

IFC Workflow Guide

United Kingdom & Ireland

Printable PDF version

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IFC Workflow Guide

Graphisoft UK would like to thank all participants for their valuable contributions to this guide. Special thanks go to Marcus Scott and Adrian Harms, GRAPHISOFT UK Technical Services.

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Introduction

To assist our customers Graphisoft have developed a new IFC Workflow Guide document. The purpose of the IFC Workflow Guide is to explain simply the recommended workflows when issuing IFCs between ARCHICAD and Revit.

We believe that having a standard approach in interoperability exchange situations will allow better training material to be developed and in time also allow UK and Ireland companies to employ staff without needing to retrain where an employee has worked for another UK or Ireland firm.

Reference Model Concept

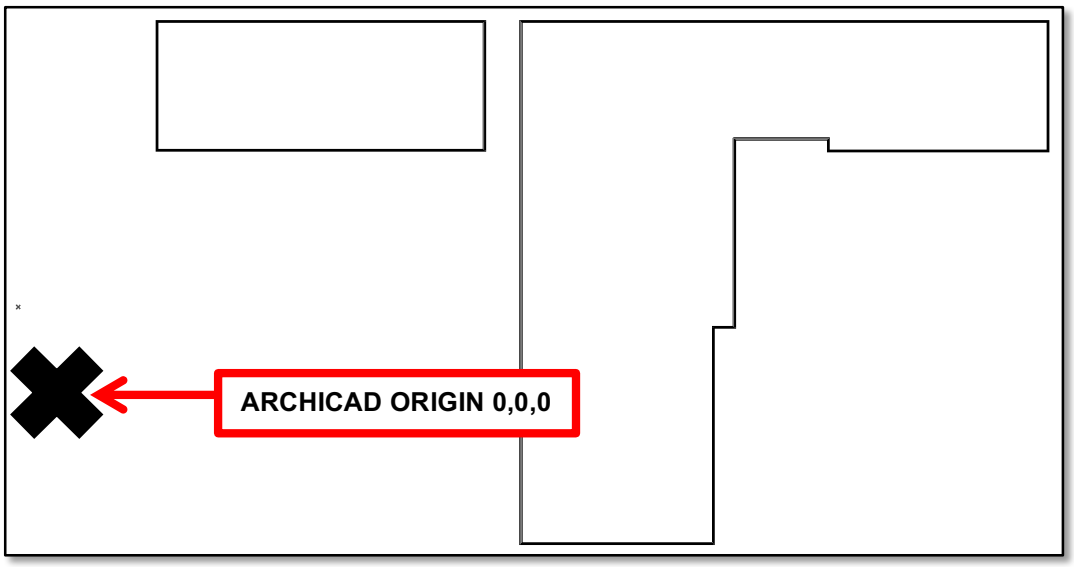
The workflows described in this article operate under a concept called the 'Reference Model Concept' which is mainly a one-directional exchange. If modifications are required to a particular model not owned by the user then these modifications must be handled by the original author of that model.
Do not modify anything on any model you do not own.

For further information please read Building Smart's definition of the reference Model Concept: http://www.buildingsmart-tech.org/specifications/ifc-view-definition/ifc4-reference-view

ARCHICAD model setup for IFC Export to Revit

Coordinates and Orientation

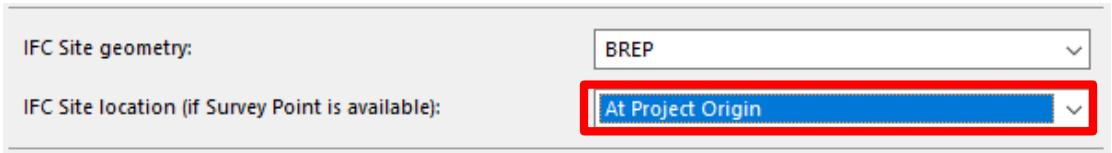
Create the ARCHICAD model close to ARCHICAD's origin which is indicated by a black cross on the floor plan. Create the ARCHICAD model orthogonally.



Coordinates and Orientation – Real World

To export an ARCHICAD IFC model to a real world location for it to be imported into an **analysis** application (Navisworks,Solibri) we would recommend the following:

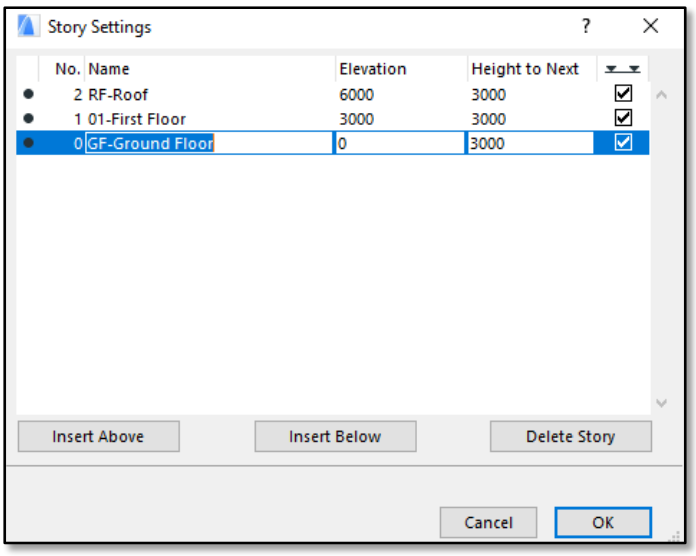
1. Setup a new ARCHICAD file which contains the site situated at real world coordinates. Also set up the storeys Elevation values to the real world Z coordinate. – Page 4 for more info.
2. Take the building model we created earlier which is situated at 0,0,0 and hotlink it into the site model.
3. Drag the hotlink module to the desired X/Y position.
4. Rotate the hotlink module to the correct orientation (Angle to True North)
5. Export to IFC with the IFC Site location option set to 'At Project Origin' found within the IFC Translator>Export Options>Geometry Conversion Options.



