SBim Assess Modelling Guide for Revit

Modelling Guide

Specifications and requirements in creating BIM models for the purposes of using automated model checker - SBim Assess

This modelling guide is built for **Autodesk Revit**-based modelling

Contents

1 Introduction

SBim Assess is a rule-based checking program for conducting automated code compliance check with Building Information Model (BIM). Based on Industry Foundation Classes (.ifc) open format. SBim Assess is accommodated to suit users of different BIM modelling tools and is tailored specifically to support BCA's stipulated regulations for BIM model verification and submission processes in Singapore.

This modelling guide specifies the requirements in creating BIM models in REVIT for the purpose of using SBIM Assess. Currently, this guide only covers the modelling methods for the BCA regulations required for the Trial Testing.

1.1 IFC Export Settings

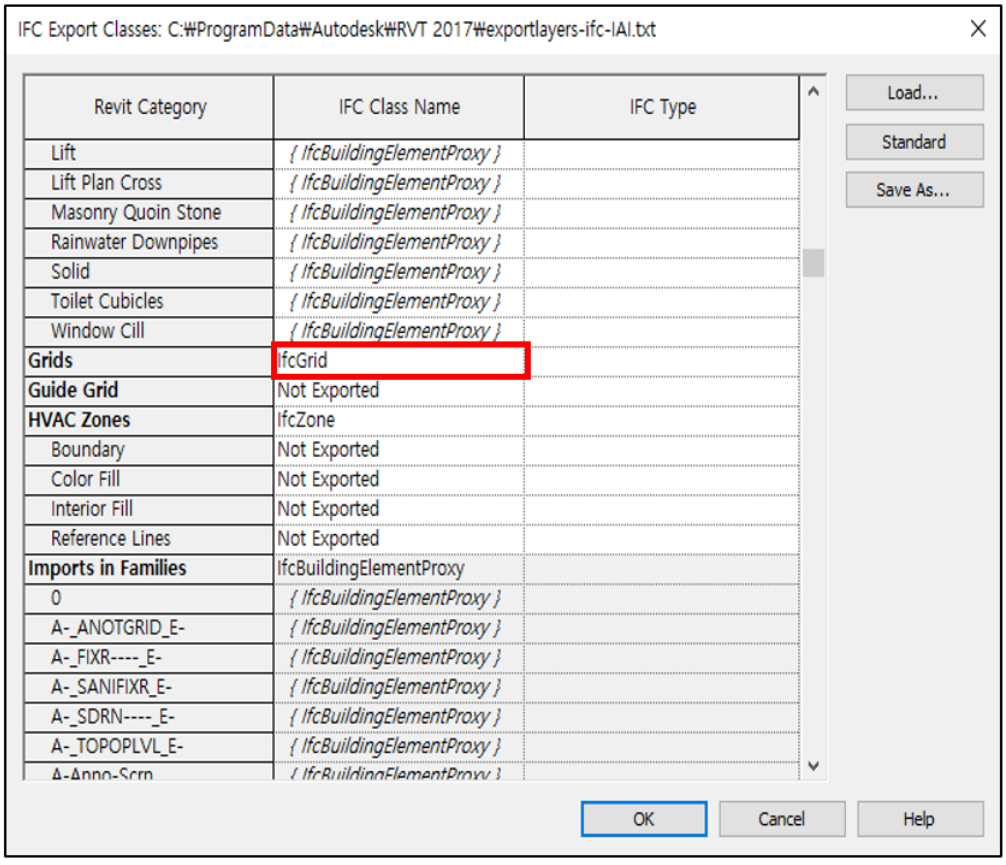
When exporting BIM Model file from Revit to IFC format, users must ensure that IFC Class Name for the relevant Revit Category is in the right export setting.

1.1.1 Exporting the Grids

In order for the gridlines created in the BIM model to be displayed normally in SBim Assess, IFC Export option should be set as below:

(Revit → File → Export → Options → IFC Options)

In IFC Options, scroll down to **Grids** and set the IFC Class Name as IfcGrid.



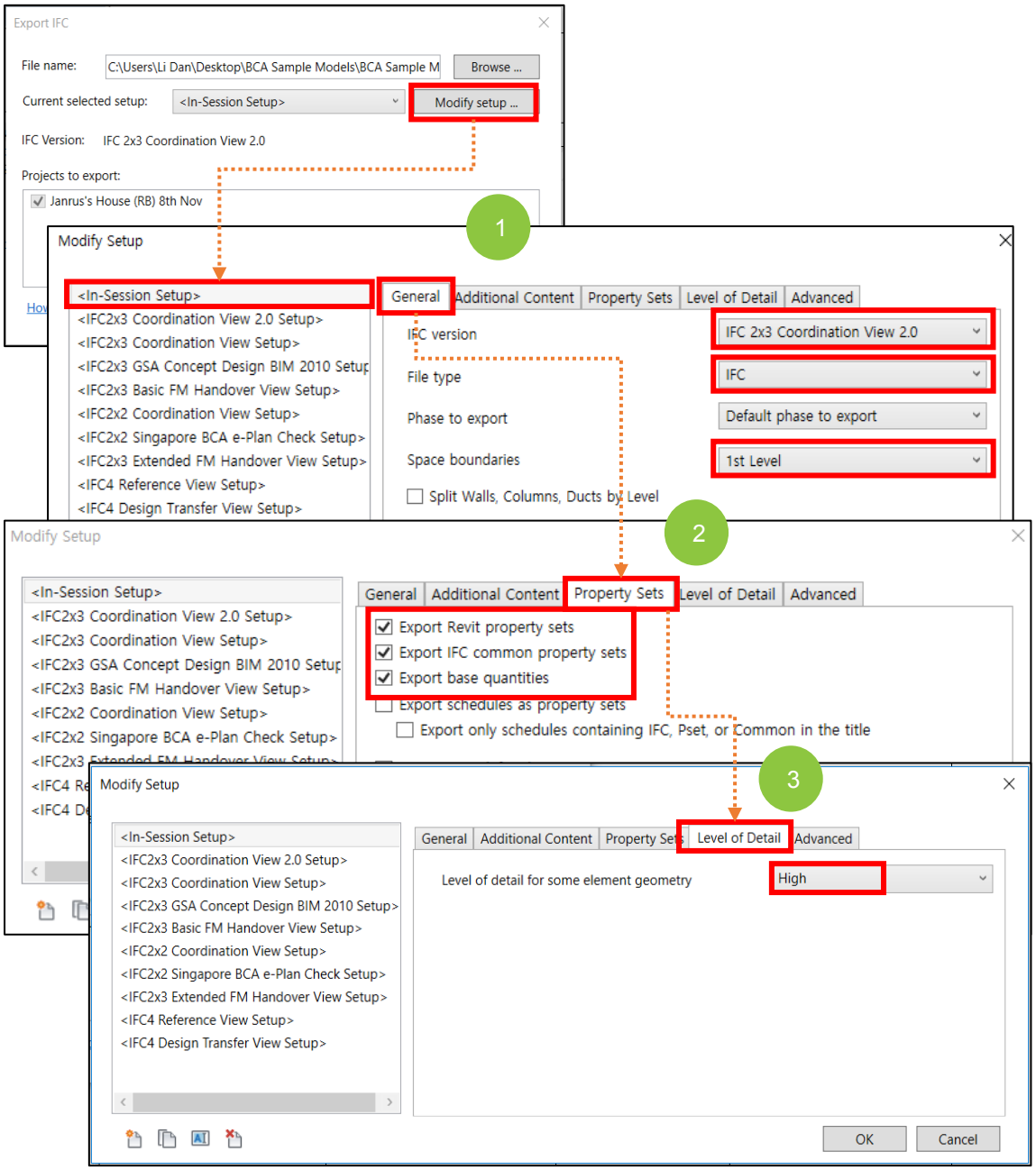
1.1.2 Exporting the Model to IFC

Method 1: For Group Parameter Under "Identity Data"

For accurate checking results, the model should be exported to IFC 2x3 version with the following settings:

- IFC Version: IFC 2x3 Coordination View 2.0
- File Type: IFC
- Space boundaries: 1st Level
- Property Sets: Export Revit Property Sets, Export IFC common property sets, Export Base Quantities
- Level of Detail: High

(Revit → File → Export → Option→ IFC → Modify setup)

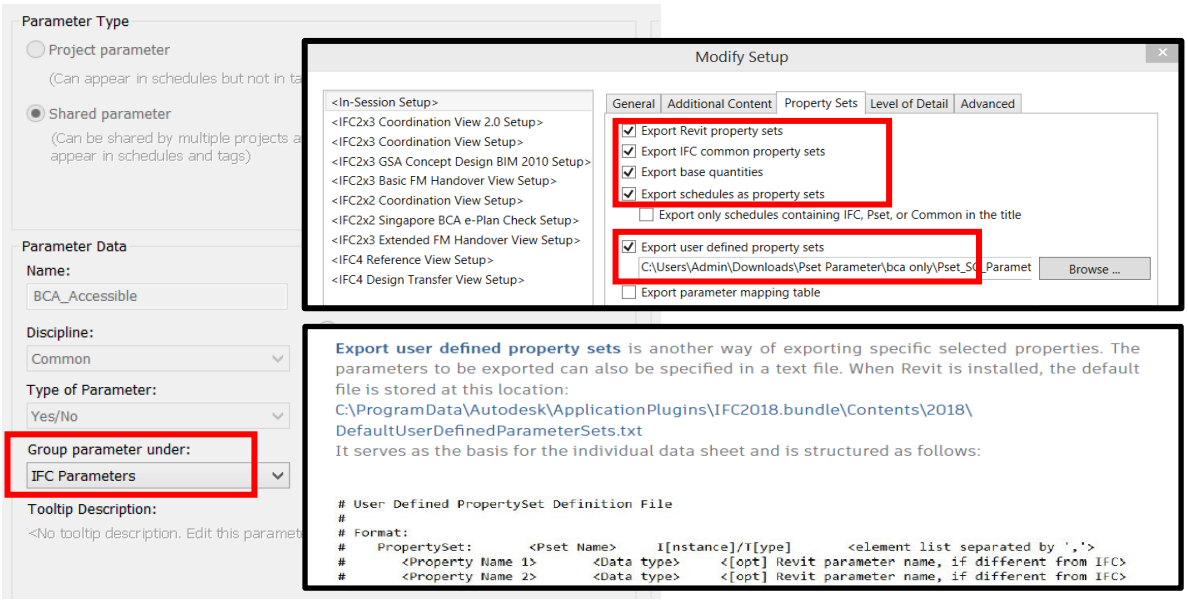


Method 2: Group Parameter Under "IFC Parameters"

Due to the data loss in "IFC Parameters" during the export output, there is an alternative method during the stage of exporting, by using "Export user defined property sets".

(Revit → File → Export → Option→ IFC → Modify setup)

- IFC Version: IFC 2x3 Coordination View 2.0
- File Type: IFC
- Space boundaries: 1st Level
- Property Sets: Export Revit Property Sets, Export IFC common property sets, Export Base Quantities, Export schedules as property sets, **Export user defined property sets**
    - *Load in the text file for SG_Parameter*
- Level of Detail: High



Contents in the Text File for SG_Parameter:

#

PropertySet: SG_Parameter I IfcWall, IfcDoor, IfcColumn, IfcWindow, IfcSpace, IfcCovering, IfcSlab, IfcFlowTerminal

SG_Name	Text
BCA_Accessible	Boolean
BCA_Ambulant	Boolean
BCA_ElderFriendly	Boolean
BCA_FamilyFriendly	Boolean
BCA_ChildFriendly	Boolean
BCA_ModeOfVentilation	Text
BCA_VentilationOpening	Text
BCA_AreaCluster	Text

1.2 Setting of "SG_Name" Property

For clause checking based on the Room/Object classification system, the **SG_Name** property should be created and a value according to the classification should be defined.

The steps for setting the property are as follows:

(Revit → Manage → Project Parameters → Add → Parameter Data)

- **Name:** SG_Name
- **Group Parameter under:** Identity Data

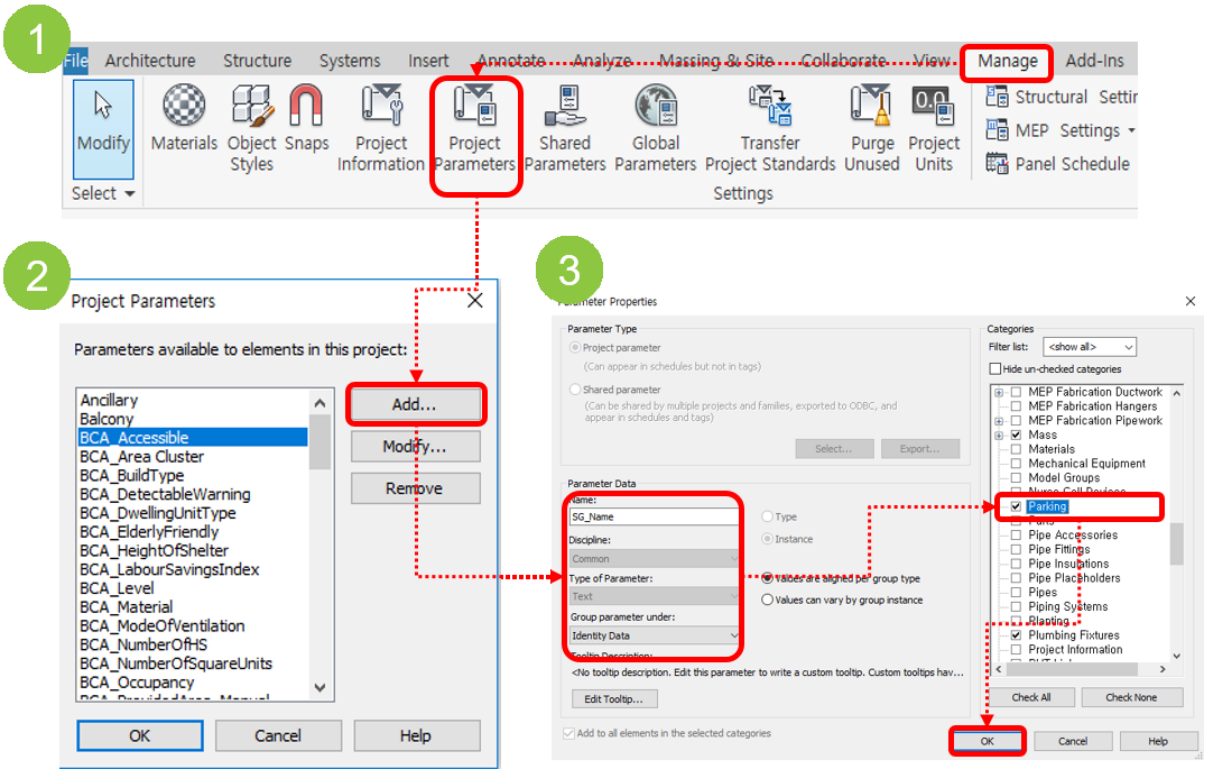


Figure 1. Setting Method for SG_Name

Refer to **Section 8: Appendix** for Project Parameter and Shared Parameter Screenshots.

2 Vehicle Parking Component

The car parking lot should be modelled using the **Parking Component** family object. Car parking lots modelled using lines, rectangles or symbols in the traditional CAD method will not be detected in the model checker. The 'Car Parking Lot' must consist of a Surface or Solid.

Setting of 'SG_Name' Property

For clause checking based on the Room/Object classification system, the **SG_Name** property should be created and a value according to the classification should be defined. *(Refer to Section 1.2)*

Project Parameters	
Name	SG_Name
Discipline	Common
Type of Parameter	Text
Group parameter under	Identity Data
Categories	Parking
Parameter Type	Select **'Instance'** and select 'Values are aligned per group type'

All types of car parking lot should be categorised under **SG_Name: "Parking_Lot".**

2.1 Standard Car Parking Lot

To create a Standard Car Parking Lot Object, the steps are as follows:

(Revit → Massing & Site → Parking Component → Properties)

- **Family**: Car Parking Lot
- **Type:** Standard Car Parking Lot
- **SG_Name:** Parking_Lot

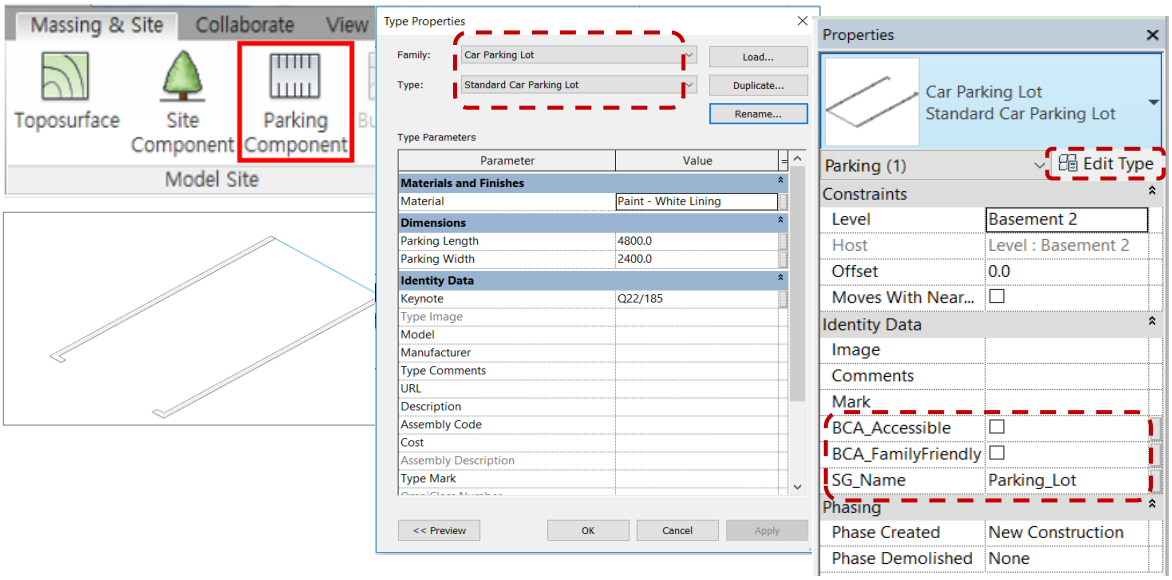


Figure 2. Setting of Standard Car Parking Lot

To edit the 'Car Parking Lot' object, click on the object and under the object **Properties** window, click **Edit Type.** Modify the name of the described object under **SG_Name.**

Modify the size of the car park lot under **Dimensions** → **Parking Length** (4800mm)**, Parking Width** (2400mm).

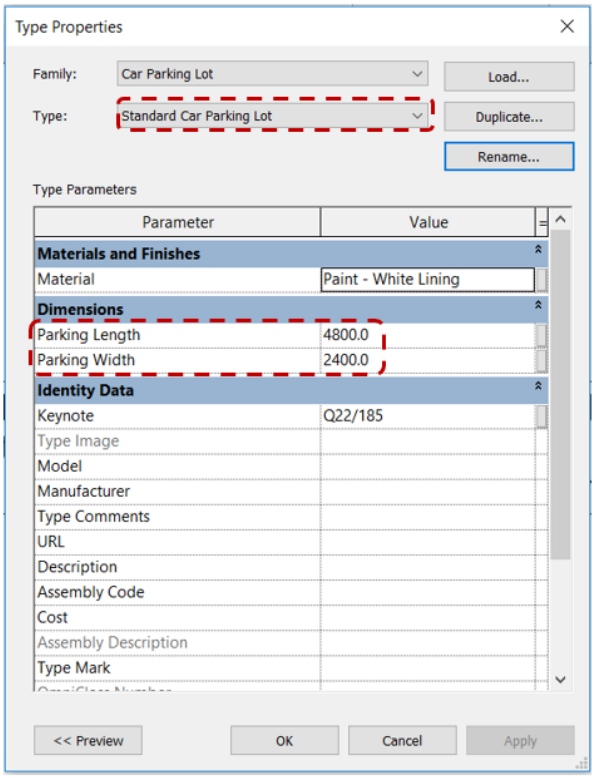


Figure 3. Setting the size of Standard Car Parking Lot

2.2 Accessible Car Parking Lot

2.2.1 Regulations of Accessible Car Parking Lot

<table>
<tr><th>Document</th><th>Clause No.</th><th>Regulation</th></tr>
<tr><td>Code on Accessibility in the built environment 2013</td><td>3.5.1.1</td><td>
Parking Provision

Where vehicle parks are required to be provided, the number of accessible parking lots for vehicles driven by persons with disabilities shall be in accordance with Table 1.

