OpenBuildings Designer How-to Guides

2022

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1 PREFACE

It is recommended that users have gone through the documents in the resource kit, which provides an overview on the requirements and the importance of preparing an IFC model for submission to Corenet X;

Step 0) How to Learn IFC-SG,
Step 1) IFC 101,
Step 2) Industry Mappings,
Step 3) Configurations (respective BIM Authoring Tool)

Users may refer to Step 4) Exercise on IFC Key Data Structure to verify their understanding when they have completed all the steps listed above.

INTRODUCTION

IFC-SG aims to adopt the international Industry Foundation Classes (IFC) standard as the base for the common representation for BIM submission. IFC is a standardized, digital description of the built asset industry. It is an open, international standard (ISO 16739-1:2018) and promotes vendor-neutral, or agnostic, and usable capabilities across a wide range of hardware devices, software platforms, and interfaces for many different use cases.

This document is intended as a reference for the users in preparing BIM files for submission in IFC-SG. It contains software configuration setup, export settings, and IFC-SG-specific concepts used to map the native information for the applicable IFC-SG export.

2   UNDERSTANDING IFC-SG

With IFC being a semantically rich data structure, IFC Concepts are captured and used to map objects for IFC-SG. The building elements listed in the IFC-SG BIM Objects Dictionary are derived from various regulatory handbooks that are mapped in the early stage of IFC-SG. These objects are any physical elements referred to as BIM concepts such as walls, doors, and windows, and non-physical elements such as building containers, space, properties, and material information. IFC Concepts provide another level of identifying what an object is. IFC concepts are

- Standard IFC entities and types,

- Predefined type enumeration, and

- IFC standard property set(s).

When no directly appropriate entity, predefined type, or property set is found, standard extension using USERDEFINED ObjectTypes and USERDEFINED PropertySets "SGPset_" is used.

3   IFC4 REFERENCE VIEW

IFC-SG is mapped using IFC4 Reference View, which is currently the broadest proliferation of IFC BIM data across many software application types supporting different communication and collaboration workflows.

IFC4 Reference View is particularly suitable for all BIM workflows that are based on reference models, where the exchange is mainly one-directional, similar to the workflow defined for the exchange in requirements in IFC-SG.

4   IFC-SG AS AN MVD

IFC-SG is much like what an MVD does. It is only a subset of requirement definition from the overall IFC schema to describe data exchange for a specific use or workflow. Mainly, it narrows down the scope of the IFC schema to one that will be used as an exchange requirement for the local building plans submission using a neutral format.
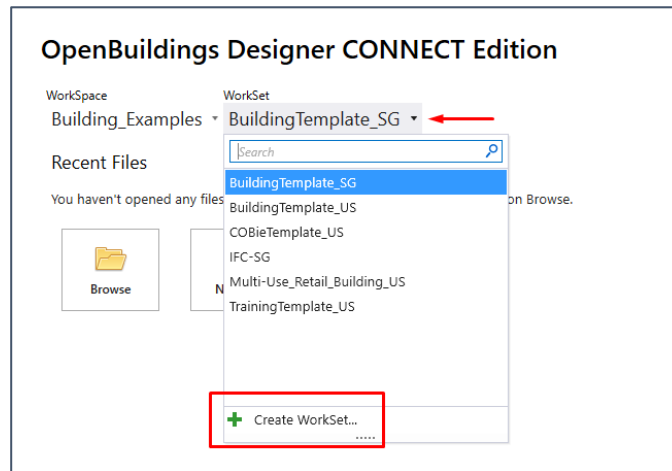
GENERAL BIM GUIDE

Note: It is preferable that users refer to the wiki from the authoring tool
https://communities.bentley.com/products/building/building_analysis___design/w/building_analysis_and_design_wiki/41119/openbuildings-designer

1   CREATING NEW WORKSETS

It is advisable to create a new workset since some of the files will be configured and userdefined psets will be added.

1. After opening OpenBuildings Designer, go to **Workset** and open the dropdown menu
2. Select **Create Workset…**

OpenBuildings Designer CONNECT Edition

WorkSpace   WorkSet
Building_Examples ▾ BuildingTemplate_SG ▾

Recent Files

You haven't opened any files ... on Browse.

BuildingTemplate_SG
BuildingTemplate_US
COBieTemplate_US
IFC-SG
Multi-Use_Retail_Building_US
TrainingTemplate_US

＋ Create WorkSet…

Browse

Creating New Workset

3. Type the name for the new *Workset.*
4. For the Template, open the dropdown menu and select **BuildingTemplate_SG.**
5. Click **Ok.**
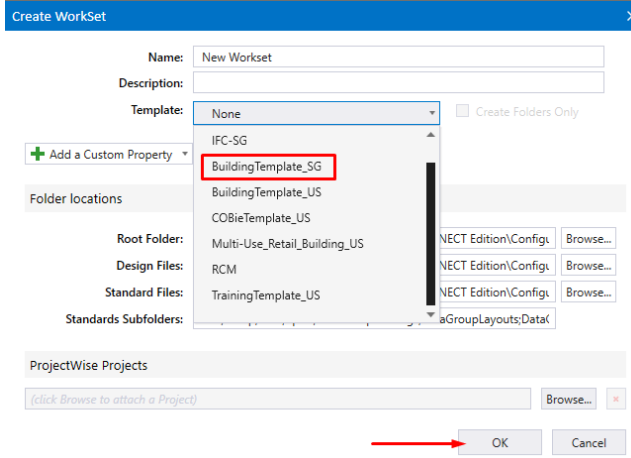
BuildingTemplate_SG as Template

CONFIGURING THE NEW WORKSET

The template's default setting excludes psets from the IFC configuration. The cfg file must be configured to expand the template's IFC Dataset. The worksets folder contains the CFG file. An example of a folder link is shown below.

C:\ProgramData\Bentley\OpenBuildingsCONNECTEdition\Configuration\WorkSpaces\Building_Examples\worksets

1. Open the CFG file of the new workset with Notepad or any text editor app.
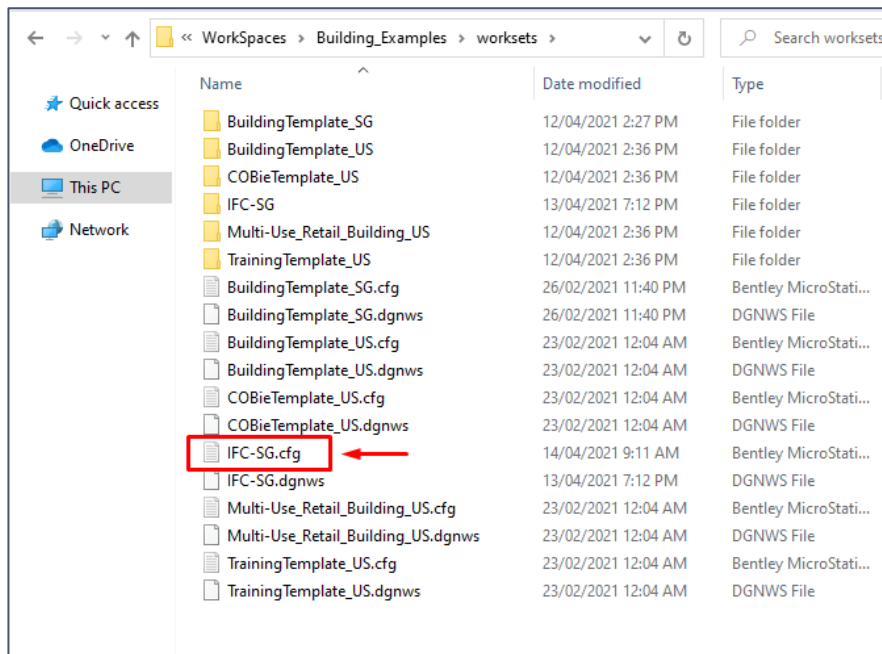
Editing IFC-SG.cfg File

2. Scroll down and look for *IFC Dataset Extension*.
3. Change the value of IFC_WORKSET to 1 to enable the psets in the template.


Enabling the Property Sets

4. Save the cfg file.

2 HOW TO APPLY PREDEFINED AND USERDEFINED-PREDEFINED TYPE

The corresponding IFC Class and Type are already mapped to the default objects in OpenBuildings. However, the user can modify the value of the Predefined and the Userdefined Type using the IFC4 Override Property if necessary.
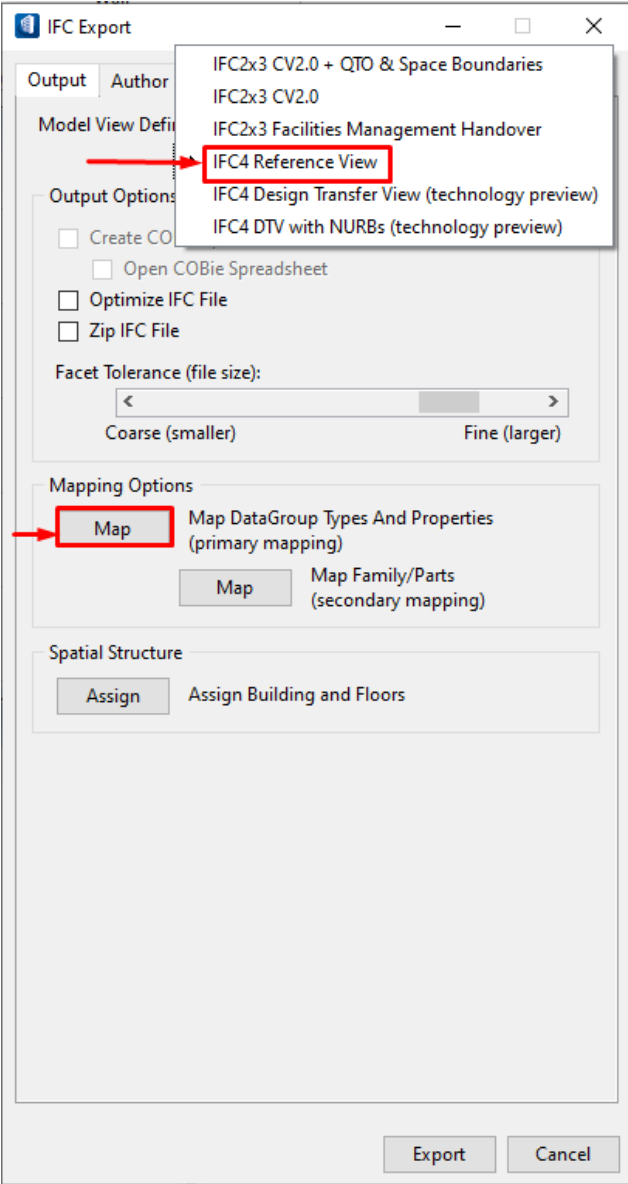
CLASS MAPPING