6. If a requirement is to federate within **Revit** then you will need to introduce the ARCHICAD survey point object into the model then set IFC Site Location to At Survey Point position.

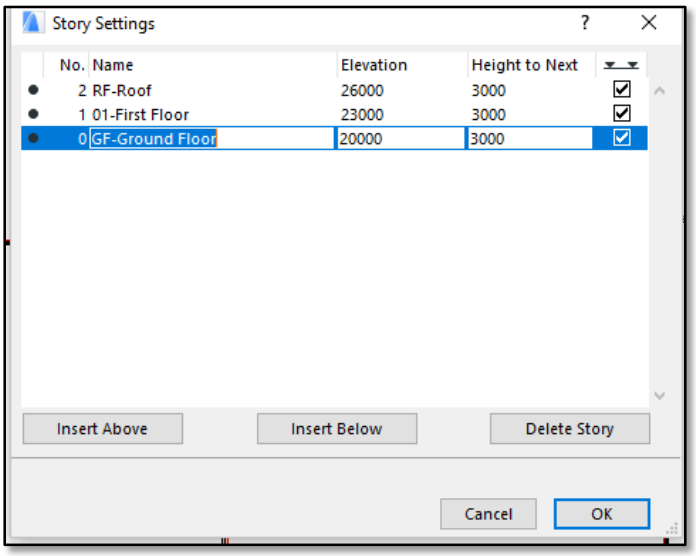
Storeys/Levels

Set the ARCHICAD storeys so that they're calculated from 0.



Storeys/Levels – Real World

Set the ARCHICAD elevation values in the site model to the real world Z coordinate. Keep the Height to Next values the same however. When the building model at ARCHICAD origin is hotlinked it will simply be elevated to the new heights specified in the site file.



General Modelling tips

- Save only the levels that will be a part of the building.
- Storeys should not be used as space for sketches or as a temporary storage for alternative design solutions.
- Avoid negative heights. Always start modelling in Z-coordinate”0”.
- Consider and import levels that other disciplines use.
- Check all floor heights to other disciplines’ models before the exchange of information takes place.
- Find out how other disciplines’ applications handle levels.

Common mistakes

- The entire model is placed far from the origin.
- Data that is no longer required remain in the model. Also, there may be wall pieces, slabs or objects that have accidentally ended up far from the origin.
- A combination of the above, where both model and building components are located far from the origin.
- The model contains too many objects with complex geometry. E.g. 500 seating objects with detailed armrests, headrests and wheels, or 1000 detailed doors with locks and handles on both sides.
- Incorrect setting in, or use of the IFC translator: All the properties of objects in the library are[…]”

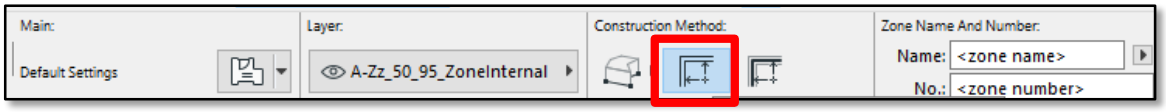
Reference – IFC Guide International page 10.

Zones

Model the ARCHICAD zones with the inner edge construction method.

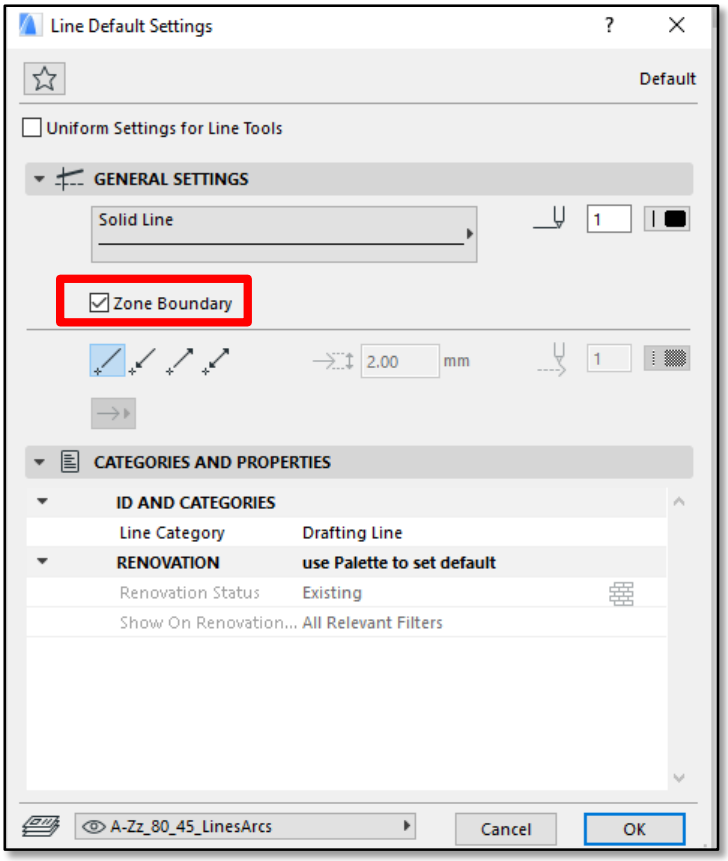
Manual zones are time consuming to create and cannot be updated via the Update Zones command (Design Menu>Update Zones) which may also lead to inaccuracies for area calculation/zone calculation within ARCHICAD’s scheduling environment.