Table 1. Accessible Parking Lots
<table>
<tr><th>Number of vehicle park lots</th><th>Number of accessible lots</th></tr>
<tr><td>First 50 lots(1-50)</td><td>1</td></tr>
<tr><td>Next 50 lots(51-100)</td><td>1</td></tr>
<tr><td>Every subsequent 200 lots or any part thereof</td><td>1</td></tr>
</table>
</td></tr>
<tr><td>Code on Accessibility in the built environment 2013</td><td>3.5.2.1b</td><td>
Accessible Vehicle Parking Lots

An accessible vehicle parking lot shall have the minimum dimensions of 4800mm by 3600mm for angled parking as illustrated in Figure 4.

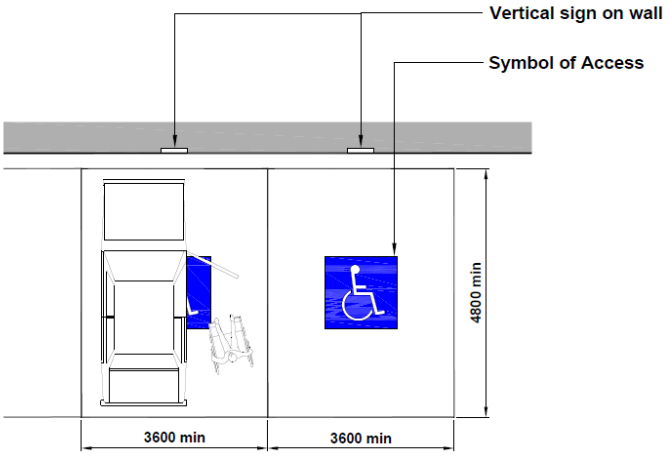


Figure 4. Angled Parking for Accessible Lots
</td></tr>
<tr><td>Code on Accessibility in the built environment 2013</td><td>6.9.5</td><td>
Family Car Parking Lots

Family car parking lots shall have the minimum dimension of 4800mm in length by 3600mm wide
</td></tr>
</table>

2.2.2 Setting of Property

To define the property of accessibility, the steps are as follows: (**Revit → Manage → Project parameters → click 'Modify' button → Setting the Parameter properties)**

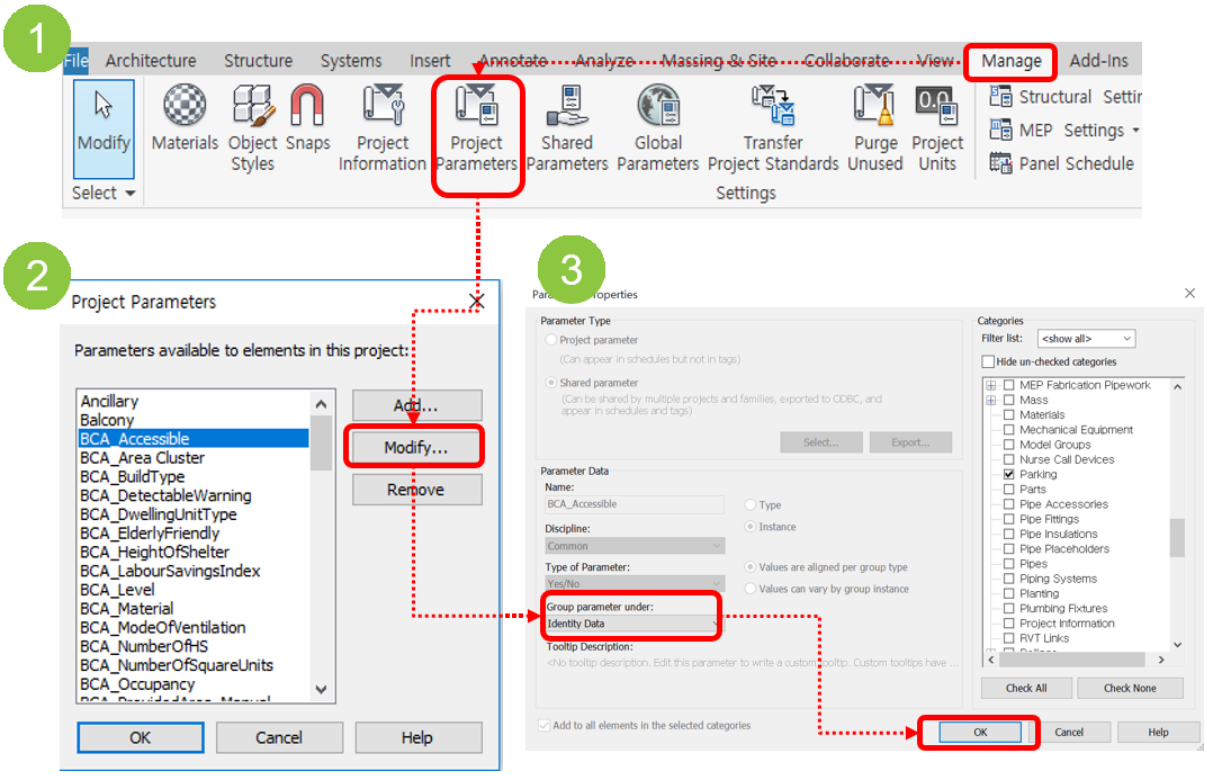


Figure 5. Setting of property set of "BCA_Accessible" property

Parameter Properties

Project parameters		
Name	BCA_Accessible	BCA_FamilyFriendly
Discipline	Common	
Type of Parameter	Yes/No	
Group parameter under	Identity Data	
Categories	Parking	
Parameter Type	Select **'Instance'** and select 'Values are aligned per group type'	

2.2.3 Creating an Accessible Car Parking Lot Object

To create an Accessible Car Parking Lot Object, the steps are as follows:
(Revit → Massing & Site → Parking Component → Properties)

- **Family**: Car Parking Lot
- **Type:** Accessible Car Parking Lot
- **Identity Data:**
  - SG_Name: Parking_Lot
  - BCA_Accessible: Yes (Tick)
- **Dimensions:**
  - Parking Length: 4800mm
  - Parking Width: 3600mm

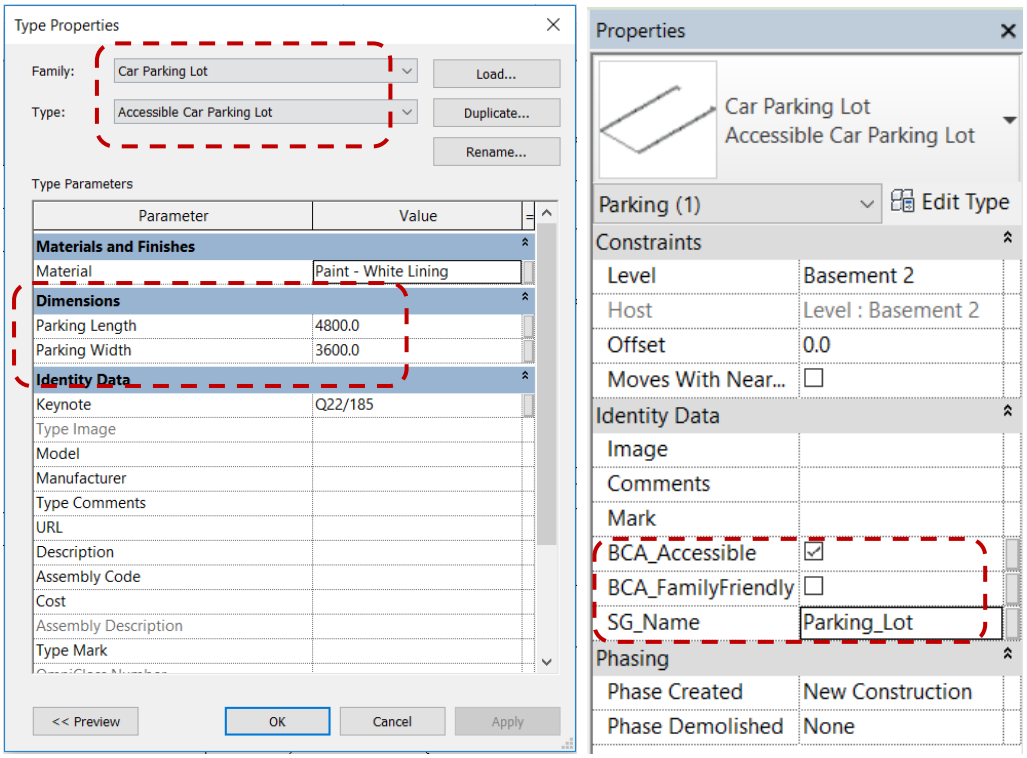


Figure 6. Setting of the Accessible Car Parking Lot (Dimension & Property)

2.2.4 Creating Family Car Parking Lot

To create an Family Car Parking Lot Object, the steps are as follows:
(Revit → Massing & Site → Parking Component → Properties)

- **Family**: Car Parking Lot
- **Type:** Family Car Parking Lot
- **Identity Data:**
  - SG_Name: Parking_Lot
  - BCA_FamilyFriendly : Yes (Tick)
- **Dimensions:**
  - Parking Length: 4800mm
  - Parking Width: 3600mm

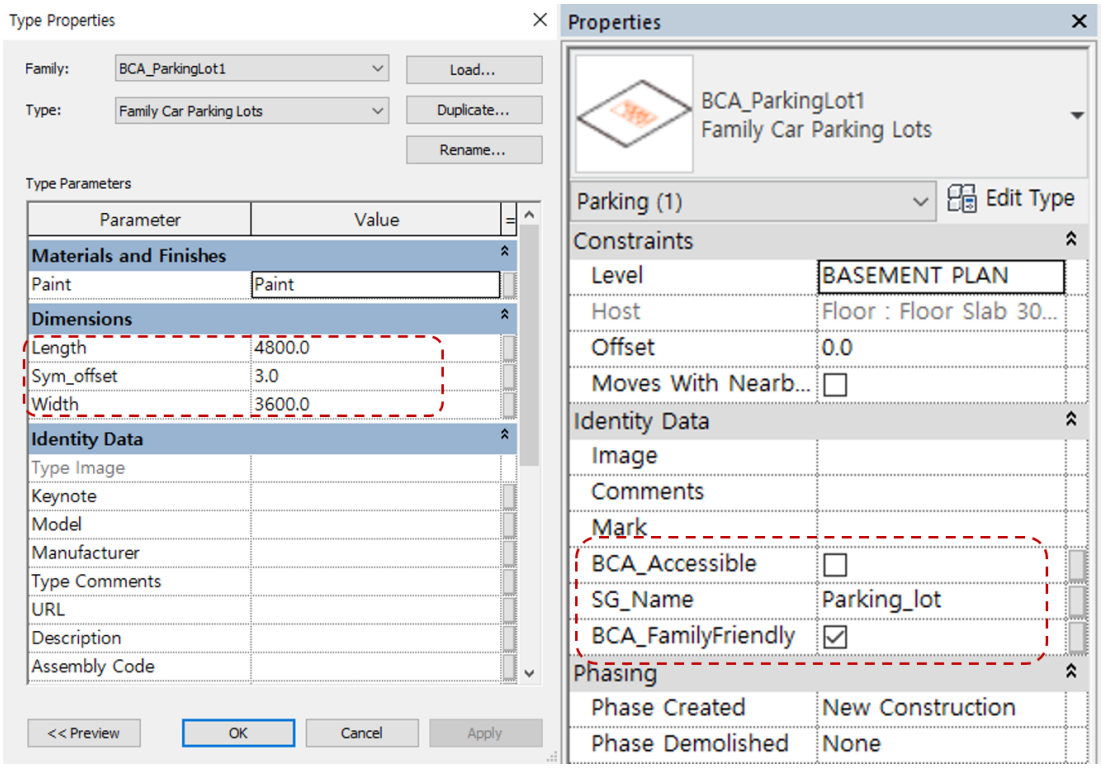
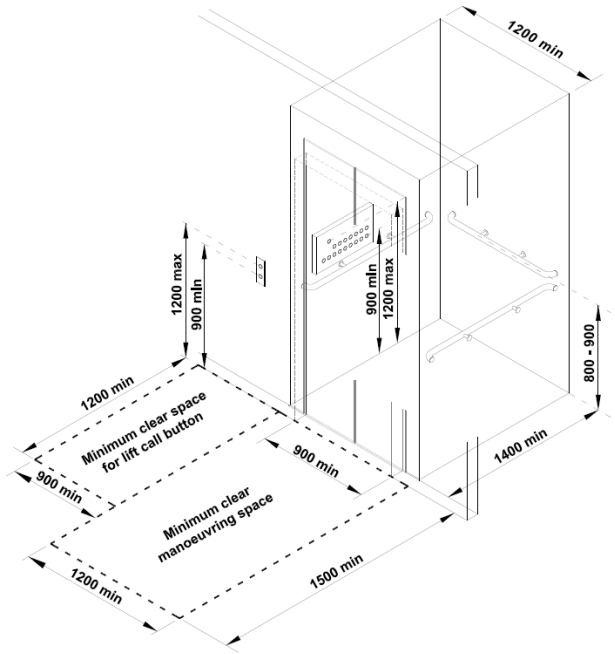


Figure 7 Setting of the Family Car Parking Lot(Dimension & Property)

3 Vertical Circulation

3.1 Lift

3.1.1 Regulations of Lift

Document	Clause No.	Regulation
Code on Accessibility in the built environment 2013	4.9.1.3	**LIFTS DESIGNED FOR WHEELCHAIR USERS** Lift lobby space for lifts designed for wheelchair users shall have clear manoeuvring space of 1200mm x 1500mm deep as illustrated in Figure 8.  (b) Isometric view ***Figure 8. Lift for Wheelchair User***
Code on Accessibility in the built environment 2013	4.9.2.1	**Lift Size** The minimum internal lift car dimension shall be 1200mm wide by 1400mm deep.
Code on Accessibility in the built environment 2013	4.9.3.1	**Door width** The lift car shall have a clear door opening of at least 900mm
Approved Document	K.2.2	**LIFT AND ESCALATOR** A building comprising 5 or more storeys (including the ground level) shall be provided with one or more passenger lifts

3.1.2 Setting of Lift Property

To define the accessibility for Lift, the following properties are required:

- **BCA_Accessible** *(Refer to Section 2.2.2)*
- **SG_Name** *(Refer to Table below)*

Parameter Properties

Project parameters		
Name	BCA_Accessible	SG_Name
Discipline	Common	Common
Type of Parameter	Yes/No	Text
Group parameter under	Identity Data	
Categories	Mass	
Parameter Type	Select **'Instance'** and select 'Values are aligned per group type'	

3.1.3 Creating the Lift Car Object

Lift car object is required for lift internal dimension checking (Clause D.4.9.2.1).

To create the **Lift Car by using Mass**, the steps are as follows:
(Revit → Massing & Site → In-Place Mass → Name → Drawing mass line → Create Form → Solid Form → Finish Mass → Properties → SG_Name: Lift_Car)

To create the **Lift Car by Component**, the steps are as follows:
(Revit → Architecture → Component → Lift Car → Properties → SG_Name : Lift_Car)

- **SG_Name:** Lift_Car
- **Dimensions:** Minimum internal lift car dimension shall be 1200mm wide by 1400mm deep.

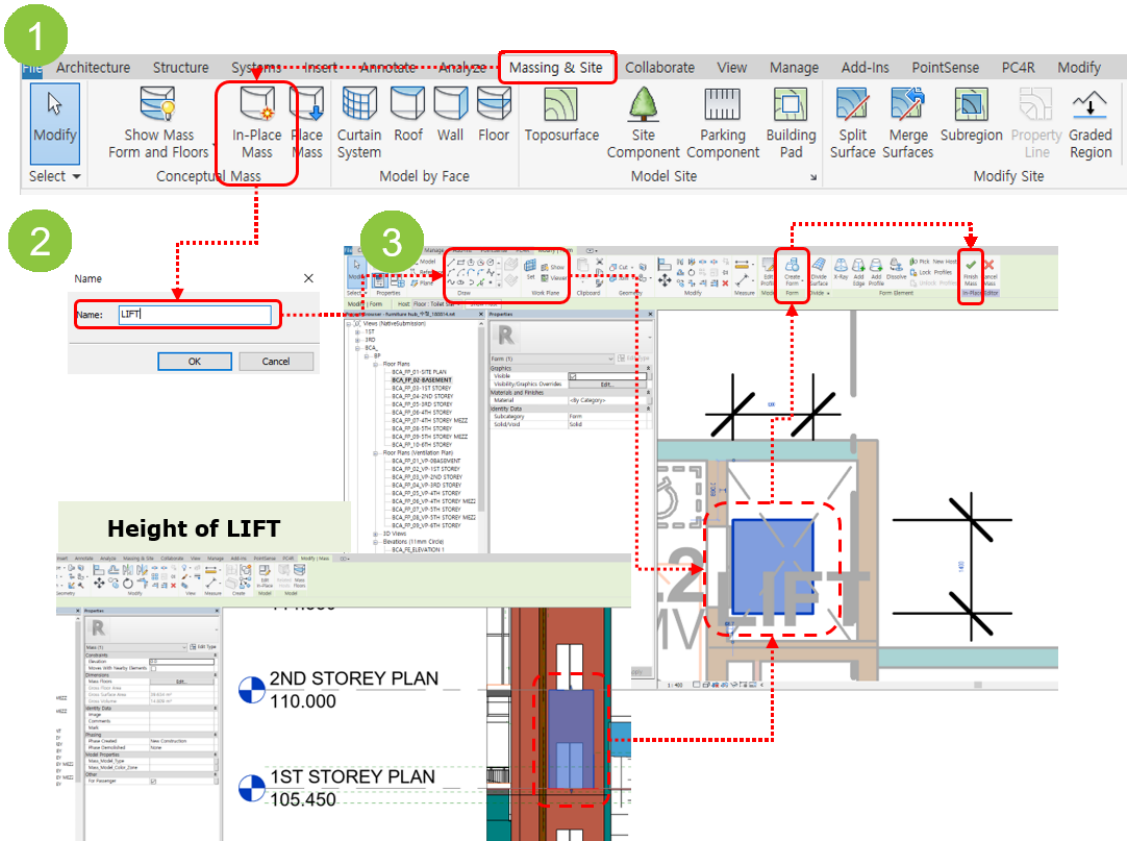


Figure 9 Create Lift object by using mass

Caution!