1. To edit the Predefined type, go to **File** and Select **Export**. Select **Exchange File Types** and choose **IFC.**
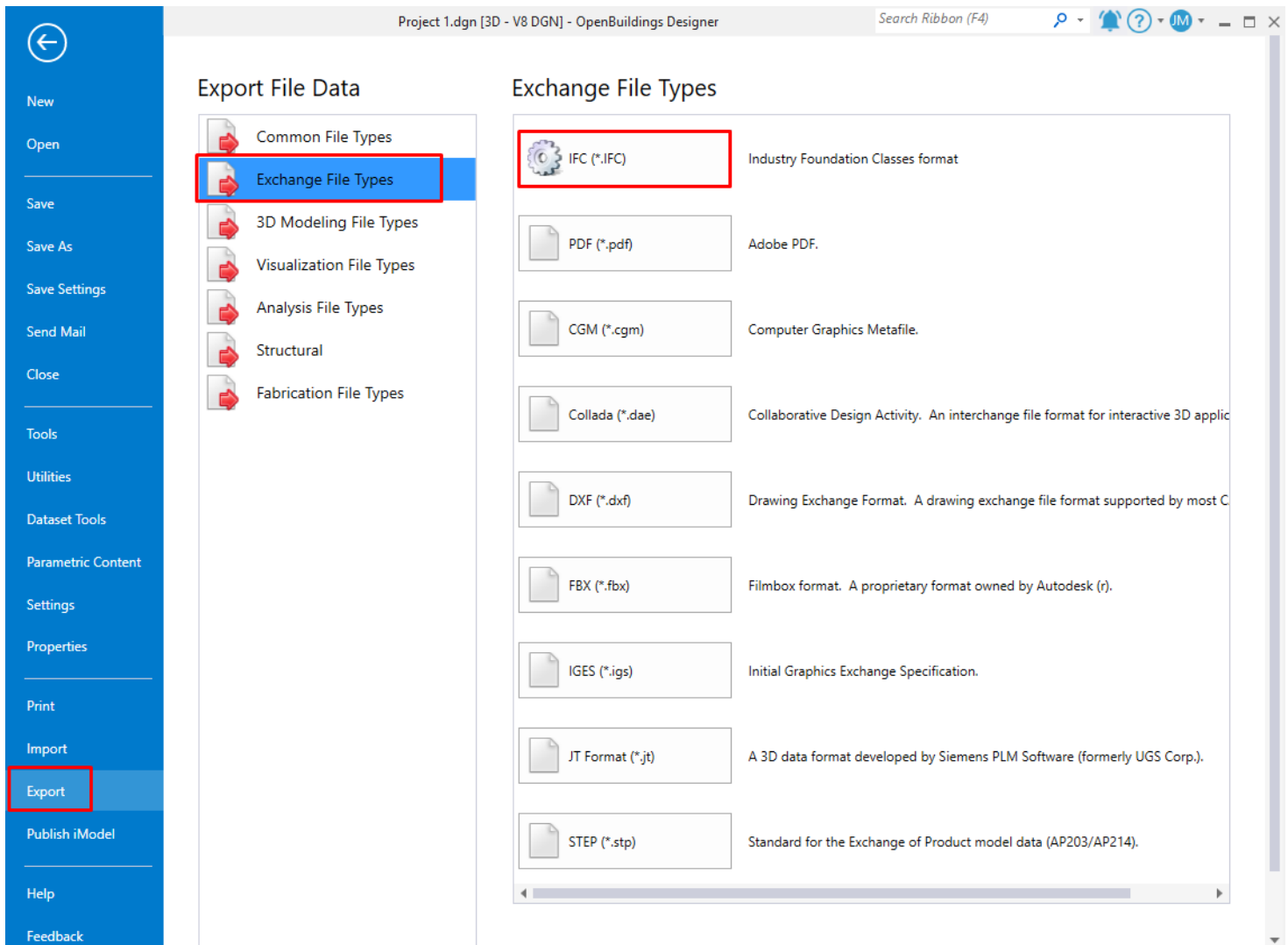
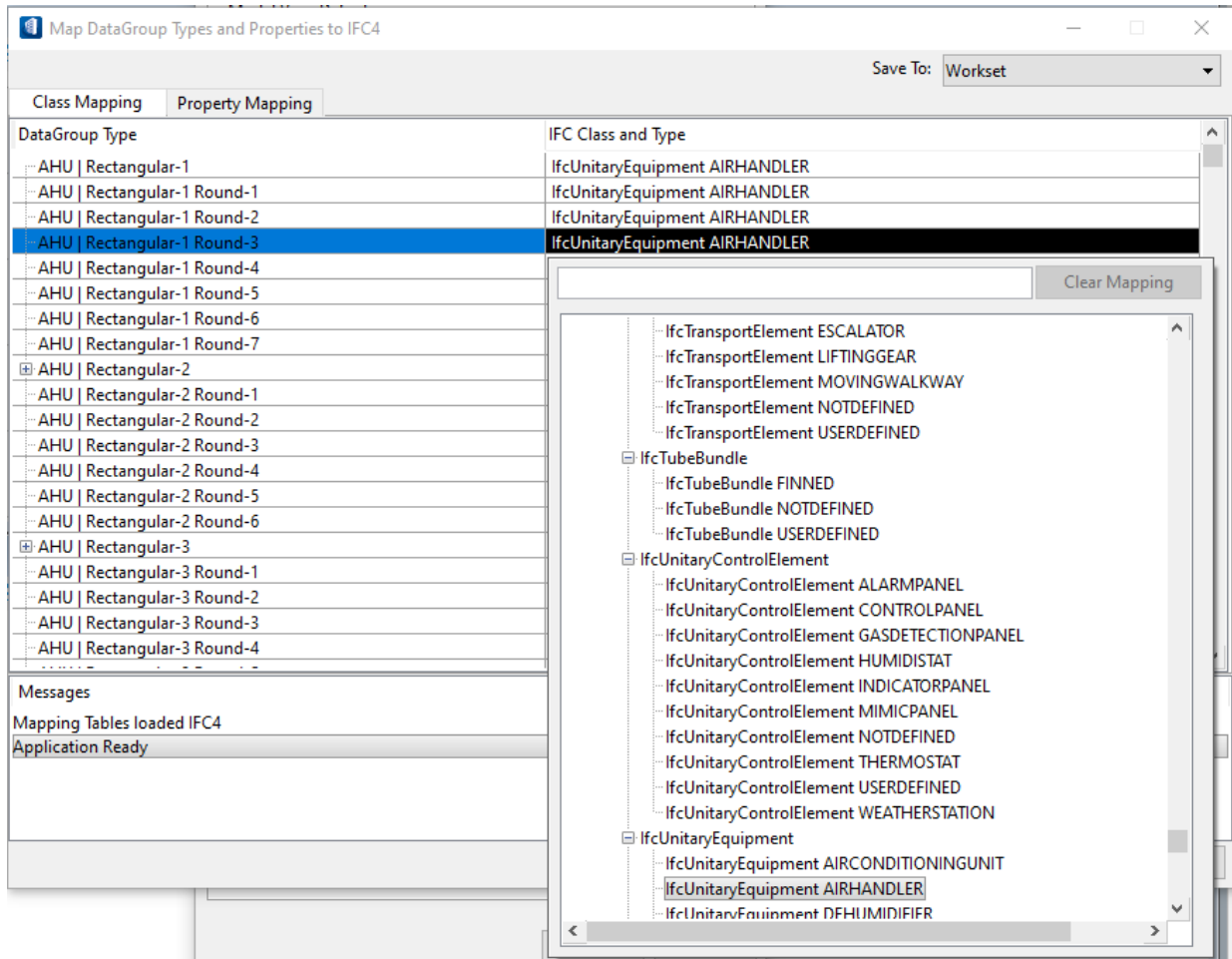**Export Settings for Class Mapping**

2. On the **Model View Definition**, open the dropdown list and select **IFC4 Reference View.**

3. Select **Map** (Map DataGroup Types and Properties) to open the list of all objects.

Map DataGroup Types and Properties from Mapping Options

4. To modify the Predefined Type of an object, select it and then click on the IFC Class and Type.


Modifying IFC Class and Type through Mapping Options

IFC4 OVERRIDE

The IFC4 Override is a property that can be assigned to any catalog type. Its function is to override the value of the IFC Class and Type of the object and modify the Predefined and Userdefined Type.

1. To assign the IFC4 Override property to any Catalog Type, Go to **File** and and under **Dataset Tools**, Select **Catalog Editor.**
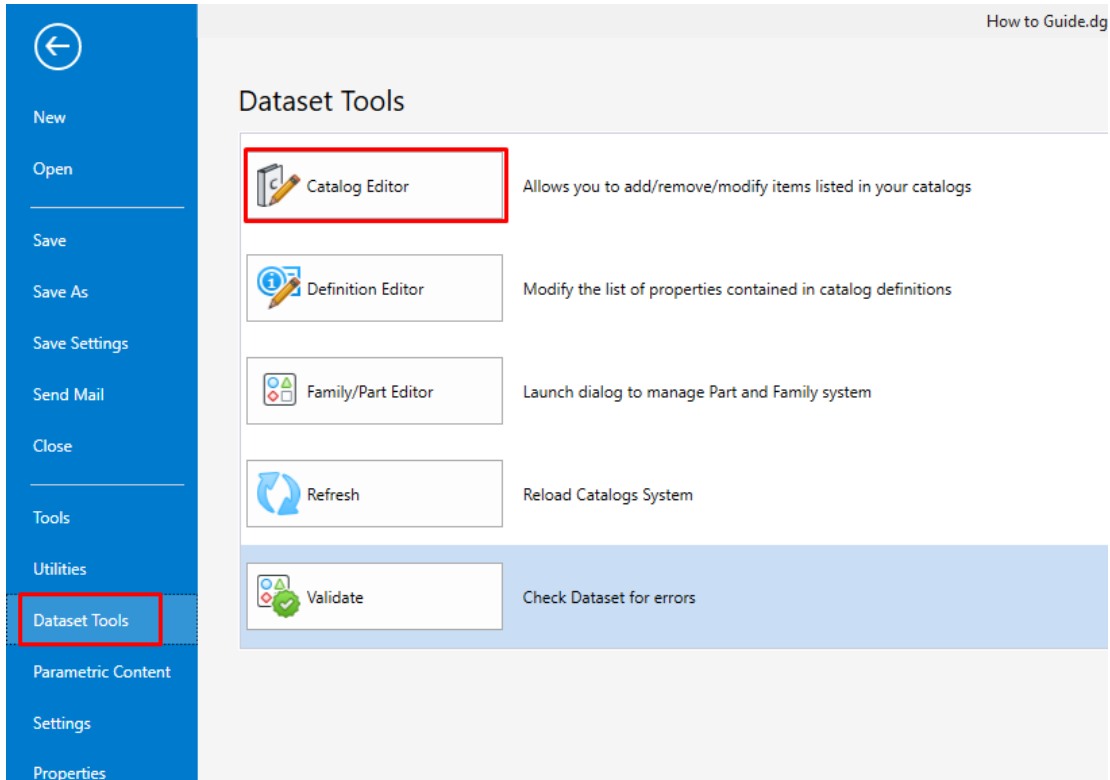
**Location of Catalog Editor**

2. Right click on the **Catalog Type** and select **Properties.**

3. On the available definitions on the left column, find and select **IFC_Override** and click the single forward button to assign the selected definition to the catalog type and click **Ok**.
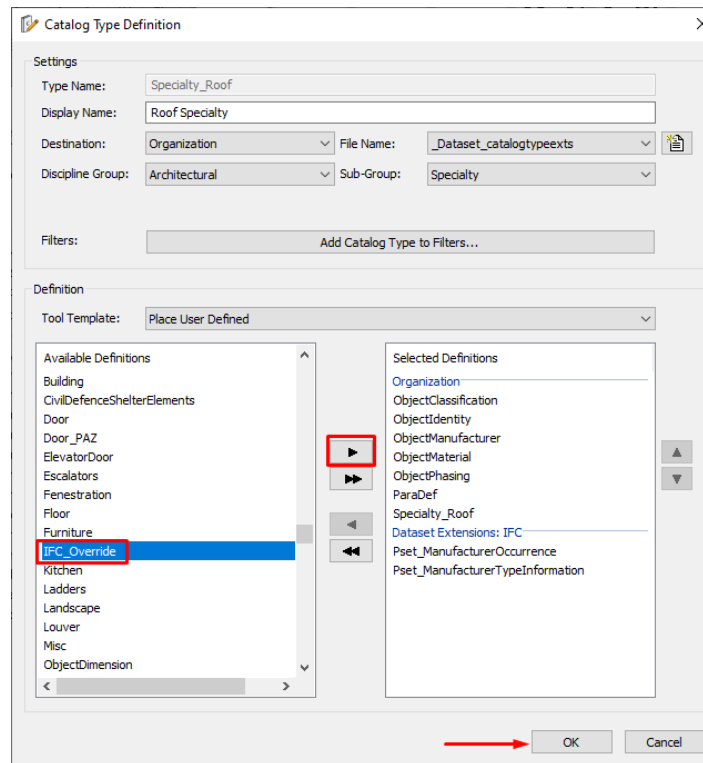
Adding IFC_Override as Selected Definitions for Roof Specialty

4. Save the changes made and restart OpenBuildings for the changes to apply.
5. Before placing an object, on the Modify Panel, look the IFC Override property and open the dropdown list of **IFC4 Class/Type Override** to select the appropriate Class and type the object type under the **User-Defined Object Type** property.
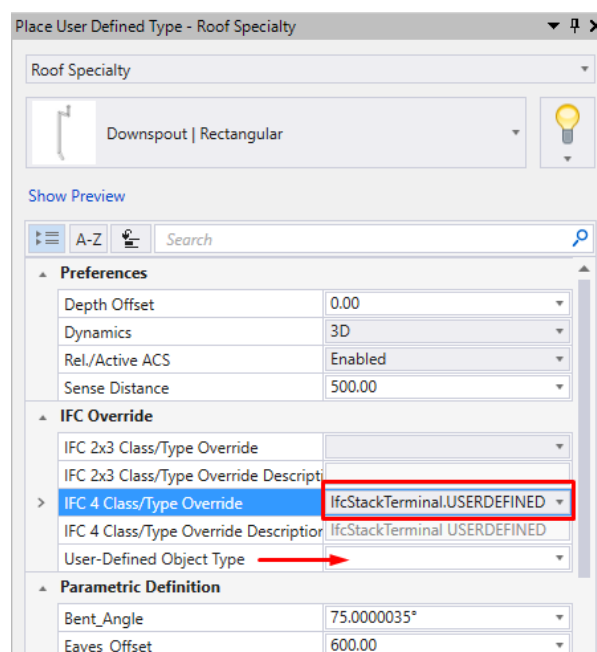

Classifying Userdefined Object

3 EDITING OBJECTS IN CATALOG EDITOR VS PROPERTY PANEL

In OpenBuildings Design, there are two ways to edit an object's entity and properties. It can be done either in the *Catalog Editor* or *Property Panel*. Both can be used when the user wants to modify the values but where you edit affects the data type when it's exported to an IFC file.
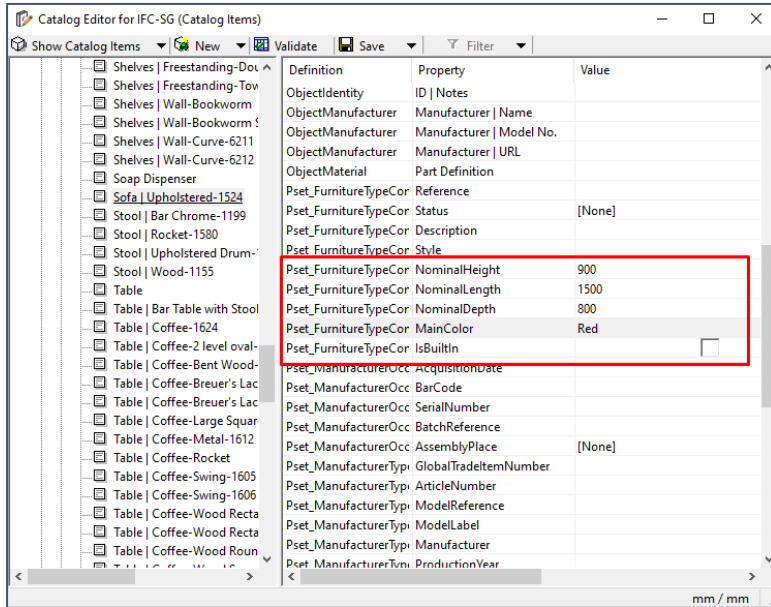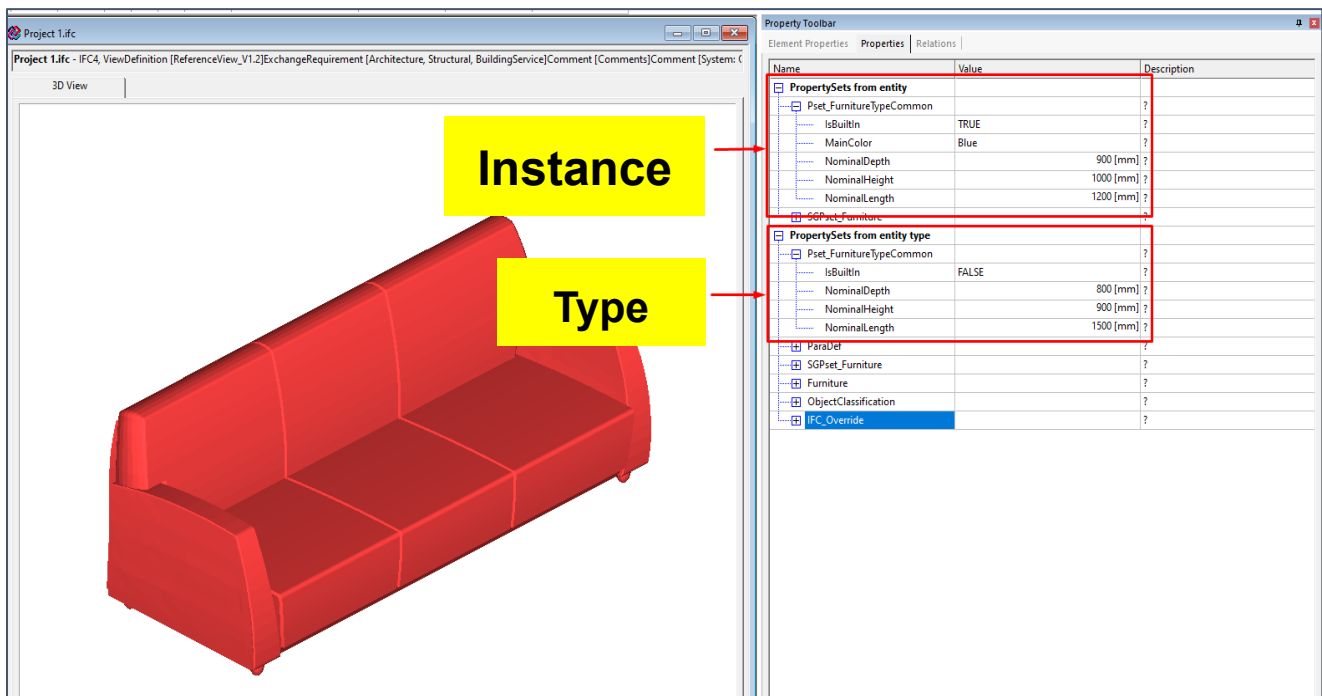