Manual zones can also cause import errors for Revit users in which the converted ARCHICAD zones may be reported as ‘room is not in a properly enclosed region’



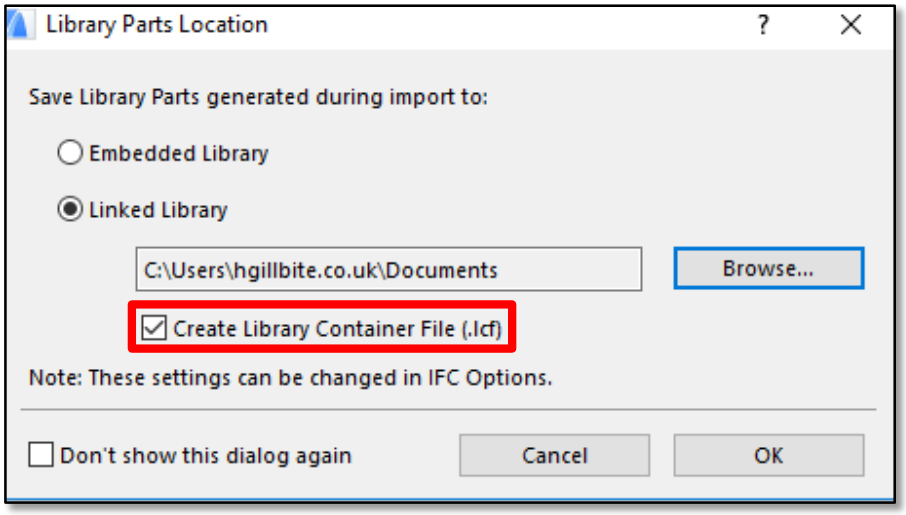
If exporting an IFC to Revit, ensure that the subfloor thickness value of the ARCHICAD zone is set to 0mm. We’ve come across an issue where if a subfloor thickness is defined it can cause the Revit error ‘room is not in a properly enclosed region’

For rooms that are not bounded by walls, use the line tool and set it to act as a zone boundary. That way you can place zones using the inner edge construction method.



IFC Import to ARCHICAD Workflow

1. File Menu > Open > Choose IFC Translator > Open .IFC Model.
2. Create a .lcf (if the IFC Model contains objects)



3. Save the imported .IFC as a .PLN.
4. Additional step for teamwork users, firstly remove the .lcf via Library Manager (File Menu>Libraries and Objects>Library Manager) and then upload the .lcf as a BIM Server Library. (File Menu>Libraries and Objects>Manage BIMcloud/BIM Server Libraries) Add the BIM Server Library to the main ARCHICAD project.
5. Hotlink the .PLN which contains the .IFC Model into the main ARHICAD model.

IFC Import Workflow for revised IFC models

1. Delete the original IFC Model hotlink .PLN via Hotlink Manager (File Menu>External Content>Hotlink Manager)
2. Remove the current .lcf from Library Manager.
3. Remove any attributes (e.g. profiles) associated with the previous hotlink if at the time of translation, new attributes were created in the main file. This will crop up if you choose to convert construction elements to construction elements (native conversion)
4. Repeat the steps from 1 to 5 above.