- The lift car object shall be modelled only at the 1st Storey level. Lift massing to follow typical lift car height constraint.
- The lift shaft (room/ space) shall be modelled from the bottom level to top level in a single space. *(Refer to Section 3.1.5)*

3.1.4 Settings for Accessible Lift

For the checking of Accessible Lift, the following properties are required for an accessible lift object:

- **SG_Name:** Lift_Car
- **BCA_Accessible:** Yes (Tick)
- **Size of accessible lift:** 1200mm (width) x1400mm(depth)

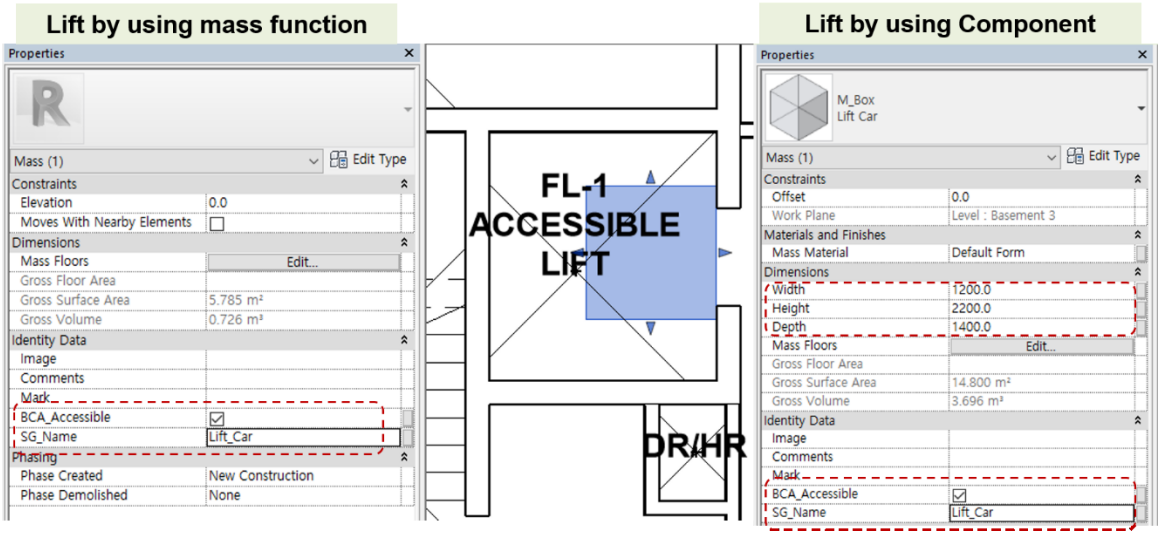


Figure 10. Settings for Accessible Lift

3.1.5 Creating the Lift Space

Lift space objects are required for Lift Lobby manoeuvring space & Clear door opening checking (Clause D.4.9.1.3 & D.4.9.3.1).

To create the Lift Space, the steps are as follows:
(Revit → Architecture → Room → Properties → Identity Data)

- **SG_Name:** LIFT

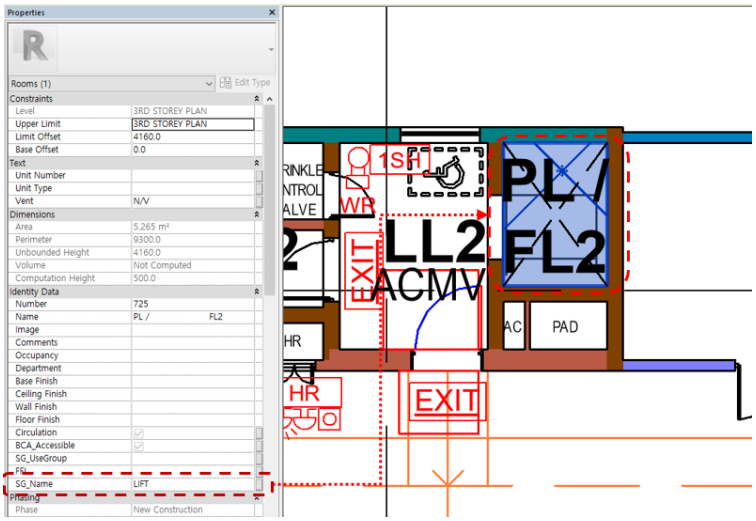


Figure 11. Setting of Lift Space object

3.1.6 Creating the Door/ Door opening object

Door/Door opening objects are required for **clear door opening** checking (Clause D.4.9.3.1).

- For the checking of clear door opening, the door/door opening objects must be in contact with the **Lift space object**.
- The door opening objects have to be modelled by using **Wall Opening** function.
- For checking of the clear door opening, opening object (IfcOpeningElement) have to be found beside the lift space.

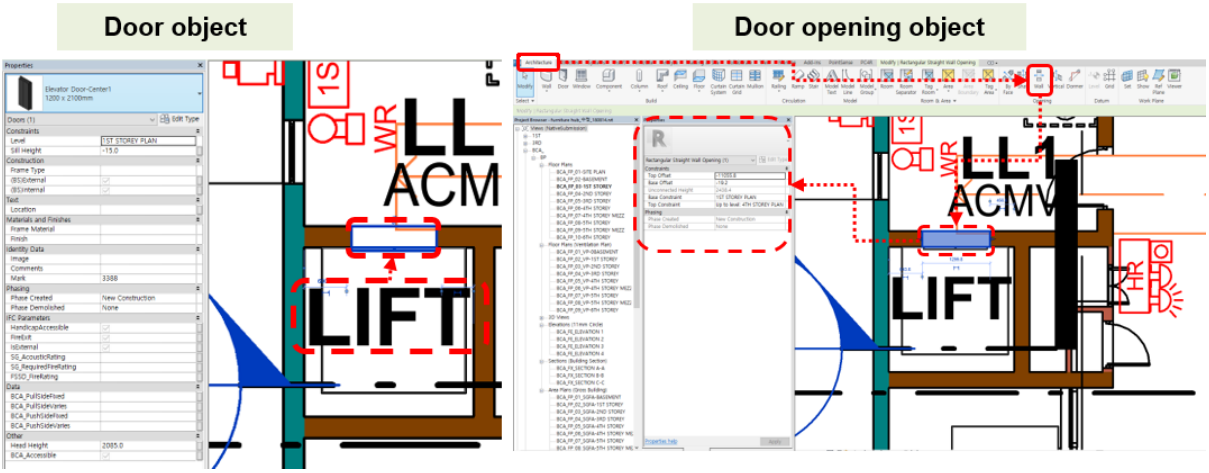
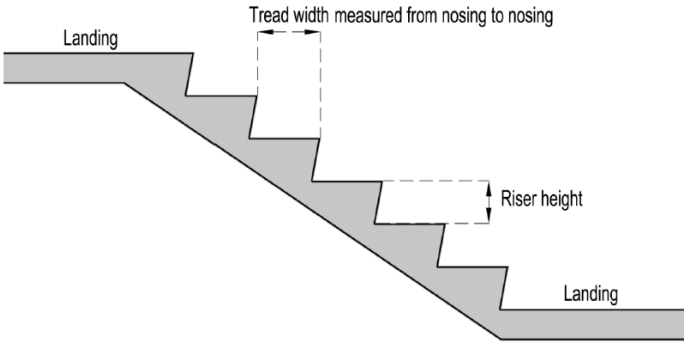
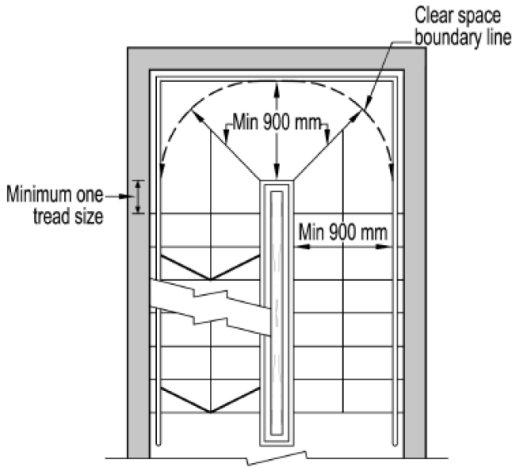


Figure 12. Clear door opening of Lift

3.2 Staircase

3.2.1 Regulations for Staircase

Document	Clause No.	Regulation
Approved Document	E.3.3.1	**Width of staircase** The clearance of the width of every staircase shall not be less than 900mm.
Approved Document	E.3.4.1	**Risers and treads** The height of a riser shall not be more than 175mm.
Approved Document	E.3.4.2	**Risers and treads** The width of a tread shall not be less than 275mm.  ***Figure 13. Measurement of Riser & Tread***
Approved Document	E.3.4.2.a	**Risers and treads** Notwithstanding paragraph E.3.4.2, the width of a tread of any staircase in any **residential unit shall not be less than 225mm.**
Approved Document	E.3.4.2.b	**Risers and treads** Notwithstanding paragraph E.3.4.2, the width of a tread of any staircase in any **industrial building shall not be less than 250mm.**
Approved Document	E.3.4.3	**Risers and treads** The width of the tread of any tapered step shall be taken as that when measured at a distance of 500mm from the narrower end.
Approved Document	E.3.4.4	**Risers and treads** The risers and tread within each flight of stairs shall be of uniform height and size:

		A tolerance of 5mm between two consecutive steps in any flight of staircase is acceptable
Approved Document	E.3.5.1	**Landing** A landing shall be provided at every floor level and door opening
Approved Document	E.3.5.2	**Landing** Except for spiral staircases, an intermediate landing shall be provided in between floor levels **at intervals of not more than 18 risers**
Approved Document	E.3.5.3	**Landing** The clear width of any landing, measured from the handrail or kerb to the wall or external railing of the landing, **shall not be less than 900mm**.  ***Figure 14. Measurement of landing width***
Approved Document	E.3.5.4	**Landing** A landing shall not have any step or drop
Approved Document	E.3.5.5	**Landing** Notwithstanding paragraph E.3.5.4, one winder is allowed in every **90 degrees turn** in the staircase of any dwelling unit.
Approved Document	E.3.6.1	**Handrails** A handrail shall be provided on at least one side of the flight of staircase.
Approved		

Document	E.3.6.2	**Handrails** The height of the handrail shall be between 750mm and 1000mm above the pitch line.

3.2.2 Creating a Standard Staircase

Staircases are required for the checking of width of staircase, risers & treads and landings (Clause No. E.3.3.1, E.3.4.1, E.3.4.2, E.3.4.2.a, E.3.4.2.b, E.3.4.4, E.3.5.1, E.3.5.2, E.3.5.3, E.3.5.4, E.3.6.1, E.3.6.2).

To create a standard staircase, the steps are as follows:

(Revit → Architecture → Stair → Choose the drawing method: 'Straight' → Adjust the Dimension: Run width → Adjust the Dimension: Riser height/Tread depth → Drawing Stair → Click 'Railing' → Set the Railing option → Click 'Finish Edit Mode')

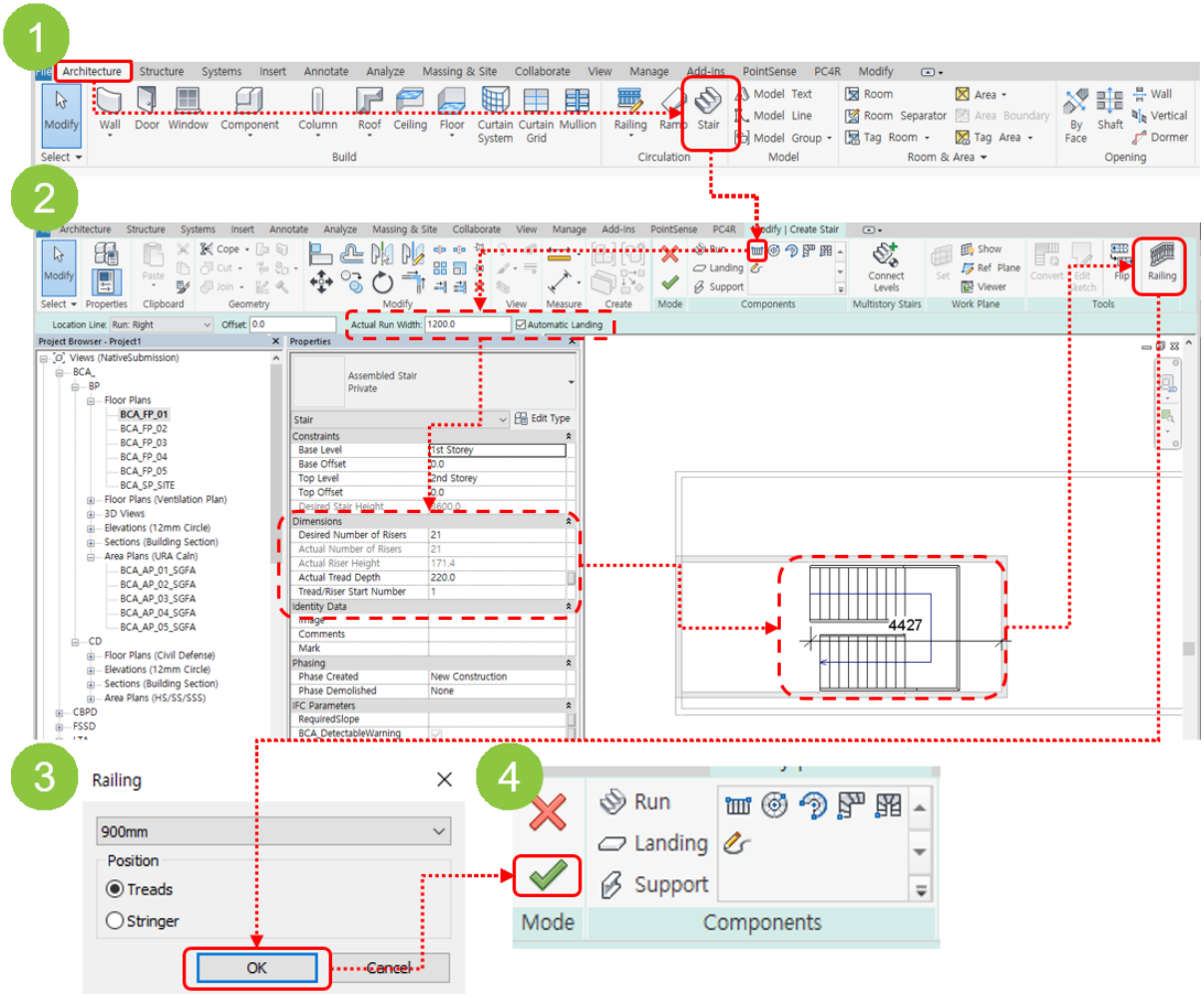


Figure 15. Creating a Standard Staircase

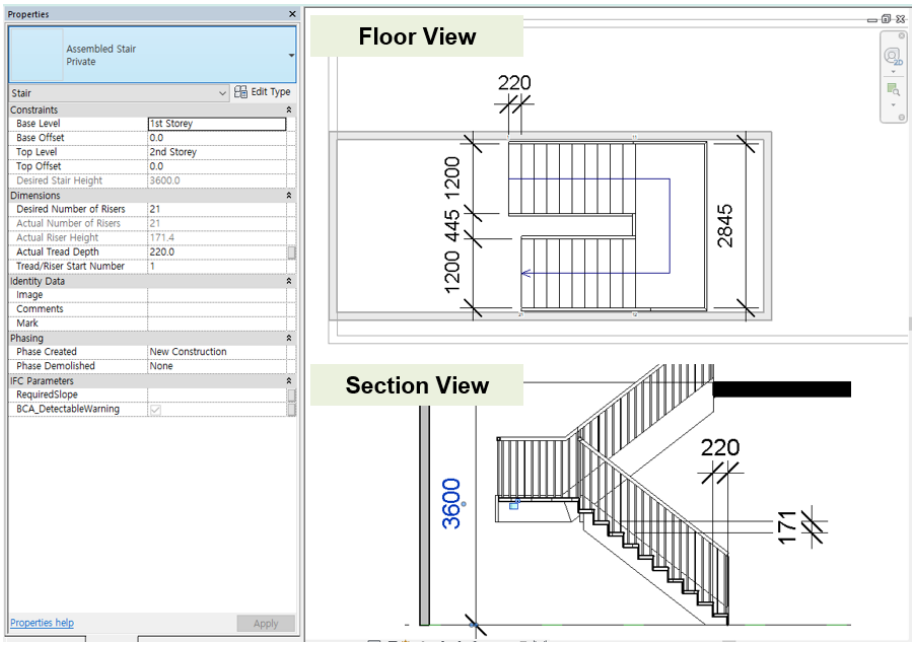


Figure 16. Dimensions of Standard Stair Object

Table 2: Setting of Standard Stair Object according to Regulation

Setting of Stair		
Regulation	Revit Category	Insert Data
E.3.3.1 Stair Clear Width	Actual Run Width	More than **900mm**
E.3.4.1 Maximum Riser Height	Actual Riser Height	(Height of Level) / (Number of Risers) ≤ **175mm**
E.3.4.2 Tread width – All except industrial development	Actual Tread Depth	More than **275mm**
E.3.4.2.a Tread width – Residential		More than **225mm**
E.3.4.2.b Tread width - Industrial		More than **250mm**
E.3.4.4 Treads/Risers Uniformed Width/Height	Actual Riser Height / Actual Tread Depth	Riser height ≤ **175** ± **5mm** Tread width ≥ 275/225/250 ± 5mm
E.3.5.2 Maximum Treads/Flights	Number of Risers - 1	Number of Risers - 1 ≤ **18**
E.3.5.3 Clear Landing Width	Actual Run Width	More than **900mm**
E.3.6.1 Handrail provided to 1 side	Railing	Every type except for **no stair object**
E.3.6.2 Handrail Height above pitch line	Railing	**1000mm** ≥ Railing Height ≥ **750mm**

Items E.3.5.1 and E.3.5.4, which are not specified in the **Table 2**, are naturally satisfactory if drawn in the accordance to Figure 15 as the landings are automatically generated by **'Automatic Landing'** function.

3.2.3 Spiral Staircase

Spiral staircases are required for the width of spiral staircase, treads checking (Clause No. E.3.3.1, E.3.4.1, E.3.4.3, E,3.4.4, E.3.5.1, E.3.6.1).

