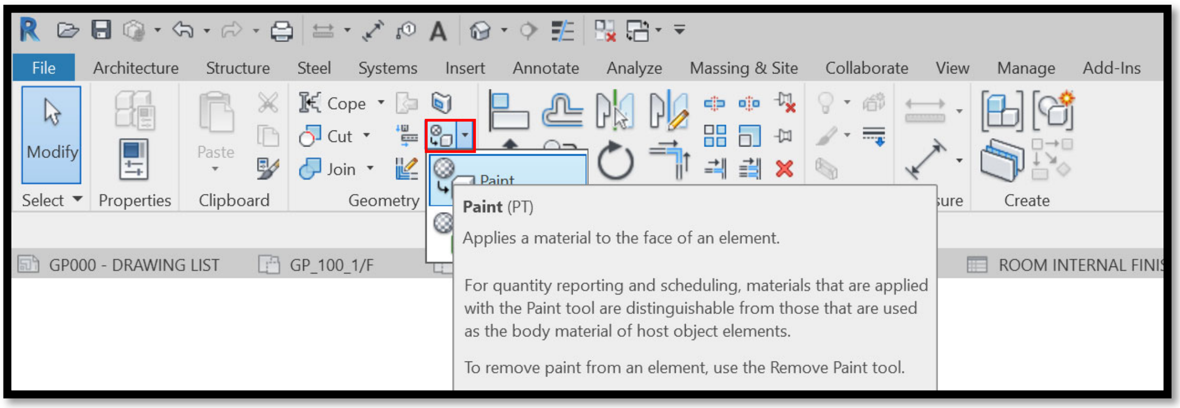
iii) Suggest to insert the door mark/ window mark in the schedule for finishing adjustment.

4.10.3.3 Paint

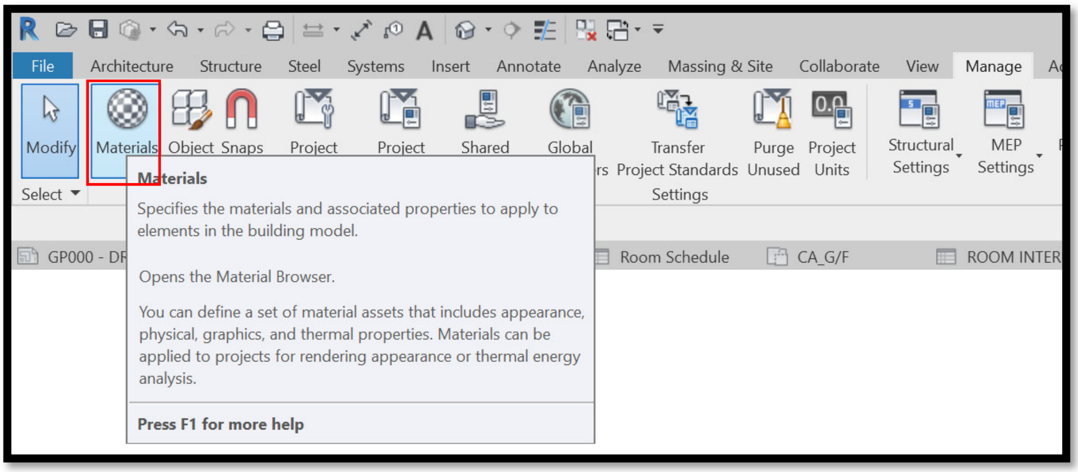
For irregular shape and finishing adjustments

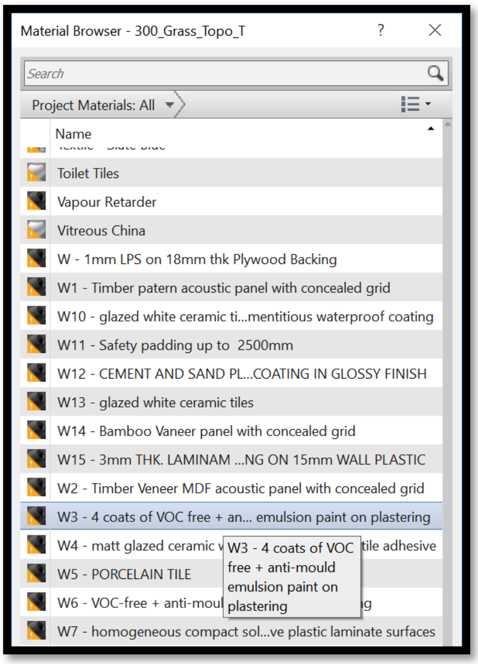
Use of **Paint** function is recommended. It could supplement the limitation of **Finishes Layer** and **Room**.

Modify > Geometry > Paint (PT)



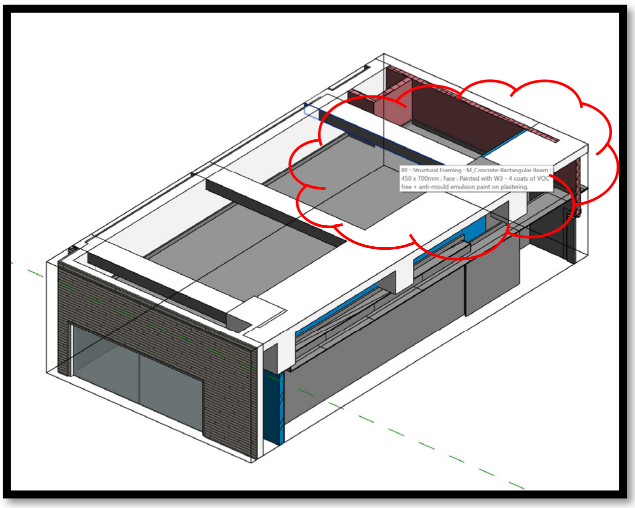
Select/Create the required materials to apply to elements in 3D view



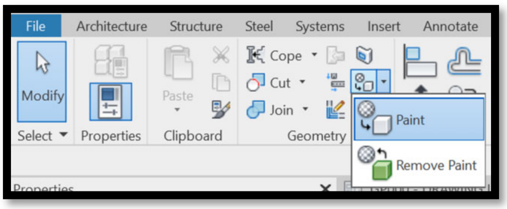


Material Browser

Applied the **Paint** by point to the elements directly.



You may remove the **Paint** easily.



Notes:

i) QTO in **Paint** is similar to the **Material Takeoff**, please refer to 4.10.3.1.

ii) Suggest to add a mark to a shared parameter (e.g. Comments) to identify the elements to be painted.

4.11 Landscaping Works

This section mainly focuses on the following items:

i. Trees (Retained / Transplanting)
ii. Trees (Proposed)
iii. Shrubs
iv. Soil Area

4.11.1 Basic Information

4.11.1.1 Building Elements to Model

Modelling elements:

Elements	Object Category
Tree	Planting
Shrubs / Groundcovers / Climbers / Turf / Plants without geometry	Floor
Soil	Topo-surface

4.11.1.2 Level of Information Need

Items	LOD-G	LOD-I
Tree	LOD-G 200	LOD-I 300, Including approximate location, Tree name, height, spread
Shrubs	LOD-G 100	LOD-I 300, Including Shrubs name, area, Total No.
Soil	LOD-G 100	LOD-I 100, Including Soil top level, Soil depth

4.11.2 Modelling Approach

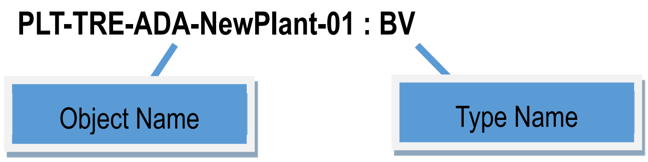
4.11.2.1 Trees

Object / Type Naming

Format:

<Category> - <Functional Type> - <Originator> - <Descriptor 1> - <Descriptor 2>

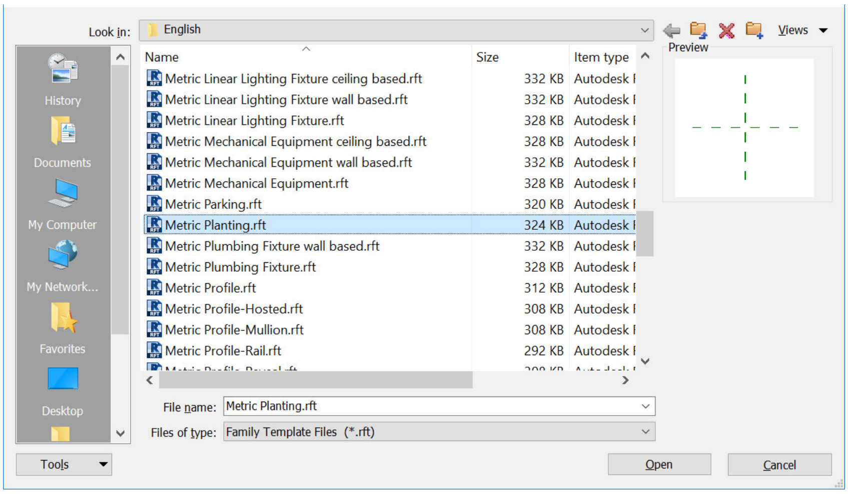
Object Name	PLT-TRE-ADA-NewPlant-01	Descriptions
Category	**PLT**-TRE-ADA-NewPlant-01	A plant, PLT is the short form of the Category type "Planting"
Functional Type	PLT-**TRE**-ADA-NewPlant-01	TRE is the short form of the functional type "tree"
Originator	PLT-TRE-**ADA**-NewPlant-01	ADA for architectural discipline of ArchSD
Descriptor 1	PLT-TRE-ADA-**NewPlant**-01	This text describes the type of tree.
Descriptor 2	PLT-TRE-ADA-NewPlant-**01**	Type 1 of the new planting tree



Type of Tree	Type Naming	Description
New Planting Tree	BV	Tree Code
Transplanting / Retained Tree	T950 Livistona chinensis	Existing Tree Marks and Tree Name

Step 1

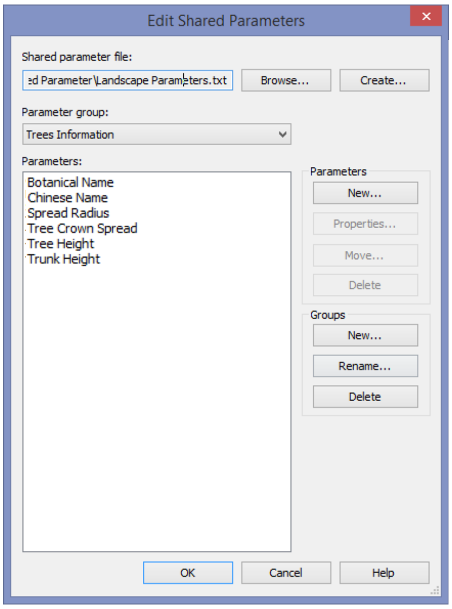
Create a new object of tree using Planting as a template.



Step 2

Create Shared Parameters as below; refer to Part 7 Techniques for QTO - 7.2 Shared Parameters.

Create a **Landscape Parameters.txt** file, add necessary parameters under the **Trees Information** group and click **OK** to Progress.



Step 3

Create the Tree model.

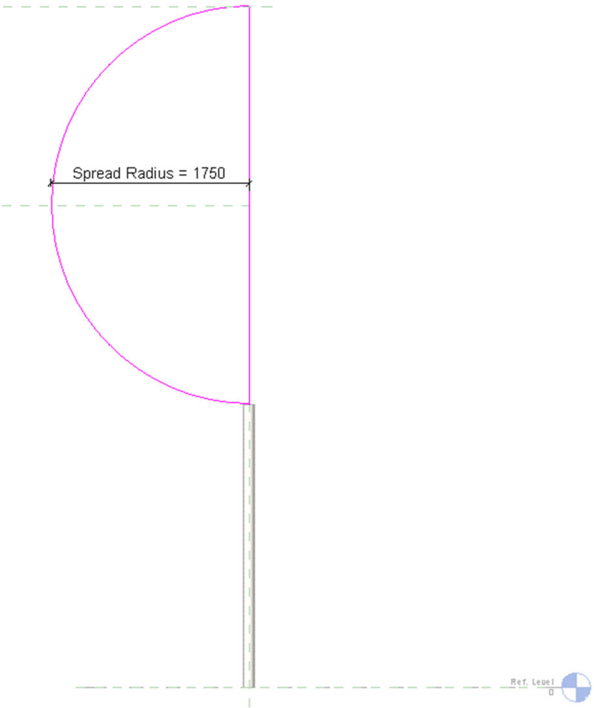
The spread can be created by **Revolve** and the trunk can be created by **Extrusion**.

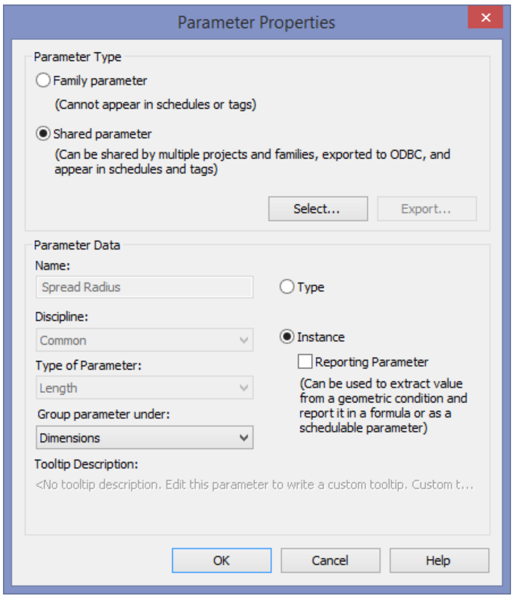
Step 4

Create a new parameter **Spread Radius** as below picture.

Select **Shared parameter** and click the **Select..** under the **Parameter Type.**

Select **Instance** Parameter.

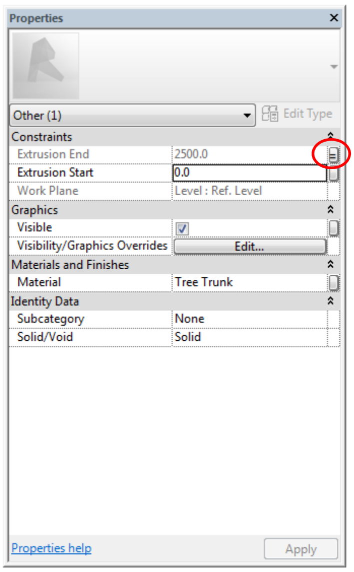


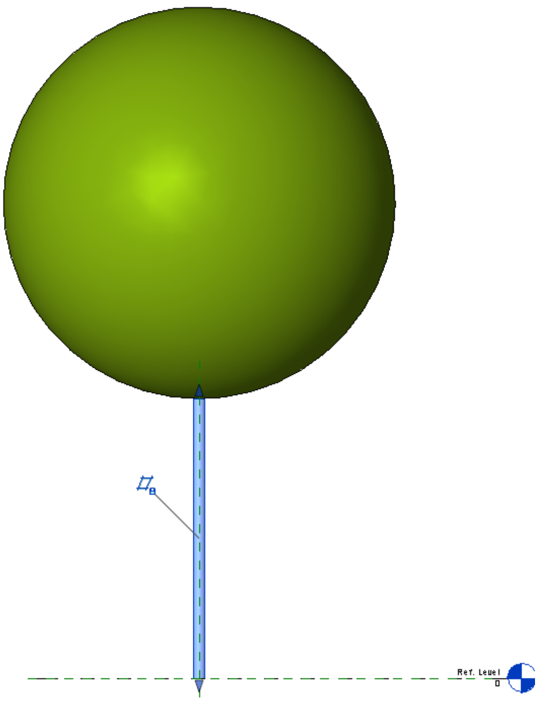


Step 5

Select the trunk

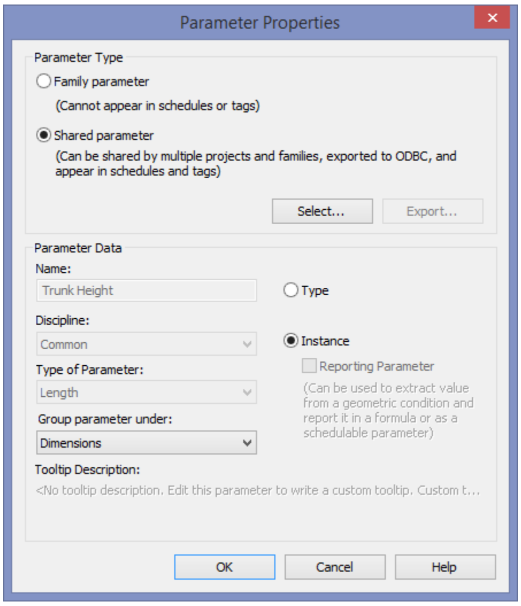
In properties, select **Extrusion End** as below picture.





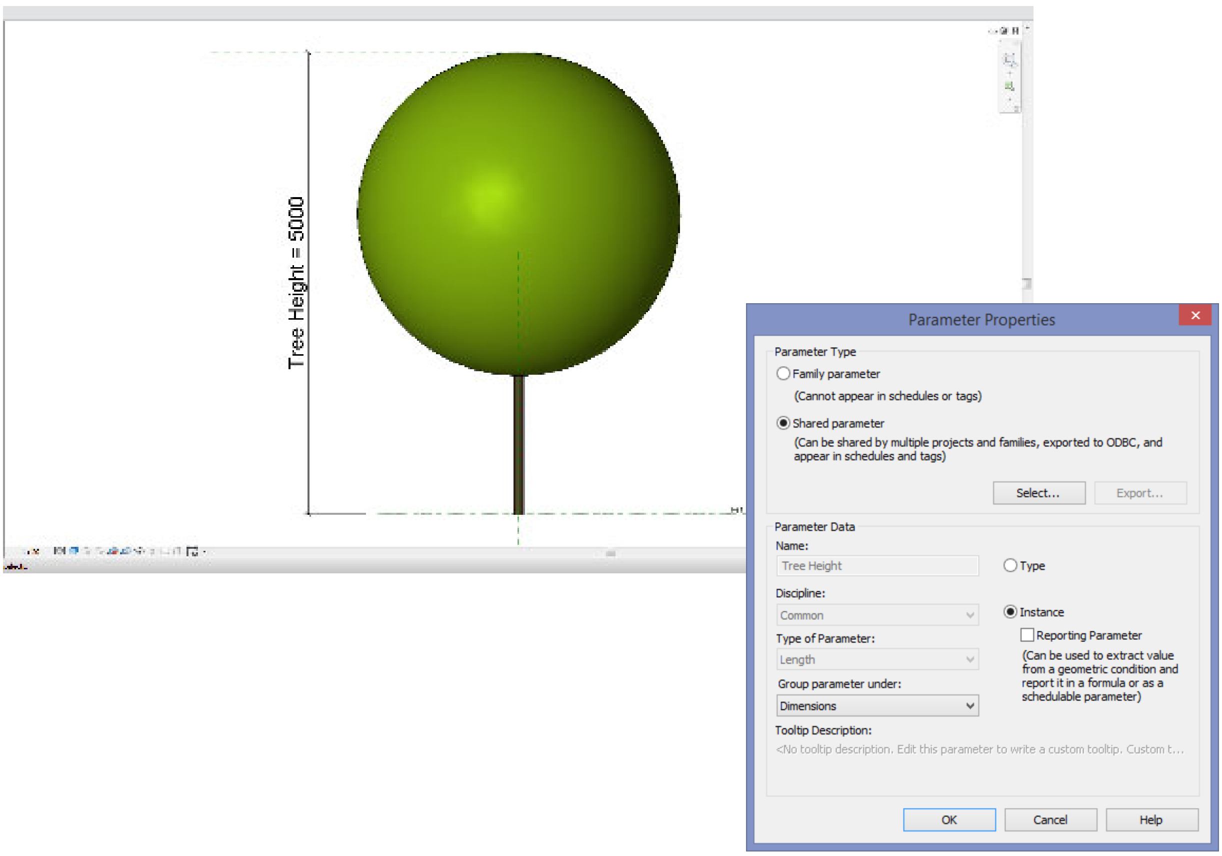
Under **Associate Family Parameter**, create a new shared parameter **Trunk Height.**

Select **Instance** Parameter.



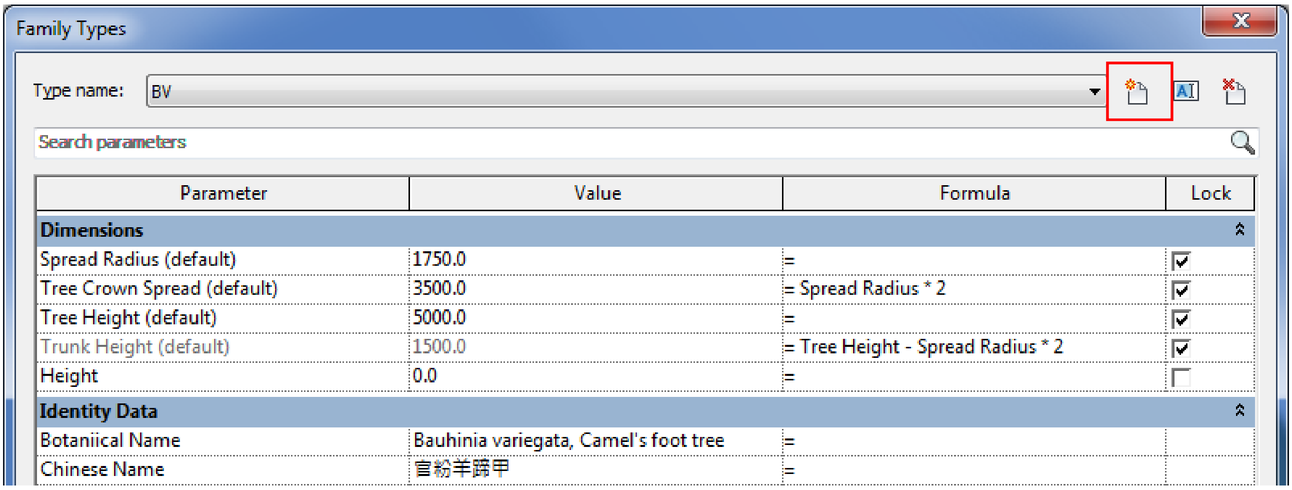
Step 6

Create a new shared parameter **Tree Height** as below picture.



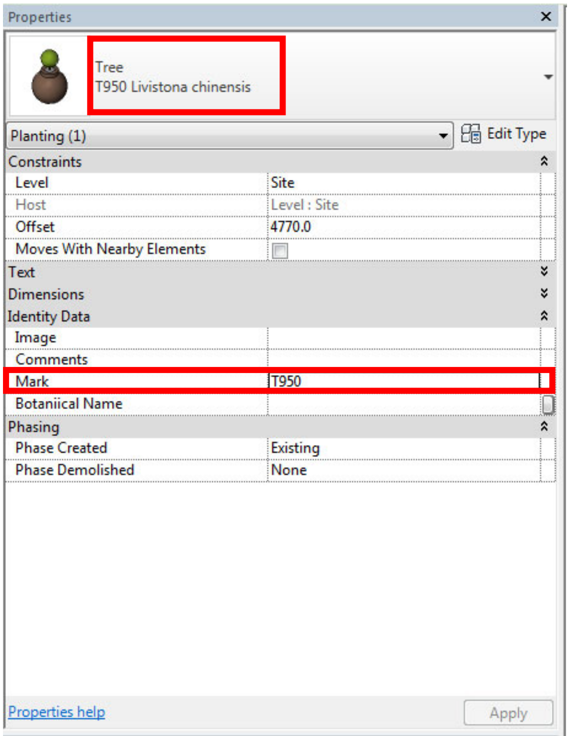
Step 7

1. Create a new parameter **Tree Crown Spread**, set Formula = **Spread Radius * 2**
2. In parameter **Trunk Height**, set Formula = **Tree Height - Spread Radius * 2**
3. Tick **Lock** for parameter **Tree Height, Tree Crown Spread, Spread Radius** and **Truck Height**
4. Click  for create New Type and change the Type Name as per Naming Convention stipulated previously.



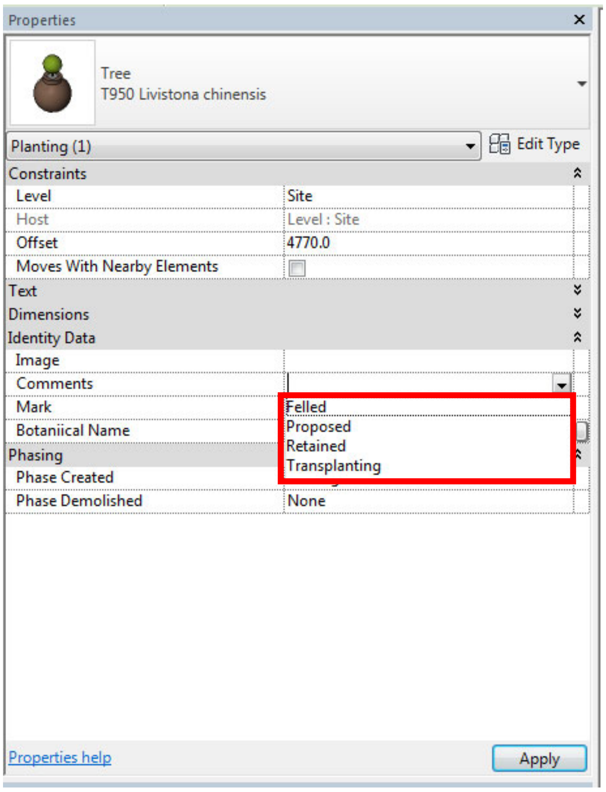
Step 8

After load into project, mark the existing tree no. into **Mark**.



Step 9

Determine the tree status in the **Comments** box.



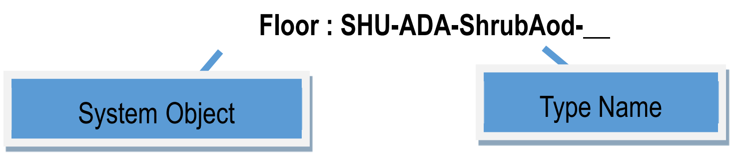
4.11.2.2 Shrubs

Type Naming

Format:

<Functional Type> - <Originator> - <Descriptor 1> - <Descriptor 2>

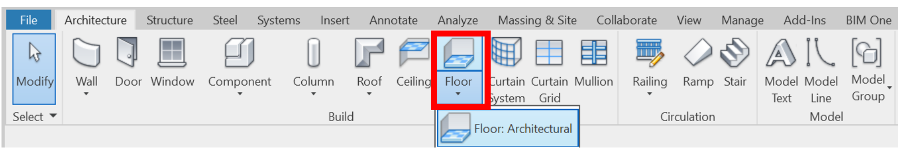
Type Name	SHU-ADA-ShrubAod-__	Descriptions
Functional Type	**SHU**-ADA-ShrubAod-__	SHU is the short form of the functional type "Shrub"
Originator	SHU-**ADA**-ShrubAod-__	ADA for architectural discipline of ArchSD
Descriptor 1	SHU-ADA-**ShrubAod**-__	This text describes the type of shrub.
Descriptor 2	SHU-ADA-ShrubAod-__	2-digit sequential number to distinguish different types, if Descriptor 2 is blank, two underscores (__) should be used



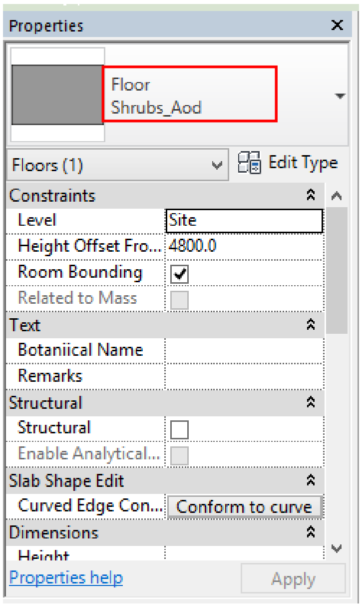
Descriptor 1	Description
Shrubxxx	Plant Type + Plant Reference Name
Groundcoverxxx	
Climberxxx	
OrnamentalGrassxxx	
Bambooxxx	
Turfxxx	

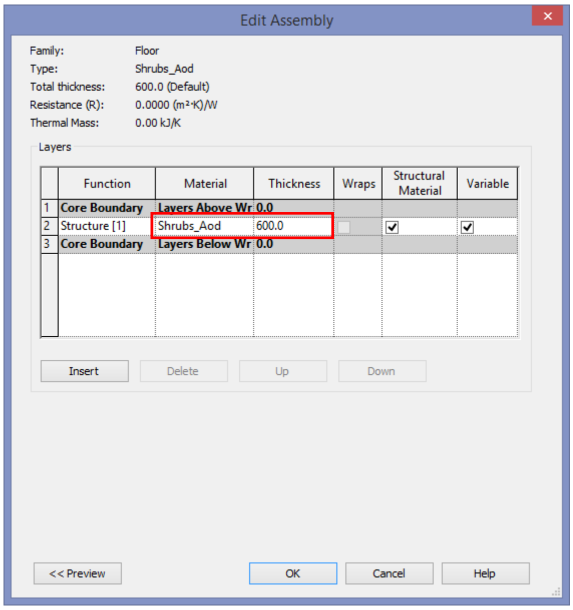
Step 1

Use **Floor** as the shrub area

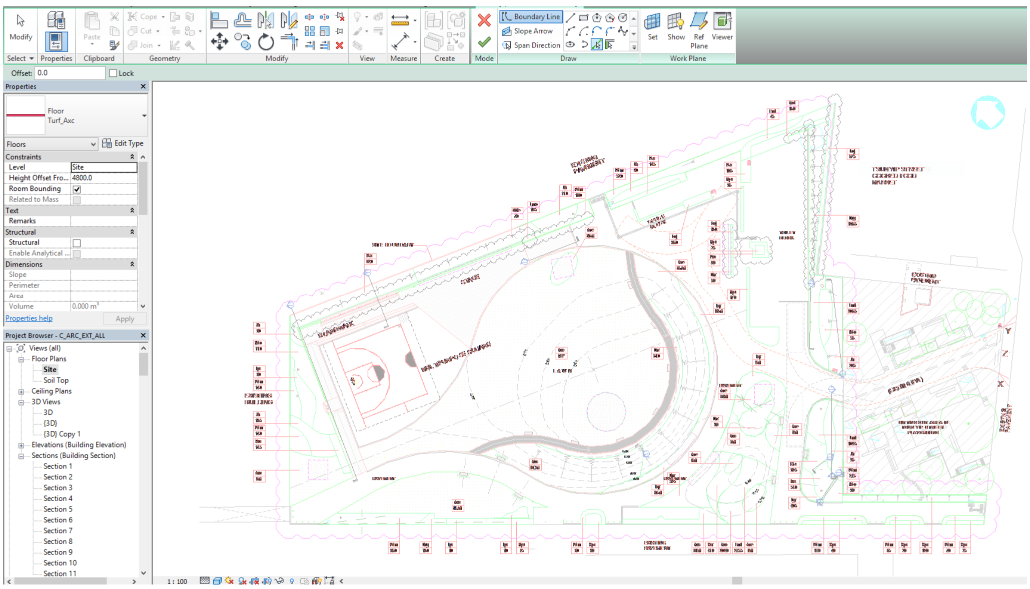


1. Floor **Type Name** refer to Landscape drawings (e.g.SHU-ADA-ShrubAod-__)
2. Set the **Thickness** = Depth
3. Set the **Material** same as **Type Name**





4. Create the floor refer to Landscape Drawings

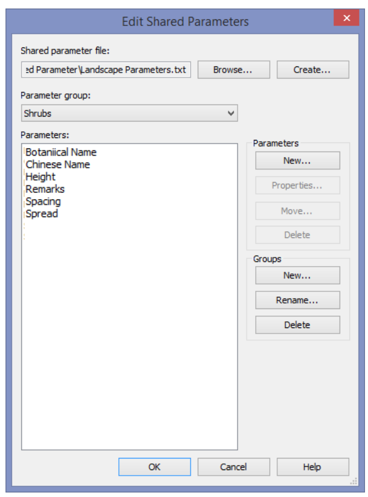


Step 2

Create a new Shared Parameter

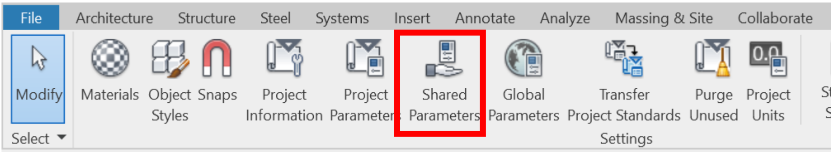
Create a **Landscape Parameters.txt** file

Add all necessary parameters under the **Shrubs** group (see the images)

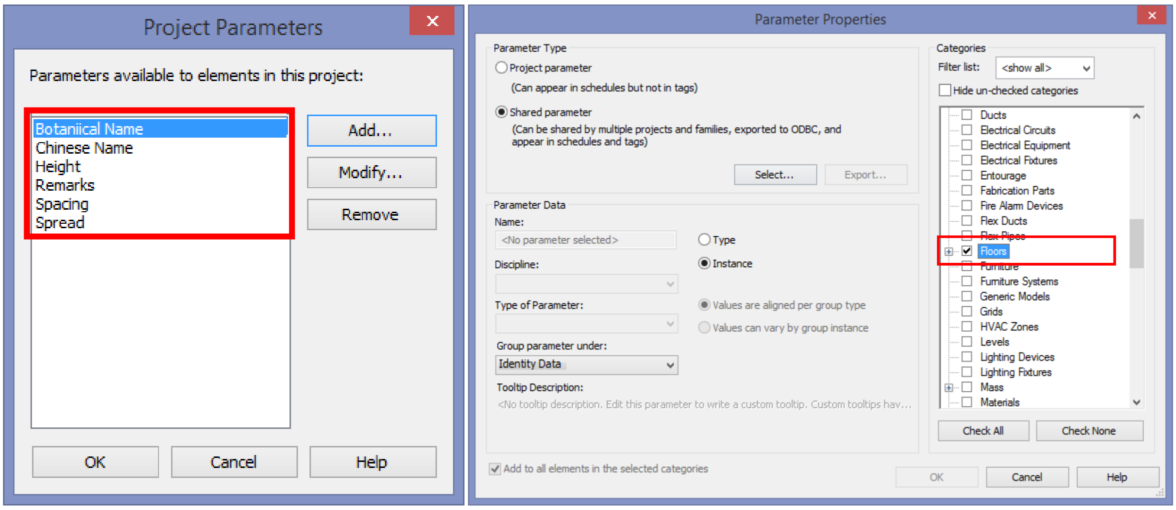


Step 3

Create a new Project Parameter

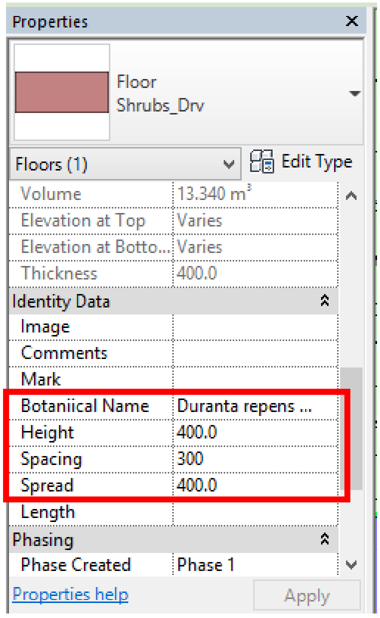


Click **Add** and add all shared parameter that you have created before into **Floor** and set into the group of **Identity Data**.



Step 4

Project parameters are added under the properties and input information (**Botanical name**, **Chinese Name**, **Height**, **Spacing** and **Spread**) for every plant area.

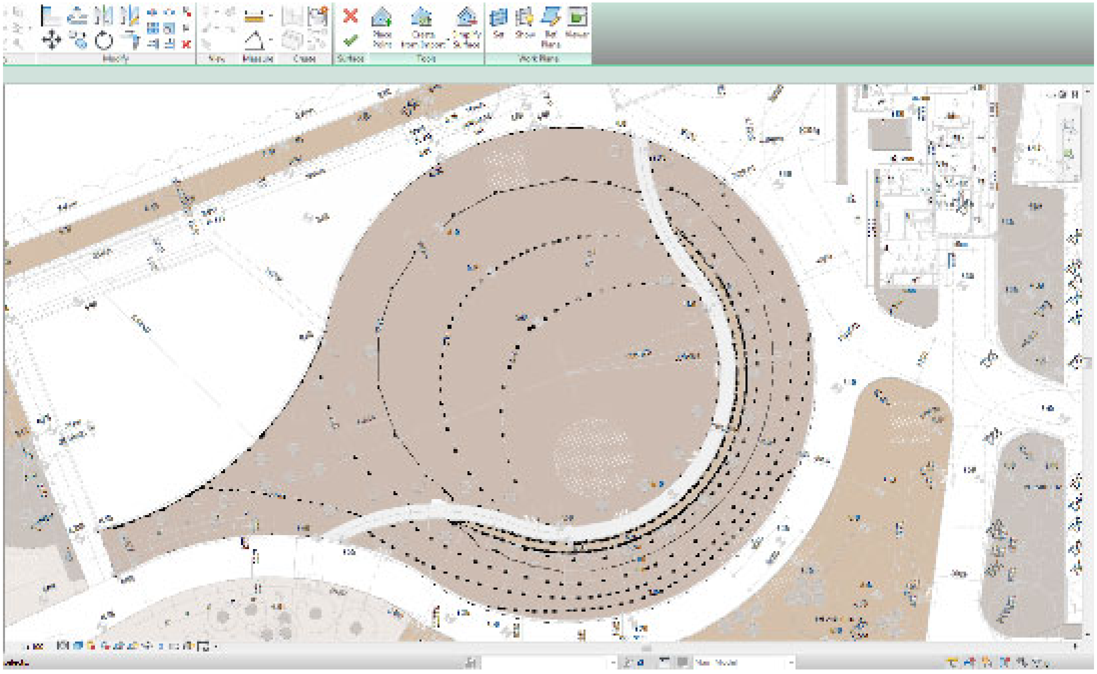


\# The same modelling method can be applied for groundcover, climbers, etc.

4.11.2.3 Soil

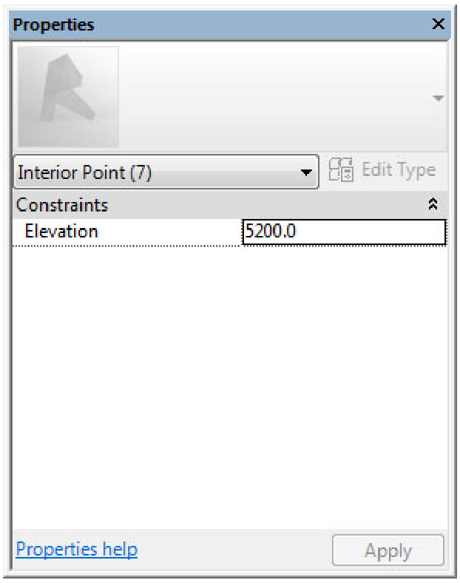
Step 1

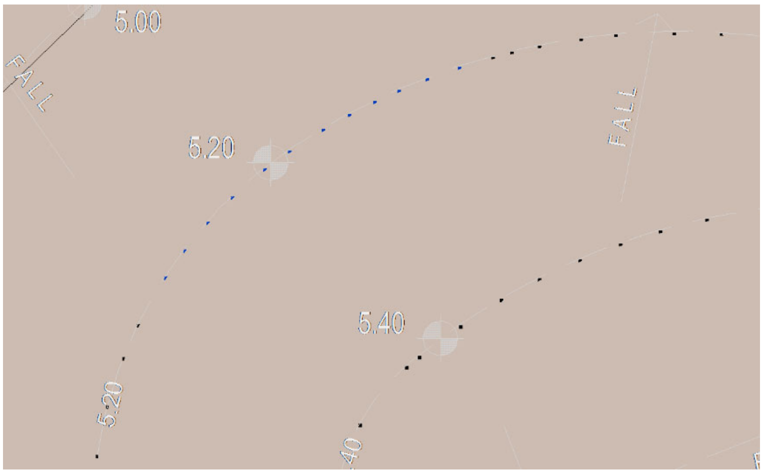
Use Toposurface to create the soil area.



Step 2

Set the elevation of each point.

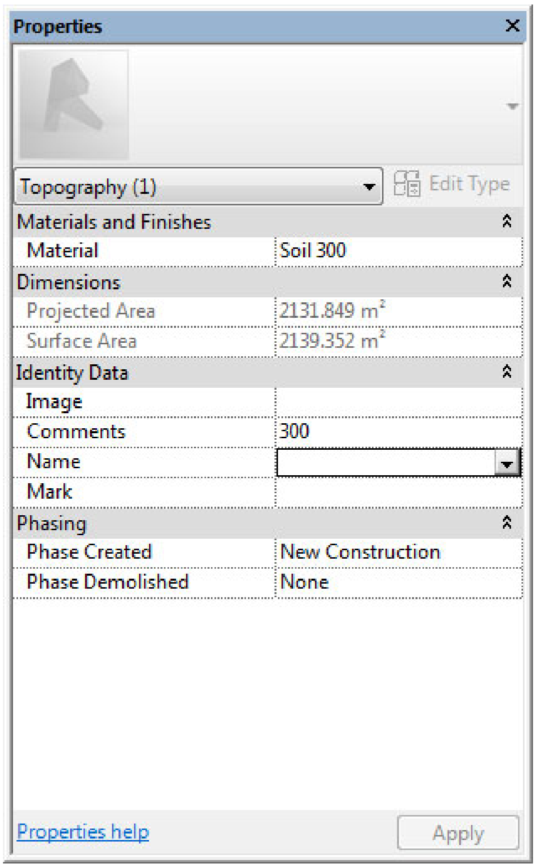




Step 3

Select the toposurface.

Enter the soil depth in **Comments**



4.11.3 Quantity Take-off

4.11.3.1 Trees Schedule (Retained/Transplanting)

Step 1

Create a new **Planting** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

Sample of Tree Schedule (Retained)

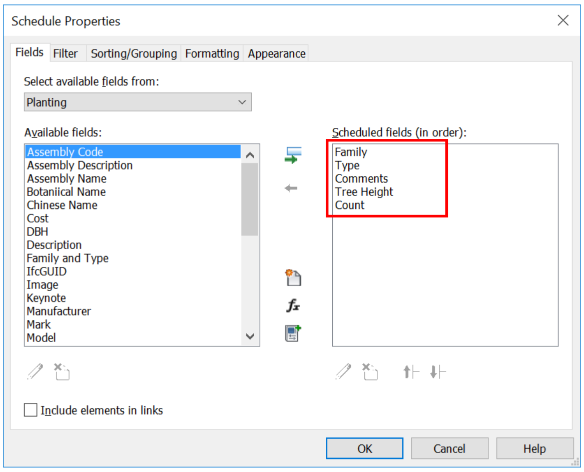
<Planting Schedule>

A	B	C	D	E
Family	Type	Comments	Tree Height	Count
Tree	T909 Koelrouteria paniculata	Retained	12000	1
Tree	T910 Schefflera actinophylla	Retained	9000	1
Tree	T935 Aleurites moluccana	Retained	14000	1
Tree	T936 Albizia lebbek	Retained	10000	1
Tree	T937 Koelrouteria paniculata	Retained	8000	1
Tree	T938 Aleurites moluccana	Retained	9000	1
Tree	T940 Koelrouteria paniculata	Retained	3500	1
Tree	T941 Koelrouteria paniculata	Retained	12000	1
Tree	T942 Ficus microcarpa	Retained	14000	1
Tree	T945 Aleurites moluccana	Retained	16000	1
Tree	T948 Bombax ceiba	Retained	18000	1
Tree	T949 Bombax ceiba	Retained	20000	1
Tree	T953 Aleurites moluccana	Retained	16000	1
Tree	T954 Aleurites moluccana	Retained	13000	1
Tree	T957 Aleurites moluccana	Retained	15000	1
Tree	T959 Elaeocarpus sylvestris	Retained	7000	1
Grand total: 16				16

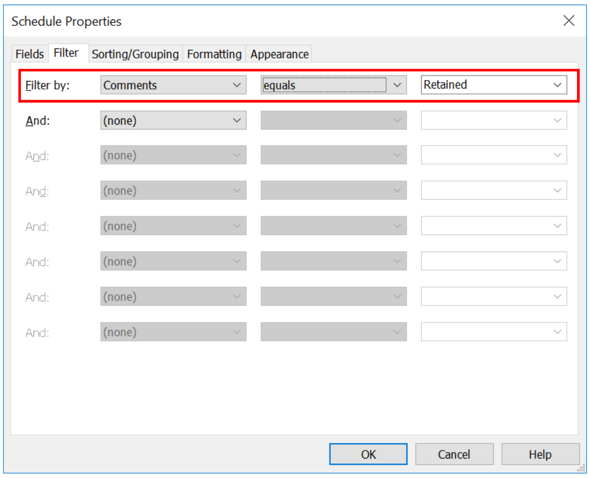
Step 2

Schedule Properties and Setting

- Fields

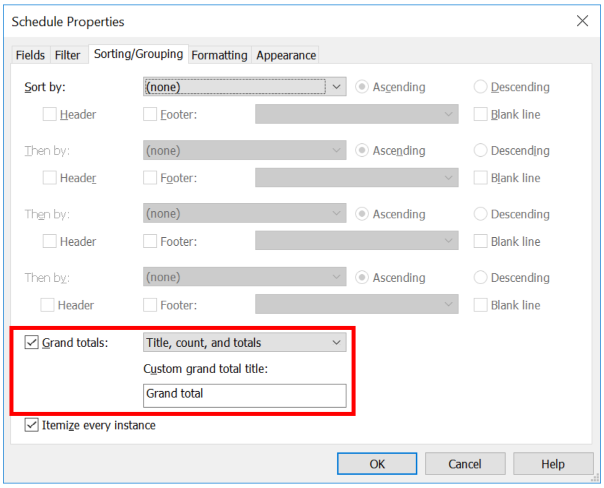


- Filter

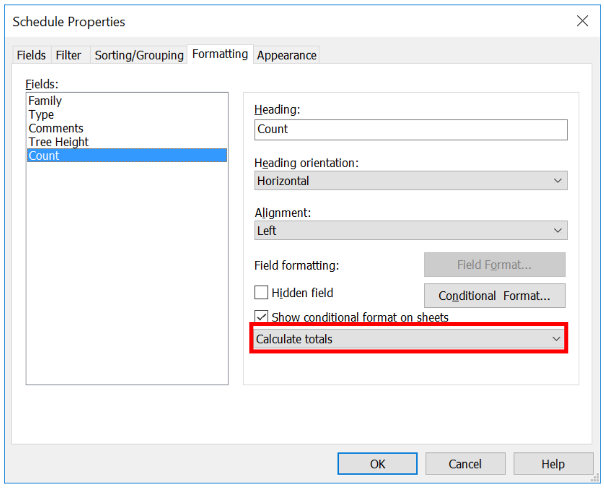


4.11.3.1 Trees Schedule (Retained/Transplanting) (Cont'd)

❖ Sorting/Grouping



❖ Formatting - **Count**



4.11.3.2 Trees Schedule

Step 1

Create a new **Planting** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

Sample of Tree Schedule (Proposed)

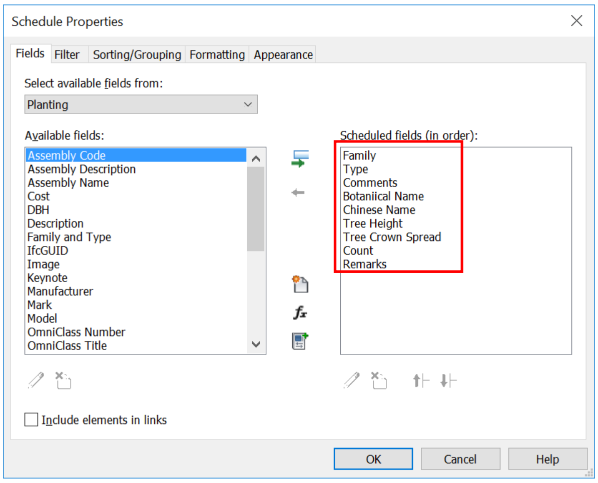
<Planting Schedule 2>

A	B	C	D	E	F	G	H	I
Family	Type	Comments	Botaniical Name	Chinese Name	Tree Height	Tree Crown Spread	Count	Remarks
Tree	BV	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	5000	3000	1	Straight trunk
Tree	BV	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	5000	3000	1	Straight trunk
Tree	BV	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	5000	3000	1	Min. height of lowest branch 2.1m
Tree	BV	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	5000	3000	1	Min. height of lowest branch 2.1m
Tree	BV	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	5000	3000	1	Straight trunk
Tree	BV	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	5000	3000	1	Straight trunk
							6	
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	1	Min. height of lowest branch 2.1m

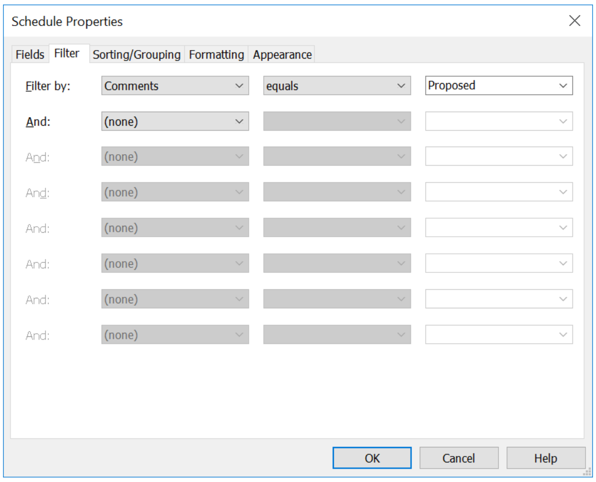
Step 2

Schedule Properties and Setting

❖ Fields

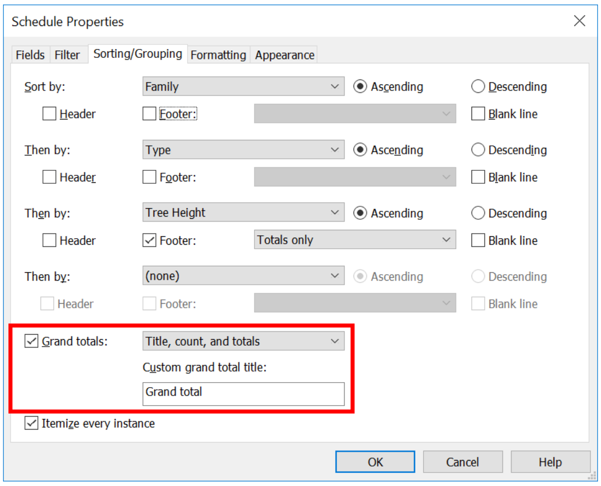


❖ Filter

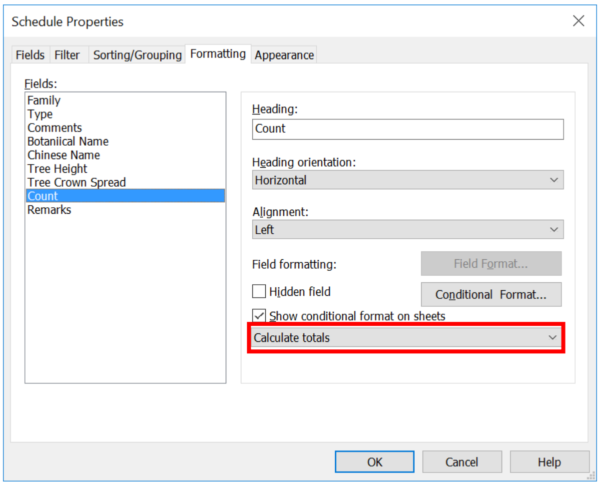


4.11.3.2 Trees Schedule (Cont'd)

❖ Sorting/Grouping

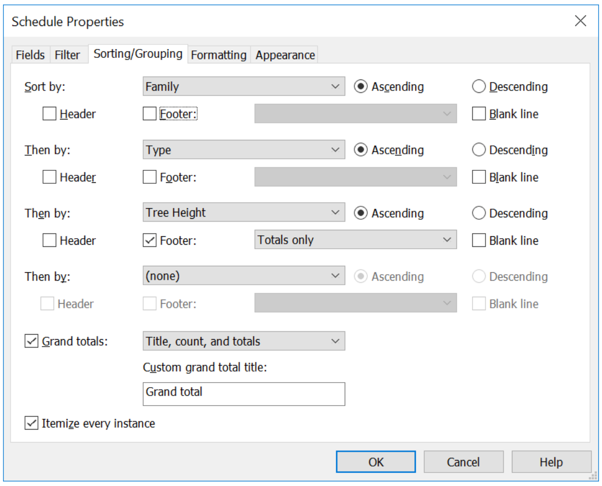


❖ Formatting - **Count**



Step 3

In **Sorting/Grouping**, untick **Itemize every instance** to show the summary table.



<Planting Schedule 2>

A	B	C	D	E	F	G	H	I
Family	Type	Comments	Botanical Name	Chinese Name	Tree Height	Tree Crown Spread	Count	Remarks
Tree	BV	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	5000	3000	6	
Tree	BV2	Proposed	Bauhinia variegata, Camel's foot tree	官粉羊蹄甲	6000	4000	34	Min. height of lowest branch 2.1m
Tree	BVC	Proposed	Bauhinia variegata var. candia, White bauhinia	白花羊蹄甲	5000	3000	4	Straight trunk
Tree	BVC2	Proposed	Bauhinia variegata var. candia, White bauhinia	白花羊蹄甲	6000	3500	7	Min. height of lowest branch 2.1m
Tree	TM	Proposed	Terminalia mantaly, Small leaved terminalia	小葉欖仁樹	6000	3500	24	Min. height of lowest branch 2.5m
Small Tree	Cjw2	Proposed	Camellia japonica cvs. Japanese camelia - White flower	山茶花(白花)	2500	1500	2	Low branching; multi-trunks; round shape
Small Tree	Lsi2	Proposed	Ligustrum sinense, Chinese privet	山指甲	2000	1500	4	Low branching; multi-trunks; round shape
Small Tree	Mpa2	Proposed	Murraya paniculata, Orange jasmine	九里香	2000	1200	15	Low branching; multi-trunks; round shape
Small Tree	Pto2	Proposed	Pittosporum tobira	海桐花	2000	1800	17	Low branching; multi-trunks; round shape
Small Tree	Sfo2	Proposed	Syzygium formosanum, Taiwan eugenia	紅芽赤楠	1500	800	5	Low branching; multi-trunks; round shape
Grand total: 118							118	

4.11.3.3 Shrubs Schedule

<u>Step 1</u>

Create a new **Floor** schedule to report Shrub information, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off. Rename the schedule as **Shrubs Schedule** and click **OK**

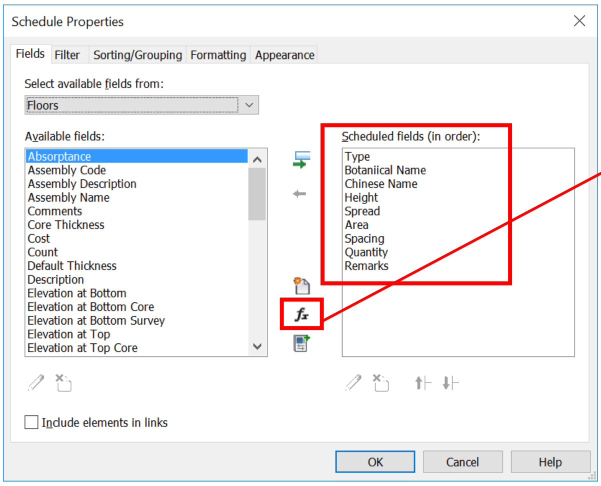
<u>Sample of Shrubs Schedule</u>

<Shrubs Schedule>							
A	B	C	D	E	F	G	H
Type	Botaniical Name	Chinese Name	Height	Spread	Area	Spacing	Quantity
Climber_Loj	Lonicera japonica	金銀花			45.775 m²	0.040 m²	1144
Climber_Psa	Pseudocalymma alliaceum	蒜香藤	0	0	95.666 m²	0.090 m²	1063
Groundcover_Aco	Ageratum conyzoides	藿香薊	150	150	48.342 m²	0.023 m²	2102
Groundcover_Cha	Cuphea hyssopifolia cv. Alba	白雪茄花	300	250	24.516 m²	0.063 m²	389
Groundcover_Iwa	Ixora x williamsii 'Dwarf Alba'	矮白仙丹	200	250	21.596 m²	0.040 m²	540
Groundcover_Lgr	Eustoma grandiflorum(Lisianthus g.)	洋桔梗六角花	300	250	16.117 m²	0.040 m²	403

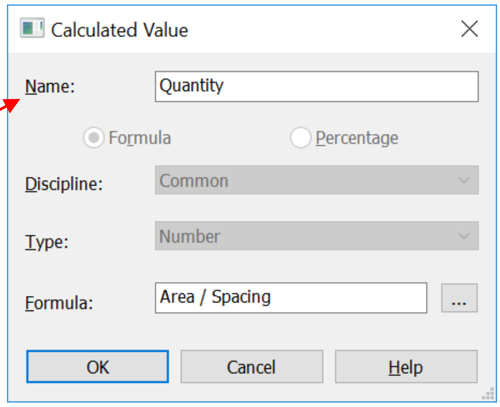
<u>Step 2</u>

<u>Schedule Properties and Setting</u>

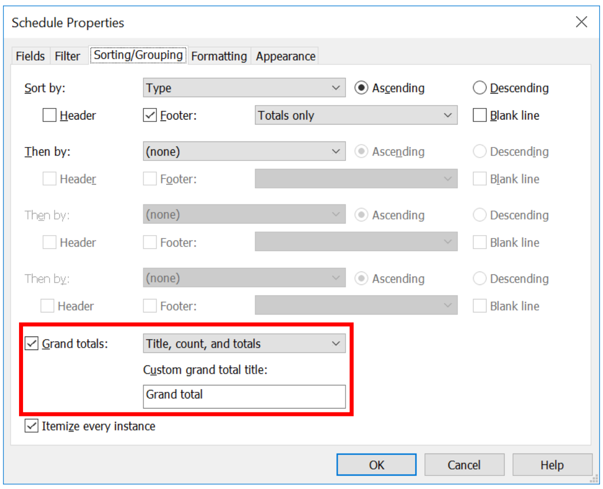
- Fields



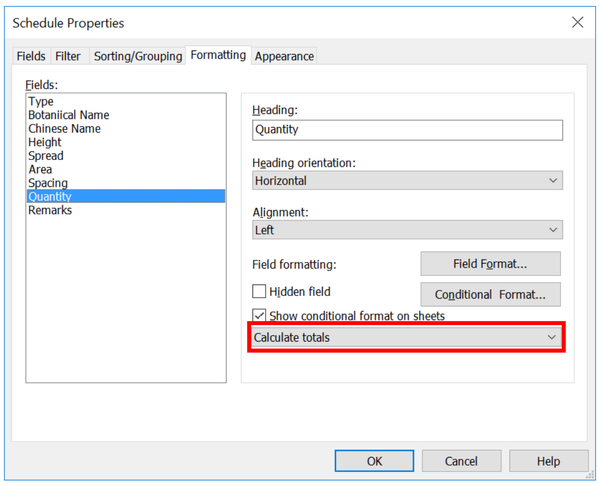
- Calculated Value - **Quantity**



- Sorting/Grouping



- Formatting - **Quantity**

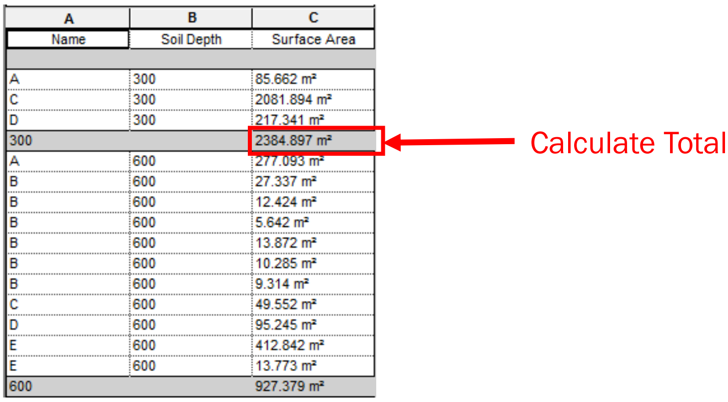


4.11.3.4 Soil Area Schedule

Step 1

Create a new **Topography** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

Sample of Soil Schedule

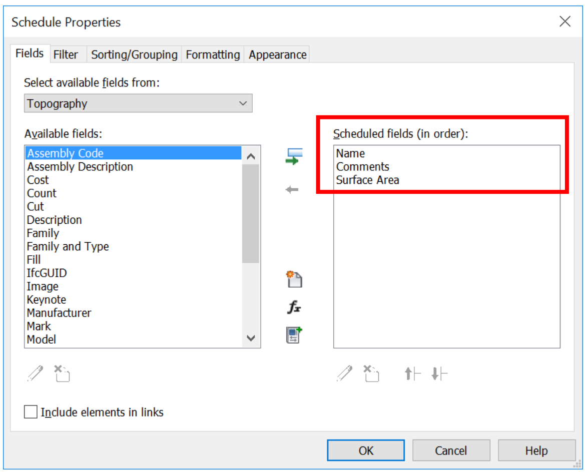


A	B	C
Name	Soil Depth	Surface Area
A	300	85.662 m²
C	300	2081.894 m²
D	300	217.341 m²
300		2384.897 m²
A	600	277.093 m²
B	600	27.337 m²
B	600	12.424 m²
B	600	5.642 m²
B	600	13.872 m²
B	600	10.285 m²
B	600	9.314 m²
C	600	49.552 m²
D	600	95.245 m²
E	600	412.842 m²
E	600	13.773 m²
600		927.379 m²

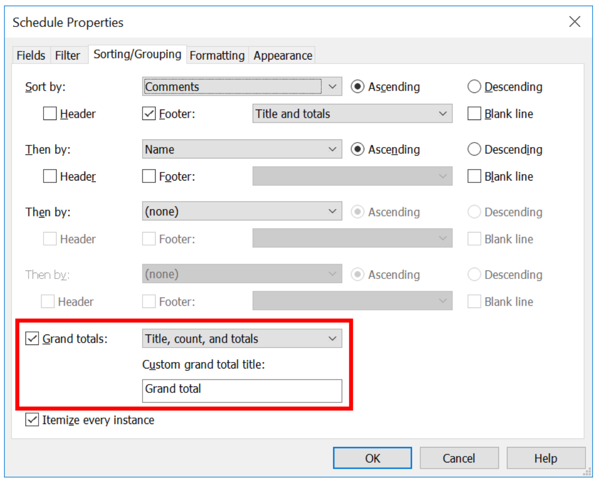
Step 2

Schedule Properties and Setting

- Fields

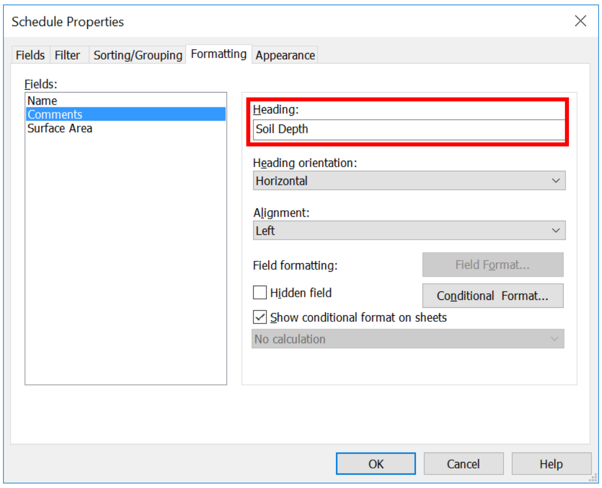


- Sorting/Grouping

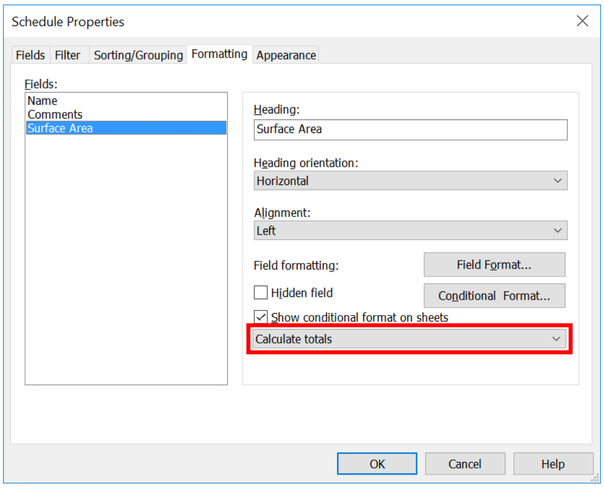


4.11.3.4 Soil Area Schedule (Cont'd)

❖ Formatting - **Comments**



❖ Formatting – **Surface Area**



5. Detailed Modelling Guidelines – Structural Engineering and Site Formation

5.1 Site Formation (Applicable for project with toposurface model provided)

This section mainly focuses on the Site Formation QTO (by taking retaining wall for demonstration) of the following items:

i. RC Wall
ii. RC Foundation
iii. Blinding (to be input by QS)
iv. Formwork (to be input by QS)
v. Movement Joint (to be input by QS)
vi. Excavation (Applicable for project with toposurface model provided)

5.1.1 Basic Information

5.1.1.1 Building Elements to Model

<u>Modelling elements:</u>

Elements	Object Category
Retaining Wall – Wall	Structure/ Structure/ Wall
Retaining Wall – Foundation	Structure/ Foundation/ Slab Structure/ Foundation/ Isolated Structure/ Foundation/ Wall
Site Terrain	1. Massing & Site/ Model Site/ Toposurface
	2. Massing & Site/ Model Site/ Building Pad

5.1.1.2 Sequence of modelling

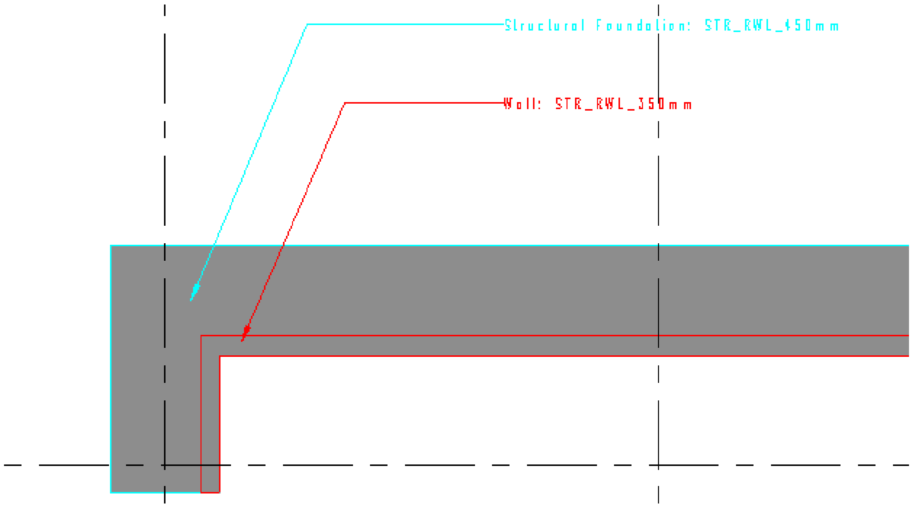
<u>The sequence of modelling:</u>

Site Terrain (Toposurface) > Retaining Wall – Wall > Retaining Wall - Foundation > Excavation Works (Building Pad)

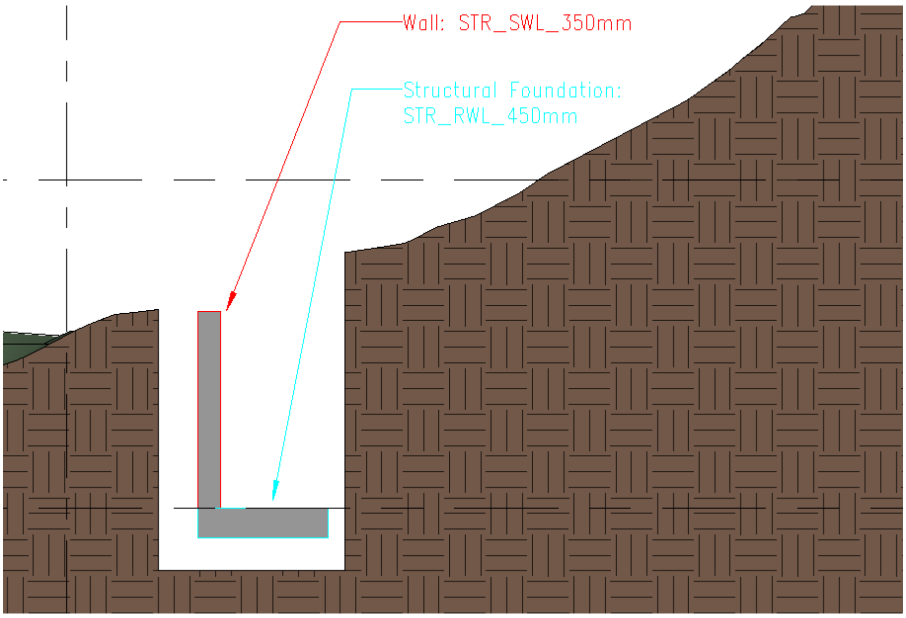
5.1.1.3 Sample of Retaining Wall

1. Retaining Wall

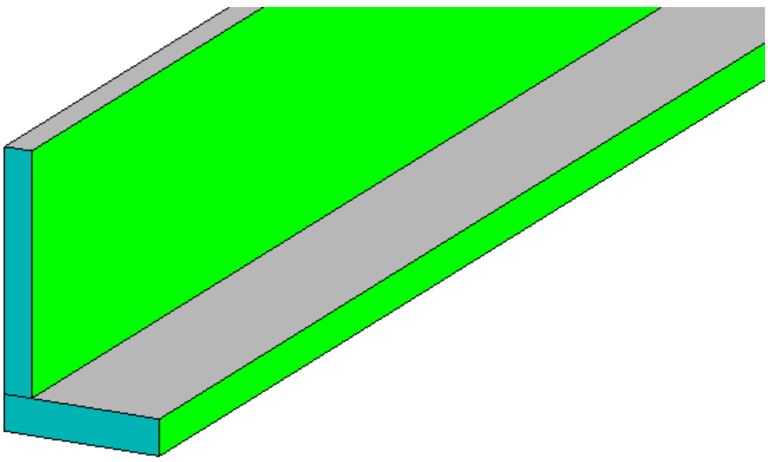
Plan View



Section View



3D View



5.1.2 Modelling Approach

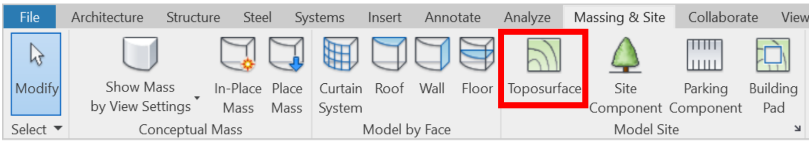
5.1.2.1 Site Terrain - Toposurface

5.1.2.1.1 Application

<u>Create a new Toposurface</u>

<u>Step 1</u>

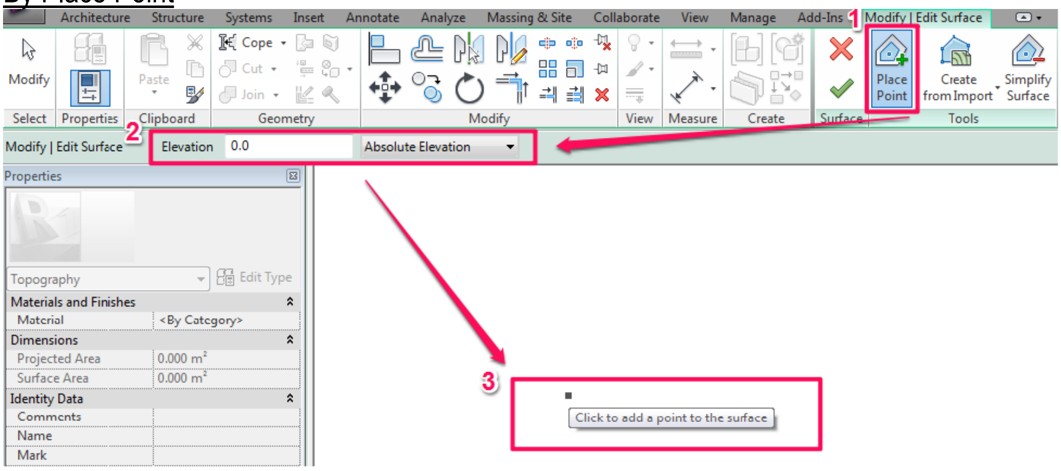
Go to the Massing & Site Tab > Model Site panel > Toposurface



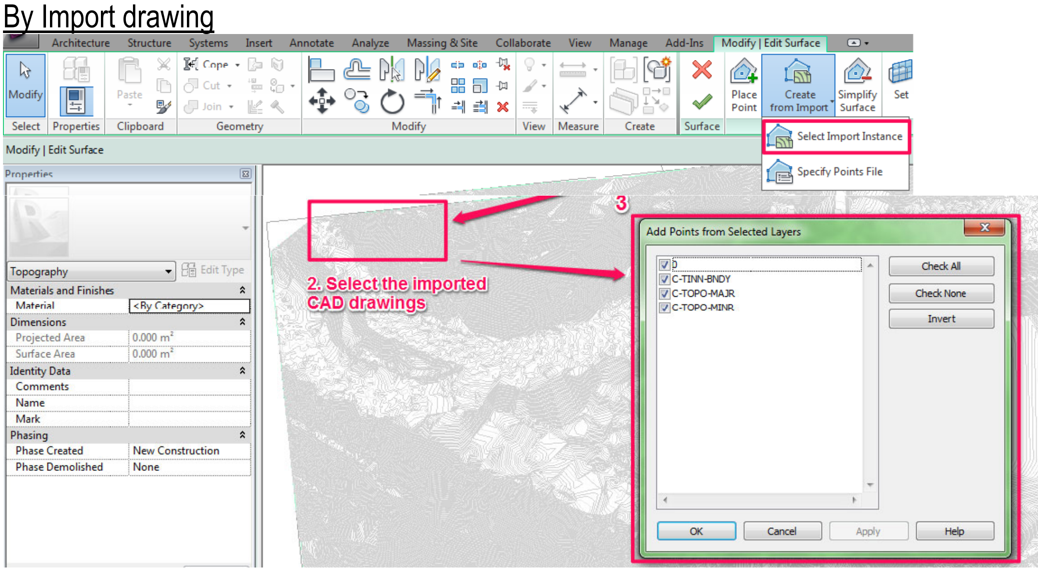
<u>Step 2</u>

Two method to create a new Toposurface:

<u>By Place Point</u>



<u>By Import drawing</u>



<u>Step 3</u>

Click “Tick” to finish.