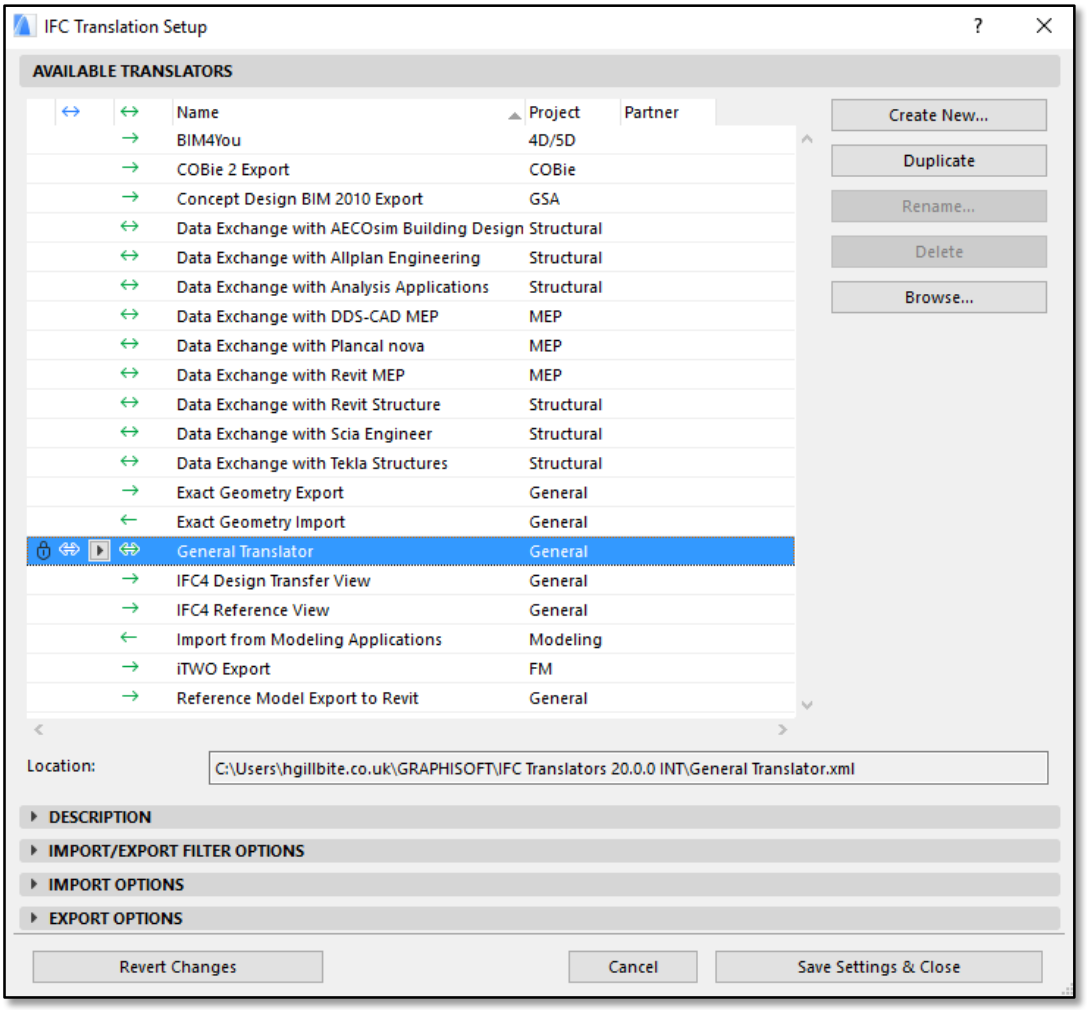
Notes

Never use the Merge command to import an IFC Model into the main ARCHICAD model.

Do not store Library Parts into the Embedded Library especially for teamwork projects. By having hundreds of .gsm files within the Embedded Library it can cause teamwork performance issues.