To create a spiral staircase, the steps are as follows:

(Revit → Architecture → Stair → Choose the drawing method: 'Spiral' → Adjust the Dimension: Run width → Adjust the Dimension: Riser height/Tread depth → Drawing Stair → Click 'Railing' → Set the Railing option → Click 'Finish Edit Mode')

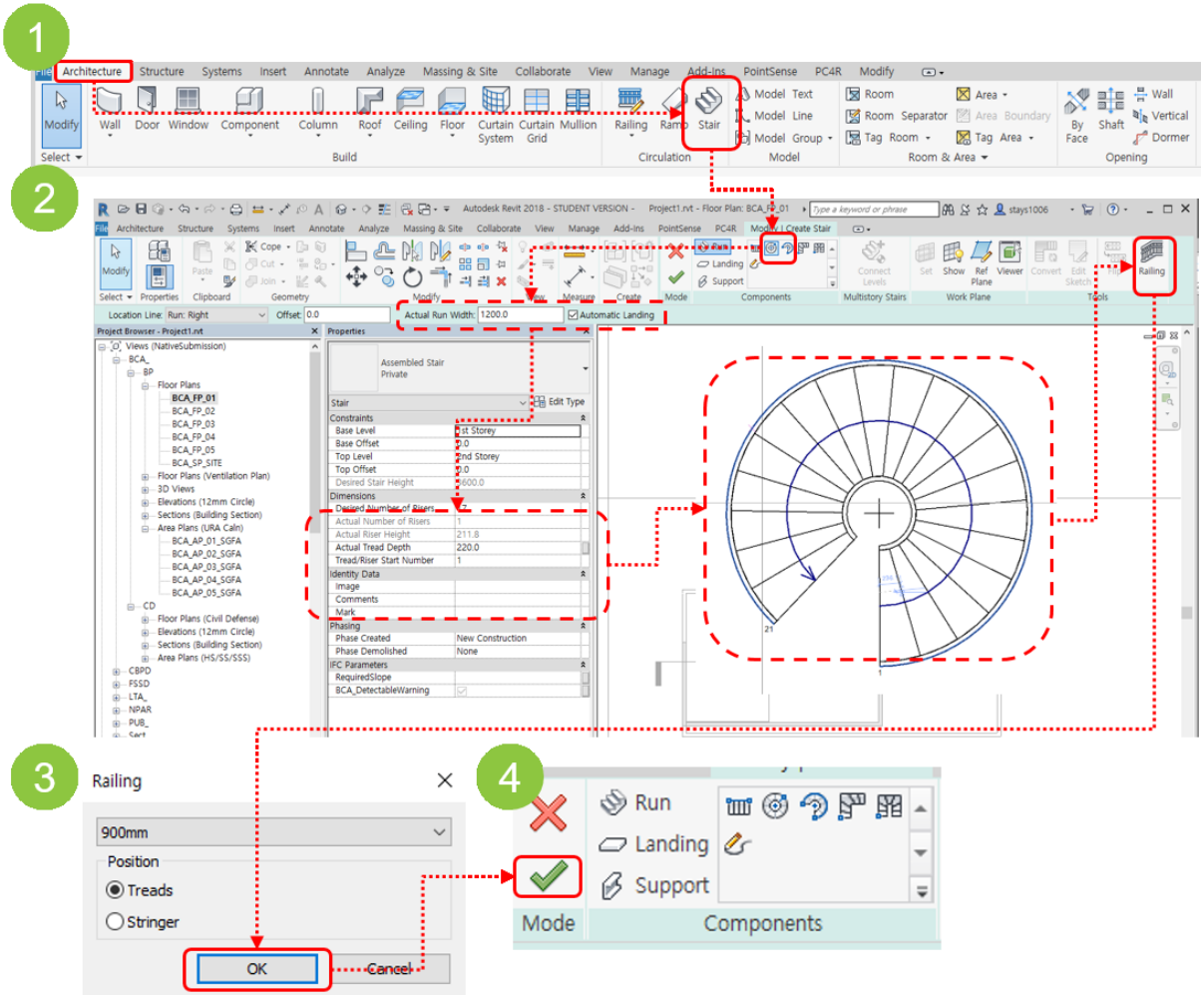


Figure 17. Drawing Order of Spiral Stair

Table 3 Setting of Spiral Stair according to Regulation

Setting of Stair		
Regulation	Revit Category	Insert Data
E.3.3.1 Stair Clear Width	Actual Run Width	More than **900mm**
E.3.4.1 Maximum Riser Height	Actual Riser Height	(Height of Level) / (Number of Risers) ≤ **175mm**
E.3.4.3 Width of Tread for Tapered Step		More than **275mm** (All except in industrial development) More than **225mm** (Residential) More than **250mm**(Industrial)
E.3.4.4 Treads/Risers Uniformed Width/Height	Actual Riser Height / Actual Tread Depth	Riser height ≤ **175 ± 5mm** Tread width ≥ **275/225/250 ± 5mm**
E.3.6.1 Handrail provided to 1 side	Railing	Every type except for **no stair object**
E.3.6.2 Handrail Height above pitch line	Railing	**1000mm** ≥ Railing Height ≥ **750mm**

Caution!

For spiral staircase regulation, the tread width checking is measured from the narrow side(inside) at an offset of 500mm, so it should be modelled sufficiently wide.

3.2.4 Winder Staircase

Winder staircases are required for the checking of width of winder staircase, treads, flight and turn degrees checking (Clause No. E.3.3.1, E.3.4.1, E.3.4.3, E,3.4.4, E.3.5.1, E.3.5.2, E.3.6.1).

To create a winder staircase, the steps are as follows:

(Revit → Architecture → Stair → Choose the drawing method: 'L-Shape Winder' → Drawing Stair → Click 'Railing' → Set the Railing option → Click 'Finish Edit Mode')

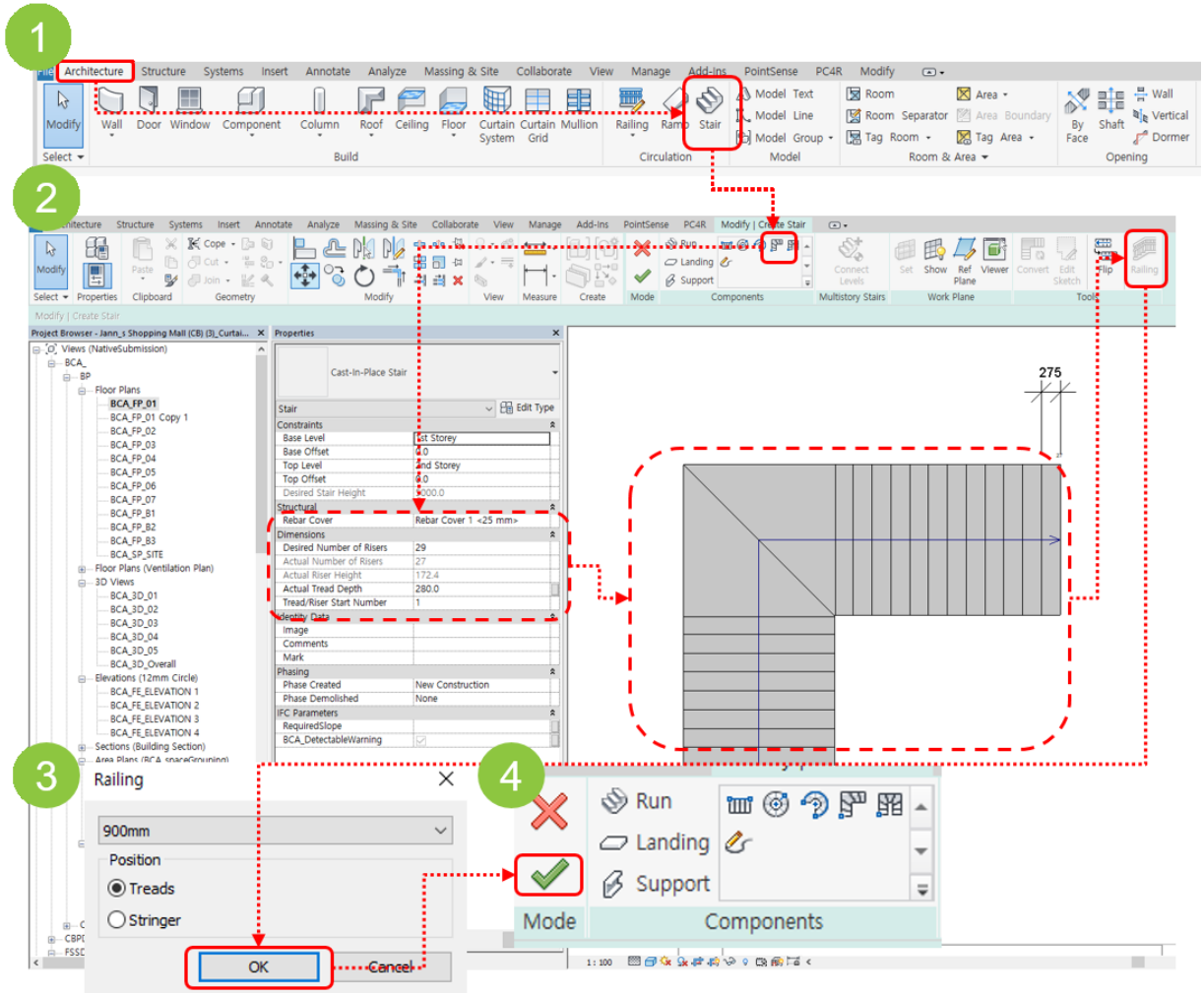


Figure 18. Drawing Order of Winder Stair

Table 4. Setting of Winder Stair according to Regulation

Setting of Stair		
Regulation	Revit Category	Insert Data
E.3.3.1 Stair Clear Width	Actual Run Width	More than **900mm**
E.3.4.1 Maximum Riser Height	Actual Riser Height	(Height of Level) / (Number of Risers) ≤ **175mm**
E.3.4.3 Width of Tread for Tapered Step		More than **275mm** (All except in industrial development) More than **225mm** (Residential) More than **250mm** (Industrial)
E.3.4.4 Treads/Risers Uniformed Width/Height	Actual Riser Height / Actual Tread Depth	Riser height ≤ **175** ± **5mm** Tread width ≥ **275/225/250** ± **5mm**
E.3.5.2 Maximum Treads/Flights	Number of Risers - 1	Number of Risers - 1 ≤ **18**
E.3.5.5 1 Winder Allowed/90° Turn in Staircase	L-Shape Winder	Degree of Path Line is **less than 90°**
E.3.6.1 Handrail provided to 1 side	Railing	Every type except for **no stair object**
E.3.6.2 Handrail Height above pitch line	Railing	**1000mm** ≥ Railing Height ≥ **750mm**

Caution!

For winder staircase regulation, the tread width review is measured from the narrow side(inside) at an offset of 500mm, so it should be modelled sufficiently wide.

For special cases such as E.3.5.1/E.3.5.4 (Landing)

For Clauses **E.3.5.1/E.3.5.4,** if the slab object associated with the staircase is modelled, it is automatically checked and there is no specific setting in the stair function.

3.3 Ramp

3.3.1 Regulation of Ramp

<table>
<tr><th>Document</th><th>Clause No.</th><th>Regulation</th></tr>
<tr><td>Code on Accessibility in the built environment 2013</td><td>4.5.1</td><td>Changes in Levels

Any change in level of the floor surface, the gradient of the slope shall conform below Table

<table>
<tr><th>Changes in Vertical Rise (mm)</th><th>Gradient not steeper than</th></tr>
<tr><td>0 to 15</td><td>1 : 2</td></tr>
<tr><td>more than 15 to 50</td><td>1 : 5</td></tr>
<tr><td>more than 50 to 200</td><td>1 : 10</td></tr>
<tr><td>Exceeding 200</td><td>1 : 12</td></tr>
</table>
</td></tr>
<tr><td>Code on Accessibility in the built environment 2013</td><td>4.6.5.2</td><td>Landings

Landings shall have a level platform of 1500mm or more</td></tr>
<tr><td>Code on Accessibility in the built environment 2013</td><td>4.6.6.1</td><td>Ramp Handrails

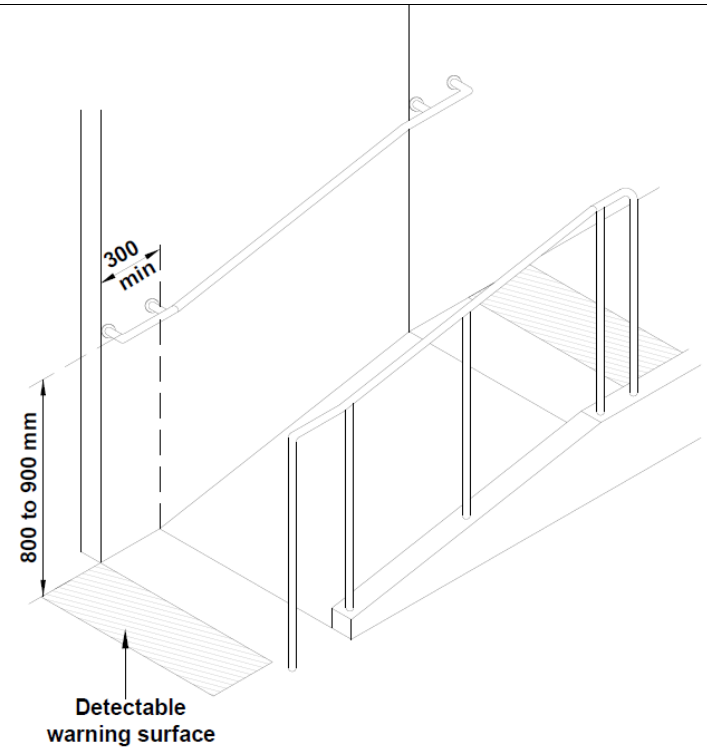
A ramp run with a rise greater than 175mm shall have handrails that :

(a) Are on both sides;

(b) Are placed at a height of between 800mm and 900mm above the floor level; and

(c) Are continuous along the entire length of the ramp</td></tr>
<tr><td>Code on Accessibility in the built environment 2013</td><td>4.6.6.2</td><td>Ramp Handrails

Handrail extensions shall extend horizontally for a distance of 300mm or more beyond the top and bottom of the ramp to provide support for persons who may need help to negotiate the ramp</td></tr>
</table>



3.3.2 Setting of Accessible Ramp

In the SBim Assess, items related to ramp are checked only for the accessible ramp. So accessible ramp is defined by using 'BCA_Accessible' property. (Clause No. 4.5.1, 4.6.5.2, 4.6.6.1, 4.6.6.2)

Project Parameters	
Name	BCA_Accessible
Discipline	Common
Type of Parameter	Yes/No
Group parameter under	Identity Data
Categories	Ramps
Parameter Type	Select **'Instance'** and select 'Values are aligned per group type'

Create the Accessible Ramp

Create an accessible ramp object by adding the accessible property to the ramp object:

The configuration screen in Revit is shown below **Figure 19**.

- **Identity Data:**
    - BCA_Accessible : Yes(Tick)

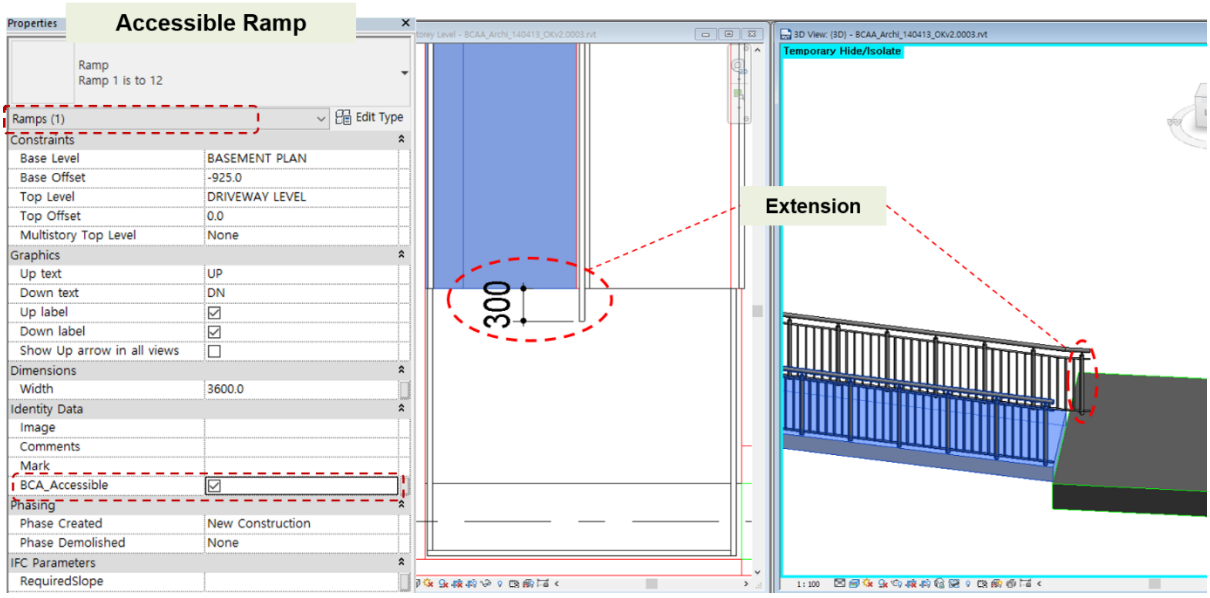


Figure 19 Setting of Accessible Ramp(Property & Dimension)

Table 5 Setting of Accessible Ramp according to regulation

Setting of Ramp		
Regulation	Revit Category	Insert Data
4.5.1 Gradient Change		Change level**: 0-15mm** ≤ gradient **1:2** Change level**: 15-50mm** ≤ gradient **1:5** Change level**: 50-200mm** ≤ gradient **1:10** Change level**:** **more than 200mm** ≤ gradient **1:12**
4.6.5.2 Size of Landing	Width	More than **1500mm**
4.6.6.1 Handrail Both Sides & Continuous	Railing	Railing object is existed on **both sides & Continuous**
4.6.6.2 Handrail Extension	Railing extension	More than **300mm**

4 Horizontal Circulation

All spaces in the model should be classified according to the **"SG_Name"** classification.

Setting of 'SG_Name' Property *(Refer to Section 1.2 for details on how to set up)*

Project Parameters	
Name	SG_Name
Discipline	Common
Type of Parameter	Text
Group parameter under	Identity Data
Categories	Rooms, Areas
Parameter Type	Select **'Instance'** and select 'Values are aligned per group type'

4.1 Headroom

4.1.1 Regulation of Headroom

Document	Clause No.	Regulation
Approved Document	C.3.2.1	**Headroom** The headroom of every room, access route and circulation space shall not be less than **2.0m**
Approved Document	C.3.2.2	**Headroom** For sheltered car parks, the headroom at parking lots and driveway shall not be less than **2.2m**

4.1.2 Naming – Space (Room)

Space object is required for all spaces where headroom checking is required, except for circular staircases and spaces which are exempted from headroom checking. *(Refer to Table 6)*

Space Naming Rules Cases:

Table 6. Room Classification for the Headroom Checking

Headroom	• Room (All Rooms) • Circulation Space: Corridor, Lobby, Hall etc. • **SG_Name: CIRCULATION_SPACE, STAIRCASE**
Exemption	• Store Room • Equipment Room • Mechanical Room • Attic Level (Building Storey): space area < 10m^2 • **SG_Name; STORE_ROOM, MEP, ATTIC**

Among the exemption items, if the area of the space object included in the **Attic Level is less than 10m^2**, all objects are excluded from the headroom checking.