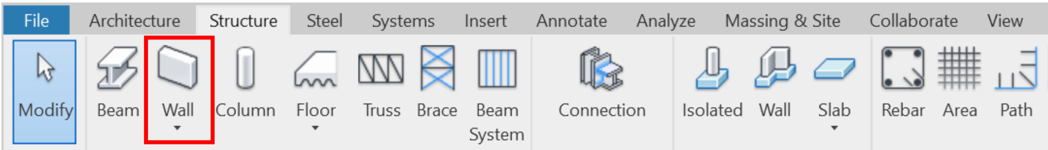
5.1.2.2 Retaining Wall – Wall

5.1.2.2.1 Application

<u>Placing wall</u>

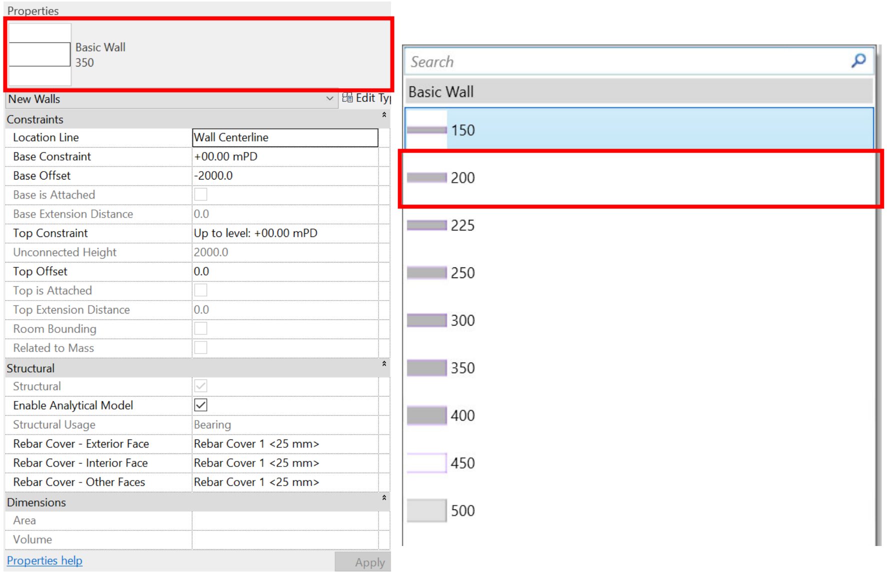
<u>Step 1</u>

Go to the Structure Tab > Build Panel > Wall



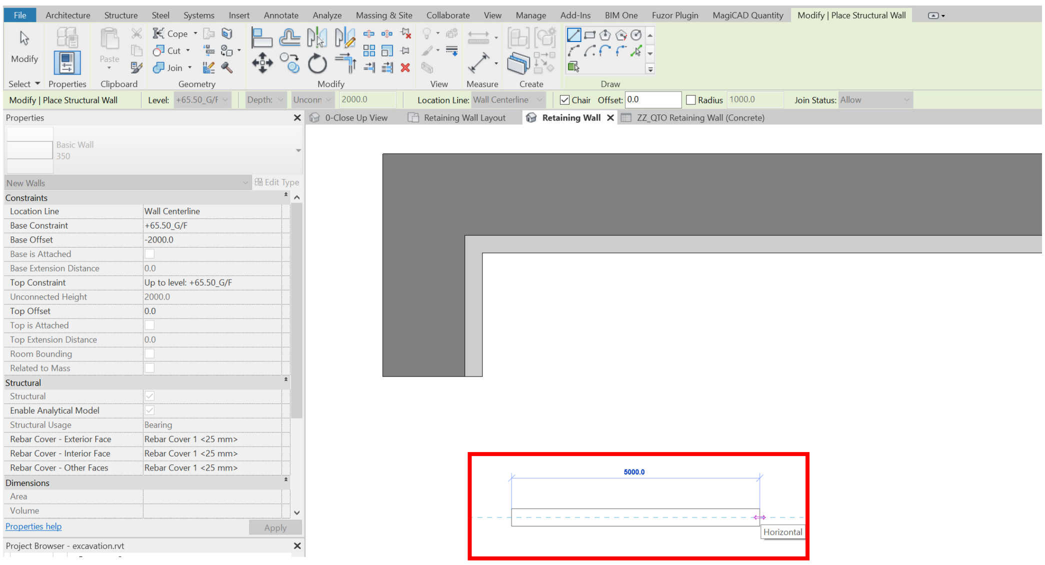
<u>Step 2</u>

Select the wall type in the properties window



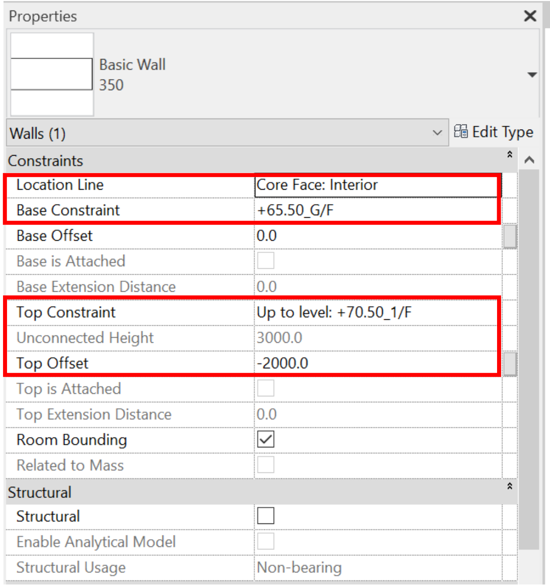
<u>Step 3</u>

Draw the wall on the activated Floor Plan View or 3D View



Step 4

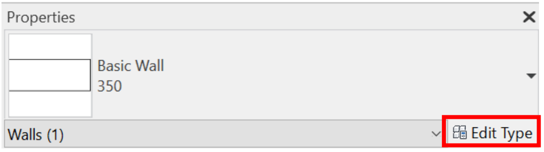
Select the wall and change the wall height in the properties window



Create Wall Type

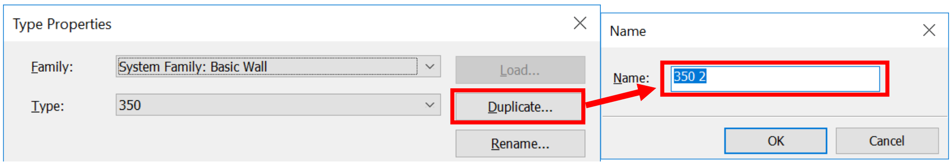
Step 1

Select the wall > Click the **Edit Type** in the Properties window



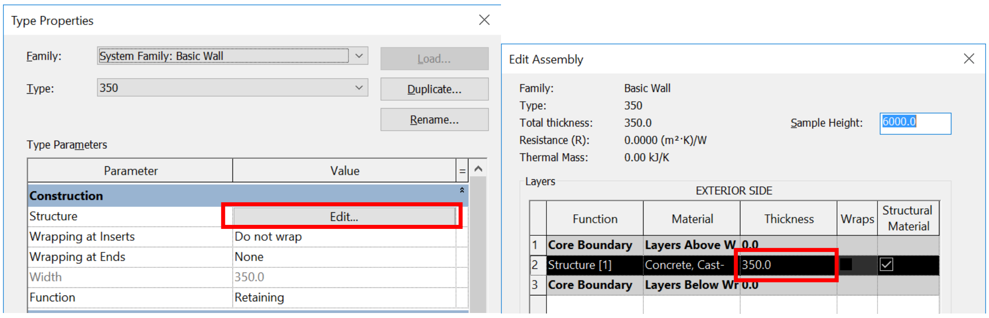
Step 2

Duplicate the existing type of wall > Type the Wall name



Step 3

Edit the Wall Structure and type the wall thickness in the Thickness field



Step 4

Click ok to finish

5.1.2.2.2 Properties

The major properties in Schedule:

			Remark
i)	Naming		
	Properties > Change Type Panel		
	(1) Object Name	e.g. Basic Wall	Figure 1
ii)	Parameter Input (By Modeller)		
	Properties > Identity Data		
	(2) **Mark**	e.g. RW-5	Retaining Wall Mark; Figure 1
	Properties > Other		
	(3) **Concrete Grade**	e.g. Grade 35/20	Figure 1
	(4) **QS Curved element**	e.g. No	Figure 1
iii)	Parameter Input (By QS)		
	Properties > Other		
	(5) **Wall Type**	e.g. Retaining Wall	Figure 1
	(6) **Element Code**	e.g. XWRS	Sub-Element Code; Figure 1
iv)	Material/ Thickness		
	Properties > Edit Type > Construction > Structure		
	(7) **Material**	e.g. Concrete	Figure 2
	(8) **Width**	e.g. 250	Wall Thickness; Figure 2; The Wall thickness can be found at the Type Name, see Figure 1

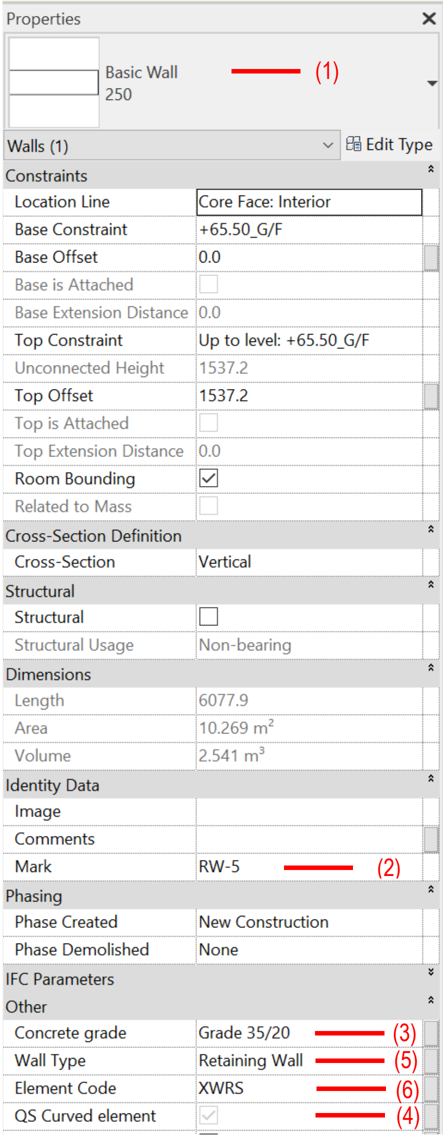


Figure 1 Wall Properties

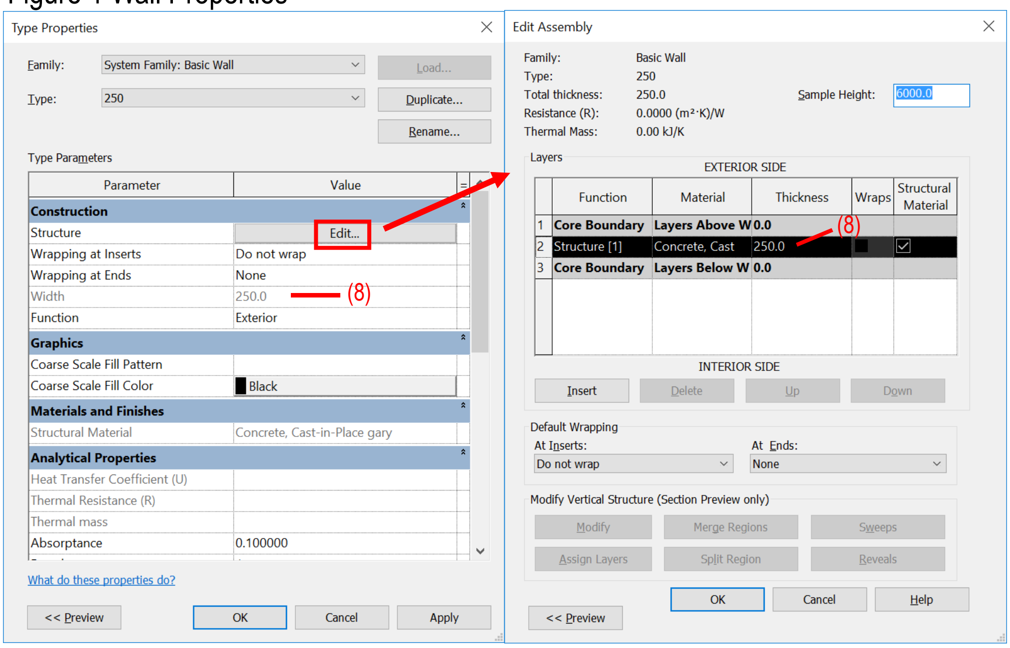


Figure 2 Wall Type Properties

5.1.2.3 Retaining Wall – Foundation

5.1.2.3.1 Application

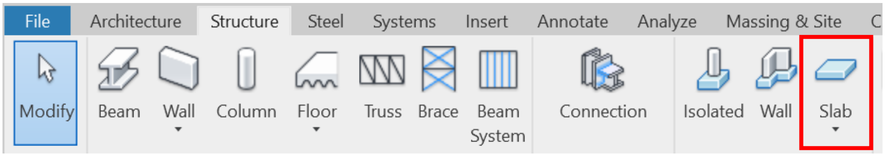
Create a new foundation slab for retaining wall – foundation

- **By Structure - Foundation - Slab**
- **By Structure - Foundation - Isolated**
- **By Structure - Foundation - Wall**

By Structure - Foundation - Slab

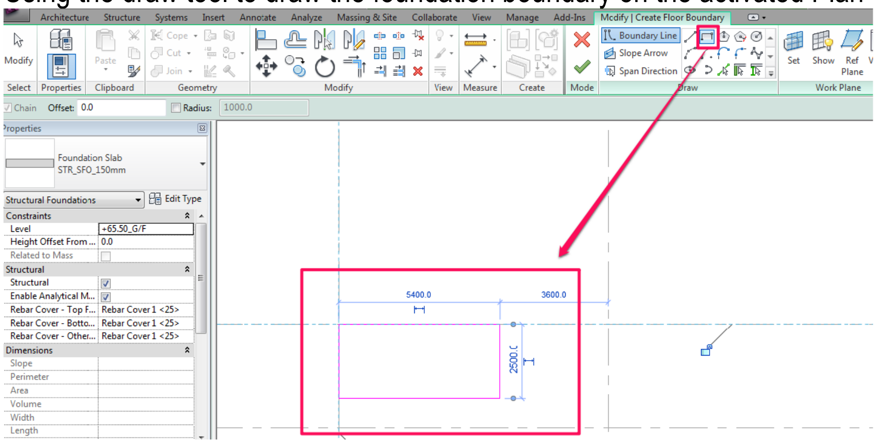
Step 1

Go to the Structure Tab > Foundation Panel > Slab



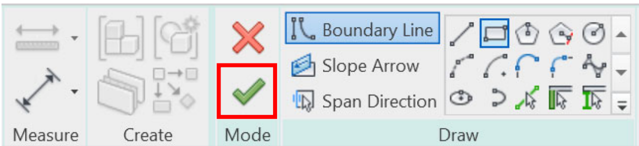
Step 2

Using the draw tool to draw the foundation boundary on the activated Plan View or 3D View



Step 3

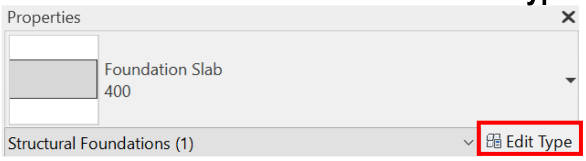
Click "Tick" to finish



Change Foundation Slab Type

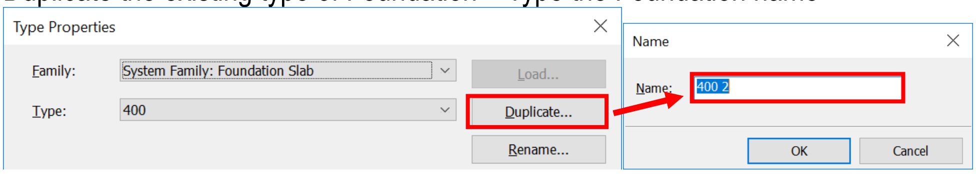
Step 1

Select the Foundation Slab > Click the **Edit Type** in the Properties window



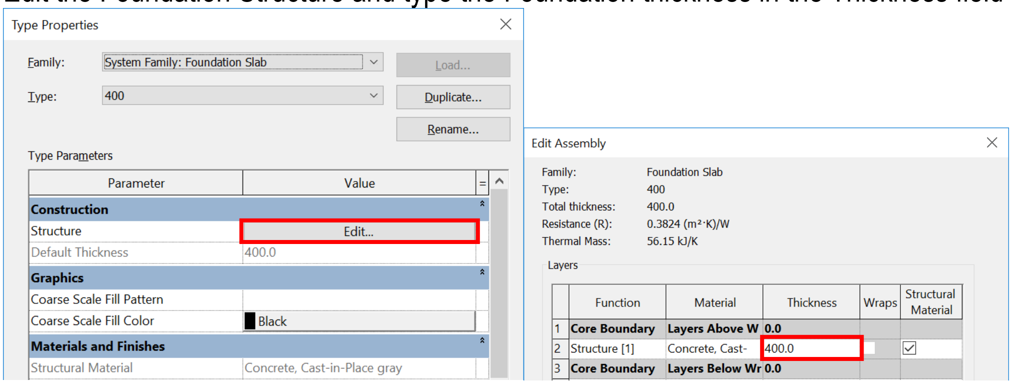
Step 2

Duplicate the existing type of Foundation > Type the Foundation name



Step 3

Edit the Foundation Structure and type the Foundation thickness in the Thickness field



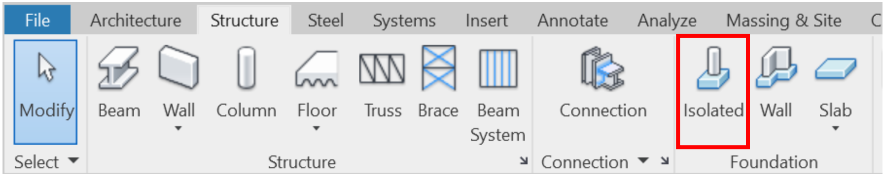
Step 4

Click OK to finish.

By Structure - Foundation - Isolated

Step 1

Go to the Structure Tab > Foundation Panel > Slab

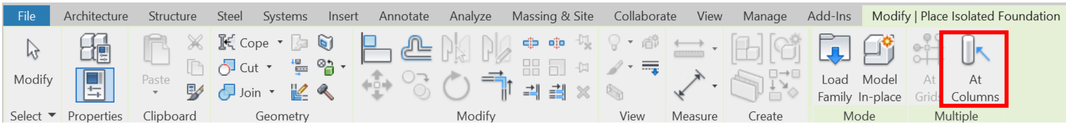


Step 2

To place a single footing click in the drawing area on the activated Plan View or 3D View.

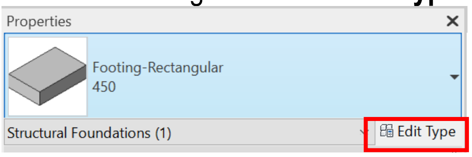
OR

To place multiple instances of the footing beneath specific columns,
go to the Modify | Place Isolated Foundation > Multiple panel > At Columns > Select the columns > Finish

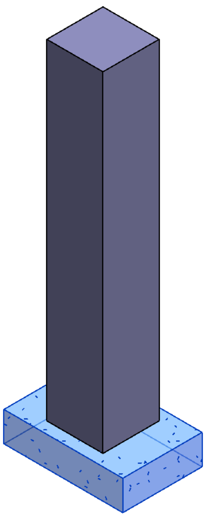


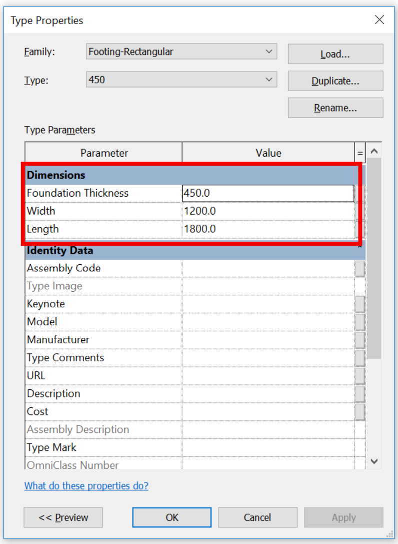
Step 3

Select the footing > Click the **Edit Type** in the Properties window



Edit the Foundation thickness, Width and Length in the Dimensions field.





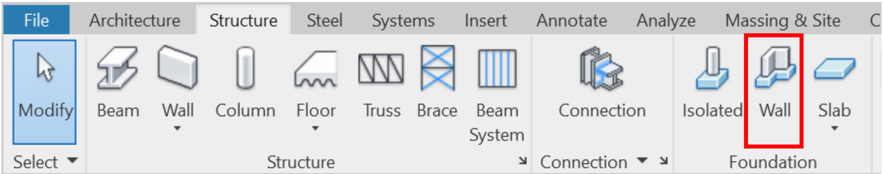
Step 4

Click OK to finish.

By Structure - Foundation - Wall

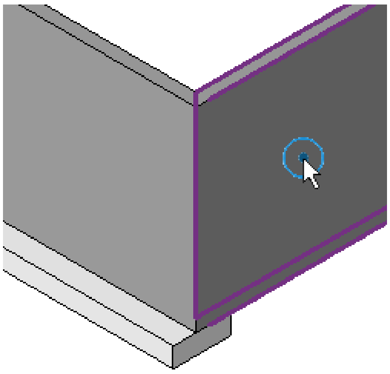
Step 1

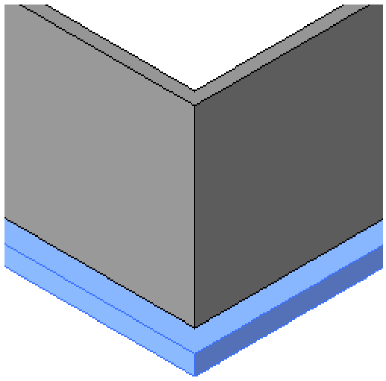
Go to the Structure Tab > Foundation Panel > Wall



Step 2

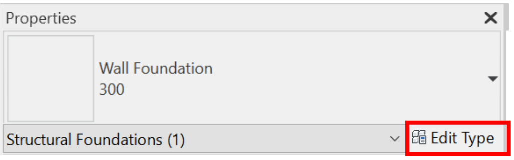
Select a wall to receive the wall foundation on the activated Plan View or 3D View.



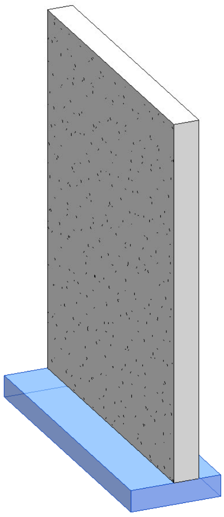


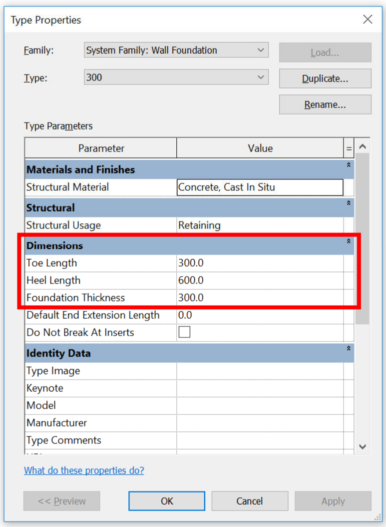
Step 3

Select the Foundation Slab > Click the **Edit Type** in the Properties window



Edit the Foundation Toe Length, Heel Length and Thickness in the Dimensions field.





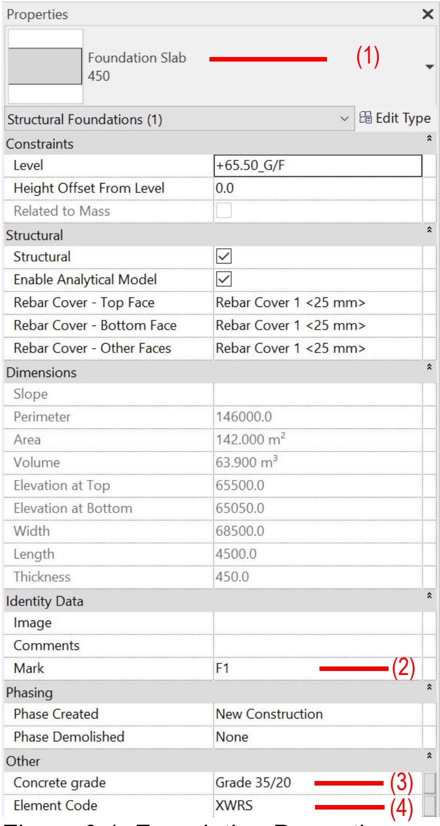
Step 4

Click OK to finish.

5.1.2.3.2 Properties

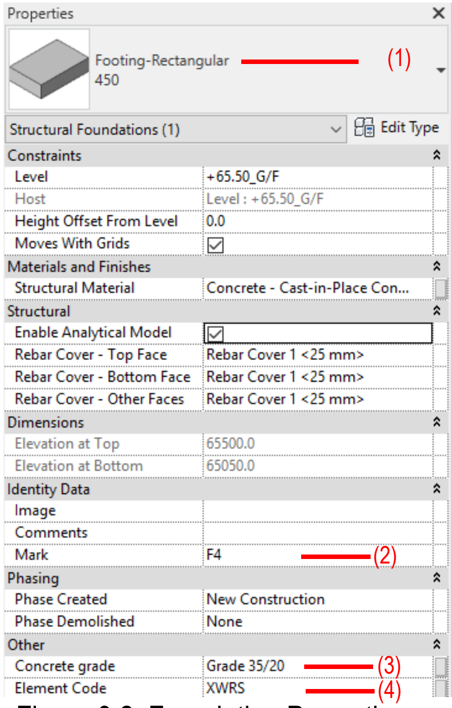
The major properties in Schedule:

			Remark
i)	Naming		
	Properties > Change Type Panel		
	(1) Object Name	e.g. Foundation Slab Footing-Rectangular Wall Foundation	Figure 3.1 Figure 3.2 Figure 3.3
ii)	Parameter Input (By Modeller)		
	Properties > Identity Data		
	(2) **Mark**	e.g. F1 F4 F3	Figure 3.1 Figure 3.2 Figure 3.3
	Properties > Other		
	(3) **Concrete grade**	e.g. Grade 35/20	Figure 3.1-3.3
iii)	Parameter Input (By QS)		
	Properties > Identity Data		
	(4) **Element Code**	e.g. XWRS	Sub-Element Code; Figure 3.1 – 3.3
iv)	Material/ Thickness		
	Properties > Edit Type		
	(5) **Material** (6) **Thickness**	e.g. Concrete e.g. 450 300	Figure 4.1 & 4.2; default material Retaining Wall – Foundation thickness; Figure 4.1; The foundation thickness can be found at the Type Name, see Figure 3.1 – 3.3



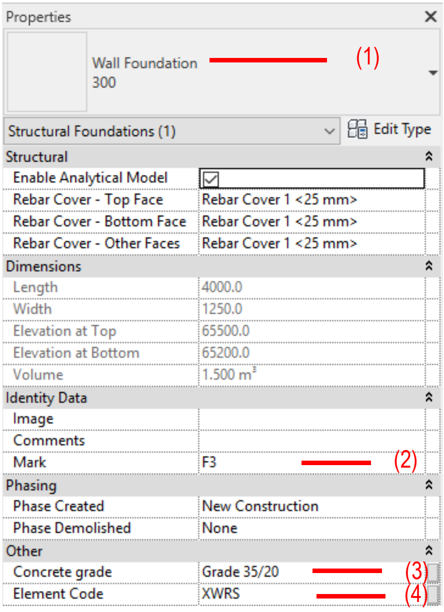
Properties	
Foundation Slab 450	(1)
Structural Foundations (1)	Edit Type
Constraints	
Level	+65.50_G/F
Height Offset From Level	0.0
Related to Mass	
Structural	
Structural	☑
Enable Analytical Model	☑
Rebar Cover - Top Face	Rebar Cover 1 <25 mm>
Rebar Cover - Bottom Face	Rebar Cover 1 <25 mm>
Rebar Cover - Other Faces	Rebar Cover 1 <25 mm>
Dimensions	
Slope	
Perimeter	146000.0
Area	142.000 m^2
Volume	63.900 m^3
Elevation at Top	65500.0
Elevation at Bottom	65050.0
Width	68500.0
Length	4500.0
Thickness	450.0
Identity Data	
Image	
Comments	
Mark	F1 (2)
Phasing	
Phase Created	New Construction
Phase Demolished	None
Other	
Concrete grade	Grade 35/20 (3)
Element Code	XWRS (4)

Figure 3.1 Foundation Properties (By Foundation – Slab)



Properties	
Footing-Rectangular 450	(1)
Structural Foundations (1)	Edit Type
Constraints	
Level	+65.50_G/F
Host	Level : +65.50_G/F
Height Offset From Level	0.0
Moves With Grids	☑
Materials and Finishes	
Structural Material	Concrete - Cast-in-Place Con...
Structural	
Enable Analytical Model	☑
Rebar Cover - Top Face	Rebar Cover 1 <25 mm>
Rebar Cover - Bottom Face	Rebar Cover 1 <25 mm>
Rebar Cover - Other Faces	Rebar Cover 1 <25 mm>
Dimensions	
Elevation at Top	65500.0
Elevation at Bottom	65050.0
Identity Data	
Image	
Comments	
Mark	F4 (2)
Phasing	
Phase Created	New Construction
Phase Demolished	None
Other	
Concrete grade	Grade 35/20 (3)
Element Code	XWRS (4)

Figure 3.2 Foundation Properties (By Foundation – Isolated)



Properties	
Wall Foundation 300	(1)
Structural Foundations (1)	Edit Type
Structural	
Enable Analytical Model	☑
Rebar Cover - Top Face	Rebar Cover 1 <25 mm>
Rebar Cover - Bottom Face	Rebar Cover 1 <25 mm>
Rebar Cover - Other Faces	Rebar Cover 1 <25 mm>
Dimensions	
Length	4000.0
Width	1250.0
Elevation at Top	65500.0
Elevation at Bottom	65200.0
Volume	1.500 m^3
Identity Data	
Image	
Comments	
Mark	F3 (2)
Phasing	
Phase Created	New Construction
Phase Demolished	None
Other	
Concrete grade	Grade 35/20 (3)
Element Code	XWRS (4)

Figure 3.3 Foundation Properties (By Foundation – Wall)

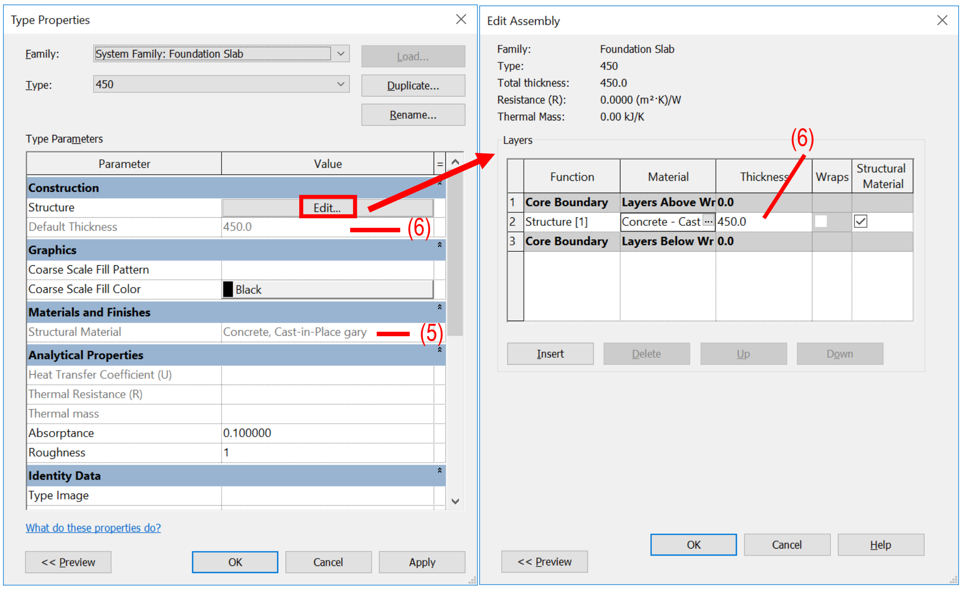


Figure 4.1 Foundation Type Properties (By Foundation – Slab)

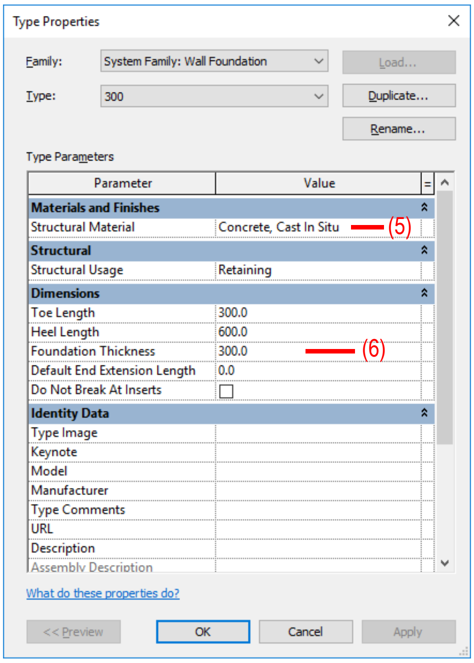


Figure 4.2 Foundation Type Properties (By Foundation – Wall)

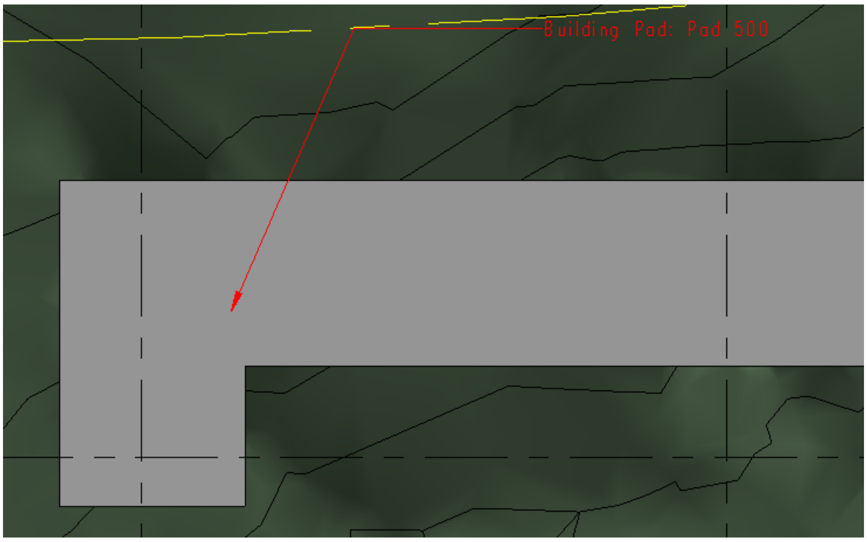
5.1.3 Quantity Take-off

5.1.3.1 Excavation

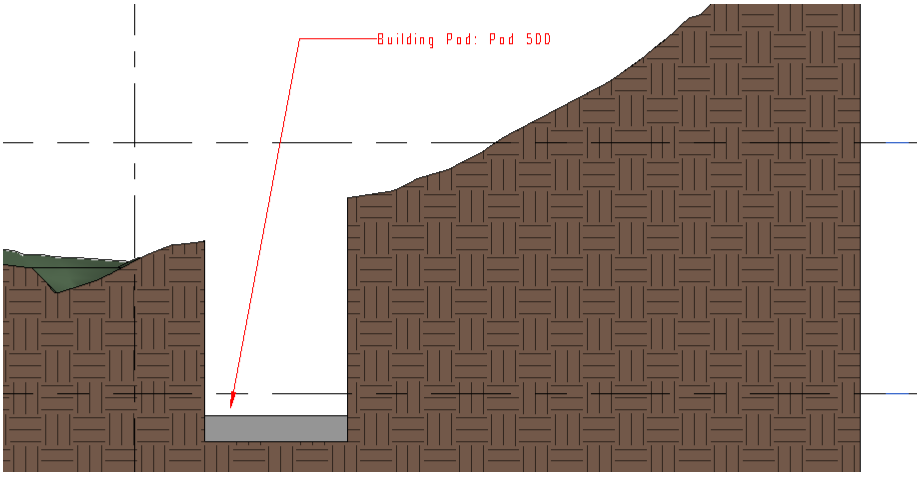
5.1.3.1.1 Sample of Cut & Fill Model

1. Cut & Fill (Excavated Model)

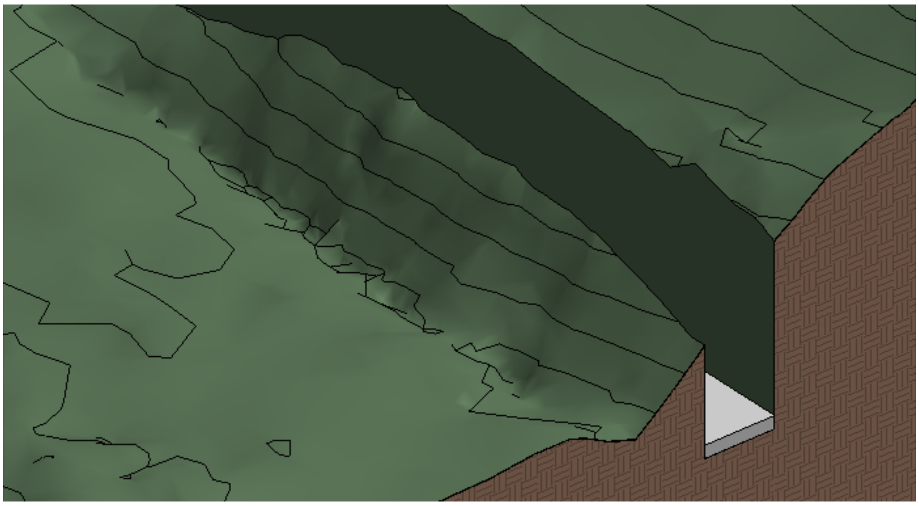
Plan View



Section View

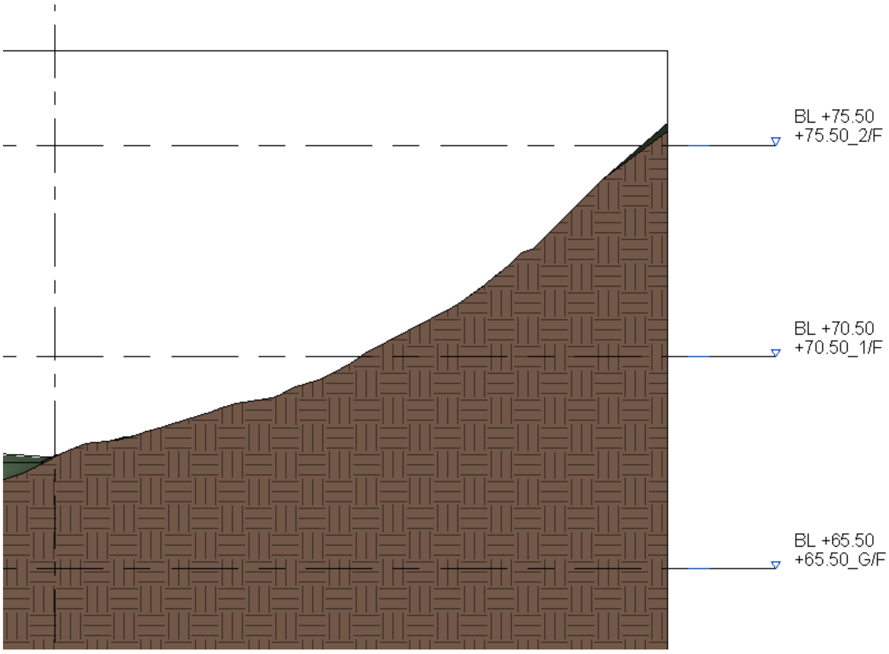


3D View

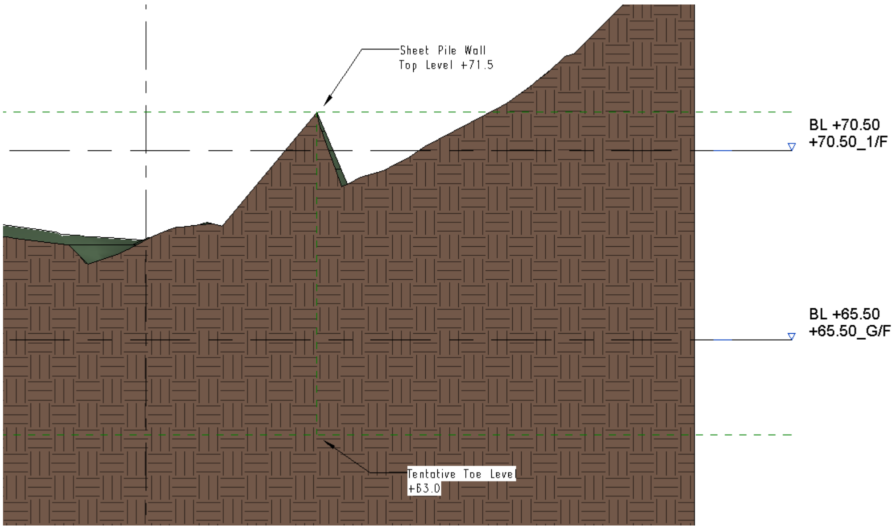


2. Cut & Fill (Filled Model)

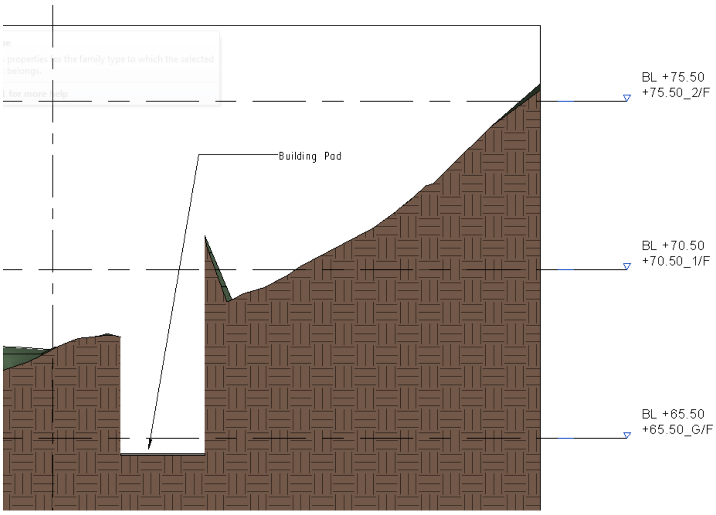
Before
(Original
Terrain)



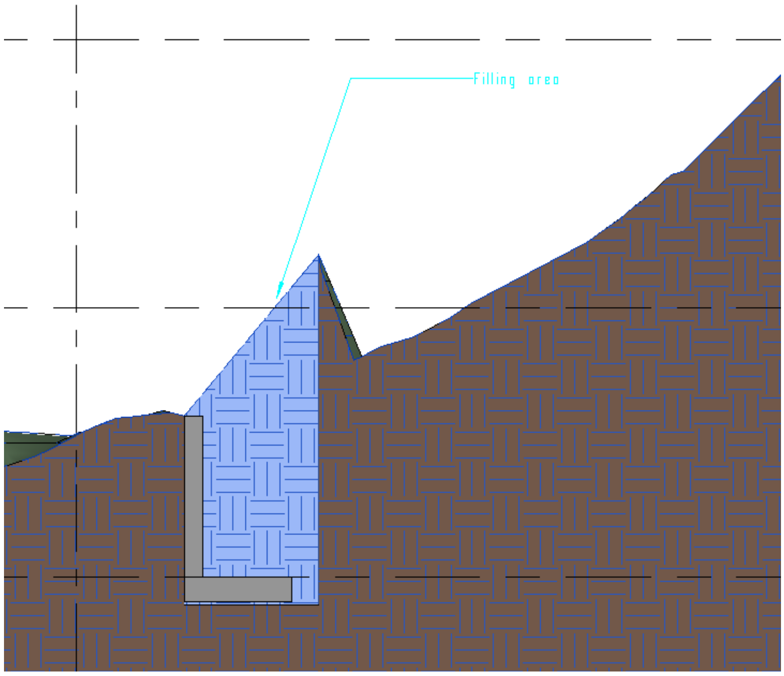
Working – 1
(Formed
Terrain)



Working – 2
(Create the
Building Pad)



After (Graded Region the Toposurface)



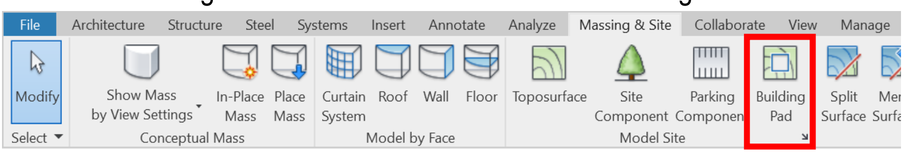
Cut and Fill (Excavation Model) and Cut and Fill (Fill Model) are for use in measurement only.

5.1.3.1.2 Building Pad - Application

<u>Create a new building pad (For Measurement of Excavation Works)</u>

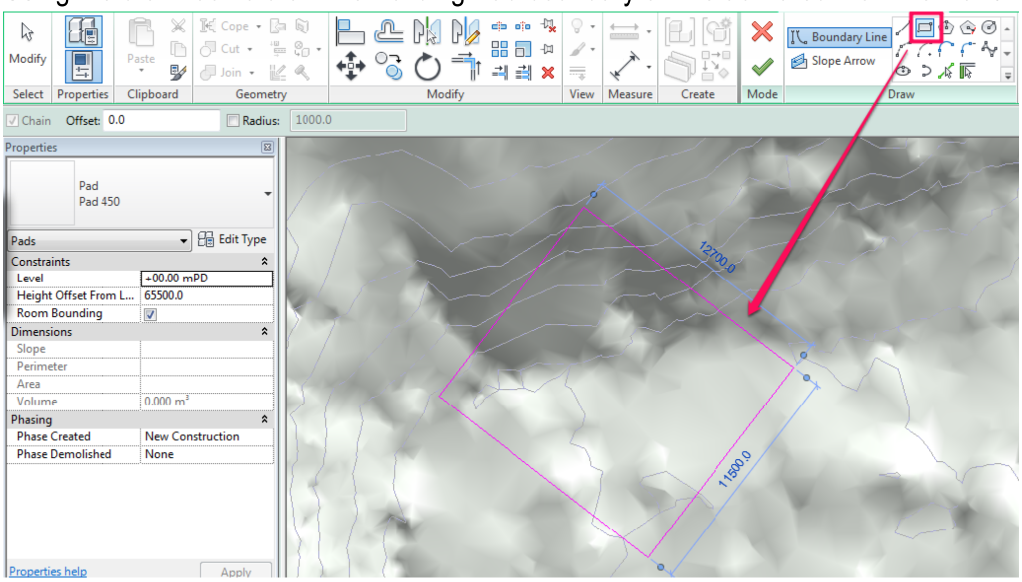
<u>Step 1</u>

Go to the Massing & Site Tab > Model Site Panel > Building Pad



<u>Step 2</u>

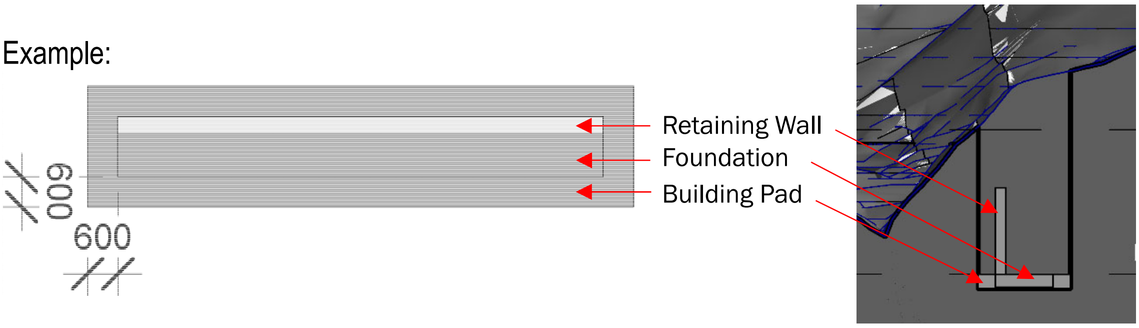
Using the draw tool to draw the Building Pad boundary on the activated Plan View or 3D View.



Step 3

When drawing the Building Pad boundary, allow working space for excavation as appropriate.

Example:



Step 4

Click "Tick" to finish

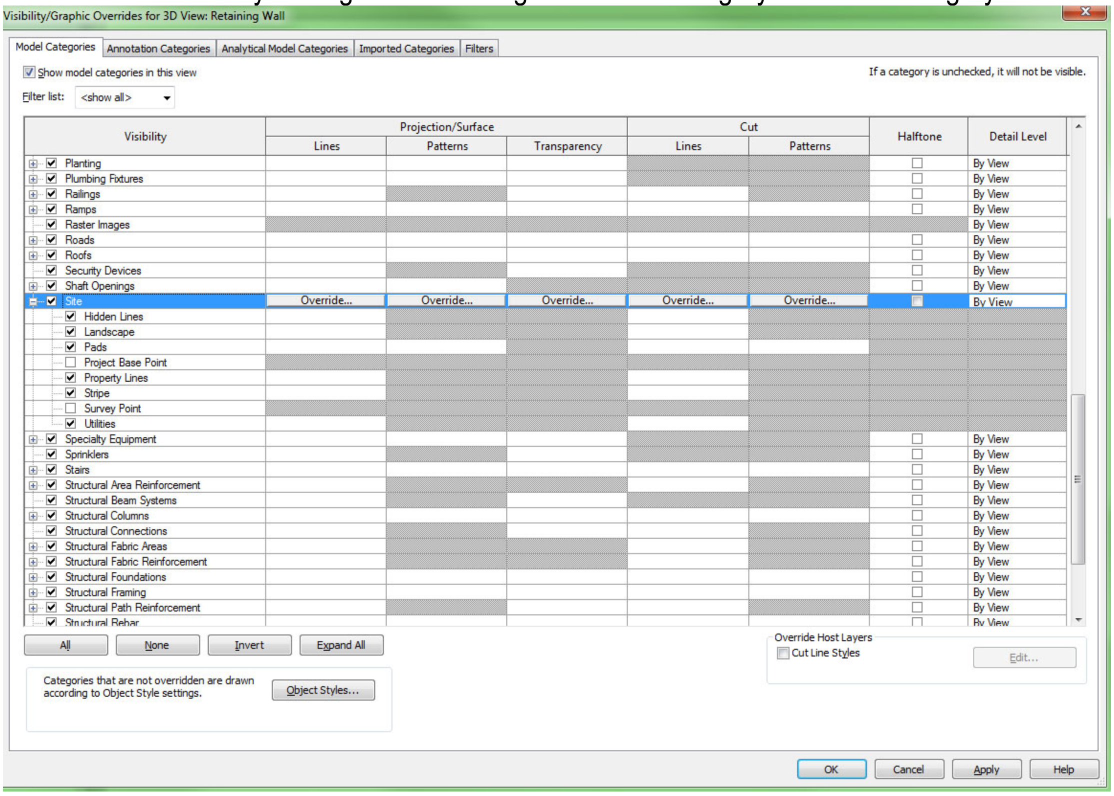
Using the Building Pad to set out the excavation depth

Step 1

Activate the 3D View.

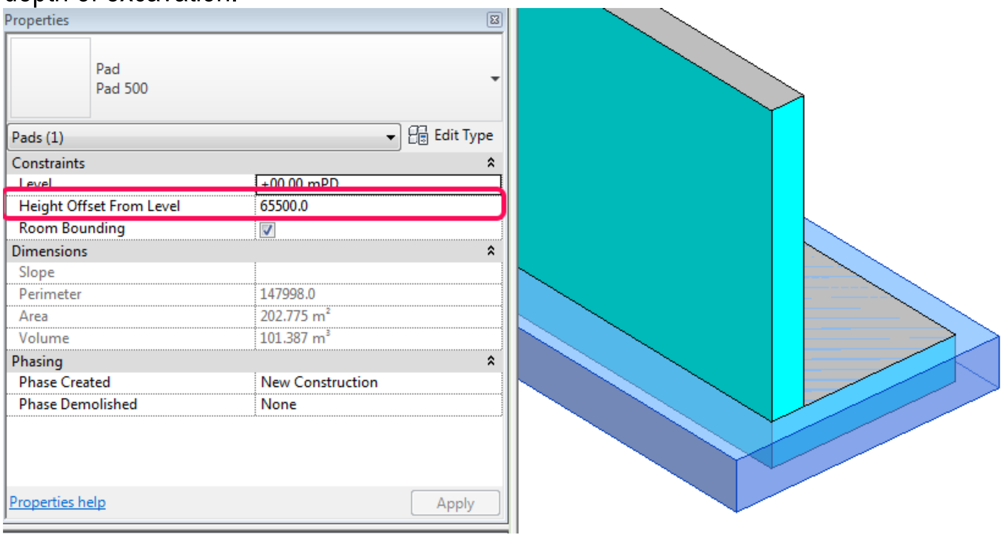
Step 2

Make sure the Visibility Setting > Model Categories > Site Category & the Sub-category **Pads** are checked.



Step 3

Select Building Pad in 3D View, and change the properties **Height offset From Level**, to control the depth of excavation.



5.1.3.1.3 Building Pad - Properties

1. The major properties in Schedule (Building Pad):

		Remark
(i) Name		
Properties > Change Type Panel		
(1) Object Name (2) Type Name	e.g. Pad e.g. Pad 500	Figure 5 Figure 5
(ii) Pad Level		
Properties > Constraints		
(3) **Level** (4) **Height Offset From Level**	e.g. +00.00 mPD e.g. 65500	Figure 5 Figure 5; Pad level should be equal to the bottom level of structural foundation

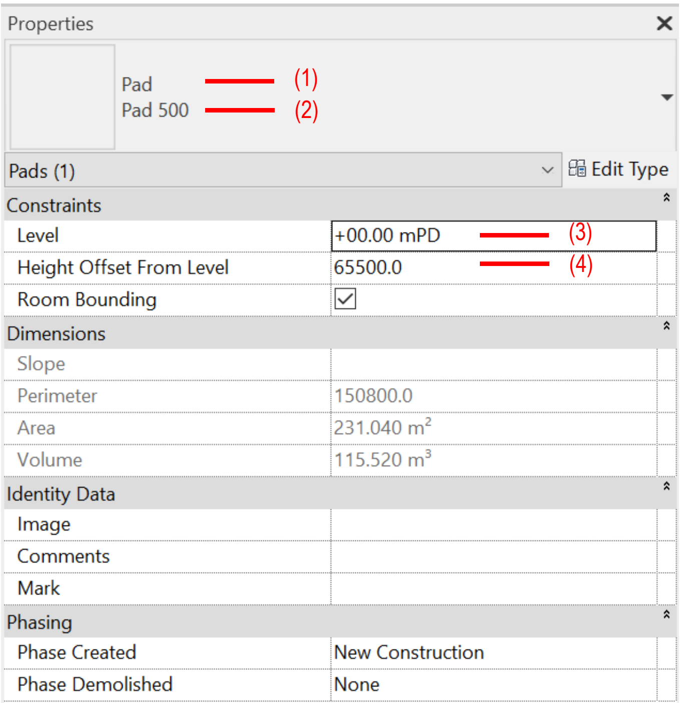


Figure 5 Building Pad Properties

2. The major properties in Schedule (Toposurface with Building Pad):

		Remark
(i) Parameter Input		
Properties > Identity Data		
(1) **Comments**	e.g. Cut & Fill	Figure 6
(2) **Name**	e.g. RW-1, RW-2	Figure 6

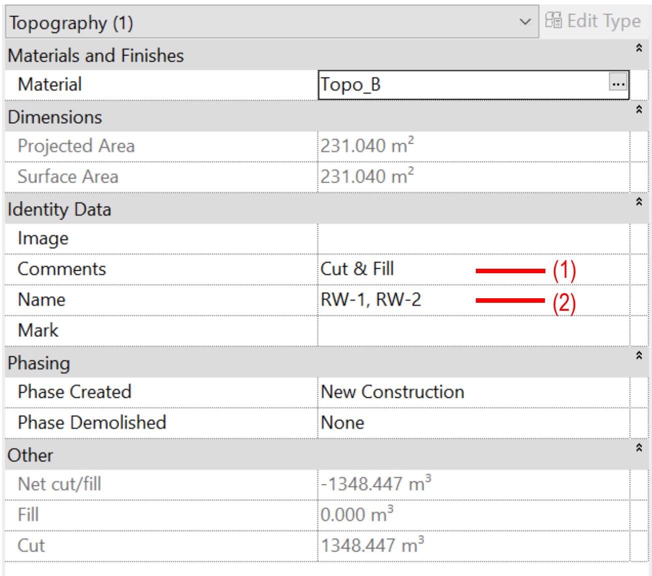


Figure 6 Toposurface Properties

5.1.3.1.4 Cut & Fill Schedule

Step 1

Create a new **Toposurface** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off

<QTO.1_Cut & Fill Schedule (Retaining Wall - Cut)>

A	B	C	D	E	F
Name	Comments	Cut	Fill	Projected Area	Caculated Average Deep
RW-1, RW-2	Cut & Fill	1348.45 m³	0.00 m³	231 m²	5.84 m
RW-3, RW-4, RW-5	Cut & Fill	454.93 m³	0.00 m³	126 m²	3.60 m
Total: 2		1803.38 m³	0.00 m³		

Figure 9

		Remark	**BQ Items**
Name	e.g. RW-1, RW-2	Refer to Figure 6, (2)	
Cut	e.g. 1348.45 m^3	Refer to Figure 7; Using the Building Pad to control the excavation deep;	Excavation; Excavating trenches for retaining walls; commencing at natural ground level; not exceeding 1.50m deep*
Fill	e.g. 0.00 m^3		
Projected Area	e.g. 231 m^2		

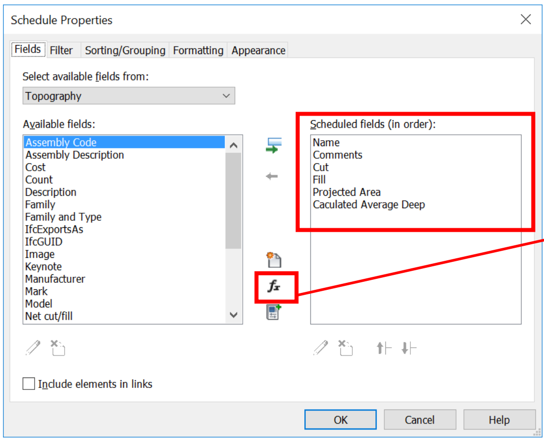
* Further manipulation for the excavation depth in successive stages of 1.50m, backfilling to excavation and disposal could be done in Excel.

5.1.3.1.4 Cut & Fill Schedule (Cont'd)

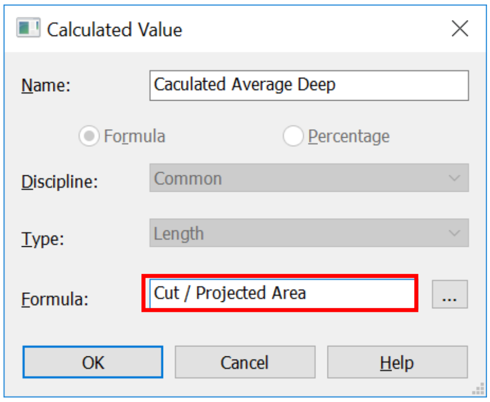
Step 2

Schedule Properties and Setting

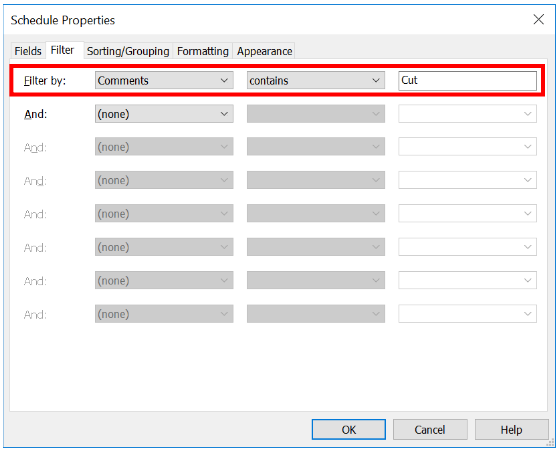
❖ Fields



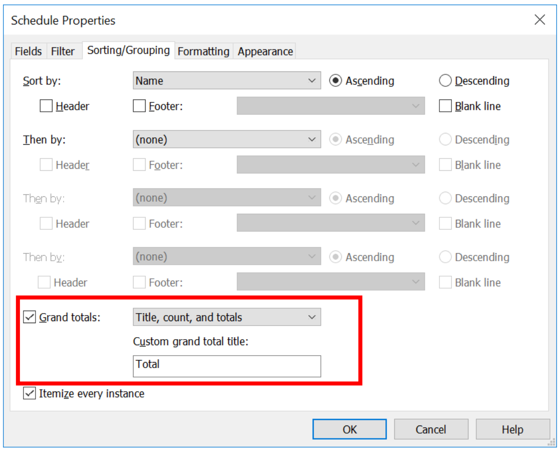
❖ Calculated Value – **Calculated Average Deep**



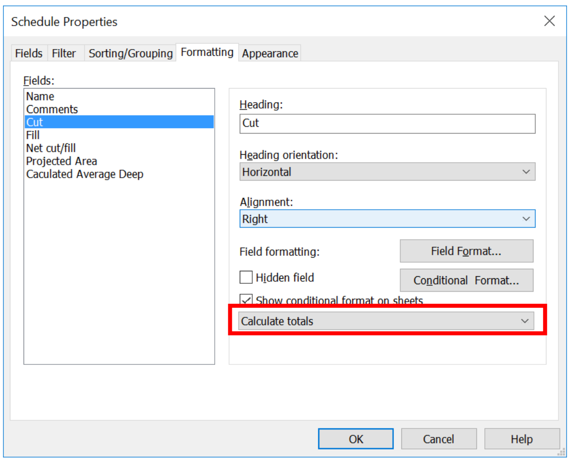
❖ Filter



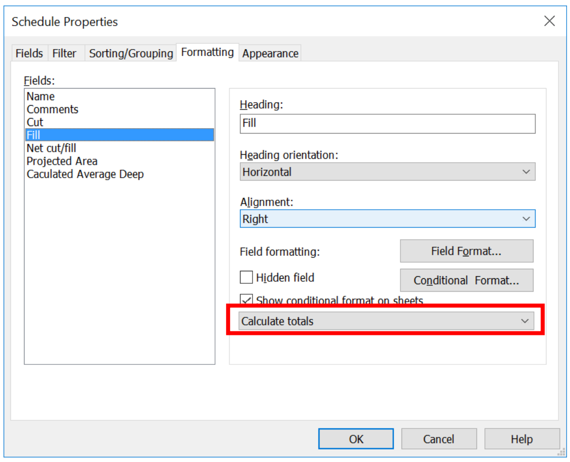
❖ Sorting/Grouping



❖ Formatting - **Cut**



❖ Formatting – **Fill**



5.1.3.2 RC Wall

Step 1

Create a new **Wall** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

<QTO.3_Retaining Wall Schedule>

A	B	C	D	E	F	G	H	I	J	K
Family	Type	Concrete grade	Wall Type	Special Shape	Length	Width	Unconnected Height	Volume	Mark	Element Code
Basic Wall	250	Grade 35/20	Retaining Wall	Curved	11.81	0.25	4.50	11.78 m³	RW-3	XWRS
Basic Wall	250	Grade 35/20	Retaining Wall	Curved	21.00	0.25	4.50	13.89 m³	RW-4	XWRS
Basic Wall	250	Grade 35/20	Retaining Wall	Curved	6.08	0.25	1.54	2.54 m³	RW-5	XWRS
250: 3								28.21 m³		
Basic Wall	350	Grade 35/20	Retaining Wall		2.68	0.35	3.00	2.81 m³	RW-1	XWRS
Basic Wall	350	Grade 35/20	Retaining Wall		66.68	0.35	3.00	70.01 m³	RW-2	XWRS
Basic Wall	350	Grade 35/20	Retaining Wall		4.00	0.35	5.00	7.00 m³	RW-6	XWRS
350: 3								79.82 m³		
Grand total: 6								108.03 m³		

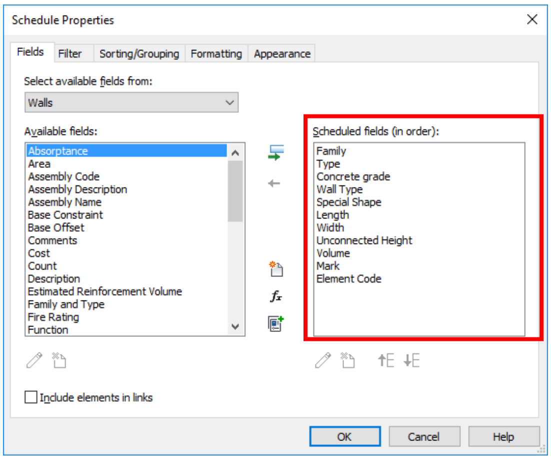
		Remark	**BQ Items**
Object	e.g. Basic Wall	Refer to Figure 1, (1)	
Type	e.g. 250	Refer to Figure 1, (2)	
Concrete grade	e.g. Grade 35/20	Refer to Figure 1, (4)	
Wall Type	e.g. Retaining Wall	Refer to Figure 1, (6)	
Special Shape	e.g. Curved	Refer to Figure 1, (5)	
Width	e.g. 0.25	Refer to Figure 2, (8)	
Volume	e.g. 11.78 m^3		Reinforced concrete; grade 35/20; retaining walls; 250 thick
Mark	e.g. RW-3	Refer to Figure 1, (3)	
Element Code	e.g. XWRS	Refer to Figure 1, (7)	

5.1.3.2 RC Wall (Cont'd)

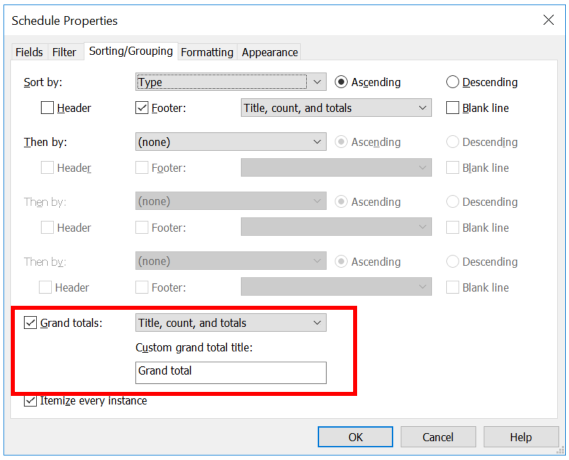
Step 2

Schedule Properties and Setting

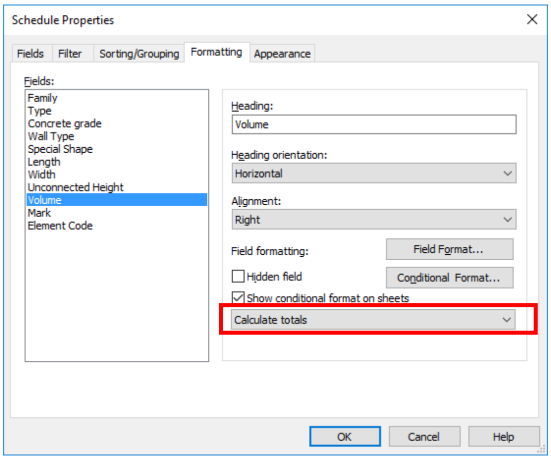
❖ Fields



❖ Sorting/Grouping



❖ Formatting - **Volume**



5.1.3.3 RC Foundation

Step 1

Create a new **Structural Foundation** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

<QTO.2_Structural Foundation Schedule>

A	B	C	D	E	F	G	H	I
Family	Type	Concrete grade	Length	Width	Foundation Thickness	Volume	Mark	Element Code
Foundation Slab	450	Grade 35/20	4.50	68.50	0.45	63.90 m³	F1	XWRS
Foundation Slab	350	Grade 35/20	35.20	14.31	0.35	26.22 m³	F2	XWRS
Wall Foundation	300	Grade 35/20	4.00	1.25	0.30	1.50 m³	F3	XWRS
Footing-Rectangular	450	Grade 35/20	1.80	1.20	0.45	0.97 m³	F4	XWRS
Grand total: 4						92.60 m³		

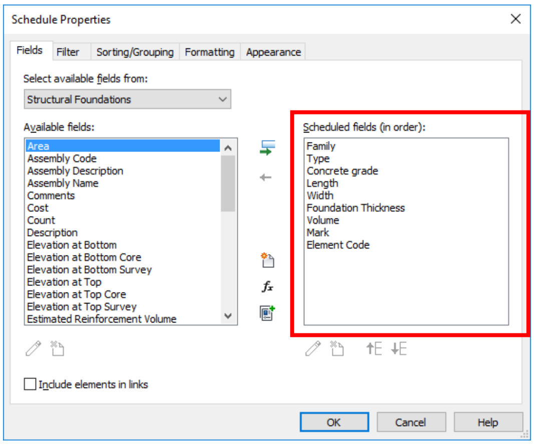
		Remark	BQ Items
Object	e.g. Foundation Slab	Refer to Figure 3.1, (1)	
Type	e.g. 450	Refer to Figure 3.1, (2)	
Concrete grade	e.g. Grade 35/20	Refer to Figure 3.1, (4)	
Volume	e.g. 63.90 m^3		Reinforced concrete; grade 35/20; foundations, attached bases or pile cap
Mark	e.g. F1	Refer to Figure 3.1, (3)	
Element Code	e.g. XWRS	Refer to Figure 3.1, (5)	

5.1.3.3 RC Foundation (Cont'd)

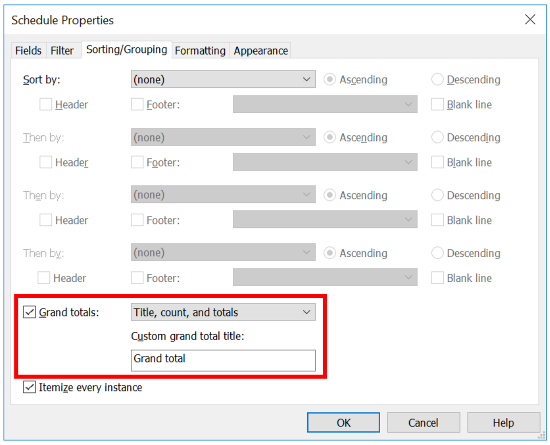
Step 2

Schedule Properties and Setting

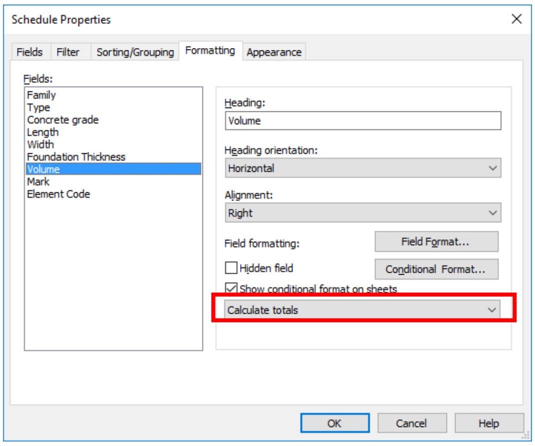
❖ Fields



❖ Sorting/Grouping



❖ Formatting - **Volume**



5.1.3.4 Blinding

Step 1

Blinding layer will not be modelled in structural models, the volume of blinding can be calculated with reference to the foundation area. Create a new **Structural Foundation** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

<QTO.4_Blinding Layer Schedule>

A	B	C	D	E	F	G	H
Family	Type	Length	Width	Area	Blinding Volume	Mark	Element Code
Foundation Slab	450	4.50	68.50	142.00 m²	7.10 m³	F1	XWRS
Foundation Slab	350	35.20	14.31	74.93 m²	3.75 m³	F2	XWRS
Wall Foundation	300	4.00	1.25	5.00 m²	0.25 m³	F3	XWRS
Footing-Rectangular	450	1.80	1.20	2.16 m²	0.11 m³	F4	XWRS
Grand total: 4					11.20 m³		

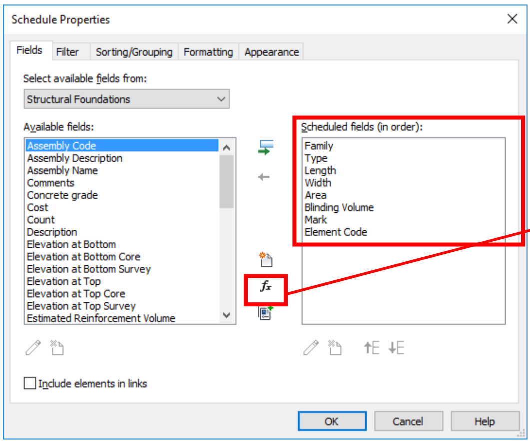
		Remark	**BQ Items**
Object	e.g. Foundation Slab	Refer to Figure 3.1, (1)	
Type	e.g. 450	Refer to Figure 3.1, (2)	
Area	e.g. 142.00 m^2		
Blinding Volume	e.g. 7.10 m^3	Volume = Area x Blinding 50 thick	Concrete; grade 20/20; blinding under foundations; 50 thick
Mark	e.g. F2	Refer to Figure 3.1, (3)	
Element Code	e.g. XWRS	Refer to Figure 3.1, (5)	

5.1.3.4 Blinding (Cont'd)

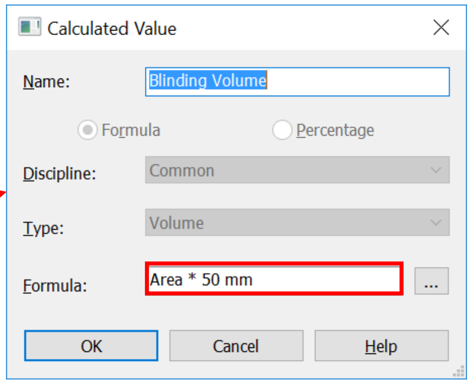
Step 2

Schedule Properties and Setting

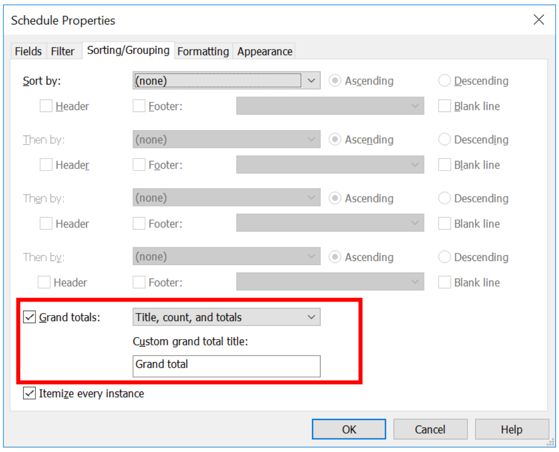
❖ Fields



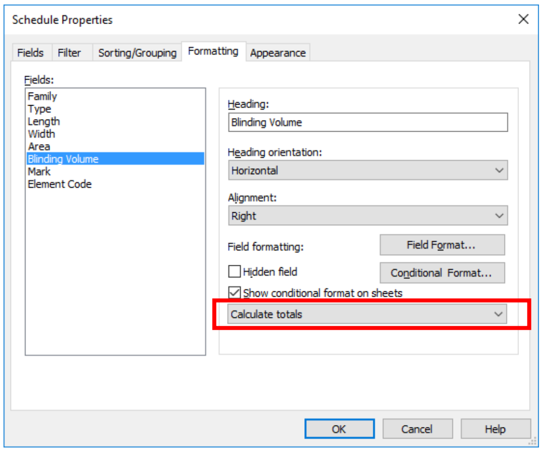
❖ Calculated Value – **Blinding Volume**



❖ Sorting/Grouping



❖ Formatting – **Blinding Volume**



5.1.3.5 Formwork

5.1.3.5.1 Material Paint for Formwork

Step 1

Setting the Material Paint for calculating formwork, create a new material; refer to Part 7 Techniques for QTO – 7.6 New Material:

			Remark
(i)	Material Name		
	Material Browser		
	(1) Name	e.g. QTO – Retaining Wall (m2) (V) – Wall	Material Naming refer to below table; Figure. 8
(ii)	Material Information		
	Material Browser > Identity > Descriptive Information >		
	(2) Description:	e.g. Formworks	The material function; Figure. 9
	(3) Type	e.g. Wood	Figure. 9
	(4) Comments	e.g. QTO	Figure. 9
	Material Browser > Graphics > Shading		
	(5) Shading – Color	e.g. RGB 000 255 000	For identify the object's material; Figure. 9

Material Naming for QTO

PART 1		PART2		PART3
Filter	-	Description 1	-	Description 2

Example

QTO	-	Retaining Wall (m2) (V)	-	Bed
QTO	-	Retaining Wall (m2) (V)	-	Wall
QTO	-	Retaining Wall (m2) (V)	-	Wall (Fair Faced Finish)
QTO	-	Retaining Wall (m2) (V)	-	Edge Wall
QTO	-	Retaining Wall (m) (V)	-	Edge Wall (<300)
QTO	-	Retaining Wall (m) (S)	-	Top formwork (<300)

PART 1

Filter – for searching the material

PART 2

(m) – calculate object in run
(m2) – calculate object in area
(H) – horizontal face
(V) – vertical face
(S) – sloping face

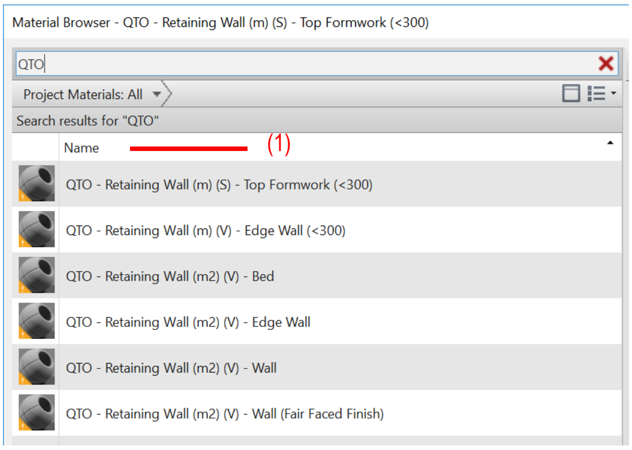


Figure 8 Material Browser

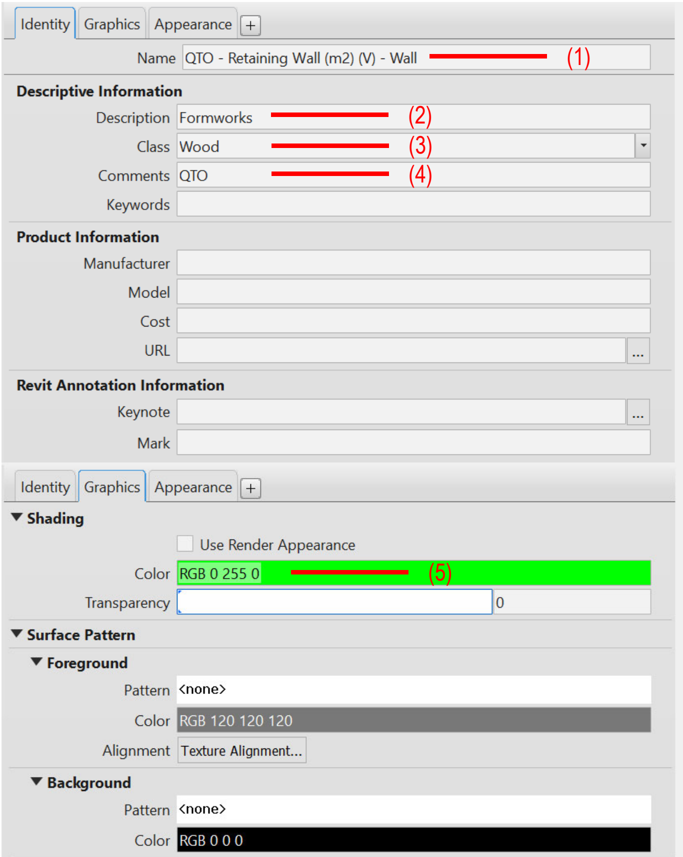
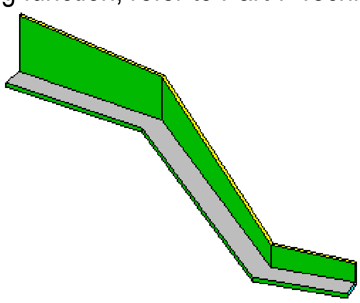


Figure 9 Material Editor

Step 2

Use painting function; refer to Part 7 Techniques for QTO - 7.7 Paint Function.