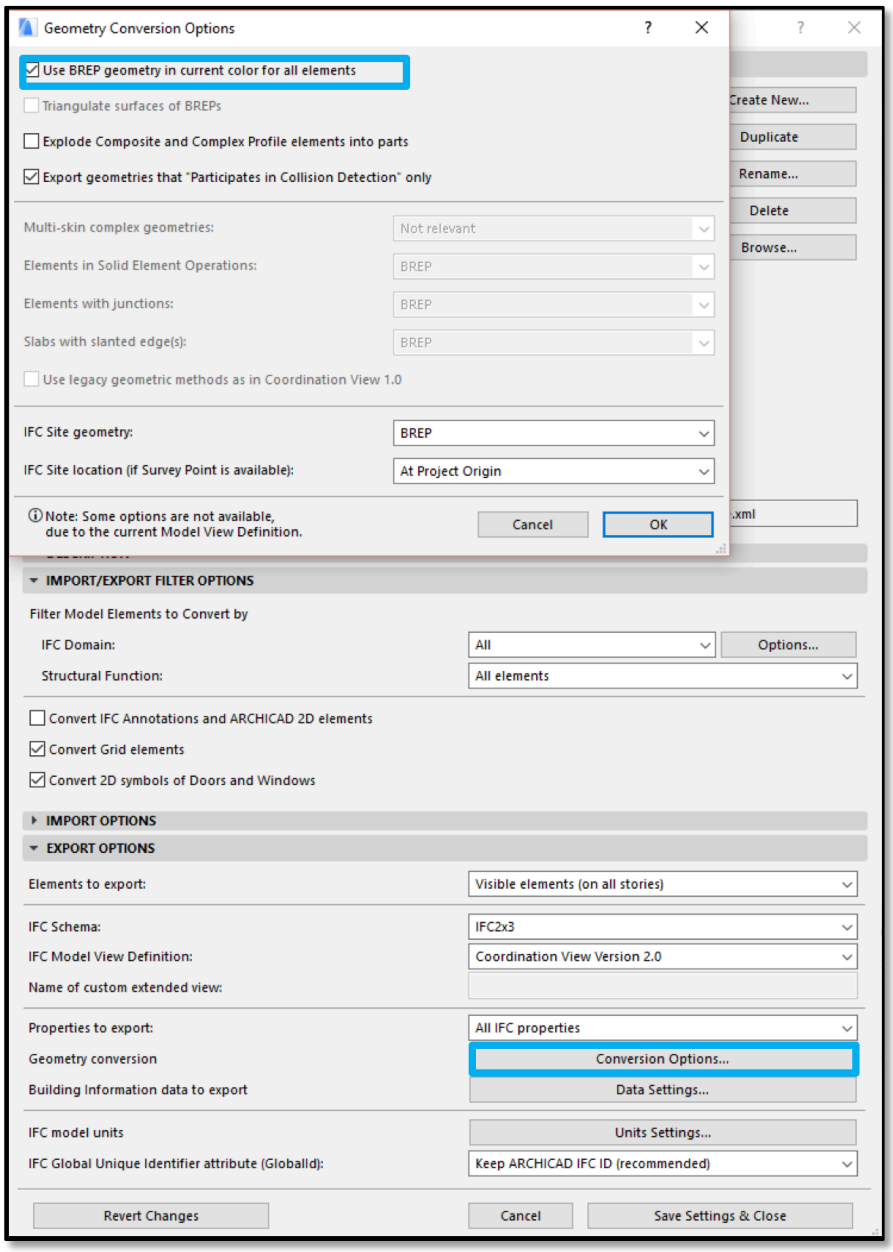
ARCHICAD IFC Translators

Importing and exporting model data using IFC is controlled by the settings of the translator you are using. ARCHICAD provides predefined, factory-default IFC Translators, but you can define your own. IFC Translation Setup command (File > Interoperability > IFC) allows you to view or modify translator settings, or to create new translators. The following is a description of the settings found in the IFC Translator Setup dialog box:



For more information please read the following HelpCentre article:
http://helpcenter.graphisoft.com/guides/ARCHICAD-17-guides/ARCHICAD-17-int-reference-guide/interoperability/file-handling-and-exchange/working-with-ifc/ifc-translators/