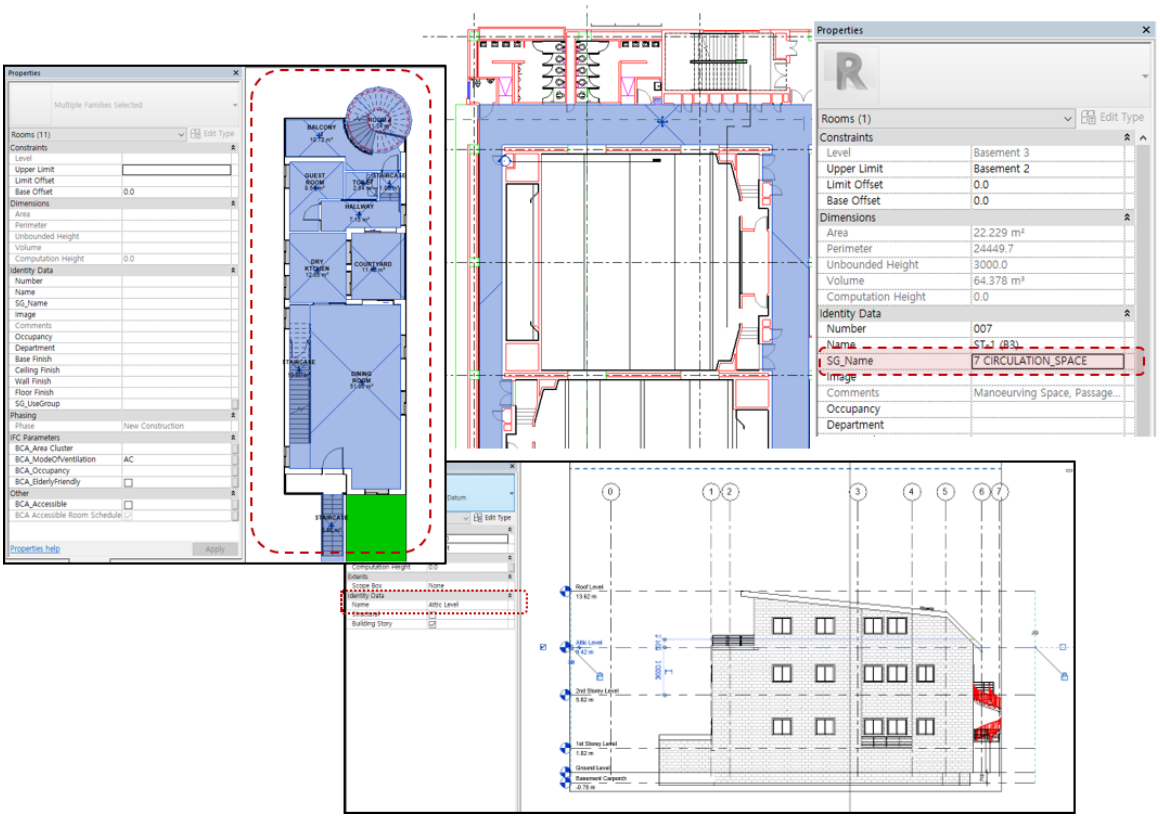


Figure 20. Room Objects for Headroom Checking

4.1.3 Headroom Check for Driveway, Parking Lot Objects

Driveway and Parking lot objects are required for headroom checking, with the **SG_Name: "PARKING".**

To create a **space object**, the steps are as follow:

(Revit → Architecture → Room → Properties → Identity Data)

- **SG_Name:** PARKING

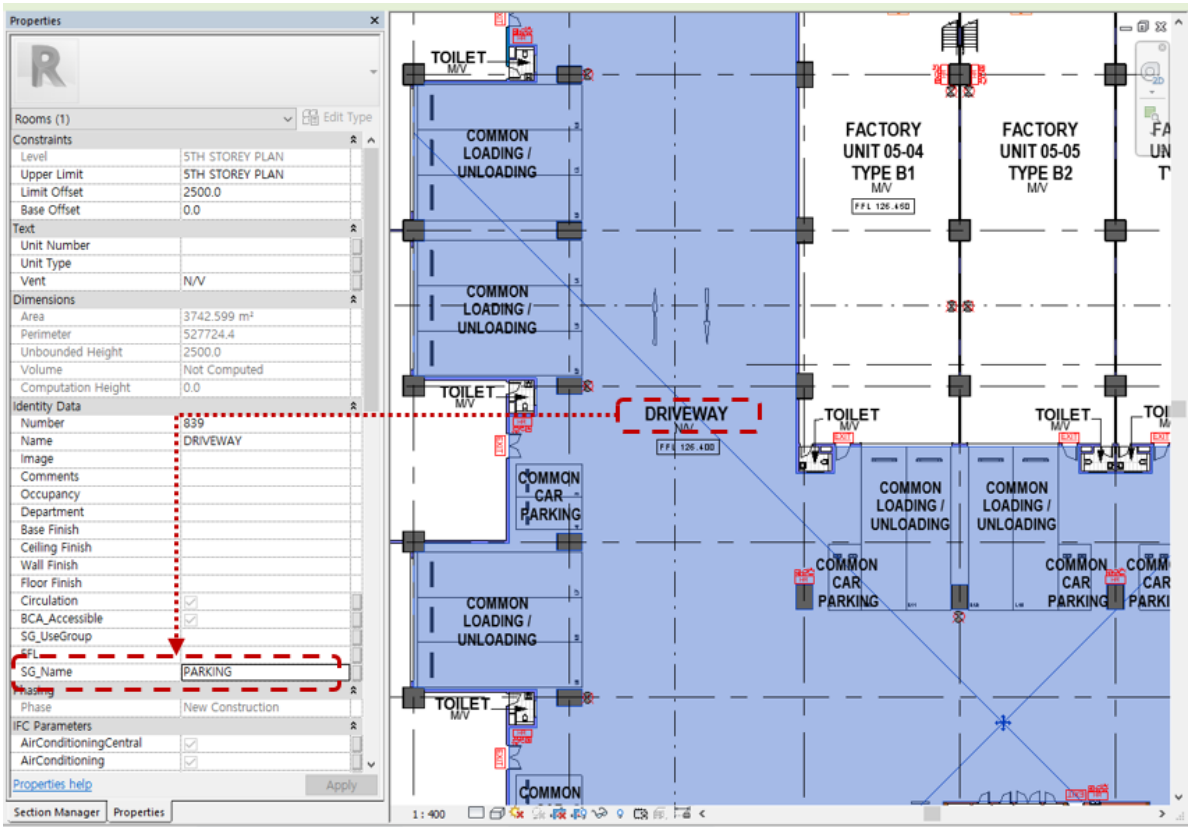


Figure 21. Settings of Space Object (Room) for Driveway

Creating a Driveway by using Mass

The steps are as follows: **(Revit → Massing & Site → In-Place Mass → SG_Name: 'PARKING" → Drawing mass line → Create Form → Solid Form → Finish Mass)**

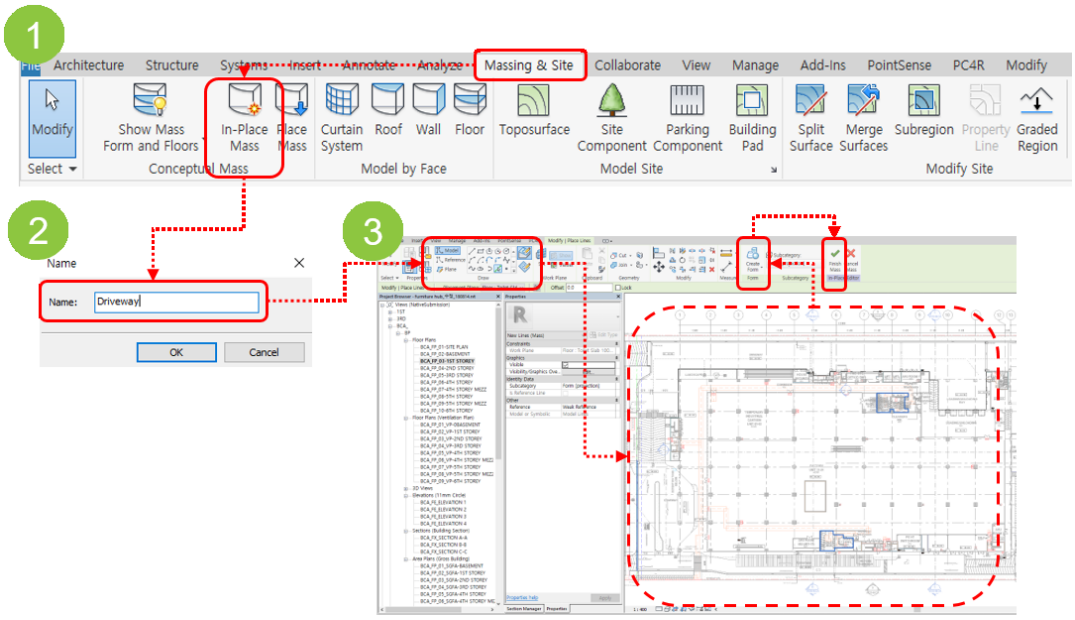


Figure 22. Drawing Order of Driveway by using Mass function

Creating a Driveway by using Slab

The steps are as follows: **(Revit → Architecture → Floor → Edit Type → Duplicate → Name: 'Driveway' → Drawing floor's outline → Finish)**

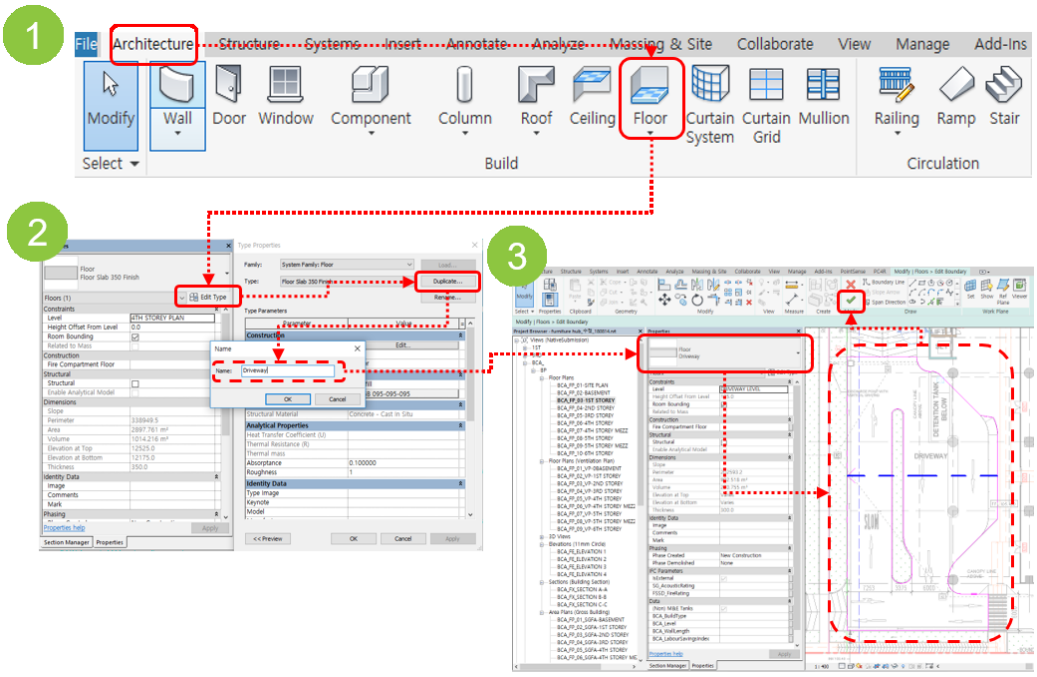


Figure 23. Drawing Order of Driveway by using Floor function

Creating a Car Parking Lot by using Parking Component

User must follow how to define the **Parking Lot** *(Section 2.1)* by placing the Car Parking Lot Object.

- **SG_Name:** Parking_Lot

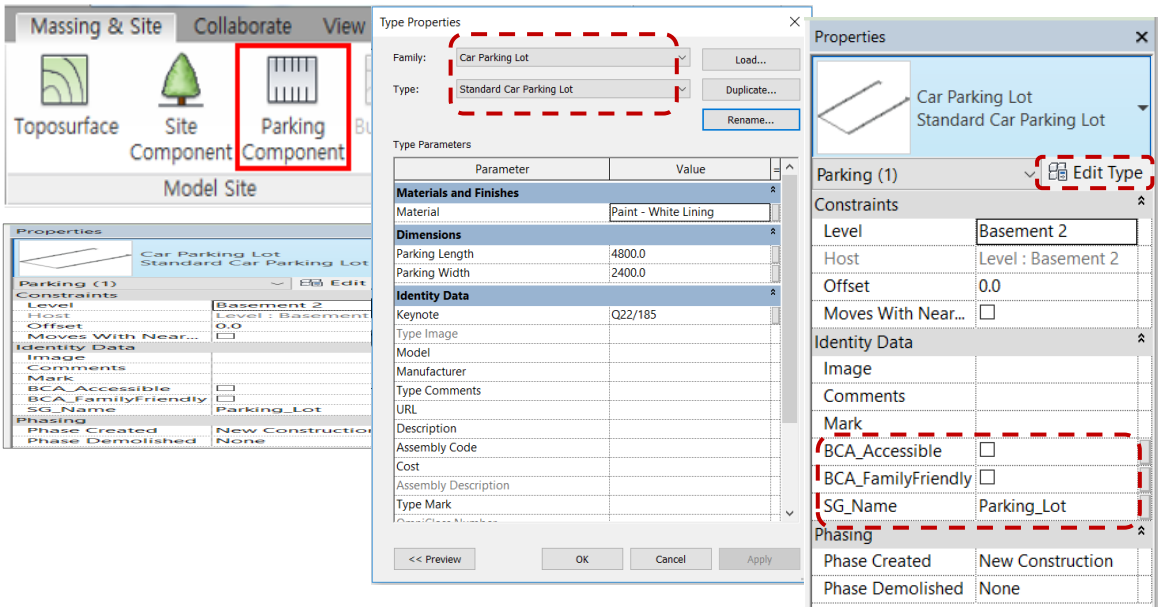
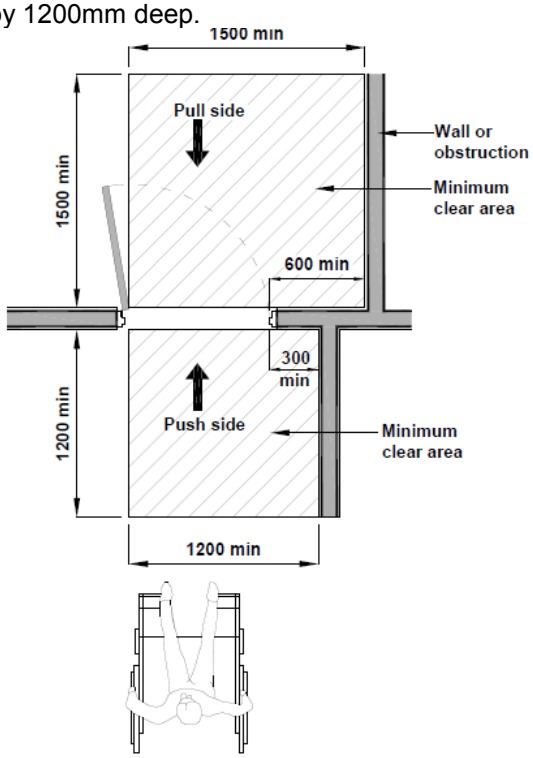


Figure 24. Place the Car Parking Lot Objects for the Headroom Checking

4.2 Door

4.2.1 Regulations of Door

Document	Clause No.	Regulation
Code on Accessibility in the built environment 2013	4.4	**Door** Width of Clear opening Sliding / Swing Door is more than **850mm**
Code on Accessibility in the built environment 2013	4.4.6.1	**Manoeuvring Space** (a) On the pull side, a minimum space of 600mm adjacent to the leading edge of the door with a minimum clear floor space of 1500mm wide by 1500mm deep; and (b) On the push side, a minimum space of 300mm adjacent to the leading edge of the door with a minimum clear floor space of 1200mm by 1200mm deep.  ***Figure 25. Minimum Doorway Manoeuvring Space***

4.2.2 Creating an Accessible Door

The checking of "**Clear Door Width**" and **"Manoeuvring Space**" applies to all **Accessible Doors**.

To create an accessible door, there are 2 methods:

(a) Adding "BCA_Accessible" property to the Door

(b) Creating an "Accessible Route" which is in contact with the Door

Adding the 'BCA_Accessible' Property

For information on modifying Revit Project Property, please refer to Section 1.2.

Project parameters	
Name	BCA_Accessible
Discipline	Common
Type of Parameter	Yes/No
Group parameter under	Identity Data
Categories	Doors
Parameter Type	Select **'Instance'** and select 'Values are aligned per group type'

Check the **'BCA_Accessible'** checkbox

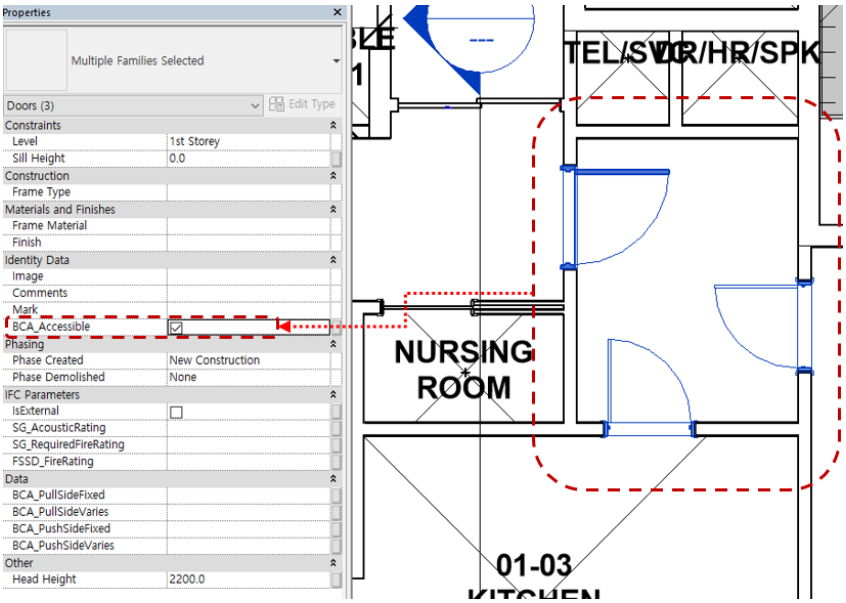


Figure 26. Accessible Door by using Property

Creating an Accessible Route

Accessible Route on the door is defined by must placing the 'Accessible Route' on the door.

To create an accessible route, the steps are as follows (Refer to Section 4.3.2 for more details):

(Revit → Architecture → Component → Place a component → Draw the 'SG_Name: Accessible Route' on the door)

The system is able to check all the cases shown in **Figure 27** where the 'Accessible Route' is drawn on the door.

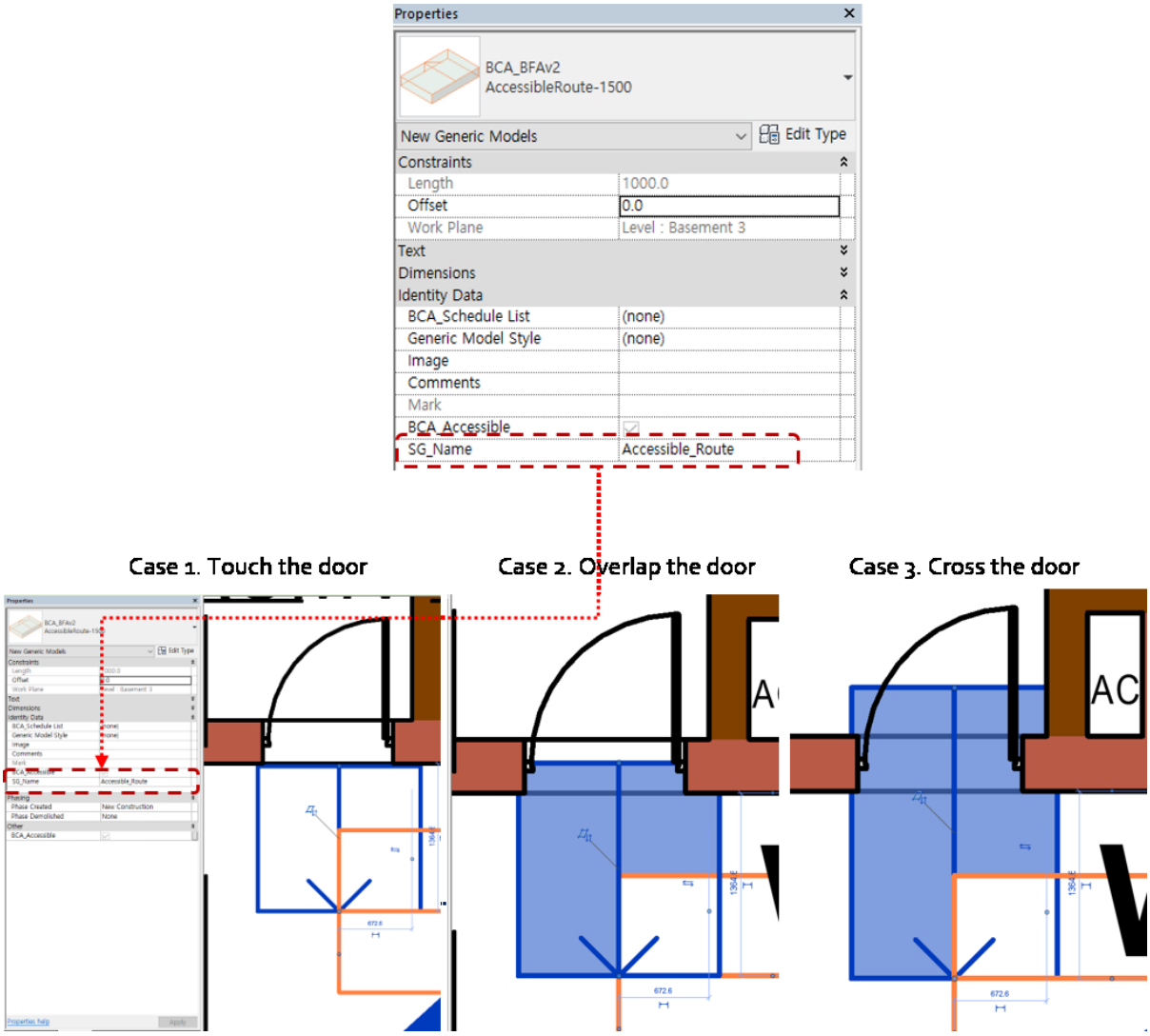


Figure 27. Drawing Method for the Accessible Door

Caution!