5.1.3.5.2 Formwork Schedule

Step 1

Create a new **Multiple Categories** material take-off schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

<QTO.5_Retaining Wall (Formworks)>

A	B	C	D	E	F	G	H
Family	Type	Material: Name	Material: Description	Material: Comments	Material: Area	Mark	Element Code
Foundation Slab	450	QTO - Retaining Wall (m2) (V) - Bed	Formworks	QTO	34.65 m²	F1	XWRS
Foundation Slab	350	QTO - Retaining Wall (m2) (V) - Bed	Formworks	QTO	15.15 m²	F2	XWRS
QTO - Retaining Wall (m2) (V) - Bed: 2					49.80 m²		
Basic Wall	350	QTO - Retaining Wall (m2) (V) - Edge Wall	Formworks	QTO	1.05 m²	RW-1	XWRS
Basic Wall	350	QTO - Retaining Wall (m2) (V) - Edge Wall	Formworks	QTO	1.05 m²	RW-2	XWRS
QTO - Retaining Wall (m2) (V) - Edge Wall: 2					2.10 m²		
Basic Wall	350	QTO - Retaining Wall (m2) (V) - Wall	Formworks	QTO	8.55 m²	RW-1	XWRS
Basic Wall	350	QTO - Retaining Wall (m2) (V) - Wall	Formworks	QTO	200.55 m²	RW-2	XWRS
Basic Wall	250	QTO - Retaining Wall (m2) (V) - Wall	Formworks	QTO	46.98 m²	RW-3	XWRS
Basic Wall	250	QTO - Retaining Wall (m2) (V) - Wall	Formworks	QTO	55.52 m²	RW-4	XWRS
Basic Wall	250	QTO - Retaining Wall (m2) (V) - Wall	Formworks	QTO	10.27 m²	RW-5	XWRS
QTO - Retaining Wall (m2) (V) - Wall: 5					321.87 m²		
Foundation Slab	450	QTO - Retaining Wall (m2) (V) - Wall (Fair Faced Finish)	Formworks	QTO	31.05 m²	F1	XWRS
Basic Wall	350	QTO - Retaining Wall (m2) (V) - Wall (Fair Faced Finish)	Formworks	QTO	7.50 m²	RW-1	XWRS
Basic Wall	350	QTO - Retaining Wall (m2) (V) - Wall (Fair Faced Finish)	Formworks	QTO	199.50 m²	RW-2	XWRS
Foundation Slab	350	QTO - Retaining Wall (m2) (V) - Wall (Fair Faced Finish)	Formworks	QTO	13.60 m²	F2	XWRS
Basic Wall	250	QTO - Retaining Wall (m2) (V) - Wall (Fair Faced Finish)	Formworks	QTO	47.26 m²	RW-3	XWRS
Basic Wall	250	QTO - Retaining Wall (m2) (V) - Wall (Fair Faced Finish)	Formworks	QTO	55.58 m²	RW-4	XWRS
Basic Wall	250	QTO - Retaining Wall (m2) (V) - Wall (Fair Faced Finish)	Formworks	QTO	10.06 m²	RW-5	XWRS
QTO - Retaining Wall (m2) (V) - Wall (Fair Faced Finish): 7					364.55 m²		
Basic Wall	250	QTO - Retaining Wall (m) (S) - Top Formwork (<300)	Formworks	QTO	2.96 m²	RW-3	XWRS
Basic Wall	250	QTO - Retaining Wall (m) (S) - Top Formwork (<300)	Formworks	QTO	5.27 m²	RW-4	XWRS
Basic Wall	250	QTO - Retaining Wall (m) (S) - Top Formwork (<300)	Formworks	QTO	1.52 m²	RW-5	XWRS
QTO - Retaining Wall (m) (S) - Top Formwork (<300): 3					9.75 m²		
Basic Wall	250	QTO - Retaining Wall (m) (V) - Edge Wall (<300)	Formworks	QTO	1.13 m²	RW-3	XWRS
Basic Wall	250	QTO - Retaining Wall (m) (V) - Edge Wall (<300)	Formworks	QTO	0.38 m²	RW-5	XWRS
QTO - Retaining Wall (m) (V) - Edge Wall (<300): 2					1.51 m²		
Grand total: 21					749.58 m²		

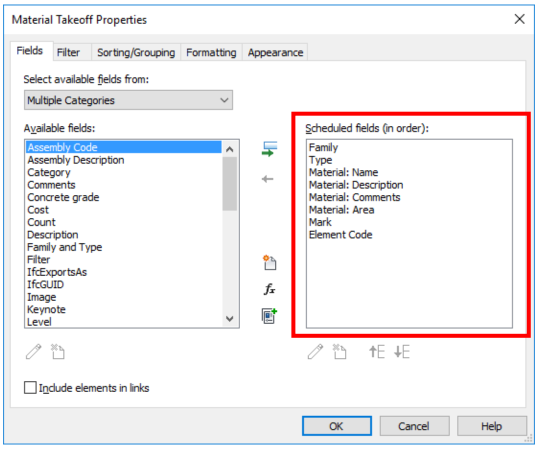
		Remark	**BQ Items**
Object	e.g. Foundation Slab	Refer to Figure 3.1, (1)	
Type	e.g. 450	Refer to Figure 3.1, (2)	
Material: Name	e.g. QTO – Retaining Wall (m2) (V) - Bed	Refer to Figure 9, (1)	
Material: Description	e.g. Formworks	Refer to Figure 9, (2)	
Material: Comments	e.g. QTO	Refer to Figure 9, (4)	
Material: Area	e.g. 34.65m^2	the painted area;	Sawn formwork; vertical surface; foundations, pile caps, ground beams and the like
Mark	e.g. F1	Refer to Figure 3.1, (3)	
Element Code	e.g. XWRS	Refer to Figure 3.1, (5)	

5.1.3.5.2 Formwork Schedule (Cont'd)

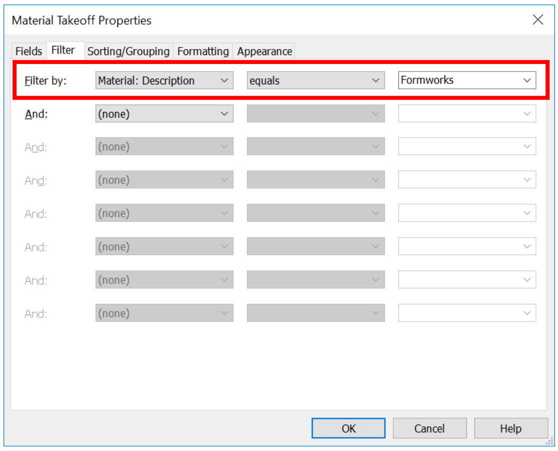
Step 2

Schedule Properties and Setting

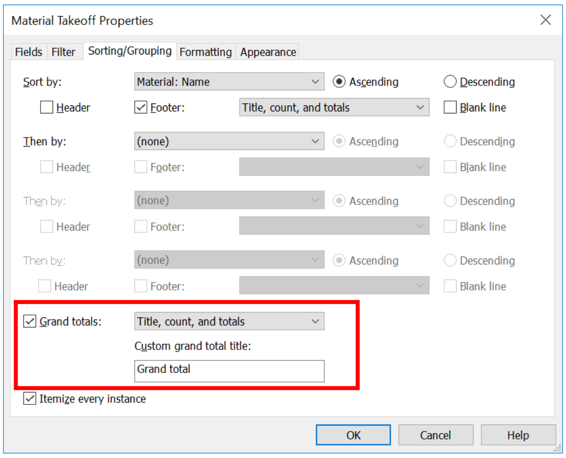
❖ Fields



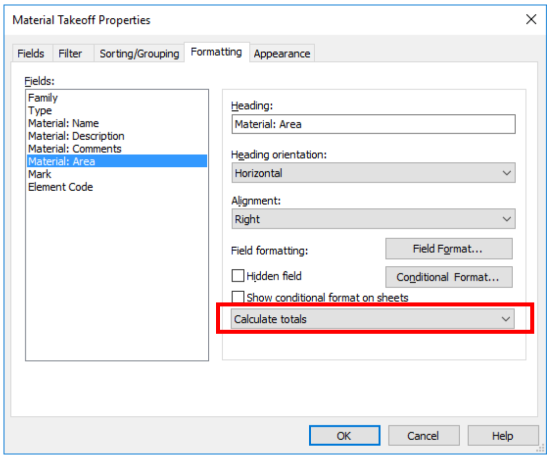
❖ Filter



❖ Sorting/Grouping



❖ Formatting – Material: Area



5.1.3.6 Movement Joint

Step 1

Create a new **Multiple Categories** material take-off schedule, refer to Part 4 Techniques for QTO - 4.3 Schedule/ Material Take-off.

<QTO.6_Retaining Wall (Movement Joint)>

A	B	C	D	E	F	G	H
Family	Type	Material: Name	Material: Description	Material: Comments	Material: Area	Mark	Element Code
Basic Wall	350	QTO - Retaining Wall (m2) (V) - Edge Wall	Formworks	QTO	1.05 m²	RW-1	XWRS
Basic Wall	350	QTO - Retaining Wall (m2) (V) - Edge Wall	Formworks	QTO	1.05 m²	RW-2	XWRS
QTO - Retaining Wall (m2) (V) - Edge Wall: 2					2.10 m²		
Basic Wall	250	QTO - Retaining Wall (m) (V) - Edge Wall (<300)	Formworks	QTO	1.13 m²	RW-3	XWRS
Basic Wall	250	QTO - Retaining Wall (m) (V) - Edge Wall (<300)	Formworks	QTO	0.38 m²	RW-5	XWRS
QTO - Retaining Wall (m) (V) - Edge Wall (<300): 2					1.51 m²		
Grand total: 4					3.61 m²		

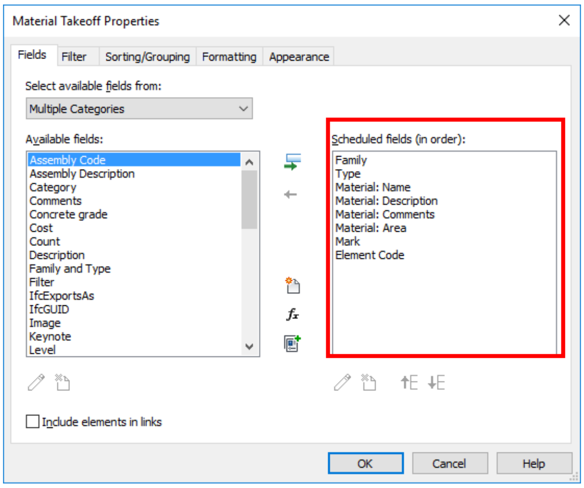
		Remark	**BQ Items**
Object	e.g. Basic Wall	Refer to Figure 1, (1)	
Type	e.g. 350	Refer to Figure 1, (2)	
Material: Name	e.g. QTO – Retaining Wall (m2) (V) – Edge Wall	Refer to Figure 8, (1)	
Material: Description	e.g. Formworks	Refer to Figure 9, (2)	
Material: Comments	e.g. QTO	Refer to Figure 9, (4)	
Material: Area	e.g. 1.05 m^2		Forming movement joints; formwork; in walls; 20 wide x 350 deep Length of Movement Joint = Material area / Wall Thickness; e.g. 1.05 / 0.35 = 3m
Mark	e.g. RW-1	Refer to Figure 1, (3)	

5.1.3.6 Movement Joint (Cont'd)

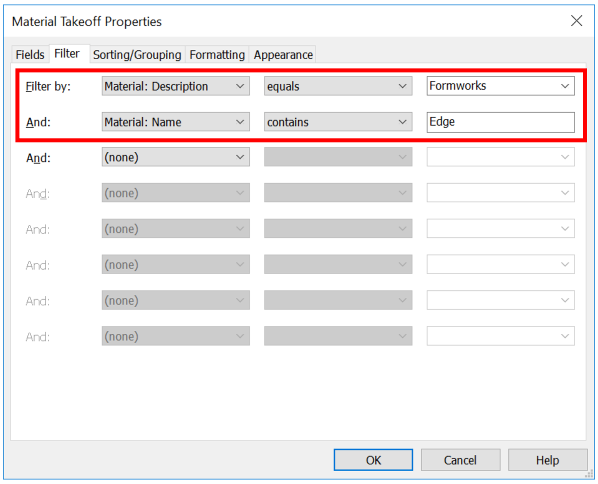
Step 2

Schedule Properties and Setting

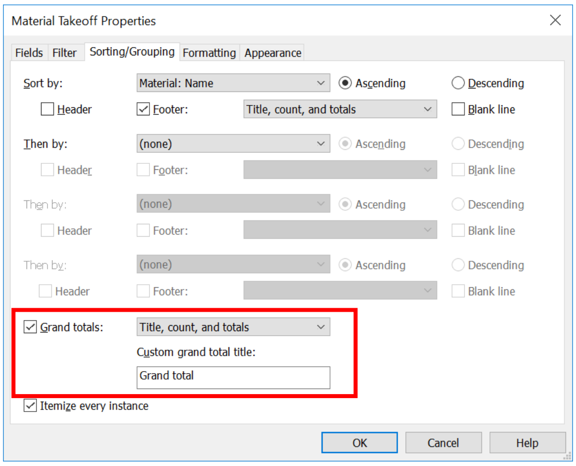
❖ Fields



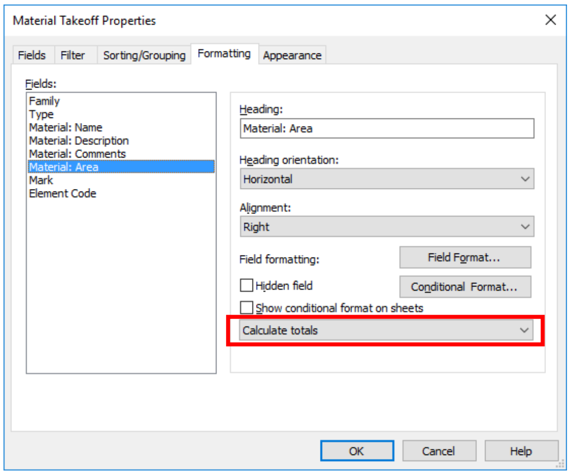
❖ Filter



❖ Sorting/Grouping



❖ Formatting – Material: Area



5.2 Concrete Works

This section mainly focuses on the following four main structural elements which are in the same concrete mix:

i. Structural Wall
ii. Structural Framing
iii. Structural Column
iv. Structural Slab

5.2.1 Basic Information

5.2.1.1 Building Element to Model: Concrete Structural Object

Modelling elements:

Elements	Object Category
Structural Column	Structure / Structure / Column
Structural Wall	Structure / Structure / Wall: Structural
Structural Framing	Structure / Structure / Beam
Structural Slab	Structure / Structure / Floor: Structural

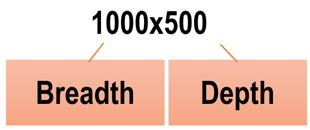
5.2.2 Modelling Approach

5.2.2.1 Structural Column

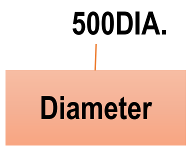
5.2.2.1.1 Naming Convention

Type of Column: Concrete Column
Object Naming:
Details of naming convention shall refer to Section 2.5.4 of BIM Guide for Structural Engineering issued by Structural Engineering Branch, Architectural Services Department.

Type Naming:
a) Rectangular Column



b) Circular Column



5.2.2.1.2 Shared Parameters

The following parameters shall be set in column objects:

Under **Dimensions**

Description	Parameter	Type / Instance
Breath of Column (Rectangular Column)	**QS Breadth**	Type
Depth of Column (Rectangular Column)	**QS Depth**	Type
Diameter of Column (Circular column)	**QS Diameter**	Type

Under **Other** (Information input by Modeller)

Description	Parameter	Type / Instance
Concrete Grade for Column	**Concrete grade**	Instance
For liquid retaining structure, should be specified in parameter.	**Liquid retaining structure**	Instance

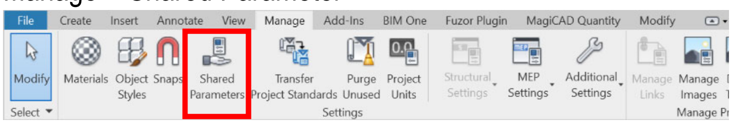
Under **Identity Data** (Information input by Modeller)

Description	Parameter	Type / Instance
Column Mark	**Mark**	Default parameter

For QTO, Shared Parameters **QS Breadth** and **QS Depth** shall be added in Column Object. (Remark: Though the breadth "**b"** and depth "**h"** of a column have been defaulted in the column object, however, they cannot be extracted to the schedule for QTO.)

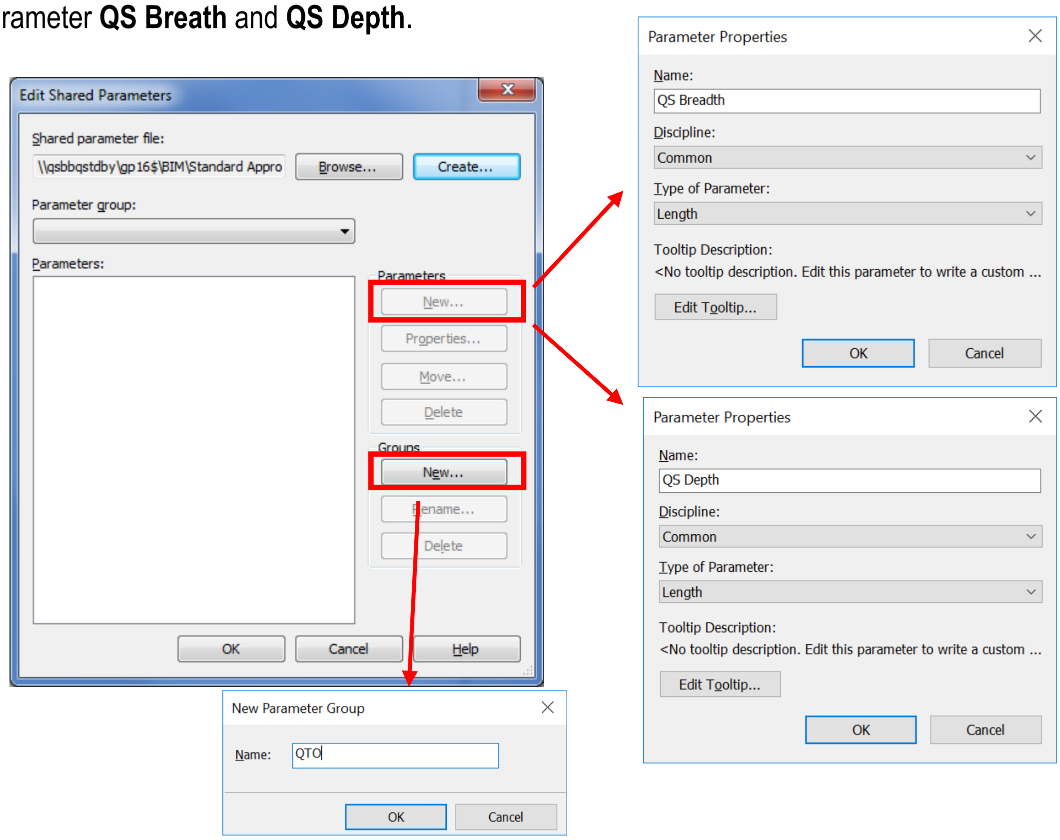
Step 1

Manage > Shared Parameter



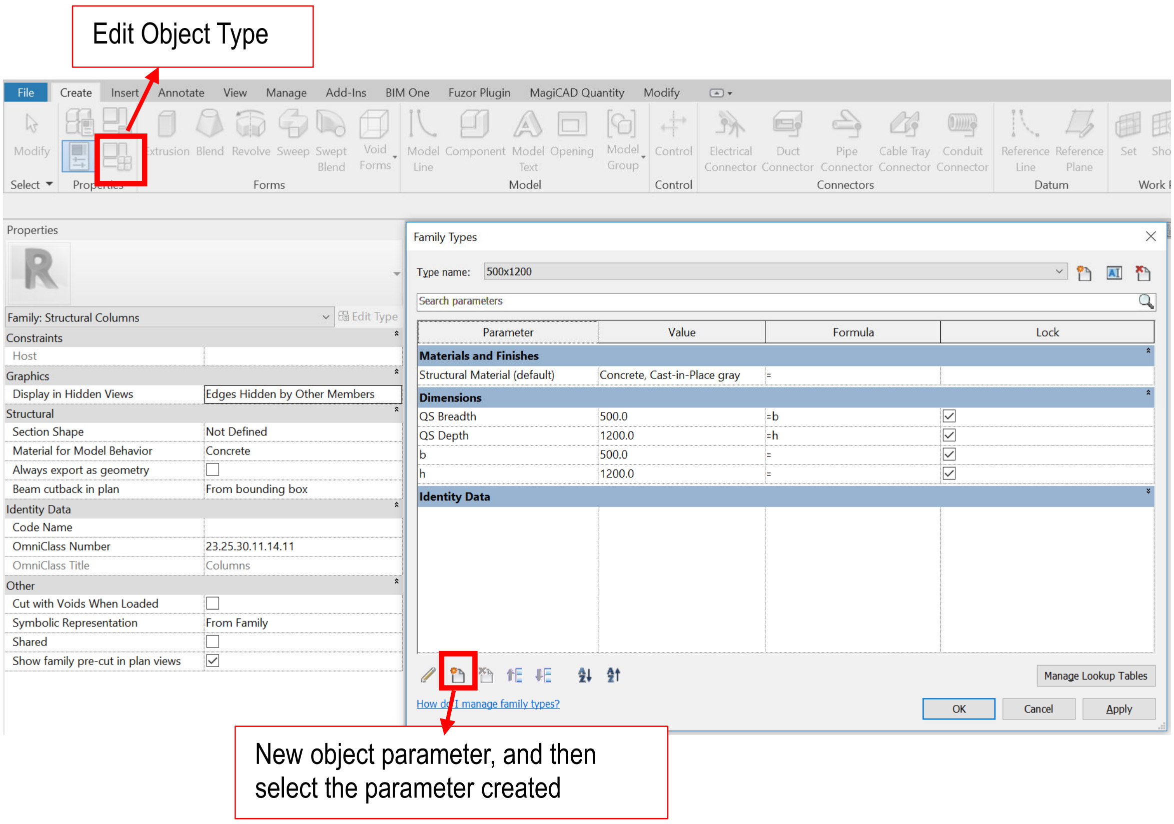
Step 2

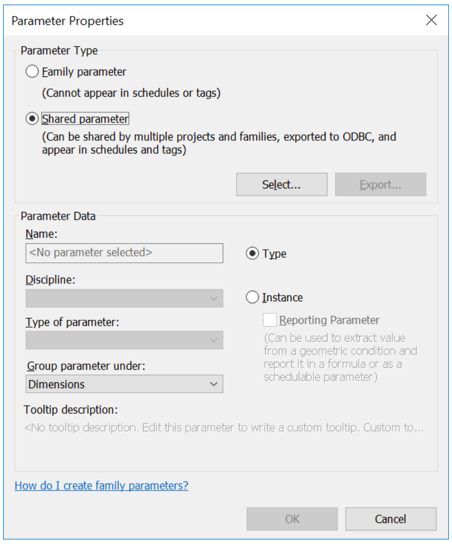
In Shared Parameter Brower, create a new group and name the group e.g. “QTO” and create new shared parameter **QS Breath** and **QS Depth**.

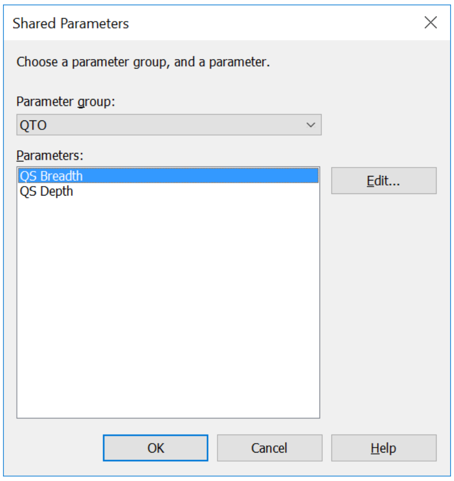


Step 3

Home Button > Edit Family

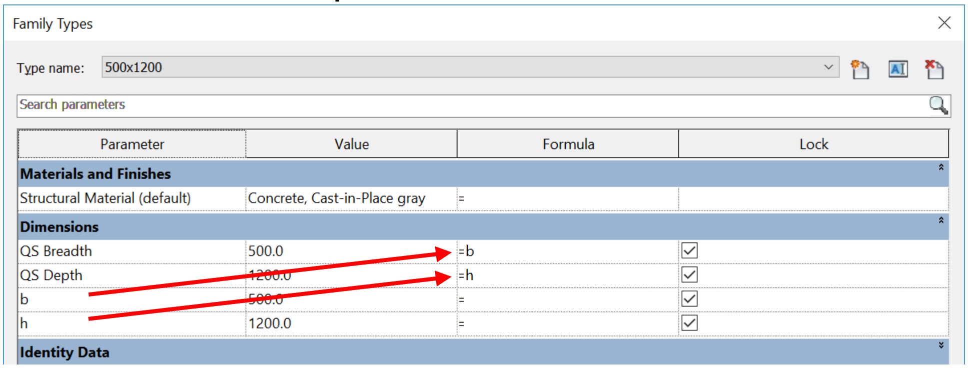






Step 4

Set **QS Breadth** = **b**, **QS Depth** = **h**

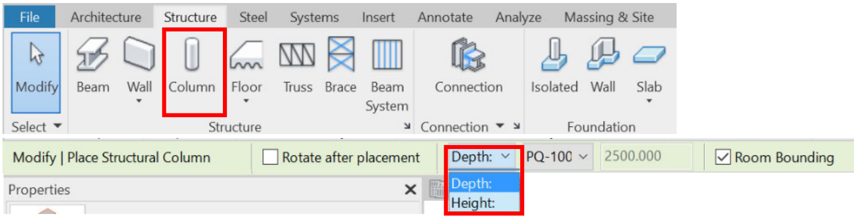


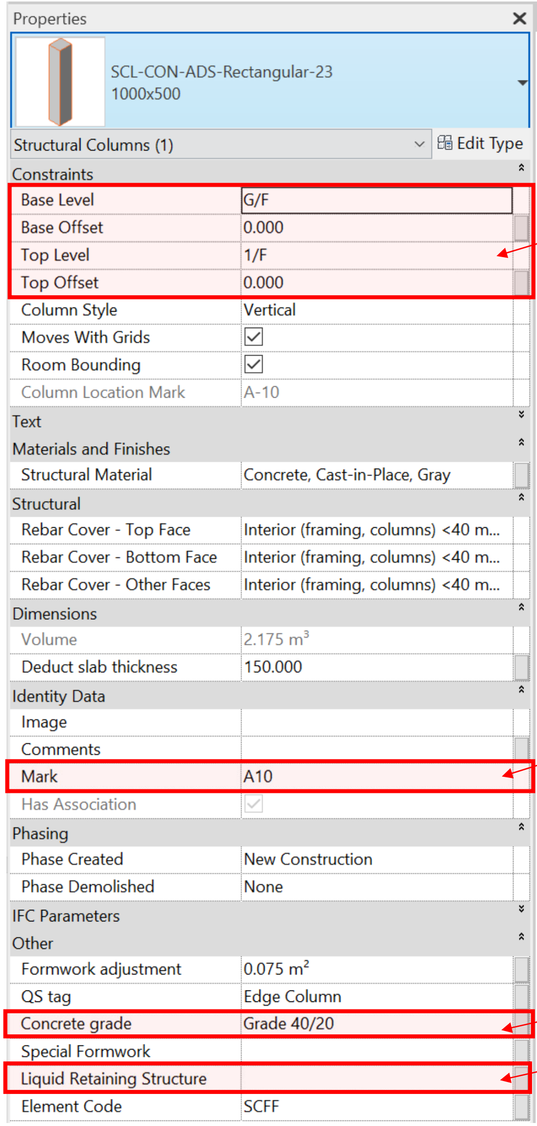
Step 5

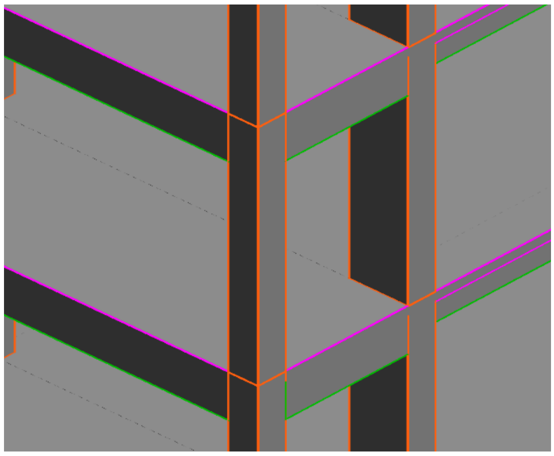
Load the Column object into project.

5.2.2.1.3 Creating a Column

All structural column shall be modelled as Structure > Column







Structural Column

(a): Reference Level: e.g. 1/F

- Place Structural Column select <u>Depth: Lower Level (e.g. G/F)</u>
  Base Level: Lower Level (e.g. G/F)
  Top Level: Reference Level (e.g. 1/F)

All columns shall be defined between the levels where they serve as support for other elements and top of their supporting elements (like top of the column / wall / beam and foundation below), with required level offsets.

(b): Add a parameter to specify concrete grade.

(c): Add a parameter to specify liquid retaining structure.

(d): Add Column Mark in the default parameter **Mark**.

5.2.2.2 Structural Wall

5.2.2.2.1 Naming Convention

Details of naming convention shall refer to Section 2.5.4 of BIM Guide for Structural Engineering issued by Structural Engineering Branch, Architectural Services Department.

Type of Wall: Structural Wall/ Hanger Wall
Non-structural Wall/ Parapet Wall (Refer to Architectural Model)

System Object: Basic Wall (Wall is a System Object that means object file cannot be created for wall but it can be defined new wall types for individual models.)

Type Naming:

300

Wall thickness

5.2.2.2.2 Shared Parameters

The following parameters shall be set in wall objects:

Under **Other**

Description	Parameter	Type / Instance
Concrete grade for wall	**Concrete grade**	Instance
For liquid retaining structure should be specified in parameter.	**Liquid retaining structure**	Instance
Identification of curved wall	**QS Curved element**	Instance
Identification of Wall type[1] (e.g. Hanger wall, Structural wall, etc.)	**Wall type**	Instance

Under **Identity Data**

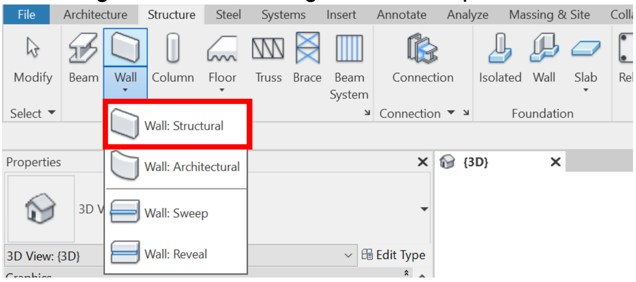
Description	Parameter	Type / Instance
Wall Mark	**Mark**	Default parameter

[1] Hanger wall shall be identified by modeller. Structural wall may be identified by QS for filtering in Schedule.

5.2.2.2.3 Creating a Wall

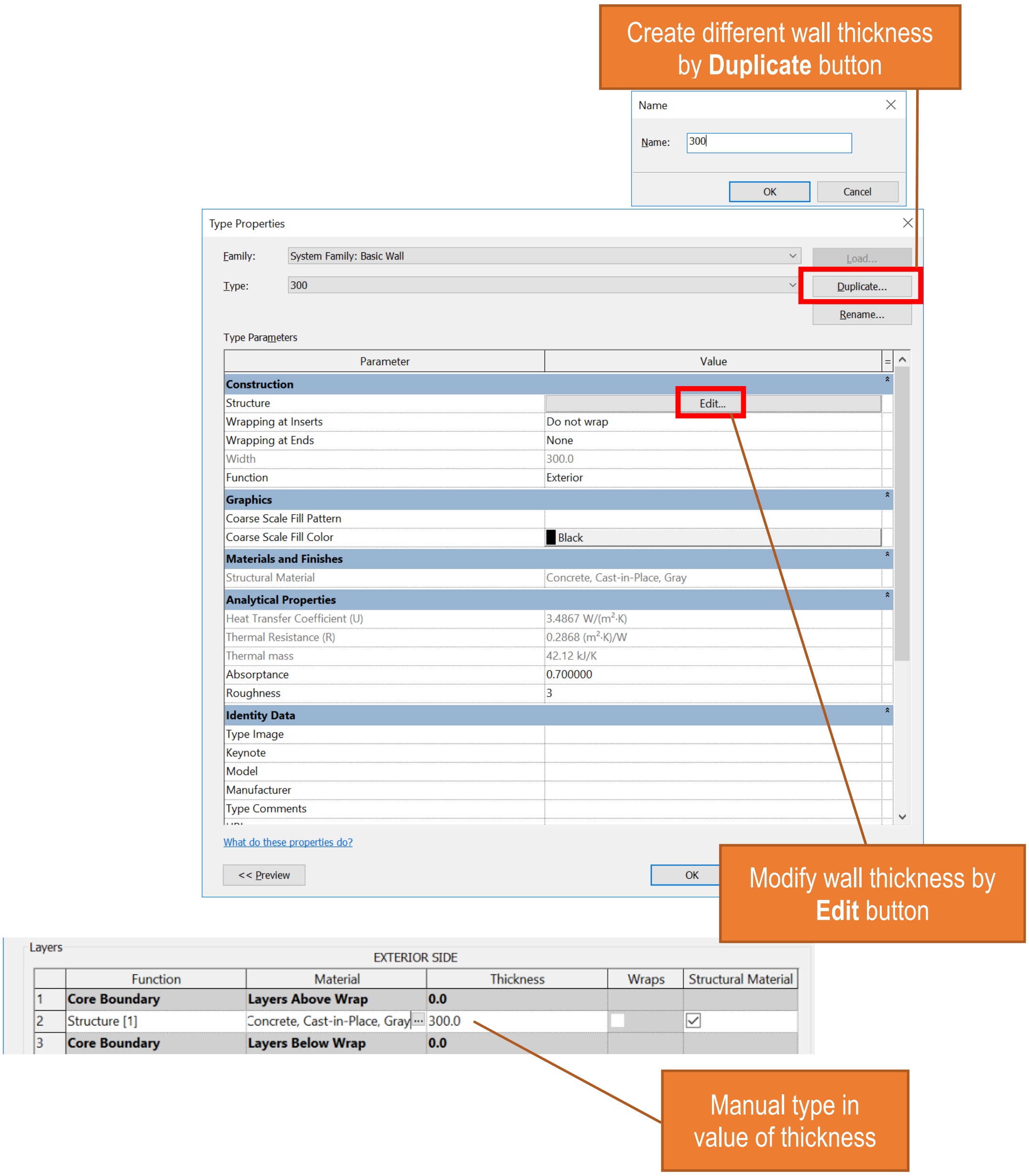
Step 1

Selecting ribbon, Home tag > Structure panel > Wall dropdown list > Structural Wall



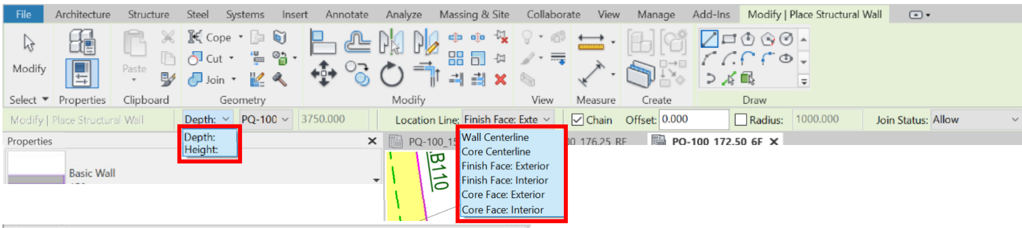
Step 2

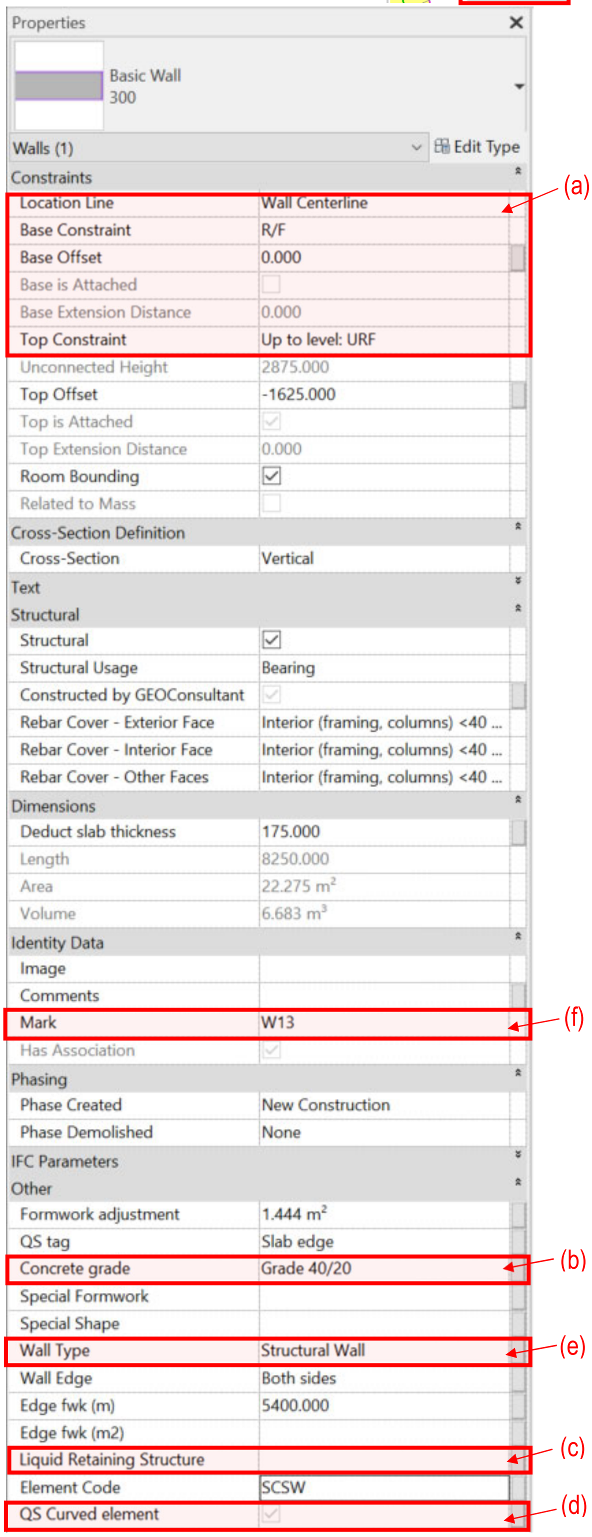
Select Edit type to create different wall type.



Step 3

Draw the wall.





Structural Wall

(a): Structural Wall

All walls shall be defined with **Top** and **Base Constraints** between the levels where they serve as support for other elements and top of their supporting elements. Level offsets can be applied as appropriate. The top level of walls shall be extended to top of slabs being supported instead of to the soffits of slab elements only.

e.g. Reference Level: 6/F

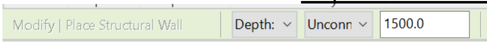
- Place Structural Wall select Depth: Lower Level (e.g. 5/F)
  Base Constraint: Lower Level (e.g. 5/F)
  Top Constraint: Reference Level (e.g. 6/F)

Hanger Wall

e.g. Hanger walls supported by 6/F structural member

(1) Both **Top** and **Base Constraints** of hanger walls shall be assigned with identical level and with negative value of **Base Offset** which value made equal to required hanger wall height (including slab thickness).

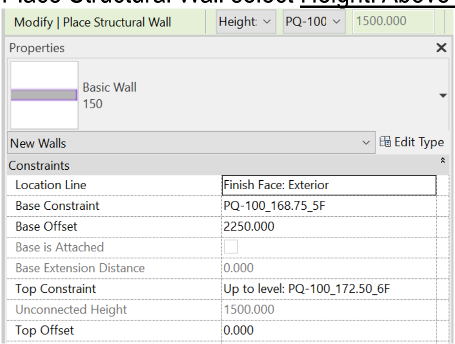
- Reference Level: 6/F
  Place Structural Wall select Depth: Unconnected 1500



Base Constraint: Reference Level (e.g. 6/F)
Top Constraint: Reference Level (e.g. 6/F)
Base Offset: e.g. -1500mm (equal to required hanger wall height including slab thickness)

(2) Hanger walls shall be defined with **Top** and **Base Constraints** between the levels with base offsets applied where equal to the height from the structural floor level to soffit of hanger wall.

- Reference Level: 6/F
  Place Structural Wall select Height: Above level (6/F)



Base Constraint: Reference Level (e.g. 5/F)
Top Constraint: Upper Level (e.g. 6/F)
Base Offset: e.g. 2250mm

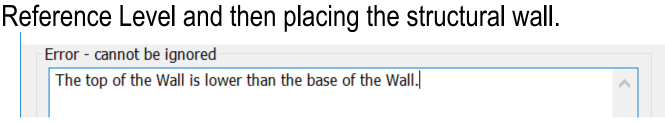
Structural Wall not in full floor height

Both **Top** and **Base Constraints** of structural walls shall be assigned with identical level with **Top Offset** made equal to required height (excluding slab thickness).

e.g. Reference Level: 6/F

- Place Structural Wall select Height: Above Level (e.g. R/F)
  Top Offset: e.g.1500mm (equal to required height)
  Base Constraint: Reference Level (e.g. 6/F)
  Top Constraint: Reference Level (e.g. 6/F)*

*As the **Top** and **Base Constraints** set as the identical level will have the Error warning. Set the **Top Constraint** to above level and input **Top Offset** first, then set the **Top Constraint** to the Reference Level and then placing the structural wall.



(b): Add a parameter to specify concrete grade.
(c): Add a parameter to specify liquid retaining structure.
(d): Add a parameter to specify curved wall.
(e): Add a parameter to specify wall type[1] (e.g. structural wall, hanger wall, parapet wall, etc.).
(f): Add Wall Mark in the default parameter **Mark**.

[1] Hanger wall shall be identified by modeller. Structural wall may be identified by QS for filtering in Schedule.

5.2.2.3 Structural Framing

5.2.2.3.1 Naming Convention

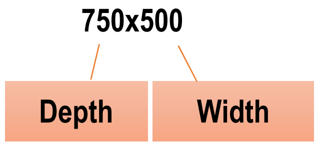
Type of Structural Framing: Concrete Beam

<u>Object</u> Naming:

Details of naming convention shall refer to Section 2.5.4 of BIM Guide for Structural Engineering issued by Structural Engineering Branch, Architectural Services Department.

<u>Type</u> Naming:

Rectangular Beam



5.2.2.3.2 Shared Parameters

The following parameters shall be set in beam objects:

<u>Under **Dimensions**</u>

Description	**Parameter**	**Type / Instance**
Depth of beam	**QS Depth**	Type
Width of beam	**QS Width**	Type

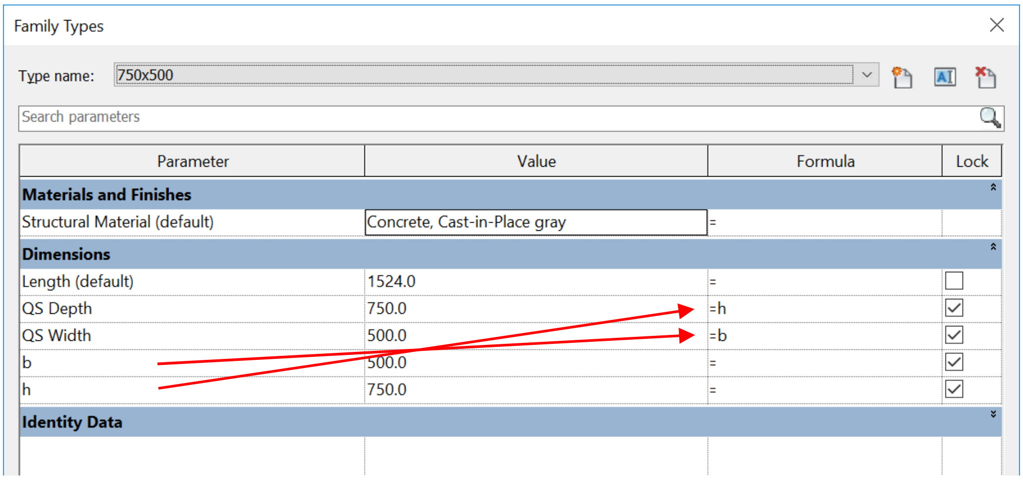
Under **Other** (Information input by Modeller)

Description	Parameter	Type / Instance
Concrete Grade for Beam	**Concrete grade**	Instance
For liquid retaining structure should be specified in parameter.	**Liquid retaining structure**	Instance
Identification of curved beam	**QS Curved element**	Instance
Identification of sloping beam	**QS Sloping element**	Instance

Under **Identity Data** (Information input by Modeller)

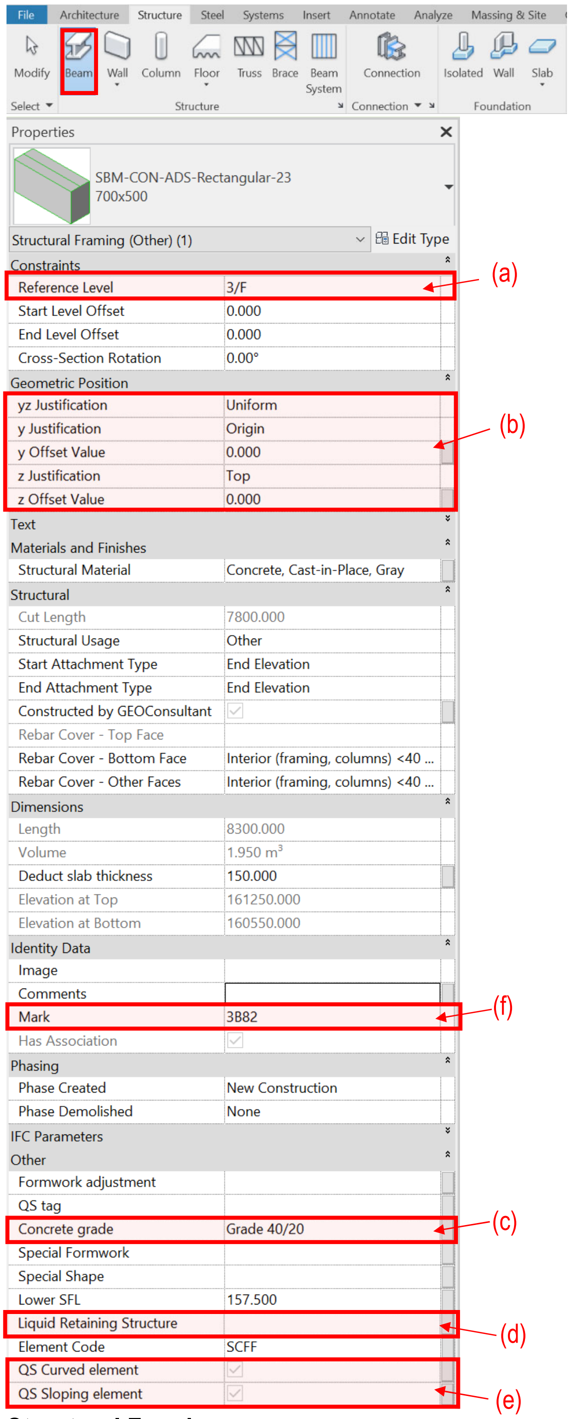
Description	Parameter	Type / Instance
Beam Mark	**Mark**	Default parameter

For QTO, Shared Parameters **QS Depth and QS Width** shall be added in the Beam Object. (*Details refer to the method of Structural Column)



5.2.2.3.3 Creating a Beam

All beams shall be modelled as Structure > Beam



Structural Framing

(a): Reference Level: Above Level

(b): The alignments of the beam shall be selected in **y Justification** (Origin/Left/Center/Right); **z Justification** (Top/Center/Bottom).

- ➢ Inverted beam: **z Justification** to "Top", **z Offset Value** input value e.g. 550, say 700 (Depth) -150 (slab thickness).

(c): Add a parameter to specify concrete grade.

(d): Add a parameter to specify liquid retaining structure.

(e): Add a parameter to specify curved beam or sloping beam.

(f): Add Beam Mark in the default parameter **Mark**.

5.2.2.4 Structural Slab

5.2.2.4.1 Naming Convention

Details of naming convention shall refer to Section 2.5.4 of BIM Guide for Structural Engineering issued by Structural Engineering Branch, Architectural Services Department.

Type of Slab: Structural Slab / Transfer Plate

System Object: Floor (Floor is a System Object that means object file cannot be created but it can be defined new slab types for individual models.)

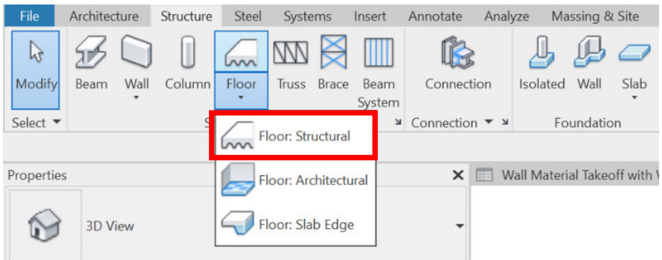
<u>Type</u> Naming:

150

Slab thickness

5.2.2.4.2 Creating a Slab

Structural Slab shall be modelled as follow:

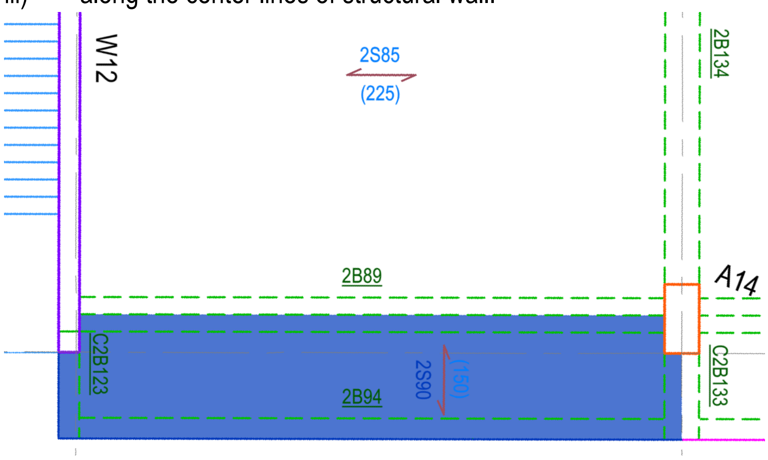


(a) Slab is offset downward from the level on which it is created.

(b) Slab shall be modelled panel by panel.

(c) Slab boundaries (except free edge slab) shall be defined either:

- i) along the center lines of supporting beams; or
- ii) along the center lines of column; or
- iii) along the center lines of structural wall.



(d) No overlapping of slabs shall be allowed.

5.2.2.4.3 Shared Parameters

The following parameters shall be set in Slab objects:

Under **Other**

Description	Parameter	Type / Instance
Concrete Grade for Slab	**Concrete grade**	Instance
For liquid retaining structure should be specified in parameter.	**Liquid retaining structure**	Instance
Identification of sloping slab	**QS Sloping element**	Instance
Identification of curved slab	**QS Curved element**	Instance

Under **Identity Data**

Description	Parameter	Type / Instance
Slab Mark	**Mark**	Default parameter

5.2.3 Quantity Take-off

Step 1: Setup new Shared Parameters to all elements.
Step 2: Draw QTO Floor slab and input the relevant information.
Step 3: Identify and input the relevant information for other elements.
Step 4: Create new QTO Schedules.

5.2.3.1 Setup new Shared Parameters

The followings parameters shall be set in the QS model to facilitate QTO. Refer to Part 7 Techniques for QTO – 7.2 Shared Parameters and 7.3 Project Parameters for the details.

5.2.3.1.1 Structural Column

Under **Dimensions**

Description	Parameter	Type / Instance
For calculate the column height	**Deduct slab thickness**	Instance

Under **Identity Data**

Description	Parameter	Type / Instance
Sub-element Code (e.g. FNSE – Columns in substructure, SCFF – Columns in superstructure, etc.)	**Element Code**	Instance
For case if columns have special adjustment (e.g. corner columns, edge columns, etc.)	**QS tag**	Instance
For the columns with tagging in **QS tag**, calculate the formwork adjustment	**Formwork Adjustment**	Instance
Special type of formworks (e.g. left-in, formwork to produce fair faced finish, etc.)	**Special Formwork**	Instance

5.2.3.1.2 Structural Wall

Under **Dimensions**

Description	Parameter	Type / Instance
For calculate the structural wall height	**Deduct Slab thickness**	Instance

Under **Identity Data**

Description	Parameter	Type / Instance
Sub-element Code (e.g. FNSE – Structural Wall in substructure, SCSW – Structural Wall in superstructure, etc.)	**Element Code**	Instance

Under **Identity Data** (Cont'd)

Description	**Parameter**	**Type / Instance**
Special shape[1] for Wall elements (e.g. tapered, irregular, etc.)	**Special shape**	Instance
For case if walls have special adjustment (e.g. Slab Edge, etc.)	**QS tag**	Instance
For the walls with tagging in **QS tag**, calculate the formwork adjustment	**Formwork Adjustment**	Instance
Special type of formworks (e.g. left-in, formwork to produce fair faced finish, etc.)	**Special Formwork**	Instance
For identify any open end structural wall, measurement for the "edges and breaks in walls"	**Wall Edge**	Instance
For the walls with tagging in **Wall Edge**, calculate the edge formwork in (m) for wall thickness ≤300mm	**Edge Fwk (m)**	Instance
For the walls with tagging in **Wall Edge**, calculate the edge formwork in (m2) for wall thickness >300mm	**Edge Fwk (m2)**	Instance

5.2.3.1.3 Structural Framing

Under **Dimensions**

Description	**Parameter**	**Type / Instance**
For calculate the beams depth.	**Deduct Slab thickness**	Instance

Under **Identity Data**

Description	**Parameter**	**Type / Instance**
Sub-element Code (e.g. FNSE – Beams in substructure, SCFF – Beams in superstructure, SCSL – Stair Beams in superstructure, etc.)	**Element Code**	Instance
For case if beams have special adjustment (e.g. edge beams, cantilever beams, cantilever edge beams, upstand beams. Etc.)	**QS tag**	Instance
For the beams with tagging in **QS tag**, calculate the formwork adjustment	**Formwork Adjustment**	Instance
Special type of formworks (e.g. left-in, formwork to produce fair faced finish, etc.)	**Special Formwork**	Instance
Lower Structural Floor Level, for calculate the strutting height to soffit of beam	**Lower SFL**	Instance

[1] Curved wall shall be identified by modeller. All other special shaped wall may be identified by QS if required.

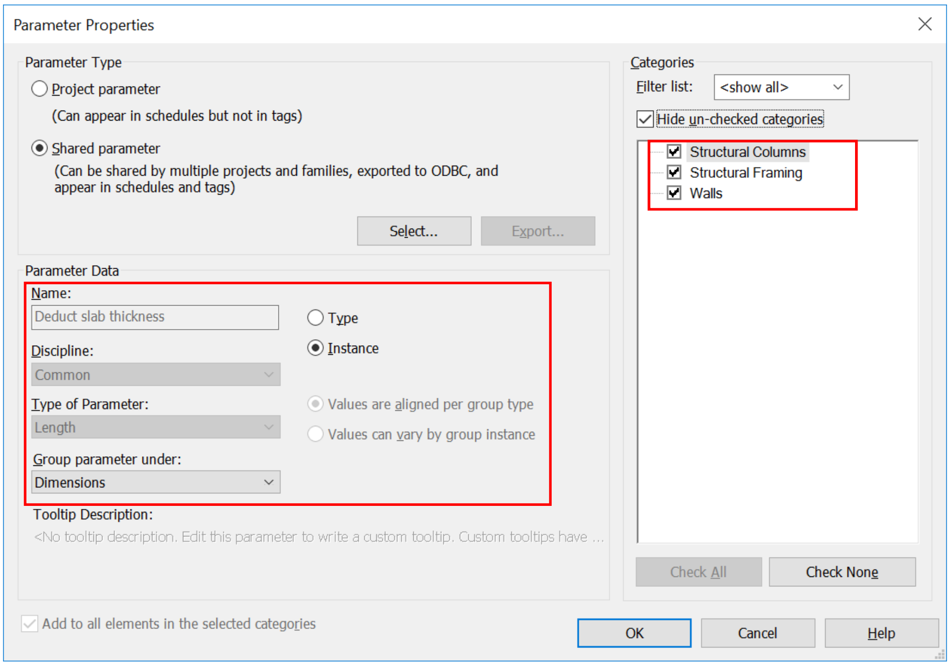
5.2.3.1.4 Structural Slab

Under **Identity Data**

Description	Parameter	Type / Instance
Sub-element Code (e.g. FNGF – Ground floor slabs in substructure, SCUF – Suspended slabs in superstructure, SCRF – Roof slabs in superstructure, SCSL – Stair slabs in superstructure, etc.)	**Element Code**	Instance
For input the slab thickness	**Slab thickness**	Instance
Special type of formworks (e.g. left-in, formwork to produce fair faced finish, etc.)	**Special Formwork**	Instance
Lower Structural Floor Level, for calculate the strutting height to soffit of slabs	**Lower SFL**	Instance

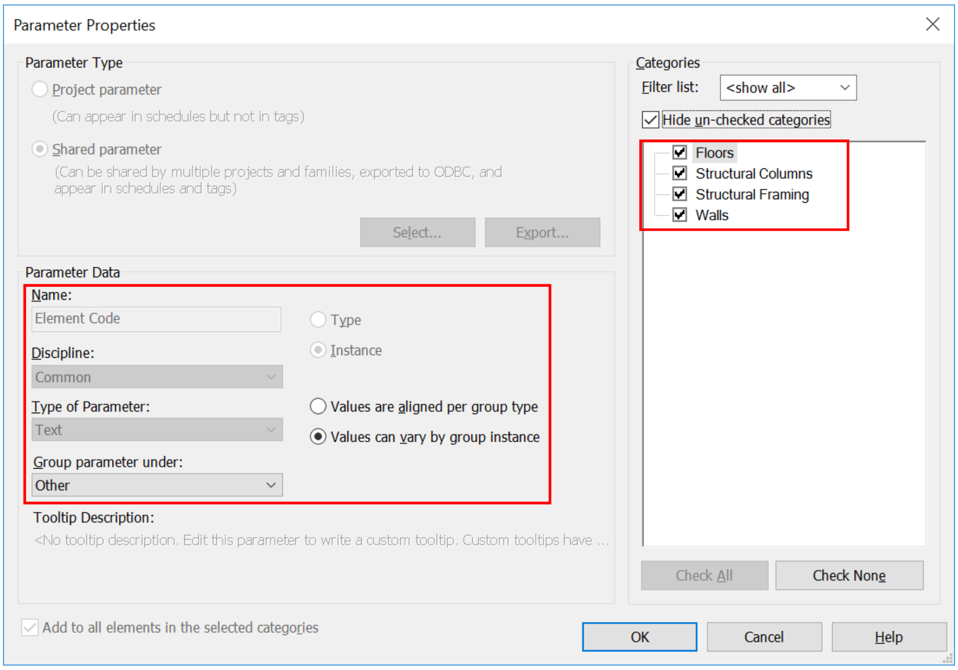
5.2.3.1.5 Parameter Properties Setting

a) **Deduct slab thickness**

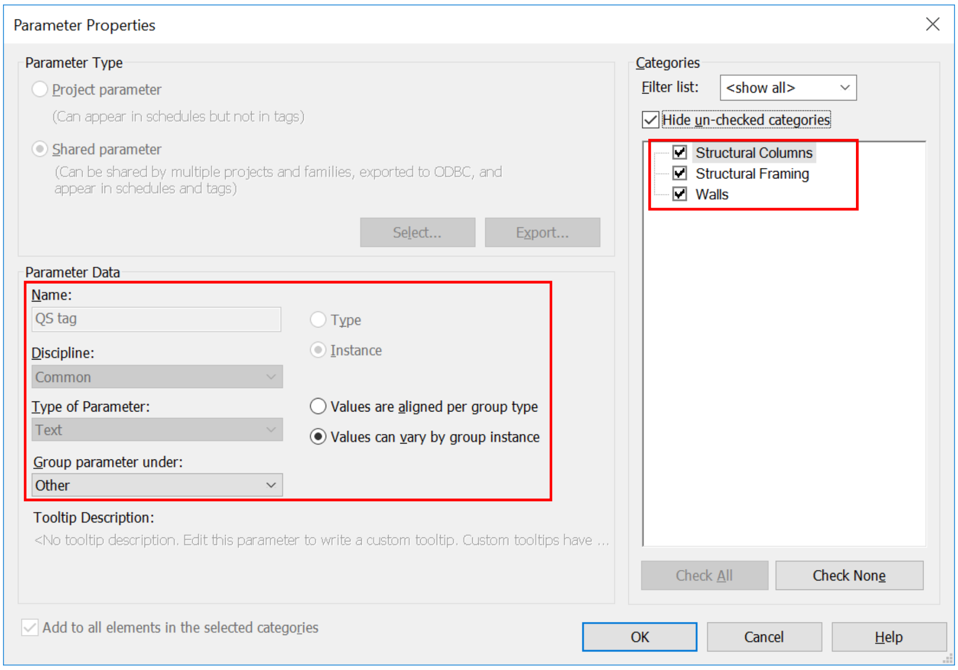


5.2.3.1.5 Parameter Properties Setting (Cont'd)

b) Element Code

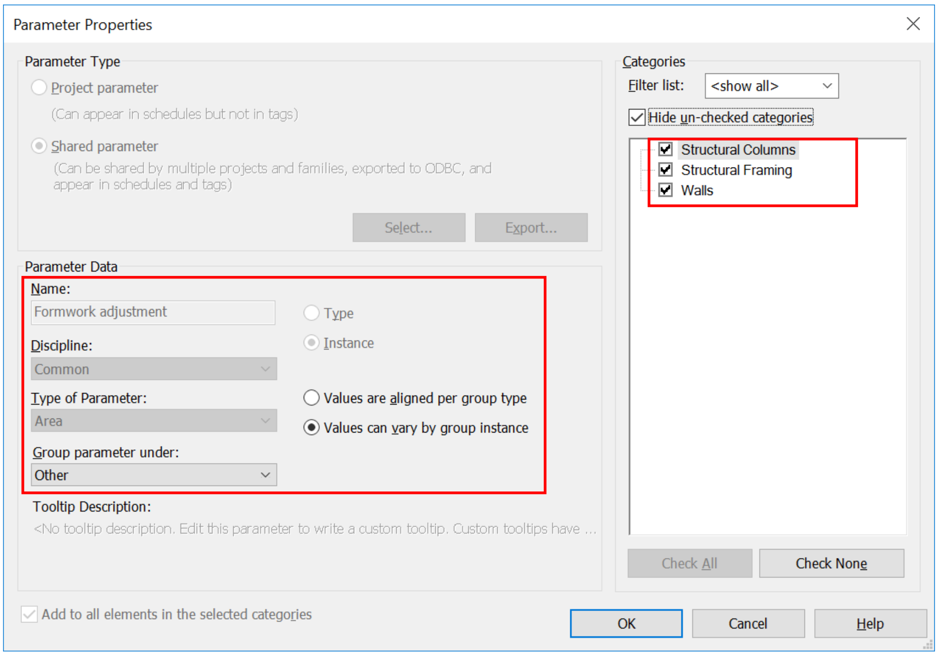


c) QS tag

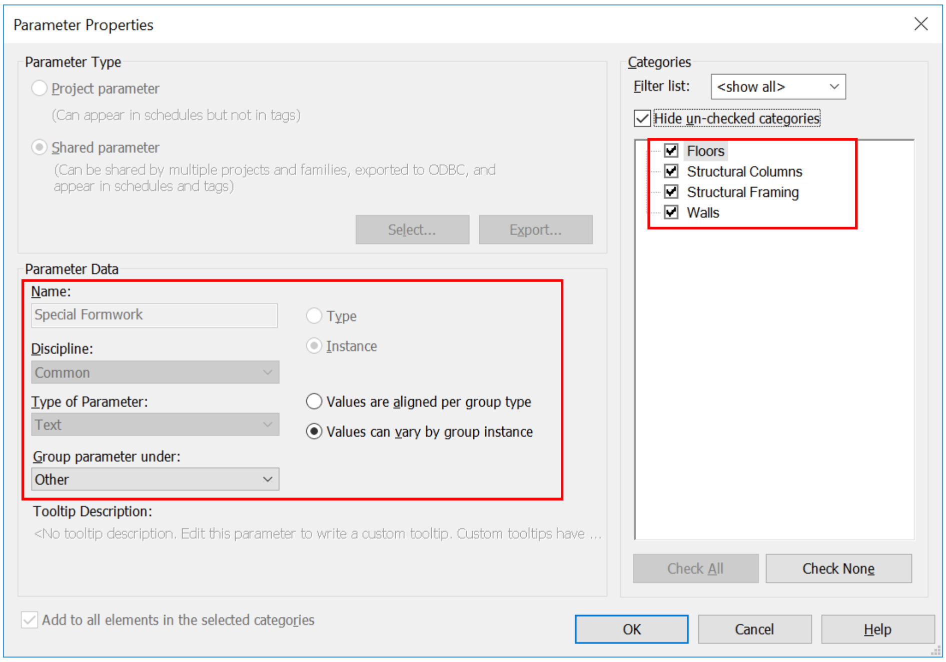


5.2.3.1.5 Parameter Properties Setting (Cont'd)

d) **Formwork adjustment**

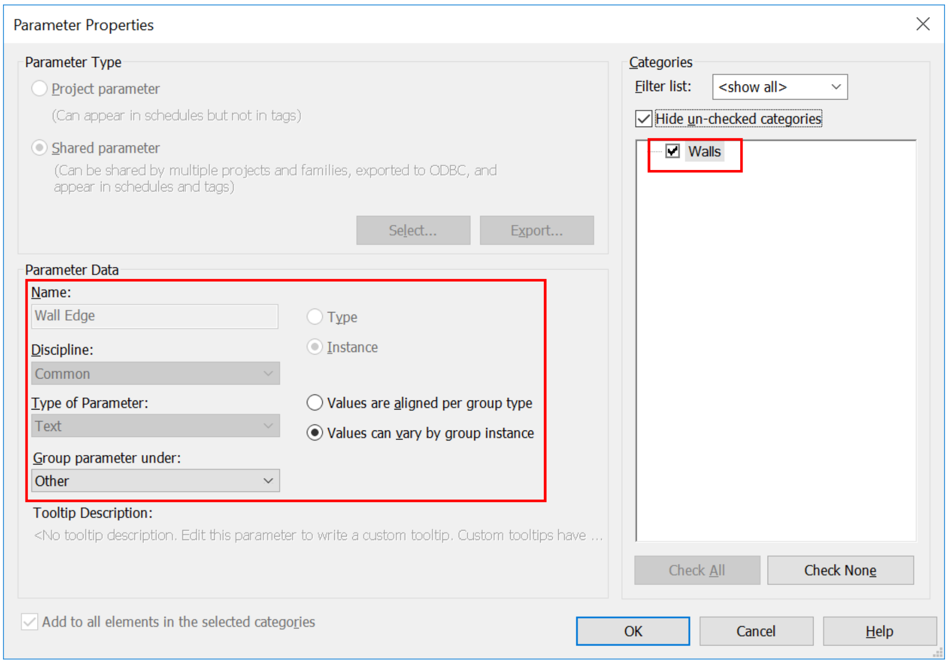


e) **Special Formwork**

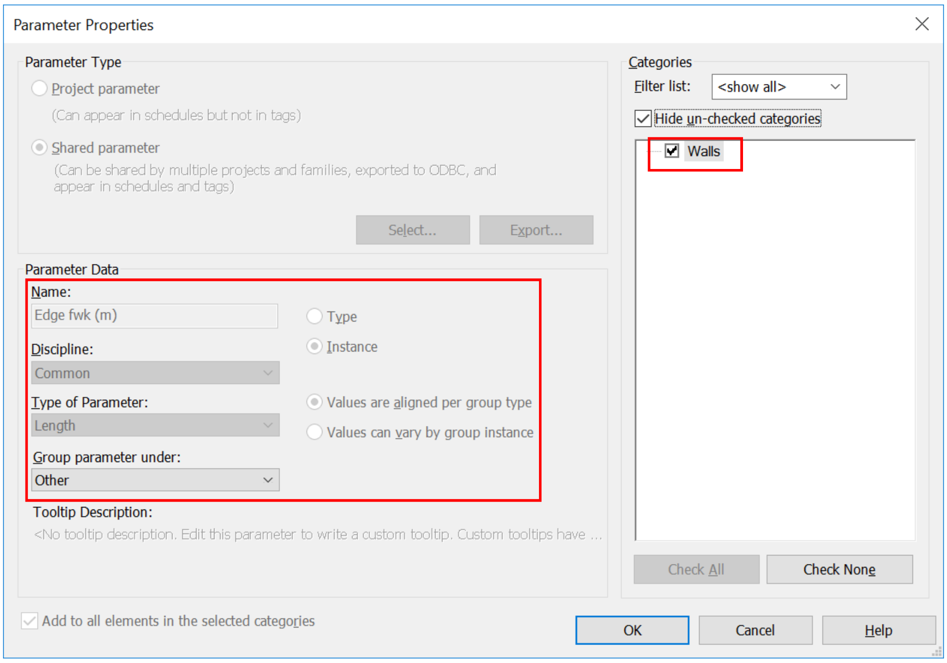


5.2.3.1.5 Parameter Properties Setting (Cont'd)

f) **Wall Edge**

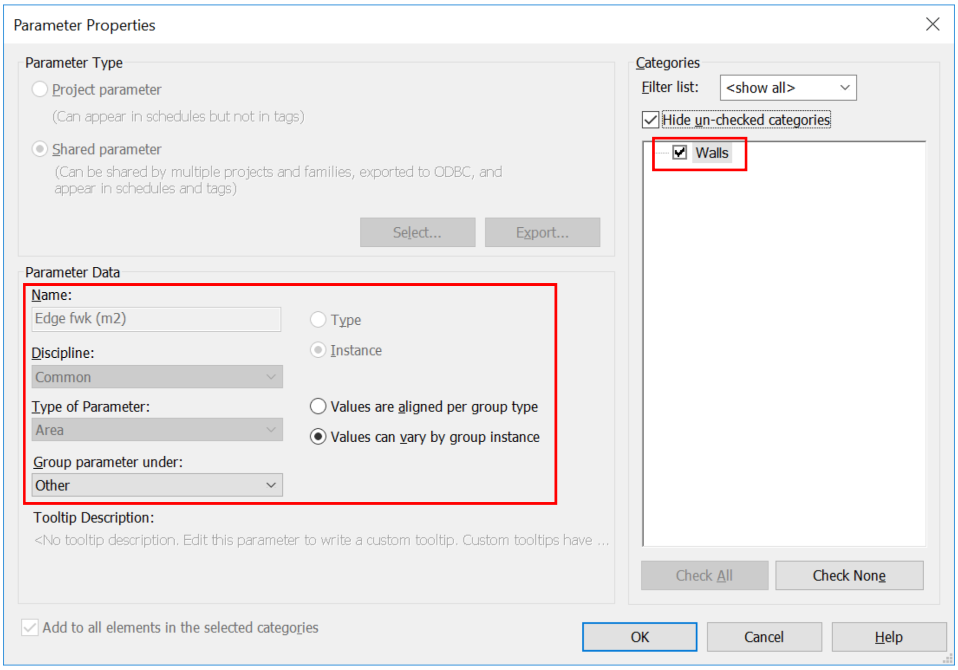


g) **Edge fwk (m)**

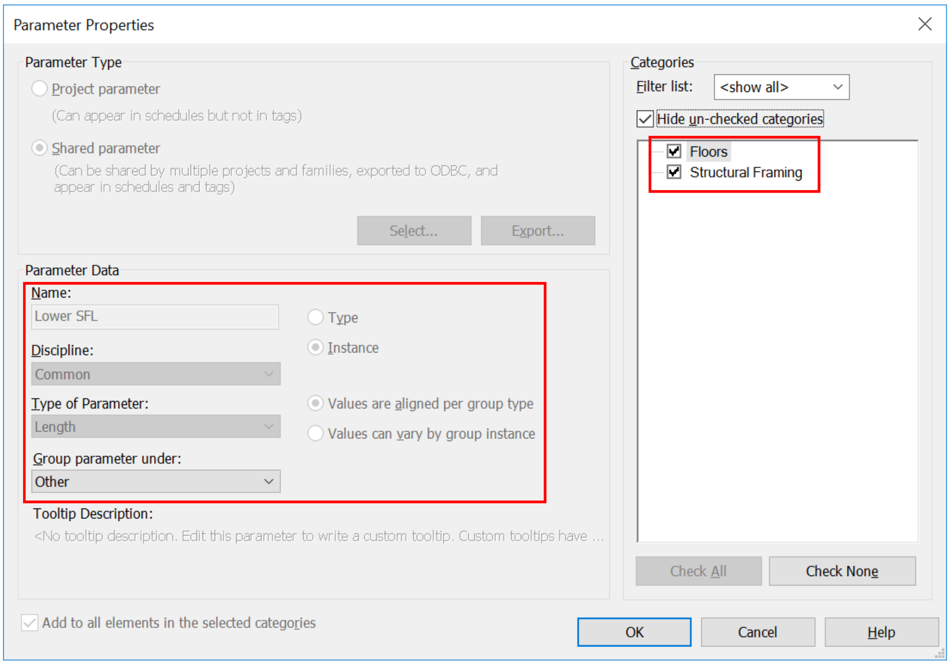


5.2.3.1.5 Parameter Properties Setting (Cont'd)

h) Edge fwk (m2)

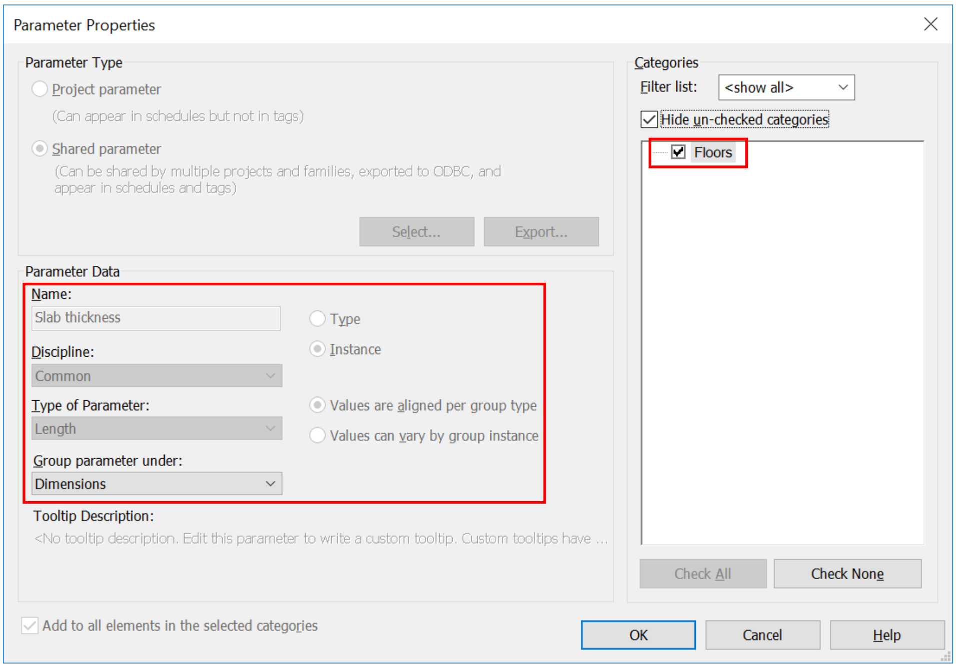


i) Lower SFL



5.2.3.1.5 Parameter Properties Setting (Cont'd)

j) **Slab thickness**

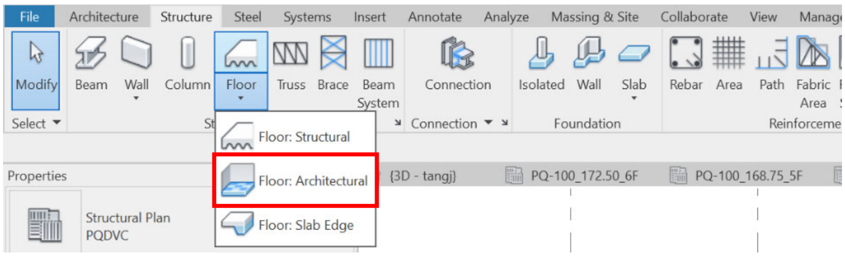


5.2.3.2 Draw QTO Floor slab and input the relevant information

Create a new QTO floor slab

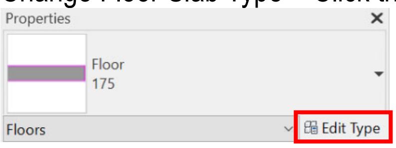
Step 1

Go to the Structure Tab > Structure Panel > Floor: Architectural



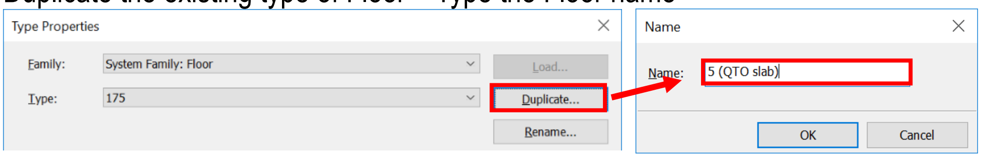
Step 2

Change Floor Slab Type > Click the **Edit Type** in the Properties window



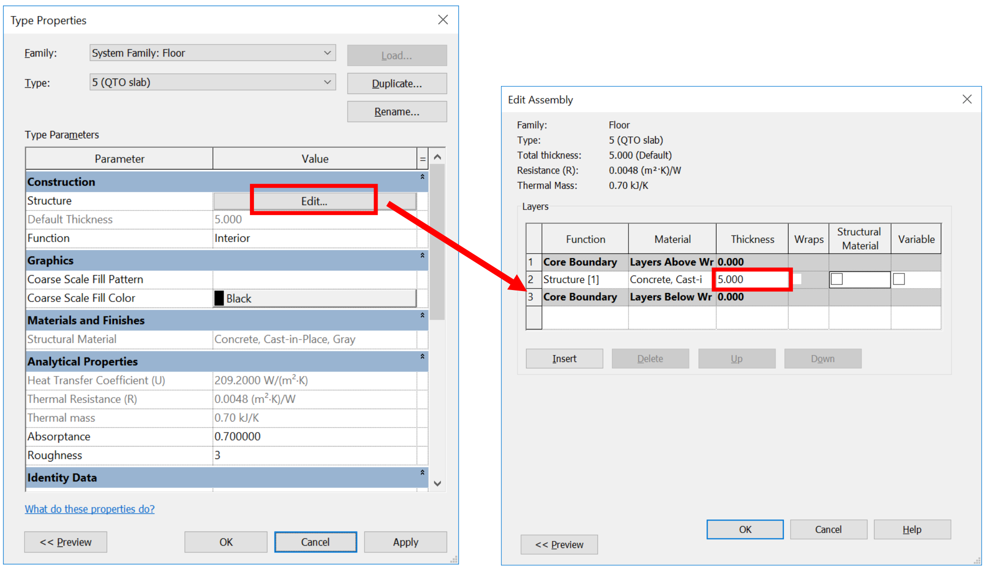
Step 3

Duplicate the existing type of Floor > Type the Floor name



Step 4

Edit the Structure and type the thickness in the Thickness field

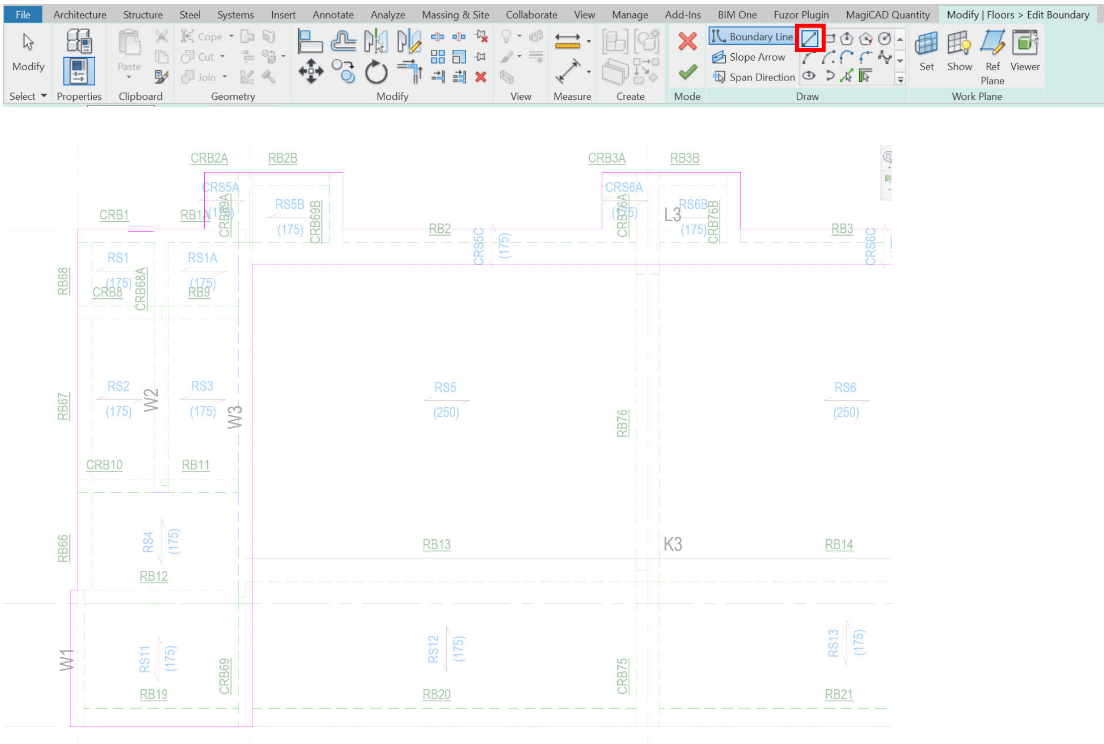


Step 5

Click OK to finish.