Catalog Editor
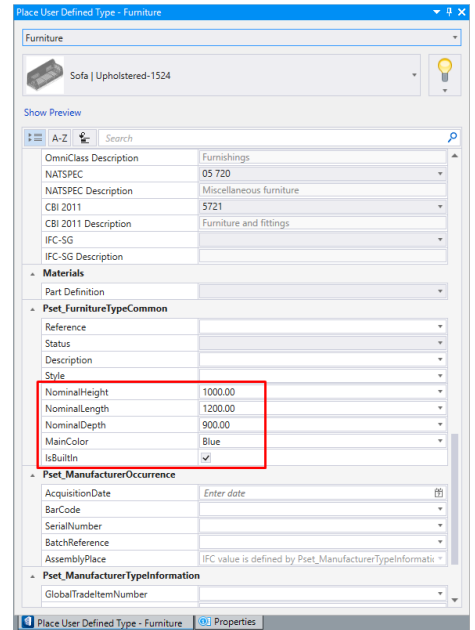
Property Panel

If the value is inputted under the *Catalog Editor* will be exported as type. Meanwhile, values inputted under the *Property Panel* will be exported as instance.



Difference Between Instance and Type Values when Exported

4 IFCMAPCONVERSION

1. To add the value of Eastings and Northings of the IfcMapConversion, go to the **Drawing Aids** tab and select the **Coordinate System.**
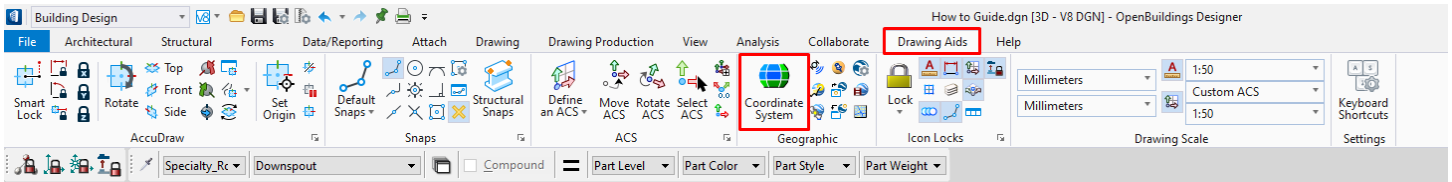

Location of Coordinate System Tool

2. After selecting the appropriate geographic coordinate system, select the **Details** button to view all the available details of the project.
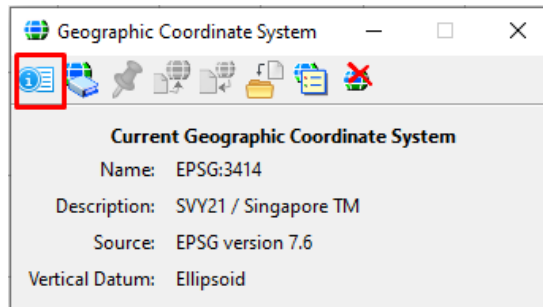

Location of Details Button

3. Under the **Coordinate System Modifiers**, change the **Local Transform Type** to **Helmert Transform** to enable the option to change the value for *Offset X* and *Offset Y*. These two properties will be exported as Northing and Easting under IfcMapConversion. *Offset X* is *Easting* and *Offset Y* is *Northing*.
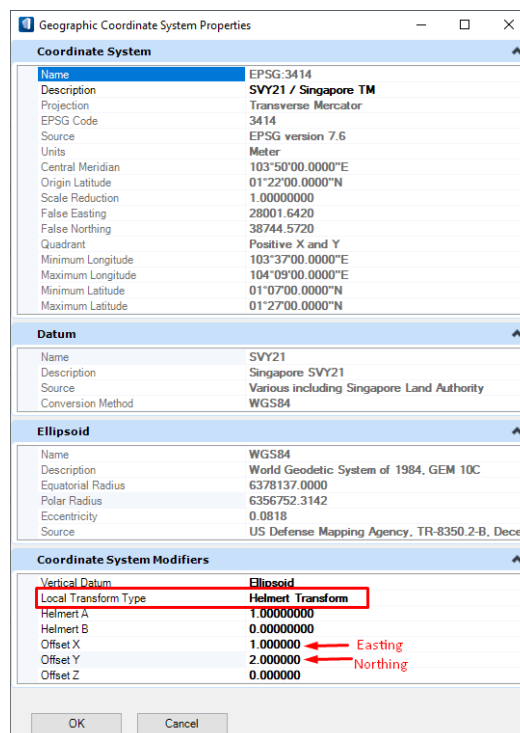

Adding Values for Eastings and Northings

4. After clicking **Ok**, a pop-up window will ask if whether to reproject the data and change the Storage Units of the project. Choose the one that applies to the project and click **Ok** again to apply the changes.
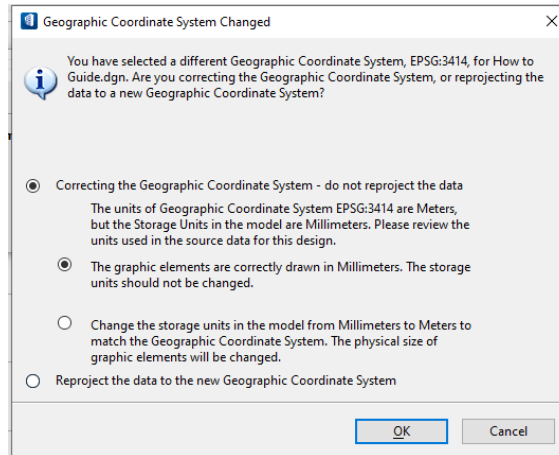
Reprojection Data and Storage Units Options

5 IFC EXPORT SETUP

1. To export the building model to an IFC file, go to **File.**
2. Under **Export**, click **Exchange File Types** and select **IFC.**
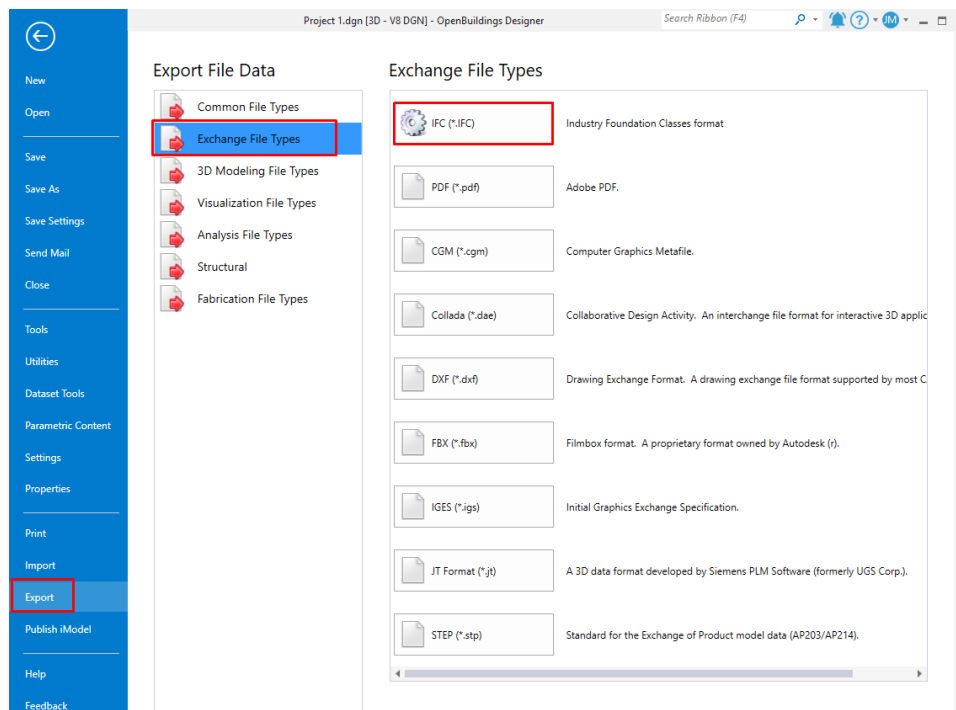
**IFC File for Export Exchange File Types**

3. The **IFC Export Dialog** is shown and under **Model View Definition**, open the dropdown menu and select IFC4 Reference View.

4. Under the **Spatial Structure**, select the **Assign** to open the **Assign Models to Spatial Containment** dialog box.
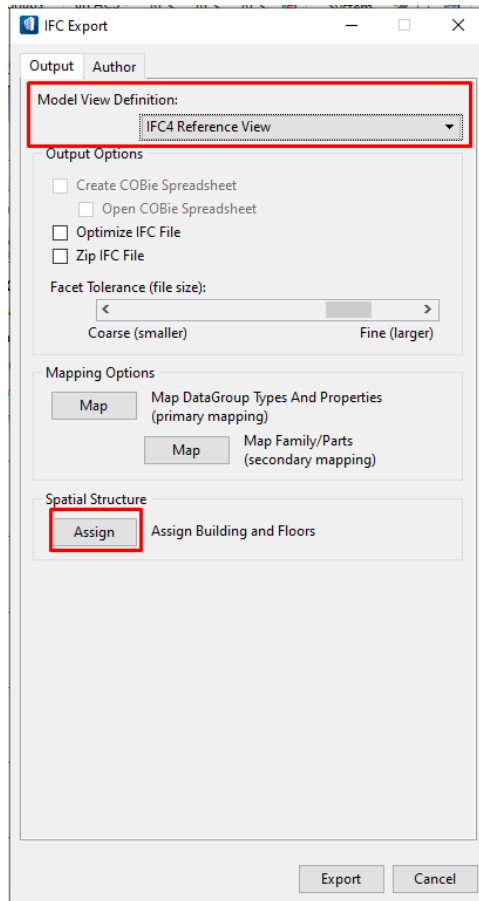
Model View Definition and Spatial Structure

5. Assign the project and the attached files to the appropriate floor and **Save** afterwards.
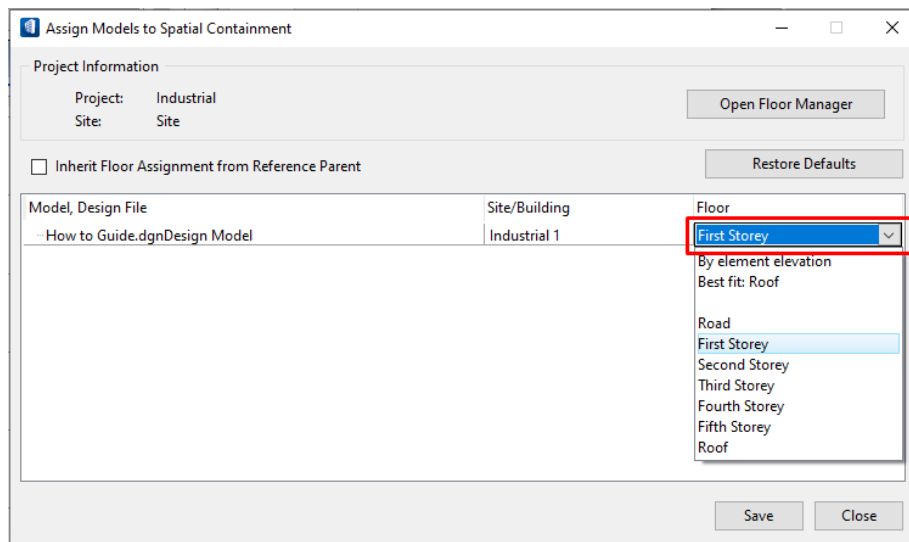
Assigning Attached Files to Floor

6. Close the dialog box and click **Export** to export the model.
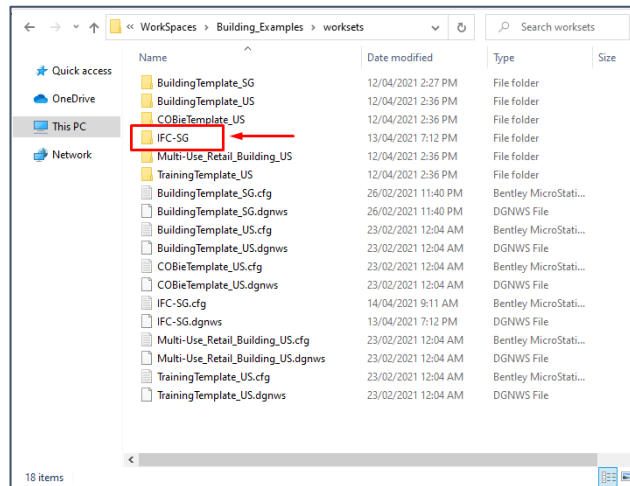
1 USERDEFINED PSETS

ADDING USERDEFINED PSETS

To add userdefined properties to catalog types, first copy the XSD files and paste them into the workset's DataGroupSystem folder. Here's a link to an example folder.