Do not use door objects with clearance box provided in the previous BCA Template. As the clearance box is recognized as a door object, it is difficult to check the door clear opening accurately.

In cases where the door is part of the curtain wall panel, the mullion around the curtain wall door must be removed because the curtain wall mullion may collide with the boundary of manoeuvring space.

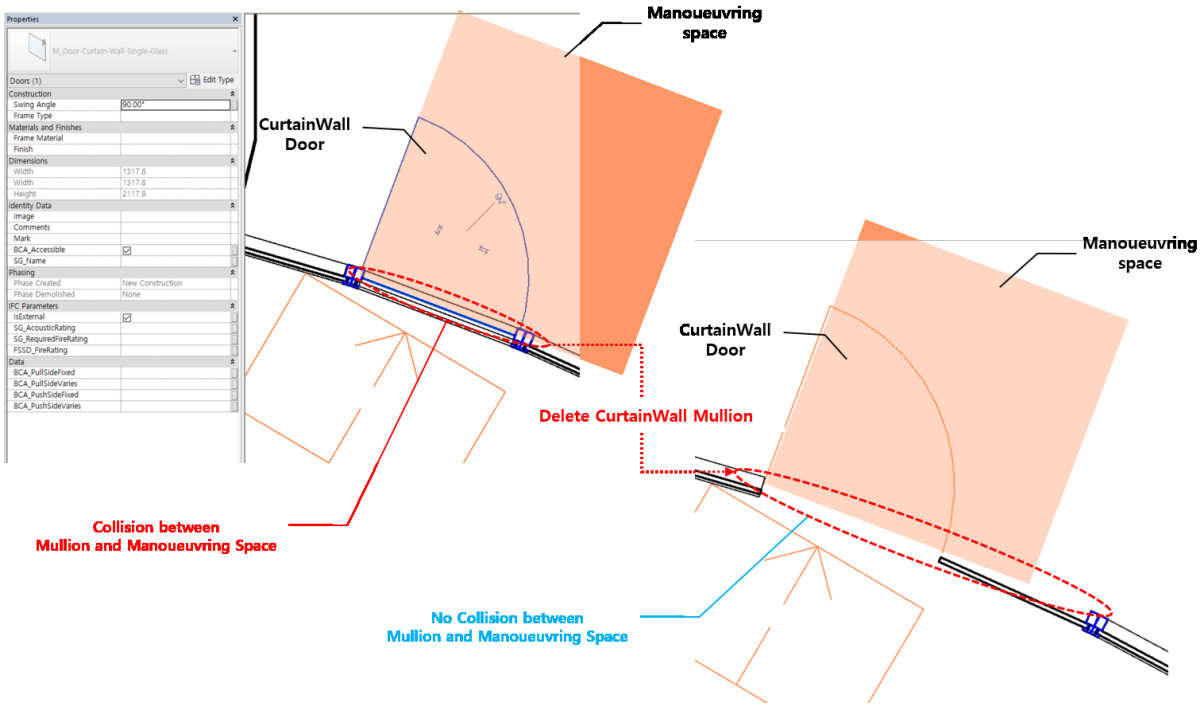


Figure 28. Collision around the Curtain Wall Mullion

4.3 Accessible Route

4.3.1 Regulation of Accessible Route

<table>
<tr><th>Document</th><th>Clause No.</th><th>Regulation</th></tr>
<tr><td>Code on Accessibility in the built environment 2013</td><td>4.2</td><td>
Accessible Routes, Corridors and Paths

The minimum width of the accessible routes, corridors and paths shall be as prescribe in Table 7.

Table 7. Accessible Route Widths
<table>
<tr><th>Building Type</th><th>Minimum width of accessible route</th></tr>
<tr><td>Residential developments, hotels, boarding houses, service apartments, workers' dormitories, hotels, halls of residence or dormitories etc.

Schools, office buildings

Factories, workshops, industrial buildings and offices/showroom areas in warehouse</td><td>1500mm</td></tr>
<tr><td>Universities, colleges and similar institutions of learning

Parks, open spaces and places of public resort

Sport complexes and public swimming pools

MRT stations and bus interchanges and passenger terminals

Shopping centres or food centres, restaurants and eating establishments

Hospitals, nursing homes, welfare homes and homes for the aged</td><td>1800mm</td></tr>
</table>
</td></tr>
</table>

4.3.2 Creating an Accessible Route

For the checking of "Primary Accessible Route Width for Wheelchair Users", the Accessible Route in the space is defined by creating an accessible route.

Setting of 'SG_Name' Property *(Refer to Section 1.2 for details on how to set up)*

Project Parameters	
Name	SG_Name
Discipline	Common
Type of Parameter	Text
Group parameter under	Identity Data
Categories	Generic Models
Parameter Type	Select **'Instance'** and select 'Values are aligned per group type'

To create an accessible route, the steps are as follows:

(Revit → Architecture → Component → Place a component → Draw the 'Accessible Route' in the space (Route part))

- **Family**: BCA_BFAv2
- **Type:** AccessibleRoute-1500/1800
- **Identity Data:**
    - SG_Name: Accessible_Route
- **Dimensions:**
    - Accessible Route width: 1500mm
      (Typology: Residential Development/Industrial/Institution/School)
    - Accessible Route width: 1800mm
      (Typology: Commercial, Bridge, Jetty, Parks etc)

Users must place the **'Accessible Route'** in the Access Route space as follows:

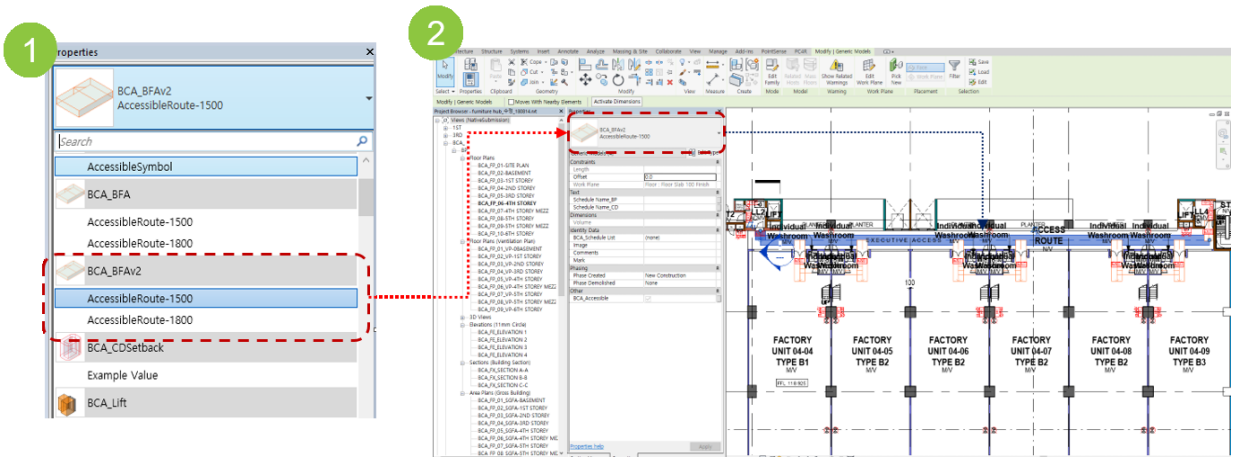


Figure 29. Drawing the Accessible Route in the Access Route Space

5 Sanitary Provision

5.1 Naming – Space (Sanitary)

Create the WC Compartment / Individual Washroom

Space objects are required for Sanitary provision checking.

Space Naming Rules Special Cases:

- For the Toilet Cluster - SG_Name: **WASHROOM** / Reference: **Toilet Cluster** (using Area function)
- For the WC Compartment - SG_Name: **WASHROOM_COMPARTMENT** (using Room function)
- For the Individual Washroom - SG_Name: **WASHROOM** (using Room function)

Setting of 'SG_Name' Property *(Refer to Section 1.2 for details on how to set up)*

Project Parameters	
Name	SG_Name
Discipline	Common
Type of Parameter	Text
Group parameter under	Identity Data
Categories	Rooms, Areas
Parameter Type	Select **'Instance'** and select 'Values are aligned per group type'

Users must specify the **SG_Name** under: **Properties → Identity Data → SG_Name**

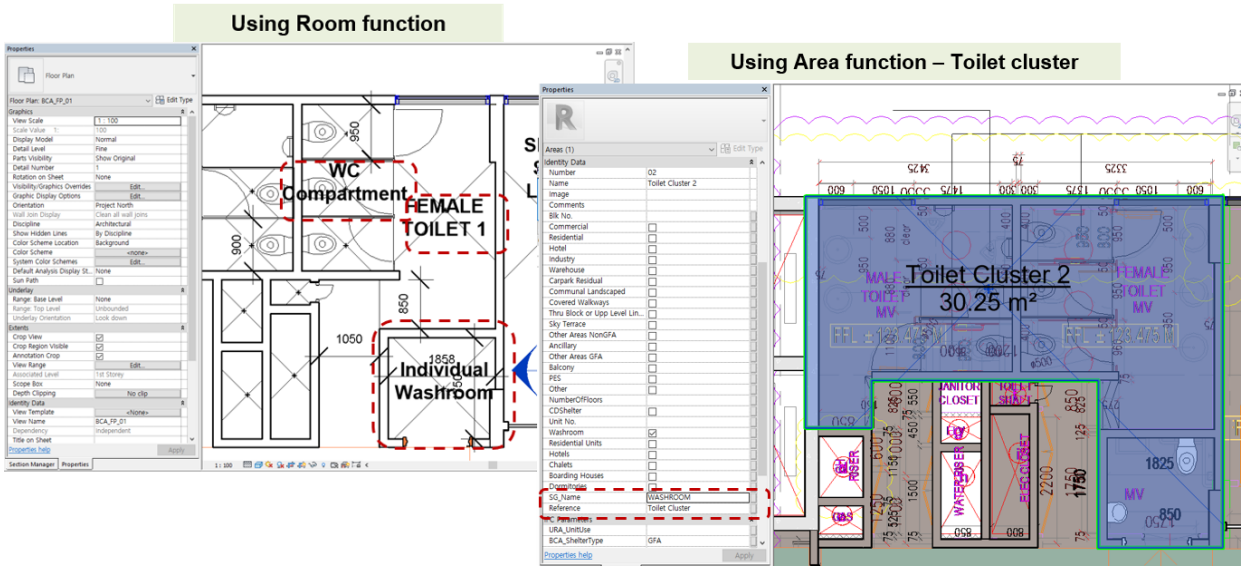


Figure 30. Setting of Room/Area Name for the Sanitary Checking

5.2 Setting of the 'BCA_Accessible' Property

For **Accessible Toilet cluster**, use the **'BCA_Accessible'** and **'Reference'** property and **SG_Name** of rooms to define Accessible WC Compartment in Toilet Cluster:

- **Toilet = Reference: Toilet Cluster**
- **Accessible WC Compartment = SG_Name: WASHROOM_COMPARTMENT + BCA_Accessible**

For **Accessible Individual Washroom**, use the **'BCA_Accessible'** property and **SG_Name** of rooms to define Accessible individual washroom:

- **Accessible Individual Washroom = SG_Name: WASHROOM + BCA_Accessible**

For information on modifying Revit Project Property, refer to Section 1.2.

Project parameters		
Name	BCA_Accessible	Reference
Discipline	Common	Common
Type of Parameter	Yes/No	Text
Group parameter under	IFC Parameter → Identity Data	Identity Data

Categories	Rooms, Areas
Parameter Type	Select **'Instance'** and select 'Values are aligned per group type'

The space names and property definitions for sanitary item checking are shown in the **Table 8**.

Table 8: Classification for the Sanitary Checking

Room Category	Used Function	Name	BCA_Accessible	Reference
Individual Washroom	Room	SG_Name: WASHROOM	No	-
Cluster of Toilet	Area	-	No	Toilet Cluster
WC Compartment	Room	SG_Name: WASHROOM_COMPARTMENT	No	-
Accessible Individual Washroom	Room	SG_Name: WASHROOM	Yes	-
Accessible WC Compartment	Room	SG_Name: WASHROOM_COMPARTMENT	Yes	-

5.3 Accessible Washroom Provision

5.3.1 Regulation of Washroom Provisions

Document	Clause No.	Regulation
Code on Accessibility in the built environment 2013	5.1.1	**Sanitary Provision** At every level of a non-residential building where toilets are provided, at least one accessible individual washroom shall be provided

Code on Accessibility in the built environment 2013	5.1.2	**Sanitary Provision** In non-residential buildings, other than factory, workshop, office/showroom areas in warehouses industrial buildings, where **two or more clusters of toilets** are provided at the same level but at different locations, the corresponding number **of accessible individual washroom shall be provided.** Each accessible individual washroom may be **replaced with one accessible water closet compartment** in the male and female toilets, provided that there is at least one accessible individual washroom on the same level.

5.3.2 Creating the Accessible WC Compartment & Accessible Individual Washroom

The room name and property settings must be defined accurately (Table 8) for the checking of the **Provision of Accessible WC Compartment** and **Accessible Individual Washroom**.

- Toilet Cluster = Reference: “Toilet Cluster”
- Accessible WC Compartment = BCA_Accessible’ + SG_Name: WASHROOM_COMPARTMENT +
- Accessible Individual Washroom = ‘BCA_Accessible’ + SG_Name: WASHROOM

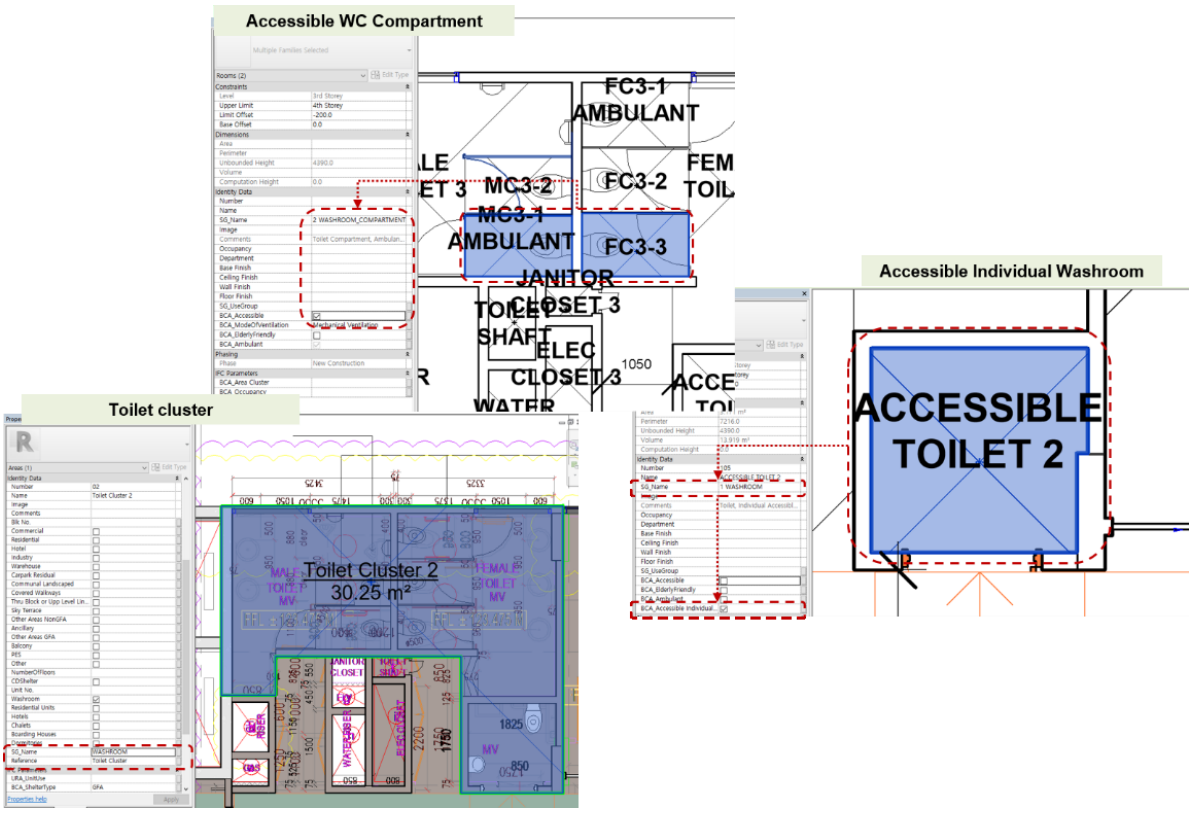


Figure 31. Setting of the Accessible Sanitary Rooms

Caution!

Toilet (drawn by area function) must contain all WC Compartments within the toilet cluster, as shown as **Figure 31**.

5.4 Accessible Individual Washroom

Definitions for Accessible Individual Washroom follow Table 8.

5.4.1 Regulation of Accessible Individual Washroom

Document	Clause No.	Regulation
Code on Accessibility in the built environment 2013	5.2.1.a	**Accessible Individual Washrooms** Accessible individual washrooms shall: Have minimum clear dimension between opposite walls of **1750mm** or more
Code on Accessibility in the built environment 2013	5.2.1.b	**Accessible Individual Washrooms** Accessible individual washrooms shall: Have a clear space of **900mm by 1500mm** or more adjacent to the water closet;
Code on Accessibility in the built environment 2013	5.2.2	**Accessible Individual Washrooms** An accessible individual washroom for the wheelchair user has clear space in front of WC more than **1000mm deep by 880mm width**.
Code on Accessibility in the built environment 2013	5.2.1.c	**Accessible Individual Washrooms** Accessible individual washrooms shall: Have a clear door opening **more than 850mm**

Note:

Of the items listed above, checking for **5.2.1.a/5.2.1.c** are automatically checked if they have been modelled accurately. Please refer to the above table for details.

5.4.2 Creating the Water Closet Object

Object Name Specifications: 'Water Closet'

For the checking of Water Closet, the object is classified under **SG_Name**: **"Water_Closet".**

Create Water Closet Object

To create a new plumbing fixture object, the steps are as follows:

(Revit → System → Plumbing Fixtures → Identity Data → SG_Name → Water_Closet)

- **Identity Data:**
  - SG_Name: Water_Closet

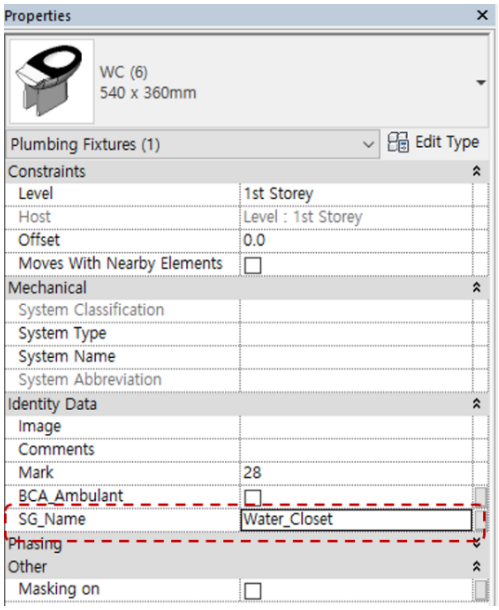


Figure 32. Setting of Water Closet

It is important to specify the word **'Water_Closet'** into the SG_Name if the IfcFlowTerminal object is meant to be a water closet.