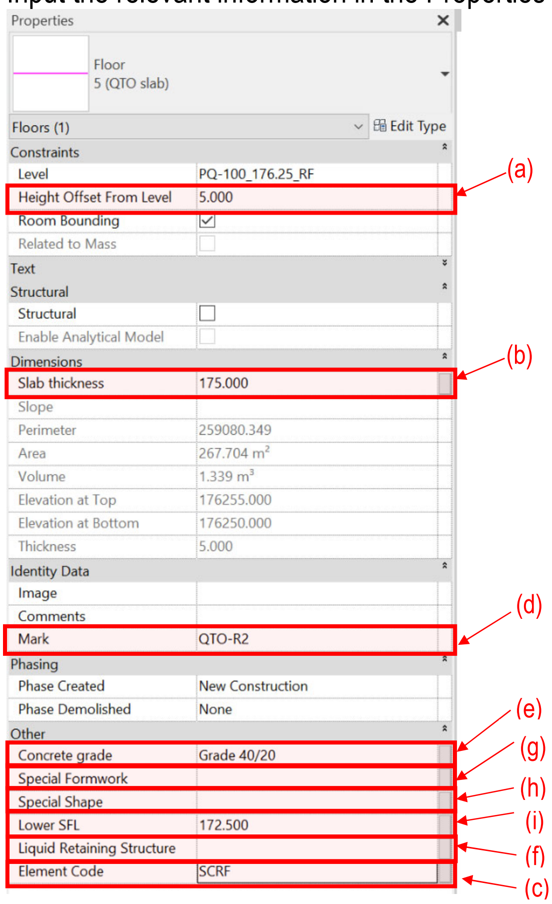
Step 6

Using the draw tool to draw the floor boundary on the activated Plan View.



Step 7

Input the relevant information in the Properties window.



(a) Input the height offset from level equal 5mm. (For prevent overlapping with the existing floor.)

(b) Input the slab thickness.

(c) Input the Sub-Element Code, e.g.
FNGF – Ground floor slabs in substructure,
SCUF – Suspended slabs in superstructure,
SCRF – Roof slabs in superstructure,
SCSL – Stair slabs in superstructure, etc.

(d) Input a slab Mark for reference (e.g. QTO-R2).

(e) Add a parameter to specify concrete grade.

(f) Add a parameter to specify liquid retaining structure.

(g) Identify any special formwork to be used, e.g. left-in, formwork to produce fair faced finish, etc.

(h) Add a parameter to specify special shape (e.g. curved, sloping, etc.).

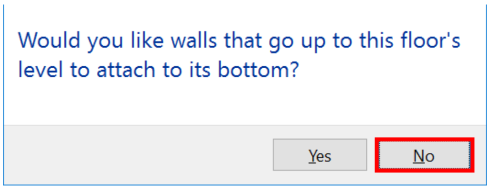
(i) Input the lower structural floor level, for calculate the strutting height to soffit of slab.

Step 8

Click "Tick" to finish.

Step 9

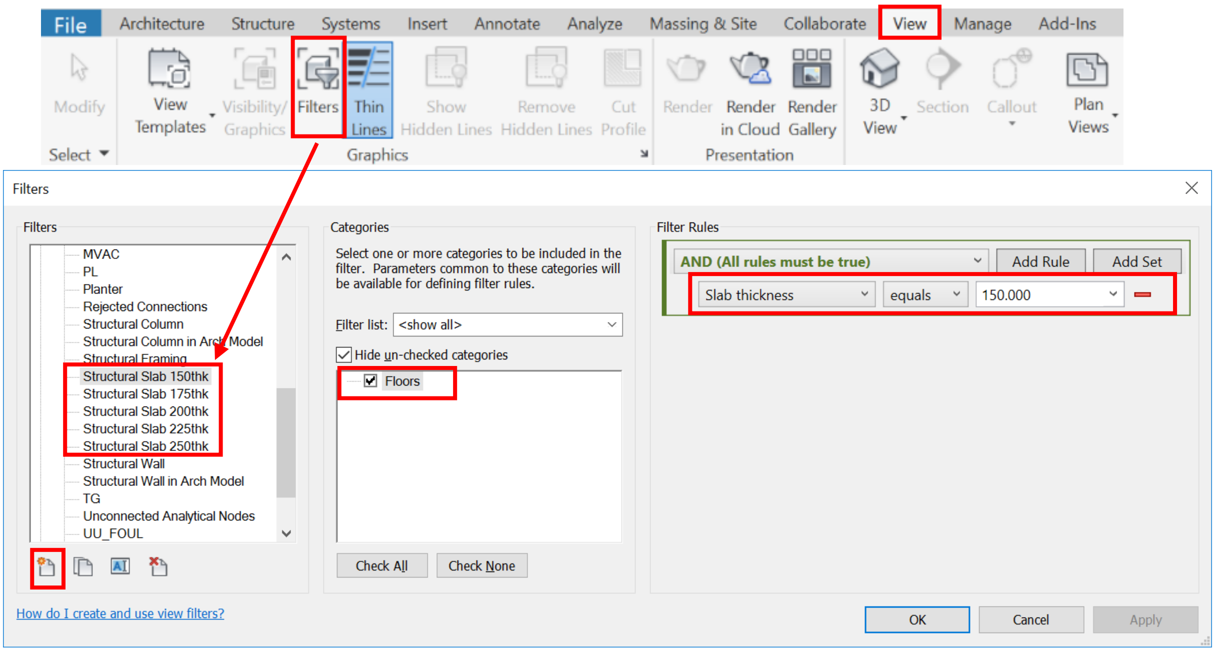
Click **No** of the following popup windows.



Step 10

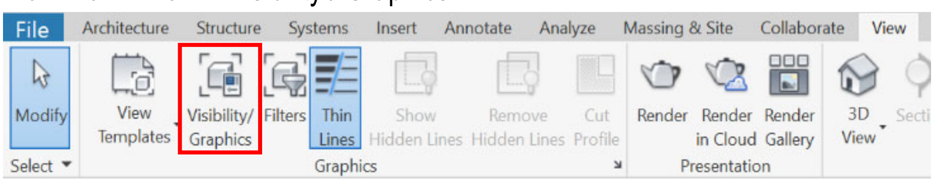
Show the QTO floor slab in different colour for different thickness by **Filters.**

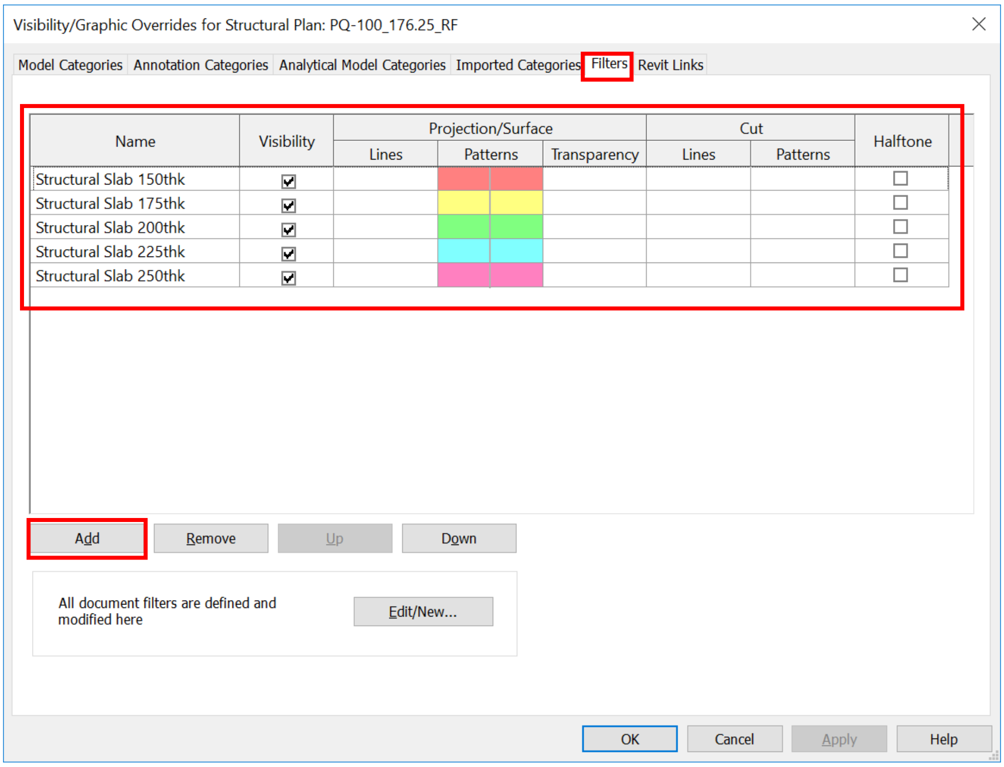
View > Filters



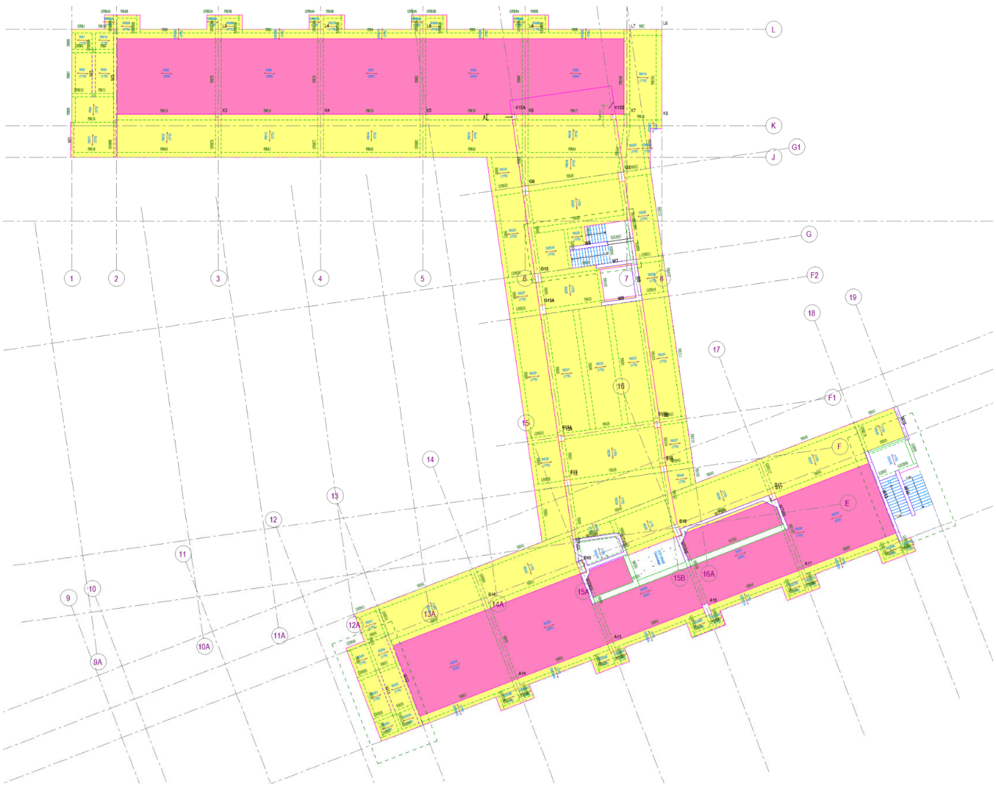
1. Add Filters  **Structural Slab 150thk**, then select the Categories, e.g. Floors.
2. Set the Filter Rules **Slab thickness** equals the 150mm.
3. And so on, create **Filters** for each thickness.
4. Set the pattern visible in the Model

Plan View : View > Visibility / Graphics



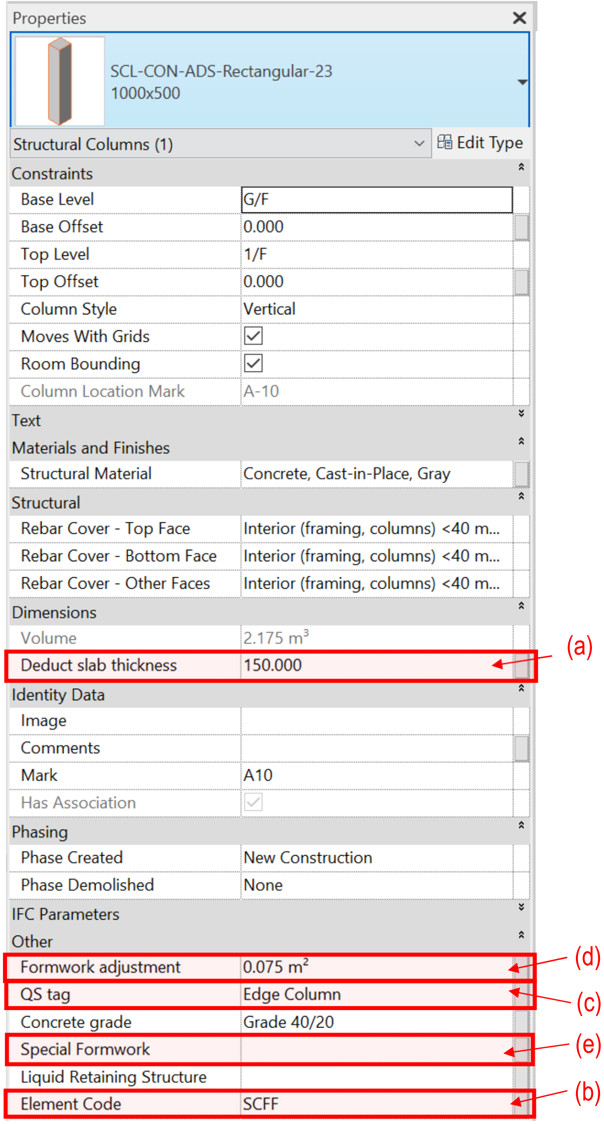


1. Add the aforesaid **Filters**, then select the **Visibility**.
2. Set the **Projection/ Surface**:
   - Lines set to <no override>
   - Pattern set to solid fill and select the colour
   - Transparency set to “0”
3. And so on, set the pattern visible for each plan view.



5.2.3.3 Input Information in structural elements

5.2.3.3.1 Structural Column

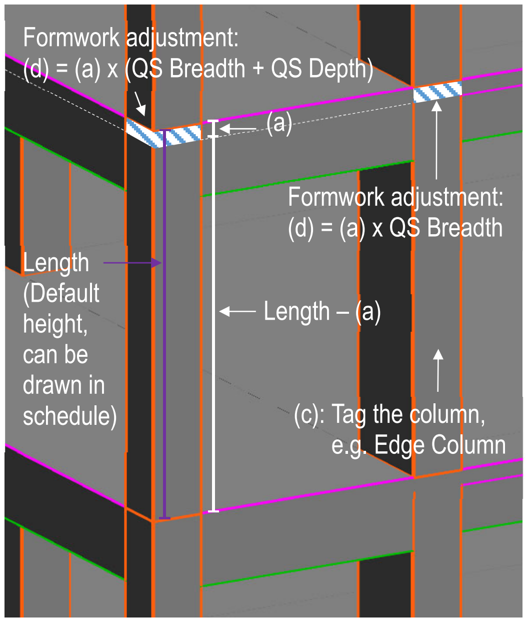


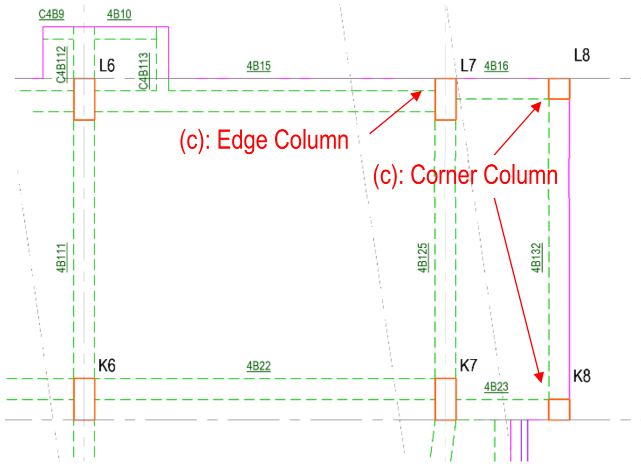
Properties

SCL-CON-ADS-Rectangular-23
1000x500

Structural Columns (1) | Edit Type

Constraints	
Base Level	G/F
Base Offset	0.000
Top Level	1/F
Top Offset	0.000
Column Style	Vertical
Moves With Grids	☑
Room Bounding	☑
Column Location Mark	A-10
Text	
Materials and Finishes	
Structural Material	Concrete, Cast-in-Place, Gray
Structural	
Rebar Cover - Top Face	Interior (framing, columns) <40 m...
Rebar Cover - Bottom Face	Interior (framing, columns) <40 m...
Rebar Cover - Other Faces	Interior (framing, columns) <40 m...
Dimensions	
Volume	2.175 m^3
Deduct slab thickness	150.000
Identity Data	
Image	
Comments	
Mark	A10
Has Association	☑
Phasing	
Phase Created	New Construction
Phase Demolished	None
IFC Parameters	
Other	
Formwork adjustment	0.075 m^2
QS tag	Edge Column
Concrete grade	Grade 40/20
Special Formwork	
Liquid Retaining Structure	
Element Code	SCFF





Structural Column

(a): Insert the thickness of slab to the parameter **Deduct slab thickness** to deduct overlapping concrete volume between structural column and slab. Enter "0"(zero) for no slab to be deducted.

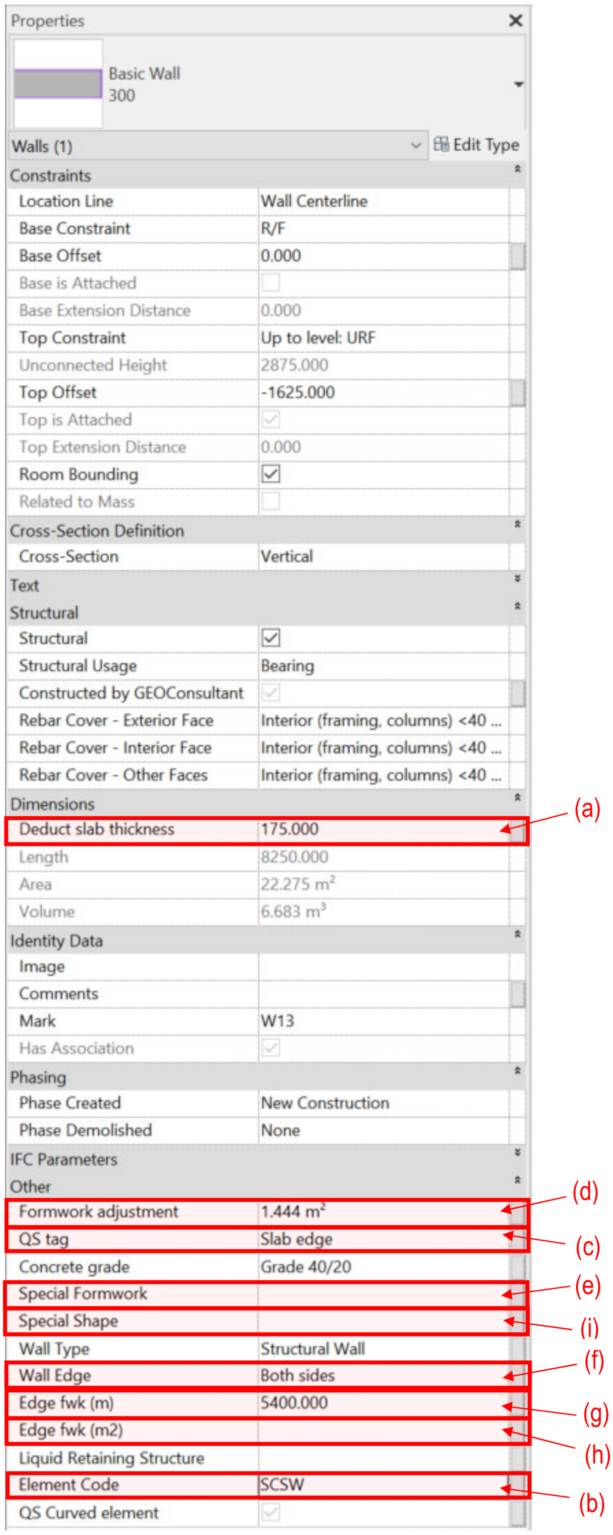
(b): Input the Sub-Element Code, e.g. FNSE – Columns in substructure, SCFF – Columns in superstructure, etc.

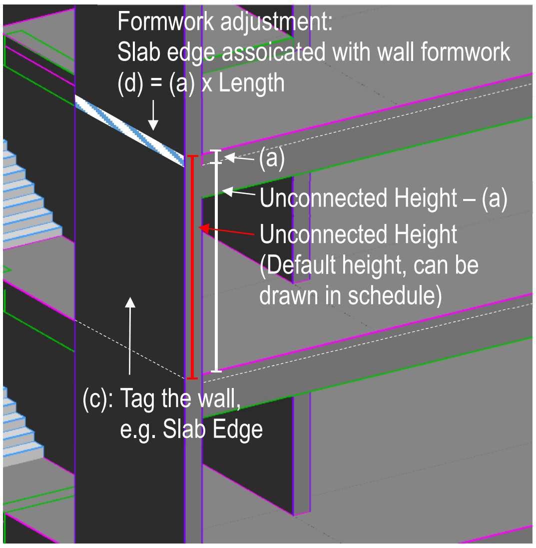
(c): Tag the column if requires formwork adjustment, e.g. Edge Column, Corner Column, etc.

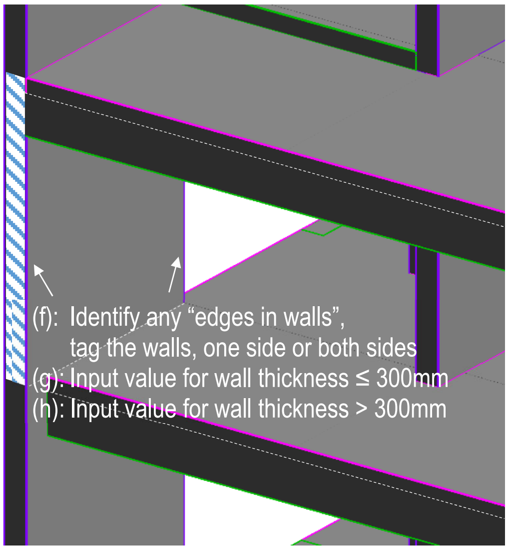
(d): For the columns with tagging in **QS tag**, calculate the formwork adjustment.

(e): Identify any special formwork to be used, e.g. left-in, formwork to produce fair faced finish, etc.

5.2.3.3.2 Structural Wall







Structural Wall

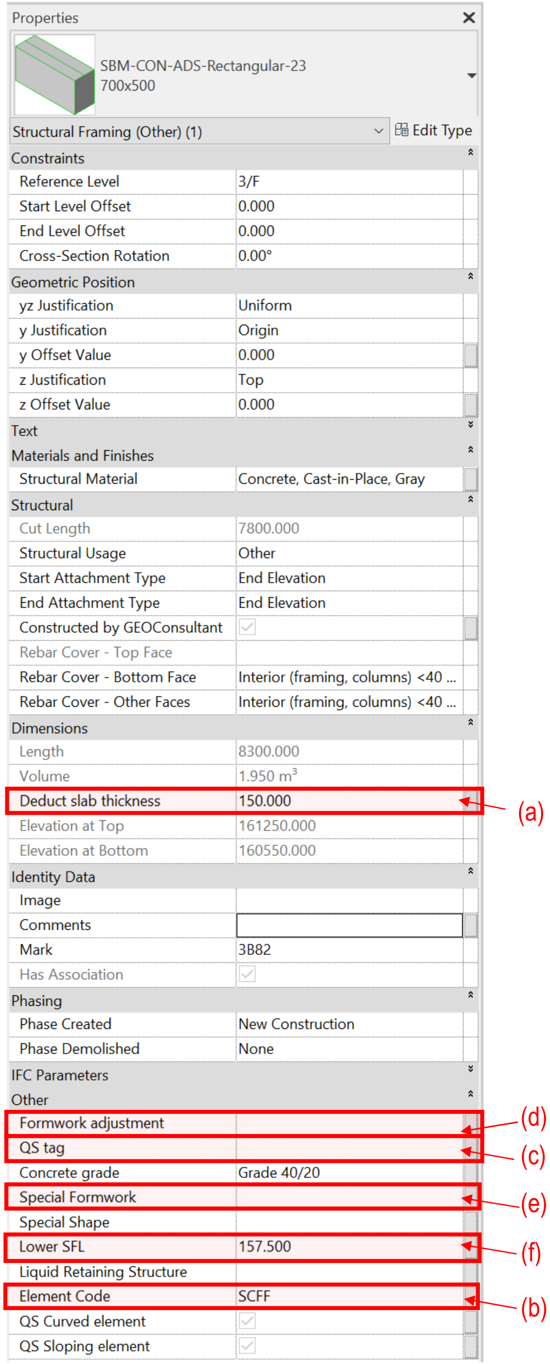
(a): Insert the thickness of slab to the parameter **Deduct slab thickness** to deduct overlapping concrete volume between structural wall and slab. If the structural wall are modelled with structural beam, input the depth of beam instead of the slab thickness. Enter "0"(zero) for no slab or beam to be deducted.

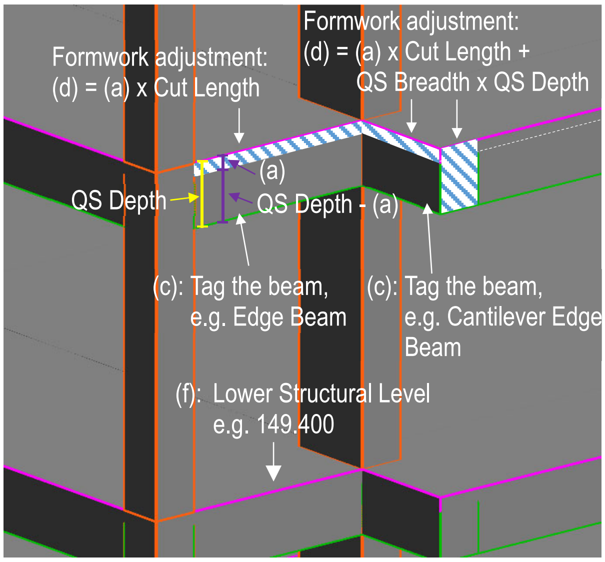
(b): Input the Sub-Element Code, e.g. FNSE – Structural Wall in substructure, SCSW – Structural Wall in superstructure, etc.

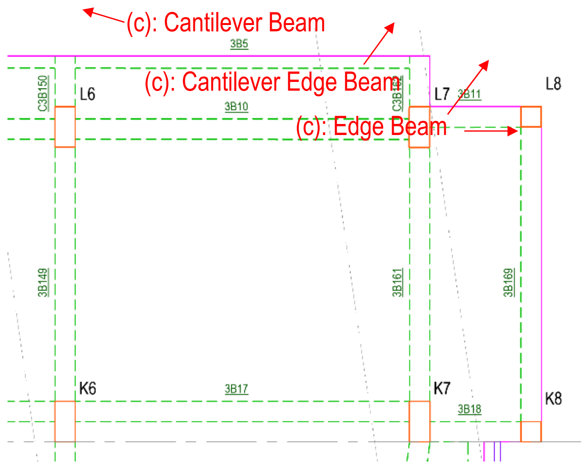
(c): Tag the structural wall if requires formwork adjustment, e.g. Slab Edge, etc.
(d): For the structural walls with tagging in **QS tag**, calculate the formwork adjustment.
(e): Identify any special formwork to be used, e.g. left-in, fwk to produce fair faced finish, etc.
(f): For identify any open end structural wall, tag the walls for measurement of “edges and breaks in walls”, e.g. one side, both sides, etc.
(g): For the walls with tagging in **Wall Edg**e, calculate the edge formwork in (m) for wall thickness ≤ 300mm.
(h): For the walls with tagging in **Wall Edge**, calculate the edge formwork in (m2) for wall thickness > 300mm.
(i): For identify any special shape[1] for wall elements (e.g. tapered, irregular, etc.)

[1] Curved wall shall be identified by modeller. All other special shaped wall may be identified by QS if required.

5.2.3.3.3 Structural Framing







Structural Framing

(a): Insert the thickness of slab to the parameter **Deduct slab thickness** to deduct overlapping concrete volume between beam and slab. Enter "0"(zero) for no slab to be deducted.

(b): Input the Sub-Element Code, e.g. FNSE – Beams in substructure, SCFF – Beams in superstructure, SCSL – Stair Beams in superstructure, etc.

(c): Tag the beam if requires formwork adjustment, e.g. edge beams, cantilever beams, cantilever edge beams, upstand beams, etc.

(d): For the beams with tagging in **QS tag**, calculate the formwork adjustment.

(e): Identify any special formwork to be used, e.g. left-in, fwk to produce fair faced finish, etc.

(f): Input the lower structural level, for calculate the strutting height to soffit of beam.

5.2.3.4 Create QTO Schedules

5.2.3.4.1 Structural Column

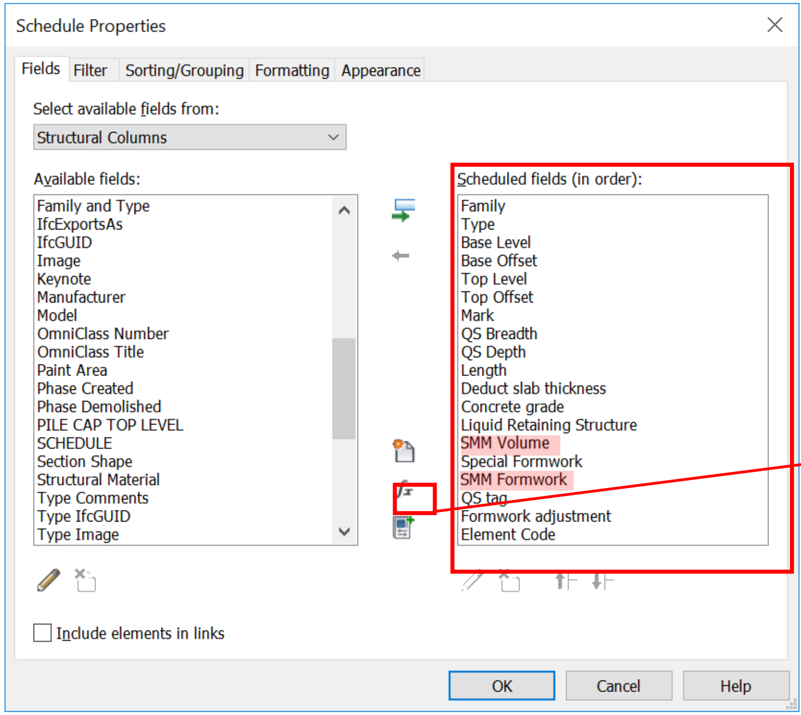
Step 1

Create a new **Structural Columns** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

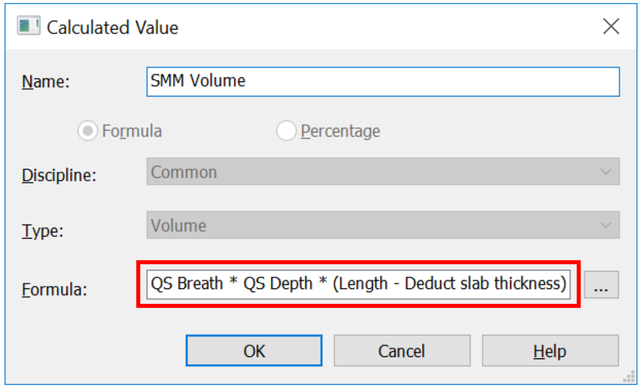
Step 2

Schedule Properties and Setting

- ❖ Fields

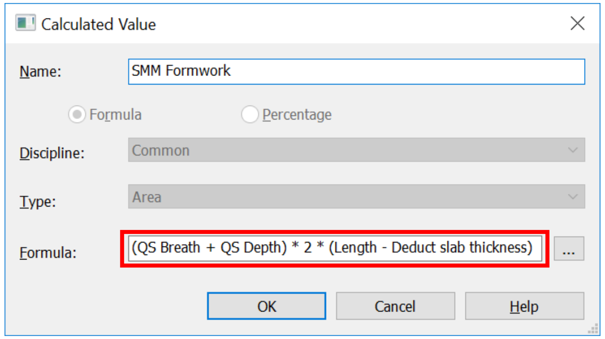


- ❖ Calculated Value - **SMM Volume**

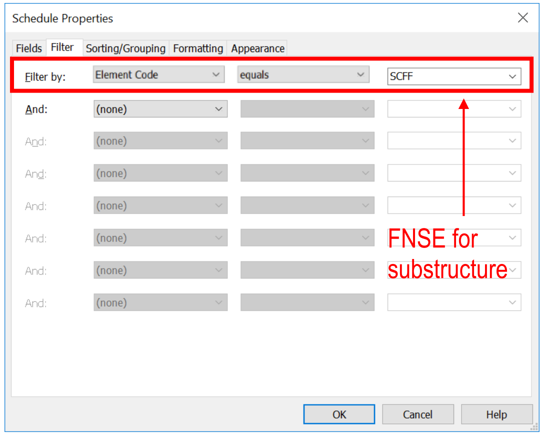


5.2.3.4.1 Structural Column (Cont'd)

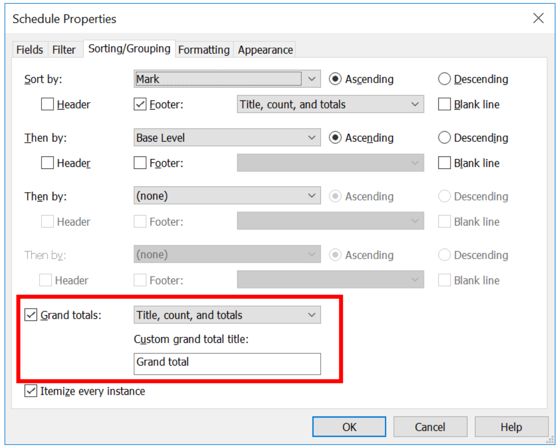
- Calculated Value – **SMM Formwork**



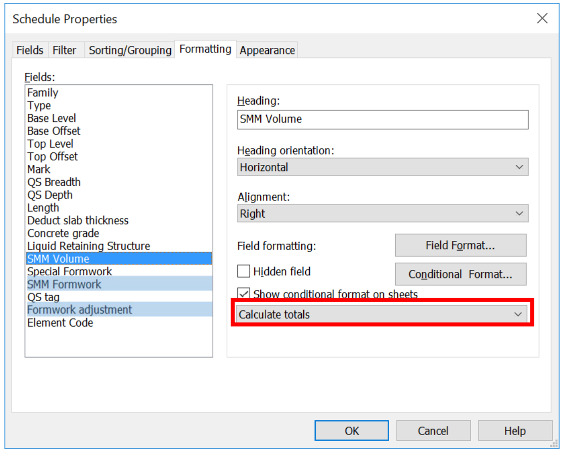
- Filter



- Sorting/Grouping



- Formatting – **SMM Volume**, **SMM Formwork** and **Formwork adjustment**



5.2.3.4.1 Structural Column (Cont'd)

Default Fields
Shared Parameter
Calculated Value

(a) Concrete Volume = ∑ Column Concrete Volume

<QTO.01_Structural Column Schedule - Superstructure>

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
		LEVEL					DIMENSIONS				CONCRETE			FORMWORK				
Family	Type	Base Level	Base Offset	Top Level	Top Offset	Mark	QS Breadth	QS Depth	Length	Deduct slab thickness	Concrete grade	Liquid Retaining Structure	SMM Volume	Special Formwork	SMM Formwork	QS tag	Formwork adjustment	Element Code
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_149.40_GF	0	PQ-100_153.75_1F	0	A10	500	1000	4350	150	Grade 40/20		2.100 m^3		12.600 m^2	Edge Column	0.075 m^2	SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_153.75_1F	0	PQ-100_157.50_2F	0	A10	500	1000	3750	225	Grade 40/20		1.763 m^3		10.575 m^2	Edge Column	0.113 m^2	SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_157.50_2F	0	PQ-100_161.25_3F	0	A10	500	1000	3750	200	Grade 40/20		1.775 m^3		10.650 m^2	Edge Column	0.100 m^2	SCFF
A10: 3													5.638 m^3		33.825 m^2		0.288 m^2	
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_149.40_GF	0	PQ-100_153.75_1F	0	A11	500	1000	4350	225	Grade 40/20		2.063 m^3		12.375 m^2	Edge Column	0.113 m^2	SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_153.75_1F	0	PQ-100_157.50_2F	0	A11	500	1000	3750	225	Grade 40/20		1.763 m^3		10.575 m^2	Edge Column	0.113 m^2	SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_157.50_2F	0	PQ-100_161.25_3F	0	A11	500	1000	3750	200	Grade 40/20		1.775 m^3		10.650 m^2	Edge Column	0.100 m^2	SCFF
A11: 3													5.600 m^3		33.600 m^2		0.326 m^2	
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_149.40_GF	0	PQ-100_153.75_1F	0	A12	500	1000	4350	225	Grade 40/20		2.063 m^3		12.375 m^2	Corner Column	0.338 m^2	SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_153.75_1F	0	PQ-100_157.50_2F	0	A12	500	1000	3750	225	Grade 40/20		1.763 m^3		10.575 m^2	Corner Column	0.338 m^2	SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_157.50_2F	0	PQ-100_161.25_3F	0	A12	500	1000	3750	200	Grade 40/20		1.775 m^3		10.650 m^2	Corner Column	0.300 m^2	SCFF
A12: 3													5.600 m^3		33.600 m^2		0.976 m^2	
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_149.40_GF	0	PQ-100_153.75_1F	0	A14	500	1000	4350	150	Grade 40/20		2.100 m^3		12.600 m^2			SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_153.75_1F	0	PQ-100_157.50_2F	0	A14	500	1000	3750	150	Grade 40/20		1.800 m^3		10.800 m^2			SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_157.50_2F	0	PQ-100_161.25_3F	0	A14	500	1000	3750	150	Grade 40/20		1.800 m^3		10.800 m^2			SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_161.25_3F	0	PQ-100_165.00_4F	0	A14	500	1000	3750	150	Grade 40/20		1.800 m^3		10.800 m^2			SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_165.00_4F	0	PQ-100_168.75_5F	0	A14	500	1000	3750	150	Grade 40/20		1.800 m^3		10.800 m^2			SCFF
										:								
										:								
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_168.75_5F	0	PQ-100_172.50_6F	0	L7	500	1000	3750	150	Grade 40/20		1.800 m^3		10.800 m^2	Edge Column	0.075 m^2	SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_172.50_6F	0	PQ-100_176.25_RF	0	L7	500	1000	3750	175	Grade 40/20		1.788 m^3		10.725 m^2	Edge Column	0.075 m^2	SCFF
L7: 7													12.888 m^3		77.325 m^2		0.300 m^2	
SCL-CON-ADS-19-rectangular	500x500	PQ-100_149.40_GF	0	PQ-100_153.75_1F	0	L8	500	500	4350	150	Grade 40/20		1.050 m^3		8.400 m^2	Corner Column	0.150 m^2	SCFF
SCL-CON-ADS-19-rectangular	500x500	PQ-100_153.75_1F	0	PQ-100_157.50_2F	0	L8	500	500	3750	150	Grade 40/20		0.900 m^3		7.200 m^2	Corner Column	0.150 m^2	SCFF
SCL-CON-ADS-19-rectangular	500x500	PQ-100_157.50_2F	0	PQ-100_161.25_3F	0	L8	500	500	3750	150	Grade 40/20		0.900 m^3		7.200 m^2	Corner Column	0.150 m^2	SCFF
SCL-CON-ADS-19-rectangular	500x500	PQ-100_161.25_3F	0	PQ-100_165.00_4F	0	L8	500	500	3750	150	Grade 40/20		0.900 m^3		7.200 m^2	Corner Column	0.150 m^2	SCFF
SCL-CON-ADS-19-rectangular	500x500	PQ-100_165.00_4F	0	PQ-100_168.75_5F	0	L8	500	500	3750	150	Grade 40/20		0.900 m^3		7.200 m^2	Corner Column	0.150 m^2	SCFF
SCL-CON-ADS-19-rectangular	500x500	PQ-100_168.75_5F	0	PQ-100_172.50_6F	0	L8	500	500	3750	150	Grade 40/20		0.900 m^3		7.200 m^2	Corner Column	0.150 m^2	SCFF
SCL-CON-ADS-19-rectangular	500x500	PQ-100_172.50_6F	0	PQ-100_176.25_RF	0	L8	500	500	3750	175	Grade 40/20		0.894 m^3		7.150 m^2	Corner Column	0.175 m^2	SCFF
L8: 7													6.444 m^3		51.550 m^2		1.075 m^2	
Grand total: 287													481.176 m^3		2980.232 m^2		6.563 m^2	

Fields name: **Length** is a default height, the height included the slab thickness.

For the circular columns, adjust the formula of **SMM Volume** appropriately.

Remarks:

To differentiate quantities related to different concrete mix, concrete type, etc., use the **Duplicate View** to duplicate the schedule and use **Filter** to create different schedules.

5.2.3.4.1 Structural Column (Cont'd)

(b) Formwork Area = ∑ Column Formwork Area + ∑ Formwork Adjustment

<QTO.01_Structural Column Schedule - Superstructure>

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
		LEVEL					DIMENSIONS				CONCRETE			FORMWORK				
Family	Type	Base Level	Base Offset	Top Level	Top Offset	Mark	QS Breadth	QS Depth	Length	Deduct slab thickness	Concrete grade	Liquid Retaining Structure	SMM Volume	Special Formwork	SMM Formwork	QS tag	Formwork adjustment	Element Code
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_149.40_GF	0	PQ-100_153.75_1F	0	A10	500	1000	4350	150	Grade 40/20		2.100 m^3		12.600 m^2	Edge Column	0.075 m^2	SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_153.75_1F	0	PQ-100_157.50_2F	0	A10	500	1000	3750	225	Grade 40/20		1.763 m^3		10.575 m^2	Edge Column	0.113 m^2	SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_157.50_2F	0	PQ-100_161.25_3F	0	A10	500	1000	3750	200	Grade 40/20		1.775 m^3		10.650 m^2	Edge Column	0.100 m^2	SCFF
A10: 3													5.638 m^3		33.825 m^2		0.288 m^2	
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_149.40_GF	0	PQ-100_153.75_1F	0	A11	500	1000	4350	225	Grade 40/20		2.063 m^3		12.375 m^2	Edge Column	0.113 m^2	SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_153.75_1F	0	PQ-100_157.50_2F	0	A11	500	1000	3750	225	Grade 40/20		1.763 m^3		10.575 m^2	Edge Column	0.113 m^2	SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_157.50_2F	0	PQ-100_161.25_3F	0	A11	500	1000	3750	200	Grade 40/20		1.775 m^3		10.650 m^2	Edge Column	0.100 m^2	SCFF
A11: 3													5.600 m^3		33.600 m^2		0.326 m^2	
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_149.40_GF	0	PQ-100_153.75_1F	0	A12	500	1000	4350	225	Grade 40/20		2.063 m^3		12.375 m^2	Corner Column	0.338 m^2	SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_153.75_1F	0	PQ-100_157.50_2F	0	A12	500	1000	3750	225	Grade 40/20		1.763 m^3		10.575 m^2	Corner Column	0.338 m^2	SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_157.50_2F	0	PQ-100_161.25_3F	0	A12	500	1000	3750	200	Grade 40/20		1.775 m^3		10.650 m^2	Corner Column	0.300 m^2	SCFF
A12: 3													5.600 m^3		33.600 m^2		0.976 m^2	
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_149.40_GF	0	PQ-100_153.75_1F	0	A14	500	1000	4350	150	Grade 40/20		2.100 m^3		12.600 m^2			SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_153.75_1F	0	PQ-100_157.50_2F	0	A14	500	1000	3750	150	Grade 40/20		1.800 m^3		10.800 m^2			SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_157.50_2F	0	PQ-100_161.25_3F	0	A14	500	1000	3750	150	Grade 40/20		1.800 m^3		10.800 m^2			SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_161.25_3F	0	PQ-100_165.00_4F	0	A14	500	1000	3750	150	Grade 40/20		1.800 m^3		10.800 m^2			SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_165.00_4F	0	PQ-100_168.75_5F	0	A14	500	1000	3750	150	Grade 40/20		1.800 m^3		10.800 m^2			SCFF
											:							
											:							
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_168.75_5F	0	PQ-100_172.50_6F	0	L7	500	1000	3750	150	Grade 40/20		1.800 m^3		10.800 m^2	Edge Column	0.075 m^2	SCFF
SCL-CON-ADS-19-rectangular	1000x500	PQ-100_172.50_6F	0	PQ-100_176.25_RF	0	L7	500	1000	3750	175	Grade 40/20		1.788 m^3		10.725 m^2	Edge Column	0.075 m^2	SCFF
L7: 7													12.888 m^3		77.325 m^2		0.300 m^2	
SCL-CON-ADS-19-rectangular	500x500	PQ-100_149.40_GF	0	PQ-100_153.75_1F	0	L8	500	500	4350	150	Grade 40/20		1.050 m^3		8.400 m^2	Corner Column	0.150 m^2	SCFF
SCL-CON-ADS-19-rectangular	500x500	PQ-100_153.75_1F	0	PQ-100_157.50_2F	0	L8	500	500	3750	150	Grade 40/20		0.900 m^3		7.200 m^2	Corner Column	0.150 m^2	SCFF
SCL-CON-ADS-19-rectangular	500x500	PQ-100_157.50_2F	0	PQ-100_161.25_3F	0	L8	500	500	3750	150	Grade 40/20		0.900 m^3		7.200 m^2	Corner Column	0.150 m^2	SCFF
SCL-CON-ADS-19-rectangular	500x500	PQ-100_161.25_3F	0	PQ-100_165.00_4F	0	L8	500	500	3750	150	Grade 40/20		0.900 m^3		7.200 m^2	Corner Column	0.150 m^2	SCFF
SCL-CON-ADS-19-rectangular	500x500	PQ-100_165.00_4F	0	PQ-100_168.75_5F	0	L8	500	500	3750	150	Grade 40/20		0.900 m^3		7.200 m^2	Corner Column	0.150 m^2	SCFF
SCL-CON-ADS-19-rectangular	500x500	PQ-100_168.75_5F	0	PQ-100_172.50_6F	0	L8	500	500	3750	150	Grade 40/20		0.900 m^3		7.200 m^2	Corner Column	0.150 m^2	SCFF
SCL-CON-ADS-19-rectangular	500x500	PQ-100_172.50_6F	0	PQ-100_176.25_RF	0	L8	500	500	3750	175	Grade 40/20		0.894 m^3		7.150 m^2	Corner Column	0.175 m^2	SCFF
L8: 7													6.444 m^3		51.550 m^2		1.075 m^2	
Grand total: 287													481.176 m^3		2980.232 m^2		6.563 m^2	

Fields name: **Length** is a default height, the height includes the slab thickness.

For the circular columns, adjust the formula of **SMM Formwork** appropriately.

<u>Remarks:</u>

To differentiate quantities related to different special formwork, etc., use the **Duplicate View** to duplicate the schedule and use **Filter** to create different schedules.

5.2.3.4.2 Structural Wall

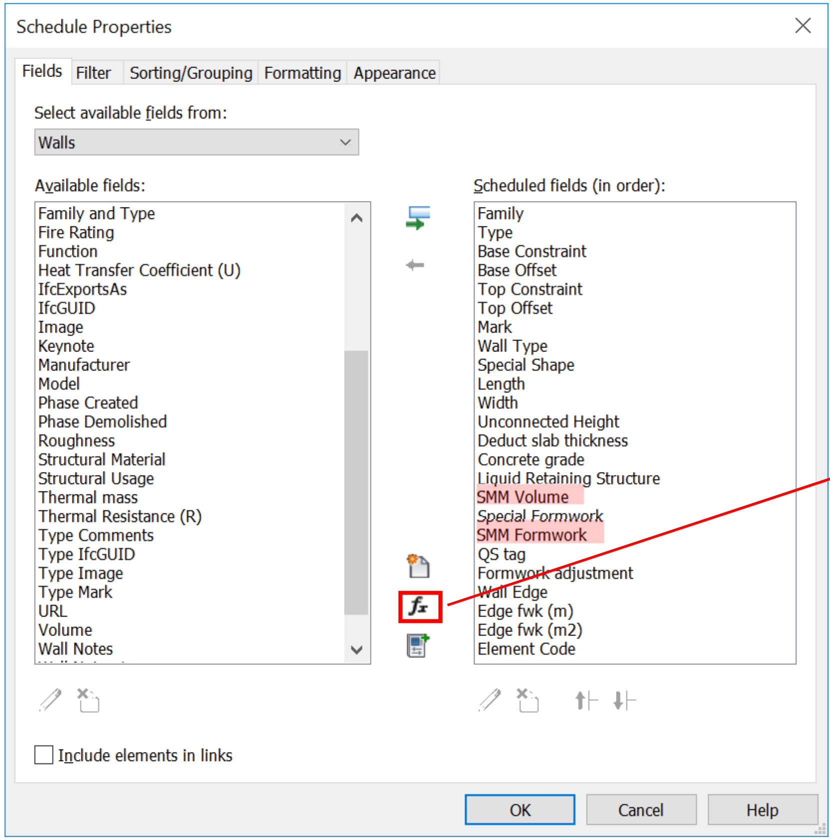
Step 1

Create a new **Walls** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

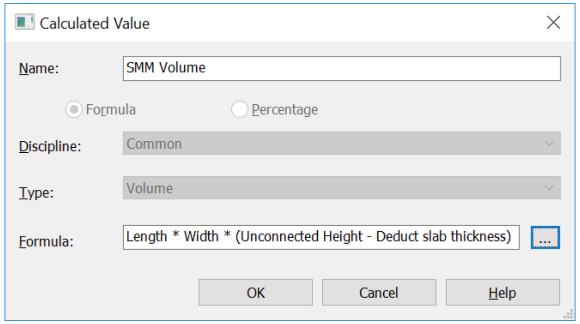
Step 2

Schedule Properties and Setting

- Fields

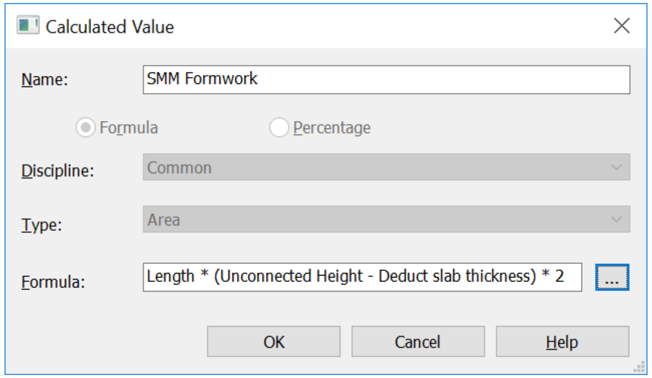


- Calculated Value – **SMM Volume**

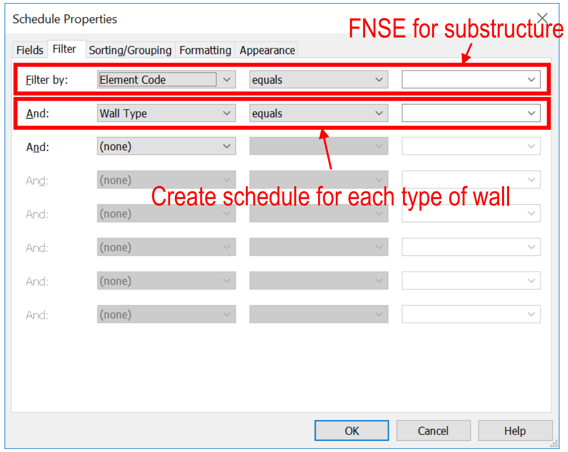


5.2.3.4.2 Structural Wall (Cont'd)

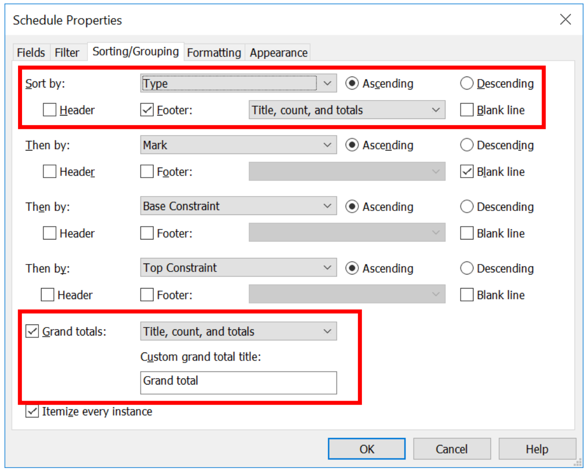
❖ Calculated Value – **SMM Formwork**



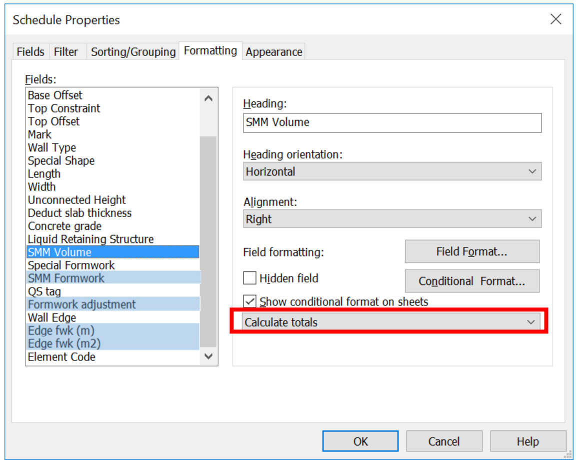
❖ Filter



❖ Sorting/Grouping



❖ Formatting – **SMM Volume**, **SMM Formwork**, **Formwork adjustment**, **Edge fwk (m)** and **Edge fwk (m2)**



Default Fields
Shared Parameter
Calculated Value

5.2.3.4.2 Structural Wall (Cont'd)

(a) Concrete Volume = $\sum$ Wall Concrete Volume (For each type and every thickness)

<QTO.03_Wall Schedule – Superstructure_Structural Wall>

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
OBJECT		LEVEL							DIMENSION				CONCRETE			FORMWORK				EDGE FORMWORK			
Family	Type	Base Constraint	Base Offset	Top Constraint	Top Offset	Mark	Wall Type	Special Shape	Length	Width	Unconnected Height	Deduct slab thickness	Concrete grade	Liquid Retaining Structure	SMM Volume	Special Formwork	SMM Formwork	QS tag	Formwork adjustment	Wall Edge	Edge fwk (m)	Edge fwk (m2)	Element Code
Basic Wall	300	PQ-100_153.75_1F	-1950	Up to level: PQ-100_153.75_1F	-775		Structural Wall		4,450	300	1,175	175	Grade 40/20		1.335 m^3		8.900 m^2	Slab edge	0.779 m^2	One side	1.000 m		SCSW
Basic Wall	300	PQ-100_157.50_2F	0	Unconnected	0		Structural Wall	Batten	3,745	300	4,000	0	Grade 40/20		4.495 m^3		29.963 m^2						SCSW
Basic Wall	300	PQ-100_149.40_GF	0	Up to level: PQ-100_153.75_1F	0	W1	Structural Wall		3,000	300	4,350	150	Grade 40/20		3.780 m^3		25.200 m^2	Slab edge	0.450 m^2	Both sides	8.400 m		SCSW
Basic Wall	300	PQ-100_153.75_1F	0	Up to level: PQ-100_157.50_2F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m^3		21.600 m^2	Slab edge	0.450 m^2	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_157.50_2F	0	Up to level: PQ-100_161.25_3F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m^3		21.600 m^2	Slab edge	0.450 m^2	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_161.25_3F	0	Up to level: PQ-100_165.00_4F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m^3		21.600 m^2	Slab edge	0.450 m^2	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_165.00_4F	0	Up to level: PQ-100_168.75_5F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m^3		21.600 m^2	Slab edge	0.450 m^2	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_168.75_5F	0	Up to level: PQ-100_172.50_6F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m^3		21.600 m^2	Slab edge	0.450 m^2	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_172.50_6F	0	Up to level: PQ-100_176.25_RF	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m^3		21.600 m^2	Slab edge	0.450 m^2	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_149.40_GF	0	Up to level: PQ-100_153.75_1F	0	W2	Structural Wall		6,550	300	4,350	0	Grade 40/20		8.548 m^3		56.985 m^2			Both sides	8.700 m		SCSW
Basic Wall	300	PQ-100_153.75_1F	0	Up to level: PQ-100_157.50_2F	0	W2	Structural Wall		4,100	300	3,750	0	Grade 40/20		4.613 m^3		30.750 m^2			Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_157.50_2F	0	Up to level: PQ-100_161.25_3F	0	W2	Structural Wall		4,100	300	3,750	0	Grade 40/20		4.613 m^3		30.750 m^2			Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_161.25_3F	0	Up to level: PQ-100_165.00_4F	0	W2	Structural Wall		4,100	300	3,750	0	Grade 40/20		4.613 m^3		30.750 m^2			Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_165.00_4F	0	Up to level: PQ-100_168.75_5F	0	W2	Structural Wall		4,100	300	3,750	0	Grade 40/20		4.613 m^3		30.750 m^2			Both sides	7.500 m		SCSW
													⋮										
Basic Wall	300	PQ-100_172.50_6F	0	Up to level: PQ-100_176.25_RF	0	W14	Structural Wall		4,100	300	3,750	0	Grade 40/20		4.613 m^3		30.750 m^2			Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_176.25_RF	-225	Up to level: PQ-100_180.75_URF	-1625	W14	Structural Wall		4,100	300	3,100	175	Grade 40/20		3.598 m^3		23.985 m^2			Both sides	5.850 m		SCSW
Basic Wall	300	PQ-100_149.40_GF	0	Up to level: PQ-100_153.75_1F	0	W15	Structural Wall		3,000	300	4,350	150	Grade 40/20		3.780 m^3		25.200 m^2	Slab edge	0.450 m^2	Both sides	8.700 m		SCSW
Basic Wall	300	PQ-100_153.75_1F	0	Up to level: PQ-100_157.50_2F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m^3		21.600 m^2	Slab edge	0.450 m^2	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_157.50_2F	0	Up to level: PQ-100_161.25_3F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m^3		21.600 m^2	Slab edge	0.450 m^2	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_161.25_3F	0	Up to level: PQ-100_165.00_4F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m^3		21.600 m^2	Slab edge	0.450 m^2	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_165.00_4F	0	Up to level: PQ-100_168.75_5F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m^3		21.600 m^2	Slab edge	0.450 m^2	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_168.75_5F	0	Up to level: PQ-100_172.50_6F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m^3		21.600 m^2	Slab edge	0.450 m^2	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_172.50_6F	0	Up to level: PQ-100_176.25_RF	0	W15	Structural Wall		3,000	300	3,750	175	Grade 40/20		3.218 m^3		21.450 m^2	Slab edge	0.525 m^2	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_176.25_RF	0	Up to level: PQ-100_180.75_URF	-1625	W15	Structural Wall		3,000	300	2,875	175	Grade 40/20		2.430 m^3		16.200 m^2	Slab edge	0.525 m^2	Both sides	5.750 m		SCSW
300: 86															439.640 m^3		2930.935 m^2		26.756 m^2		551.922 m	0.000 m^2	
Basic Wall	500	PQ-100_149.40_GF	0	Up to level: PQ-100_153.75_1F	0	W8	Structural Wall		3,250	500	4,350	150	Grade 40/20		6.825 m^3		27.300 m^2						SCSW
Basic Wall	500	PQ-100_153.75_1F	0	Up to level: PQ-100_157.50_2F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m^3		23.400 m^2						SCSW
Basic Wall	500	PQ-100_157.50_2F	0	Up to level: PQ-100_161.25_3F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m^3		23.400 m^2						SCSW
Basic Wall	500	PQ-100_161.25_3F	0	Up to level: PQ-100_165.00_4F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m^3		23.400 m^2						SCSW
Basic Wall	500	PQ-100_165.00_4F	0	Up to level: PQ-100_168.75_5F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m^3		23.400 m^2						SCSW
Basic Wall	500	PQ-100_168.75_5F	0	Up to level: PQ-100_172.50_6F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m^3		23.400 m^2						SCSW
Basic Wall	500	PQ-100_172.50_6F	0	Up to level: PQ-100_176.25_RF	0	W8	Structural Wall		3,250	500	3,750	175	Grade 40/20		5.809 m^3		23.238 m^2						SCSW
Basic Wall	500	PQ-100_176.25_RF	0	Up to level: PQ-100_180.75_URF	0	W8	Structural Wall		3,250	500	4,500	0	Grade 40/20		7.313 m^3		29.250 m^2						SCSW
Basic Wall	500	PQ-100_180.75_URF	0	Unconnected	0	W8	Structural Wall		3,250	500	1,125	175	Grade 40/20		1.544 m^3		6.175 m^2	Slab edge	0.569 m^2				SCSW
500: 9															50.741 m^3		202.962 m^2		0.569 m^2		0.000 m	0.000 m^2	
Grand total: 95															490.381 m^3		3133.897 m^2		27.325 m^2		551.922 m	0.000 m^2	

Fields name: **Unconnected Height** is a default height, the height includes the slab thickness.

Adjust the formula of **SMM Volume** to suit special shape concrete structure

<u>Remarks:</u>

To differentiate quantities related to different concrete mix, concrete type, etc., use the **Duplicate View** to duplicate the schedule and use **Filter** to create different schedules.

5.2.3.4.2 Structural Wall (Cont'd)

(b) Formwork Area = ∑ Wall Formwork Area + ∑ Formwork Adjustment

<QTO.03_Wall Schedule – Superstructure_Structural Wall>

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
OBJECT		LEVEL							DIMENSION				CONCRETE			FORMWORK				EDGE FORMWORK			
Family	Type	Base Constraint	Base Offset	Top Constraint	Top Offset	Mark	Wall Type	Special Shape	Length	Width	Unconnected Height	Deduct slab thickness	Concrete grade	Liquid Retaining Structure	SMM Volume	Special Formwork	SMM Formwork	QS tag	Formwork adjustment	Wall Edge	Edge fwk (m)	Edge fwk (m2)	Element Code
Basic Wall	300	PQ-100_153.75_1F	-1950	Up to level: PQ-100_153.75_1F	-775		Structural Wall		4,450	300	1,175	175	Grade 40/20		1.335 m³		8.900 m²	Slab edge	0.779 m²	One side	1.000 m		SCSW
Basic Wall	300	PQ-100_157.50_2F	0	Unconnected	0		Structural Wall	Batten	3,745	300	4,000	0	Grade 40/20		4.495 m³		29.963 m²						SCSW
Basic Wall	300	PQ-100_149.40_GF	0	Up to level: PQ-100_153.75_1F	0	W1	Structural Wall		3,000	300	4,350	150	Grade 40/20		3.780 m³		25.200 m²	Slab edge	0.450 m²	Both sides	8.400 m		SCSW
Basic Wall	300	PQ-100_153.75_1F	0	Up to level: PQ-100_157.50_2F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_157.50_2F	0	Up to level: PQ-100_161.25_3F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_161.25_3F	0	Up to level: PQ-100_165.00_4F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_165.00_4F	0	Up to level: PQ-100_168.75_5F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_168.75_5F	0	Up to level: PQ-100_172.50_6F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_172.50_6F	0	Up to level: PQ-100_176.25_RF	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_149.40_GF	0	Up to level: PQ-100_153.75_1F	0	W2	Structural Wall		6,550	300	4,350	0	Grade 40/20		8.548 m³		56.985 m²			Both sides	8.700 m		SCSW
Basic Wall	300	PQ-100_153.75_1F	0	Up to level: PQ-100_157.50_2F	0	W2	Structural Wall		4,100	300	3,750	0	Grade 40/20		4.613 m³		30.750 m²			Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_157.50_2F	0	Up to level: PQ-100_161.25_3F	0	W2	Structural Wall		4,100	300	3,750	0	Grade 40/20		4.613 m³		30.750 m²			Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_161.25_3F	0	Up to level: PQ-100_165.00_4F	0	W2	Structural Wall		4,100	300	3,750	0	Grade 40/20		4.613 m³		30.750 m²			Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_165.00_4F	0	Up to level: PQ-100_168.75_5F	0	W2	Structural Wall		4,100	300	3,750	0	Grade 40/20		4.613 m³		30.750 m²			Both sides	7.500 m		SCSW
													⋮										
Basic Wall	300	PQ-100_172.50_6F	0	Up to level: PQ-100_176.25_RF	0	W14	Structural Wall		4,100	300	3,750	0	Grade 40/20		4.613 m³		30.750 m²			Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_176.25_RF	-225	Up to level: PQ-100_180.75_URF	-1625	W14	Structural Wall		4,100	300	3,100	175	Grade 40/20		3.598 m³		23.985 m²			Both sides	5.850 m		SCSW
Basic Wall	300	PQ-100_149.40_GF	0	Up to level: PQ-100_153.75_1F	0	W15	Structural Wall		3,000	300	4,350	150	Grade 40/20		3.780 m³		25.200 m²	Slab edge	0.450 m²	Both sides	8.700 m		SCSW
Basic Wall	300	PQ-100_153.75_1F	0	Up to level: PQ-100_157.50_2F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_157.50_2F	0	Up to level: PQ-100_161.25_3F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_161.25_3F	0	Up to level: PQ-100_165.00_4F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_165.00_4F	0	Up to level: PQ-100_168.75_5F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_168.75_5F	0	Up to level: PQ-100_172.50_6F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_172.50_6F	0	Up to level: PQ-100_176.25_RF	0	W15	Structural Wall		3,000	300	3,750	175	Grade 40/20		3.218 m³		21.450 m²	Slab edge	0.525 m²	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_176.25_RF	0	Up to level: PQ-100_180.75_URF	-1625	W15	Structural Wall		3,000	300	2,875	175	Grade 40/20		2.430 m³		16.200 m²	Slab edge	0.525 m²	Both sides	5.750 m		SCSW
300: 86															439.640 m³		2930.935 m²		26.756 m²		551.922 m	0.000 m²	
Basic Wall	500	PQ-100_149.40_GF	0	Up to level: PQ-100_153.75_1F	0	W8	Structural Wall		3,250	500	4,350	150	Grade 40/20		6.825 m³		27.300 m²						SCSW
Basic Wall	500	PQ-100_153.75_1F	0	Up to level: PQ-100_157.50_2F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m³		23.400 m²						SCSW
Basic Wall	500	PQ-100_157.50_2F	0	Up to level: PQ-100_161.25_3F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m³		23.400 m²						SCSW
Basic Wall	500	PQ-100_161.25_3F	0	Up to level: PQ-100_165.00_4F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m³		23.400 m²						SCSW
Basic Wall	500	PQ-100_165.00_4F	0	Up to level: PQ-100_168.75_5F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m³		23.400 m²						SCSW
Basic Wall	500	PQ-100_168.75_5F	0	Up to level: PQ-100_172.50_6F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m³		23.400 m²						SCSW
Basic Wall	500	PQ-100_172.50_6F	0	Up to level: PQ-100_176.25_RF	0	W8	Structural Wall		3,250	500	3,750	175	Grade 40/20		5.809 m³		23.238 m²						SCSW
Basic Wall	500	PQ-100_176.25_RF	0	Up to level: PQ-100_180.75_URF	0	W8	Structural Wall		3,250	500	4,500	0	Grade 40/20		7.313 m³		29.250 m²						SCSW
Basic Wall	500	PQ-100_180.75_URF	0	Unconnected	0	W8	Structural Wall		3,250	500	1,125	175	Grade 40/20		1.544 m³		6.175 m²	Slab edge	0.569 m²				SCSW
500: 9															50.741 m³		202.962 m²		0.569 m²		0.000 m	0.000 m²	
Grand total: 95															490.381 m³		3133.897 m²		27.325 m²		551.922 m	0.000 m²	

Fields name: **Unconnected Height** is a default height, the height includes the slab thickness.