ARCHICAD IFC Translator setup for IFC Export to Revit Structures

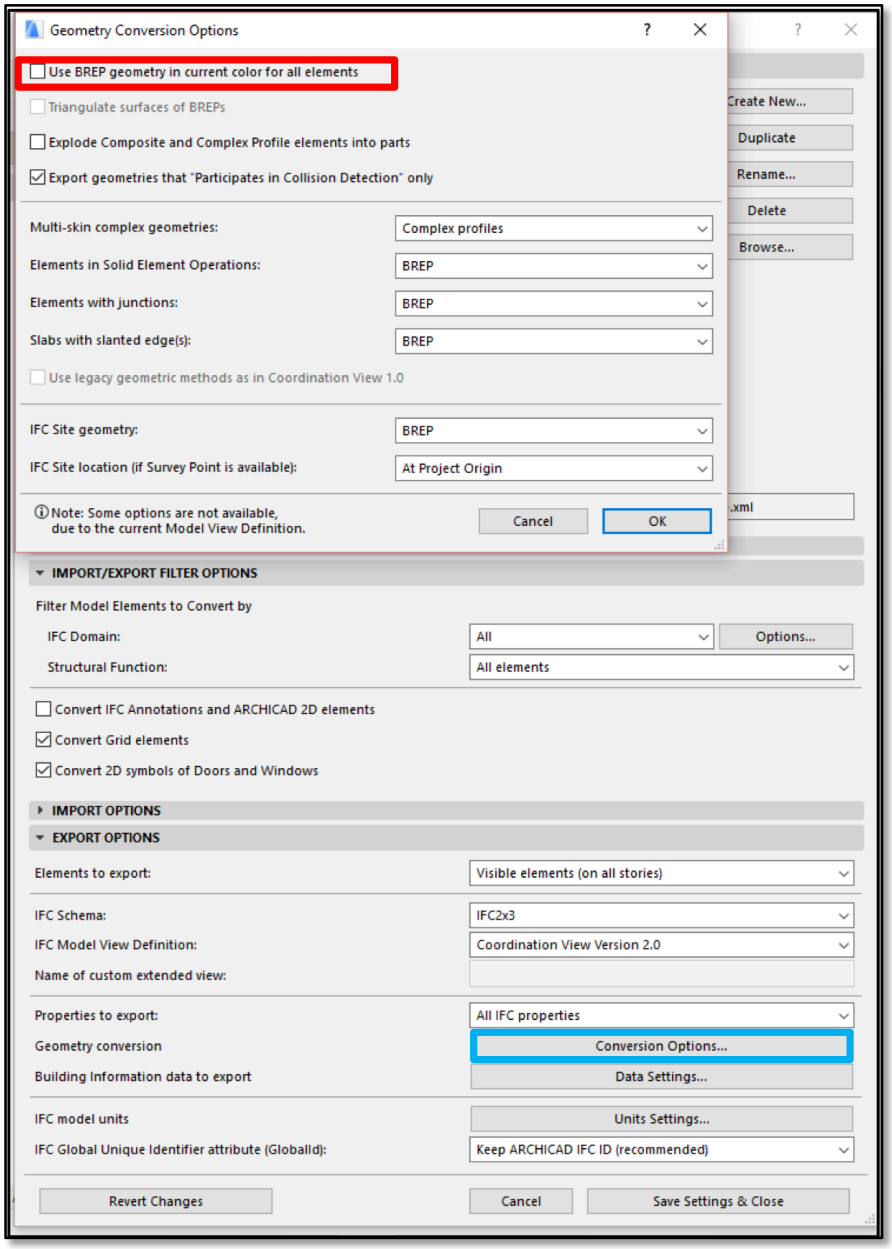


Above is a recommended IFC Translator Export setup when issuing models to Revit (or other design applications) the key option here is 'Use BREP geometry in current colour for all elements' within Geometry Conversion Options.

For further information please read Pages 2492-2506 within the ARCHICAD 20 Reference Guide.

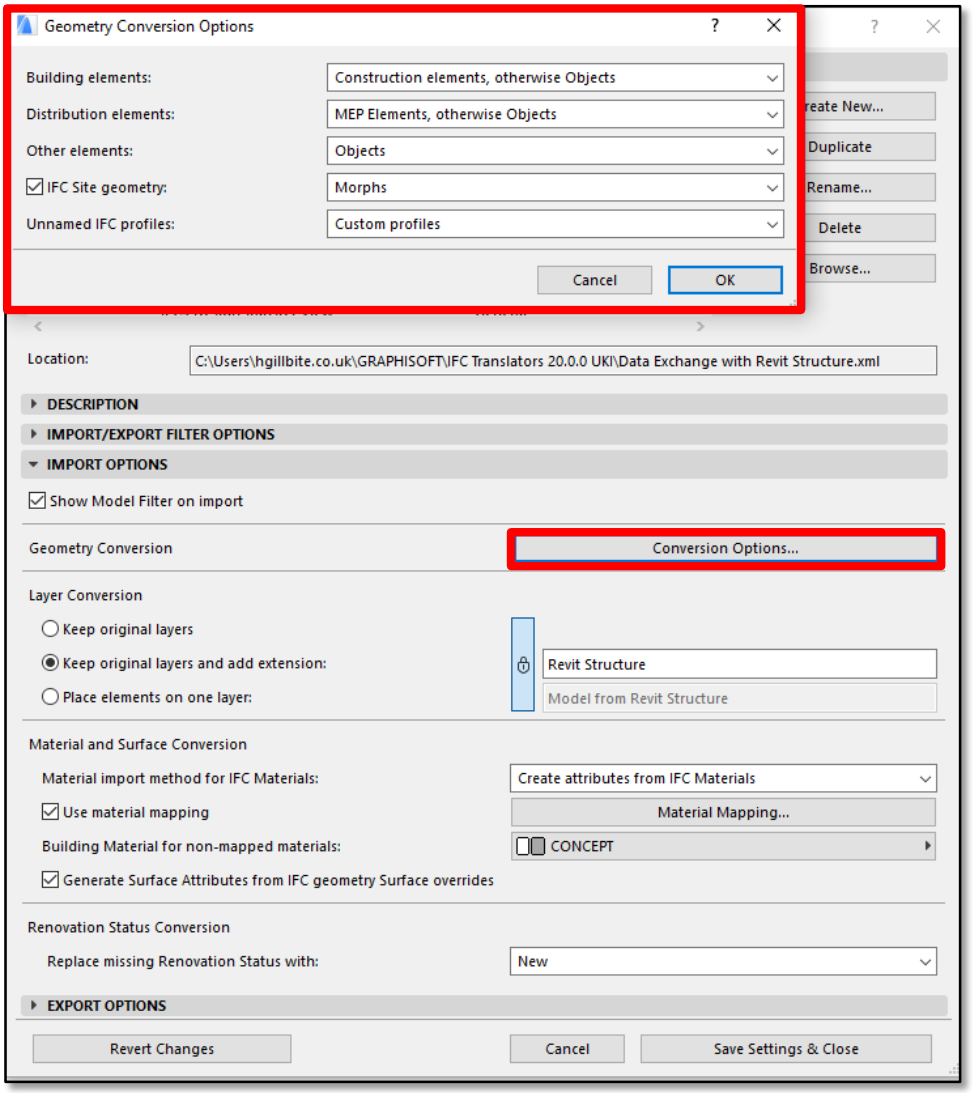
ARCHICAD IFC Translator setup for IFC Export to Revit MEP

Below is a recommended IFC Translator Export setup when issuing models to Revit MEP users who require IfcSpaces. The key option here is to uncheck 'Use BREP geometry in current colour for all elements'



ARCHICAD IFC Translator setup for IFC Import

To import an IFC file into ARCHICAD navigate to the File Menu>Open (If you already have a project running, check the option launch a new instance of ARCHICAD)
Prior to importing the IFC file you will need to decide how you wish to import the geometry/attributes of the IFC file. This is governed by the IFC Translator - import options.
Screenshot below shows the default Data Exchange with Revit Structure IFC Translator.



Notes

The benefit of using File>Open over Merge is that you can firstly check the storey setup of the IFC Model.