5.4.3 Place the Water Closet Object in Accessible Individual Washroom

Water closets are required for the checking of **Clear space** and **Front space** (Clause No. 5.2.1.b, 5.2.2).

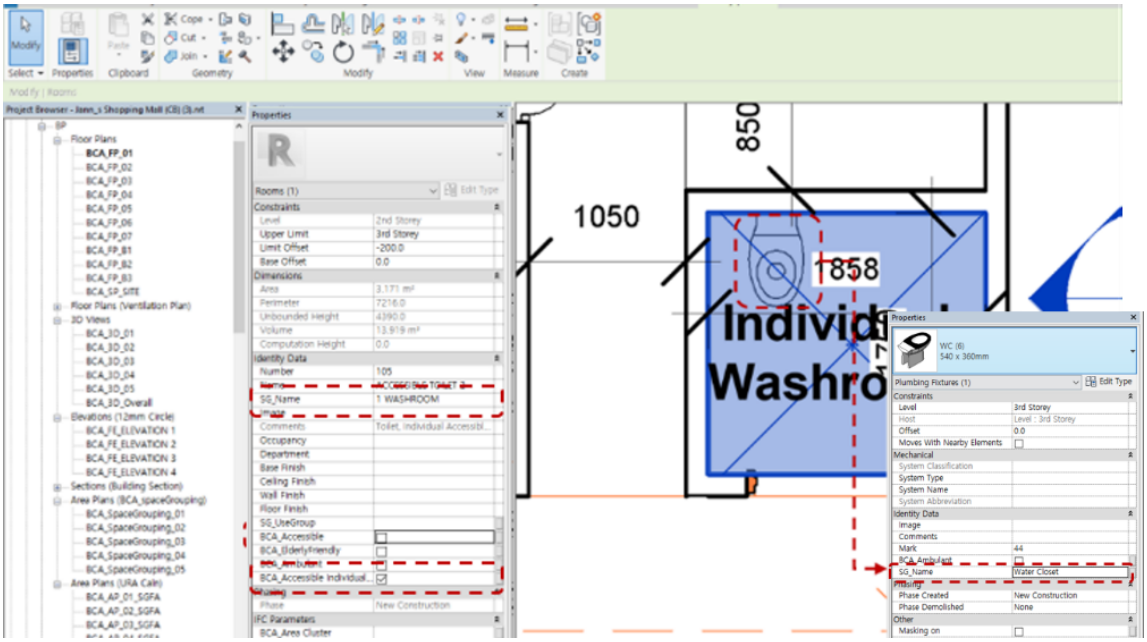


Figure 33. Water Closet Placement in Accessible Individual Washroom

6 Ventilation

6.1 Ventilation

6.1.1 Regulation of Ventilation

Document	Clause No.	Regulation
Approved Document	G.2.1	**Ventilation** Ventilation shall be adequately provided in a building for its intended occupancy..
Approved Document	G.2.2	**Ventilation** Residential building, other than houses built by the owners for their own use, shall be provided with natural ventilation for the purpose of paragraph G.2.1

6.1.2 Setting of Mode of Ventilation

For the checking of ventilation, the ventilation property of each space must be defined by using 'BCA_ModeofVentilation' property**. Therefore, all rooms must have a Mode of Ventilation value.**

Project Parameters	
Name	BCA_ModeofVentilation
Discipline	Common
Type of Parameter	Text
Group parameter under	Identity Data
Categories	Rooms,
Parameter Type	Select **'Instance'** and select 'Values are aligned per group type'

Setting of Ventilation Window

The configuration screen in Revit is shown below **Figure 34.**

- **Identity Data:**
    - BCA_ModeOfVentilation: Mechanical Ventilation
      Natural Ventilation

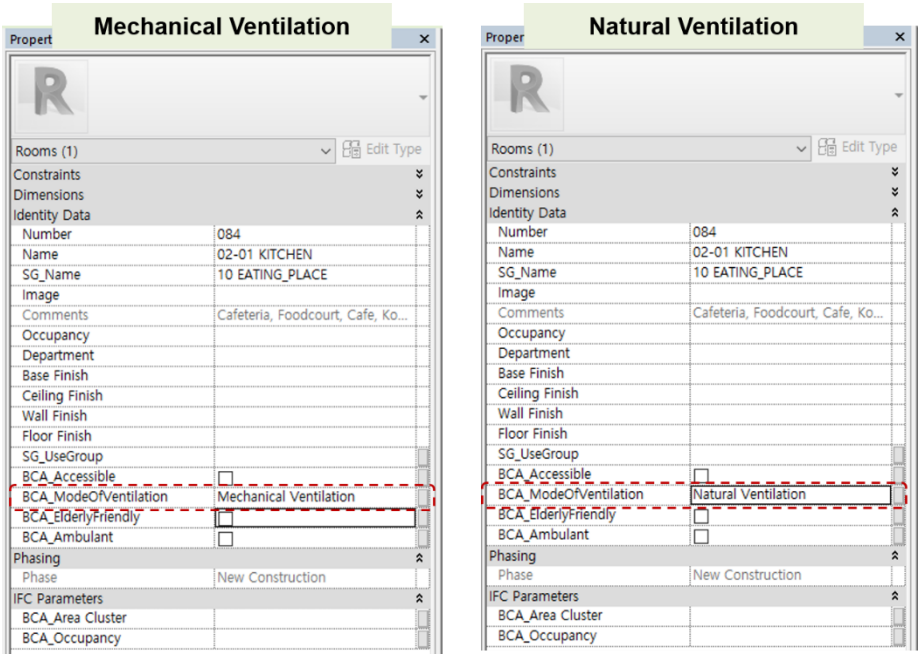


Figure 34. Setting of Mode of Ventilation

6.2 Natural Ventilation

6.2.1 Regulation of Natural Ventilation

<table>
<tr><th>Document</th><th>Clause No.</th><th>Regulation</th></tr>
<tr><td>Approved Document</td><td>G.3.2.1</td><td>Natural Ventilation

Natural ventilation shall be provided by means of one or more openable windows or other openings with an aggregate area of not less than -</td></tr>
<tr><td>Approved Document</td><td>G.3.2.1.a</td><td>Natural Ventilation

Natural ventilation shall be provided by means of one or more openable windows or other openings with an aggregate area of not less than
(a) 5% of the floor area of the room or space required to be ventilated;</td></tr>
<tr><td>Approved Document</td><td>G.3.2.2.b</td><td>Natural Ventilation

The windows or other openings shall be located such that they open to –

(b) An airwell with a minimum width of 3.0m</td></tr>
<tr><td>Approved Document</td><td>G.3.2.2.b(i)</td><td>Natural Ventilation

The windows or other openings shall be located such that they open to –

An airwell with a minimum width of 3.0m and a minimum area open to the sky complying with Table G.3.2.2(a)
<table><tr><td>Height</td><td>Minimum airwell size (m^2)</td></tr><tr><td><= 30m</td><td>10</td></tr><tr><td>Subsequent 3m</td><td>+1</td></tr></table>Table G.3.2.2(a) – Dimension of airwells</td></tr>
<tr><td>Approved Document</td><td>G.3.2.2.b(ii)</td><td>Natural Ventilation

The windows or other openings shall be located such that they open to –

An airwell with a minimum width of 3.0m and a minimum area open to the sky complying with Table G.3.2.2(a)
<table><tr><td>Height</td><td>Minimum airwell size (m^2)</td></tr><tr><td><= 30m</td><td>10</td></tr><tr><td>Subsequent 3m</td><td>+1</td></tr></table>Table G.3.2.2(a) – Dimension of airwells</td></tr>
</table>

6.2.2 Setting for the Natural Ventilation Checking

For the checking of natural ventilation area, use the 'BCA_VentilationOpening' property to define the ventilation rate of the windows, and define the airwell using SG_Name.

Project parameters		
Name	BCA_VentilationOpening	SG_Name
Discipline	Common	Common
Type of Parameter	Integer	Text
Group parameter under	Identity Data	Identity Data
Categories	Windows	Rooms
Parameter Type	Select **'Instance'** and select 'Values are aligned per group type'	

6.2.3 Create the Ventilation Windows

Ventilation Windows are required for the checking of natural ventilation area ratio (Clause No.G.3.2.1, G.3.2.1.a, G.3.2.2.b, G.3.2.2.b(i), G.3.2.2.b.(ii)).

To create a new plumbing fixture object, the steps are as follows:

(Revit → Architecture → Window → Identity Data → BCA_VentilationOpening → 0-100)

- **Identity Data:**
  - BCA_VentilationOpening: 0-100(Percentage value)

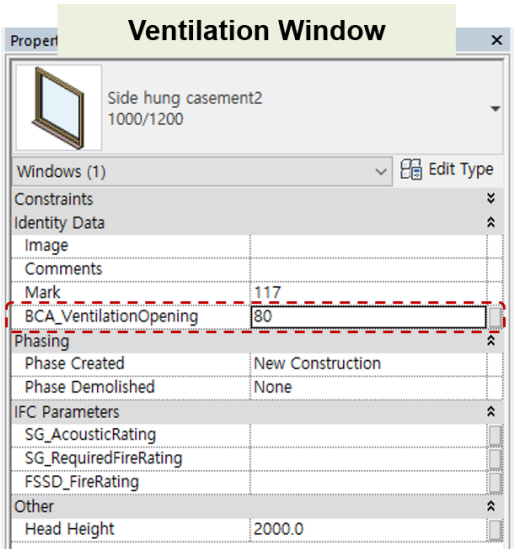


Figure 35. Setting of Ventilation Window

6.2.4 Space Naming - Airwell

For the checking Airwell related items, Airwell's space should be specified by using 'SG_Name' property. (Clause No.G.3.2.2.b, G.3.2.2.b(i), G.3.2.2.b.(ii))

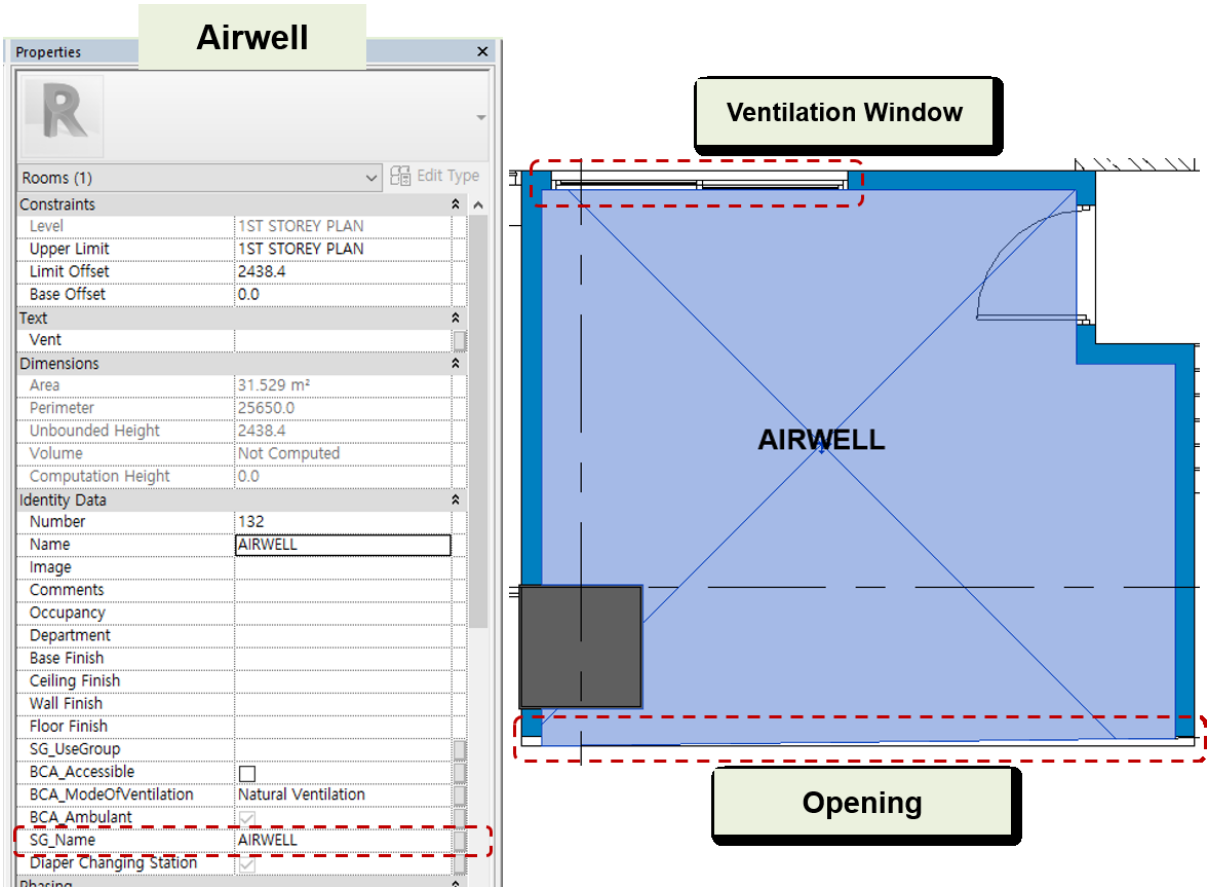


Figure 36 Setting of Airwell

CAUTION!

If the value of the **'BCA_VentilationOpening' property is absent or is 0**, it is determined that it is **not a ventilation window.**

7 Barrier

7.1 Safety Barrier

7.1.1 Regulation of Safety Barrier

Document	Clause	Regulation

	No.	
Approved Document	H.2.1	**Safety from Falling** Where there is **a vertical drop in level of 1.0m or more**, appropriate measure shall be taken to prevent people from falling from height.
Approved Document	H.3.2.1.a	**Height of Barrier** The height of a barrier shall not be less than – (a) **1.0m at all location** except for locations indicated in (b);
Approved Document	H.3.2.1.b	**Height of Barrier** The height of a barrier shall not be less than – (b) 900mm at the lower edge of the window and gallery or balcony with fixed seating in areas such as theatres, cinemas and assembling halls.
Approved Document	H.3.4.1	**Size of Opening** The lowest part of the barrier (**being at least 75mm measured from the finished floor level**) shall be built **with no gap**, in order to prevent any object from falling through the base of the barrier.

CAUTION!

"Human Accessible" areas are defined based on the existence of space objects. Hence, if a "space object" is modelled, the space will be deemed as a space where building occupants may enter.

Site topography must be modelled to prevent any false error from arising when checking for "Safety from Falling".

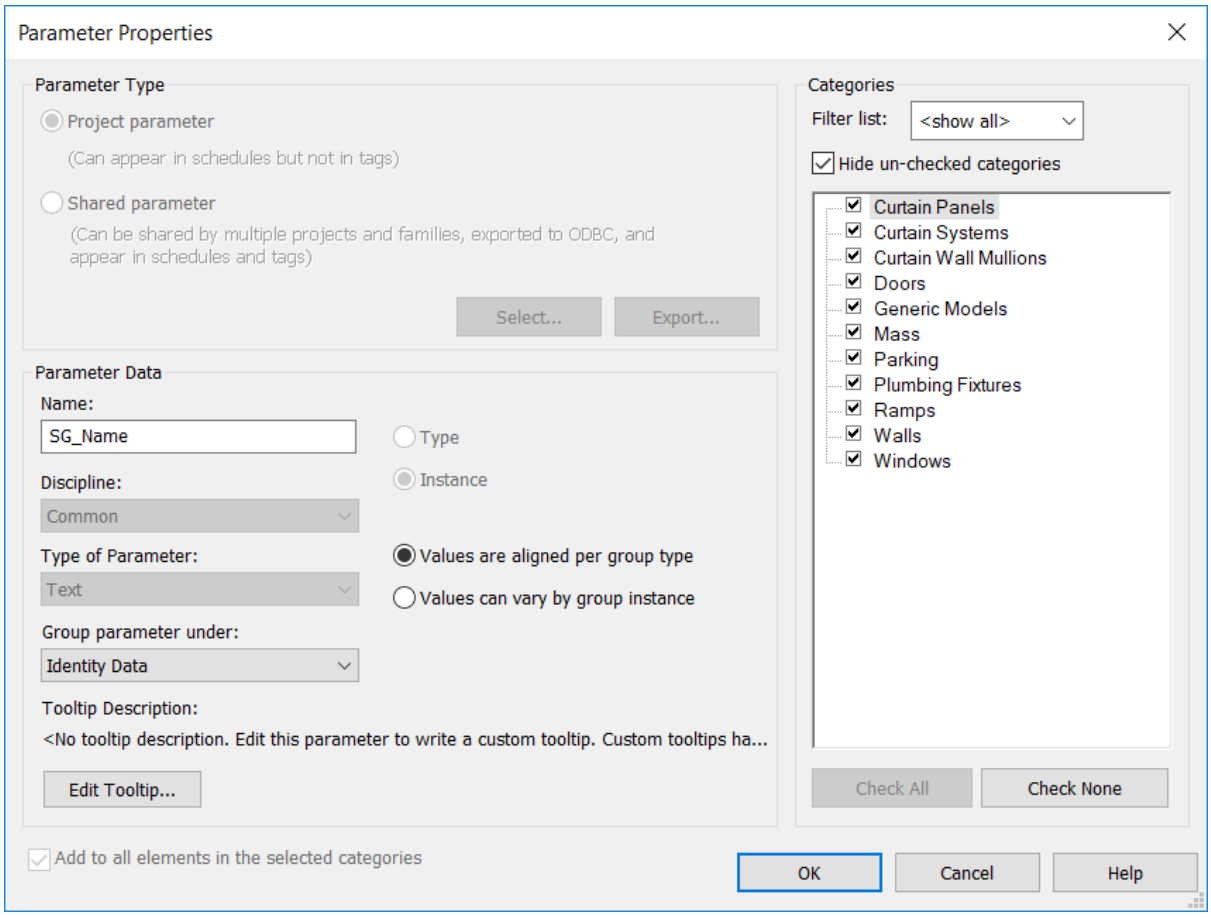
7.1.2 Creating a Barrier

For general safety barrier items (H.3.2.1.a, H.3.2.1.b, H.3.4.1), the system automatically recognizes based on space and barrier object **(Wall, Railing etc.)**. Therefore, no specific modelling method is required.