Adjust the formula of **SMM Formwork** to suit special shape concrete structure

<u>Remarks:</u>

To differentiate quantities related to different special formwork, etc., use the **Duplicate View** to duplicate the schedule and use **Filter** to create different schedules.

5.2.3.4.2 Structural Wall (Cont'd)

(c) (i) Edges and breaks of wall ; wall thickness < 300 thick or = 300 thick = ∑ Edge Formwork (m)

(ii) Edges and breaks of wall ; wall thickness > 300 thick = ∑ Edge Formwork (m2)

<QTO.03_Wall Schedule – Superstructure_Structural Wall>

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
OBJECT		LEVEL							DIMENSION				CONCRETE			FORMWORK				EDGE FORMWORK			
Family	Type	Base Constraint	Base Offset	Top Constraint	Top Offset	Mark	Wall Type	Special Shape	Length	Width	Unconnected Height	Deduct slab thickness	Concrete grade	Liquid Retaining Structure	SMM Volume	Special Formwork	SMM Formwork	QS tag	Formwork adjustment	Wall Edge	Edge fwk (m)	Edge fwk (m2)	Element Code
Basic Wall	300	PQ-100_153.75_1F	-1950	Up to level: PQ-100_153.75_1F	-775		Structural Wall		4,450	300	1,175	175	Grade 40/20		1.335 m³		8.900 m²	Slab edge	0.779 m²	One side	1.000 m		SCSW
Basic Wall	300	PQ-100_157.50_2F	0	Unconnected	0		Structural Wall	Batten	3,745	300	4,000	0	Grade 40/20		4.495 m³		29.963 m²						SCSW
Basic Wall	300	PQ-100_149.40_GF	0	Up to level: PQ-100_153.75_1F	0	W1	Structural Wall		3,000	300	4,350	150	Grade 40/20		3.780 m³		25.200 m²	Slab edge	0.450 m²	Both sides	8.400 m		SCSW
Basic Wall	300	PQ-100_153.75_1F	0	Up to level: PQ-100_157.50_2F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_157.50_2F	0	Up to level: PQ-100_161.25_3F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_161.25_3F	0	Up to level: PQ-100_165.00_4F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_165.00_4F	0	Up to level: PQ-100_168.75_5F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_168.75_5F	0	Up to level: PQ-100_172.50_6F	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_172.50_6F	0	Up to level: PQ-100_176.25_RF	0	W1	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.200 m		SCSW
Basic Wall	300	PQ-100_149.40_GF	0	Up to level: PQ-100_153.75_1F	0	W2	Structural Wall		6,550	300	4,350	0	Grade 40/20		8.548 m³		56.985 m²			Both sides	8.700 m		SCSW
Basic Wall	300	PQ-100_153.75_1F	0	Up to level: PQ-100_157.50_2F	0	W2	Structural Wall		4,100	300	3,750	0	Grade 40/20		4.613 m³		30.750 m²			Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_157.50_2F	0	Up to level: PQ-100_161.25_3F	0	W2	Structural Wall		4,100	300	3,750	0	Grade 40/20		4.613 m³		30.750 m²			Both sides	7.500 m		SCSW
													:										
													:										
Basic Wall	300	PQ-100_172.50_6F	0	Up to level: PQ-100_176.25_RF	0	W14	Structural Wall		4,100	300	3,750	0	Grade 40/20		4.613 m³		30.750 m²			Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_176.25_RF	-225	Up to level: PQ-100_180.75_URF	-1625	W14	Structural Wall		4,100	300	3,100	175	Grade 40/20		3.598 m³		23.985 m²			Both sides	5.850 m		SCSW
Basic Wall	300	PQ-100_149.40_GF	0	Up to level: PQ-100_153.75_1F	0	W15	Structural Wall		3,000	300	4,350	150	Grade 40/20		3.780 m³		25.200 m²	Slab edge	0.450 m²	Both sides	8.700 m		SCSW
Basic Wall	300	PQ-100_153.75_1F	0	Up to level: PQ-100_157.50_2F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_157.50_2F	0	Up to level: PQ-100_161.25_3F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_161.25_3F	0	Up to level: PQ-100_165.00_4F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_165.00_4F	0	Up to level: PQ-100_168.75_5F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_168.75_5F	0	Up to level: PQ-100_172.50_6F	0	W15	Structural Wall		3,000	300	3,750	150	Grade 40/20		3.240 m³		21.600 m²	Slab edge	0.450 m²	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_172.50_6F	0	Up to level: PQ-100_176.25_RF	0	W15	Structural Wall		3,000	300	3,750	175	Grade 40/20		3.218 m³		21.450 m²	Slab edge	0.525 m²	Both sides	7.500 m		SCSW
Basic Wall	300	PQ-100_176.25_RF	0	Up to level: PQ-100_180.75_URF	-1625	W15	Structural Wall		3,000	300	2,875	175	Grade 40/20		2.430 m³		16.200 m²	Slab edge	0.525 m²	Both sides	5.750 m		SCSW
300: 86															439.640 m³		2930.935 m²		26.756 m²		551.922 m	0.000 m	
Basic Wall	500	PQ-100_149.40_GF	0	Up to level: PQ-100_153.75_1F	0	W8	Structural Wall		3,250	500	4,350	150	Grade 40/20		6.825 m³		27.300 m²						SCSW
Basic Wall	500	PQ-100_153.75_1F	0	Up to level: PQ-100_157.50_2F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m³		23.400 m²						SCSW
Basic Wall	500	PQ-100_157.50_2F	0	Up to level: PQ-100_161.25_3F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m³		23.400 m²						SCSW
Basic Wall	500	PQ-100_161.25_3F	0	Up to level: PQ-100_165.00_4F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m³		23.400 m²						SCSW
Basic Wall	500	PQ-100_165.00_4F	0	Up to level: PQ-100_168.75_5F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m³		23.400 m²						SCSW
Basic Wall	500	PQ-100_168.75_5F	0	Up to level: PQ-100_172.50_6F	0	W8	Structural Wall		3,250	500	3,750	150	Grade 40/20		5.850 m³		23.400 m²						SCSW
Basic Wall	500	PQ-100_172.50_6F	0	Up to level: PQ-100_176.25_RF	0	W8	Structural Wall		3,250	500	3,750	175	Grade 40/20		5.809 m³		23.238 m²						SCSW
Basic Wall	500	PQ-100_176.25_RF	0	Up to level: PQ-100_180.75_URF	0	W8	Structural Wall		3,250	500	4,500	0	Grade 40/20		7.313 m³		29.250 m²						SCSW
Basic Wall	500	PQ-100_180.75_URF	0	Unconnected	0	W8	Structural Wall		3,250	500	1,125	175	Grade 40/20		1.544 m³		6.175 m²	Slab edge	0.569 m²				SCSW
500: 9															50.741 m³		202.962 m²		0.569 m²		0.000 m	0.000 m	
Grand total: 95															490.381 m³		3133.897 m²		27.325 m²		551.922 m	0.000 m	

Fields name: **Unconnected Height** is a default height, the height includes the slab thickness.

Remarks:

To differentiate quantities related to different special formwork, etc., use the **Duplicate View** to duplicate the schedule and use **Filter** to create different schedules.

5.2.3.4.3 Structural Framing

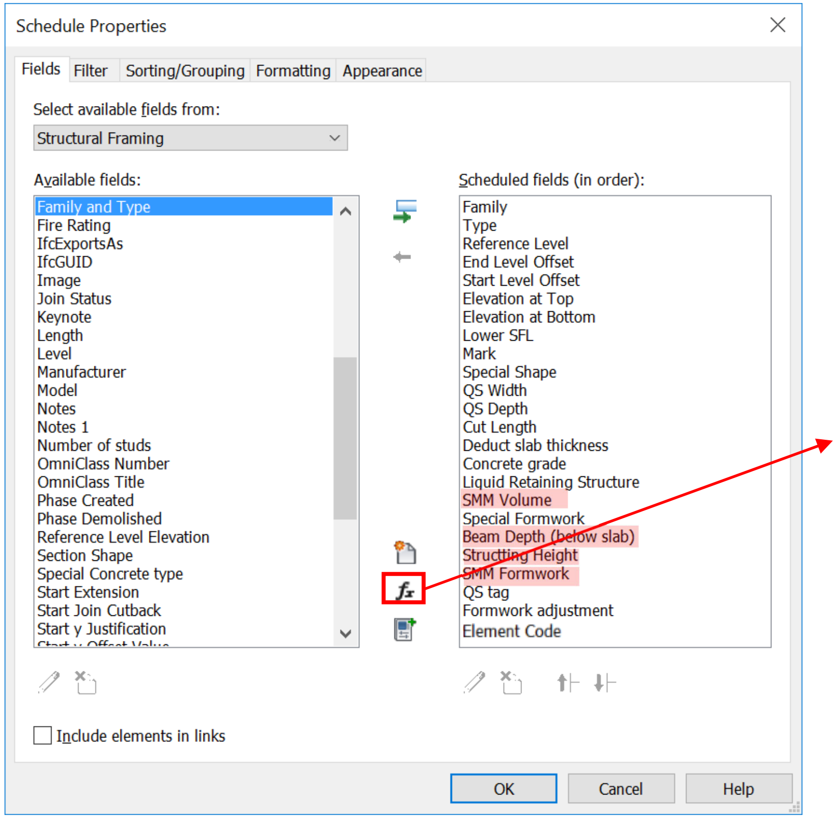
<u>Step 1</u>

Create a new **Structural Framing** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

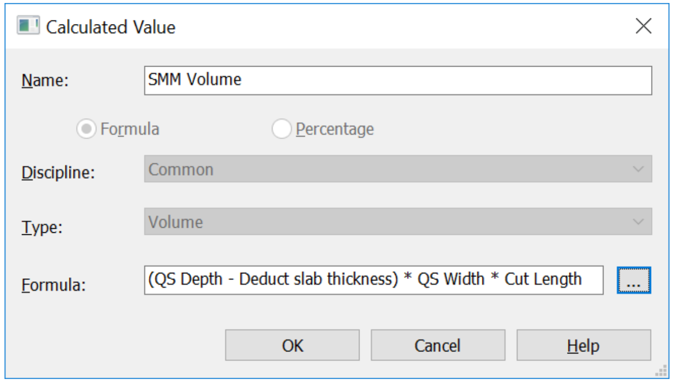
<u>Step 2</u>

<u>Schedule Properties and Setting</u>

- Fields

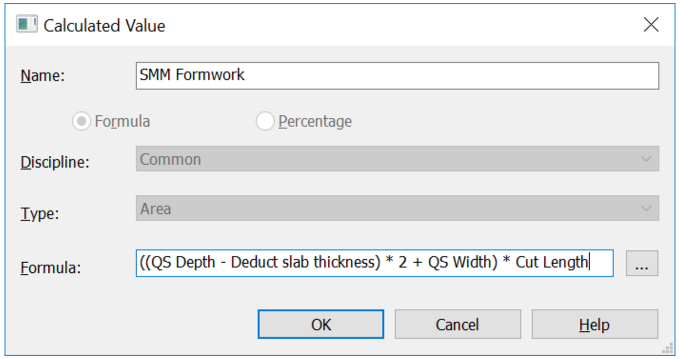


- Calculated Value – **SMM Volume**

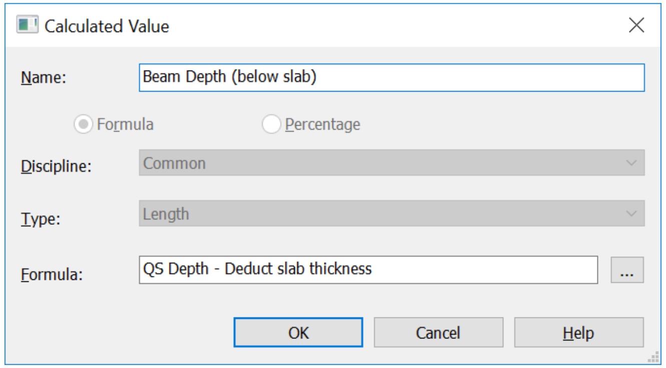


5.2.3.4.3 Structural Framing (Cont'd)

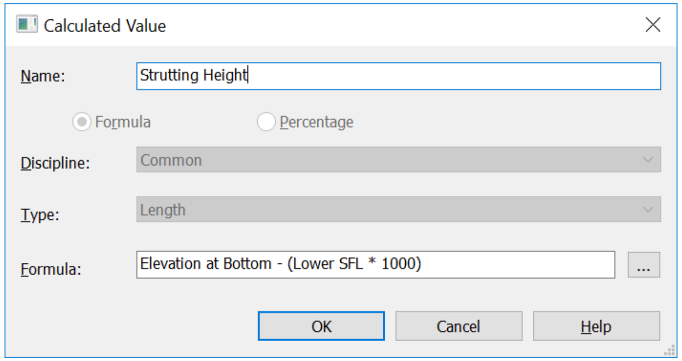
- ❖ Calculated Value – **SMM Formwork**



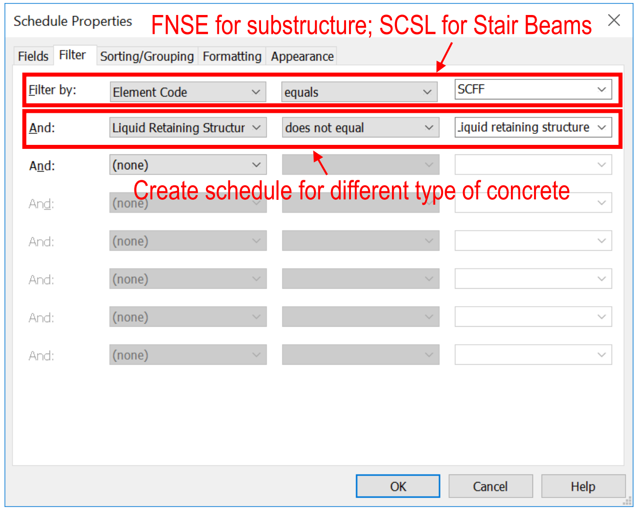
- ❖ Calculated Value – **Beam Depth (below slab)**



- ❖ Calculated Value – **Strutting Height**

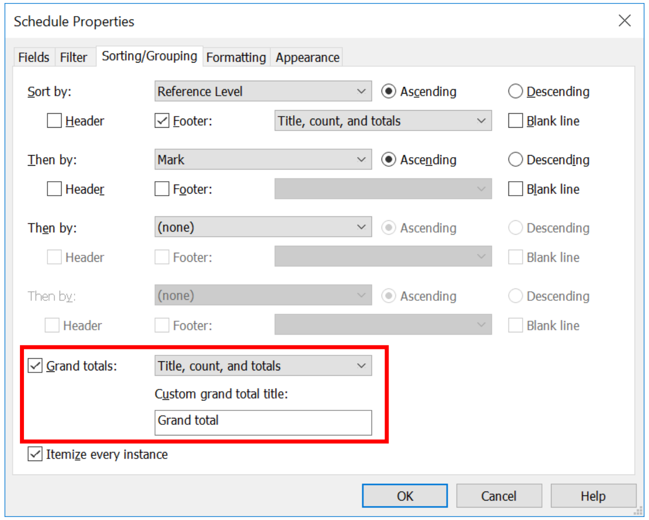


- ❖ Filter

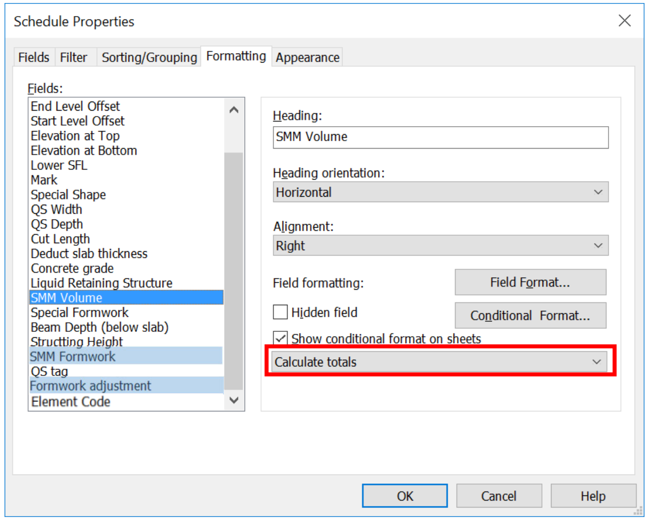


5.2.3.4.3 Structural Framing (Cont'd)

- Sorting/Grouping



- Formatting – **SMM Volume**, **SMM Formwork** and **Formwork adjustment**



Default Fields
Shared Parameter
Calculated Value

5.2.3.4.3 Structural Framing (Cont'd)

(a) Concrete Volume = ∑ Beam Concrete Volume

<QTO.07_Structural Framing Schedule - Superstructure_General>

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
		LEVEL								DIMENSION				CONCRETE			FORMWORK						
Family	Type	Reference Level	End Level Offset	Start Level Offset	Elevation at Top	Elevation at Bottom	Lower SFL	Mark	Special Shape	QS Width	QS Depth	Cut Length	Deduct slab thickness	Concrete grade	Liquid Retaining Structure	SMM Volume	Special Formwork	Beam Depth (below slab)	Structing Height	SMM Formwork	QS tag	Formwork adjustment	Element Code
SBM-CON-ADS-19-Rectangular	500x200	PQ-100_149.40_GF	0	0	152.100	151.600	149.400	1B35		200	500	3,200	150	Grade 40/20		0.224 m^3		0.350 m	2.200 m	2.880 m^2			SCFF
SBM-CON-ADS-19-Rectangular	500x250	PQ-100_149.40_GF	0	0	152.100	151.600	149.400	1B130		250	500	2,500	150	Grade 40/20		0.219 m^3		0.350 m	2.200 m	2.375 m^2			SCFF
PQ-100_149.40_GF: 2																0.443 m^3				5.255 m^2		0.000 m^2	
SBM-CON-ADS-19-Rectangular	700x300	PQ-100_153.75_1F	0	0	153.750	153.050	149.400	1B1		300	700	8,450	150	Grade 40/20		1.394 m^3		0.550 m	3.650 m	11.830 m^2	Edge Beam	1.268 m^2	SCFF
SBM-CON-ADS-19-Rectangular	700x300	PQ-100_153.75_1F	0	0	153.750	153.050	149.400	1B2		300	700	8,250	150	Grade 40/20		1.361 m^3		0.550 m	3.650 m	11.550 m^2	Edge Beam	1.238 m^2	SCFF
SBM-CON-ADS-19-Rectangular	700x300	PQ-100_153.75_1F	0	0	153.750	153.050	149.400	1B3		300	700	8,250	150	Grade 40/20		1.361 m^3		0.550 m	3.650 m	11.550 m^2	Edge Beam	1.238 m^2	SCFF
SBM-CON-ADS-19-Rectangular	700x300	PQ-100_153.75_1F	0	0	153.750	153.050	149.400	1B4		300	700	8,250	150	Grade 40/20		1.361 m^3		0.550 m	3.650 m	11.550 m^2	Edge Beam	1.238 m^2	SCFF
SBM-CON-ADS-19-Rectangular	700x300	PQ-100_153.75_1F	0	0	153.750	153.050	149.400	1B5		300	700	8,250	150	Grade 40/20		1.361 m^3		0.550 m	3.650 m	11.550 m^2	Edge Beam	1.238 m^2	SCFF
SBM-CON-ADS-19-Rectangular	700x500	PQ-100_153.75_1F	0	0	153.750	153.050	149.400	1B6		500	700	8,450	150	Grade 40/20		2.324 m^3		0.550 m	3.650 m	13.520 m^2			SCFF
SBM-CON-ADS-19-Rectangular	700x500	PQ-100_153.75_1F	0	0	153.750	153.050	149.400	1B7		500	700	8,250	150	Grade 40/20		2.269 m^3		0.550 m	3.650 m	13.200 m^2			SCFF
SBM-CON-ADS-19-Rectangular	700x500	PQ-100_153.75_1F	0	0	153.750	153.050	149.400	1B8		500	700	8,250	150	Grade 40/20		2.269 m^3		0.550 m	3.650 m	13.200 m^2			SCFF
SBM-CON-ADS-19-Rectangular	700x500	PQ-100_153.75_1F	0	0	153.750	153.050	149.400	1B9		500	700	8,250	150	Grade 40/20		2.269 m^3		0.550 m	3.650 m	13.200 m^2			SCFF
SBM-CON-ADS-19-Rectangular	700x500	PQ-100_153.75_1F	0	0	153.750	153.050	149.400	1B10		500	700	8,250	150	Grade 40/20		2.269 m^3		0.550 m	3.650 m	13.200 m^2			SCFF
SBM-CON-ADS-19-Rectangular	700x500	PQ-100_153.75_1F	0	0	153.750	153.050	149.400	1B11		500	700	2,250	150	Grade 40/20		0.619 m^3		0.550 m	3.650 m	3.600 m^2	Edge Beam	0.338 m^2	SCFF
SBM-CON-ADS-19-Rectangular	700x300	PQ-100_153.75_1F	0	0	153.750	153.050	149.400	1B12		300	700	1,550	150	Grade 40/20		0.256 m^3		0.550 m	3.650 m	2.170 m^2			SCFF
SBM-CON-ADS-19-Rectangular	700x300	PQ-100_153.75_1F	0	0	153.750	153.050	149.400	1B12A		300	700	1,550	150	Grade 40/20		0.256 m^3		0.550 m	3.650 m	2.170 m^2			SCFF
SBM-CON-ADS-19-Rectangular	700x500	PQ-100_153.75_1F	0	0	153.750	153.050	149.400	1B13		500	700	8,450	150	Grade 40/20		2.324 m^3		0.550 m	3.650 m	13.520 m^2			SCFF
													:										
													:										
SBM-CON-ADS-19-Rectangular	750x500	PQ-100_180.75_URF	0	0	180.750	180.000	176.300	URB20		500	750	10,500	175	Grade 40/20		3.019 m^3		0.575 m	3.700 m	17.325 m^2			SCFF
SBM-CON-ADS-19-Rectangular	700x300	PQ-100_180.75_URF	0	0	180.750	180.050	176.300	URB21		300	700	2,850	175	Grade 40/20		0.449 m^3		0.525 m	3.750 m	3.848 m^2			SCFF
SBM-CON-ADS-19-Rectangular	700x400	PQ-100_180.75_URF	0	0	180.750	180.050	176.300	URB22		400	700	5,000	175	Grade 40/20		1.050 m^3		0.525 m	3.750 m	7.250 m^2			SCFF
SBM-CON-ADS-19-Rectangular	700x400	PQ-100_180.75_URF	0	0	180.750	180.050	176.300	URB23		400	700	4,600	175	Grade 40/20		0.966 m^3		0.525 m	3.750 m	6.670 m^2			SCFF
SBM-CON-ADS-19-Rectangular	700x400	PQ-100_180.75_URF	0	0	180.750	180.050	176.300	URB24		400	700	800	175	Grade 40/20		0.168 m^3		0.525 m	3.750 m	1.160 m^2			SCFF
SBM-CON-ADS-19-Rectangular	700x500	PQ-100_180.75_URF	0	0	180.750	180.050	176.300	URB26		500	700	4,909	225	Grade 40/20		1.166 m^3		0.475 m	3.750 m	7.119 m^2	Edge Beam	1.105 m^2	SCFF
SBM-CON-ADS-19-Rectangular	700x500	PQ-100_180.75_URF	0	0	180.750	180.050	176.300	URB27		500	700	3,350	175	Grade 40/20		0.879 m^3		0.525 m	3.750 m	5.193 m^2	Edge Beam	0.586 m^2	SCFF
SBM-CON-ADS-19-Rectangular	750x500	PQ-100_180.75_URF	0	0	180.750	180.000	176.300	URB28		500	750	10,500	175	Grade 40/20		3.019 m^3		0.575 m	3.700 m	17.325 m^2	Edge Beam	1.838 m^2	SCFF
SBM-CON-ADS-19-Rectangular	700x500	PQ-100_180.75_URF	0	0	180.750	180.050	176.300	URB29		500	700	6,750	175	Grade 40/20		1.772 m^3		0.525 m	3.750 m	10.463 m^2	Edge Beam	1.181 m^2	SCFF
SBM-CON-ADS-19-Rectangular	700x400	PQ-100_180.75_URF	0	0	180.750	180.050	176.300	URB30		400	700	4,600	175	Grade 40/20		0.966 m^3		0.525 m	3.750 m	6.670 m^2	Edge Beam	0.805 m^2	SCFF
SBM-CON-ADS-19-Rectangular	450x300	PQ-100_180.75_URF	0	0	179.125	178.675	176.300	URB32		300	450	3,400	175	Grade 40/20		0.281 m^3		0.275 m	2.375 m	2.890 m^2	Edge Beam	0.595 m^2	SCFF
SBM-CON-ADS-19-Rectangular	450x300	PQ-100_180.75_URF	0	0	179.125	178.675	176.250	URB33		300	450	3,400	175	Grade 40/20		0.281 m^3		0.275 m	2.425 m	2.890 m^2			SCFF
SBM-CON-ADS-19-Rectangular	450x300	PQ-100_180.75_URF	0	0	179.125	178.675	176.250	URB34		300	450	1,550	175	Grade 40/20		0.128 m^3		0.275 m	2.425 m	1.318 m^2			SCFF
SBM-CON-ADS-19-Rectangular	450x300	PQ-100_180.75_URF	0	0	179.125	178.675	176.250	URB36		300	450	1,550	175	Grade 40/20		0.128 m^3		0.275 m	2.425 m	1.318 m^2			SCFF
SBM-CON-ADS-19-Rectangular	450x300	PQ-100_180.75_URF	0	0	179.125	178.675	174.300	URB38		300	450	1,550	175	Grade 40/20		0.128 m^3		0.275 m	4.375 m	1.318 m^2	Edge Beam	0.271 m^2	SCFF
SBM-CON-ADS-19-Rectangular	450x300	PQ-100_180.75_URF	0	0	179.125	178.675	174.300	URB42		300	450	1,400	175	Grade 40/20		0.115 m^3		0.275 m	4.375 m	1.190 m^2	Edge Beam	0.245 m^2	SCFF
SBM-CON-ADS-19-Rectangular	450x300	PQ-100_180.75_URF	0	0	179.125	178.675	172.500	URB43		300	450	3,500	175	Grade 40/20		0.289 m^3		0.275 m	6.175 m	2.975 m^2	Edge Beam	0.613 m^2	SCFF
SBM-CON-ADS-19-Rectangular	450x300	PQ-100_180.75_URF	0	0	179.125	178.675	176.500	URB44		300	450	2,150	175	Grade 40/20		0.177 m^3		0.275 m	2.175 m	1.828 m^2	Edge Beam	0.376 m^2	SCFF
SBM-CON-ADS-19-Rectangular	700x300	PQ-100_180.75_URF	0	0	181.875	181.175	176.450	URB45		300	700	2,950	175	Grade 40/20		0.465 m^3		0.525 m	4.725 m	3.983 m^2			SCFF
PQ-100_180.75_URF: 45																46.454 m^3				299.001 m^2		17.272 m^2	
Grand total: 1239																1652.208 m^3				9849.284 m^2		91.844 m^2	

Fields name: **Length** is a default length which includes the lapping length with other structural elements. To obtain the actual length of beams for QTO, Fields name: **Cut Length** shall be used.

Adjust the formula of **SMM Volume** to suit special shape concrete structure

Remarks:

To differentiate quantities related to different concrete mix, concrete type, etc., use the **Duplicate View** to duplicate the schedule and use **Filter** to create different schedules.

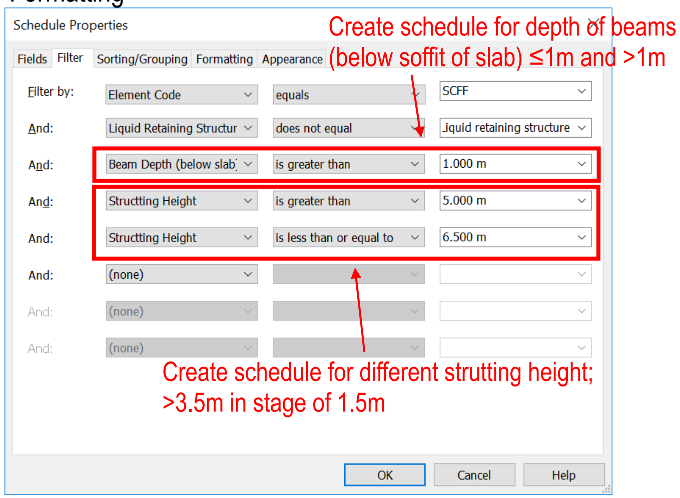
5.2.3.4.3 Structural Framing (Cont'd)

(b) Formwork Area = ∑ Beam Formwork Area + ∑ Formwork Adjustment

(i) **Duplicate View** to duplicate the schedule and use **Filter** to create different formwork schedules.
<u>For example:</u>

QTO.06_Structural Framing Schedule - Superstructure_ALL
QTO.07_Structural Framing Schedule - Superstructure_General
QTO.08_Structural Framing Schedule - Superstructure_Water tank
QTO.09_Structural Framing Schedule - Superstructure_Staircase
QTO.10_Structural Framing Schedule - Superstructure_BD≤1m_SH≤3.5m
QTO.11_Structural Framing Schedule - Superstructure_BD≤1m_SH=3.5m–5m
QTO.12_Structural Framing Schedule - Superstructure_BD≤1m_SH=5m-6.5m
QTO.13_Structural Framing Schedule - Superstructure_BD≤1m_SH=6.5m-8m
QTO.14_Structural Framing Schedule - Superstructure_BD≤1m_SH=8m-9.5m
QTO.15_Structural Framing Schedule - Superstructure_BDe.x.1m_SH≤3.5m
QTO.16_Structural Framing Schedule - Superstructure_BDe.x.1m_SH=3.5m-5m
QTO.17_Structural Framing Schedule - Superstructure_BDe.x.1m_SH=5m-6.5m
QTO.18_Structural Framing Schedule - Superstructure_BDe.x.1m_SH=6.5m-8m
QTO.19_Structural Framing Schedule - Superstructure_BDe.x.1m_SH=9.5m-11m

❖ Formatting



5.2.3.4.3 Structural Framing (Cont'd)

<QTO.17_Structural Framing Schedule - Superstructure_BDe.x.1m_SH=5m-6.5m>

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
		LEVEL											DIMENSION	CONCRETE					FORMWORK				
Family	Type	Reference Level	End Level Offset	Start Level Offset	Elevation at Top	Elevation at Bottom	Lower SFL	Mark	Special Shape	QS Width	QS Depth	Cut Length	Deduct slab thickness	Concrete grade	Liquid Retaining Structure	SMM Volume	Special Formwork	Beam Depth (below slab)	Structing Height	SMM Formwork	QS tag	Formwork adjustment	Element Code
SBM-CON-ADS-19-Rectangular	1500x600	PQ-100_161.25_3F	0	0	161.250	159.750	153.750	3B35		600	1,50	6,85	200	Grade 40/20		5.343 m³		1.300 m	6.000	21.920 m²	Partly Edge Beam	0.920 m²	SCFF
SBM-CON-ADS-19-Rectangular	1250x200	PQ-100_161.25_3F	0	0	161.175	159.925	153.750	3B44		200	1,25	2,35	200	Grade 40/20		0.494 m³		1.050 m	6.175	5.405 m²	Edge Beam	0.470 m²	SCFF
SBM-CON-ADS-19-Rectangular	1250x200	PQ-100_161.25_3F	0	0	161.175	159.925	153.750	3B45		200	1,25	2,35	200	Grade 40/20		0.494 m³		1.050 m	6.175	5.405 m²	Edge Beam	0.470 m²	SCFF
SBM-CON-ADS-19-Rectangular	1250x600	PQ-100_161.25_3F	0	0	161.250	160.000	153.750	3B55		600	1,25	6,85	200	Grade 40/20		4.316 m³		1.050 m	6.250	18.495 m²			SCFF
SBM-CON-ADS-19-Rectangular	1250x200	PQ-100_161.25_3F	0	0	161.175	159.925	153.750	3B64		200	1,25	2,35	200	Grade 40/20		0.494 m³		1.050 m	6.175	5.405 m²	Edge Beam	0.470 m²	SCFF
SBM-CON-ADS-19-Rectangular	1250x200	PQ-100_161.25_3F	0	0	161.175	159.925	153.750	3B65		200	1,25	2,35	200	Grade 40/20		0.494 m³		1.050 m	6.175	5.405 m²	Edge Beam	0.470 m²	SCFF
SBM-CON-ADS-19-Rectangular	1250x600	PQ-100_161.25_3F	0	0	161.175	159.925	153.750	3B127		600	1,25	17,20	200	Grade 40/20		10.836 m³		1.050 m	6.17	46.440 m²	Partly without slab	0.720 m²	SCFF
SBM-CON-ADS-19-Rectangular	1250x600	PQ-100_161.25_3F	0	0	161.175	159.925	153.750	3B131		600	1,25	17,20	200	Grade 40/20		10.836 m³		1.050 m	6.17	46.440 m²	Partly without slab	0.720 m²	SCFF
SBM-CON-ADS-19-Rectangular	1325x600	PQ-100_161.25_3F	0	0	161.250	159.925	153.750	3B136		600	1,32	17,55	200	Grade 40/20		11.846 m³		1.125 m	6.1[illegible]5	50.017 m²			SCFF
SBM-CON-ADS-19-Rectangular	1250x600	PQ-100_161.25_3F	0	0	161.250	160.000	153.750	3B137		600	1,25	17,20	200	Grade 40/20		10.836 m³		1.050 m	6.2[illegible]0	46.440 m²			SCFF
PQ-100_161.25_3F: 10																55.987 m³				251.372 m²		4.240 m²	
Grand total: 10																55.987 m³				251.372 m²		4.240 m²	

Adjust the formula of **SMM Formwork** to suit special shape concrete structure

<u>Remarks:</u>

To differentiate quantities related to different special formwork, etc., use the **Duplicate View** to duplicate the schedule and use **Filter** to create different schedules.

5.2.3.4.4 Structural Slab

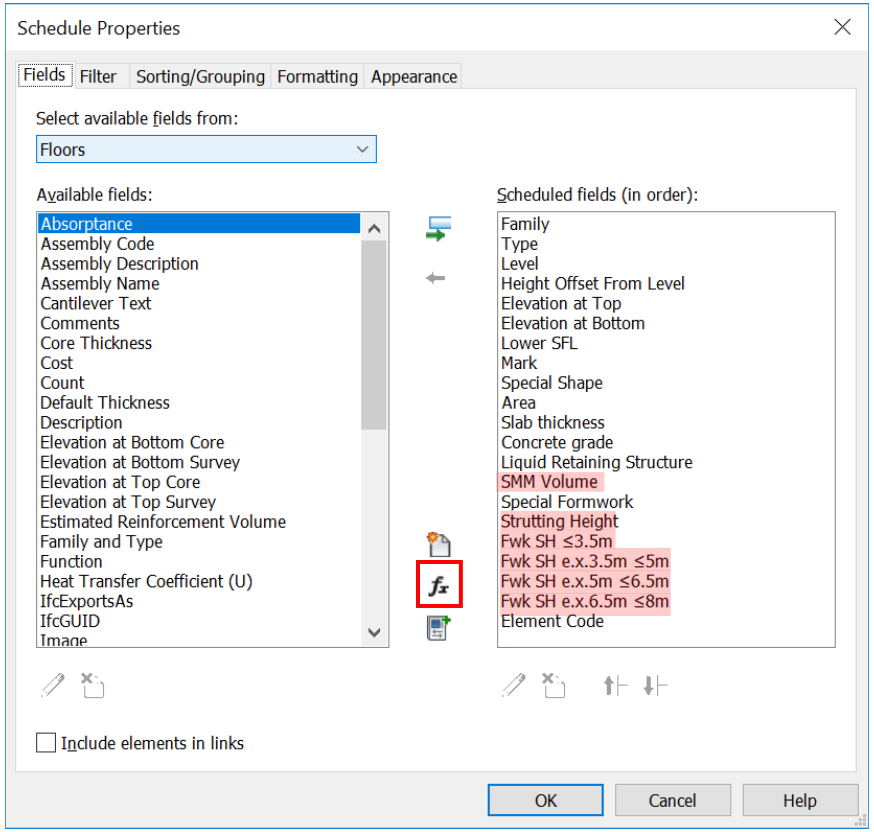
Step 1

Create a new **Floors** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.

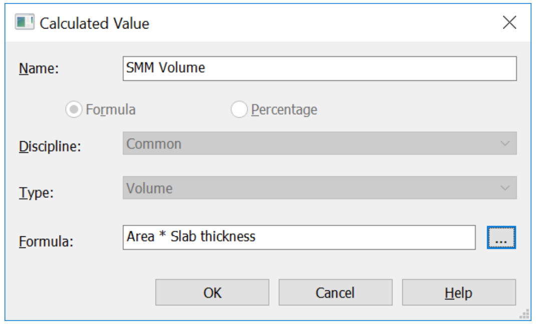
Step 2

Schedule Properties and Setting

❖ Fields

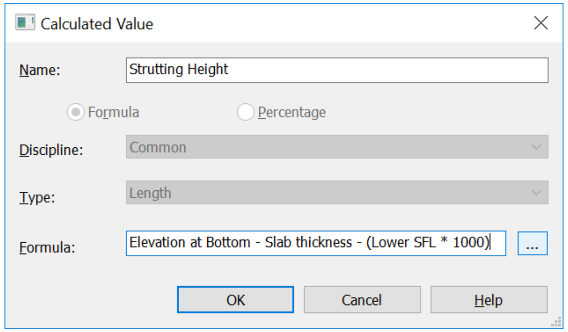


❖ Calculated Value – **SMM Volume**

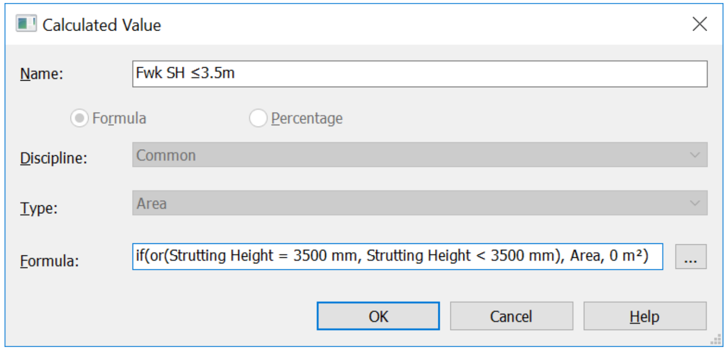


5.2.3.4.4 Structural Slab (Cont'd)

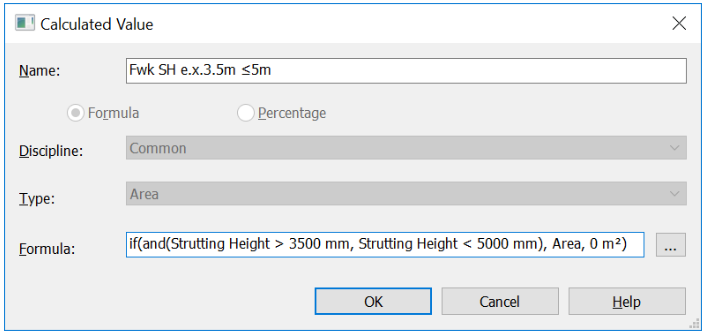
❖ Calculated Value – **Strutting Height**



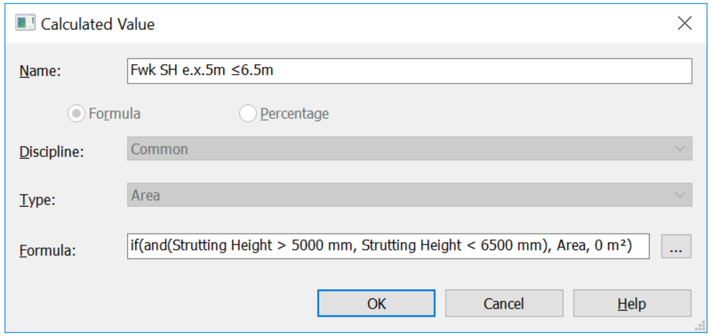
❖ Calculated Value – **Fwk SH ≤ 3.5m**



❖ Calculated Value – **Fwk SH e.x.3.5m ≤5m**

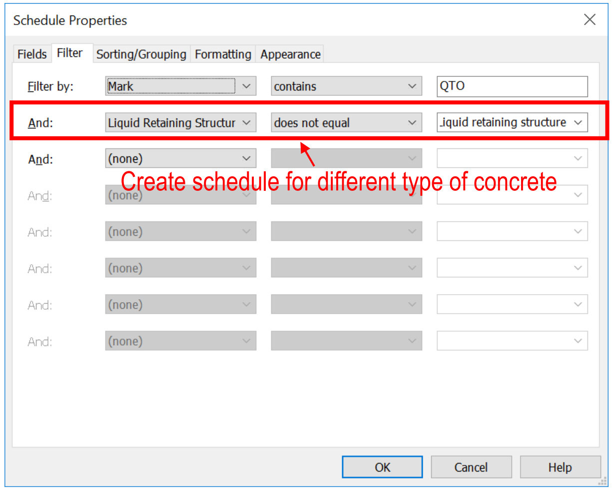


❖ Calculated Value – **Fwk SH e.x.5m ≤6.5m**

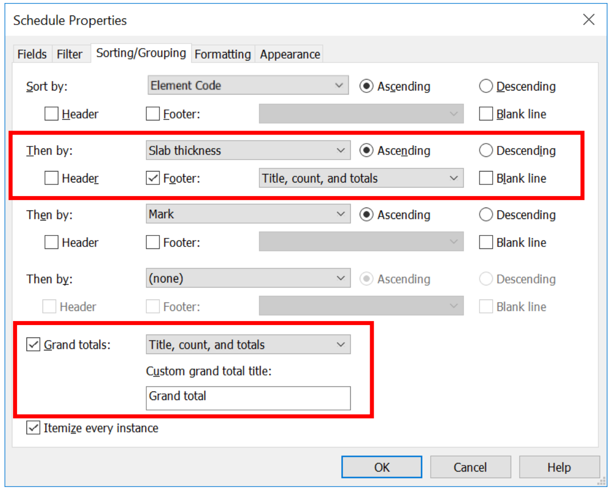


5.2.3.4.4 Structural Slab (Cont'd)

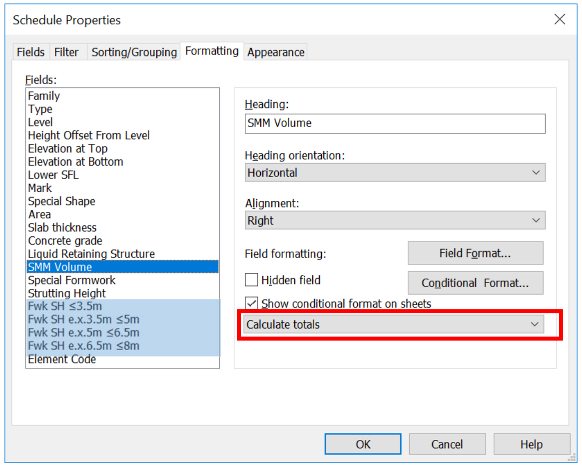
- ❖ Filter



- ❖ Sorting/Grouping



- ❖ Formatting – **SMM Volume, Fwk SH ≤ 3.5m, Fwk SH e.x.3.5m ≤5m and Fwk SH e.x.5m ≤6.5m**



5.2.3.4.4 Structural Slab (Cont'd)

(a) Concrete Volume = ∑ Slab Concrete Volume

<QTO.20_Floor Schedule - Superstructure>

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
OBJECT		LEVEL							DIMENSIONS		CONCRETE			FORMWORK						Element Code
Family	Type	Level	Height Offset From Level	Elevation at Top	Elevation at Bottom	Lower SFL	Mark	Special Shape	Area	Slab thickness	Concrete grade	Liquid Retaining Structure	SMM Volume	Special Formwork	Strutting Height	Fwk SH ≤3.5m	Fwk SH e.x.3.5m ≤5m	Fwk SH e.x.5m ≤6.5m	Fwk SH e.x.6.5m ≤8m	
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.005 m	176.255	176.250	172.500	QTO-R1		369.623 m^2	175	Grade 40/20		64.684 m^3		3.750 m	0.000 m^2	369.623 m^2	0.000 m^2	0.000 m^2	SCRF
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.005 m	176.255	176.250	172.500	QTO-R2		267.704 m^2	175	Grade 40/20		46.848 m^3		3.750 m	0.000 m^2	267.704 m^2	0.000 m^2	0.000 m^2	SCRF
Floor	5 (QTO slab)	PQ-100_180.75_URF	0.005 m	180.755	180.750	176.250	QTO-URF1		285.797 m^2	175	Grade 40/20		50.014 m^3		4.500 m	0.000 m^2	285.797 m^2	0.000 m^2	0.000 m^2	SCRF
Floor	5 (QTO slab)	PQ-100_180.75_URF	-1.620 m	179.130	179.125	176.475	QTO-URF3		42.608 m^2	175	Grade 40/20		7.456 m^3		2.650 m	42.608 m^2	0.000 m^2	0.000 m^2	0.000 m^2	SCRF
Floor	5 (QTO slab)	PQ-100_180.75_URF	1.130 m	181.880	181.875	180.750	QTO-URF4		11.364 m^2	175	Grade 40/20		1.989 m^3		1.125 m	11.364 m^2	0.000 m^2	0.000 m^2	0.000 m^2	SCRF
175: 5									977.095 m^2				170.992 m^3			53.971 m^2	923.123 m^2	0.000 m^2	0.000 m^2	
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.005 m	176.255	176.250	172.500	QTO-R3		232.978 m^2	250	Grade 40/20		58.244 m^3		3.750 m	0.000 m^2	232.978 m^2	0.000 m^2	0.000 m^2	SCRF
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.005 m	176.255	176.250	172.500	QTO-R5		264.724 m^2	250	Grade 40/20		66.181 m^3		3.750 m	0.000 m^2	264.724 m^2	0.000 m^2	0.000 m^2	SCRF
250: 2									497.702 m^2				124.425 m^3			0.000 m^2	497.702 m^2	0.000 m^2	0.000 m^2	
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.230 m	176.480	176.475	172.500	QTO-R7		305.317 m^2	175	Grade 40/20		53.430 m^3		3.975 m	0.000 m^2	305.317 m^2	0.000 m^2	0.000 m^2	SCUF
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.001 m	176.251	176.246	172.500	QTO-R8		10.635 m^2	175	Grade 40/20		1.861 m^3		3.746 m	0.000 m^2	10.635 m^2	0.000 m^2	0.000 m^2	SCUF
175: 2									315.952 m^2				55.292 m^3			0.000 m^2	315.952 m^2	0.000 m^2	0.000 m^2	
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.001 m	176.251	176.246	172.500	QTO-R4		50.400 m^2	250	Grade 40/20		12.600 m^3		3.746 m	0.000 m^2	50.400 m^2	0.000 m^2	0.000 m^2	SCUF
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.005 m	176.255	176.250	172.500	QTO-R6		15.881 m^2	250	Grade 40/20		3.970 m^3		3.750 m	0.000 m^2	15.881 m^2	0.000 m^2	0.000 m^2	SCUF
250: 2									66.281 m^2				16.570 m^3			0.000 m^2	66.281 m^2	0.000 m^2	0.000 m^2	
Grand total: 11									1857.030 m^2				367.279 m^3			53.971 m^2	1803.058 m^2	0.000 m^2	0.000 m^2	

Remarks:

To differentiate quantities related to different concrete mix, concrete type, etc., use the **Duplicate View** to duplicate the schedule and use **Filter** to create different schedules.

5.2.3.4.4 Structural Slab (Cont'd)

(b) Formwork Area = ∑ Beam Formwork Area + ∑ Deduction of overlapping area

<QTO.20_Floor Schedule - Superstructure>

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
OBJECT		LEVEL							DIMENSIONS		CONCRETE			FORMWORK						
Family	Type	Level	Height Offset From Level	Elevation at Top	Elevation at Bottom	Lower SFL	Mark	Special Shape	Area	Slab thickness	Concrete grade	Liquid Retaining Structure	SMM Volume	Special Formwork	Strutting Height	Fwk SH ≤3.5m	Fwk SH e.x.3.5m ≤5m	Fwk SH e.x.5m ≤6.5m	Fwk SH e.x.6.5m ≤8m	Element Code
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.005 m	176.255	176.250	172.500	QTO-R1		369.623 m^2	175	Grade 40/20		64.684 m^3		3.750 m	0.000 m	369.623 m^2	0.000 m^2	0.000 m^2	SCRF
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.005 m	176.255	176.250	172.500	QTO-R2		267.704 m^2	175	Grade 40/20		46.848 m^3		3.750 m	0.000 m	267.704 m^2	0.000 m^2	0.000 m^2	SCRF
Floor	5 (QTO slab)	PQ-100_180.75_URF	0.005 m	180.755	180.750	176.250	QTO-URF1		285.797 m^2	175	Grade 40/20		50.014 m^3		4.500 m	0.000 m	285.797 m^2	0.000 m^2	0.000 m^2	SCRF
Floor	5 (QTO slab)	PQ-100_180.75_URF	-1.620 m	179.130	179.125	176.475	QTO-URF3		42.608 m^2	175	Grade 40/20		7.456 m^3		2.650 m	42.608 m	0.000 m^2	0.000 m^2	0.000 m^2	SCRF
Floor	5 (QTO slab)	PQ-100_180.75_URF	1.130 m	181.880	181.875	180.750	QTO-URF4		11.364 m^2	175	Grade 40/20		1.989 m^3		1.125 m	11.364 m	0.000 m^2	0.000 m^2	0.000 m^2	SCRF
175: 5									977.095 m^2				170.992 m^3			53.971 m	923.123 m^2	0.000 m^2	0.000 m^2	
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.005 m	176.255	176.250	172.500	QTO-R3		232.978 m^2	250	Grade 40/20		58.244 m^3		3.750 m	0.000 m	232.978 m^2	0.000 m^2	0.000 m^2	SCRF
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.005 m	176.255	176.250	172.500	QTO-R5		264.724 m^2	250	Grade 40/20		66.181 m^3		3.750 m	0.000 m	264.724 m^2	0.000 m^2	0.000 m^2	SCRF
250: 2									497.702 m^2				124.425 m^3			0.000 m	497.702 m^2	0.000 m^2	0.000 m^2	
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.230 m	176.480	176.475	172.500	QTO-R7		305.317 m^2	175	Grade 40/20		53.430 m^3		3.975 m	0.000 m	305.317 m^2	0.000 m^2	0.000 m^2	SCUF
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.001 m	176.251	176.246	172.500	QTO-R8		10.635 m^2	175	Grade 40/20		1.861 m^3		3.746 m	0.000 m	10.635 m^2	0.000 m^2	0.000 m^2	SCUF
175: 2									315.952 m^2				55.292 m^3			0.000 m	315.952 m^2	0.000 m^2	0.000 m^2	
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.001 m	176.251	176.246	172.500	QTO-R4		50.400 m^2	250	Grade 40/20		12.600 m^3		3.746 m	0.000 m	50.400 m^2	0.000 m^2	0.000 m^2	SCUF
Floor	5 (QTO slab)	PQ-100_176.25_RF	0.005 m	176.255	176.250	172.500	QTO-R6		15.881 m^2	250	Grade 40/20		3.970 m^3		3.750 m	0.000 m	15.881 m^2	0.000 m^2	0.000 m^2	SCUF
250: 2									66.281 m^2				16.570 m^3			0.000 m	66.281 m^2	0.000 m^2	0.000 m^2	
Grand total: 11									1857.030 m^2				367.279 m^3			53.971 m	1803.058 m^2	0.000 m^2	0.000 m^2	

<u>Remarks:</u>

To differentiate quantities related to different special formwork, etc., use the **Duplicate View** to duplicate the schedule and use **Filter** to create different schedules.

<u>∑ Deduction of overlapping area</u>

- Deduction of Coulmn Cross Section Area (using Structural Column's Schedule)
- Deduction of Slab-Wall Overlapping Area (using Wall's Schedule)
- Deduction of Beam Soffit Formwork Area (using Structural Framing's Schedule)

5.3 Structural Steel

This section mainly focuses on the following structural steel elements:

i. Structural Column

ii. Structural Beam

5.3.1 Basic Information

5.3.1.1 Building Element to Model

Modelling elements

Elements	Object Category
Structural Column	Structure / Structure / Column
Structural Beam	Structure / Structure / Beam

5.3.2 Modelling Approach

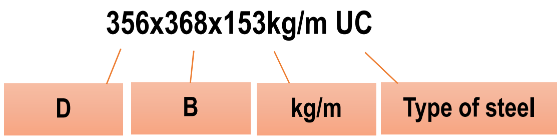
5.3.2.1 Naming Convention

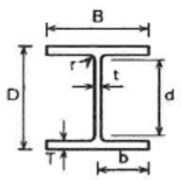
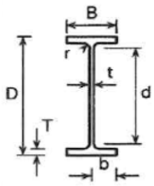
Object Naming:

Details of object naming convention shall refer to Section 2.5.4 of BIM Guide for Structural Engineering issued by Structural Engineering Branch, Architectural Services Department.

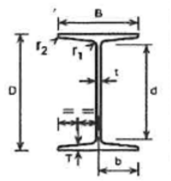
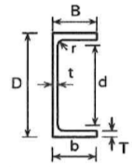
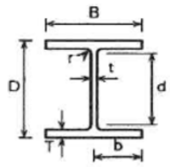
Type Naming:

a)



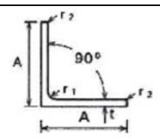
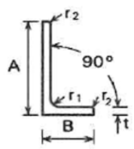
Type of steel	Shape		Naming
UC	Universal Columns		D x B x kg/m UC
UB	Universal Beams		D x B x kg/m UB

Type Naming: (Cont'd)

Type of steel	Shape		Naming
Joist	Joist		D x B x kg/m Joist
PFC	Parallel Flange Channel		D x B x kg/m PFC
UBP	Universal Bearing Piles		D x B x kg/m UBP

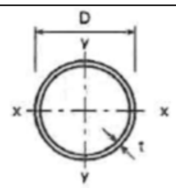
b) **120x120x12 Angle**

A | **A or B** | **t** | **Type of steel**

Type of steel	Shape		Naming
Angle	Equal Angle		A x A x t Angle
Angle	Unequal Angle		A x B x t Angle

c) **60x3 CHS**

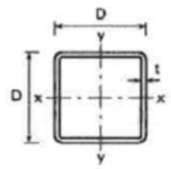
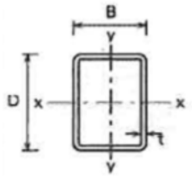
D | **t** | **Type of steel**

Type of steel	Shape		Naming
CHS	Circular Hollow Section		D x t CHS

Type Naming: (Cont'd)

d) **60x40x3 RHS**

D	**D or B**	**t**	**Type of steel**

Type of steel	Shape		Naming
SHS	Square Hollow Section		D x D x t SHS
RHS	Rectangular Hollow Sections		D x B x t RHS

5.3.2.2 Shared Parameters

The following parameters shall be set in Structural Column / Structural Beam objects:

Under **Identity Data**

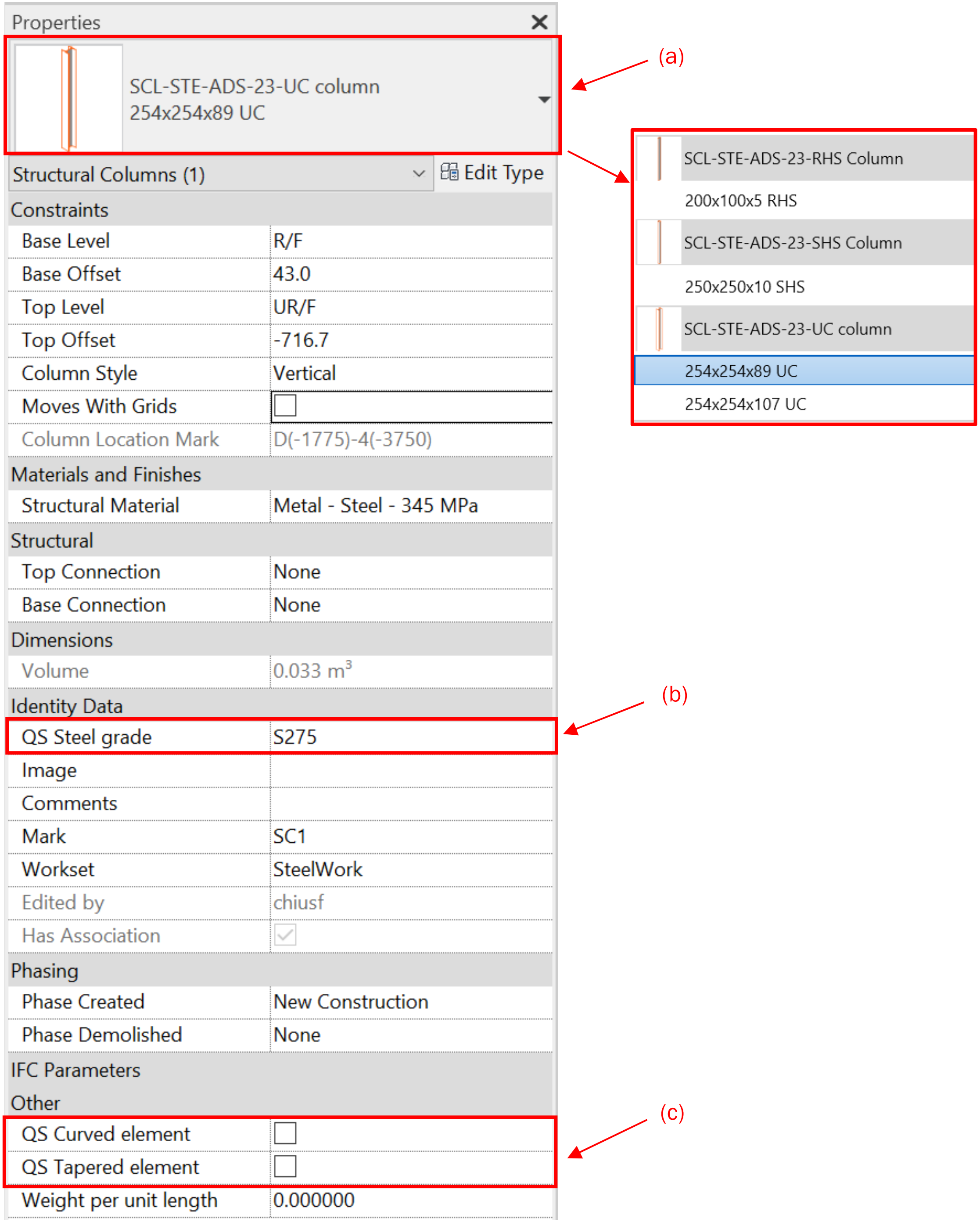
Description	Parameter	Type / Instance
Structural Steel Grade for column / beam element	**QS Steel grade**	Instance

Under **Other**

Description	Parameter	Type / Instance
Curved column/beam	**QS Curved element**	Instance
Tapered column/beam	**QS Tapered element**	Instance
Sloping beam	**QS Sloping element**	Instance

5.3.2.3 Creating a Structural Column

All structural column shall be modelled as **Structure** > **Column**



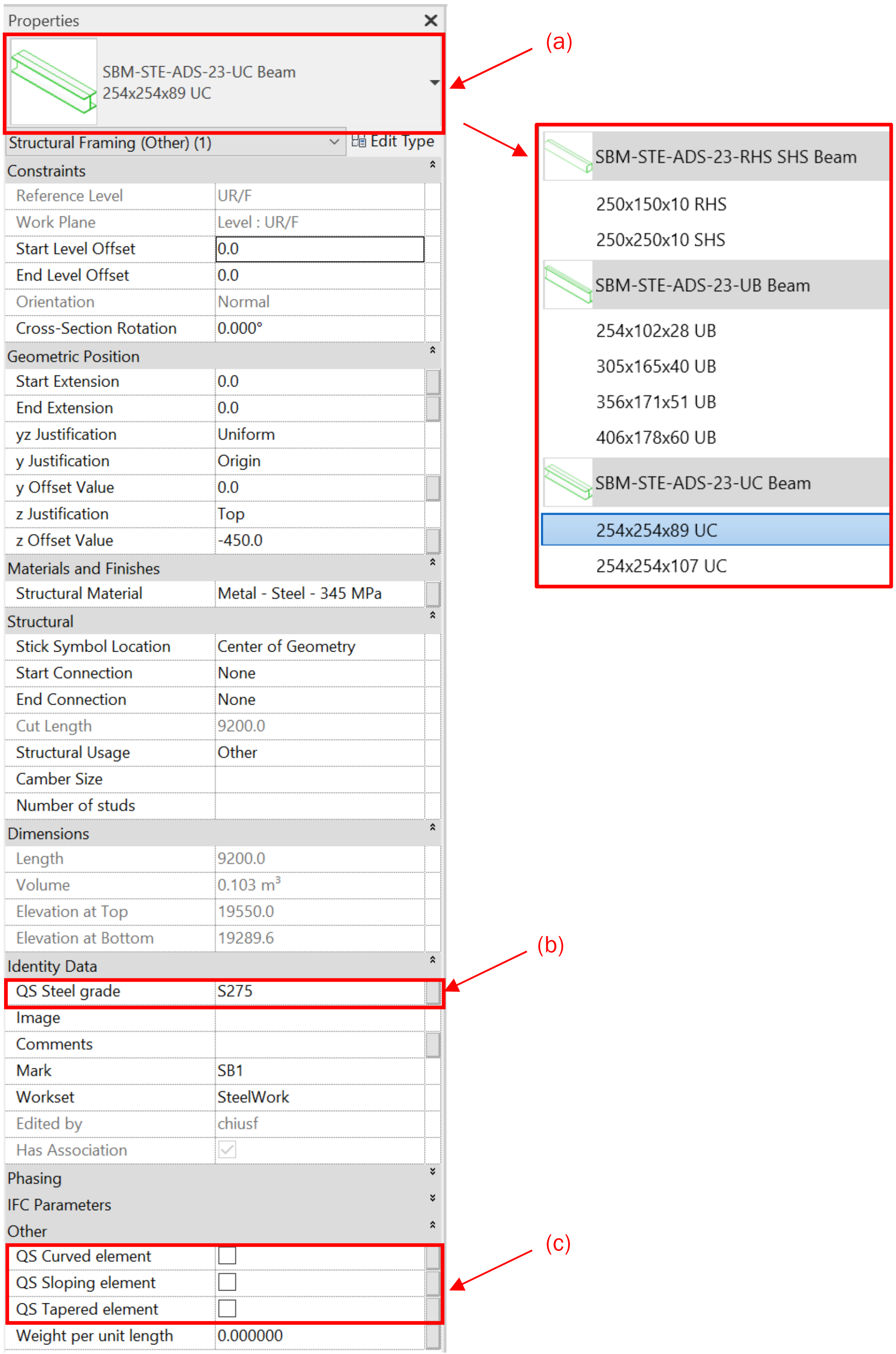
(a): Select Type Selector, select ADS structural steel column.

(b): Add a parameter to specify **structural steel grade**.

(c): Add parameters to specify curved or tapered column.

5.3.2.4 Creating a Structural Beam

All structural beam shall be modelled as **Structure** > **Beam**



(a): Select Type Selector, select ADS structural steel beam.

(b): Add a parameter to specify **structural steel grade**.

(c): Add parameters to specify curved, sloping or tapered beam.

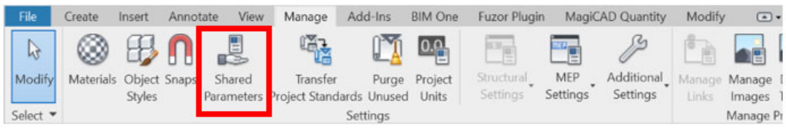
5.3.3 Quantity Take-off

5.3.3.1 Setup new Shared Parameters

For QTO, Shared Parameters **Weight per unit length** shall be added in structural column / structural beam object.

Step 1

Manage > Shared Parameters

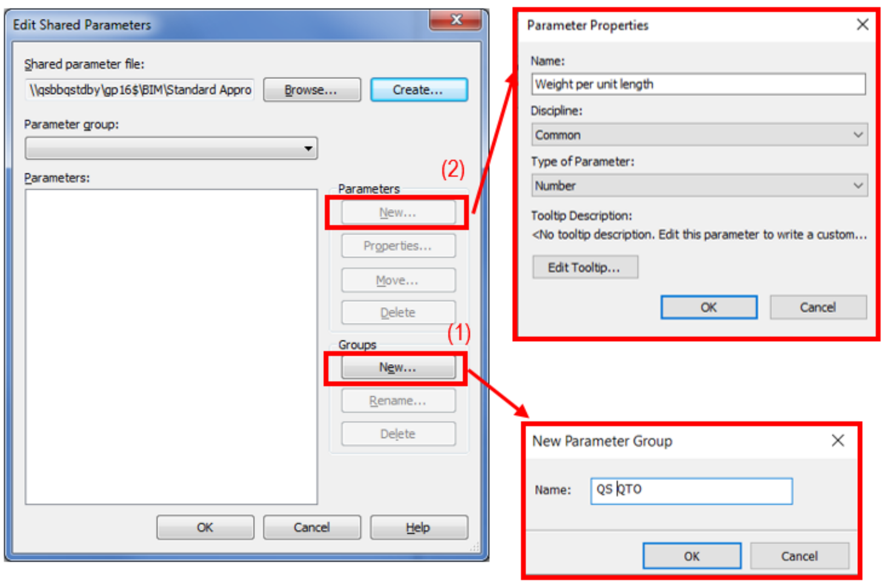


Step 2

In Shared Parameters Brower, create a new group and name the group e.g. “QS QTO” and create a new shared parameter **Weight per unit length**.

In Parameter Properties dialog box, enter “Weight per unit length”, set the Discipline to Common, and set the Type to Number.

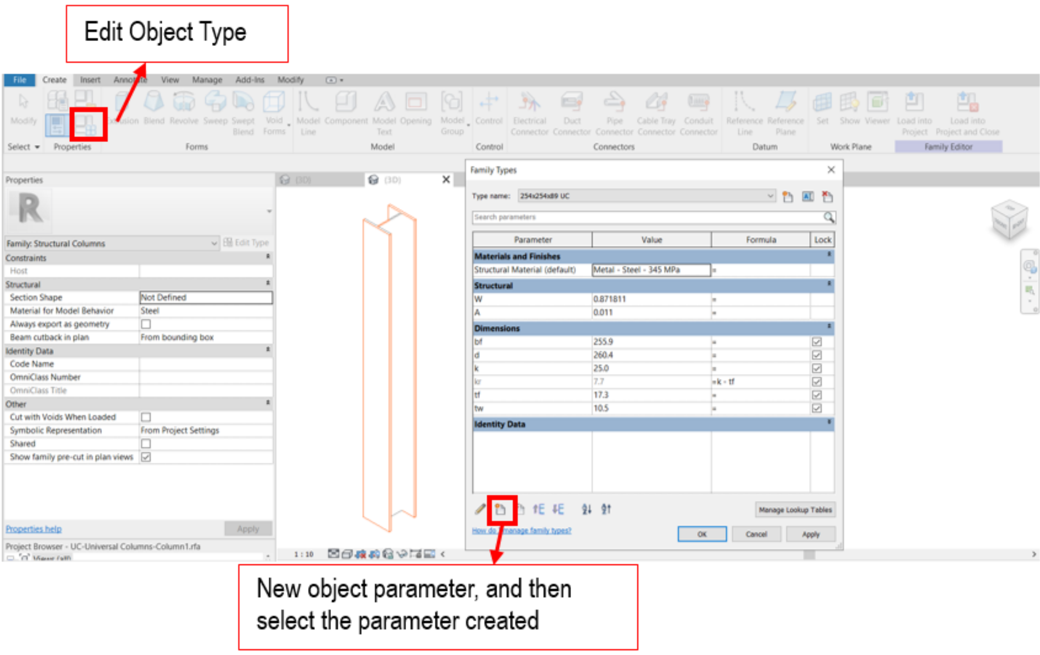
Click OK to close each dialog box.

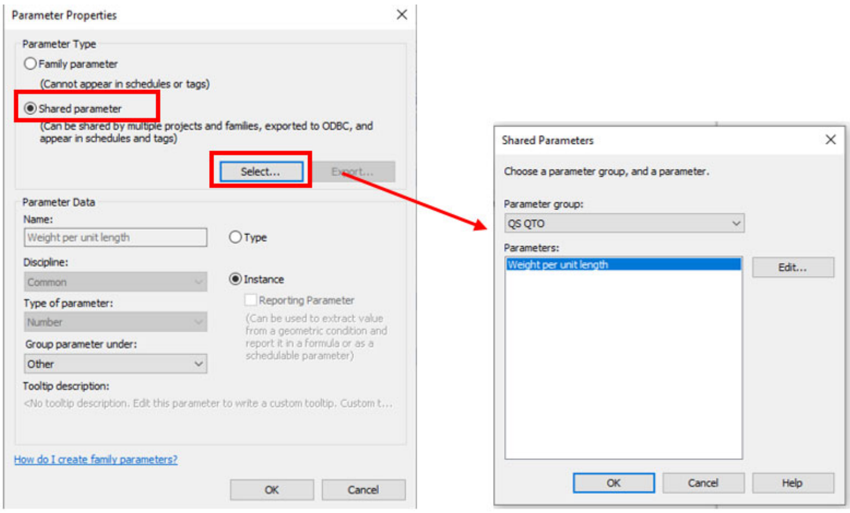


5.3.3.1 Setup new Shared Parameters (Cont'd)

Step 3

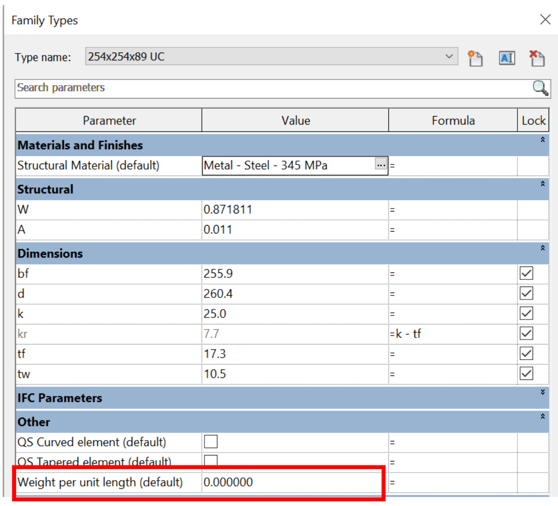
Home Button > Edit Family





Step 4

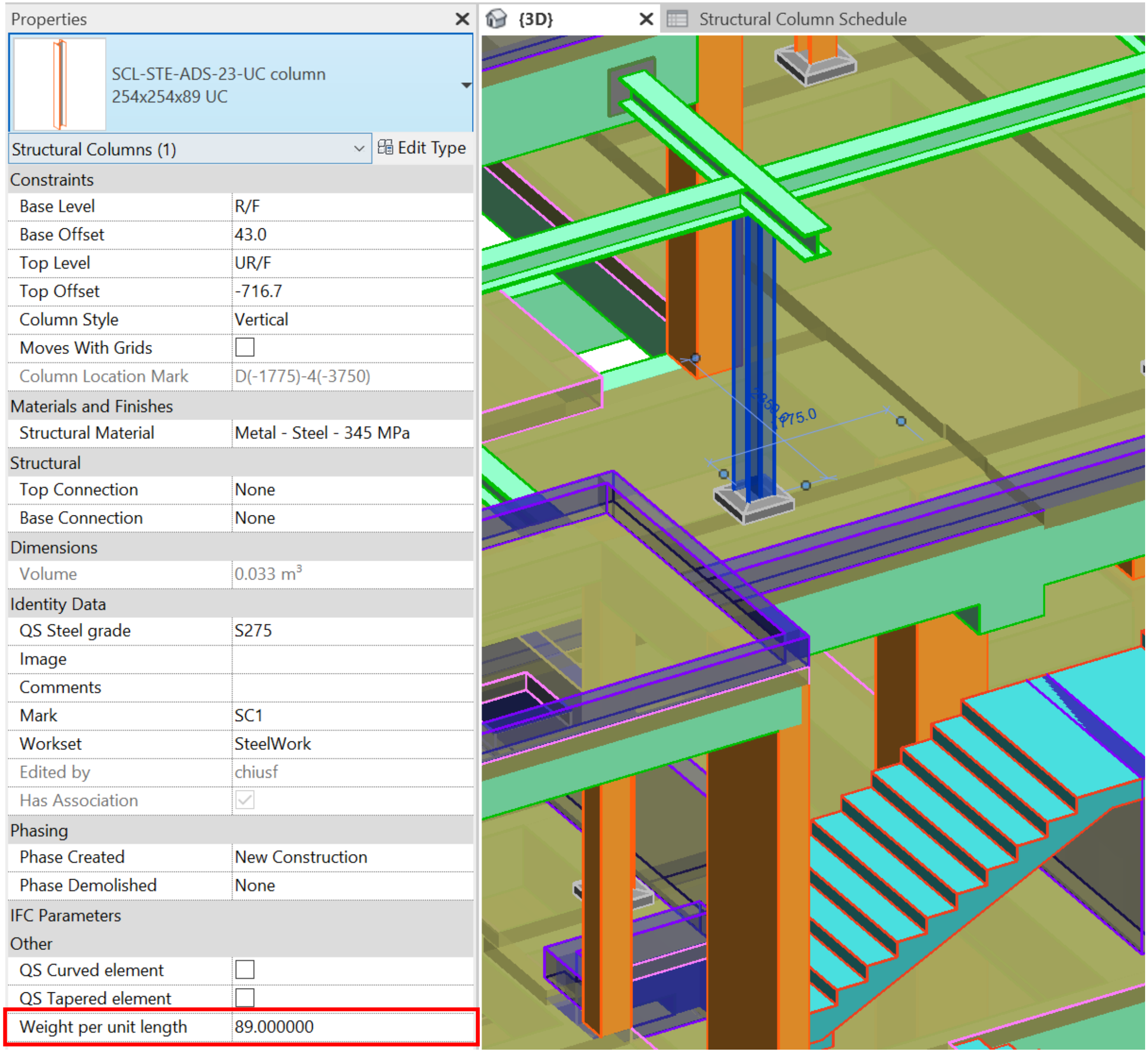
Load the Column / Beam object into project.