Geometry Conversion methodology

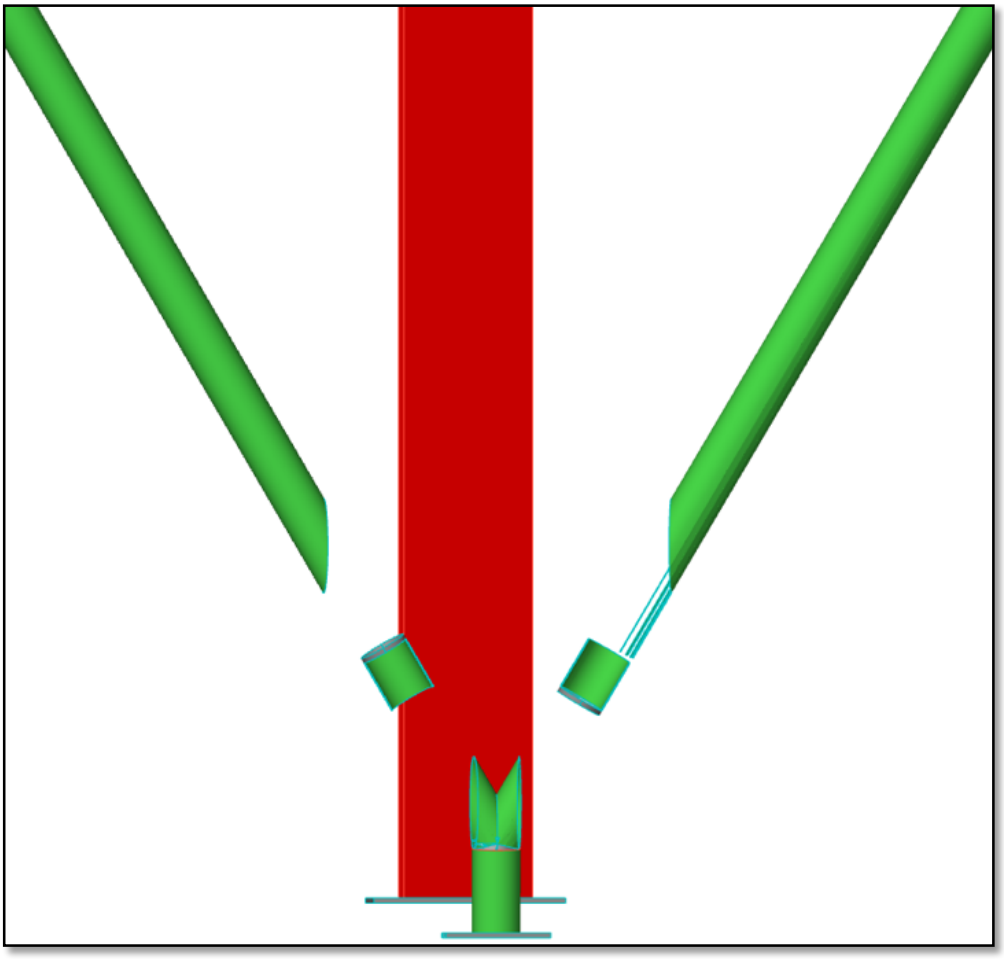
Native element import

Advantages

- Correct floor plan and section representation.

Disadvantages

- Creates complex profile attributes.
- Attributes will need to be managed carefully when revised IFC files are imported. For further information on attribute management please read the *Manage Attributes from IFC* topic.
- Imported Complex Profiles may cause conflicts with attributes that already exist in the ARCHICAD file.
- Complicated element connections may fragment when imported into ARCHICAD.
- Screenshot below shows a complicated connection from Tekla in which when the construction elements are converted to be native ARCHICAD elements (Beams) the connection breaks.