C:\ProgramData\Bentley\OpenBuildingsCONNECTEdition\Configuration\WorkSpaces\Building_Exampl es\worksets\IFC-SG\Standards\DataGroupSystem
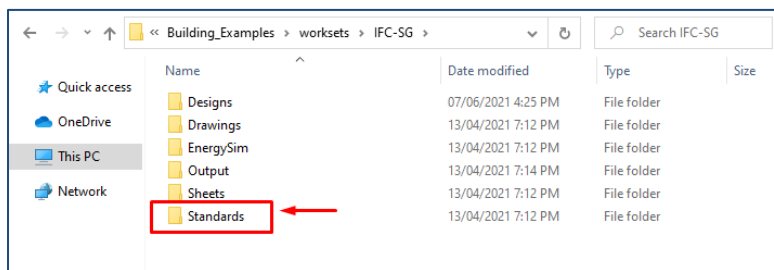
Please not that above folder link might be different because of the different WorkSets.

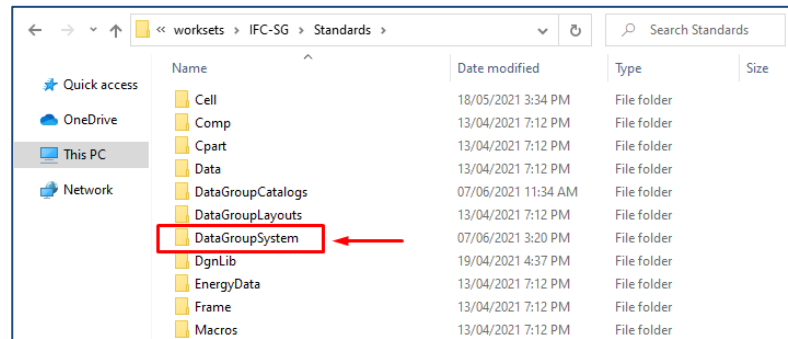1.   Under *worksets,* select the folder of the new workset.

IFC-SG Workset Folder

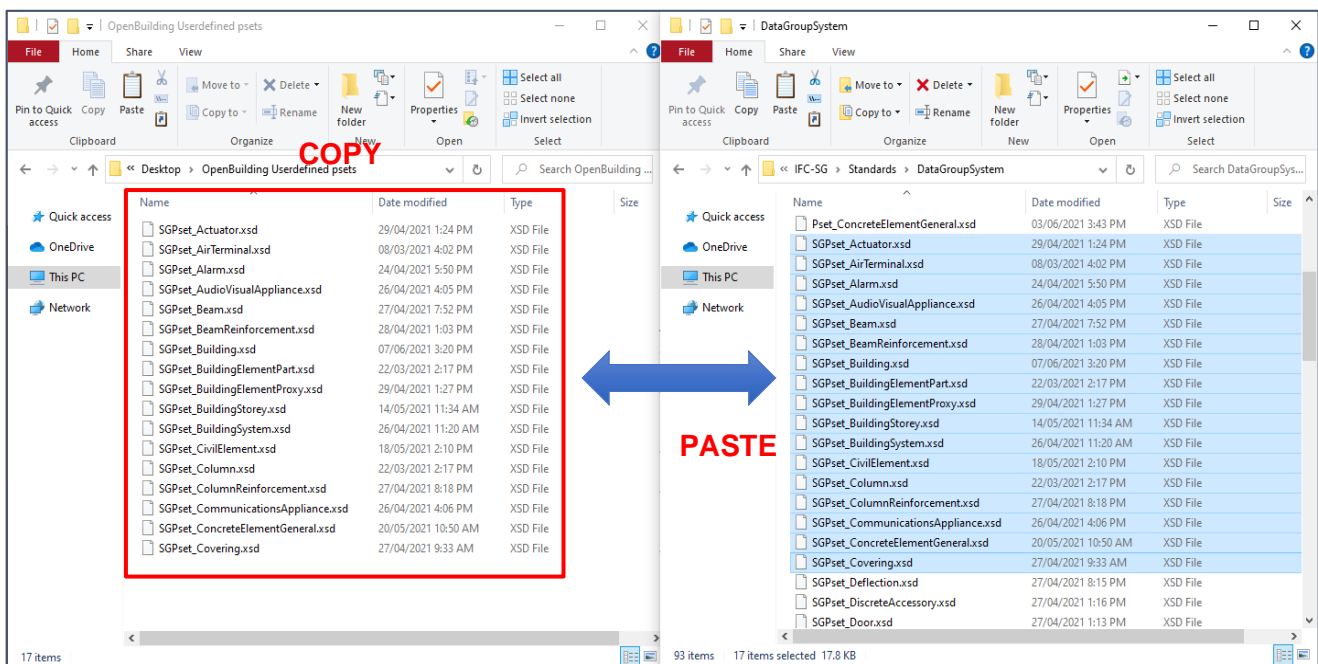2.   Select the *Standards* folder.

Standards Folder of IFC-SG

3.   Open *DataGroupSystem* folder.

DataGroupSystem Folder of IFC-SG Workset

4.   Paste the XSD files of the userdefined psets in the *DataGroupSystem* folder.

Adding Userdefined Property Sets

ASSIGNING USERDEFINED PSETS TO CATALOG TYPES

After adding the userdefined psets in the DataGroupSystem folder, it needs to be assigned to the Catalog Types in the *Catalog Editor* before it can be used in the model. In the Catalog Editor, there are two ways to add the userdefined. It can be added either using **Catalog Items** or **Definition Usage.**

A.   **Definition Usage** – This can be used when adding one userdefined pset to multiple catalog types
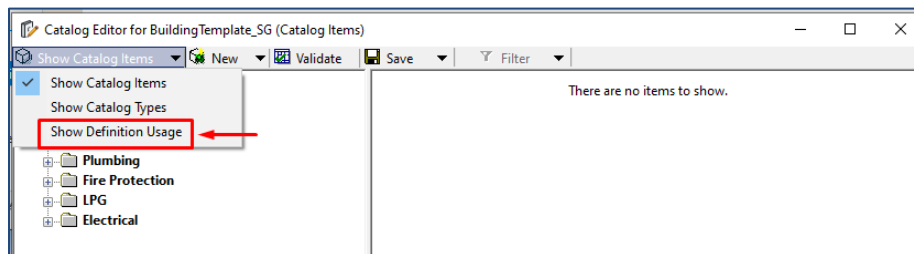B.   **Catalog Items** – This can be used when adding multiple userdefined psets to one catalog type

1.   Go to **File**, and under **Dataset Tools**, select **Catalog Editor**.
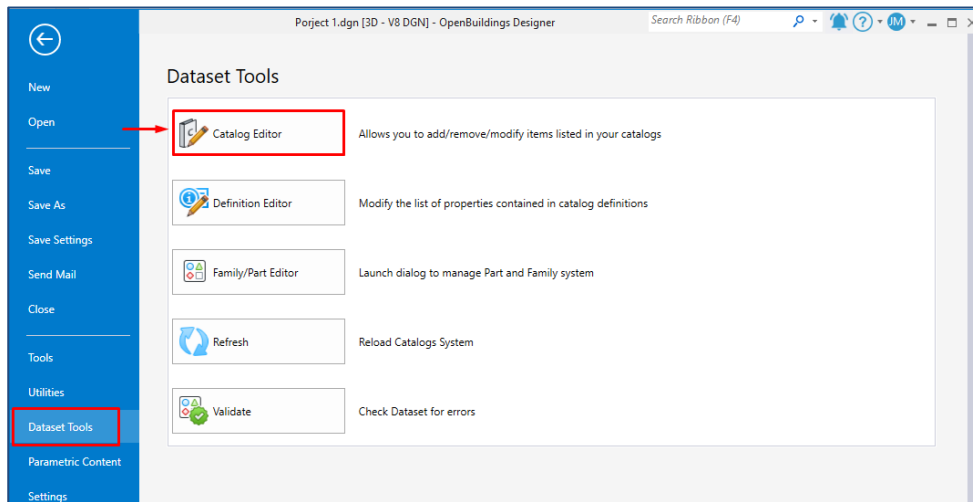
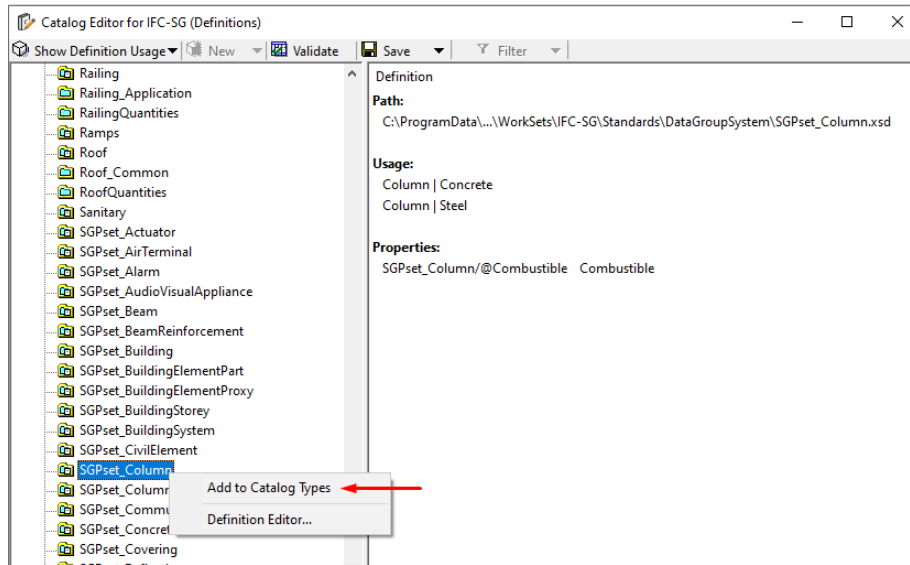**Location of Catalog Editor**

A. ADDING USERDEFINED PSETS THROUGH DEFINITION USAGE

1. Open the dropdown menu of **Show Catalog Items** and select **Show Definition Usage**


Changing the Dialog Box to Show Definition Usage

2. Select the userdefined pset and right click. Select **Add to Catalog Types**.

Adding A Userdefined Property Set to Catalog Type

3. Find and select the appropriate catalog type for the userdefined pset to be assigned to.
4. After selecting the catalog type, click the single forward button to add the catalog types to the userdefined pset. After the catalog has been added, click **Ok** and **Save.**
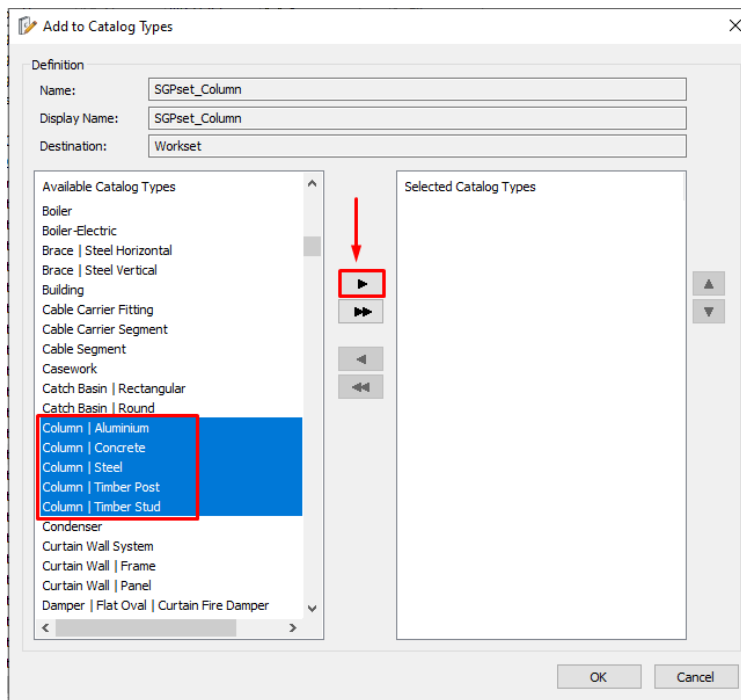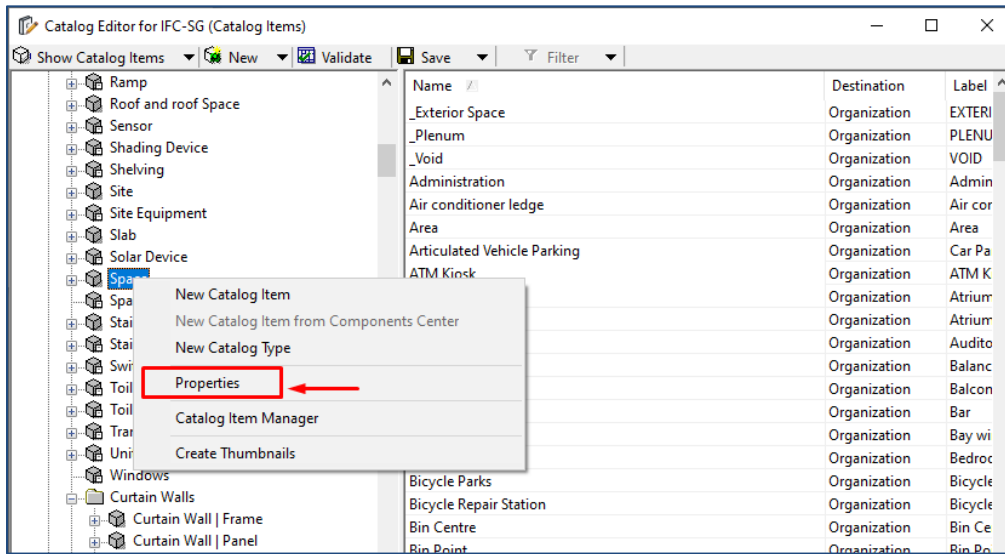

Adding Catalog Types to Userdefined Property Set

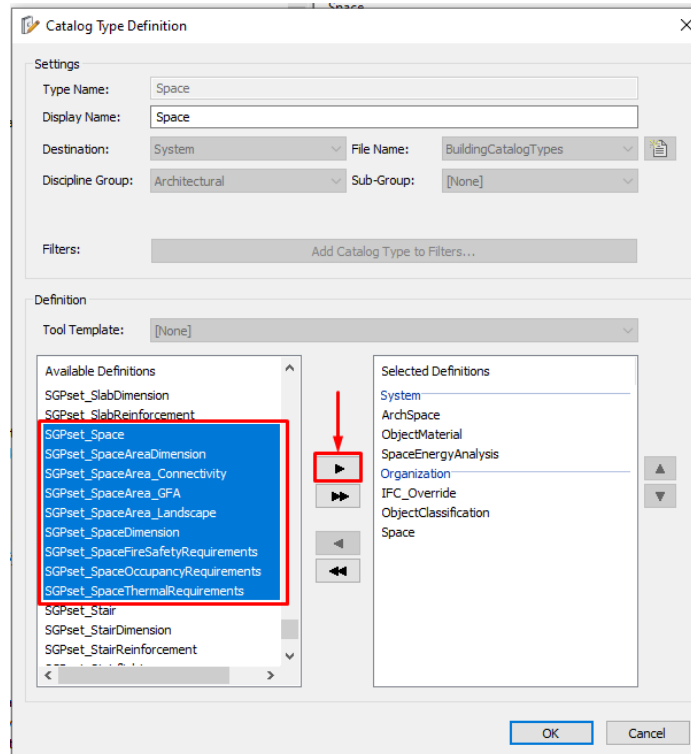5. Restart OpenBuildings for the changes to be applied.