5.3.3.1 Setup new Shared Parameters (Cont'd)

Step 5

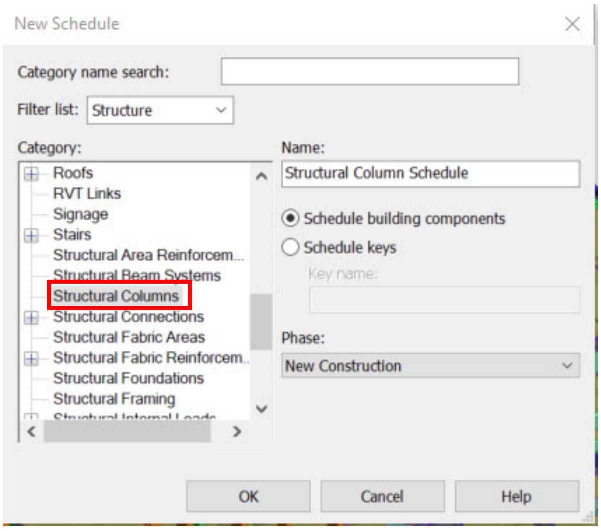
Input the details into the parameter **Weight per unit length.**



5.3.3.2 Structural Column

Step 1

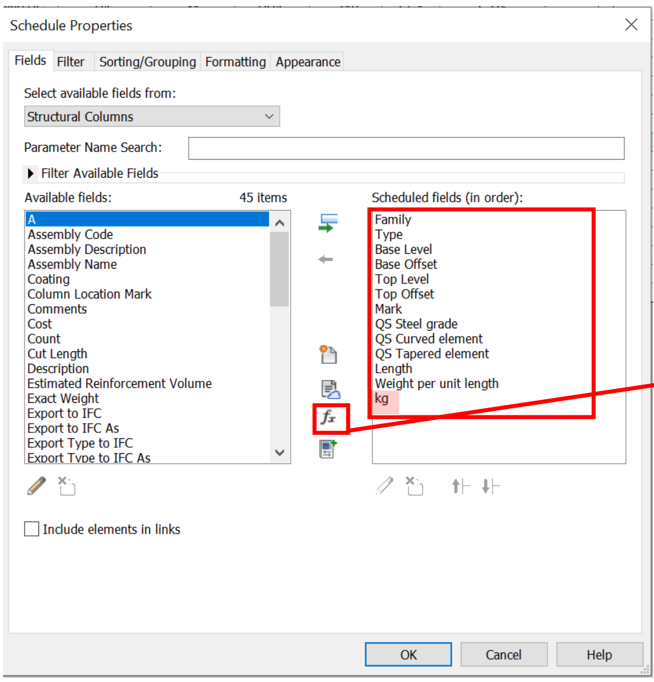
Create a new **Structural Columns** schedule, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.



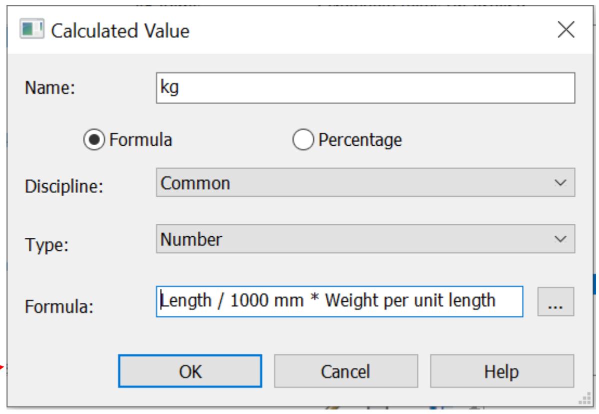
Step 2

Schedule Properties and Setting

- Fields

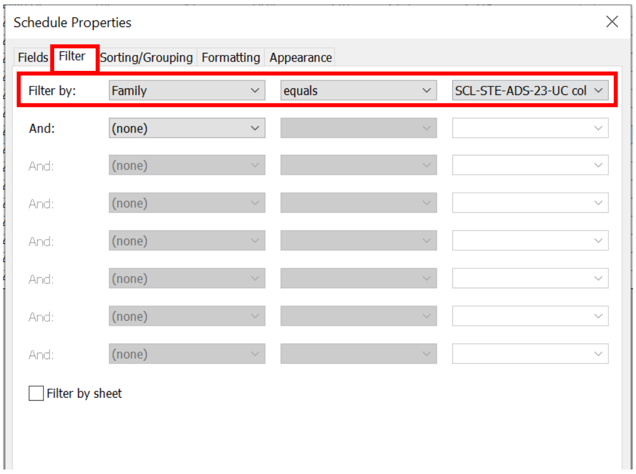


- Calculated Value - **Kg**

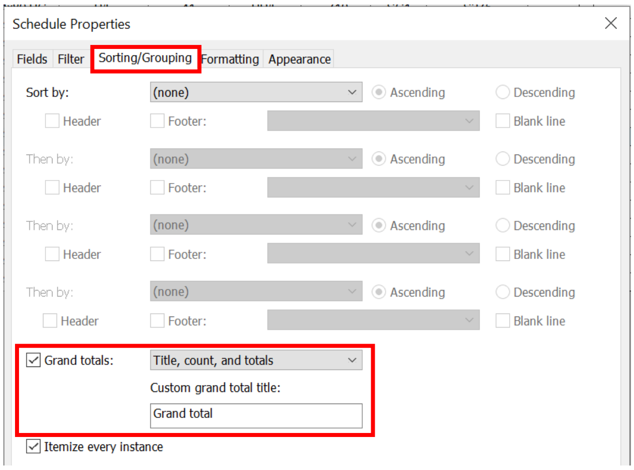


5.3.3.2 Structural Column (Cont'd)

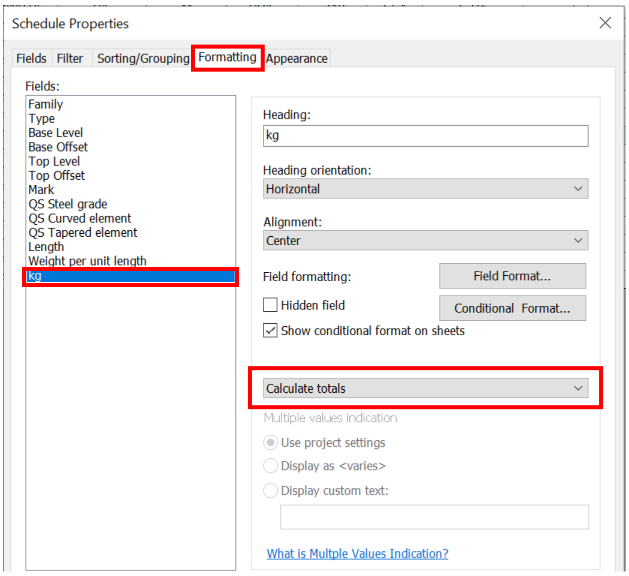
➢ Filter



➢ Sorting/Grouping



➢ Formatting



<u>Sample of Structural Columns Schedule</u>

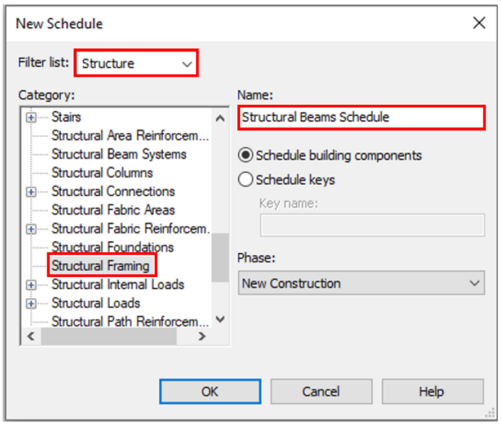
<Structural Column Schedule>

A	B	C	D	E	F	G	H	I	J	K	L	M
Family	Type	Base Level	Base Offset	Top Level	Top Offset	Mark	QS Steel grade	QS Curved element	QS Tapered element	Length	Weight per unit length	kg
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F_PART2	43	UR/F	-717	SC2	S275	☐	☐	3.29 m	89	293
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F_PART2	43	UR/F	-717	SC2	S275	☐	☐	3.29 m	89	293
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F_PART2	43	UR/F	-717	SC2	S275	☐	☐	3.29 m	89	293
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F_PART2	43	UR/F	-717	SC2	S275	☐	☐	3.29 m	89	293
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F_PART2	43	UR/F	-717	SC2	S275	☐	☐	3.29 m	89	293
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F	43	UR/F	-717	SC1	S275	☐	☐	2.94 m	89	262
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F	41	UR/F	-710	SC1	S275	☐	☐	2.95 m	89	262
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F	43	UR/F	-717	SC1	S275	☐	☐	2.94 m	89	262
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F_PART2	43	UR/F	-717	SC2	S275	☐	☐	3.29 m	89	293
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F_PART2	43	UR/F	-717	SC2	S275	☐	☐	3.29 m	89	293
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F	43	UR/F	-717	SC1	S275	☐	☐	2.94 m	89	262
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F	43	UR/F	-717	SC1	S275	☐	☐	2.94 m	89	262
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F	43	UR/F	-717	SC1	S275	☐	☐	2.94 m	89	262
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F	43	UR/F	-717	SC1	S275	☐	☐	2.94 m	89	262
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F	43	UR/F	-717	SC1	S275	☐	☐	2.94 m	89	262
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F	43	UR/F	-717	SC1	S275	☐	☐	2.94 m	89	262
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F	43	UR/F	-717	SC1	S275	☐	☐	2.94 m	89	262
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F	43	UR/F	-717	SC1	S275	☐	☐	2.94 m	89	262
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F	43	UR/F	-717	SC1	S275	☐	☐	2.94 m	89	262
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F	43	UR/F	-717	SC1	S275	☐	☐	2.94 m	89	262
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F_PART2	43	UR/F	-717	SC2	S275	☐	☐	3.29 m	89	293
SCL-STE-ADS-23-UC column	254x254x89 UC	R/F	43	UR/F	-717	SC1	S275	☐	☐	2.94 m	89	262
Grand total: 22										67.49 m		6007

5.3.3.3 Structural Beam

Step 1

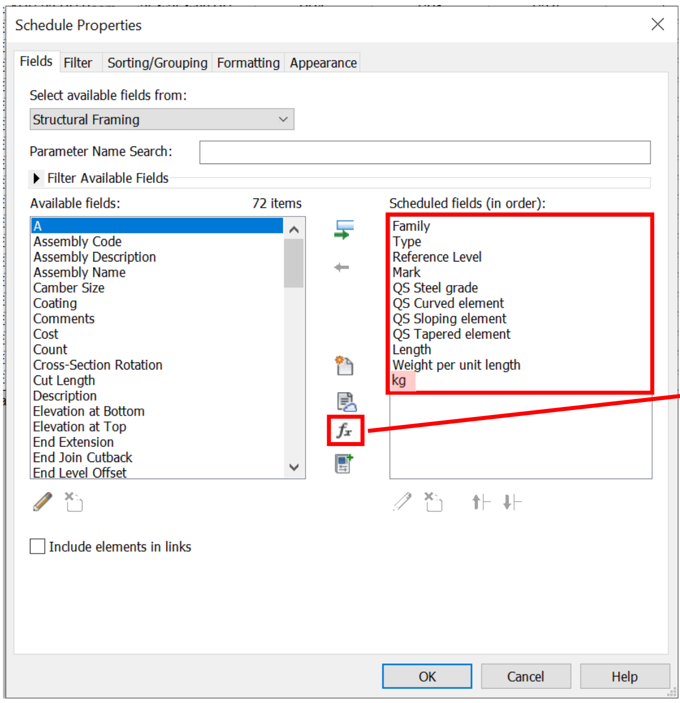
Create a new Structural Beams schedule under **Structural Framing** category, refer to Part 7 Techniques for QTO - 7.4 Schedule/ Material Take-off.



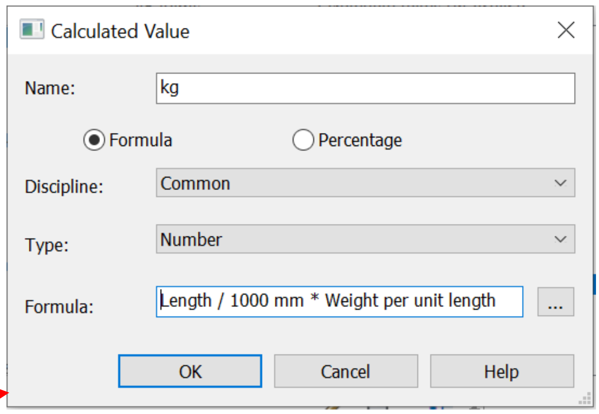
Step 2

Schedule Properties and Setting

- Fields

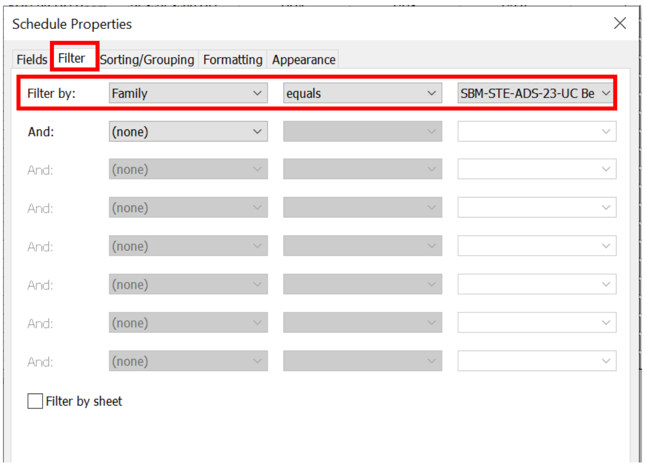


- Calculated Value - **Kg**

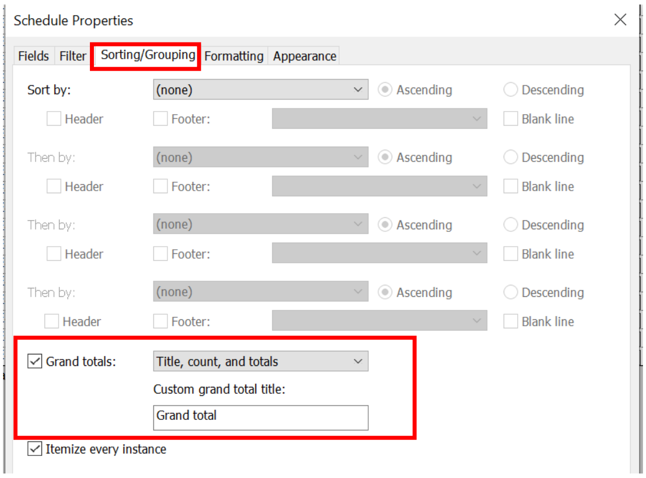


5.3.3.3 Structural Beam (Cont'd)

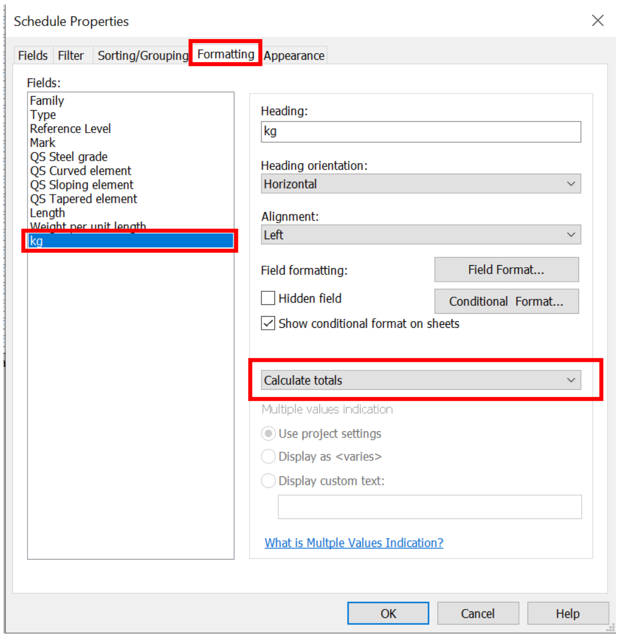
➢ Filter



➢ Sorting/Grouping



➢ Formatting



5.3.3.3 Structural Beam (Cont'd)

Sample of Structural Beams Schedule

<Structural Beams Schedule>

A	B	C	D	E	F	G	H	I	J	K
Family	Type	Reference Level	Mark	QS Steel grade	QS Curved element	QS Sloping element	QS Tapered element	Length	Weight per unit length	kg
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	3.50 m	89	312
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	3.50 m	89	312
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	2.44 m	89	217
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	4.01 m	89	357
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	2.35 m	89	209
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	4.28 m	89	380
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	2.88 m	89	256
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	3.50 m	89	312
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	3.50 m	89	312
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	2.44 m	89	217
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	4.01 m	89	357
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	2.35 m	89	209
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	3.38 m	89	300
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	2.35 m	89	209
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	4.28 m	89	380
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	4.48 m	89	398
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	8.60 m	89	765
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	3.58 m	89	318
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	9.12 m	89	812
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	3.58 m	89	318
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	3.77 m	89	336
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	3.15 m	89	280
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	3.15 m	89	280
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	5.00 m	89	445
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	5.00 m	89	445
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	9.20 m	89	819
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	9.20 m	89	819
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	9.20 m	89	819
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	9.20 m	89	819
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	3.40 m	89	303
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	9.18 m	89	817
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	9.20 m	89	819
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	3.83 m	89	340
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	3.58 m	89	318
SBM-STE-ADS-23-UC Beam	254x254x89 UC	UR/F	SB1	S275	☐	☐	☐	3.83 m	89	340
Grand total: 35								167.97 m		14,949

6. Detailed Modelling Guidelines – Building Services Installations

6.1 Air Conditioning and Mechanical Ventilation (HVAC) System

This section includes air conditioning, refrigeration, ventilation and central control & monitoring system elements only.

6.1.1 Basic Information

6.1.1.1 Building Services Elements to Model: HVAC System

The following details of Air-conditioning and Mechanical Ventilation (HVAC) System should be developed in BIM models, but not limited to:

- AHU/PAU/FCU/ split type A/C unit/VAV units/ CARC/ fans and other major equipment are modelled as generic objects with overall sizes;
- All elements shall be modelled with appropriate System Object, include air grilles/diffusers of various types, air ducts, chilled water pipe, refrigerant pipe, etc.;
- Control/supervisory panel, temperature control switch, FCU speed control switch, etc. with indicative size and locations only;
- Pipes/ducts/cable trunkings/cable trays running into/out of the plant room are modelled to verify the possible routing, headroom and space for maintenance;
- Details of equipment limited to overall sizes and positions of connections.

6.1.1.2 Level of Information Need (LOIN)

The BIM models are to be built and created stage by stage based on the project programme. The recommended LOIN for individual building services object/ element at different stages shall follow the requirements stated in Clause 4.6 – Level of Development (LOD) of the Building Information Modelling (BIM) Guide for Building Services Installation issued by Building Services Branch (BSB), Architectural Services Department.

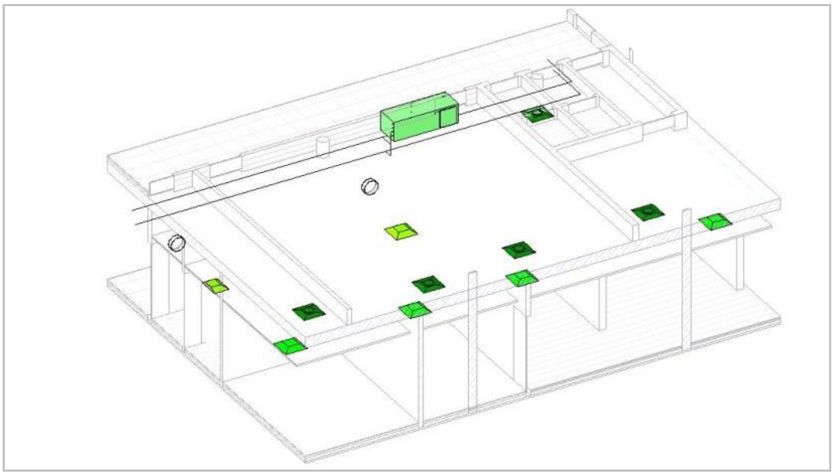
6.1.2 Modelling Approach

6.1.2.1 Modelling Process of HVAC BIM Model

The HVAC model can be modelled in the manner illustrated in the following steps.

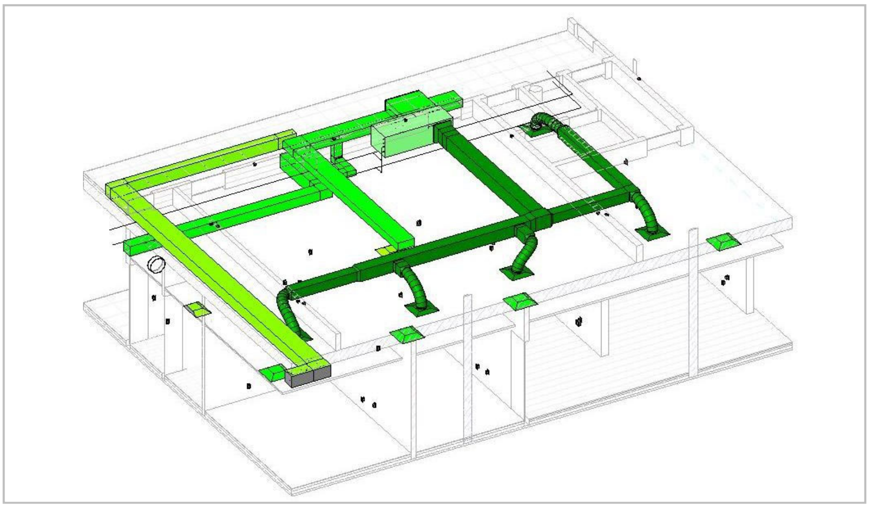
<u>Step 1:</u> Creating Diffusers and Mechanical Equipment

Choose and place the right diffusers and equipment based on the design drawing.

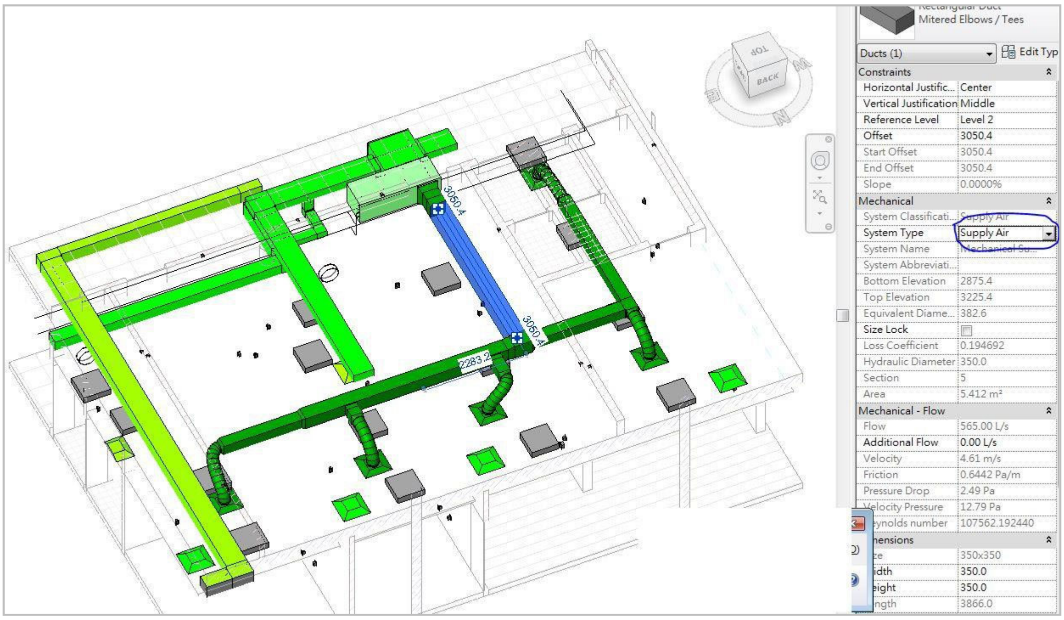


<u>Step 2:</u> Duct/Pipes Layout

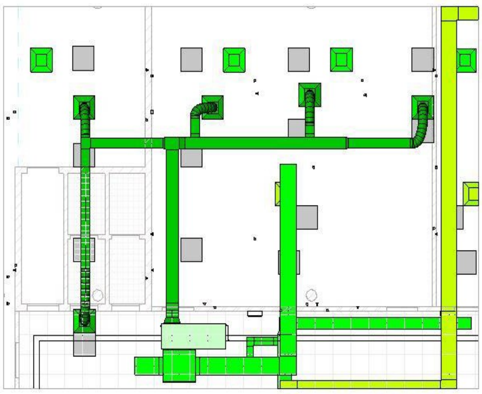
Step 2.1 Complete the HVAC systems with ducts/pipes.

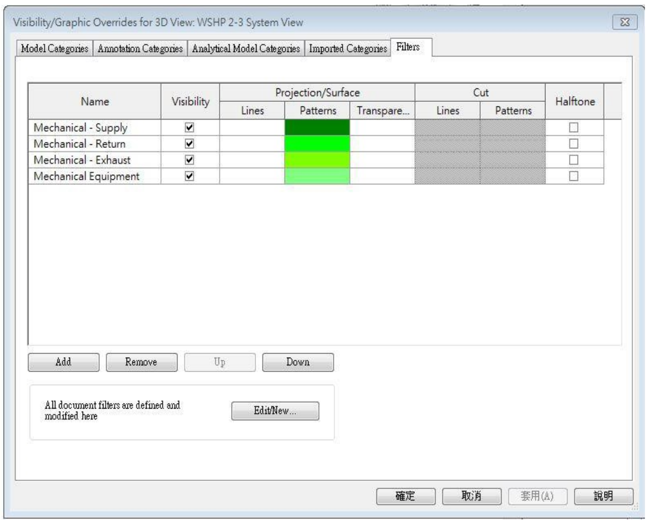


Step 2.2 Change the colour of different types of mechanical equipment and ducts.



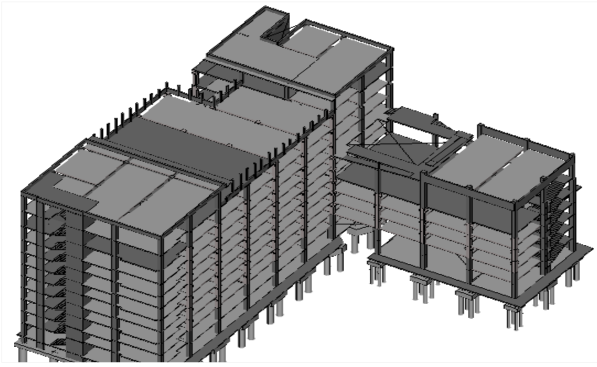
The colour coding and line style for HAVC System shall follow Clause 4.7 – Presentation Style of the Building Information Modelling (BIM) Guide for Building Services Installation issued by Building Services Branch (BSB), Architectural Services Department:



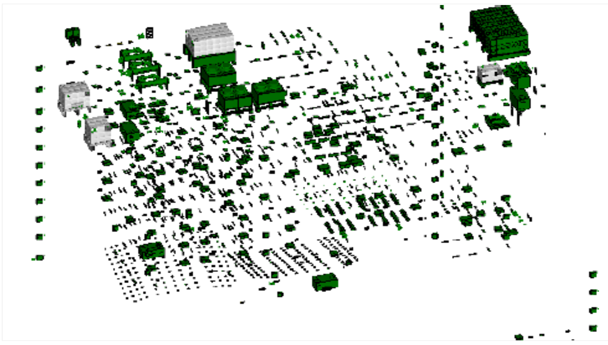


In development phase, the HVAC model shall be further developed with more accurate BIM elements. Additional BIM elements need to be added to complete the model. Refer to 6.1.2.2 for a list of typical HVAC elements with attributes need to be modelled. Details of equipment limited to overall sizes and positions of connections. The HVAC services can be modelled in the manner illustrated in the following steps:

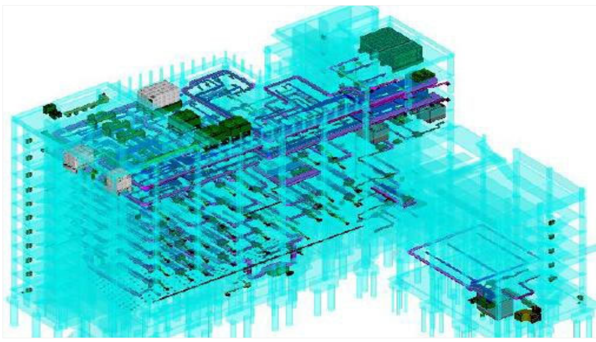
Step 3: Link Architectural or Structural Model



Step 4: Place Mechanical Equipment



Step 5: Model the System

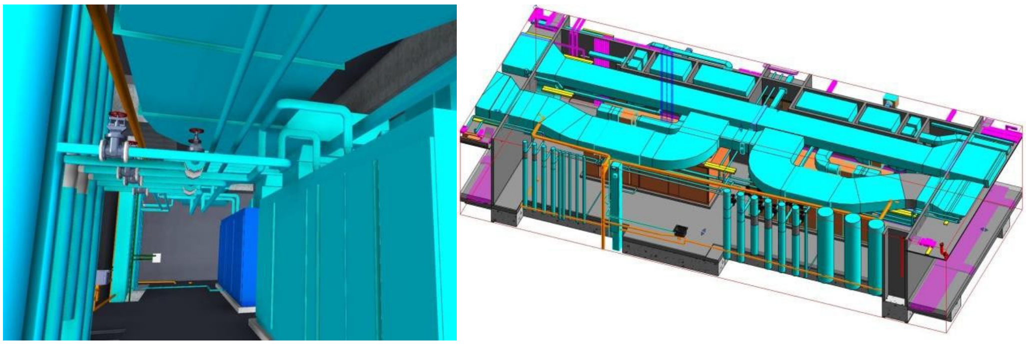


6.1.2.2 Modelling Approach of HVAC Elements and Components

6.1.2.2.1 General

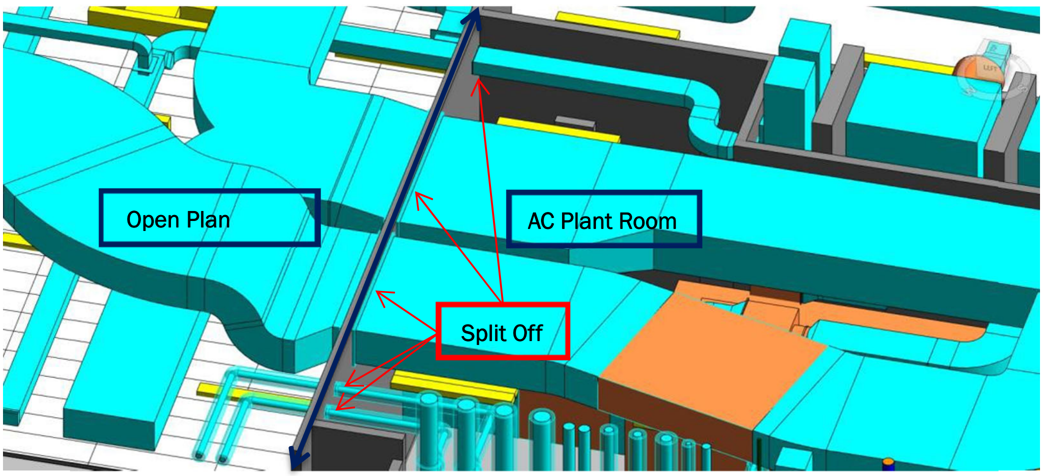
All HVAC works, whether internal, external and in plant rooms, including equipment, pipework, ductwork, and accessories, shall be defined and created in BIM model by means of separate 3D views. The HVAC works under the following systems shall be grouped together for measurement:

- Water Treatment
- Unitary Air Conditioning System
- Water Leakage Detection System
- Electricity Supply
- Control System – Automatic Control System
- Control System – Central Control and Monitoring System
- Air Conditioning Sundries



Typical HVAC Plant Room Overview

In order to separate the quantity of the pipework/ ductwork passing through internal to plant room, the pipes/ ducts will be split at plant room wall for quantity take-off. The following image shows an example of pipework/ ductwork splitting for passing through office area to plant room.



Example of ductwork splitting for passing through plant room

For pipework/ ductwork, the following properties /parameters shall be provided:

Object Category	**Object Elements**	**Properties/ Parameters**	**Fixing method (Parameter for QS input)**
Pipes	Pipework	Type and size; Method of jointing should refer to general specification/ particular specification	Laid in ducts/ trenches/ chases, Embedded in in-situ concrete/ screeds, Suspended from soffits, Fixed to walls or columns, Laid on floors
Pipe Fittings	Elbow, Reducer, Tee, Cap	size	
Ducts	Ductwork rectangular in section	size and type	Fixed to walls and columns, Suspended from soffits
Ducts	Ductwork circular or oval in section	size and type	Fixed to walls and columns, Suspended from soffits
Flex Duct	Flexible/ Extensible ductwork	type, size and length	

The naming convention of all HVAC elements shall follow Clause 4.9 – MEP Object File of the Building Information Modelling (BIM) Guide for Building Services Installation issued by Building Services Branch (BSB), Architectural Services Department.

6.1.2.2.2 Equipment

1) All HVAC equipment shall be modelled with appropriate Mechanical Equipment category object elements selected. The casing of material, thermal and acoustic insulation, protective coverings and finishing shall be described in the Properties of related equipment.

2) AHU/PAU/FCU/ split type A/C unit/VAV boxes/CRAC/fans and other major equipment shall be modelled as generic objects with overall size.

3) All HVAC equipment should be marked with a Reference code in the Properties.

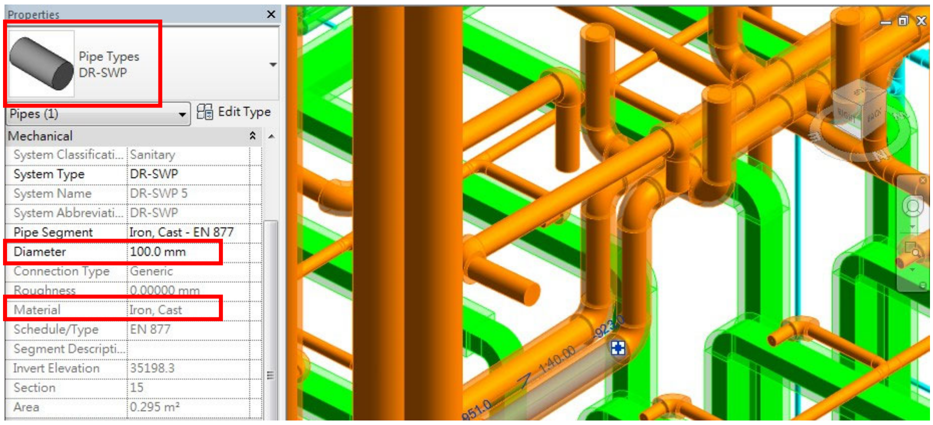
4) The type and characteristic (e.g. power rating, cooling capacity, etc.) of HVAC equipment shall be stated in BIM Model as below.

5) For each equipment, the following properties/ parameters shall be provided:

Equipment	**Properties/ Parameters**	**Fixing method (Parameter for QS input)**
Air handling units (AHU)	type ; supply air flow rate ? m3/s ; total cooling capacity ? kW ; total heating capacity ? kW ; humidification capacity ? kg/hr steam	
Pump sets	type ; water flow rate ? l/s ; differential static pressure ? kPa	
Chillers/heat pumps	type ; cooling capacity ? kW ; heating capacity ? kW	
Fan coil units (FCU)	type ; supply air volume flow rate ? m3/s ; total cooling capacity ? kW ; total heating capacity ? kW	
Dehumidifiers	type; flow rate ? kg/hour	
Ventilation fans	type ; air flow rate ? m3/s ; static pressure ? kPa	
VAV/CAV terminal units	type; number of inlets ; total heating capacity ? kW	

Equipment	Properties/ Parameters	Fixing method (Parameter for QS input)
Split package unit; VRV System	type; total cooling capacity ? kW ; total heating capacity ? kW	Ceiling mounted, Wall mounted, Floor mounted
Single packaged air-conditioner	type ; total cooling capacity ? kW ; total heating capacity ? kW	

6.1.2.2.3 Pipework



1) All pipe elements shall be modelled as Pipes, including chilled water pipe, refrigerant pipe, etc.

2) Pipe fittings, such as bends, elbows, tees, branches and flanges, shall be modelled as Pipe Fittings.

3) The ancillaries including valves, strainers, and flow meters shall be modelled when necessary.

4) The instruments like pressure gauges and thermometer shall be shown in the schematic drawings.

5) The material and diameter for each pipe, pipe fitting and ancillaries shall be stated in the Properties.

6) Header pipe shall be modelled as Pipes. Details are shown in the schematic drawings.

7) Pipework, fittings and insulation to pipework and fittings including liquid refrigerant pipes, suction pipes under different set of unitary air conditioning units shall be measured together irrespective of their sizes. The size of refrigerant/ suction pipes shall not be stated in the BIM model. Reference number should be marked in the **System Name** parameter.

8) Pipes passing through roofs or vertical cladding shall be modelled.

6.1.2.2.4 Ductwork

1) All ductwork accessories shall be modelled as Duct Accessories/ Air Terminal, including air grilles/diffusers of various types, air ducts, silencers, louvres and dampers etc. The size and shape of the ductwork shall be stated in the Properties.
2) Duct fittings including flexible connections between ducts and plants, shall be modelled as Duct Fittings.
3) The ancillaries including silencers and plenums shall be modelled when necessary. The type and size of ancillaries shall be stated.
4) Flexible duct shall be modelled when necessary as Flex Duct. The diameter and length shall be stated in the Dimensions Properties for quantity take-off.
5) The size of duct (width and height for rectangular duct, diameter for circular duct) shall be stated to facilitate QTO.

6.1.2.2.5 Control Panel and Switch

1) Control/supervisory panel, temperature control switch, FCU speed control switch, etc. shall be modelled with indicative size.

6.1.3 Quantity Take-off

6.1.3.1 Ductwork

Ductwork taking-off plan

Step 1: Setup new Shared Parameters for HVAC system

Step 2: Input the system /location filter for HVAC system

Step 3: Create new Ductwork Schedule for HVAC system

Step 4: Identify the area not measured in the Schedule

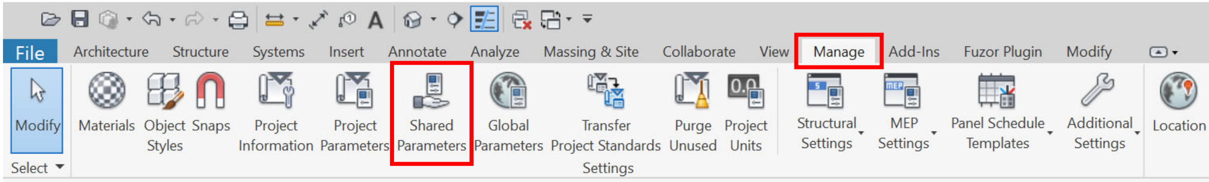
Step 5: Create other schedules e.g. air terminals, duct accessories, duct fittings and equipment, to measure the remaining portion.

Tips:

1. Area of Fire Damper, Volume Control Damper (VCD), Non-return Damper can be measured in Duct Accessory Schedule.
2. Air grille, Supply/ Return Air Diffuser can be measured in Air Terminal Schedule.
3. Air Silencer can be measured in the Mechanical Equipment Schedule.
4. Insulation, protective coverings and finishing to ductwork or related fittings shall be measured the nett area in contact with the base of all ducting as installed and overall ducting fittings and joints according to the Particular Specification.

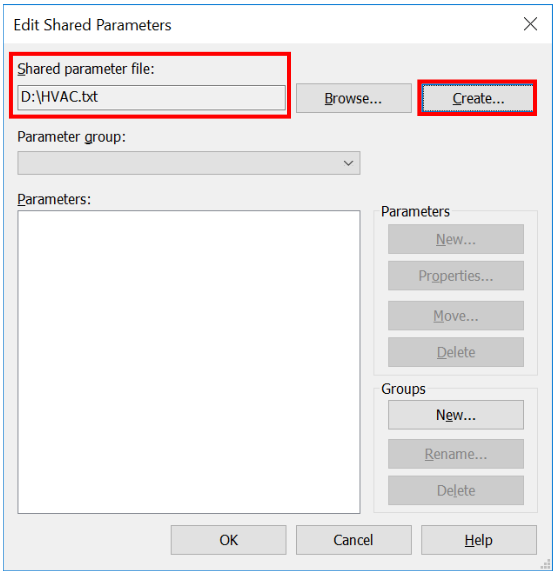
6.1.3.1.1 Setup new Shared Parameters for HVAC system

Manage > Shared parameter



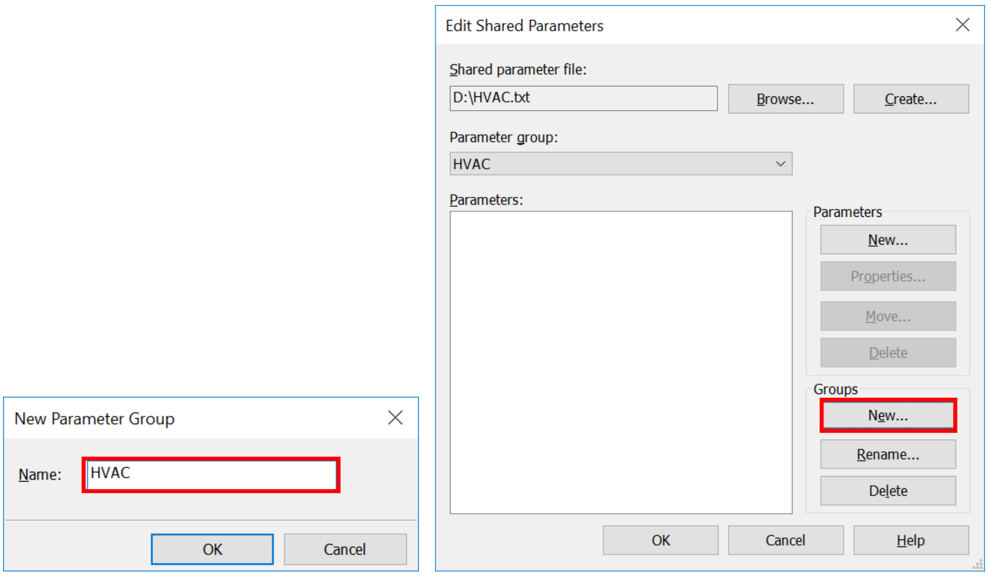
Step 1

Create a new Shared parameter file, e.g. HVAC.txt.



Step 2

Create a new Parameter group, e.g. **HVAC**.

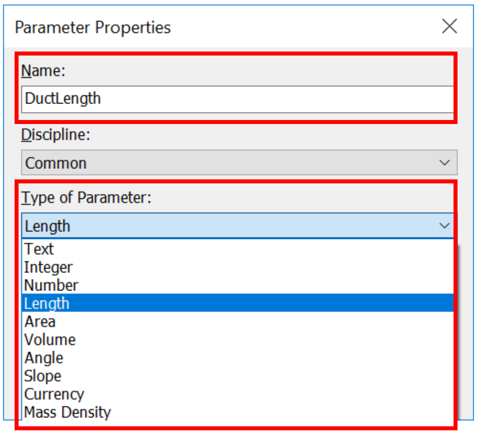


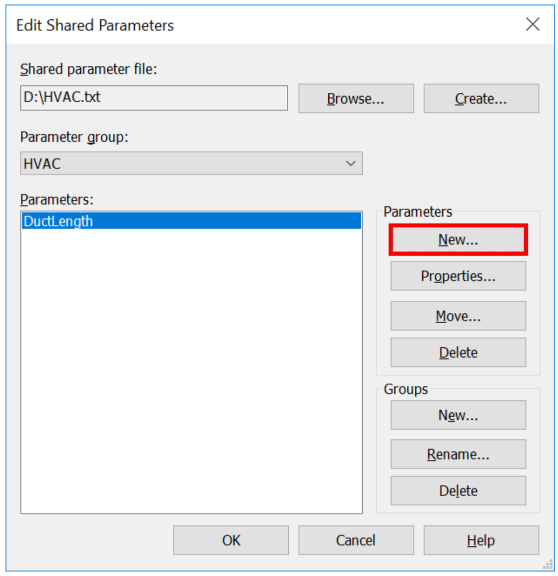
Step 3

Create a new Parameter, e.g. **DuctLength**.

(a) Input the Name of Parameter

(b) Select the Type of Parameter





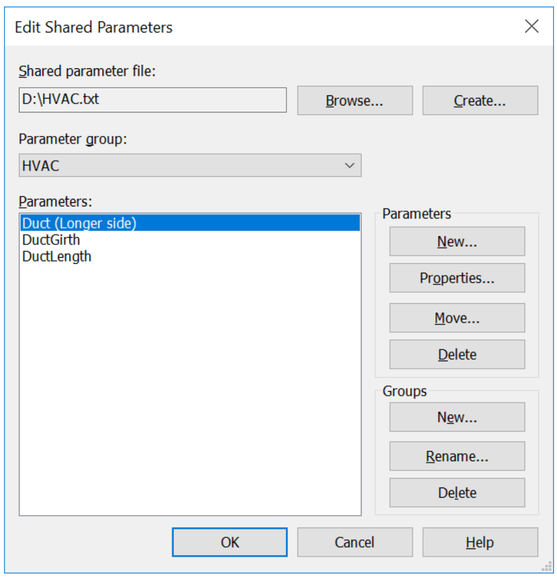
Step 4

Repeat Step 3, then create the following Shared Parameter.

(c) **DuctLength**, Type = Length (Measure the Length/Centerline of ductwork)

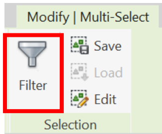
(d) **DuctGirth**, Type = Length (Measure the maximum girth of ductwork)

(e) **Duct (Longer side)**, Type = Length (for sorting propose)



6.1.3.1.2 Input the System /Location filter for HVAC system

1. Parameter under Identity Data can be used as System/ Location filter, e.g. **Comments**.
2. Select all elements in the same System /Location, then input the data, e.g. "MV"/ "MV In Plant Room".
   i. Select the elements by using pointer from right to left.
   ii. Then, refine the selected category by using **Filter** function.

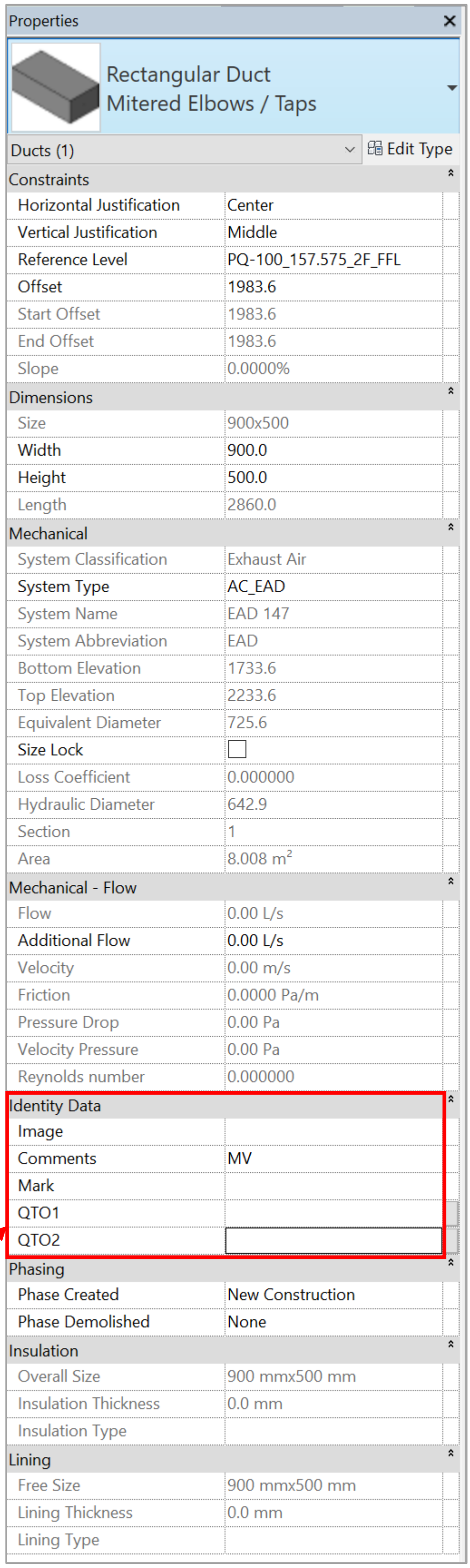


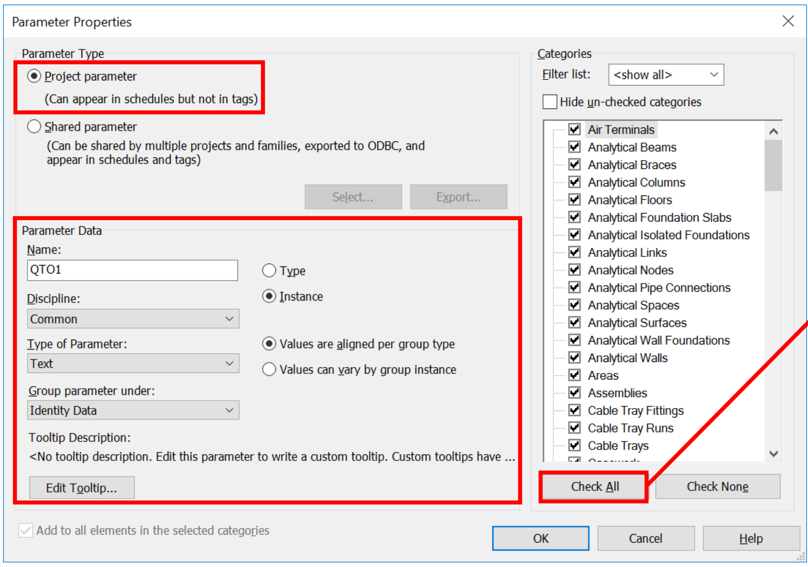
3. Alternatively, you may add a new project parameter as System/ Location filter.

   <u>Manage</u> > **<u>Project parameter</u>**

   Parameter Data

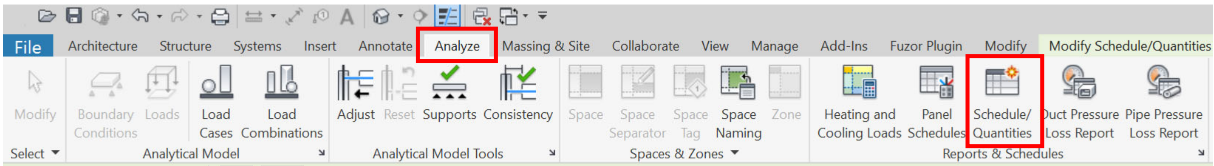
   - Name: Input "**QTO1**" / "**QTO2**"
   - Discipline: Common
   - Type of Parameter: Text
   - Group parameter under: Identity Data
   - Select Instance and Values are aligned per group type
   - Check all categories





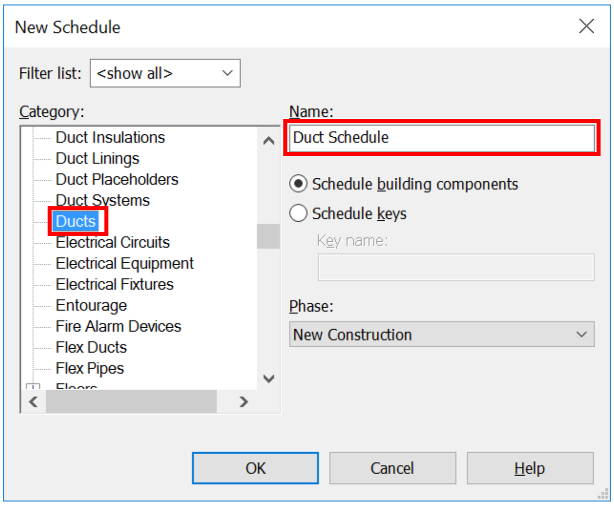
6.1.3.1.3 Create new Ductwork Schedule for HVAC system

Analyze > Schedule/Quantities



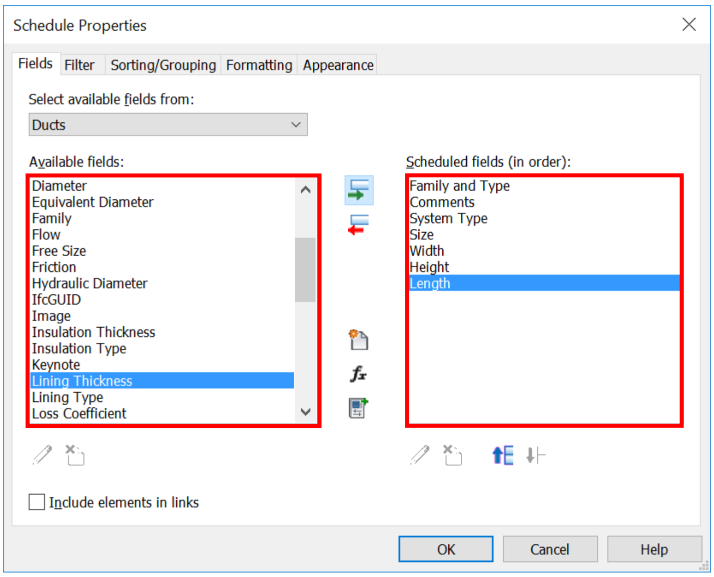
Step 1

Select the Category “Ducts” and Name the Schedule, e.g. Duct Schedule



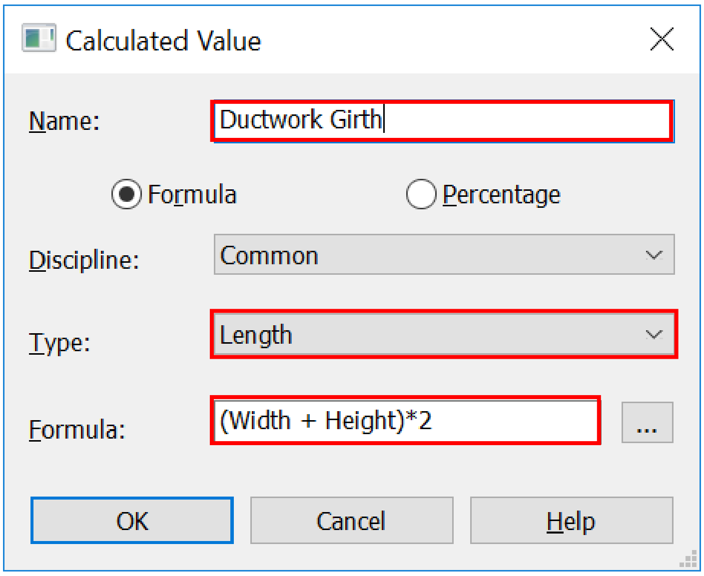
Step 2

Select the fields and set formula in the Schedule. You may move the parameter up and down .



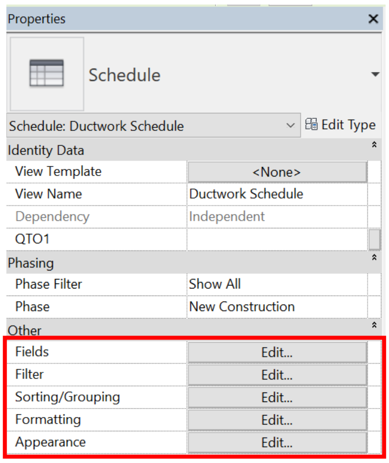
(a) Add parameter **Family and Type**, **Comments**, **System Type**, **Size**, **Width**, **Height** and **Length** etc. In this QTO, parameter **Comments** is adopted as System/ Location parameter. If **Comments** is used, you may set another parameter to filter the system/ location.

(b) Add calculated parameter Ductwork Girth, Area, Duct (Longer side), Not exceeding 400, 400 - 600, … , 2500 - 3000.



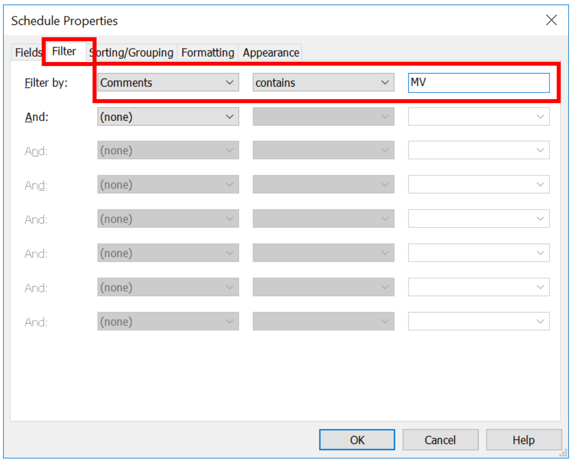
Name	**Type**	**Formula**
Ductwork Girth	Length	(**Width** + **Height**)*2
Area	Area	**Ductwork Girth*Length**
Duct (Longer side)	Length	if(and(**Width** < 400 mm, **Height** < 400 mm), **Width**, if(**Width** > **Height**, **Width**, **Height**))
Not exceeding 400	Area	if(or([**Duct (Longer side)**] < 400 mm, [**Duct (Longer side)**] = 400 mm), Area, 0 m²)
[A] – **[B]** e.g. 400 – 600 600 – 800 … 2500 – 3000	Area	if(or(and([**Duct (Longer side)**] < **[B]** mm, [**Duct (Longer side)**] > **[A]** mm), [**Duct (Longer side)**] = **[B]** mm), Area, 0 m²)

(c) Set Properties

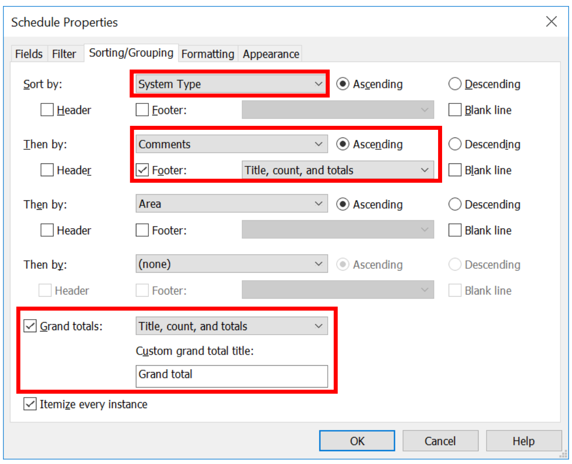


Fields – see Step 2 above.

Filter – filter by **Comments** as System, e.g. “MV” / “MV In Plant Room”

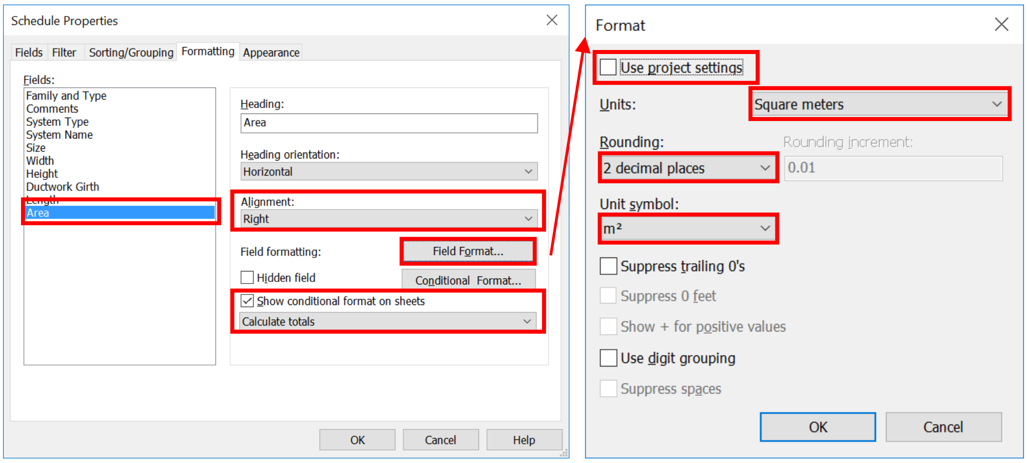


Sorting/ Grouping – Sort the System/ Location by **System Type**, **Comments** and then click the “Footer” box to calculate the sub-total.



Formatting – Set the Alignment, Field formatting and Show conditional format on sheets e.g. Fields – “Area”/ “Width” / Height” / “Length”

- Set the Alignment to Left /Center /Right
- Set Field Format
  - ➢ Untick the “Use project settings”
  - ➢ Units – Square meters /Meters
  - ➢ Rounding – 2 decimal places
  - ➢ Unit symbol – m^2 /m
- Click the Show conditional format on sheets – Calculate totals, if the total of the parameter need to be calculated.



As a result, “**Ductwork Schedule**” can be created, e.g. Ductwork Schedule for Mechanical Ventilation

<Ductwork Schedule>

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
Family and Type	System	System Type	Size	Width	Height	Ductwork Girth	Length	Area	Duct (Longer side)	Not exceeding 400	400 - 600	600 - 800	800 - 1000	1000 - 1250	1250 - 1600	1600 - 2000	2000 - 2500	2500 - 3000
Rectangular Duct: Mitered Elbows / Taps	MV	AC_EAD	150x150	0.15 m	0.15 m	0.60 m	0.06 m	0.04 m²	150	0.04 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
Rectangular Duct: Mitered Elbows / Taps	MV	AC_EAD	150x150	0.15 m	0.15 m	0.60 m	0.06 m	0.04 m²	150	0.04 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
Rectangular Duct: Mitered Elbows / Taps	MV	AC_EAD	150x150	0.15 m	0.15 m	0.60 m	0.06 m	0.04 m²	150	0.04 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
Rectangular Duct: Mitered Elbows / Taps	MV	AC_EAD	150x150	0.15 m	0.15 m	0.60 m	0.06 m	0.04 m²	150	0.04 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
⋮																		
Rectangular Duct: Mitered Elbows / Taps	MV	AC_EAD	3500x1500	3.50 m	1.50 m	10.00 m	0.80 m	8.00 m²	3500	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
Rectangular Duct: Mitered Elbows / Taps	MV	AC_EAD	3500x1500	3.50 m	1.50 m	10.00 m	0.80 m	8.00 m²	3500	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
MV: 1538								1411.89 m²		653.77 m²	498.97 m²	20.67 m²	203.09 m²	11.42 m²	1.44 m²	2.69 m²	0.00 m²	3.85 m²
Rectangular Duct: Mitered Elbows / Taps	MV In Plant Room	AC_EAD	300x150	0.30 m	0.15 m	0.90 m	0.25 m	0.23 m²	300	0.23 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
Rectangular Duct: Mitered Elbows / Taps	MV In Plant Room	AC_EAD	300x150	0.30 m	0.15 m	0.90 m	0.53 m	0.48 m²	300	0.48 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
Rectangular Duct: Mitered Elbows / Taps	MV In Plant Room	AC_EAD	300x150	0.30 m	0.15 m	0.90 m	2.97 m	2.67 m²	300	2.67 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
Rectangular Duct: Mitered Elbows / Taps	MV In Plant Room	AC_EAD	300x150	0.30 m	0.15 m	0.90 m	0.37 m	0.34 m²	300	0.34 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
Rectangular Duct: Mitered Elbows / Taps	MV In Plant Room	AC_EAD	300x150	0.30 m	0.15 m	0.90 m	0.15 m	0.14 m²	300	0.14 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
Rectangular Duct: Mitered Elbows / Taps	MV In Plant Room	AC_EAD	300x150	0.30 m	0.15 m	0.90 m	1.55 m	1.39 m²	300	1.39 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
Rectangular Duct: Mitered Elbows / Taps	MV In Plant Room	AC_EAD	300x300	0.30 m	0.30 m	1.20 m	0.08 m	0.09 m²	300	0.09 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
Rectangular Duct: Mitered Elbows / Taps	MV In Plant Room	AC_EAD	300x300	0.30 m	0.30 m	1.20 m	0.08 m	0.09 m²	300	0.09 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
MV In Plant Room: 8								5.42 m²		5.42 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
Grand total: 1546								1417.32 m²		659.20 m²	498.97 m²	20.67 m²	203.09 m²	11.42 m²	1.44 m²	2.69 m²	0.00 m²	3.85 m²

Notes:

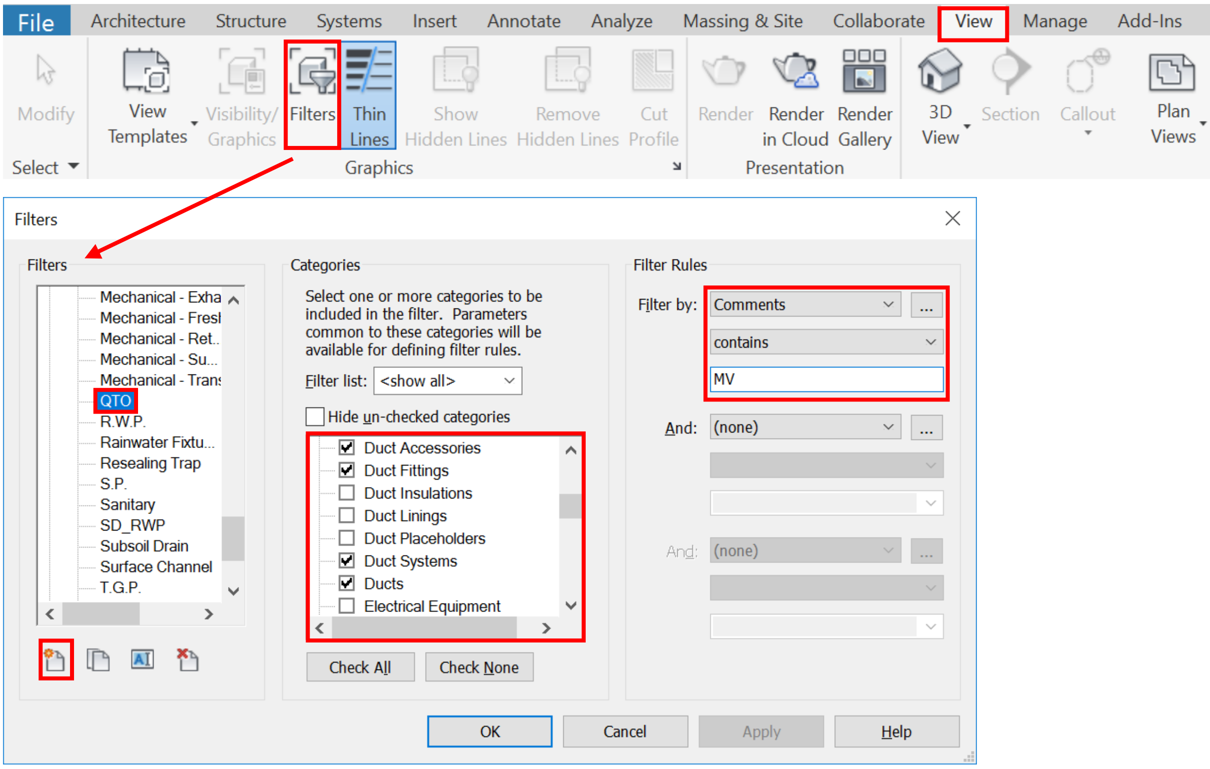
i) If the longer side is over 3000, then it should be measured in Number such as plenum box.

ii) Area in Ductwork Schedule does **not** include the area of duct accessory, duct fitting and other adjustment.

6.1.3.1.4 Identify the area of ductwork not measured in the Ductwork Schedule

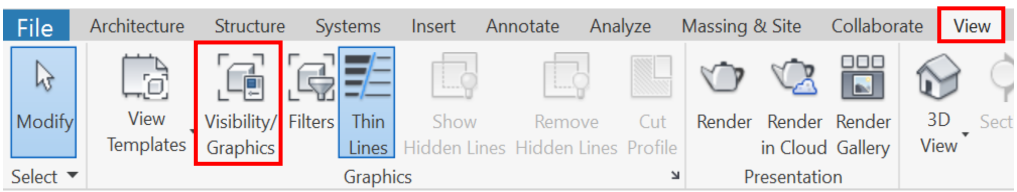
Highlight the measured quantities by Filters

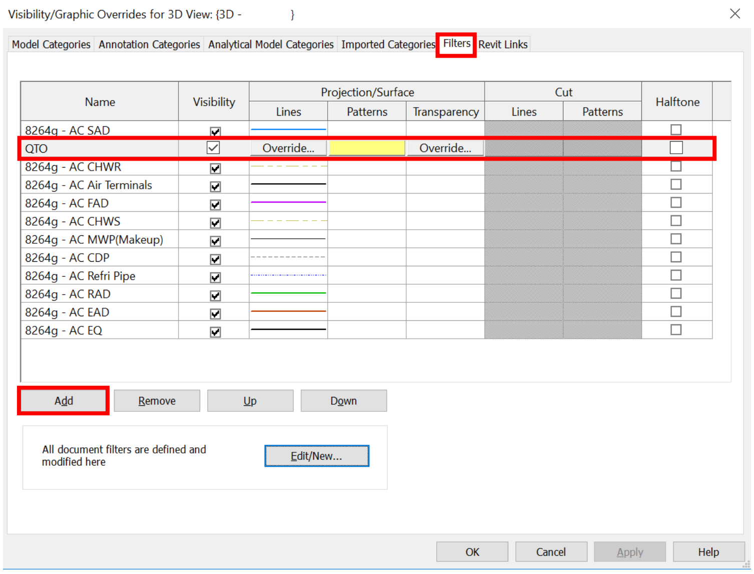
View > Filters



1. Add Filters  QTO, then select the Categories, e.g. Air Terminals, Duct Accessories, Duct Fittings, Ducts Systems and Ducts.
2. Set the Filter Rules:
   - In this QTO, "**Comments**" parameter adopted as System/ Location filter.
   - i.e. choose the "**Comments**" contains/ equal to "MV"/ "MV In Plant Room"
3. Set the pattern visible in the Model

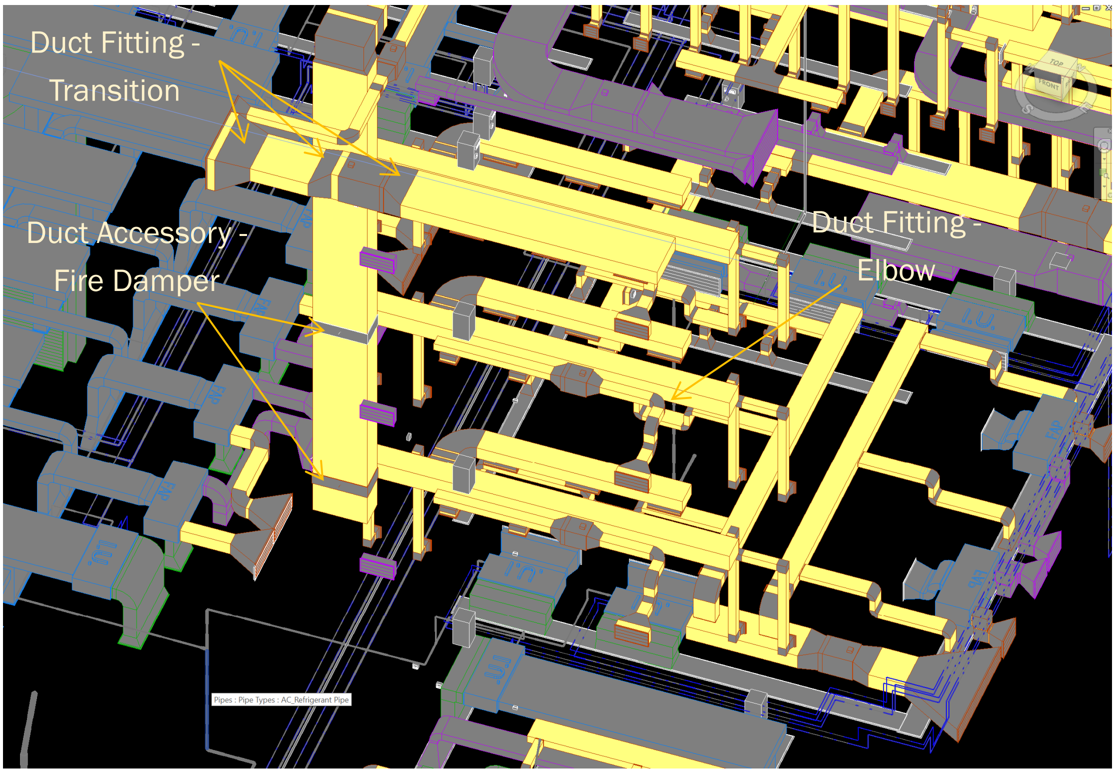
3D View : View > Visibility / Graphics





1. Add the aforesaid Filter “QTO”, then select the Visibility.
2. Set the Projection/ Surface:
   - Lines set to <no override>
   - Pattern set to solid fill and select the colour
   - Transparency set to “0”

The measured areas will be highlighted.



6.1.3.1.5 Create other schedules e.g. air terminals, duct accessories, duct fittings and equipment, to measure the remaining portion.