8 Appendix

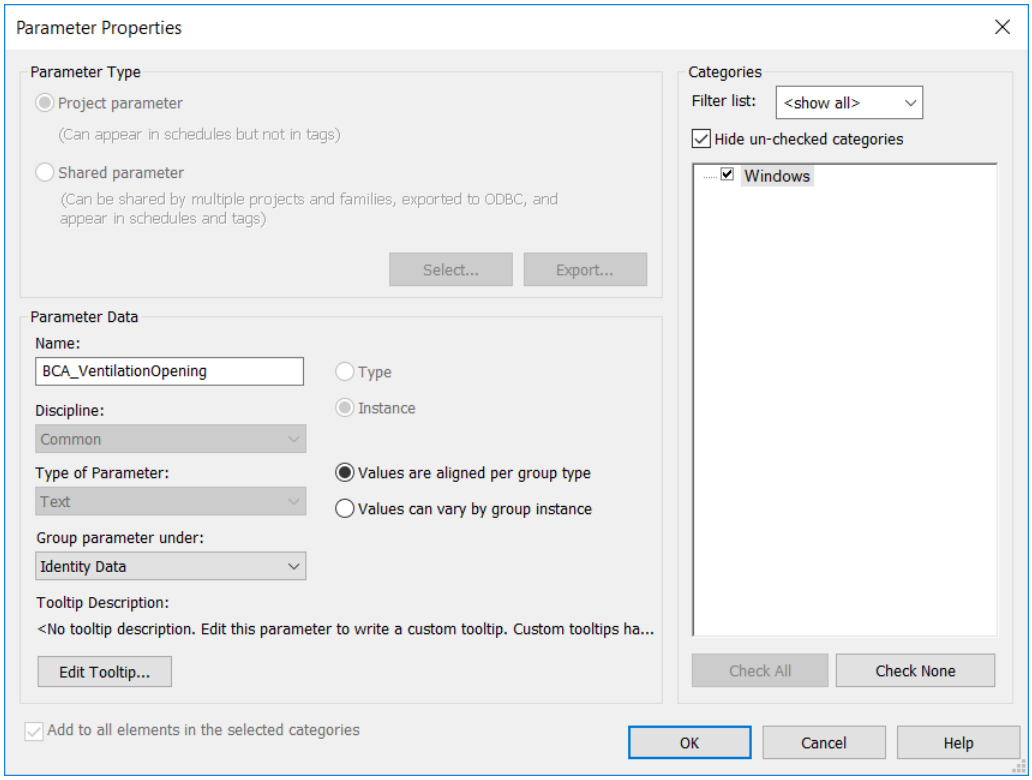
8.1 Project Parameter Screenshot

8.1.1 SG_Name

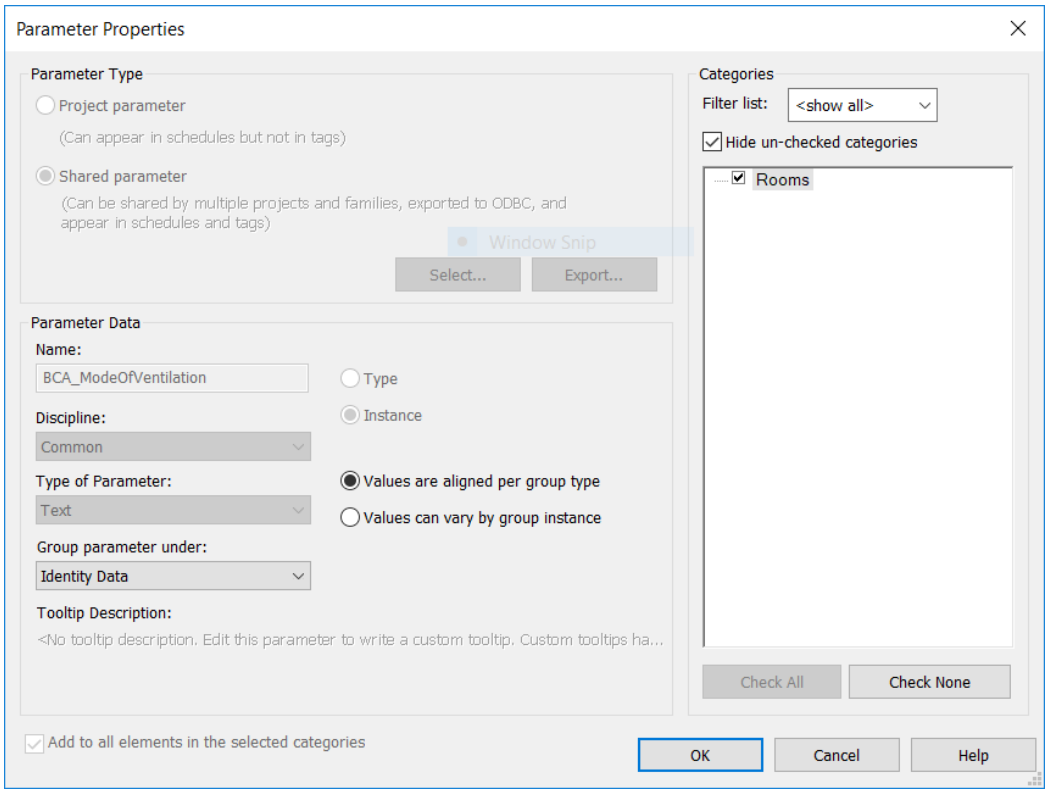


8.2 Shared Parameter Screenshots

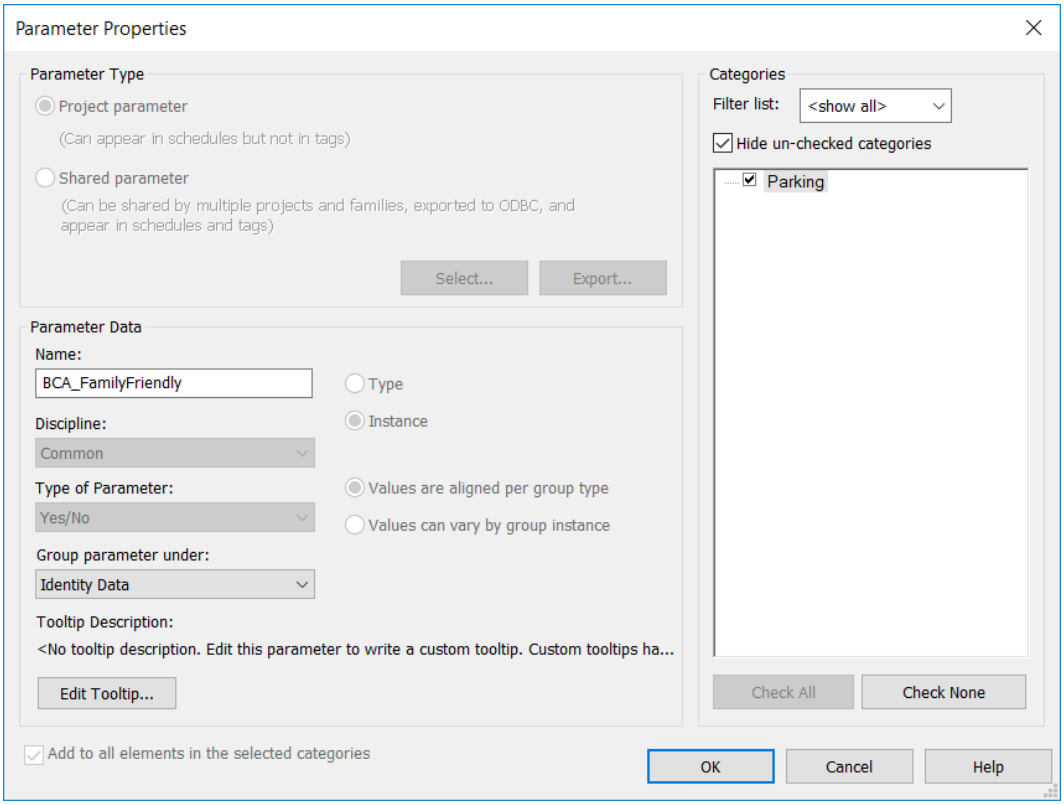
8.2.1 BCA_VentilationOpening



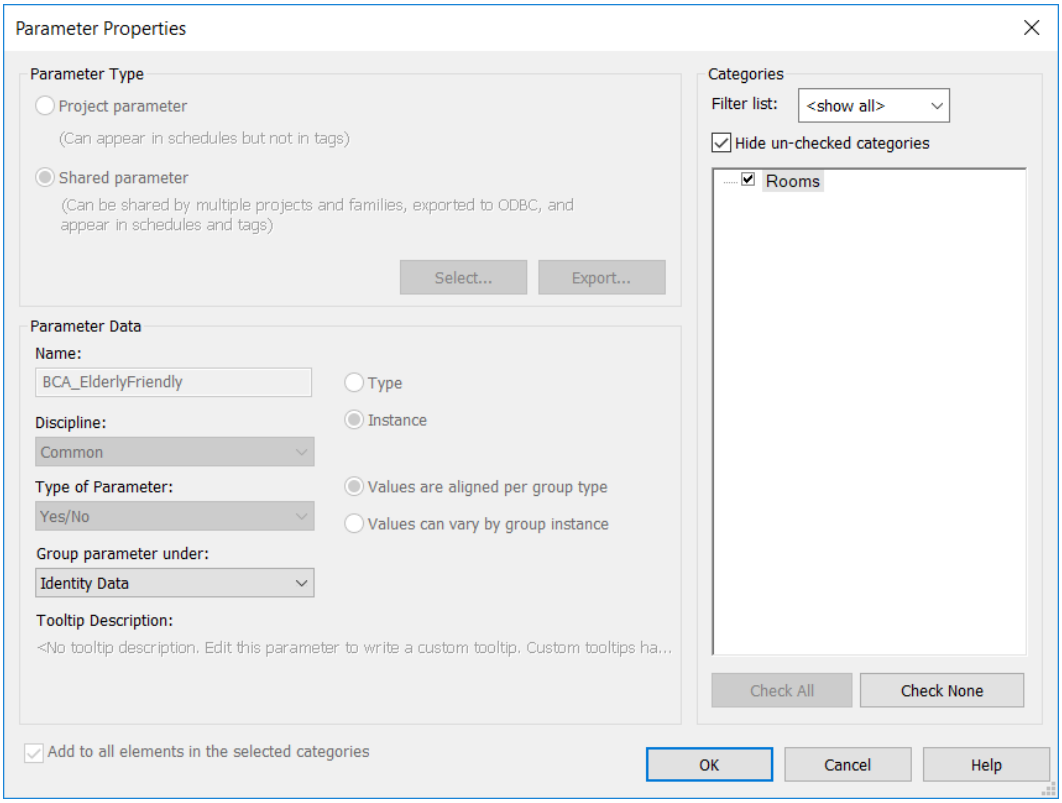
8.2.2 BCA_ModeOfVentilation



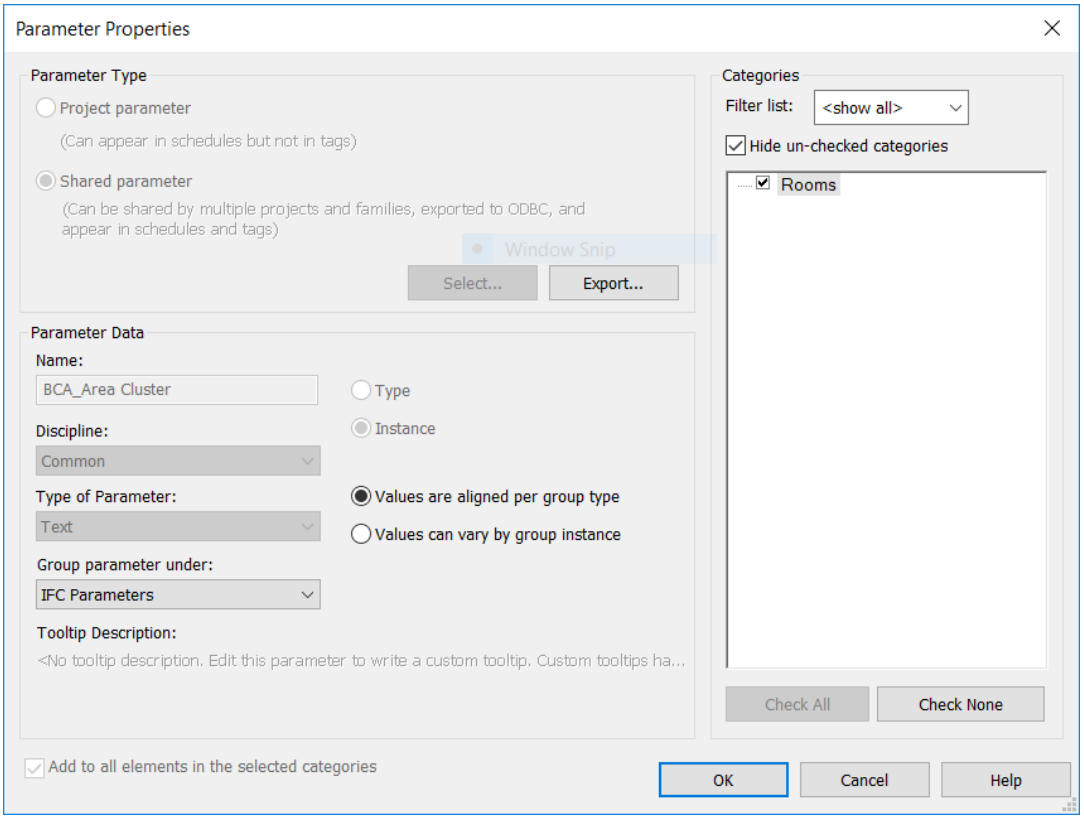
8.2.3 BCA_FamilyFriendly



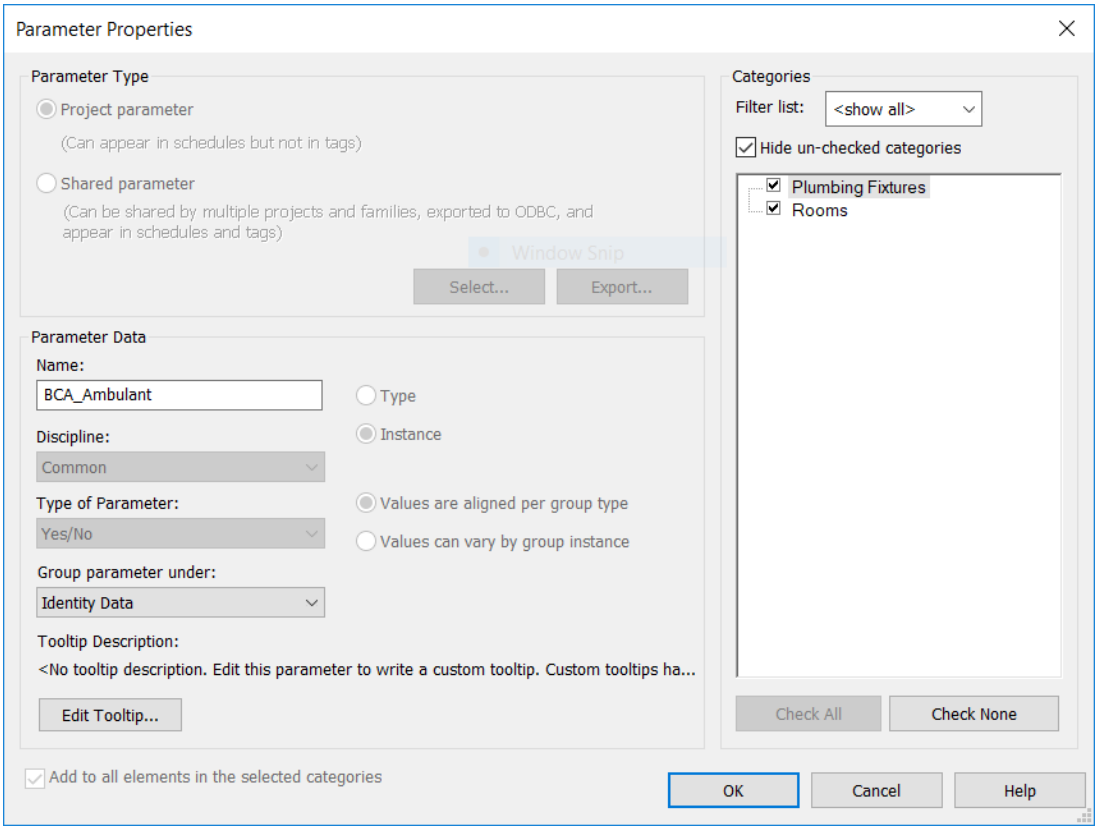
8.2.4 BCA_ElderlyFriendly



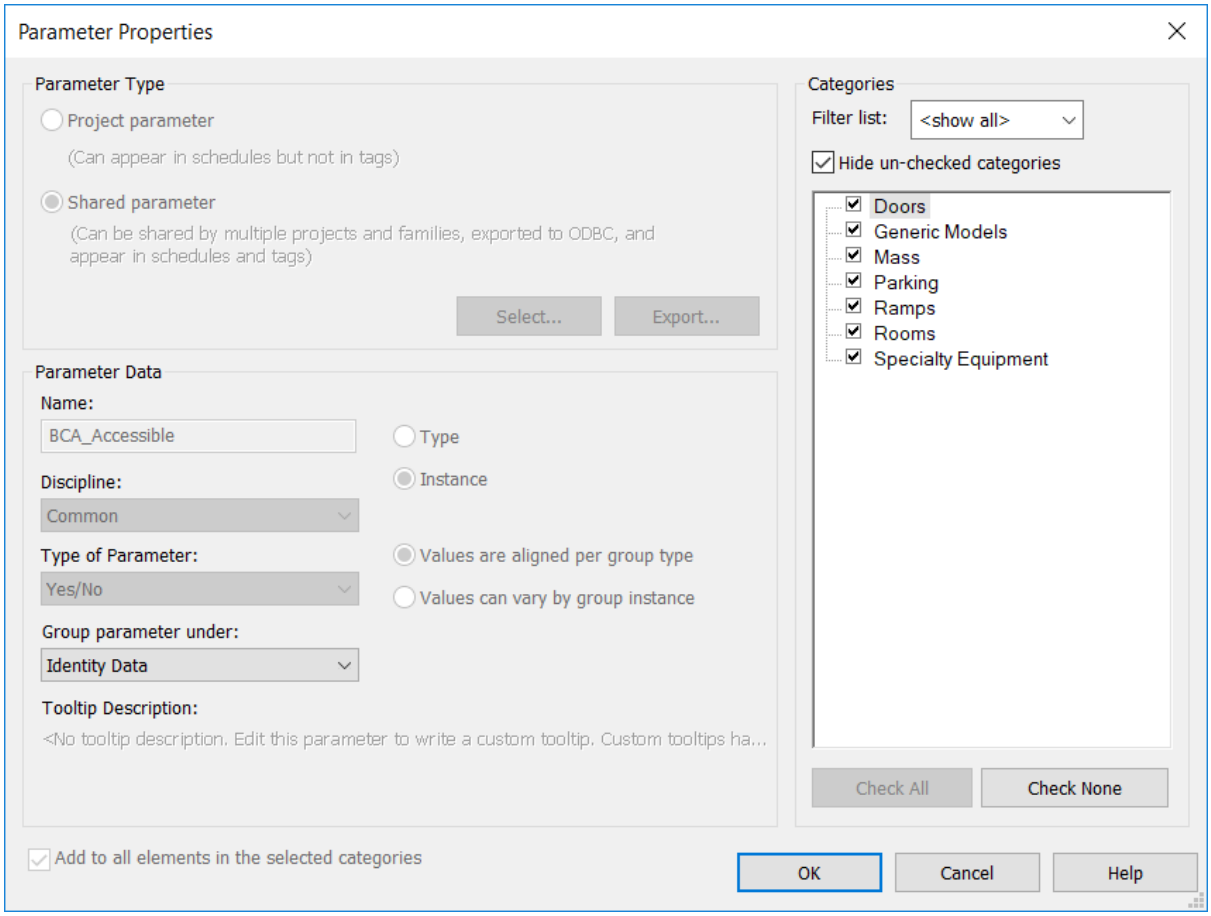
8.2.5 BCA_Area Cluster



8.2.6 BCA_Ambulant



8.2.7 BCA_Accessible



2-Stage Innovation Grant

Stage 2 POC Prototype – SBim Assess

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