B. ADDING USERDEFINED PSETS THROUGH CATALOG ITEMS

1. Select the catalog of the object which the userdefined pset will be assigned to.
2. Right click on the catalog type and select **Properties**.

Properties of Catalog Type

3. Find and select the appropriate userdefined psets which will be assigned to the catalog type
4. After selecting the userdefined psets, click the single forward button to add the psets to the catalog type.


Adding Userdefined Property Sets to the Catalog Type

5. Restart OpenBuildings for the changes to be applied.

MODIFYING USERDEFINED PROPERTIES

After adding userdefined property sets to catalog types, userdefined properties will be available to objects and the project. Adding values for properties can either be done through the **Catalog Editor** or the **Modify Properties** tool.
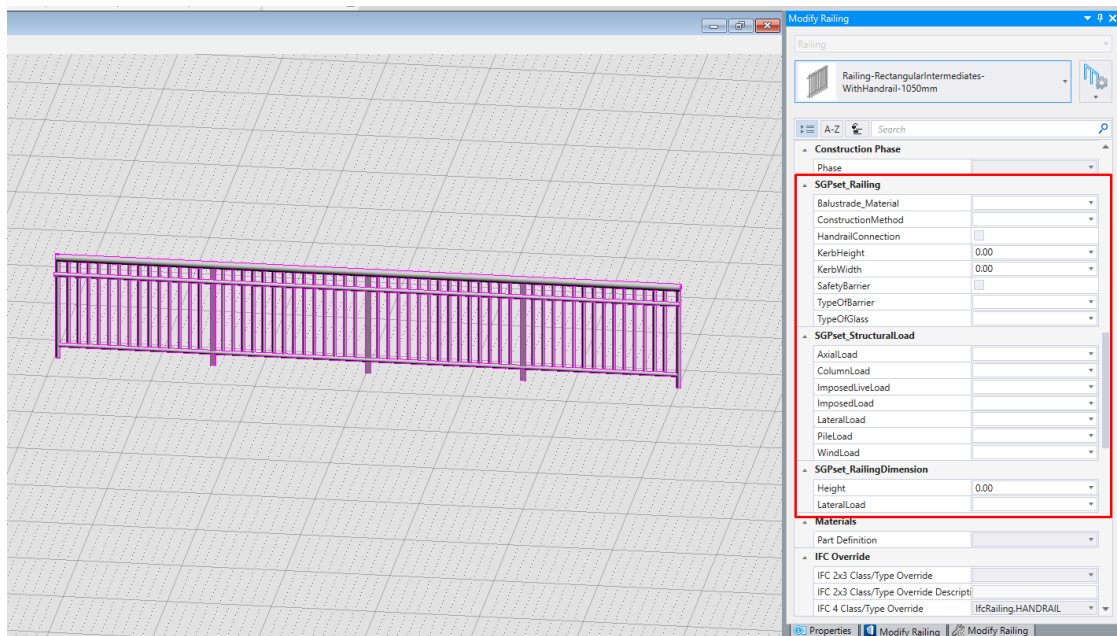
For the **Modify Properties** tool:

1.   Select the object that need to be modified and select **Modify Properties.**
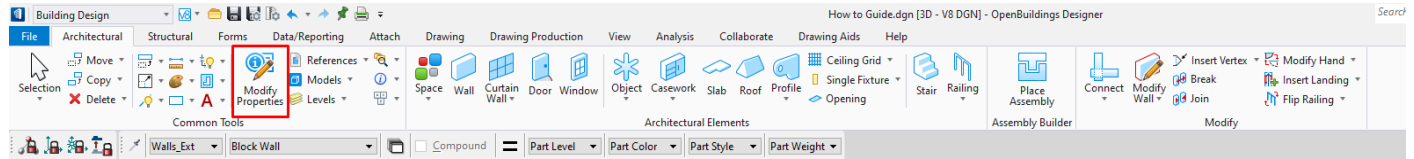
Location of Modify Properties Tool

2.   Go to the *Unified Property Panel* and modify the values of the userdefined properties.


Adding Value for Userdefined Properties in the Unified Property Panel

3.   Left click on the workspace to apply the changes.

The values for the properties IfcProject, IfcSite, IfcBuilding, and IfcBuildingStorey must be entered under **Floor Manager.**

1.   At the bottom left of the workspace, select this icon to open the *Floor Manager*. This will open up the **Floor Manager** dialog box where the values of the properties can be modified.
2.   Click **Apply** and close the dialog box.
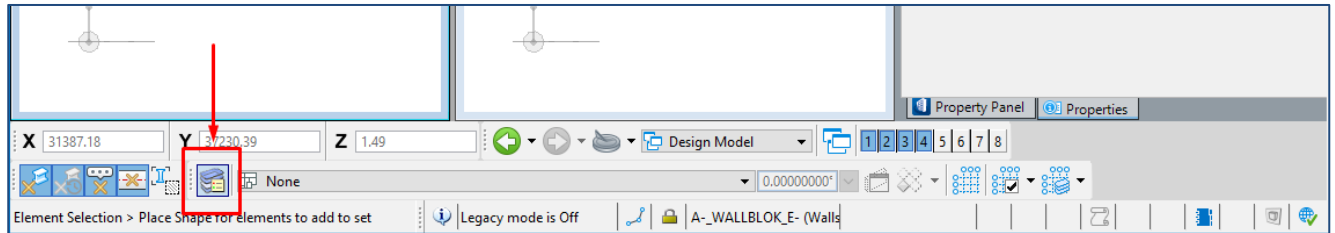

Location of Floor Manager
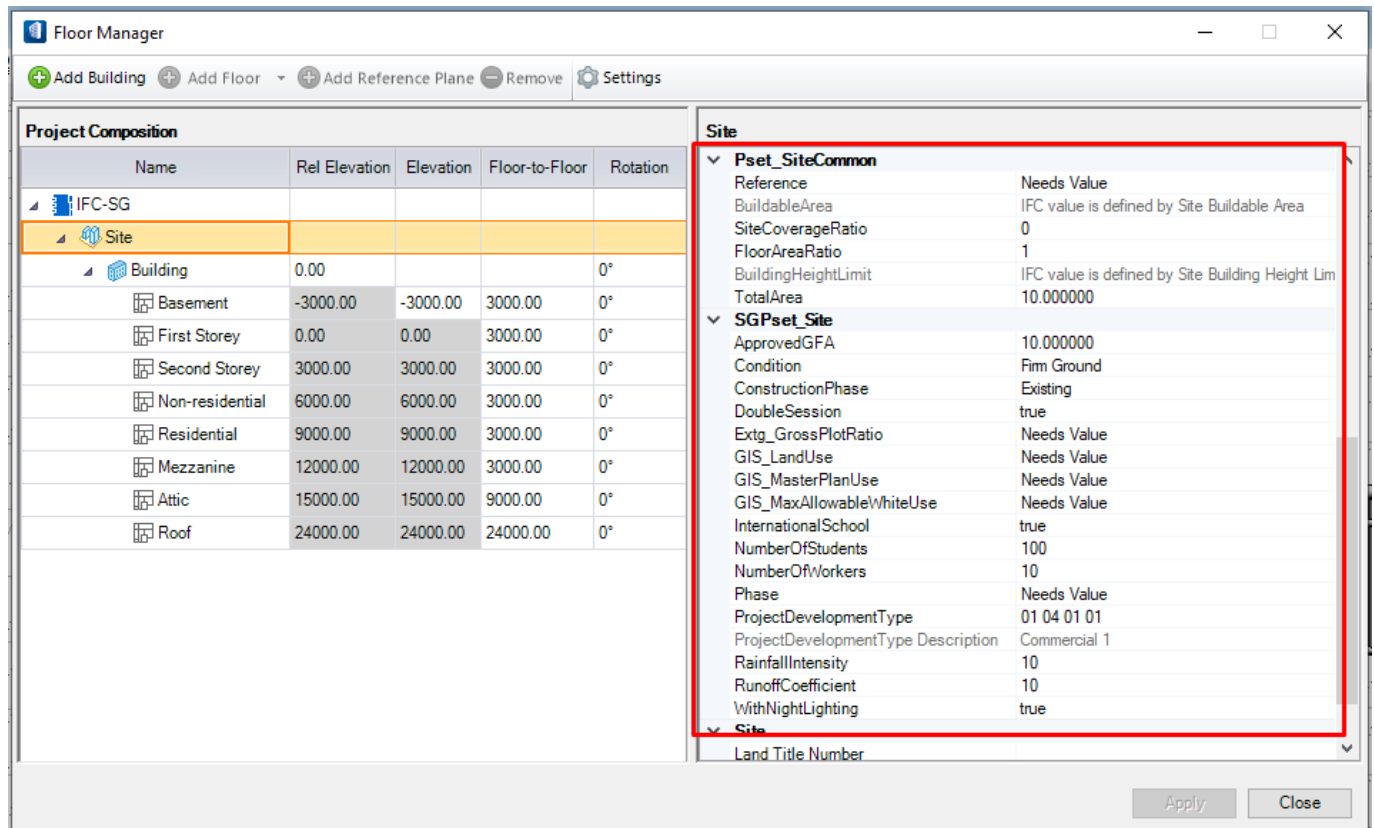
Predefined and Userdefined Properties Under Floor Manager

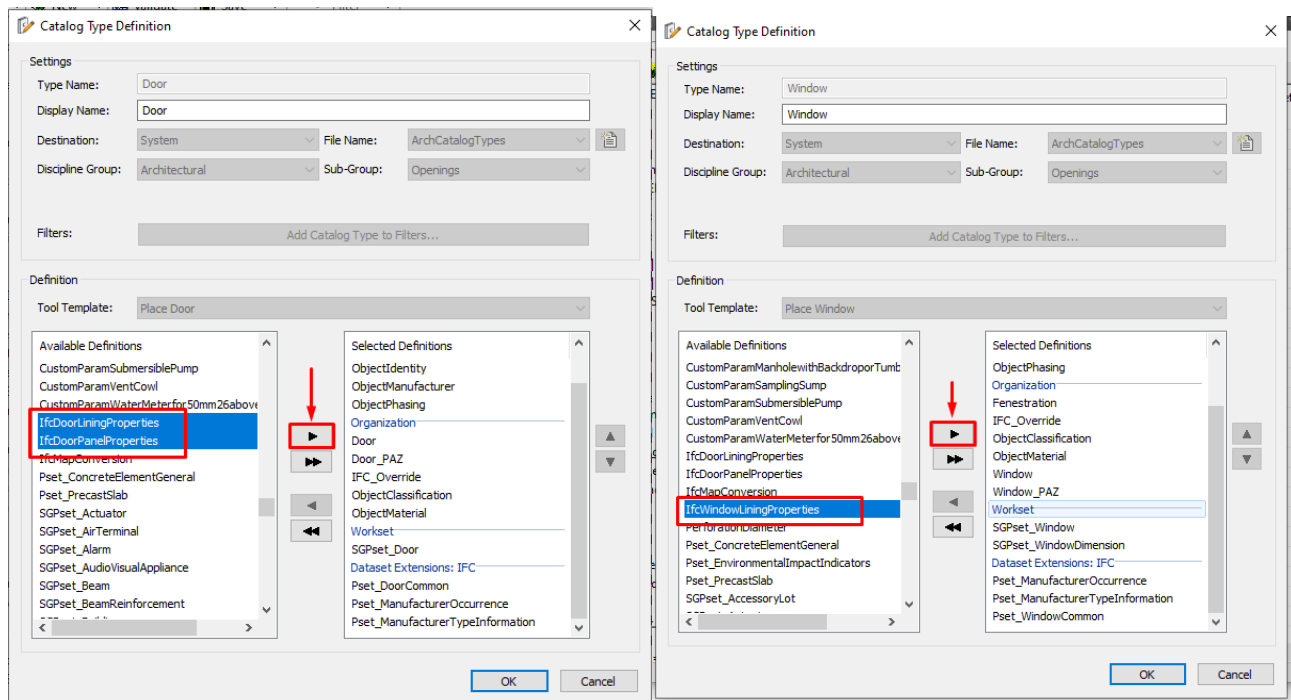## 2   IFCDOORLINING, IFCDOORPANEL, AND IFCWINDOWLINING PROPERTIES

In OpenBuildings' default setting, the available IfcDoorLiningProperties are LiningDepth and LiningThickness. To add the other Door Lining and Door Panel Properties, some configurations are required.