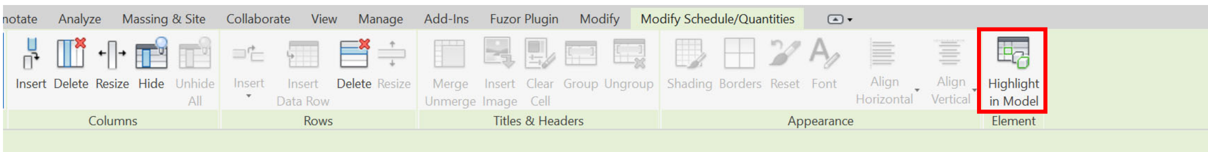
Duct Fitting /Duct Accessory /Equipment Schedule

Selection of scheduled fields:

- **Family and Type**
- **Comments** (change the title to System /Location in the Schedule)
- **System Name**
- **System Type**
- **Overall Size**
- **Size**
- **Ductwork Girth** (Shared Parameter) – see below
- **DuctLength** (Shared Parameter) – see below
- **Area** (Calculated Value) = Ductwork Girth * DuctLength

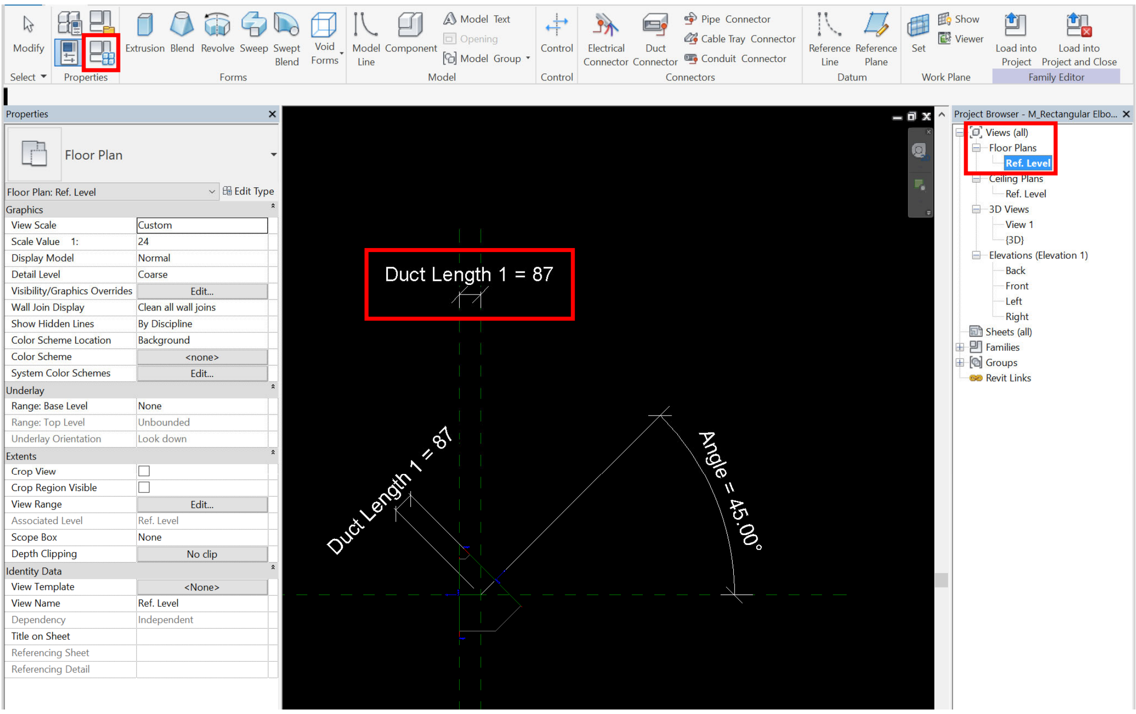
Set the shared parameter for each Object Type

Select the object in the Schedule > Highlight in Model > Show > Close > Edit Family > Views (all) - Floor Plans - Ref. level (to check the name of Dimensions) > Family Types > Set the Shared Parameter > Load into Project >

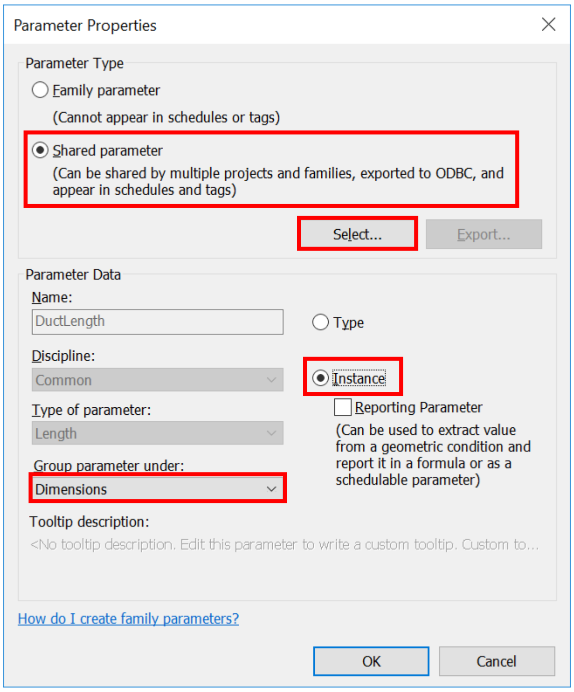


<Duct Fitting Schedule>

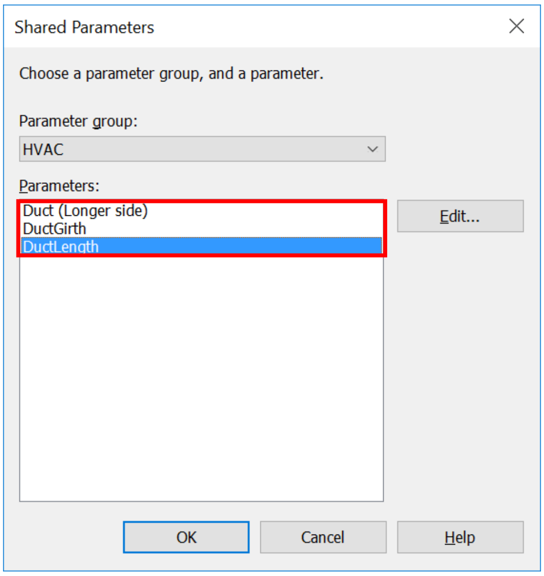
A	B	C	D	E	F	G	H	I
Family and Type	System/ Location	System Name	System Type	Overall Size	Size	Ductwork Girth	DuctLength	Area
M_Rectangular Elbow - Mitered: Standard	MV	EAD 142	AC_EAD	250 mmx250 mm-250 mmx250 mm	250x250-250x250	1.00 m	0.07 m	0.07 m²
M_Rectangular Elbow - Mitered: Standard	MV	EAD 141	AC_EAD	250 mmx250 mm-250 mmx250 mm	250x250-250x250	1.00 m	0.07 m	0.07 m²
M_Rectangular Elbow - Mitered: Standard	MV	EAD 2	AC_EAD	150 mmx150 mm-150 mmx150 mm	150x150-150x150	0.60 m	0.20 m	0.12 m²
M_Rectangular Elbow - Mitered: Standard	MV	EAD 2	AC_EAD	150 mmx150 mm-150 mmx150 mm	150x150-150x150	0.60 m	0.20 m	0.12 m²
M_Rectangular Elbow - Mitered: Standard	MV	EAD 2	AC_EAD	150 mmx150 mm-150 mmx150 mm	150x150-150x150	0.60 m	0.20 m	0.12 m²
M_Rectangular Elbow - Mitered: Standard	MV	EAD 2	AC_EAD	150 mmx150 mm-150 mmx150 mm	150x150-150x150	0.60 m	0.20 m	0.12 m²
M_Rectangular Elbow - Mitered: Standard	MV	EAD 2	AC_EAD	150 mmx150 mm-150 mmx150 mm	150x150-150x150	0.60 m	0.20 m	0.12 m²
M_Rectangular Elbow - Mitered: Standard	MV	EAD 2	AC_EAD	150 mmx150 mm-150 mmx150 mm	150x150-150x150	0.60 m	0.20 m	0.12 m²
M_Rectangular Elbow - Mitered: Standard	MV	EAD 2	AC_EAD	150 mmx150 mm-150 mmx150 mm	150x150-150x150	0.60 m	0.20 m	0.12 m²
M_Rectangular Elbow - Mitered: Standard	MV	EAD 2	AC_EAD	150 mmx150 mm-150 mmx150 mm	150x150-150x150	0.60 m	0.20 m	0.12 m²
M_Rectangular Elbow - Mitered: Standard	MV	EAD 1	AC_EAD	150 mmx150 mm-150 mmx150 mm	150x150-150x150	0.60 m	0.20 m	0.12 m²
M_Rectangular Elbow - Mitered: Standard	MV	EAD 1	AC_EAD	150 mmx150 mm-150 mmx150 mm	150x150-150x150	0.60 m	0.20 m	0.12 m²
M_Rectangular Elbow - Mitered: Standard	MV	EAD 1	AC_EAD	150 mmx150 mm-150 mmx150 mm	150x150-150x150	0.60 m	0.20 m	0.12 m²
M_Rectangular Elbow - Mitered: Standard	MV	EAD 1	AC_EAD	150 mmx150 mm-150 mmx150 mm	150x150-150x150	0.60 m	0.20 m	0.12 m²



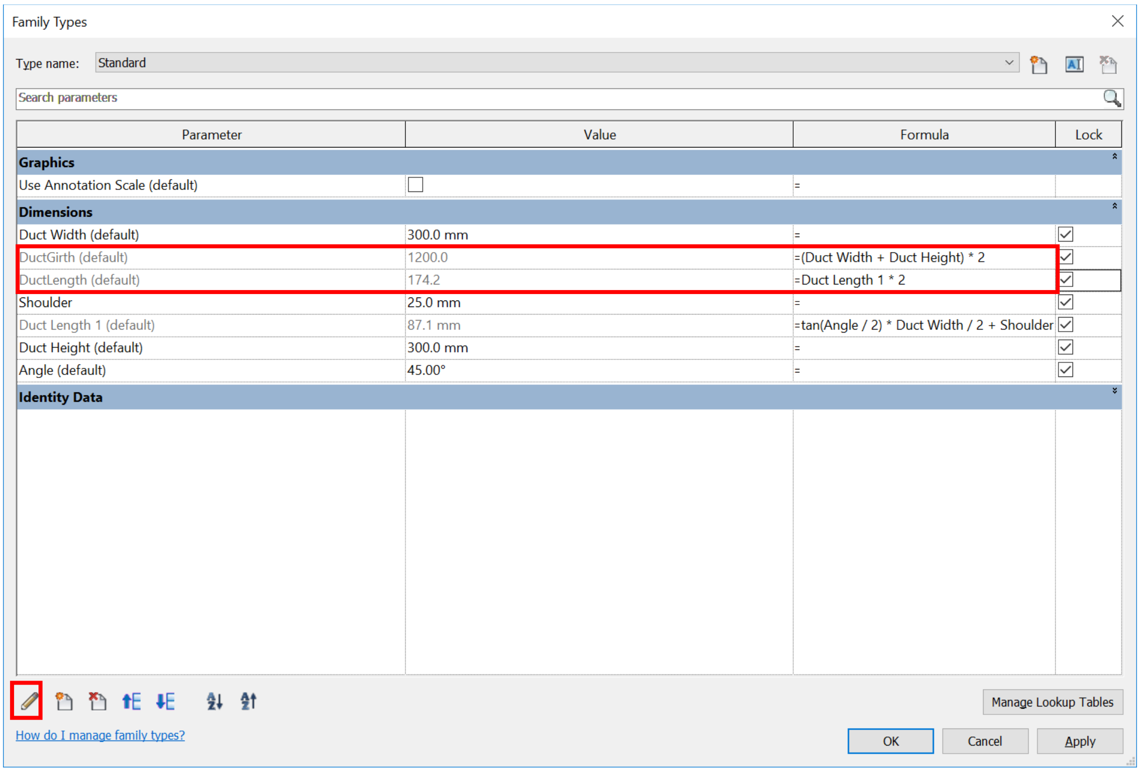
Modify
Select
Properties
Extrusion
Blend
Revolve
Sweep
Swept Blend
Void Forms
Forms
Model Line
Component
Model Text
Opening
Model Group
Model
Control
Control
Electrical Connector
Duct Connector
Pipe Connector
Cable Tray Connector
Conduit Connector
Connectors
Reference Line
Reference Plane
Datum
Set
Show
Viewer
Work Plane
Load into Project
Load into Project and Close
Family Editor
Properties
Floor Plan
Floor Plan: Ref. Level
Edit Type
Graphics
View Scale
Custom
Scale Value 1:
24
Display Model
Normal
Detail Level
Coarse
Visibility/Graphics Overrides
Edit...
Wall Join Display
Clean all wall joins
Show Hidden Lines
By Discipline
Color Scheme Location
Background
Color Scheme
<none>
System Color Schemes
Edit...
Underlay
Range: Base Level
None
Range: Top Level
Unbounded
Underlay Orientation
Look down
Extents
Crop View
Crop Region Visible
View Range
Edit...
Associated Level
Ref. Level
Scope Box
None
Depth Clipping
No clip
Identity Data
View Template
<None>
View Name
Ref. Level
Dependency
Independent
Title on Sheet
Referencing Sheet
Referencing Detail
Duct Length 1 = 87
Duct Length 1 = 87
Angle = 45.00°
Project Browser - M_Rectangular Elbo...
Views (all)
Floor Plans
Ref. Level
Ceiling Plans
Ref. Level
3D Views
View 1
{3D}
Elevations (Elevation 1)
Back
Front
Left
Right
Sheets (all)
Families
Groups
Revit Links



Parameter Properties
Parameter Type
Family parameter
(Cannot appear in schedules or tags)
Shared parameter
(Can be shared by multiple projects and families, exported to ODBC, and appear in schedules and tags)
Select...
Export...
Parameter Data
Name:
DuctLength
Type
Discipline:
Common
Instance
Type of parameter:
Length
Reporting Parameter
(Can be used to extract value from a geometric condition and report it in a formula or as a schedulable parameter)
Group parameter under:
Dimensions
Tooltip description:
<No tooltip description. Edit this parameter to write a custom tooltip. Custom to...
How do I create family parameters?
OK
Cancel



Shared Parameters
Choose a parameter group, and a parameter.
Parameter group:
HVAC
Parameters:
Duct (Longer side)
DuctGirth
DuctLength
Edit...
OK
Cancel
Help



Duct Fitting

Object Type	Shared Parameter	Formula
Elbow	**Ductwork Girth**	(Duct Width + Duct Height)*2
	DuctLength	Center Radius * 2 * pi() * Angle / 360°
Transition	**Ductwork Girth**	if((Duct Width 1 + Duct Height 1) * 2 > (Duct Width 2 + Duct Height 2) * 2, (Duct Width 1 + Duct Height 1) * 2, (Duct Width 2 + Duct Height 2) * 2)
	DuctLength	Duct Length
Takeoff (Tap – Adjustable)	**Ductwork Girth**	if((Duct Width 1 + Duct Height 1) * 2 > (Duct Width 2 + Duct Height 2) * 2, (Duct Width 1 + Duct Height 1) * 2, (Duct Width 2 + Duct Height 2) * 2)
	DuctLength	Takeoff Length + Takeoff Length Projection
Tee - Fillet	**Ductwork Girth**	if(and(Duct Width 1 > Duct Width 3, Duct Width 1 > Duct Width 4), (Duct Width 1 + Duct Height) * 2, if(Duct Width 3 > Duct Width 4, (Duct Width 3 + Duct Height) * 2, (Duct Width 4 + Duct Height) * 2))
	DuctLength	Duct Length 1 * 2 + Duct Length 3

Duct Accessory

Object Type	Shared Parameter	Formula
Fire Damper/ Fire and Smoke Damper	**Ductwork Girth**	(Height of damper + Width of damper) * 2
	DuctLength	Length of damper
Fire Damper Curtain Type	**Ductwork Girth**	(Duct Width + Duct Height) * 2
	DuctLength	Damper Long
Volume Control Damper /Non-return Damper /Motorized Control Damper	**Ductwork Girth**	(Duct Width + Duct Height) * 2
	DuctLength	Damper Length

Mechanical Equipment Schedule

Object Type	Shared Parameter	Formula
Silencer	**Ductwork Girth**	(Height + Width) * 2
	DuctLength	Length

Notes:

i) Ductwork rectangular in section is measured over all in-line fittings, short running lengths and branches, i.e. the area of duct fittings shall be measured.

ii) Where an in-line reduction in size occurs at a reducer or tee etc., the largest size shall be measured for the full length of the duct fittings.

iii) In-line fittings to circular or oval ducts shall be measured extra over the ducts in which they occur, e.g. transformation pieces.

iv) Total Area of Ductwork = Area of Ducts + Area of Duct Fittings + Area of Duct Accessories + Area of Silencer

6.1.3.2 Pipework

Pipework taking-off plan

Step 1: Setup new Shared Parameters for HVAC system (Same as Ductwork)

Step 2: Input the system /location filter for HVAC system (Same as Ductwork)

Step 3: Create new Pipework Schedule for HVAC system

Step 4: Identify the area not measured in the Schedule (Same as Ductwork)

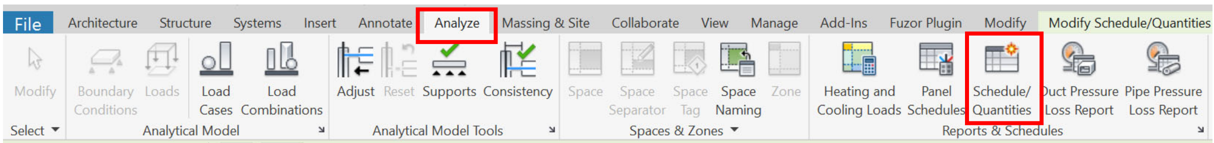
Step 5: Create other schedules e.g. pipe accessory and pipe fitting to measure the remaining portion.

Tips:

1. Refrigerant and suction pipe shall be measured in Length between outdoor unit and indoor unit, reference number can be found in the System Name.
2. Header pipe shall be measured in Number. Header pipe length shall be deducted in the pipework schedule.
3. Quantity of Valves shall be counter checked with the model and the schematic drawings.
4. Insulation, protective coverings and finishing to pipework or related fittings shall be measured in according to the Particular Specification.

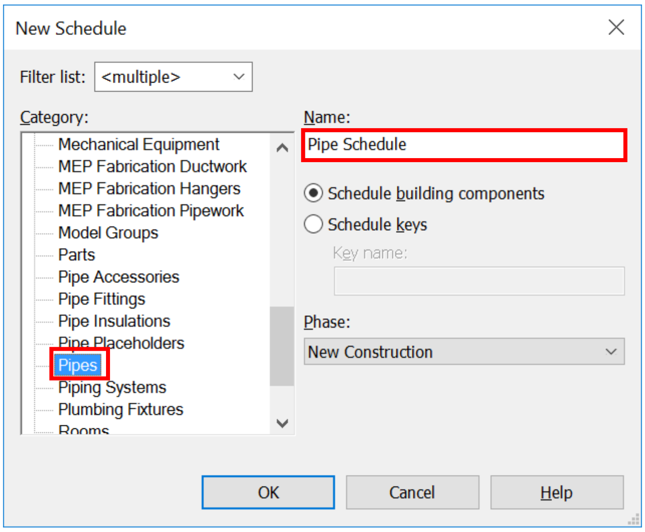
6.1.3.2.1 Create new Pipework Schedule for HVAC system

Analyze > Schedule/Quantities



Step 1

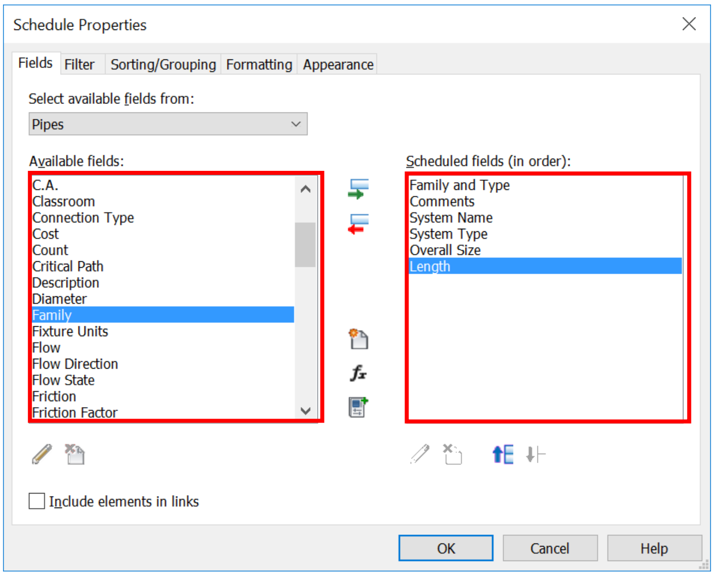
Select the Category **Pipes** and Name the Schedule, e.g. Pipe Schedule



Step 2

Selection of scheduled fields:

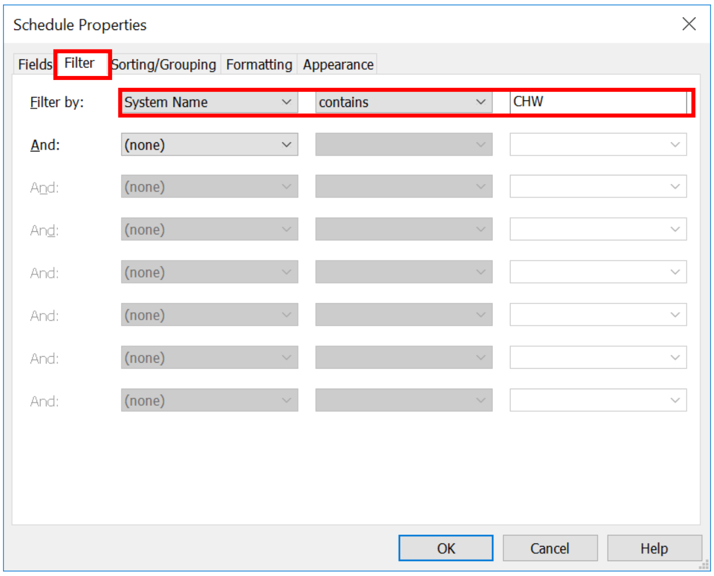
- **Family and Type**
- **Comments** (change the title to System /Location in the Schedule)
- **System Name**
- **System Type**
- **Overall Size**
- **Length**



Step 3

Filter, Sorting/ Grouping and Formatting the Schedule

Filter – filter by **System Name** as System, e.g. CHW for Chilled Water /CDP for Condensate Drain.



Sorting/ Grouping and Formatting should reference to the Ductwork Schedule.

As a result, **Pipework Schedule** can be created, e.g. Pipe Schedule for Chilled Water System

<Pipe Schedule for Chilled Water System>						
A	B	C	D	E	F	G
Family and Type	System/ Location	System Name	System Type	Overall Size	Diameter	Length
Pipe Types: AC_CHWR	Chilled Water In Plant Room	AC_CHWR 2	AC_CHWR	ø100 mm	100.0	0.08 m
Pipe Types: AC_MWP	Chilled Water In Plant Room	AC_CHWR 2	AC_CHWR	ø100 mm	100.0	0.08 m
Pipe Types: AC_MWP	Chilled Water In Plant Room	AC_CHWR 2	AC_CHWR	ø100 mm	100.0	0.08 m
Pipe Types: AC_CHWR	Chilled Water In Plant Room	AC_CHWR 2	AC_CHWR	ø100 mm	100.0	0.10 m
Pipe Types: AC_MWP	Chilled Water In Plant Room	AC_CHWR 2	AC_CHWR	ø100 mm	100.0	0.10 m
Pipe Types: AC_MWP	Chilled Water In Plant Room	AC_CHWR 2	AC_CHWR	ø100 mm	100.0	0.10 m
Pipe Types: AC_CHWR	Chilled Water In Plant Room	AC_CHWR 2	AC_CHWR	ø100 mm	100.0	0.39 m
Pipe Types: AC_CHWR	Chilled Water In Plant Room	AC_CHWR 2	AC_CHWR	ø100 mm	100.0	0.39 m
Pipe Types: AC_CHWS	Chilled Water On Roof	AC_CHWS 1	AC_CHWS	ø150 mm	150.0	0.98 m
Pipe Types: AC_CHWS	Chilled Water On Roof	AC_CHWS 1	AC_CHWS	ø150 mm	150.0	4.96 m
Pipe Types: AC_CHWS	Chilled Water On Roof	AC_CHWS 1	AC_CHWS	ø150 mm	150.0	5.44 m
150: 5						12.27 m
Pipe Types: AC_CHWS	Chilled Water Wall	AC_CHWS 1	AC_CHWS	ø150 mm	150.0	8.35 m
Pipe Types: AC_CHWS	Chilled Water Wall	AC_CHWS 1	AC_CHWS	ø150 mm	150.0	9.37 m
150: 2						17.71 m
Pipe Types: AC_CHWS	Chilled Water In Plant Room	AC_CHWS 4	AC_CHWS	ø150 mm	150.0	0.17 m
Pipe Types: AC_CHWS	Chilled Water In Plant Room	AC_CHWS 4	AC_CHWS	ø150 mm	150.0	0.88 m
150: 2						1.05 m
Grand total: 124						228.61 m

Note:

iii) Length in Pipework Schedule does **<u>not</u>** include the length of pipe accessory and pipe fitting and other adjustment.

6.1.3.2.2 Create pipe accessory and pipe fitting schedule to measure the remaining portion

Pipe Fitting /Pipe Accessory

Selection of scheduled fields:

- **Family and Type**
- **Comments** (change the title to System /Location in the Schedule)
- **System Name**
- **System Type**
- **Overall Size**
- **PipeLength** (Shared Parameter) – (Same as Ductwork)

Set the shared parameter for each Object Type

Pipe Fitting

Object Type	**Shared Parameter**	**Formula**
Elbow	**PipeLength**	**Center Radius** * 2 * pi() * Angle / 360°
Transition	**PipeLength**	**Length**
Tee	**PipeLength**	**Center to End** * 3

Pipe Accessory

Object Type	**Shared Parameter**	**Formula**
Gate valve	**PipeLength**	**Body Length**
Balancing valve	**PipeLength**	**TotalLength**

In Pipe Fitting and Pipe Accessory Schedule, quantities of fittings/ valves in Number can be extracted under the Sorting/ Grouping.

<Pipe Accessory Schedule>

A	B	C	D	E	F	G
Family and Type	Comments	System Name	System Type	Overall Size	Size	PipeLength
ADB-PPA-Balancing Valve: DN 150	Chilled Water In Plant Room	AC_CHWR 2,AC_CHWR 7	AC_CHWR	ø150 mm-ø150 mm	ø150-ø150	480 mm
ø150-ø150: 1						480 mm
ADB-PPA-Balancing Valve: DN 150	Chilled Water In Plant Room	AC_CHWS 1,AC_CHWS 4	AC_CHWS	ø150 mm-ø150 mm	ø150-ø150	480 mm
ø150-ø150: 1						480 mm
ADB-PPA-Gate Valve Flange: 28 mm	Chilled Water	AC_MWP 2	AC_MWP	ø28 mm-ø28 mm	ø28-ø28	84 mm
ADB-PPA-Gate Valve Flange: 28 mm	Chilled Water	AC_MWP 2	AC_MWP	ø28 mm-ø28 mm	ø28-ø28	84 mm
ø28-ø28: 2						168 mm
ADB-PPA-Gate Valve Flange: 150 mm	Chilled Water In Plant Room	AC_CHWR 2	AC_CHWR	ø150 mm-ø150 mm	ø150-ø150	450 mm
ADB-PPA-Gate Valve Flange: 150 mm	Chilled Water In Plant Room	AC_CHWR 7	AC_CHWR	ø150 mm-ø150 mm	ø150-ø150	450 mm
ø150-ø150: 2						900 mm
ADB-PPA-Gate Valve Flange: 150 mm	Chilled Water In Plant Room	AC_CHWS 1	AC_CHWS	ø150 mm-ø150 mm	ø150-ø150	450 mm
ADB-PPA-Gate Valve Flange: 150 mm	Chilled Water In Plant Room	AC_CHWS 1	AC_CHWS	ø150 mm-ø150 mm	ø150-ø150	450 mm
ADB-PPA-Gate Valve Flange: 150 mm	Chilled Water In Plant Room	AC_CHWS 1	AC_CHWS	ø150 mm-ø150 mm	ø150-ø150	450 mm
ADB-PPA-Gate Valve Flange: 150 mm	Chilled Water In Plant Room	AC_CHWS 4	AC_CHWS	ø150 mm-ø150 mm	ø150-ø150	450 mm
ø150-ø150: 4						1800 mm
Grand total: 10						3828 mm

6.1.3.3 Equipment

Equipment taking-off plan

Step 1: Setup new Shared Parameters for HVAC system (Same as Ductwork)

Step 2: Input the system /location filter for HVAC system (Same as Ductwork)

Step 3: Create new Equipment Schedule for HVAC system

Step 4: Identify the Equipment not measured in the Schedule (Same as Ductwork)

Tips:

1. Check the required data in properties carefully.

Equipment Schedule

Step 1

Select the Category "Mechanical Equipment" and Name the Schedule, e.g. Equipment Schedule.

Step 2

Selection of scheduled fields (Essential information for item description).

Fields \ Equipment	Ventilation Fan	Fresh Air Pre-conditioner	Split package unit/ VRV	Air Handling Units	Air Cooled Chillers	Chilled Water Pumps	Fan Coil Units	Dehumidifiers	VAV/ CAV Terminal Units
Family and Type	✓	✓	✓	✓	✓	✓	✓	✓	✓
Reference Code	✓	✓	✓	✓	✓	✓	✓	✓	✓
Location	✓	✓	✓	✓	✓	✓	✓	✓	✓
Type	✓	✓	✓			✓	✓	✓	✓
Volume flow rate	✓	✓	✓	✓			✓	✓	
External Static Pressure	✓		✓	✓					
Cooling capacity total load			✓	✓	✓		✓		
Heating capacity			✓	✓			✓		✓
Water flow rate						✓			
Pump head						✓			
Interlock with other equipment (if any)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Remark (if any)	✓	✓	✓	✓	✓	✓	✓	✓	✓

Step 3

Create the Equipment Schedule as aforesaid.

Sample of Mechanical Equipment Schedule – Ventilation Fan

<Mechanical Equipment Schedule - Venlitation Fan>							
A	B	C	D	E	F	G	H
Family	Reference Code	Location	Type	Volume flow rate	Exernal Static Pressure	Interlock with other equipment	Remark
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	FAF-2F-04	A/C PLANT ROOM	IN-LINE DUCT FAN	1650.0 L/s	300.0 Pa	EAF-2F-19	WITH DUCTWORK SILENCER
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-2F-19	A/C PLANT ROOM	IN-LINE DUCT FAN	1650.0 L/s	300.0 Pa	FAF-2F-04	WITH DUCTWORK SILENCER
1650.0 L/s: 2							
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-GF-15	MAIN SWITCH ROOM	IN-LINE DUCT FAN	560.0 L/s	200.0 Pa	-	-
560.0 L/s: 1							
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	FAF-RF-03	PUMP & TANK ROOM (F.S. & SPRINKLER)	IN-LINE DUCT FAN	825.0 L/s	200.0 Pa	EAF-RF-07	-
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-RF-07	PUMP & TANK ROOM (F.S. & SPRINKLER)	IN-LINE DUCT FAN	825.0 L/s	200.0 Pa	FAF-RF-03	-
825.0 L/s: 2							
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-RF-04	PUMP & TANK ROOM (POTABLE, NON-POTA	IN-LINE DUCT FAN	960.0 L/s	200.0 Pa	FAF-RF-02	-
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	FAF-RF-02	PUMP & TANK ROOM (POTABLE, NON-POTA	IN-LINE DUCT FAN	960.0 L/s	200.0 Pa	EAF-RF-04	-
960.0 L/s: 2							
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-RF-08	PV SYSTEM ROOM	IN-LINE DUCT FAN	85.0 L/s	150.0 Pa	-	-
85.0 L/s: 1							
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-2F-12	SWITCH ROOM 1	IN-LINE DUCT FAN	90.0 L/s	150.0 Pa	-	-
90.0 L/s: 1							
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-3F-13	SWITCH ROOM 1	IN-LINE DUCT FAN	100.0 L/s	150.0 Pa	-	-
100.0 L/s: 1							
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-4F-02	SWITCH ROOM 1	IN-LINE DUCT FAN	110.0 L/s	150.0 Pa	-	-
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-5F-02	SWITCH ROOM 1	IN-LINE DUCT FAN	110.0 L/s	150.0 Pa	-	-
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-6F-02	SWITCH ROOM 1	IN-LINE DUCT FAN	110.0 L/s	150.0 Pa	-	-
110.0 L/s: 3							
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-1F-11	SWITCH ROOM 1	IN-LINE DUCT FAN	120.0 L/s	150.0 Pa	-	-
120.0 L/s: 1							
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-GF-10	SWITCH ROOM 1	IN-LINE DUCT FAN	135.0 L/s	150.0 Pa	-	-
135.0 L/s: 1							
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-GF-04	SWITCH ROOM 2	IN-LINE DUCT FAN	160.0 L/s	150.0 Pa	-	-
160.0 L/s: 1							
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-3F-08	SWITCH ROOM 2 & HUB ROOM	IN-LINE DUCT FAN	175.0 L/s	150.0 Pa	-	-
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-4F-01	SWITCH ROOM 2 & HUB ROOM	IN-LINE DUCT FAN	175.0 L/s	150.0 Pa	-	-
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-5F-01	SWITCH ROOM 2 & HUB ROOM	IN-LINE DUCT FAN	175.0 L/s	150.0 Pa	-	-
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-6F-01	SWITCH ROOM 2 & HUB ROOM	IN-LINE DUCT FAN	175.0 L/s	150.0 Pa	-	-
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-2F-05	SWITCH ROOM 2 & HUB ROOM	IN-LINE DUCT FAN	175.0 L/s	150.0 Pa	-	-
ADB-MCQ-Centrifugal Fan - Inline - Direct Drive	EAF-1F-05	SWITCH ROOM 2 & HUB ROOM	IN-LINE DUCT FAN	175.0 L/s	150.0 Pa	-	-
175.0 L/s: 6							

6.1.3.4 Control and Monitoring System

1) All the control panels and control points shall be measured in according to the schematic drawing.

2) Total quantities of control points/ valves/ sensors shall be checked between the model and schematic drawing.

6.2 Electrical Installation (Coming)

6.3 Fire Service Installation (Coming)

6.4 Above Ground Plumbing and Drainage Works (Coming)

6.5 Underground Drainage Works

6.5.1 Basic Information

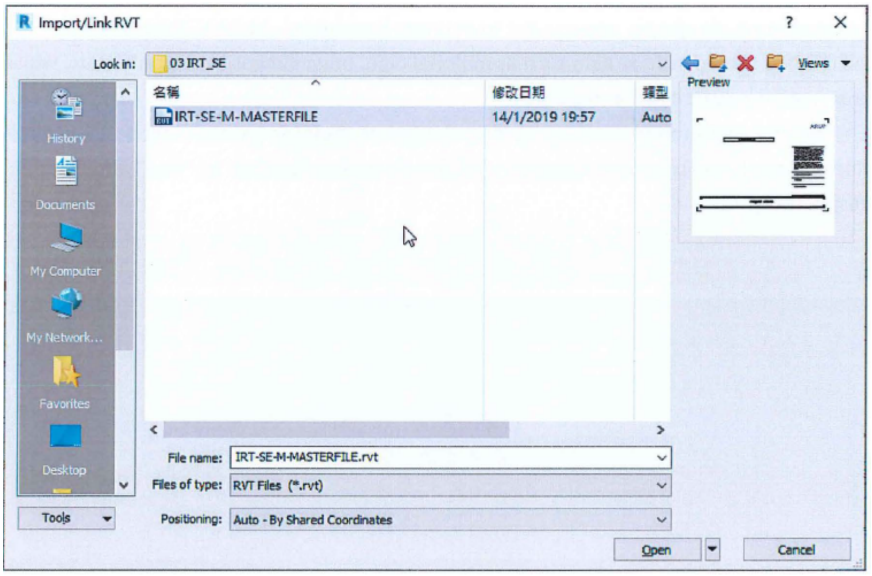
6.5.1.1 Building Services Elements to Model: Underground Drainage System

The following details of underground drainage should be developed in BIM models, but not limited to:

- Manholes;
- Sump Pit;
- Sealed Trapped Gully (STG) (i.e. Back Inlet Gully Trap (BIGT);
- Open Trapped Gully (OTG);
- Rain Water Outlet (RWO);
- Gully Trap (GT);
- Drainage pipes;
- Drainage pipe fittings and
- Surface channel

The followings are the general principles should be adopted when assembling an Underground Drainage Building Information Model:

1) The following elements are to be excluded from general BIM underground drainage model:
   a. Concrete surrounding/ bedding of pipes.
2) To facilitate the linking of individual sub-model to a building model at later stages, modeller should adopt the following practices when making the sub-models.
   - The locations and orientations of all sub-models should refer to the same origin.
   - Select "Auto - By Shared Coordination" for Positioning during the linking sub-model process.



3) All elements should be specified with the designed construction material (i.e. concrete for manholes, OTG, STG and ductile iron/ precast concrete for pipes).
4) All objects should include data such as pipe material, basic dimensions, type no. etc. which can be extracted for quantity takeoff purpose.
5) For tender stage drawings production process, all underground drainage pipes should be shown in single line.

6.5.1.2 Sequence of Modelling

The sequence of modelling:

- Step 1: Drainage fixture (incl. Manholes, STG, OTG, sump pit etc.);
- Step 2: Pipework.

6.5.2 Modelling Approach

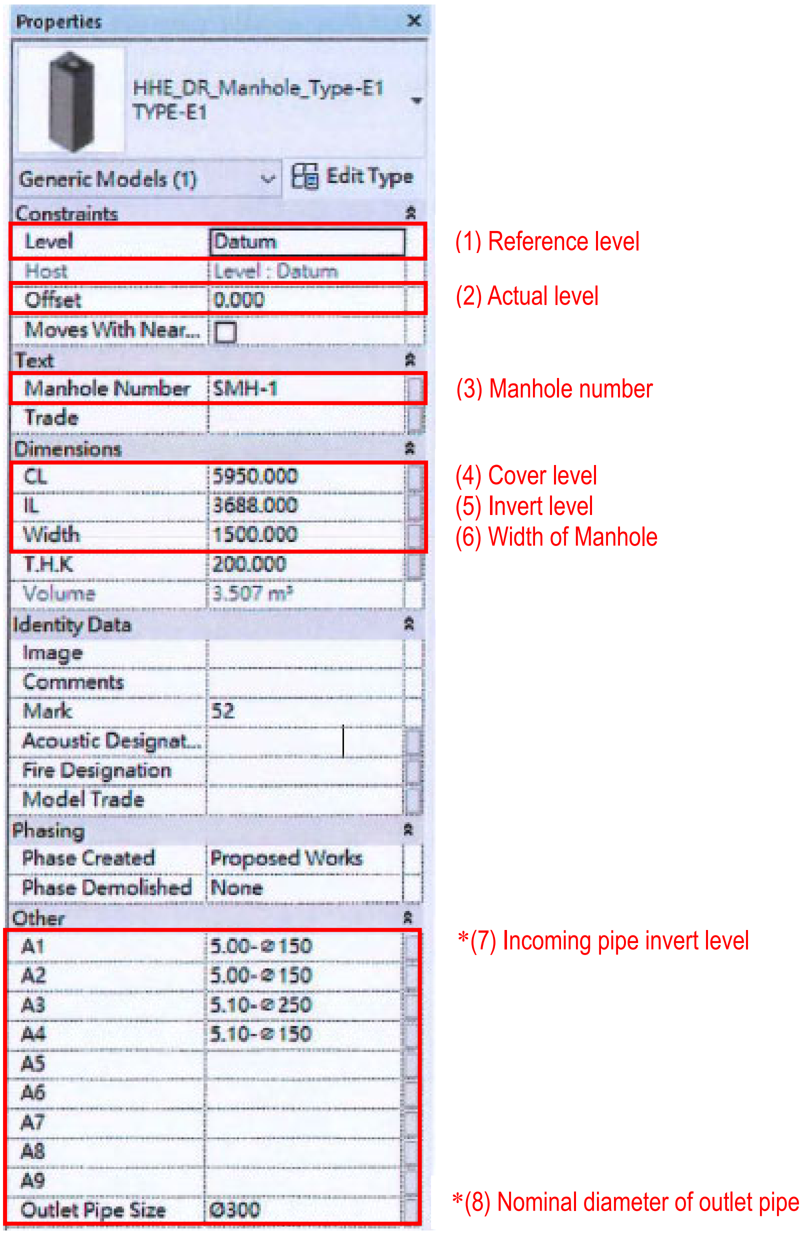
6.5.2.1 Modelling Process of Underground Drainage Fixtures (Manholes, Sump Pits, BIGT, OTG)

1) Manhole, Sump Pit, Sealed Trapped Gully (STG), Open Trapped Gully (OTG) element shall be modelled as a Plumbing Fixtures model category.
2) Drainage fixtures shall be created as a Loadable object. The objects shall be built based on the standard drawing provided by the Drainage Services Department or designers' drawing details.
3) The variable dimension shall be labelled as a parameter in the objects in order to control the dimensions of the fixtures.
4) The "Offset" is the actual level of the manholes/pits.
5) The following sharable parameters have to be added to the (a) manhole object and (b) drainage fixtures other than manholes such that they can provide relevant information for other model users or element annotating:

Parameter	Type/ Instance	Description	Manhole object (a)	Other drainage fixtures (b)
Manhole Number	Instance	Manhole number	✓	✓
Cover Level	Instance	Cover level of manhole	✓	✓
Invert Level	Instance	Invert level of manhole	✓	✓
Manhole Width	Instance	Width of manhole	✓	✓
A1 to A9	Instance	The incoming pipe invert level counting clockwise from outgoing pipe	✓*	
Outlet Pipe Size	Instance	Nominal diameter of outlet pipe	✓*	

* Add parameter for QS input

Manhole Properties

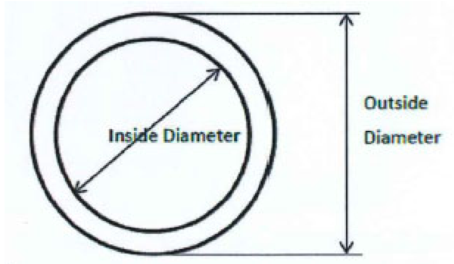


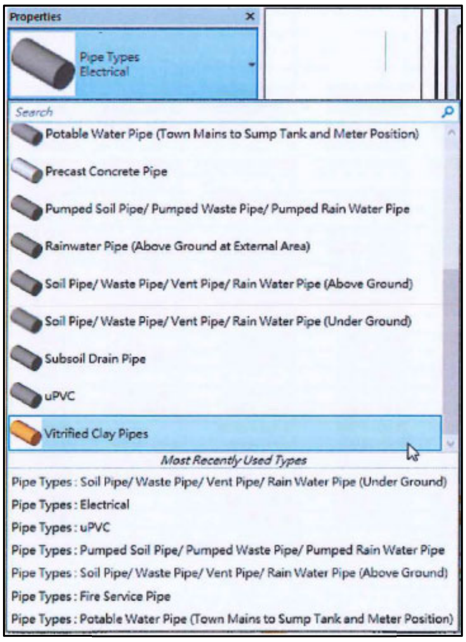
* Add parameter for QS input

6.5.2.2 Modelling Process of Pipework

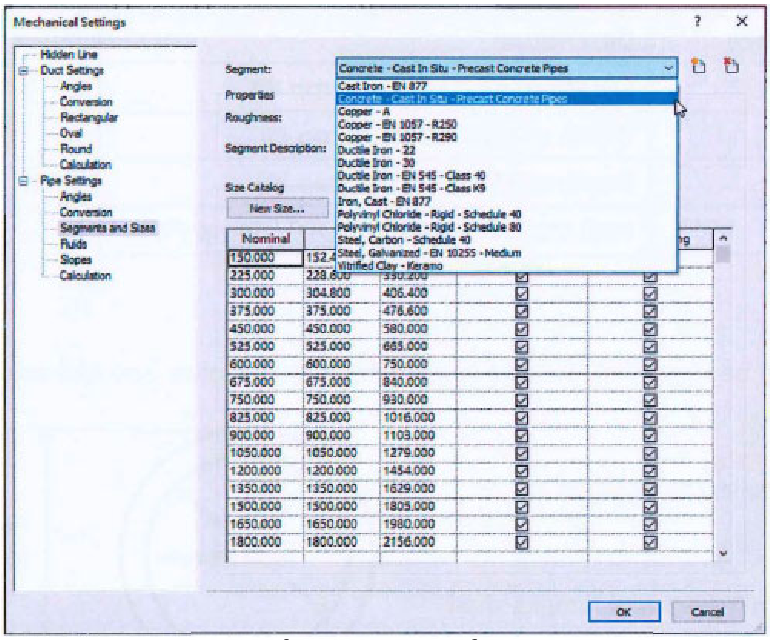
1) All underground drainage pipes should be modelled, include subsoil drain, waste pipe, soil and waste pipe, vent pipe, pumped waste pipe etc.
2) Pipe segments shall be applied to all pipes to differentiate different pipe system. Each pipe segment includes a material and schedule/ type combination a roughness, and a range of sizes.
3) Pipe fittings such as bend, branches and gully trap shall be modelled.

4) The material, inner and outer diameter for each pipe, pipe fitting and ancillaries shall follow the specification of underground drainage system and stated in the Properties.





Pipe Type Setting



Pipe Segment and Sizes

5) Unless shown otherwise, underground drains or sewers shall be laid to fall as follows.

PIPE DIA. (mm)	FALL*
100	1 to 40
150	1 to 70
200	1 to 100
225	1 to 100
250	1 to 120
300	1 to 150
350	1 to 170
400	1 to 200
450	1 to 210

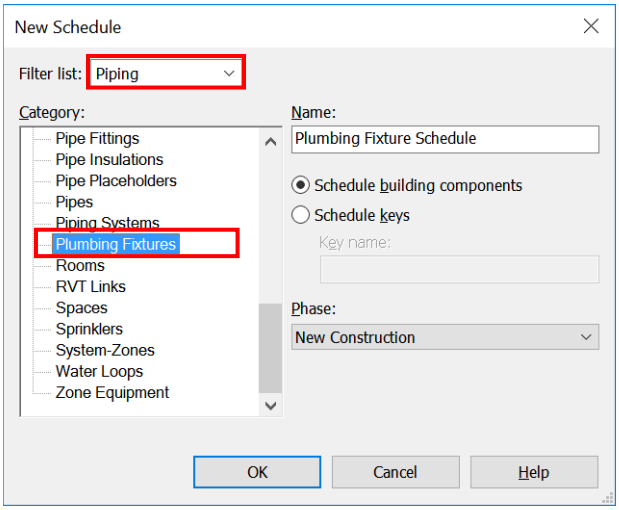
* For indication only, the exact value should be depended on site condition.

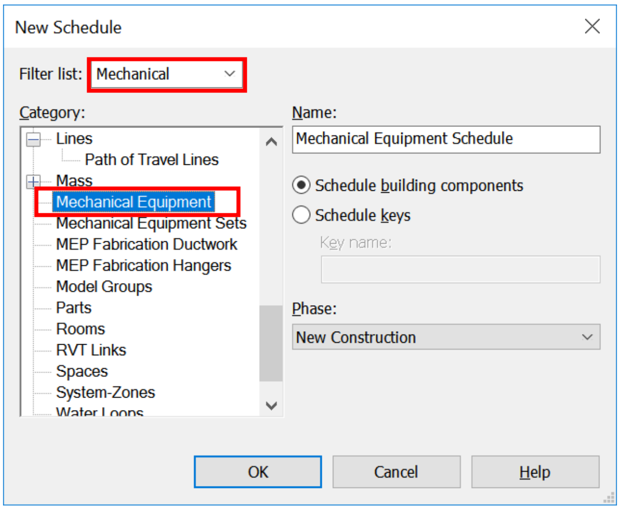
6) The 'Start offset' is the actual start level of the pipe and the 'End offset' is the actual end level of the pipe.
7) Start and end of underground drainage pipes should align with inner wall of drainage fixtures.
8) The running length of pipes (mm) is calculated for quantity extraction.
9) The diameter of pipes shall be added for quantity extraction.

6.5.3 Quantity Take-off

6.5.3.1 Manholes and the like

1. Number of Manholes can be measured in Plumbing Fixtures Schedule under Piping Category. In rare case, some drainage equipment may be measured in Mechanical Equipment Schedule under Mechanical Category.





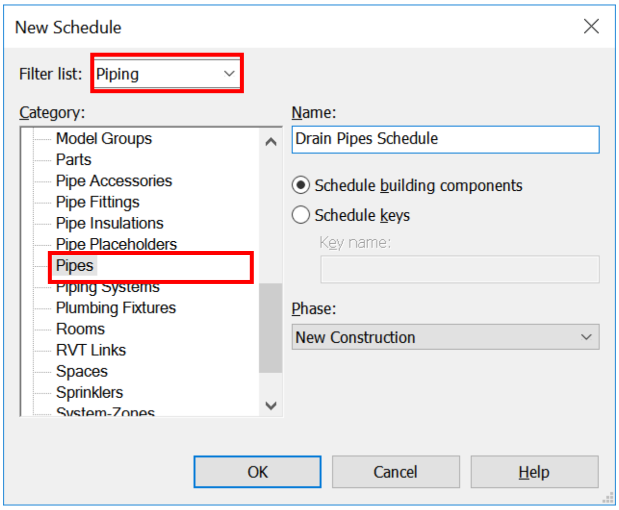
2. Manhole Depth shall be calculated between the cover level and the invert level by inserting a calculated parameter. It shall be grouped in (1) not exceeding 1.0m; and (2) thereafter in 0.50m stages.

<Manholes Schedule >

A	B	C	D	E
Manhole Number	Type	Cover Level	Invert Level	Manhole Depth (m)
FMH-4	Soil & Waste Manhole Type E1	5700.0	3770.0	1.93
FMH-5	Soil & Waste Manhole Type E1	5725.0	3575.0	2.15
FMH-5b	Soil & Waste Manhole Type E1	5650.0	3320.0	2.33
FMH-7	Soil & Waste Manhole Type E1	5800.0	3220.0	2.58
FMH-11	Soil & Waste Manhole Type C1	5415.0	4488.0	0.93
FMH-12	Soil & Waste Manhole Type C1	5415.0	4115.0	1.30
FMH-13	Soil & Waste Manhole Type C1	5650.0	4803.0	0.85
FMH-34d	Soil & Waste Manhole Type E1	5925.0	3825.0	2.10
FMH-34e	Soil & Waste Manhole Type D1	5650.0	3870.0	1.78
FMH-34f	Soil & Waste Manhole Type E1	5535.0	3655.0	1.88
FTMH-1	Soil & Waste Manhole (EXISTING) T3	5805.0	2825.0	2.98
P.I. NO.1	P46A_DR_Plumbing Fixtures_Petrol_02			
SMH4105443	Storm Manhole (EXISTING)	5100.0	2190.0	2.91
SMH4105444	Storm Manhole (EXISTING)	5100.0	2140.0	2.96
SMH-1	Storm Manhole Type E1	5755.0	3773.3	1.98
SMH-2	Storm Manhole Type E1	5755.0	3650.8	2.10
SMH-3	Storm Manhole Type E1	5755.0	3543.6	2.21
SMH-4	Storm Manhole Type E1	5755.0	3349.8	2.41
SMH-5	Storm Manhole Type H	5745.0	3226.0	2.52
SMH-5a	Storm Manhole Type H	5745.0	3226.0	2.52
SMH-6	Storm Manhole Type H	5600.0	3000.0	2.60
SMH-7	Storm Manhole Type E1	5875.0	3770.4	2.10
SMH-8	Storm Manhole Type E1	6000.0	3995.0	2.01
SMH-9	Storm Manhole Type E1	5940.0	4250.0	1.69
SMH-9a	Storm Manhole Type E1	5938.0	4423.0	1.51
SMH-10	Storm Manhole Type D1	5785.0	4730.0	1.06
SMH-16	Storm Manhole Type C1	5745.0	4753.7	0.99
SMH-16b	Storm Manhole Type C1	5665.0	4978.8	0.69
STMH-1	Soil & Waste Manhole Type T2_1	5550.0	4150.0	1.40

6.5.3.2 Drain pipes

1. Drain pipes can be measured in Pipes Schedule under Piping Category.



2. Drain pipes shall be measured along the centerline of pipes over all bends, junctions and other pipe fittings in meter (m) run. It shall be measured to inside surfaces of manholes and accessories.

<Drain Pipes Schedule>

A	B	C	D	E	F
Family	Family and Type	System Type	Material	Diameter	Length (m)
Pipe Types	Pipe Types: 04_DSI_PumpedWaste_Ductile Iron_Flanged (BSEN598)	DR-PRWP	Ductile Iron	80.0 mm	11.08
Pipe Types	Pipe Types: 04_DSI_PumpedWaste_Ductile Iron_Flanged (BSEN598)	DR-PRWP	Ductile Iron	80.0 mm	11.10
80 mm					22.18
Pipe Types	Pipe Types: 04_DSI_UnderGround_RWP_Grey Iron (BS4622) / Cast Iron (BS437)	DR-PWP	CAST IRON	150.0 mm	0.69
Pipe Types	Pipe Types: 04_DSI_UnderGround_RWP_Grey Iron (BS4622) / Cast Iron (BS437)	DR-PWP	CAST IRON	150.0 mm	0.47
Pipe Types	Pipe Types: 04_DSI_UnderGround_RWP_Grey Iron (BS4622) / Cast Iron (BS437)	DR-PWP	CAST IRON	150.0 mm	0.92
150 mm					2.08
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	100.0 mm	1.86
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	100.0 mm	3.11
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	100.0 mm	5.00
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	100.0 mm	0.68
100 mm					10.65
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	150.0 mm	1.84
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	150.0 mm	3.45
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	150.0 mm	3.07
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	150.0 mm	3.45
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	150.0 mm	1.09
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	150.0 mm	1.09
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	150.0 mm	5.17
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	150.0 mm	5.91
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	150.0 mm	5.63
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	150.0 mm	0.59
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	150.0 mm	0.59
Pipe Types	Pipe Types: 04_DSI_UnderGround_SWP_Ductile Iron_Flanged (BSEN598)	DR-PWP	Ductile Iron	150.0 mm	0.59
150 mm					32.46

7. Techniques for Quantity-Take-Off (QTO)

7.1 Open a Model

- when you open a model file, you can detach the local model from a central workshared model (open a model independently for whom want to see changes or make changes without saving them).

<u>**Open a Workshared Project Independent of the Central Model**</u>

<u>**Step 1**</u>

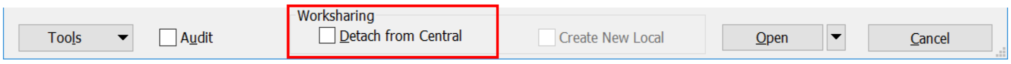
On the Home page, under Models, click **Open**.

or

Go to File tab → Click Open → (Project).

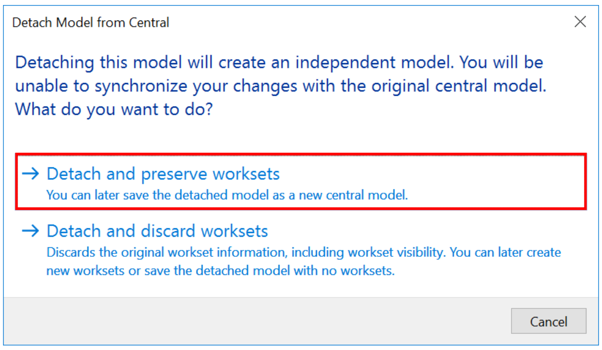
<u>**Step 2**</u>

In the Open dialog, navigate to the folder where the model resides → Select the Model → Select **Detach from Central** → Click **Open**



<u>**Step 3**</u>

Detach and preserve worksets



After open the project, it no longer has any path or permissions information, and the default file name is the original filename with "_detached" appended. The project is in a state similar to when worksharing was first enabled; all elements in the project can be modified, but no changes can be saved back to the central model. If you save the project, it is saved as a new central model.

7.2 Shared Parameters

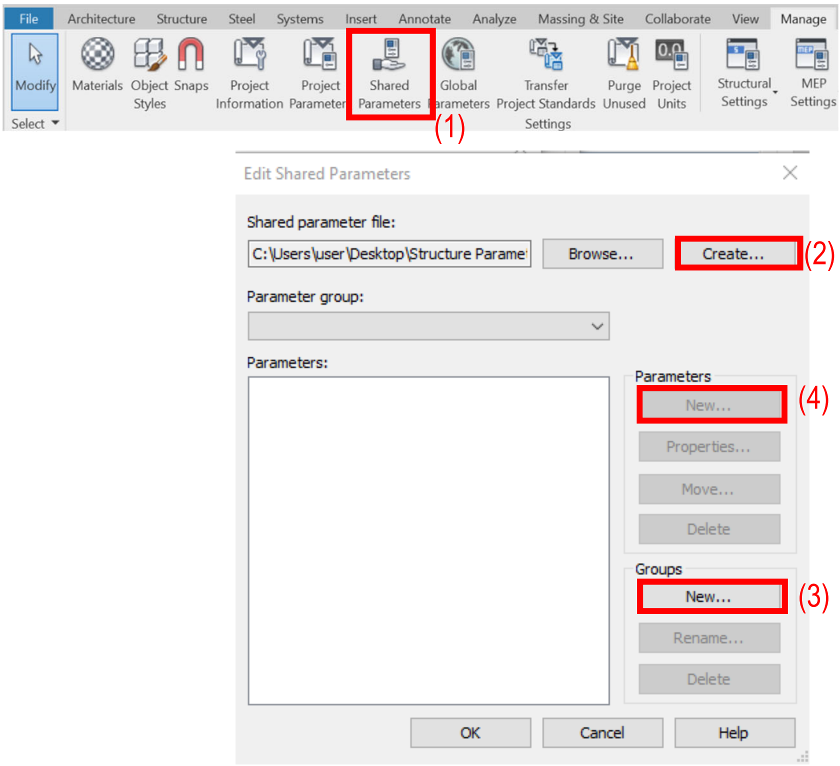
- use shared parameters to add specific data which is not yet defined in object file or project template.
- can be used in multiple objects and projects.
- stored in a file independent of any object file or project.

Create a Shared Parameters

Step 1

To set up the shared parameters:

Go to Manage Tab → Setting panel → Click **Shared Parameters** (1) → In the Edit Shared Parameters dialog, click **Create** (2)



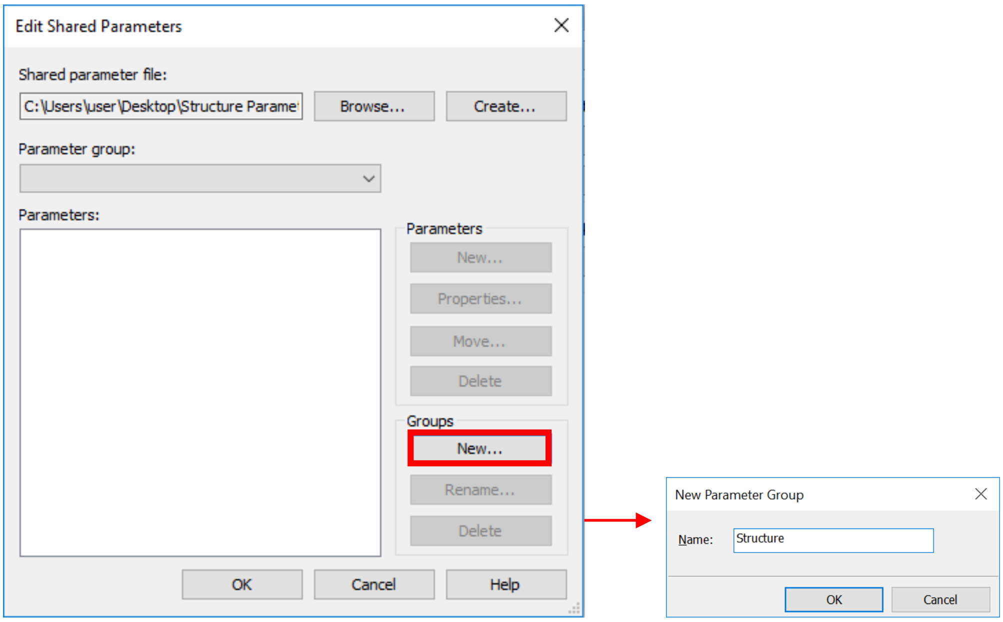
Step 2

In the Edit Shared Parameters dialog, you can (3) create a Parameter group and (4) add new parameters in Parameter group.

Step 3

For creating new Parameter Group:

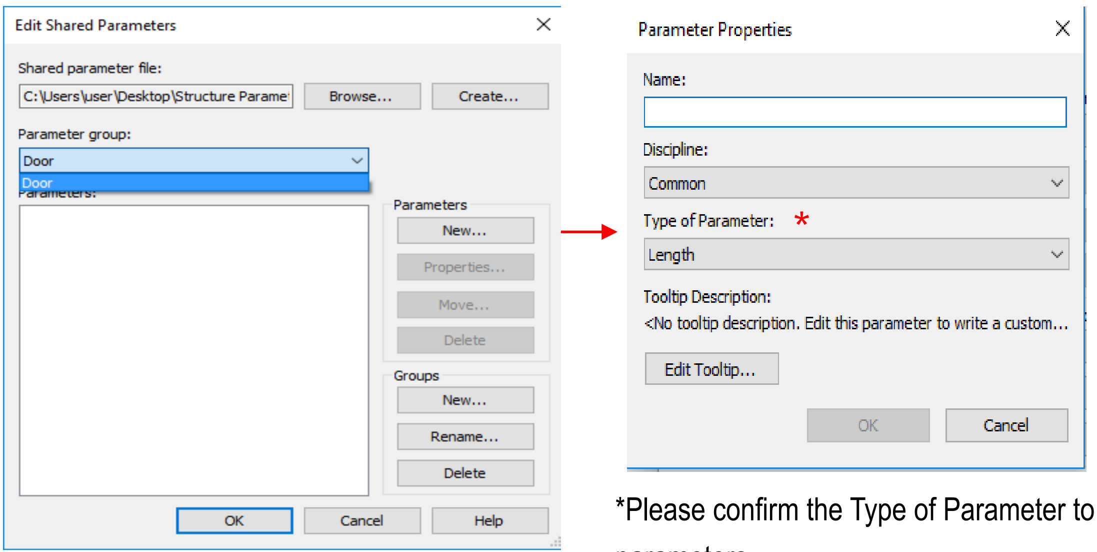
In Groups Tab, Click **New** → Add group name



Step 4

For creating new Parameters in Parameter Group:

In Parameter Tab, Click **New** → Add Parameter name → Choose **Discipline** and **Type of Parameter***



*Please confirm the Type of Parameter to create new parameters.

7.3 Project Parameters

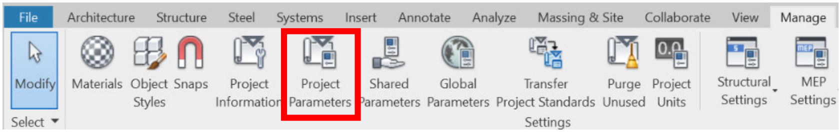
- can be added to categories of elements in a project, and used in schedules.
- cannot be shared with other projects or objects.

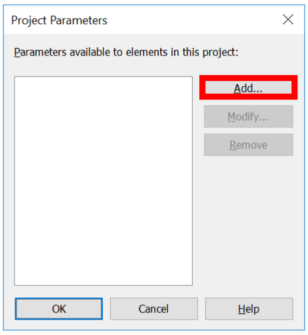
Create a Project Parameters

Step 1

To add the project parameter in the project:

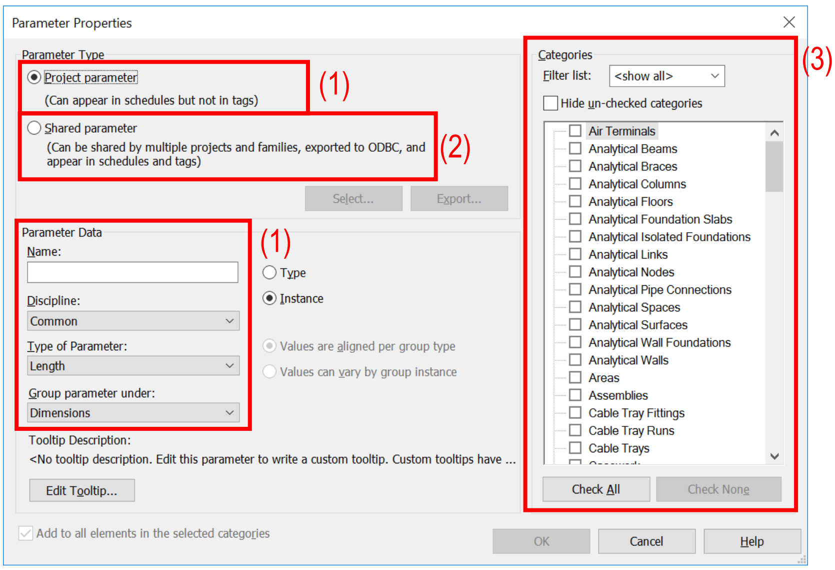
Go to Manage Tab → Setting panel → Click **Project Parameters** (1) → In the Edit Project Parameters dialog, click **Add**





Step 2

In the Edit Parameter Properties dialog, you can (1) create a new Project parameter by input **Name**, select related **Discipline**, **Type of Parameter** and **Group parameter under:** or (2) add the created Shared parameter as details in 4.1.



Step 3

Check the related Categories (3).

Step 4

Select **Type** or **Instance** in the Parameter Data.

Type: Enable to modify the parameter value to all elements of the object type.

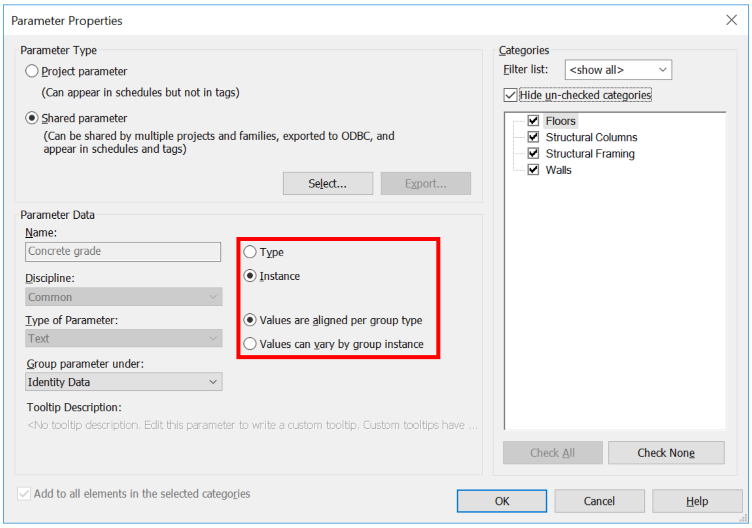
Instance: Enable to modify the parameter value separately for every instance.

- **Values are aligned per group type**:

  If an element with this instance parameter is part of multiple groups, the parameter value will be the same for corresponding elements in all group instances. While in Edit Group mode, you can select the element and modify the parameter on the Properties palette. Changing the parameter value for the element in one group will change the value for the corresponding element in all other instances of the same group type.

- **Values can vary by group instance**:

  If the element with this instance parameter is part of multiple groups, the parameter value can vary for corresponding elements in group instances. While in Edit Group mode, you can select the element and modify the parameter on the Properties palette. Changing the parameter value for the element in one group will not change the value for the corresponding element in other instances of the same group type.



Step 5

Click OK to add the parameters into project.

7.4 Schedule/ Material Takeoff

Two helpful functions under **Schedules** for QTO:

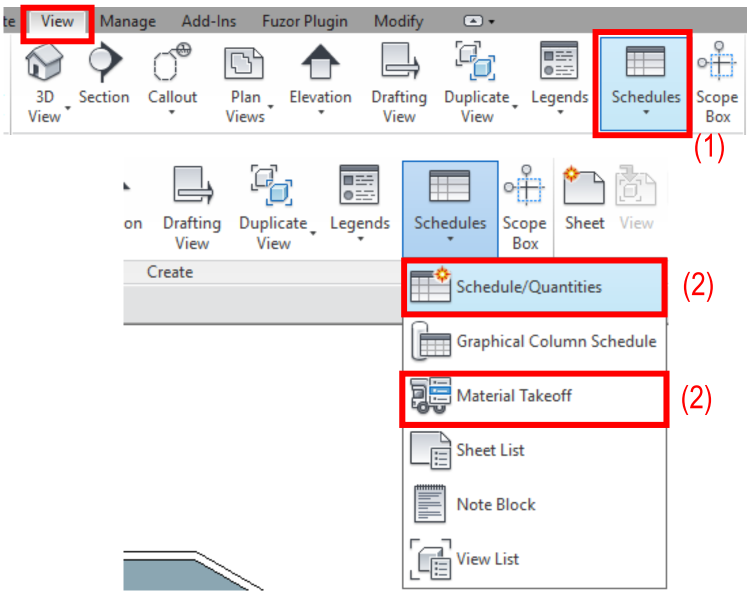
Schedule/Quantities – for extraction of general information except material information.

Material Takeoff – possess all the functions and characteristics of schedule views, but allow to get material quantities such as paint area.