1.   Copy and paste the given XSD file of IfcDoorLiningProperties and IfcDoorPanelProperties to the *DataGroupSystem* folder of the workset.
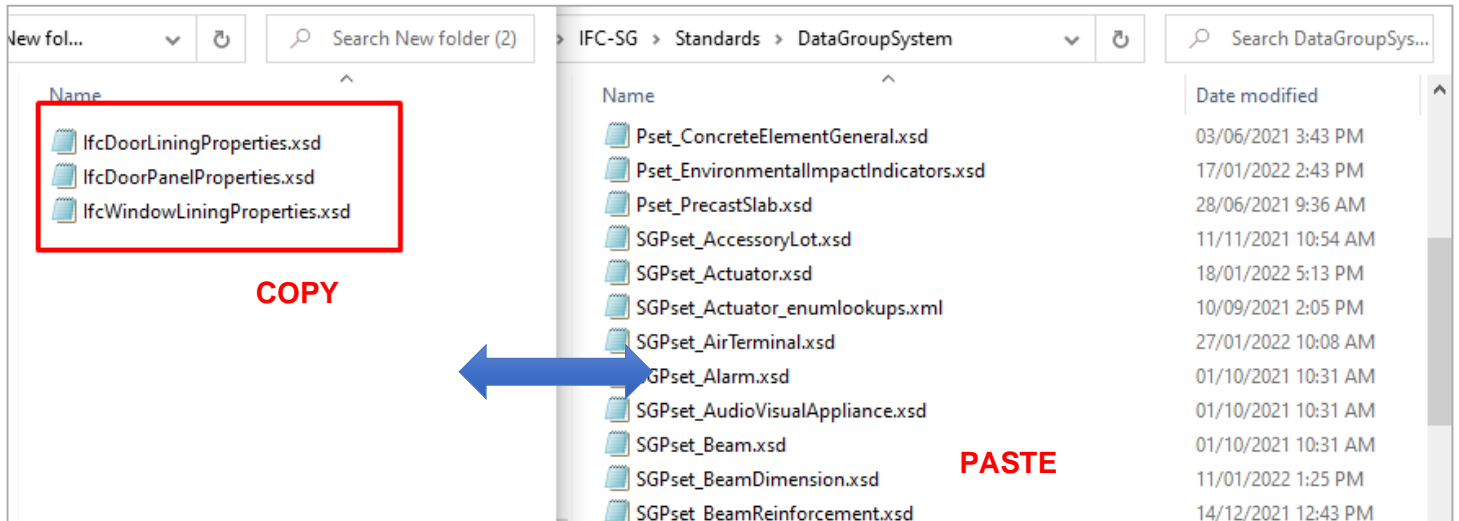
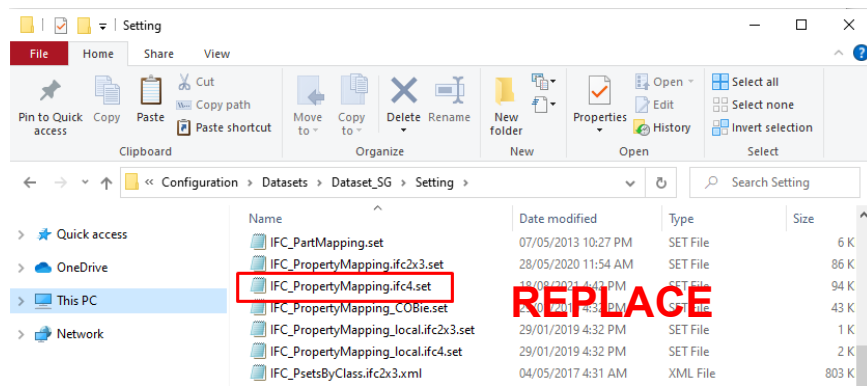**Adding XSD Files of Door Lining, Door Panel and Window Lining Properties**

2.   Assign the *Definition File* to Door and Window object using the *Catalog Editor*.

Adding the Door Lining, Door Panel and Window Lining Properties in the Catalog Editor

3.   Go to *Dataset_SG* and open the *Setting* folder.

4. Replace the *IFC_PropertyMapping.ifc4.set* file with the given file.

Replacing the IFC4 Property Mapping.

5. After restarting OpenBuildings, the IfcDoorLiningProperties, IfcDoorPanelProperties and IfcWindowLiningProperties should be available on the door object.
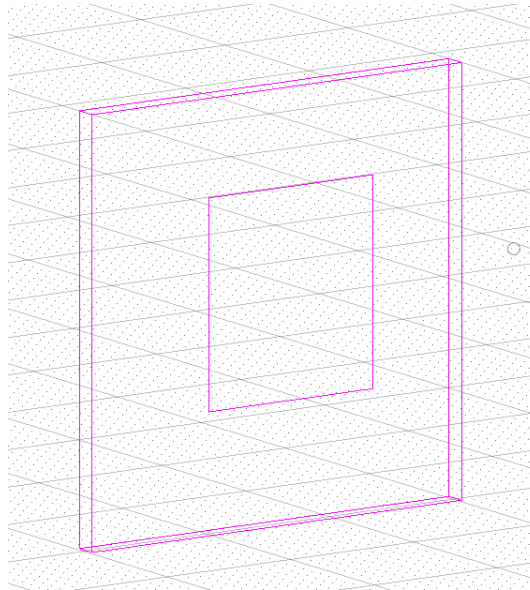
1   IFCOPENING – PREDEFINED TYPE: RECESS

The predefined type RECESS of IfcOpening will be exported as NOTDEFINED when using IFCOverride or Mapping Options. To properly export the predefined type, the wall/floor needs to have a niche.

1.   After creating a wall, create a shape for the outline of the recess. The *draw shape tool* can be found under **Common Tools.**
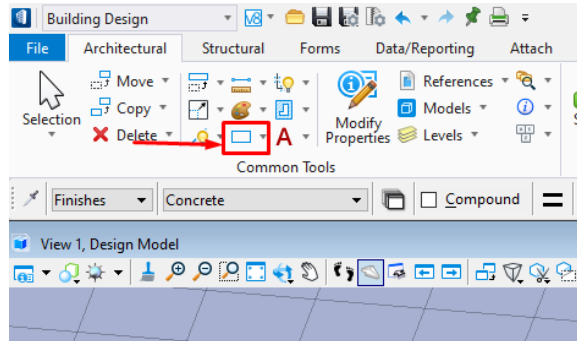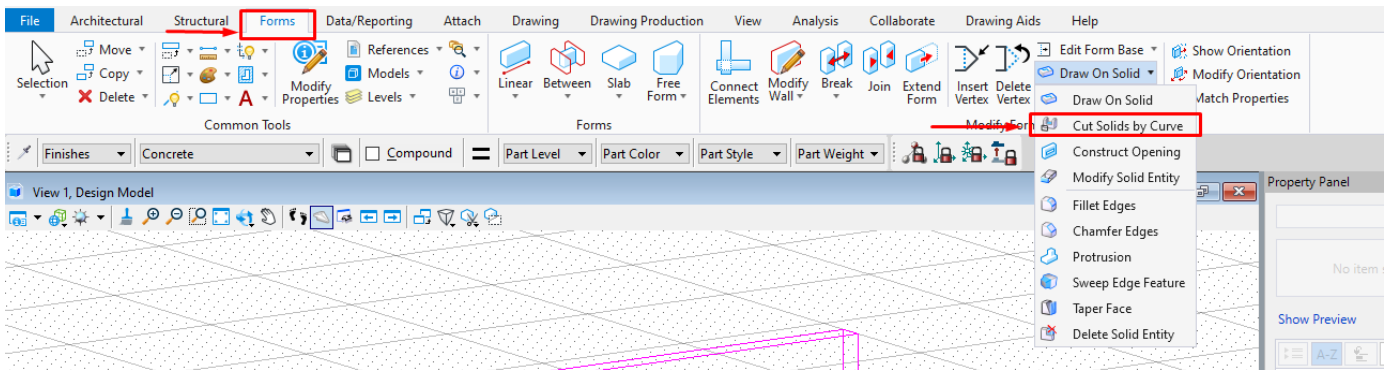

Draw Shape Tool

Placing the Shape on the Surface of the Wall

2. After placing the shape on the wall, go to the **Forms Tab > Modify Forms**. Open the drop-down list for **Draw On Solid** and select **Cut Solids by Curve.**


Location of Cut Solids by Curve Tool

3. The Cut Solids by Curve dialog box will open. To create the recess, the settings should be modified first.
   a. **Cut Direction**: there will be three options, **Both, Forward** and **Back**. Choose the appropriate option. *(Note: The direction depends on the orientation of the shape. For the example, **Forward** was selected as the shape was placed on the surface of the wall).*
   b. **Cut Mode**: Select **Define Depth.** Check the box for **Cut Depth** and specify the depth of the recess.
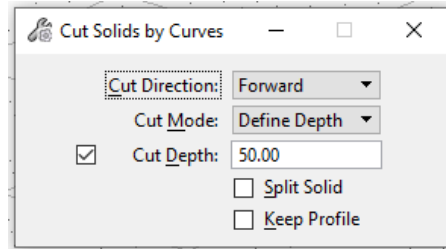

Cut by Solids Dialog Box

   c. After configuring the settings, first select the wall and followed by the shape. After selecting the two, an arrow will appear, indicating the direction of the cut. The direction can also be changed by clicking it.
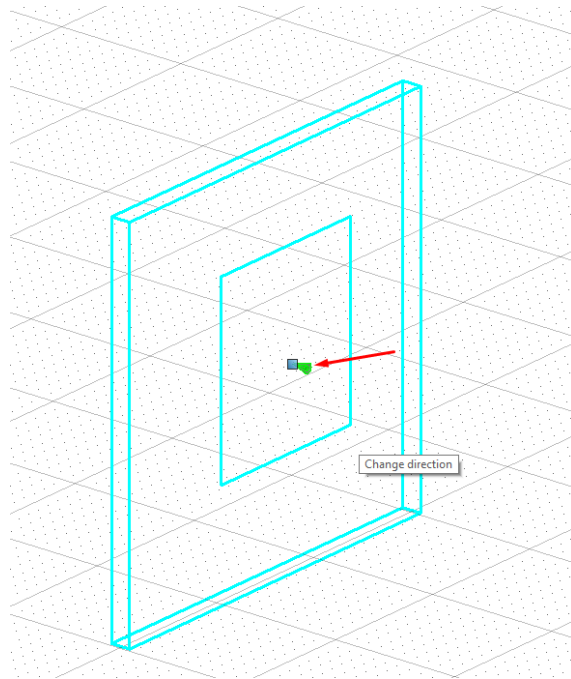
Direction of the Cut

d. Left click on the model space twice for the changes to appear. OpenBuilding will automatically export the cut as IfcOpening with the predefined type RECESS.
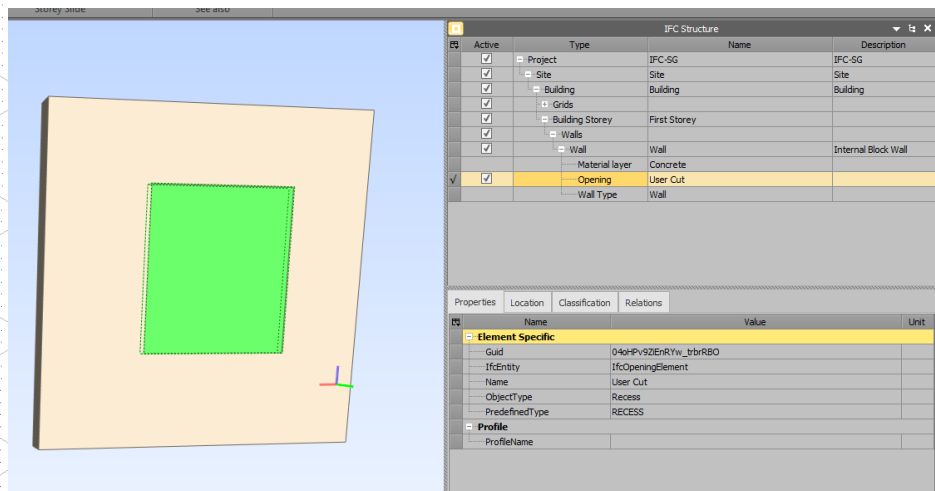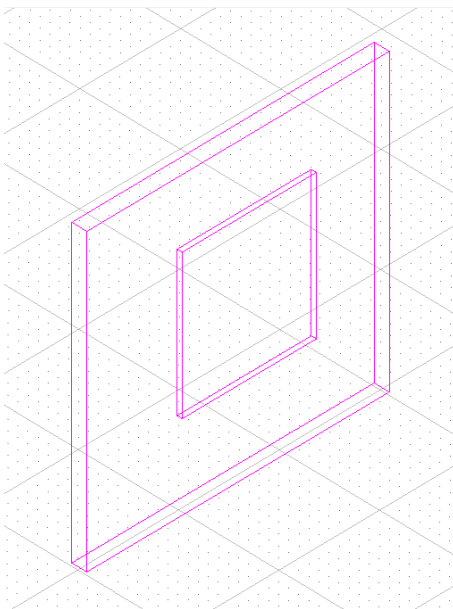

Exported Wall with Recess

2   IFCDOOR - DOOR OPERATION TYPE

Some operation types are not available in OpenBuildings. Operation types for doors are limited to DOUBLE_SWING_RIGHT, DOUBLE_SWING_LEFT, SINGLE_SWING_RIGHT, SINGLE_SWING_LEFT, DOUBLE_DOOR_SINGLE_SWING, DOUBLE_DOOR_DOUBLE_SWING, and SWING_FIXED_LEFT.

The Door Operation type can be changed through Door Modify Properties under Door Parameters. Change the value of the LeafAngle to 180 for the Double Swing operation types
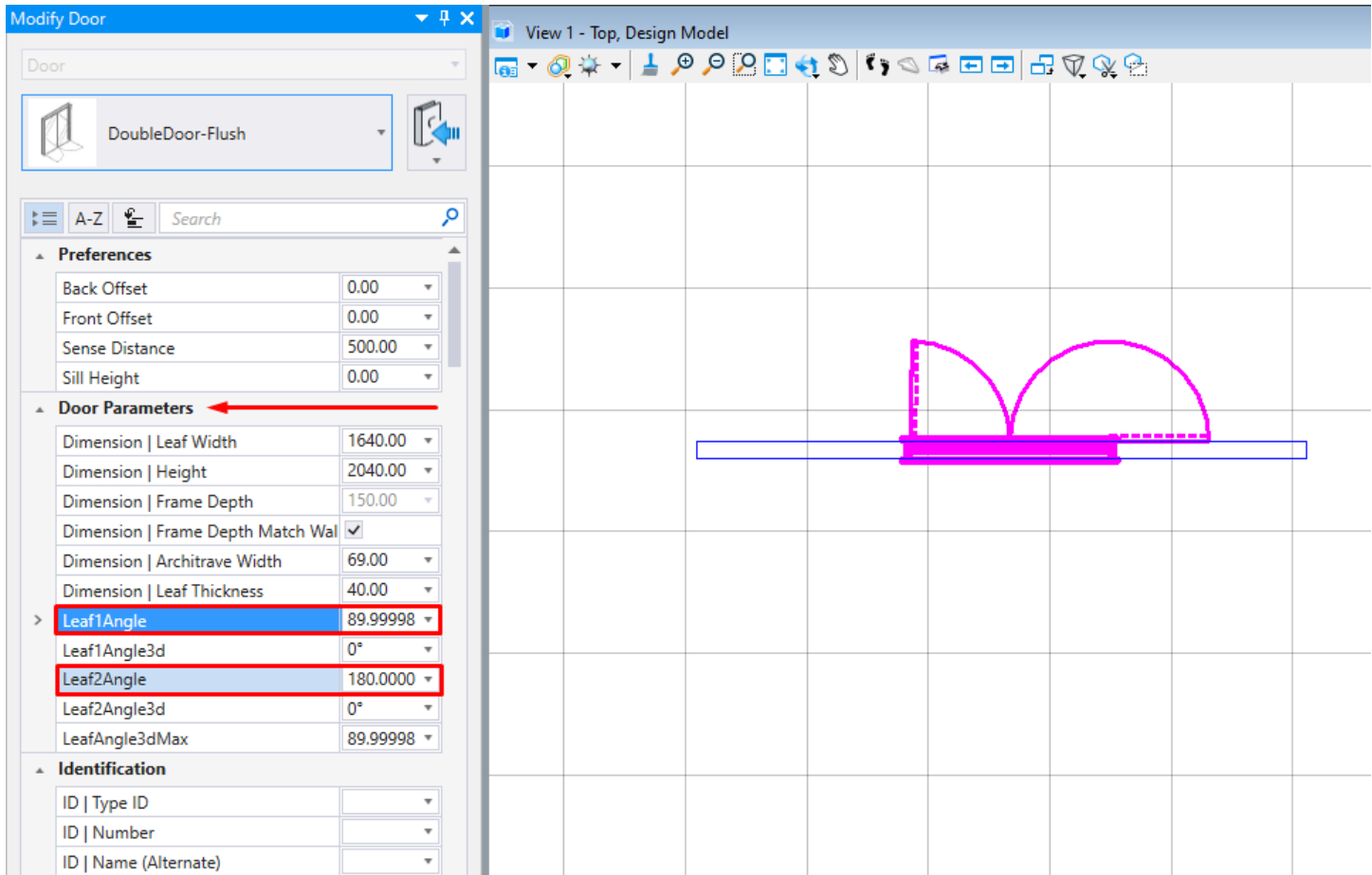

Changing Door Operation Types

3 EXPORTING IFCBUILDINGSYSTEM AND IFCDISTRIBUTIONSYSTEM AS IFCGROUP

As of Update 9 of OpenBuildings, the entities IfcBuildingSystem and IfcDistributionSystem can be exported but there are some limitations when exporting the predefined and userdefined object type. However, there is a workaround for both entities.

1.   Go to the Settings folder of Dataset_SG and replace IFC_ItemMapping.ifc4.set with the provided file. The item mapping is similar to IFCOverride where it overrides the assigned entity, predefined and userdefined object type. The difference is that it directly calls the item in the catalog editor and overrides its values. Any value that was added through the catalog editor or unified property panel will be override by *IFC_ItemMapping.ifc4.set*.
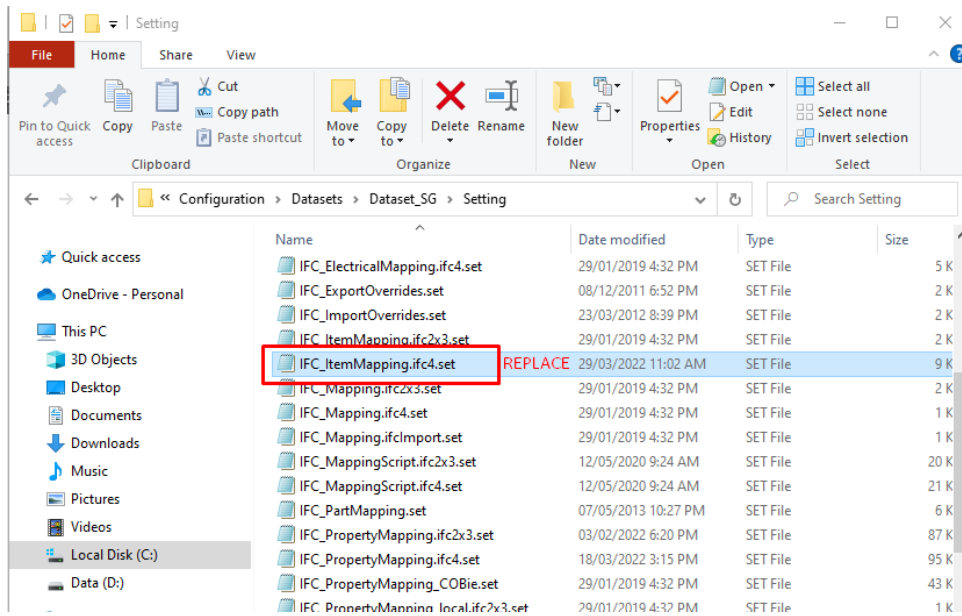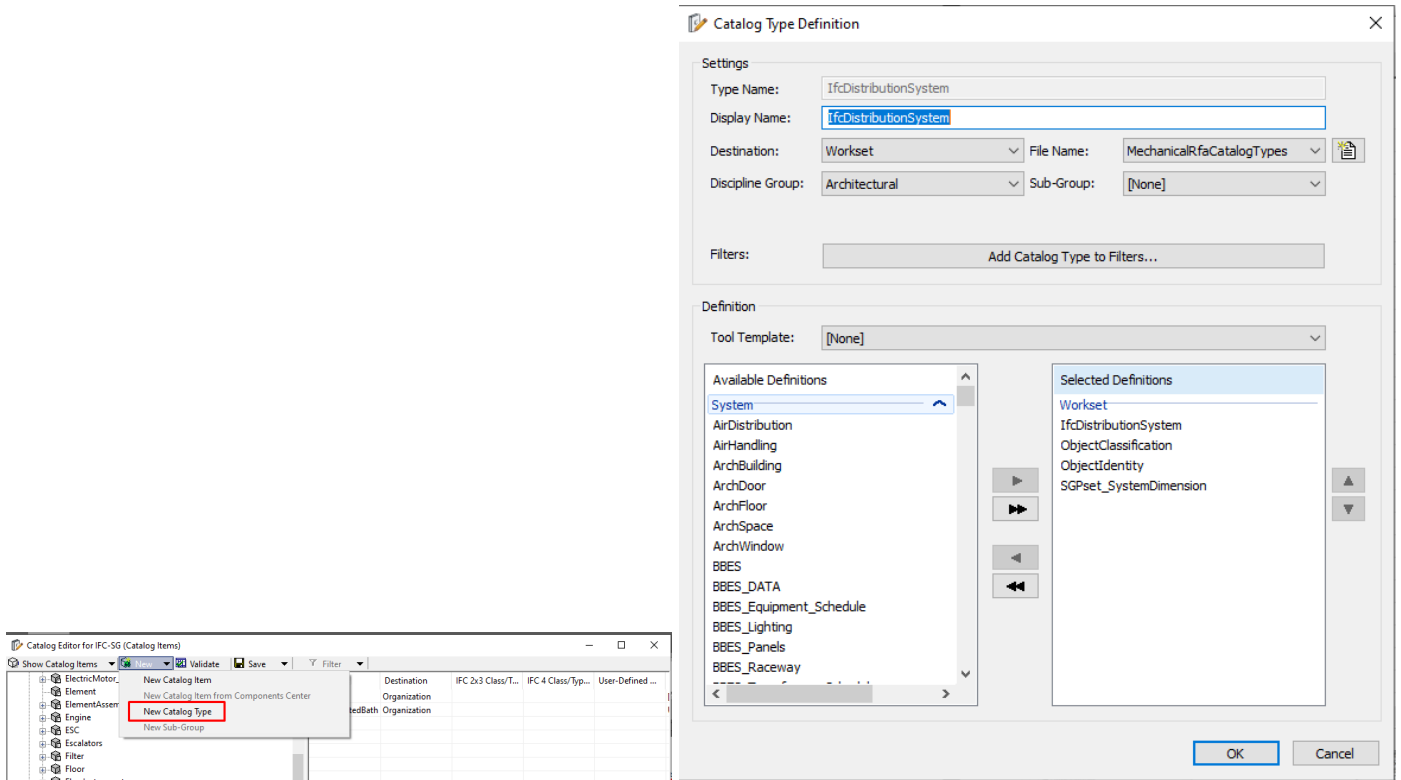

Location of IFC_ItemMapping.ifc4.set

An example of the location of the SET file is shown below:

C:\ProgramData\Bentley\OpenBuildingsCONNECTEdition\Configuration\Datasets\Dataset_S G\Setting

2.	Go to **Catalog Editor** and create a new catalog type for *IfcDistributionSystem*. Add the property set *IfcDistributionSystem* and *SGPset_SystemDimension*.
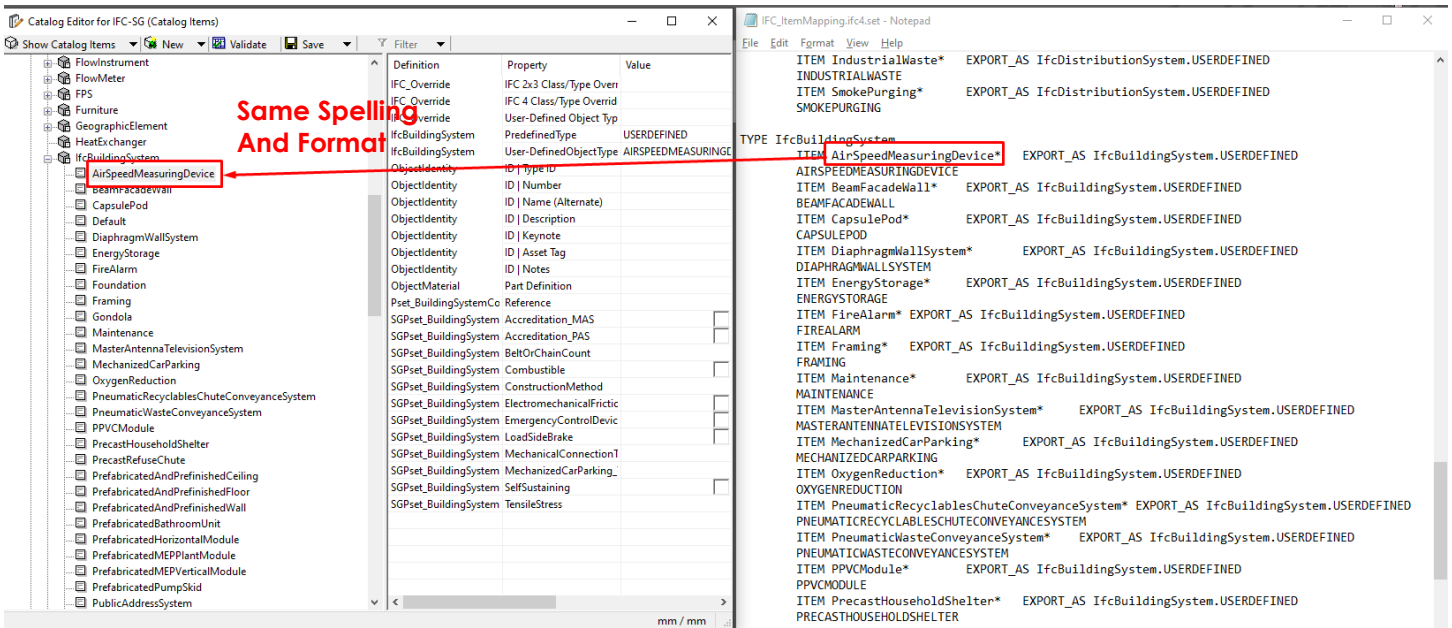

Adding New Catalog Type

3.	For *IfcBuildingSystem*, right click on the catalog name and select **Properties** to open *Catalog Type Definition* window. Add *SGPset_BuildingSystem* and click *Ok*.
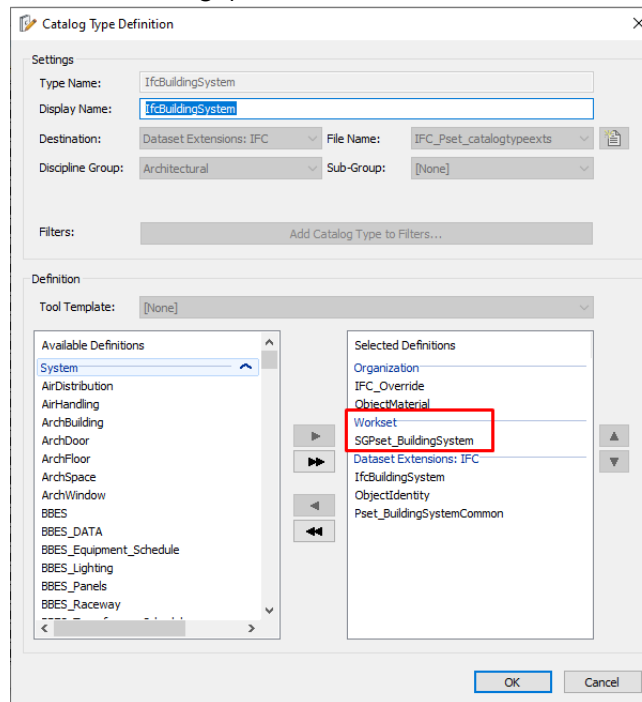

Adding SGPset_BuildingSystem to IfcBuildingSystem Catalog

4.   Create a new *Catalog Item*. The name of the item should correspond to the item in IFC_ItemMapping.ifc4.set. Add the appropriate values for the predefined and/or userdefined object type.