<u>Create a Schedule/ Material Takeoff</u>

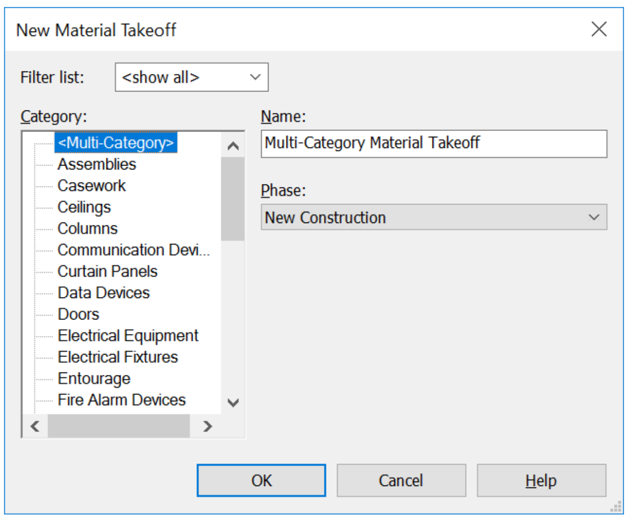
<u>Step 1</u>

Go to View Tab → Click **Schedule** (1) → Click **Schedule /Quantities** or **Material Takeoff** (2)



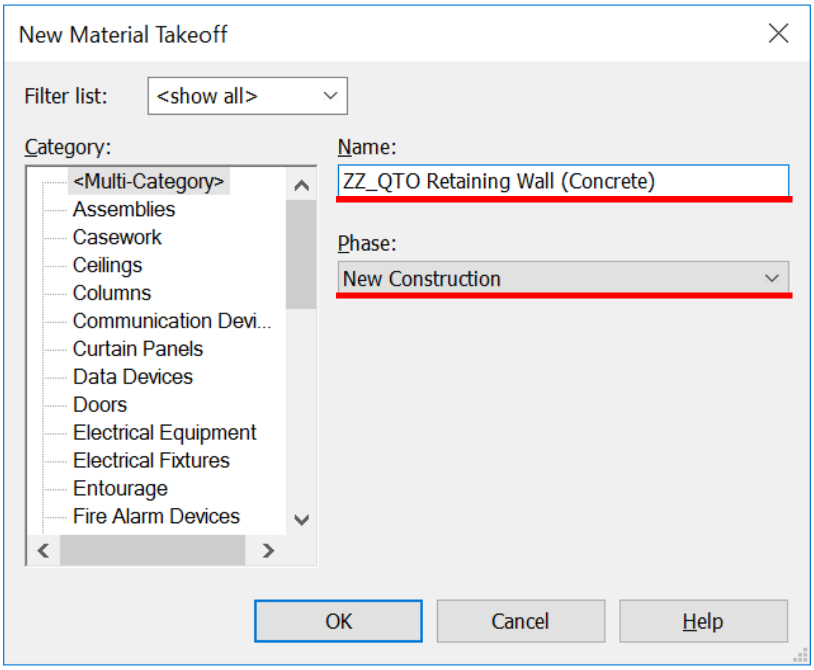
<u>Step 2</u>

In the New Schedule/ New Material Takeoff dialog, click a category for the material takeoff schedule (for taking-off different elements, you can choose **<Multi-Category>**)



Step 3

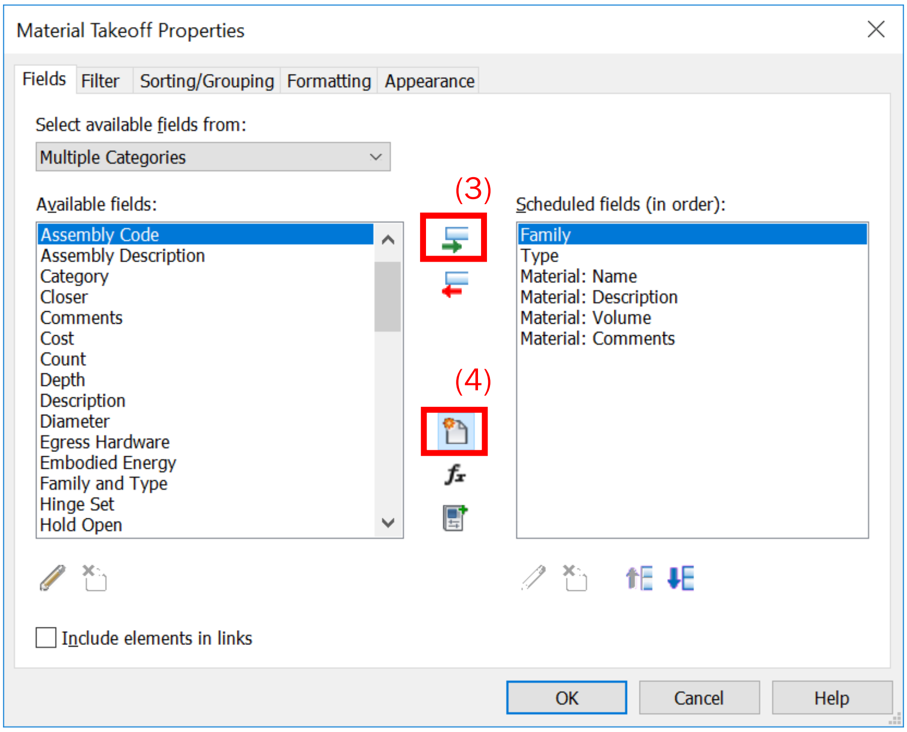
Type the name into the Name field → make sure the **Phase** is **New Construction**



Step 4

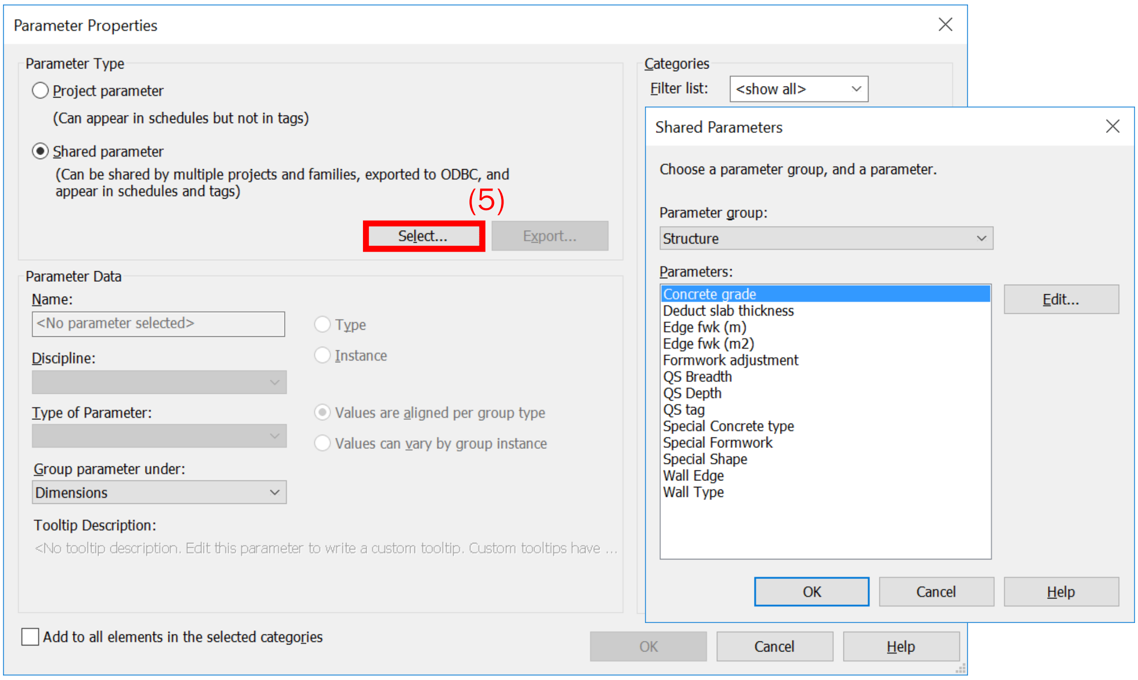
Fields:

(a) To customize the schedule, “Add” the required fields from **Available fields** to **Scheduled fields**: Select parameter in **Available fields** box → Click (3)



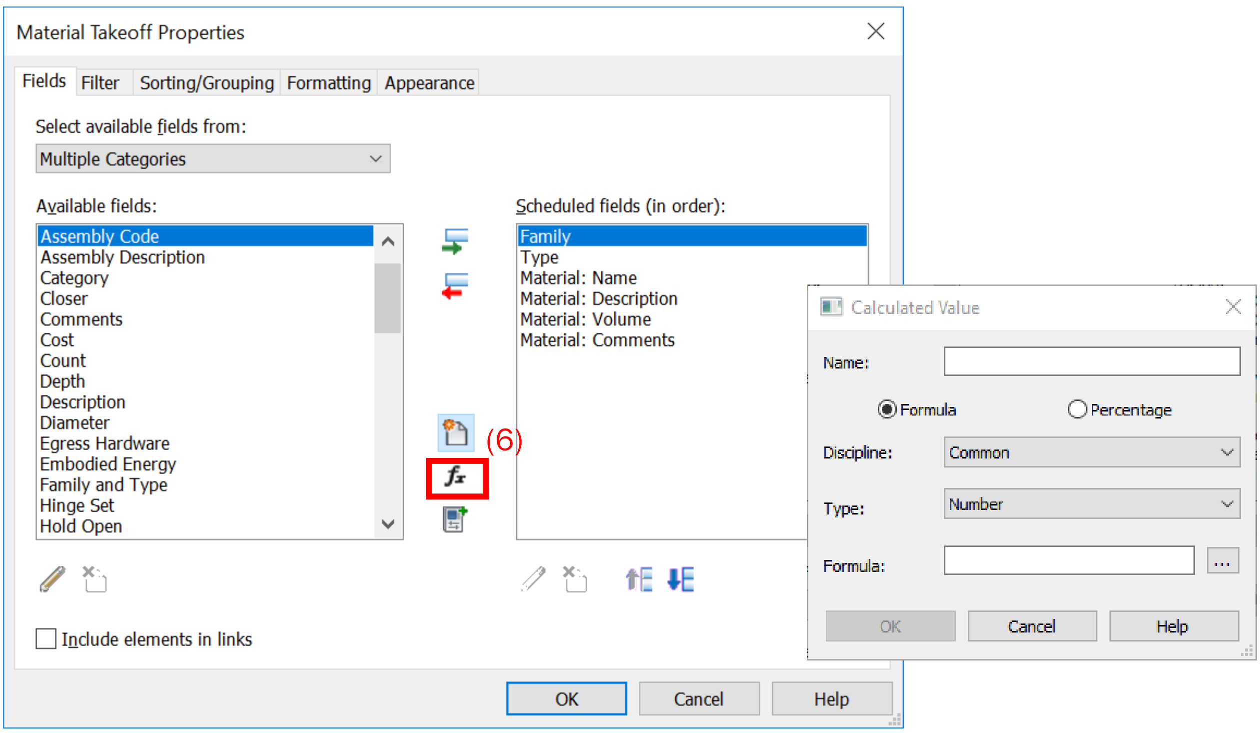
(b) Add the parameters in schedule:

Click “Add Parameter” (4) → Pick **Share Parameter** → Click **Select** (5) → Choose a parameter group, and a parameter → Click **OK**



(c) Calculated Value in schedule:

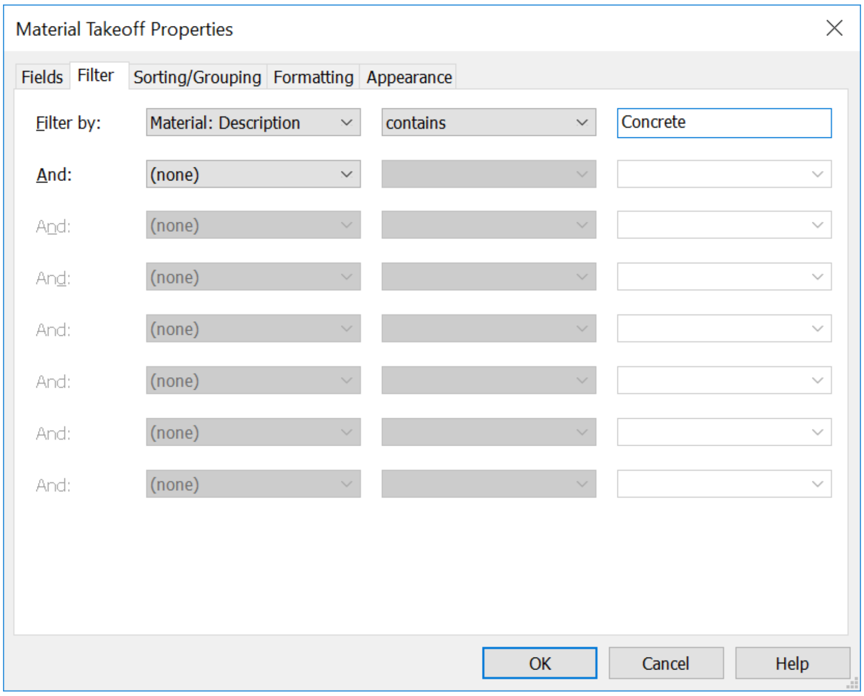
Click “Calculated Value” (6)→ Add Name and Choose Type → Use Selected Parameter to create Formula → Click **OK**



Step 5

Filter:

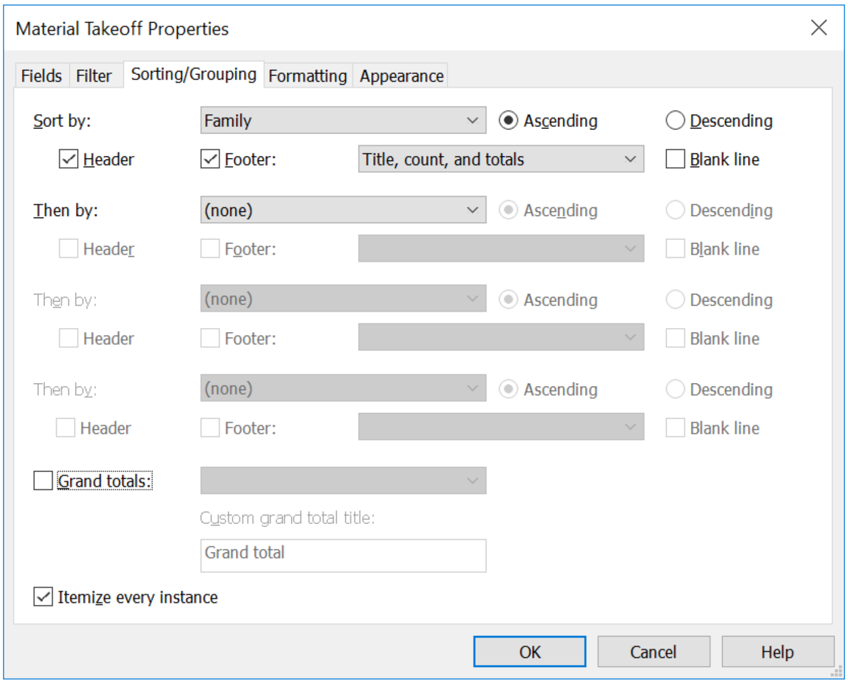
(a) Use the filter to specify which material(s) you want to show into the schedule or limit the display of data in the schedule. (e.g. Level)



Step 6

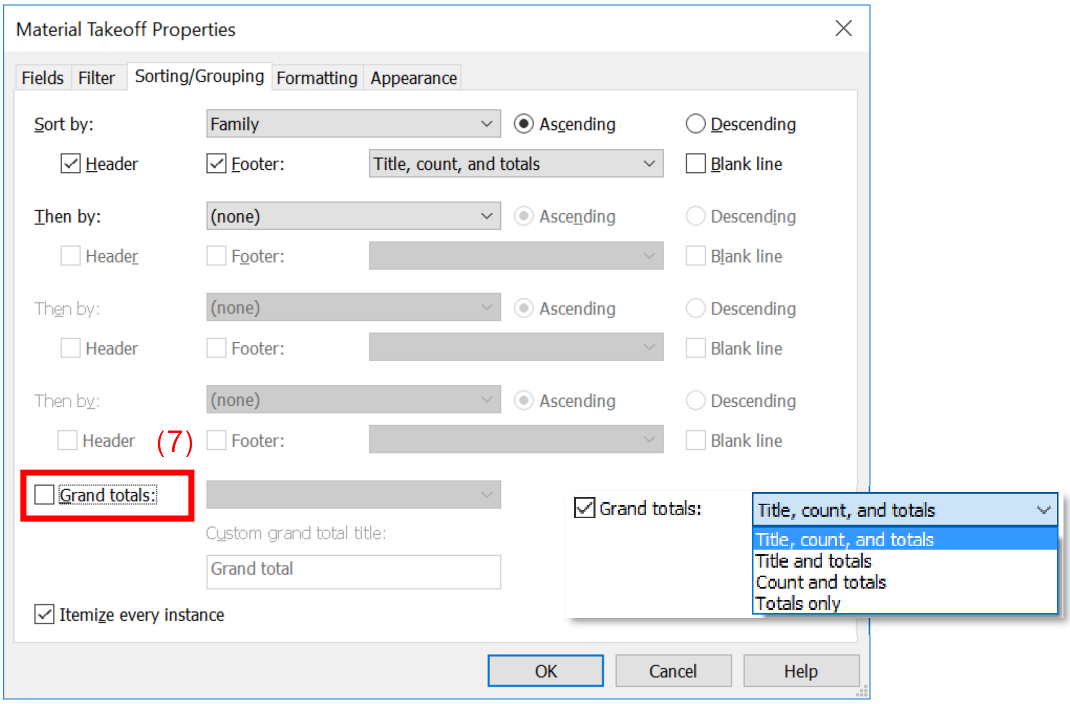
Sorting/Grouping:

(a) Choose the properties, if you would like the schedule are sorting by



(b) Click the option **Grand totals**, if you would like itemize every instance

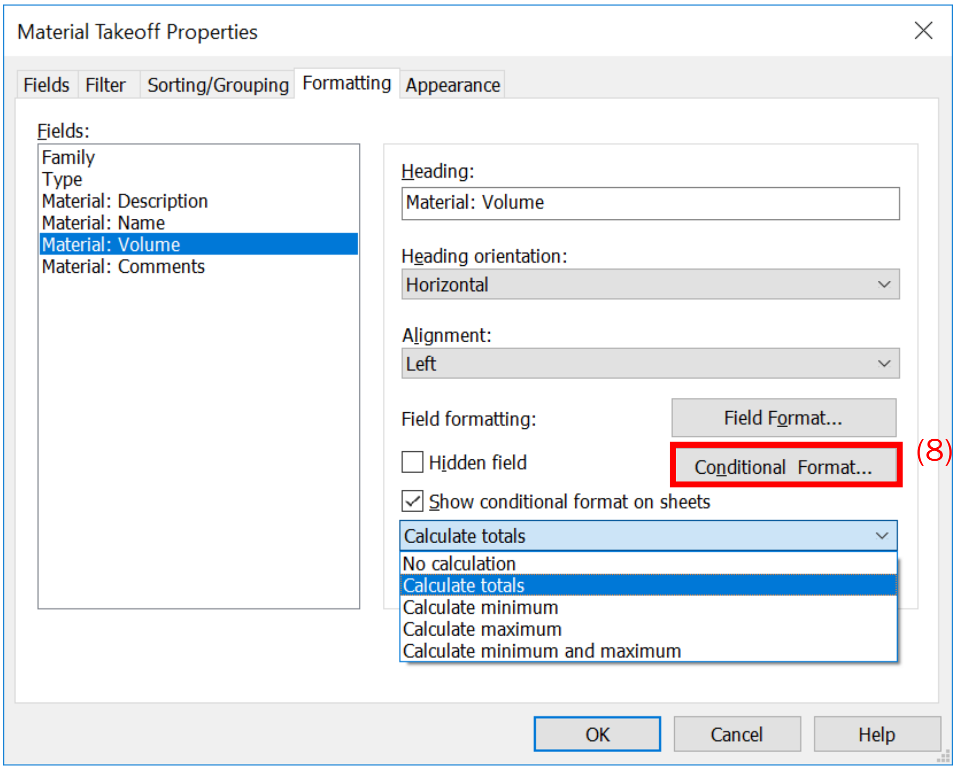
On the **Sorting/Grouping** tab → Click **Ground Total** (7) → Select option



Step 7

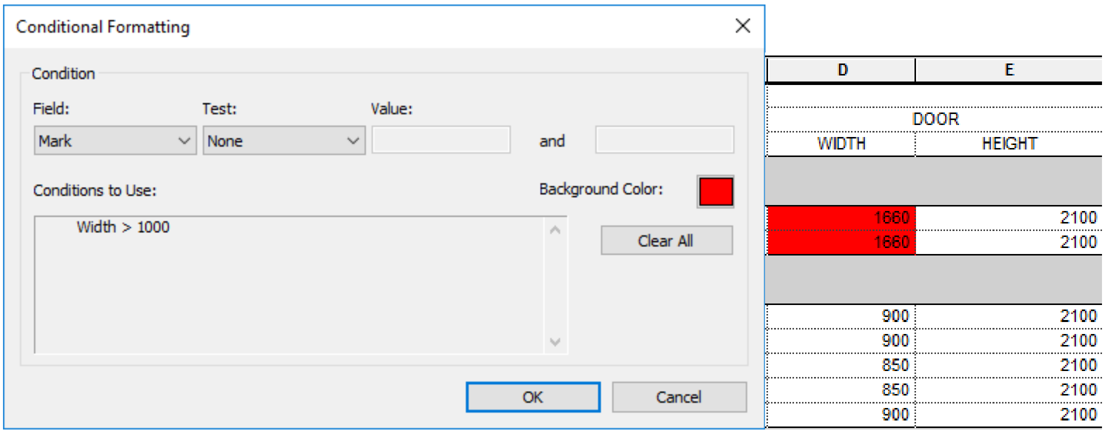
Formatting:

(a) If the option Grand totals clicked, also click the option **Calculate totals** in area / volume properties fields



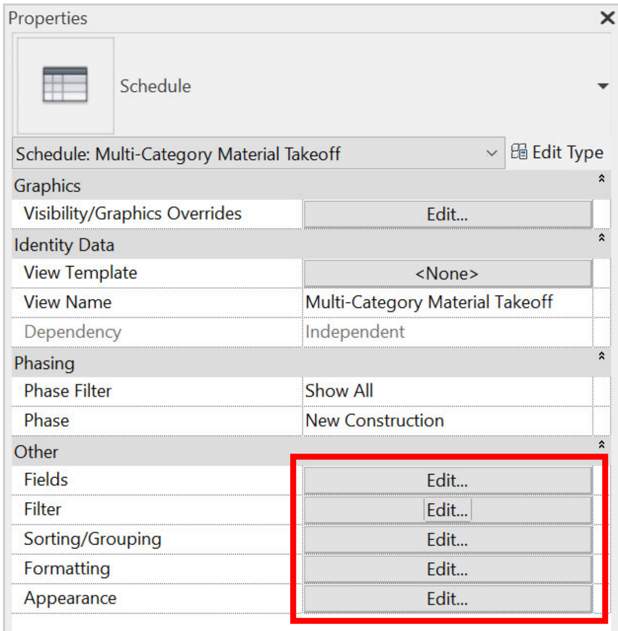
(b) Specify various formatting options, such as column orientation and alignment, grid lines, borders, and font styles.

Click **Conditional Format** (8) → Add rule → Set Background Color



Step 8

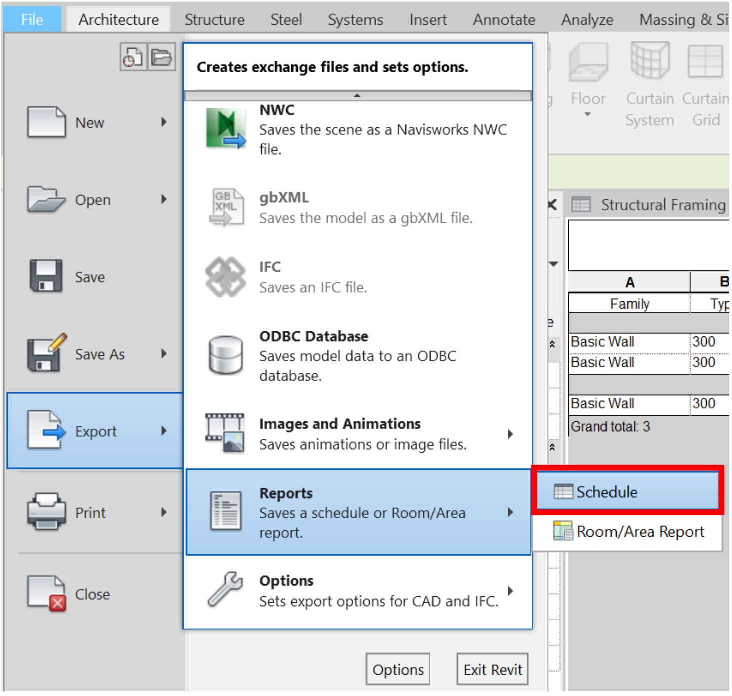
You can change the setting at properties window to modify the schedule.



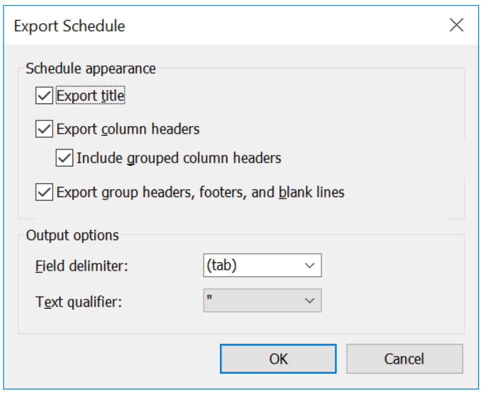
Step 9

Schedule/ Materials Take-off can be exported as a text file and copied to Excel for further manipulation or can be exported to Excel by plug-in software.

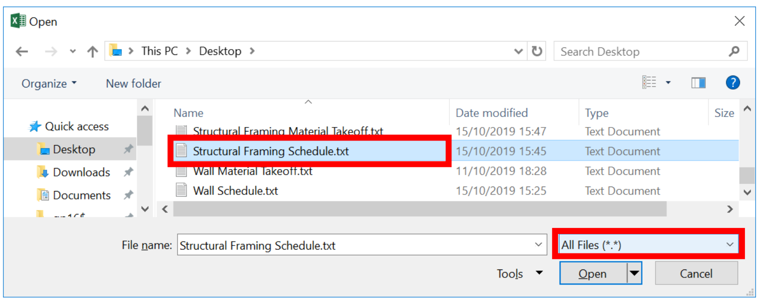
(a) Go to File tab > Export > Reports > Schedule



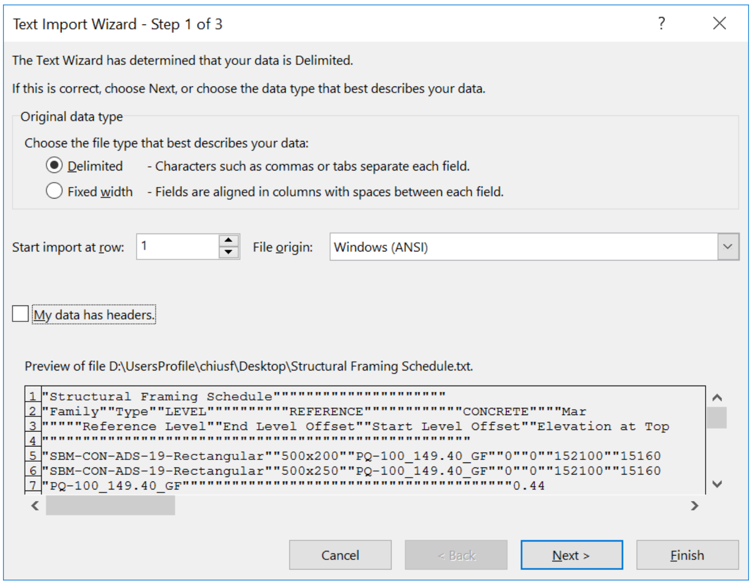
(b) Save the schedule to related folder, setting of the Export Schedule as following:

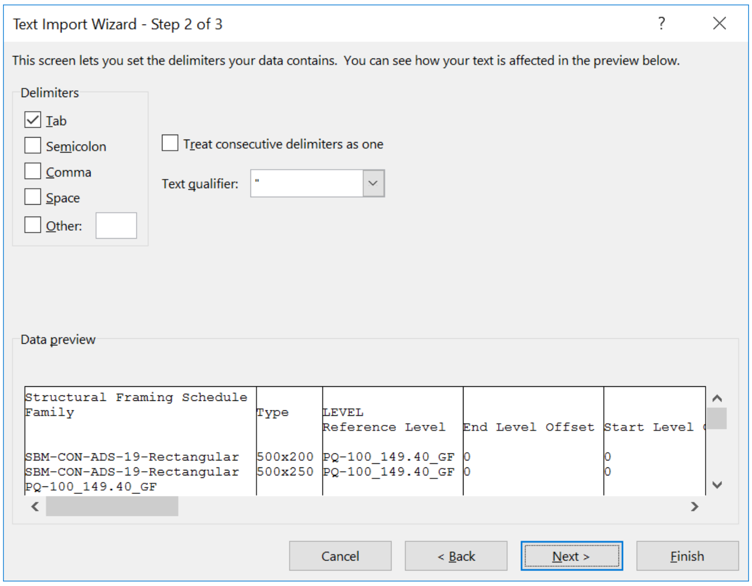


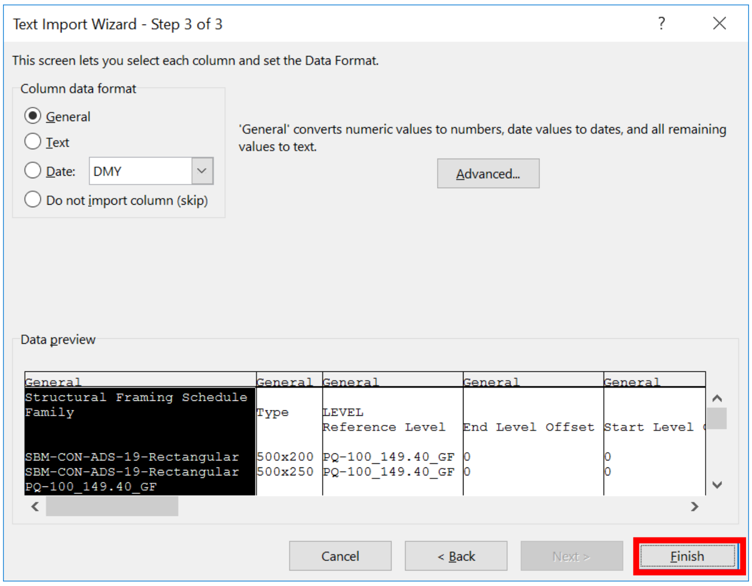
(c) Open "txt" file in Excel.



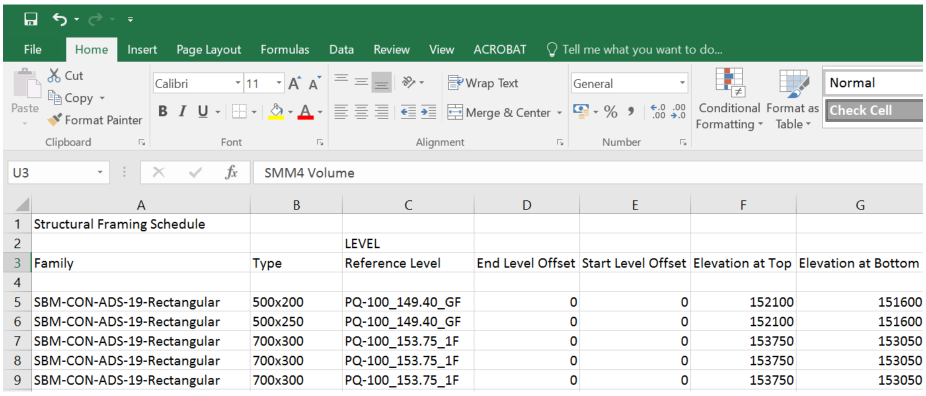
(d) Set the “Text Import Wizard” Step 1 to Step 3 as following:







(e) Further manipulation can be done in Excel.



U3 SMM4 Volume

	A	B	C	D	E	F	G
1	Structural Framing Schedule						
2			LEVEL				
3	Family	Type	Reference Level	End Level Offset	Start Level Offset	Elevation at Top	Elevation at Bottom
4							
5	SBM-CON-ADS-19-Rectangular	500x200	PQ-100_149.40_GF	0	0	152100	151600
6	SBM-CON-ADS-19-Rectangular	500x250	PQ-100_149.40_GF	0	0	152100	151600
7	SBM-CON-ADS-19-Rectangular	700x300	PQ-100_153.75_1F	0	0	153750	153050
8	SBM-CON-ADS-19-Rectangular	700x300	PQ-100_153.75_1F	0	0	153750	153050
9	SBM-CON-ADS-19-Rectangular	700x300	PQ-100_153.75_1F	0	0	153750	153050

7.5 Schedule/ Material Takeoff Template

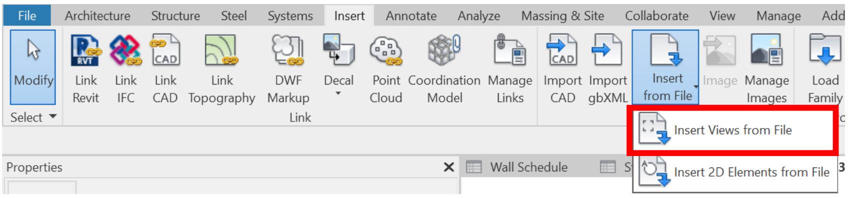
- to incorporate the details of a new project into an existing schedule template, to create a new schedule for a new project.

Method 1: Import previous project schedules in a new project

Step 1

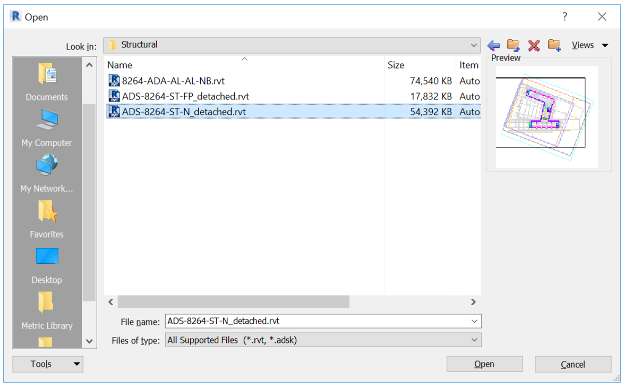
Refer to the new project.

Go to Insert Tab → Import Panel → Click **Insert from File** → Click **Insert Views from File**



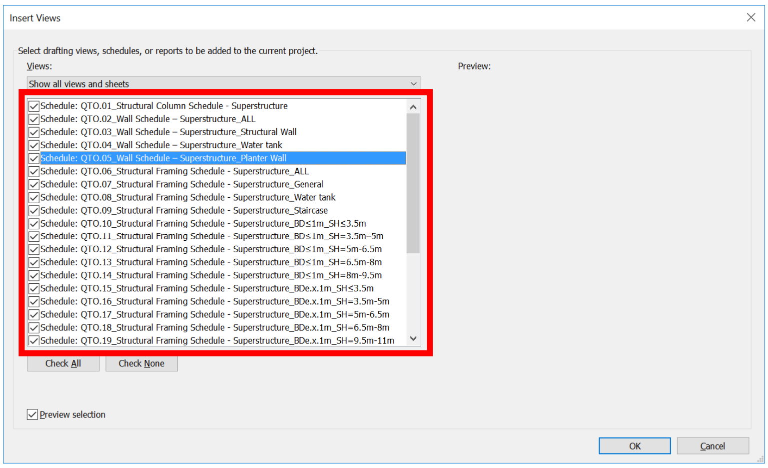
Step 2

In Open dialog, open the previous project or schedule template.



Step 3

In Insert Views dialog, select the schedules that need to copy into the new project.



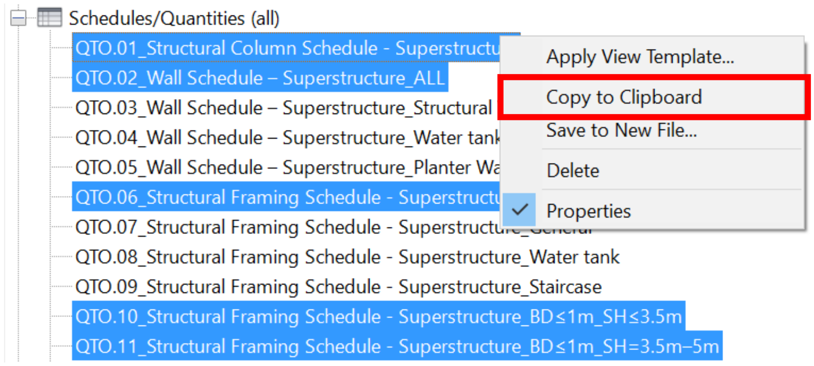
Step 4

Go to Project Browser, the schedules have been copied to the new project.

Method 2: Use "Copy to Clipboard"

Step 1

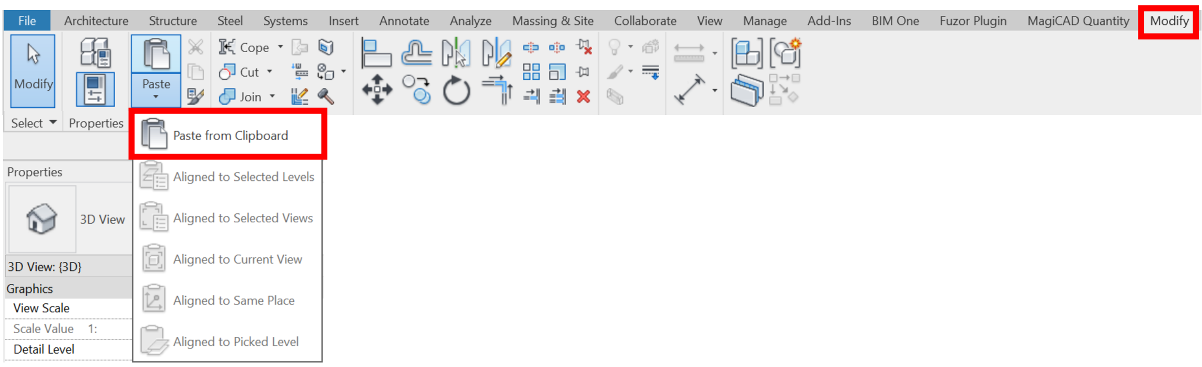
Open previous project. Go to Project Browser, select the schedules, right click and select **Copy to Clipboard**.



Step 2

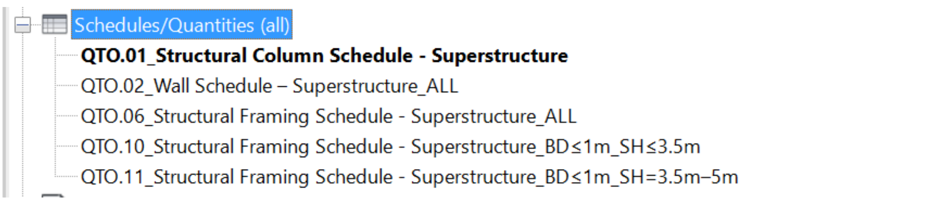
Refer to the new project.

Go to Modify Tab → Clipboard Panel > Click **Paste** → Click **Paste from Clipboard**



Step 3

Go to Project Browser, the schedules have been copied to the new project.

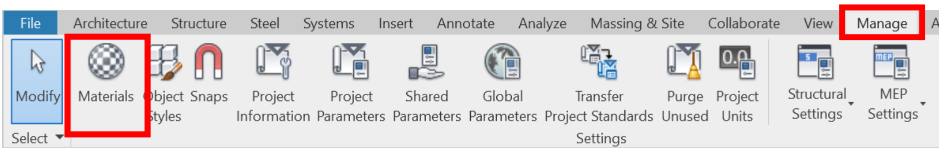


7.6 New Material

Create a new Materials

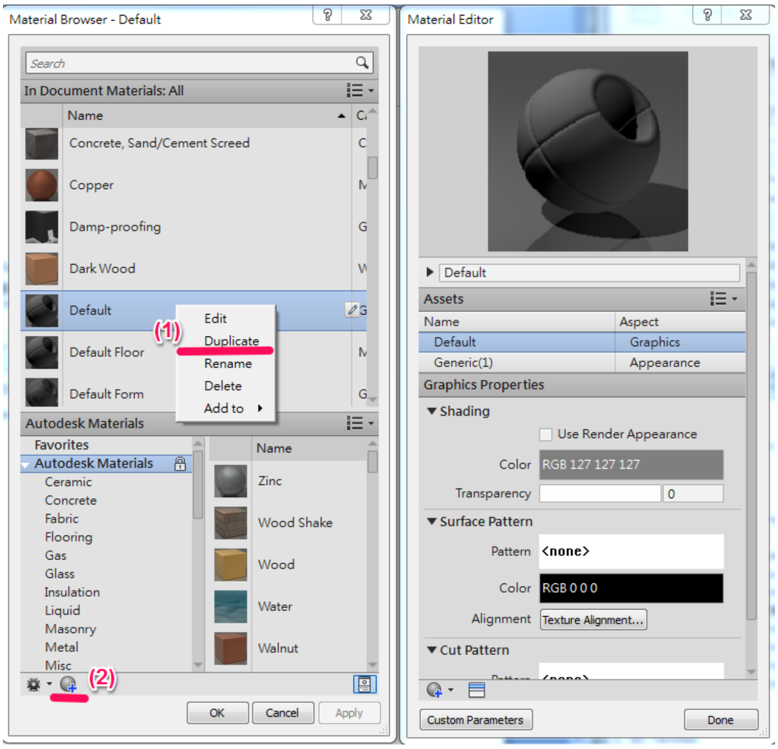
Step 1

Go to Manage Tab → Setting Panel → Click **Material**



Step 2

In the Material Browser dialog, you can (1) duplicate an existing material or (2) create a new material from scratch

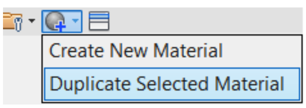


For using the duplicate method:

Select the material → right click → Duplicate

For using the toolbar:

Click the button  → Create New Material



7.7 Paint Function

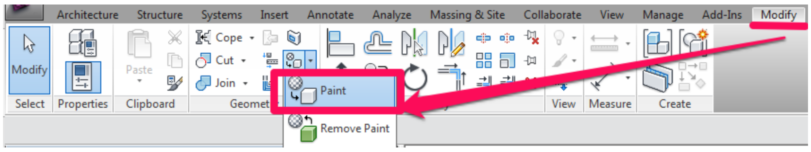
Apply paint to the face of an element to calculate the elements' area in model

Step 1

Activate the 3D View

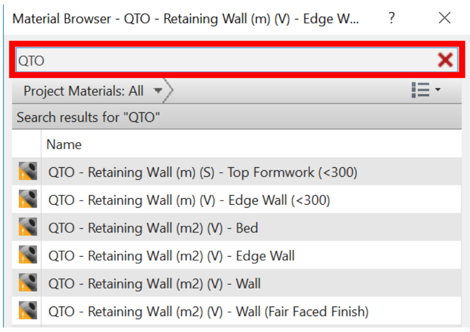
Step 2

Go to Modify Tab → Geometry Panel → Click **Paint**



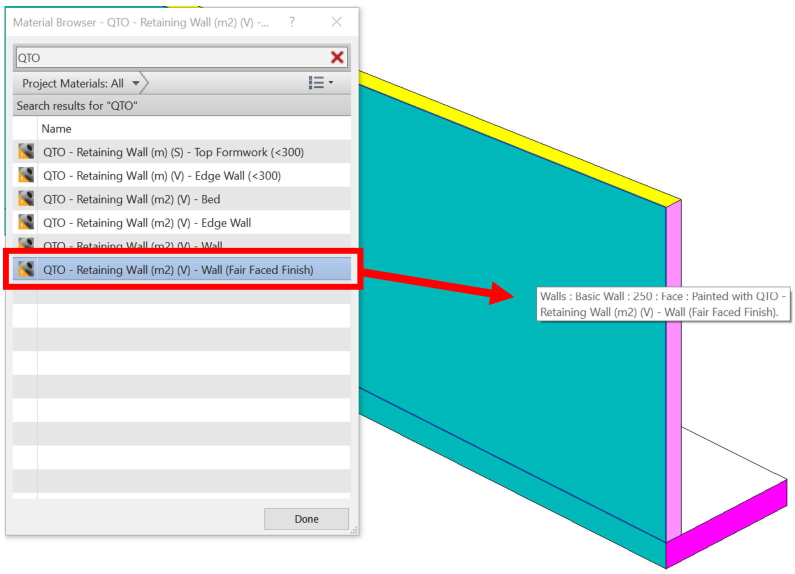
Step 3

In the Material Browser dialog → Search the keyword → Select the material



Step 4

And paint the material into the object's surface (the color of painted area will be changed to material shading color).



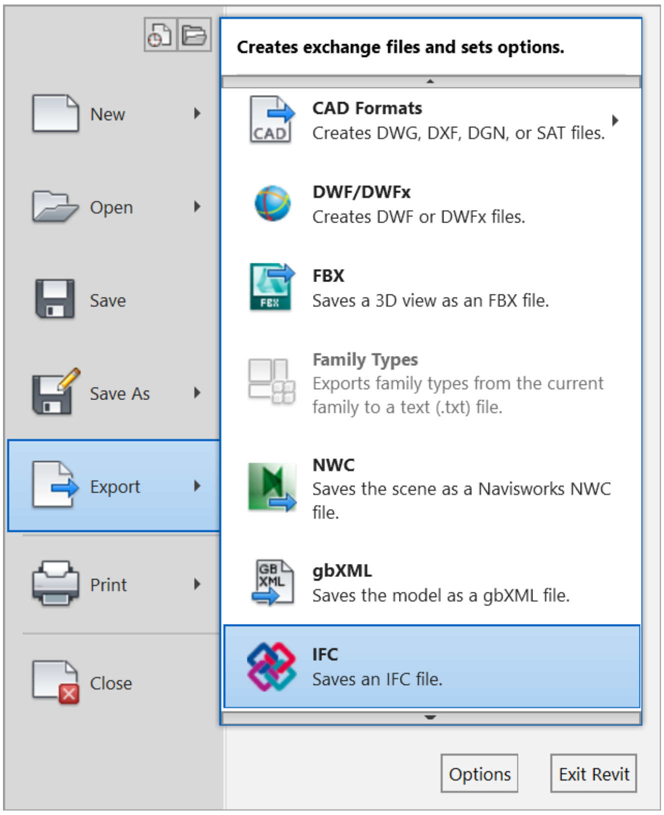
Step 5

The results of painted area will be shown into the **Material Takeoff**.

7.8 Export to IFC

Step 1

Go to File tab > Click **Export** → Click **IFC**, save the "ifc" file in the proper folder.



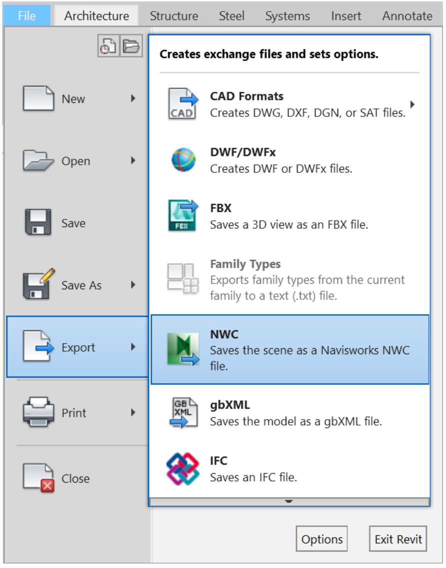
7.9 Quantification

- to count building components automatically

[Quantification feature is available for Navisworks Manage and Navisworks Simulate users. Navisworks Freedom (the free viewer) does not have the necessary functionality.]

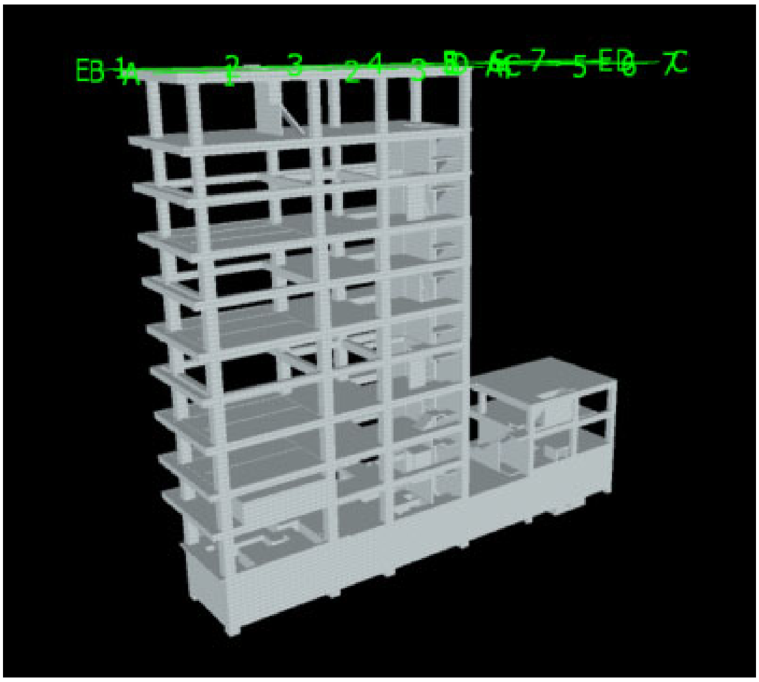
Step 1

Go to File tab > Click **Export** → Click **NWC**, save the ".nwc" file in the proper folder.



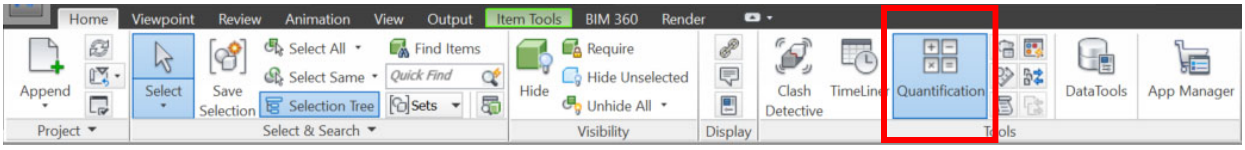
Step 2

Open the model (.nwc) in Navisworks Manage or Navisworks Simulate users.



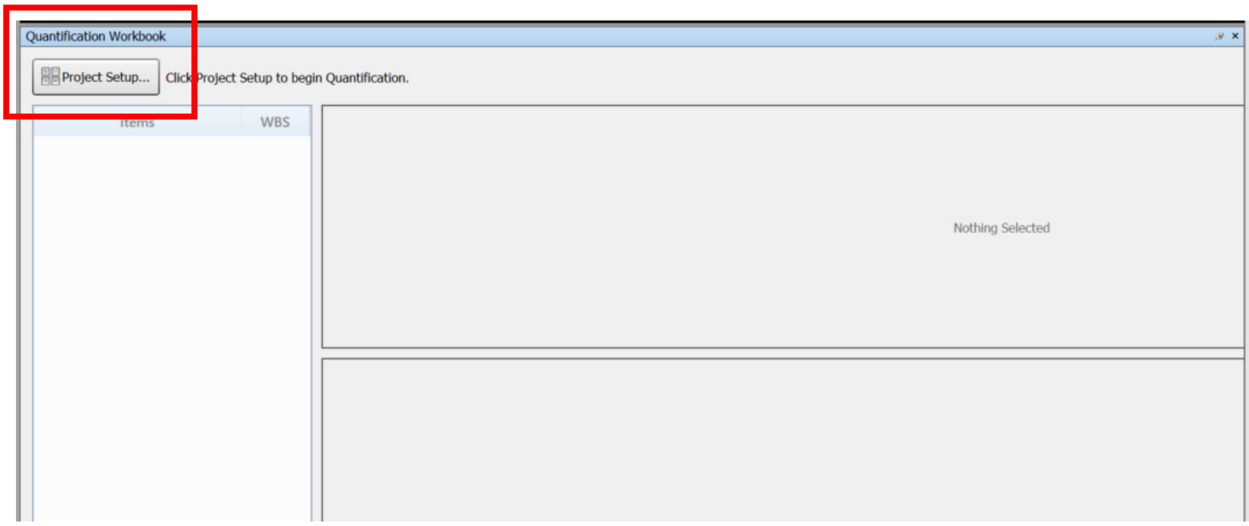
Step 3

In the **Home** tab of the ribbon, select **Quantification**.



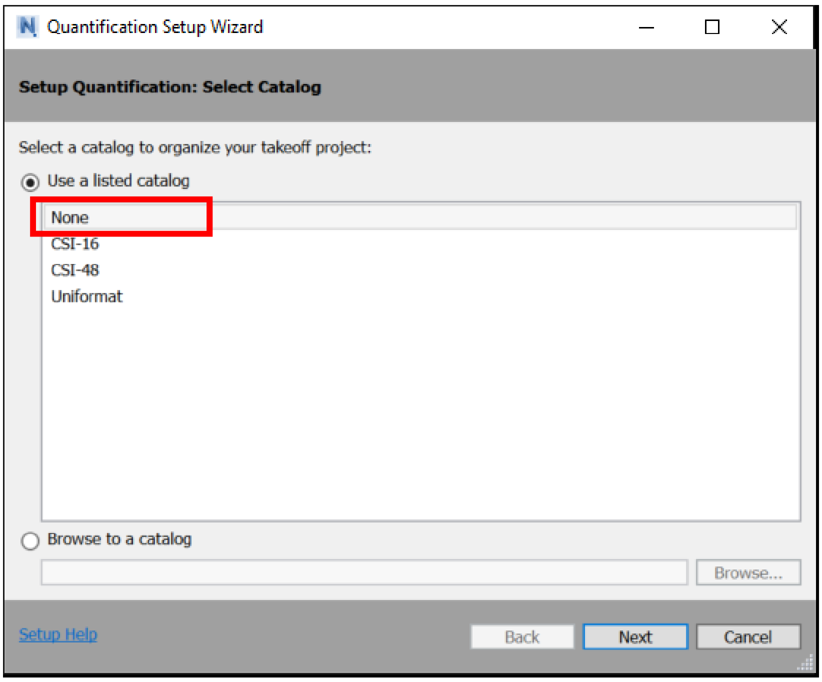
Step 4

Click the **Project Setup** button.



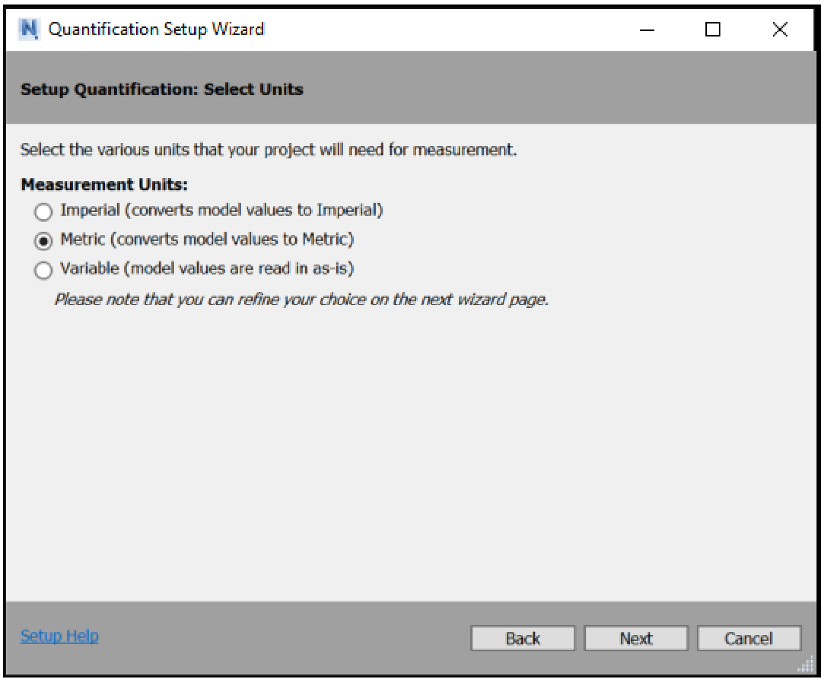
Step 5

And select the specification catalogue. In our case, we will use **None**. **None** for all take-offs since CSI-16, CSI-48 and Uniformat are all US standards and are not applicable to Hong Kong.



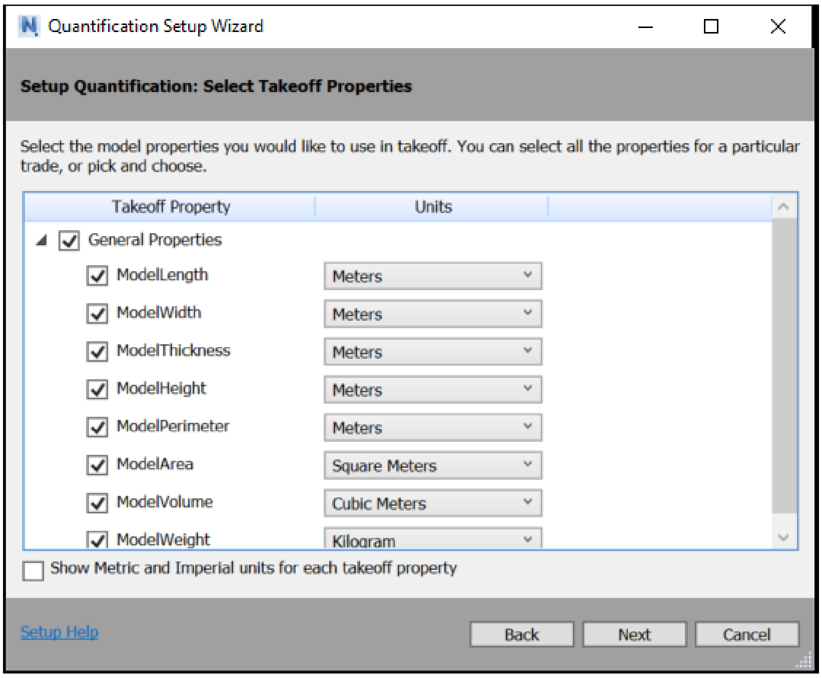
Step 6

Ensure the correct unit of measurement is selected.



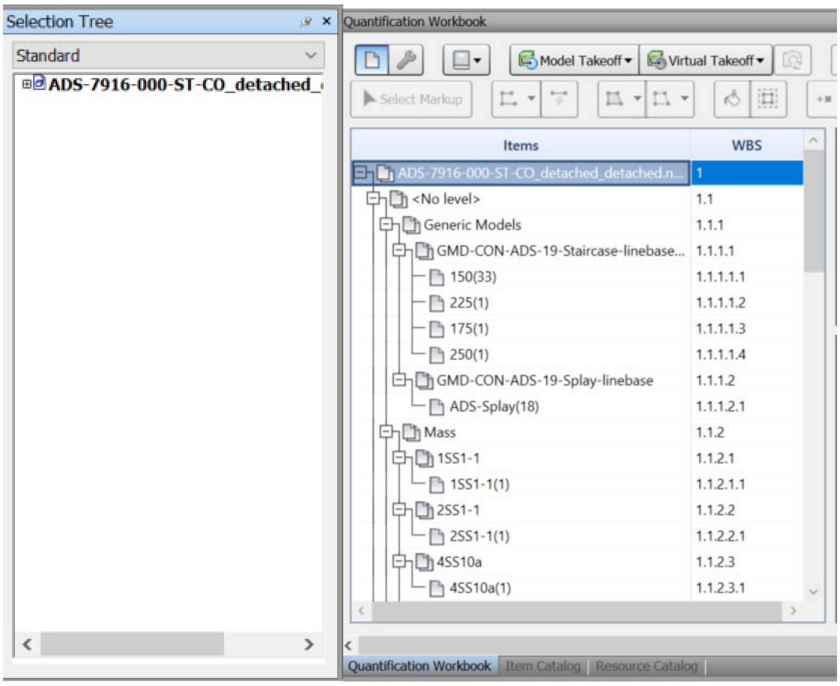
Step 7

And select, or deselect, which properties are of interest.



Step 8

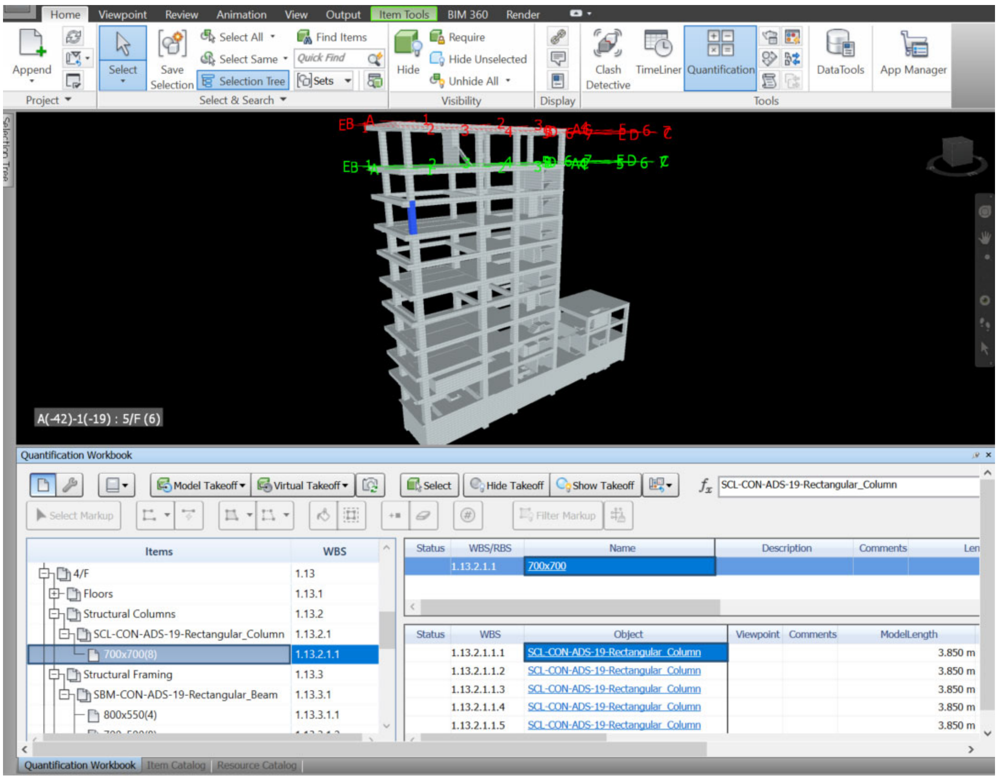
A blank workbook opens. Now you need to select all the items for take-off and drag them into the white pane on the left, you can select from the **Selection Tree**.



The items are automatically categorised according to whichever schema selected.

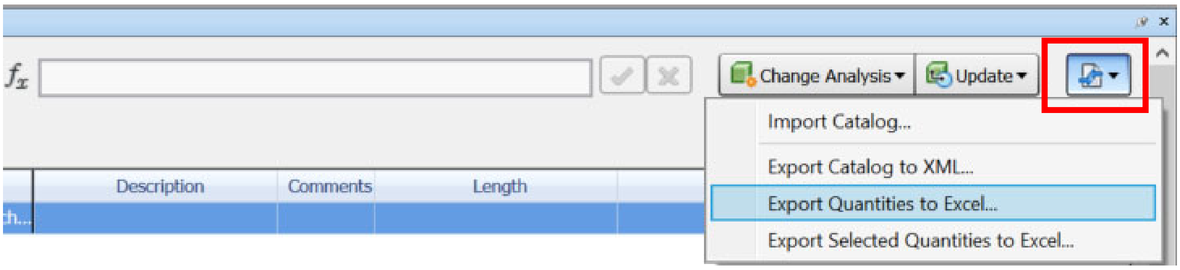
Step 9

The items are automatically colour coded. And can be viewed and overridden if required.



Step 10

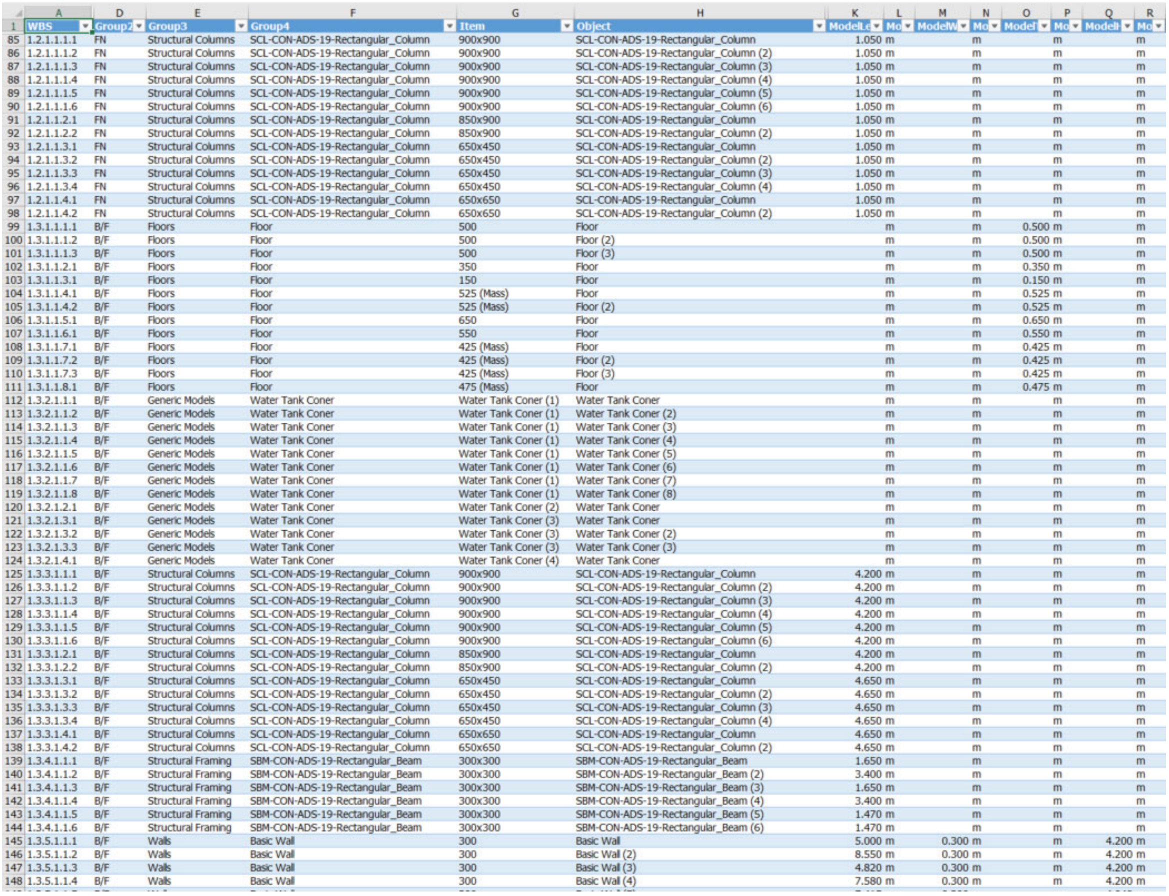
Finally, in the top right-hand corner of the Quantification Workbook tab, there is an icon with two blue arrows. This is the import/export dialogue. Click on the button. And select **Export Quantities to Excel.**



Step 11

The workbook is exported to Excel and automatically generated:

- RAW data tabs



	A	D	E	F	G	H	K	L	M	N	O	P	Q	R
1	WBS	Group2	Group3	Group4	Item	Object	ModelLe	Mo	ModelW	Mo	Model	Mo	ModelH	Mo
85	1.2.1.1.1.1	FN	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	900x900	SCL-CON-ADS-19-Rectangular_Column	1.050	m		m		m		m
86	1.2.1.1.1.2	FN	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	900x900	SCL-CON-ADS-19-Rectangular_Column (2)	1.050	m		m		m		m
87	1.2.1.1.1.3	FN	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	900x900	SCL-CON-ADS-19-Rectangular_Column (3)	1.050	m		m		m		m
88	1.2.1.1.1.4	FN	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	900x900	SCL-CON-ADS-19-Rectangular_Column (4)	1.050	m		m		m		m
89	1.2.1.1.1.5	FN	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	900x900	SCL-CON-ADS-19-Rectangular_Column (5)	1.050	m		m		m		m
90	1.2.1.1.1.6	FN	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	900x900	SCL-CON-ADS-19-Rectangular_Column (6)	1.050	m		m		m		m
91	1.2.1.1.2.1	FN	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	850x900	SCL-CON-ADS-19-Rectangular_Column	1.050	m		m		m		m
92	1.2.1.1.2.2	FN	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	850x900	SCL-CON-ADS-19-Rectangular_Column (2)	1.050	m		m		m		m
93	1.2.1.1.3.1	FN	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	650x450	SCL-CON-ADS-19-Rectangular_Column	1.050	m		m		m		m
94	1.2.1.1.3.2	FN	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	650x450	SCL-CON-ADS-19-Rectangular_Column (2)	1.050	m		m		m		m
95	1.2.1.1.3.3	FN	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	650x450	SCL-CON-ADS-19-Rectangular_Column (3)	1.050	m		m		m		m
96	1.2.1.1.3.4	FN	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	650x450	SCL-CON-ADS-19-Rectangular_Column (4)	1.050	m		m		m		m
97	1.2.1.1.4.1	FN	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	650x650	SCL-CON-ADS-19-Rectangular_Column	1.050	m		m		m		m
98	1.2.1.1.4.2	FN	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	650x650	SCL-CON-ADS-19-Rectangular_Column (2)	1.050	m		m		m		m
99	1.3.1.1.1.1	B/F	Floors	Floor	500	Floor		m		m	0.500	m		m
100	1.3.1.1.1.2	B/F	Floors	Floor	500	Floor (2)		m		m	0.500	m		m
101	1.3.1.1.1.3	B/F	Floors	Floor	500	Floor (3)		m		m	0.500	m		m
102	1.3.1.1.2.1	B/F	Floors	Floor	350	Floor		m		m	0.350	m		m
103	1.3.1.1.3.1	B/F	Floors	Floor	150	Floor		m		m	0.150	m		m
104	1.3.1.1.4.1	B/F	Floors	Floor	525 (Mass)	Floor		m		m	0.525	m		m
105	1.3.1.1.4.2	B/F	Floors	Floor	525 (Mass)	Floor (2)		m		m	0.525	m		m
106	1.3.1.1.5.1	B/F	Floors	Floor	650	Floor		m		m	0.650	m		m
107	1.3.1.1.6.1	B/F	Floors	Floor	550	Floor		m		m	0.550	m		m
108	1.3.1.1.7.1	B/F	Floors	Floor	425 (Mass)	Floor		m		m	0.425	m		m
109	1.3.1.1.7.2	B/F	Floors	Floor	425 (Mass)	Floor (2)		m		m	0.425	m		m
110	1.3.1.1.7.3	B/F	Floors	Floor	425 (Mass)	Floor (3)		m		m	0.425	m		m
111	1.3.1.1.8.1	B/F	Floors	Floor	475 (Mass)	Floor		m		m	0.475	m		m
112	1.3.2.1.1.1	B/F	Generic Models	Water Tank Coner	Water Tank Coner (1)	Water Tank Coner		m		m		m		m
113	1.3.2.1.1.2	B/F	Generic Models	Water Tank Coner	Water Tank Coner (1)	Water Tank Coner (2)		m		m		m		m
114	1.3.2.1.1.3	B/F	Generic Models	Water Tank Coner	Water Tank Coner (1)	Water Tank Coner (3)		m		m		m		m
115	1.3.2.1.1.4	B/F	Generic Models	Water Tank Coner	Water Tank Coner (1)	Water Tank Coner (4)		m		m		m		m
116	1.3.2.1.1.5	B/F	Generic Models	Water Tank Coner	Water Tank Coner (1)	Water Tank Coner (5)		m		m		m		m
117	1.3.2.1.1.6	B/F	Generic Models	Water Tank Coner	Water Tank Coner (1)	Water Tank Coner (6)		m		m		m		m
118	1.3.2.1.1.7	B/F	Generic Models	Water Tank Coner	Water Tank Coner (1)	Water Tank Coner (7)		m		m		m		m
119	1.3.2.1.1.8	B/F	Generic Models	Water Tank Coner	Water Tank Coner (1)	Water Tank Coner (8)		m		m		m		m
120	1.3.2.1.2.1	B/F	Generic Models	Water Tank Coner	Water Tank Coner (2)	Water Tank Coner		m		m		m		m
121	1.3.2.1.3.1	B/F	Generic Models	Water Tank Coner	Water Tank Coner (3)	Water Tank Coner		m		m		m		m
122	1.3.2.1.3.2	B/F	Generic Models	Water Tank Coner	Water Tank Coner (3)	Water Tank Coner (2)		m		m		m		m
123	1.3.2.1.3.3	B/F	Generic Models	Water Tank Coner	Water Tank Coner (3)	Water Tank Coner (3)		m		m		m		m
124	1.3.2.1.4.1	B/F	Generic Models	Water Tank Coner	Water Tank Coner (4)	Water Tank Coner		m		m		m		m
125	1.3.3.1.1.1	B/F	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	900x900	SCL-CON-ADS-19-Rectangular_Column	4.200	m		m		m		m
126	1.3.3.1.1.2	B/F	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	900x900	SCL-CON-ADS-19-Rectangular_Column (2)	4.200	m		m		m		m
127	1.3.3.1.1.3	B/F	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	900x900	SCL-CON-ADS-19-Rectangular_Column (3)	4.200	m		m		m		m
128	1.3.3.1.1.4	B/F	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	900x900	SCL-CON-ADS-19-Rectangular_Column (4)	4.200	m		m		m		m
129	1.3.3.1.1.5	B/F	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	900x900	SCL-CON-ADS-19-Rectangular_Column (5)	4.200	m		m		m		m
130	1.3.3.1.1.6	B/F	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	900x900	SCL-CON-ADS-19-Rectangular_Column (6)	4.200	m		m		m		m
131	1.3.3.1.2.1	B/F	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	850x900	SCL-CON-ADS-19-Rectangular_Column	4.200	m		m		m		m
132	1.3.3.1.2.2	B/F	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	850x900	SCL-CON-ADS-19-Rectangular_Column (2)	4.200	m		m		m		m
133	1.3.3.1.3.1	B/F	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	650x450	SCL-CON-ADS-19-Rectangular_Column	4.650	m		m		m		m
134	1.3.3.1.3.2	B/F	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	650x450	SCL-CON-ADS-19-Rectangular_Column (2)	4.650	m		m		m		m
135	1.3.3.1.3.3	B/F	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	650x450	SCL-CON-ADS-19-Rectangular_Column (3)	4.650	m		m		m		m
136	1.3.3.1.3.4	B/F	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	650x450	SCL-CON-ADS-19-Rectangular_Column (4)	4.650	m		m		m		m
137	1.3.3.1.4.1	B/F	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	650x650	SCL-CON-ADS-19-Rectangular_Column	4.650	m		m		m		m
138	1.3.3.1.4.2	B/F	Structural Columns	SCL-CON-ADS-19-Rectangular_Column	650x650	SCL-CON-ADS-19-Rectangular_Column (2)	4.650	m		m		m		m
139	1.3.4.1.1.1	B/F	Structural Framing	SBM-CON-ADS-19-Rectangular_Beam	300x300	SBM-CON-ADS-19-Rectangular_Beam	1.650	m		m		m		m
140	1.3.4.1.1.2	B/F	Structural Framing	SBM-CON-ADS-19-Rectangular_Beam	300x300	SBM-CON-ADS-19-Rectangular_Beam (2)	3.400	m		m		m		m
141	1.3.4.1.1.3	B/F	Structural Framing	SBM-CON-ADS-19-Rectangular_Beam	300x300	SBM-CON-ADS-19-Rectangular_Beam (3)	1.650	m		m		m		m
142	1.3.4.1.1.4	B/F	Structural Framing	SBM-CON-ADS-19-Rectangular_Beam	300x300	SBM-CON-ADS-19-Rectangular_Beam (4)	3.400	m		m		m		m
143	1.3.4.1.1.5	B/F	Structural Framing	SBM-CON-ADS-19-Rectangular_Beam	300x300	SBM-CON-ADS-19-Rectangular_Beam (5)	1.470	m		m		m		m
144	1.3.4.1.1.6	B/F	Structural Framing	SBM-CON-ADS-19-Rectangular_Beam	300x300	SBM-CON-ADS-19-Rectangular_Beam (6)	1.470	m		m		m		m
145	1.3.5.1.1.1	B/F	Walls	Basic Wall	300	Basic Wall	5.000	m	0.300	m		m	4.200	m
146	1.3.5.1.1.2	B/F	Walls	Basic Wall	300	Basic Wall (2)	8.550	m	0.300	m		m	4.200	m
147	1.3.5.1.1.3	B/F	Walls	Basic Wall	300	Basic Wall (3)	4.820	m	0.300	m		m	4.200	m
148	1.3.5.1.1.4	B/F	Walls	Basic Wall	300	Basic Wall (4)	7.580	m	0.300	m		m	4.200	m

- Pivot table (Itemized all items and categorized by level > categories > type)

	A	B	C	D	E	F	G	H	I	J
1	Row Labels	ModelLength	ModelWidth	ModelThickness	ModelHeight	ModelPerimeter	ModelArea	ModelVolume	ModelWeight	Length
2	⊟ADS-7916-000-ST-CO_detached_detached.nwc									
3	⊞<No level>	181.1784505					264.8617301	62.01149036		181.1784505
4	⊟1/F									
5	⊟Floors									
6	⊟Floor									
7	⊞150			1.05		67.5799595	30.73167374	4.592978478		0
8	⊞175			0.525		57.4299982	51.7659984	9.05904972		0
9	⊞200			1.4		115.45	79.26875043	15.85375009		0
10	⊞300			0.3		15.6	1.77	0.531		0
11	⊞310			0.62		3.84	0.396	0.12276		0
12	⊟Structural Columns									
13	⊟SCL-CON-ADS-19-Rectangular_Column									
14	⊟850x900	7.7						5.885999982		7.7
15	SCL-CON-ADS-19-Rectangular_Column	3.85						2.940749982		3.85
16	SCL-CON-ADS-19-Rectangular_Column (2)	3.85						2.94525		3.85
17	⊞900x900	23.1						18.711		23.1
18	⊟Structural Framing									
19	⊟SBM-CON-ADS-19-Rectangular_Beam									
20	⊞500x300	4.924999589						0.674999938		4.924999589
21	⊞600x300	33.975						5.634		33.975
22	⊟600x400	15.345						3.4188		15.345
23	SBM-CON-ADS-19-Rectangular_Beam	9.275						2.094		9.275
24	SBM-CON-ADS-19-Rectangular_Beam (2)	6.07						1.3248		6.07
25	⊞600x500	2.72						0.48		2.72
26	⊞600x550	7.62						2.079		7.62
27	⊞700x300	7.2						1.407		7.2
28	⊞700x500	47.3						14.665		47.3
29	⊞800x550	29.72803938						11.308		29.72803938
30	⊟Walls									
31	⊟Basic Wall									
32	⊞200	12.25000059	1		9.975		27.77883561	5.533901569		12.25000059
33	⊞280	2.925	0.28		3.85		11.26125	3.15315		2.925
34	⊞300	2.400000001	0.3		3.85		7.560000002	2.268000001		2.400000001
35	⊟2/F									
36	⊟Floors									
37	⊟Floor									
38	⊞150			1.5		109.9500286	61.14712684	9.172069026		0
39	⊞175			0.35		36.88	32.288	5.6504		0
40	⊞200			1		100.9	76.13	15.226		0
41	⊞300			0.6		22.3	2.4	0.72		0

- Groups Pivot table (Group all items and categorized by level > categories > type)

	A	B	C	D	E	F	G	H	I	J
1	Row Labels	Length	Width	Thickness	Height	Perimeter	Area	Volume	Weight	Count
2	⊟ADS-7916-000-ST-CO_detached_detached.nwc									
3	⊞<No level>	181.1784505	0	0	0	0	264.8617301	62.01149036	0	83
4	⊟1/F									
5	⊟Floors									
6	⊟Floor									
7	150	0	0	1.05	0	67.5799595	30.73167374	4.592978478	0	7
8	175	0	0	0.525	0	57.4299982	51.7659984	9.05904972	0	3
9	200	0	0	1.4	0	115.45	79.26875043	15.85375009	0	7
10	300	0	0	0.3	0	15.6	1.77	0.531	0	1
11	310	0	0	0.62	0	3.84	0.396	0.12276	0	2
12	⊟Structural Columns									
13	⊟SCL-CON-ADS-19-Rectangular_Column									
14	850x900	7.7	0	0	0	0	0	5.885999982	0	2
15	900x900	23.1	0	0	0	0	0	18.711	0	6
16	⊟Structural Framing									
17	⊟SBM-CON-ADS-19-Rectangular_Beam									
18	500x300	4.924999589	0	0	0	0	0	0.674999938	0	1
19	600x300	33.975	0	0	0	0	0	5.634	0	6
20	600x400	15.345	0	0	0	0	0	3.4188	0	2
21	600x500	2.72	0	0	0	0	0	0.48	0	2
22	600x550	7.62	0	0	0	0	0	2.079	0	3
23	700x300	7.2	0	0	0	0	0	1.407	0	1
24	700x500	47.3	0	0	0	0	0	14.665	0	6
25	800x550	29.72803938	0	0	0	0	0	11.308	0	5
26	⊟Walls									
27	⊟Basic Wall									
28	200	12.25000059	1	0	9.975	0	27.77883561	5.533901569	0	5
29	280	2.925	0.28	0	3.85	0	11.26125	3.15315	0	1
30	300	2.400000001	0.3	0	3.85	0	7.560000002	2.268000001	0	1
31	⊞2/F	202.2280394	1.13	3.45	19.25	270.0300286	222.4523768	107.232694	0	61
32	⊞2U/F	165.3730394	1.18	1.05	15.55	44.84002859	55.93500115	72.42162517	0	41
33	⊞3/F	199.1230164	1.13	3.325	16.8	259.6200302	218.9457224	106.4704459	0	59

7.10 Useful Keyboard Shortcuts

General	
KS	Open **Keyboard Shortcuts**
VV	Open **Visibility/Graphics**
BX	Open **Section Box**
PT	Apply **Paint**
Select/Hide/Isolate	
IC	Isolate Category
HC	Hide Category
HI	Isolate Element
HH	Hide Element
HR	Reset Temporary Hide/Isolate
SA	Select All Instances: In Entire Project
Zoom	
ZA	Zoom All to Fit
ZO	Zoom Out

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- Shui On Construction Company Limited
- China Harbour Engineering Company Limited