Adding New Catalog Items

5.   In the model space, create a text and use the predefined/userdefined type of the building system/distribution system as the value of the text. Go to the *Drawing Tab* and select *Place Text*. Type the predefined/userdefined type and place in the model.
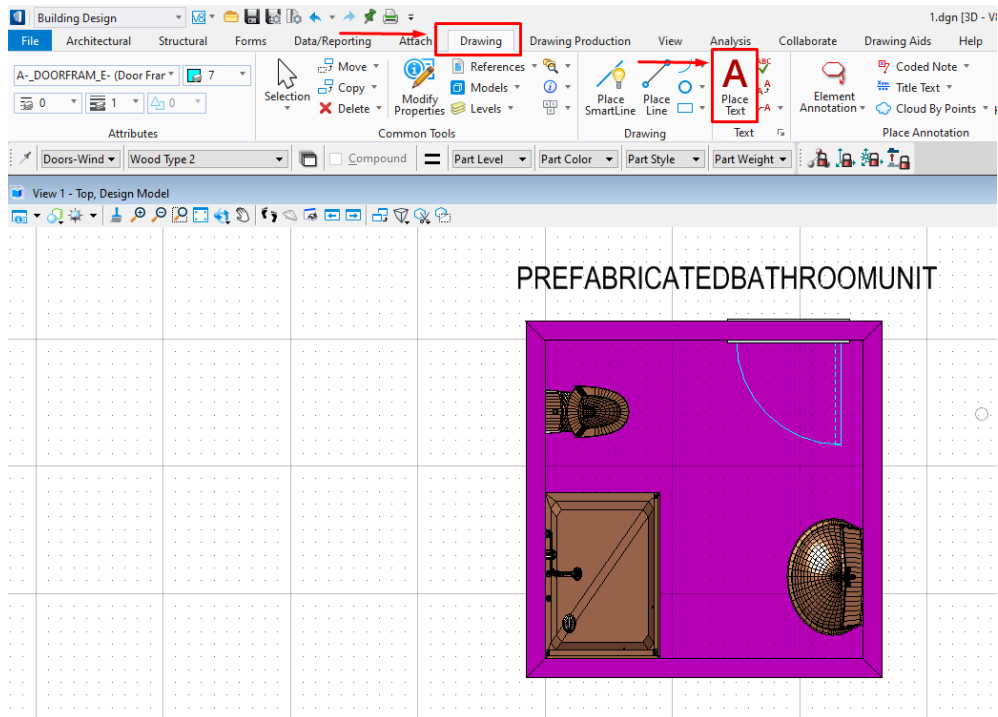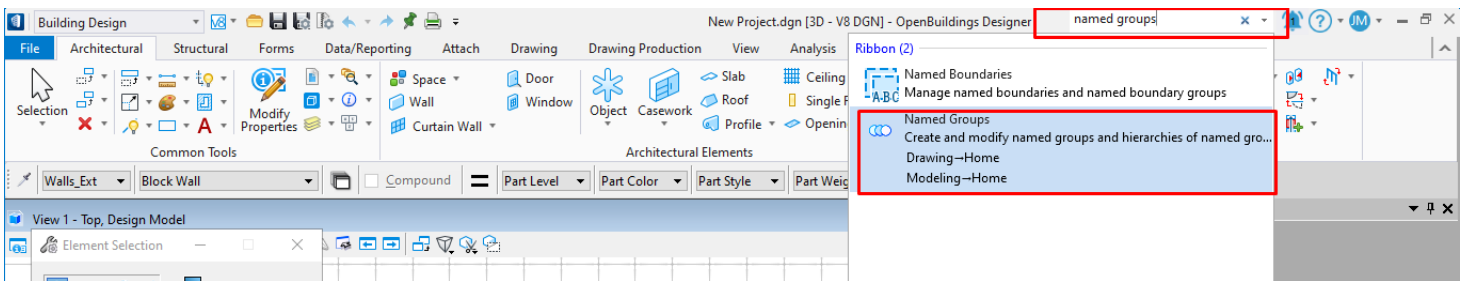

Adding Text to the Model

6.   Set the *Active Workflow* to **Drawing** and expand the **Group** tab to open **Named Groups** or use the search bar at the top right corner.
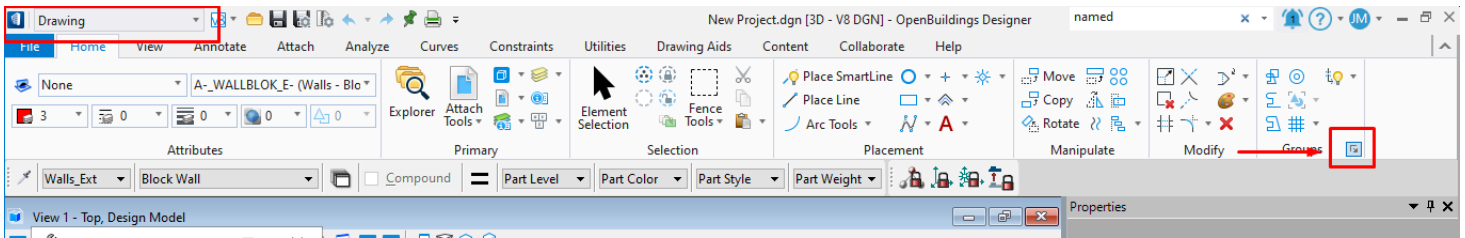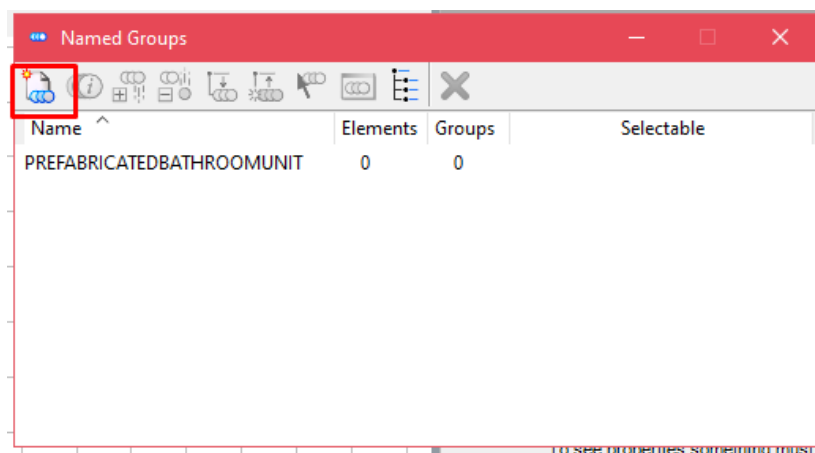

**Changing the Active Workflow to *Drawing***

OR

Using the Search Bar to look for Named Groups

7.   Click the icon on the upper left of the **Named Groups** dialog box to create a new *Group*. For the name of the group, use the predefined type or userdefined object type of the building system or distribution system.


Creating A New Group

8.   To add the objects to the building/distribution system, first, select the appropriate group. Select the objects and the text, click the **add elements** icon and click on the working space to apply the changes.
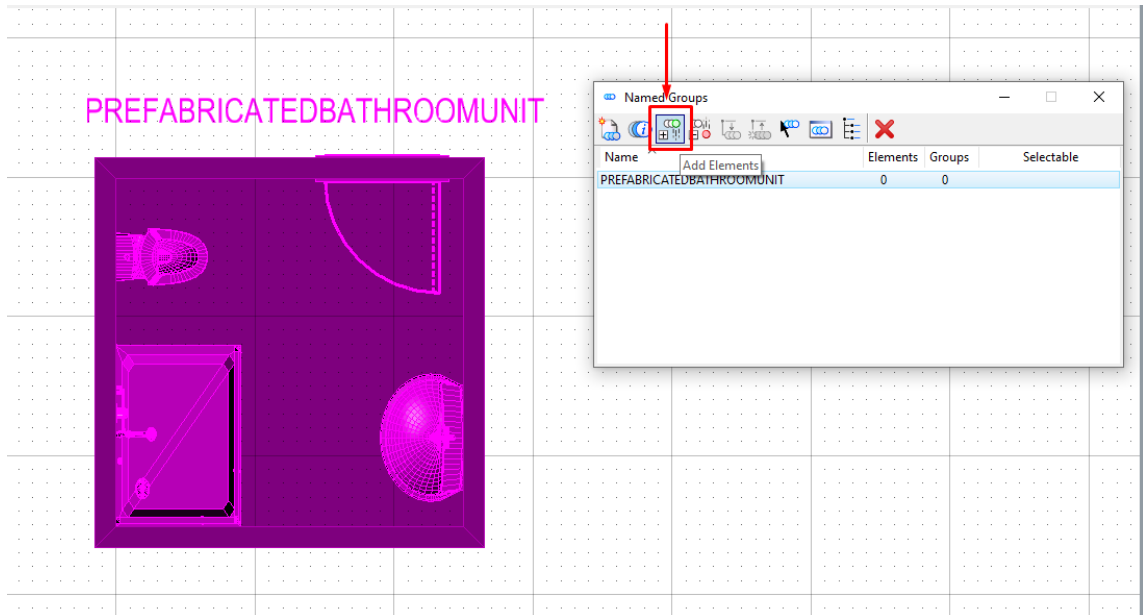

Adding the Objects to the Group

9.   Select all the objects and text again and go to **Data/Reporting** tab. Select **Add Data** to add the IfcEntity and its properties. Under the property panel, find and select the appropriate entity. *(Note: For this example, IfcBuildingSystem will be selected.)*
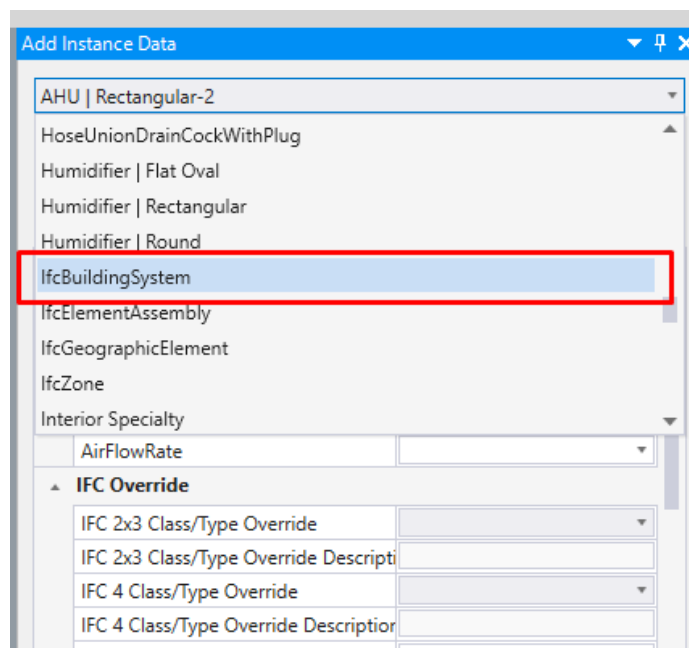
Adding the IfcBuildingSystem as Instance Data

10. Select the appropriate catalog item. Add the necessary values for the properties and left click on the model space to apply the changes.
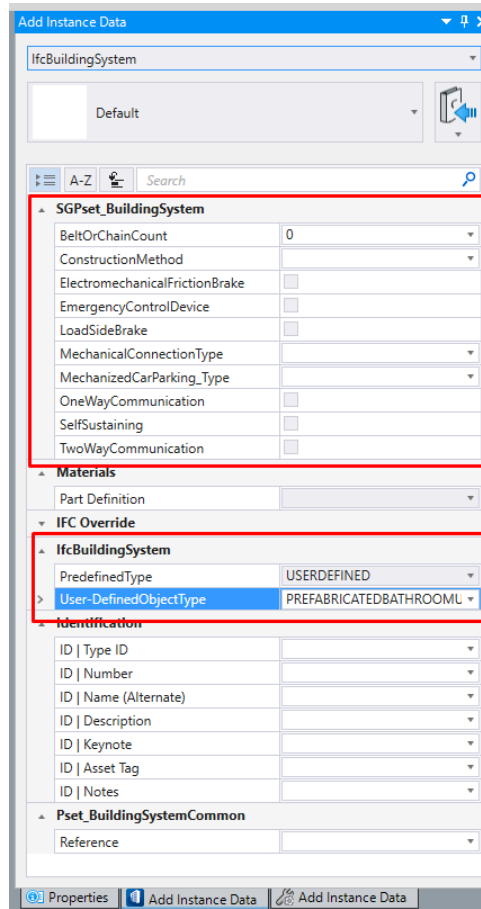
Adding the Predefined/Userdefined Type and Properties

Note: Before exporting, make sure that in the predefined and object type are properly mapped in the SET file for IFC4 files. An example of the location of the SET file is shown below:

C:\ProgramData\Bentley\OpenBuildingsCONNECTEdition\Configuration\Datasets\Dataset_SG\Setting
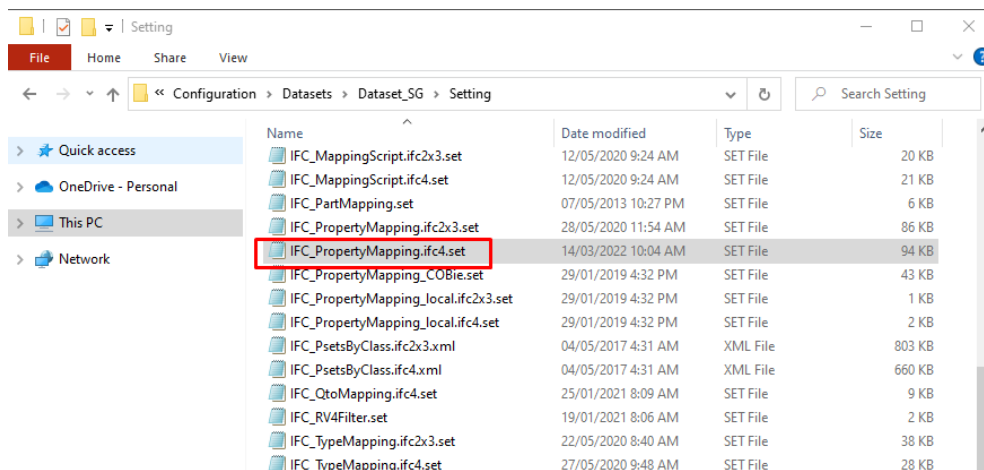
Location of Property Mapping SET File

Open the SET File and search for IfcBuildingSystem. For the object type to export correctly, make sure the property User-DefinedObjectType is linked to ObjectType

Property Mapping of IfcBuildingSyste

CHANGE LOG

Date	Description
Feb 2023	Added preface section and updated screenshots