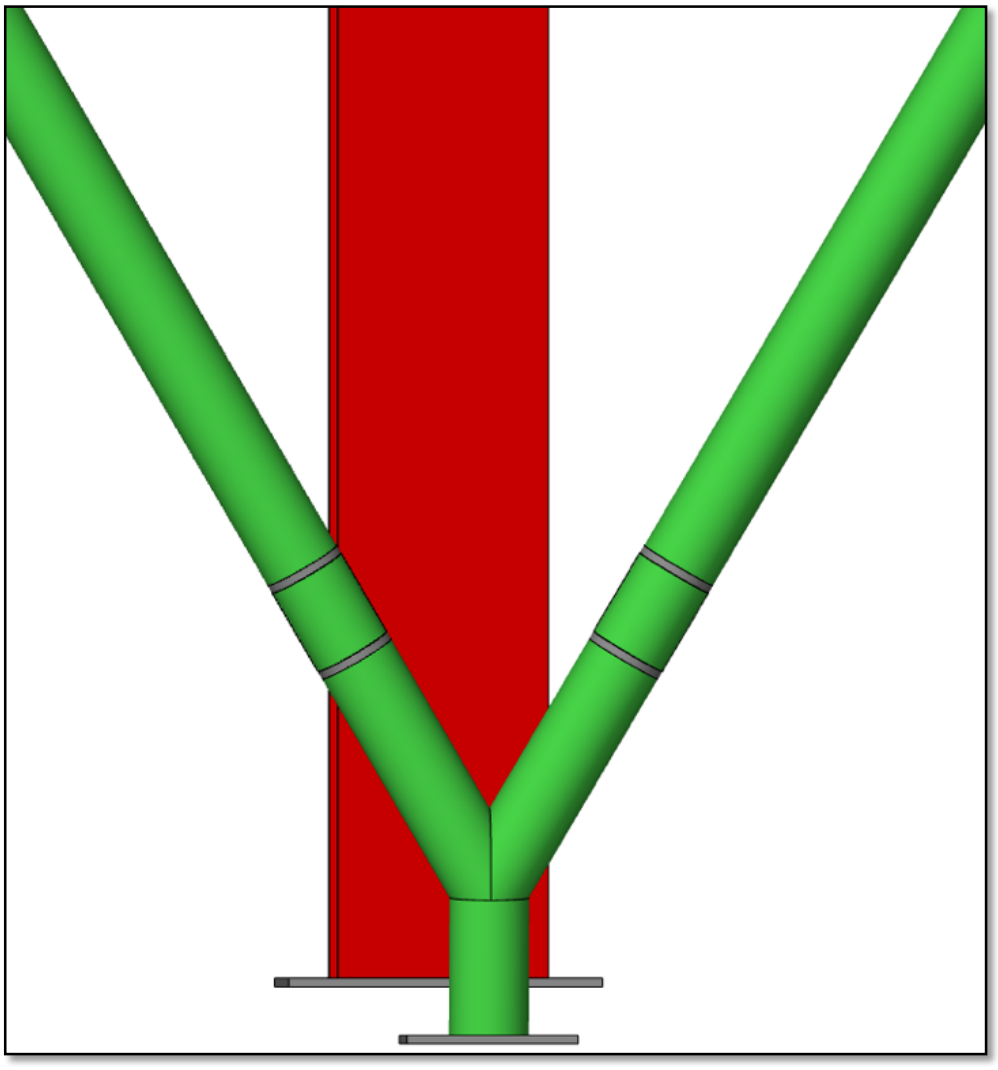
Morphs

Advantages

- Good control over 2D representation - (Projected, Projected with overhead, etc)
- No complex profile attributes are created
- No library parts are created.
- Complicated element connections will be left intact creating precise geometry.
- Screenshot bellow shows the same complicated element connection from Tekla but the elements have been converted to Morphs. As you can see the geometry has been left intact creating precise geometry.

Disadvantages

- May become heavier than objects (slow performance in 3D) – may need to check this with GSHQ?
- 2D representation may suffer for other construction elements (Walls/Slabs/etc)



Objects

Advantages

- No complex profile attributes are created.
- Objects can be stored in Linked Libraries or .lcfs for easier management.
- Complicated element connections will be left intact creating precise geometry.

Disadvantages

- It is difficult to control the 2D representation.
- There may be issues with objects not showing on the correct storeys.

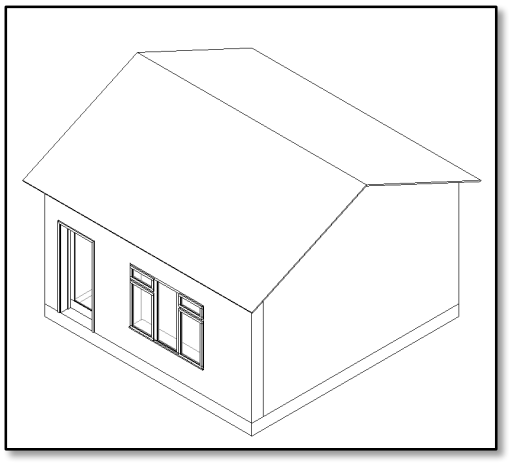
What is BREP?

BREP short for Boundary Representation reproduces the precise geometry when exporting IFC files. BREP geometries will include Solid Element Operations, Trims, Crops, etc from the ARCHICAD model.

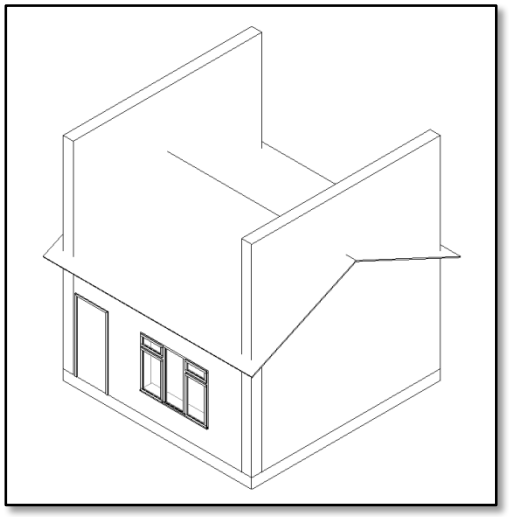
Limitations of BREP

- Non editable elements (object based)
- Some parameters are lost

Example of an ARCHICAD IFC exported under BREP (Revit 2016).



Example of an ARCHICAD IFC exported under Extruded/Revolved geometries (Revit 2016)

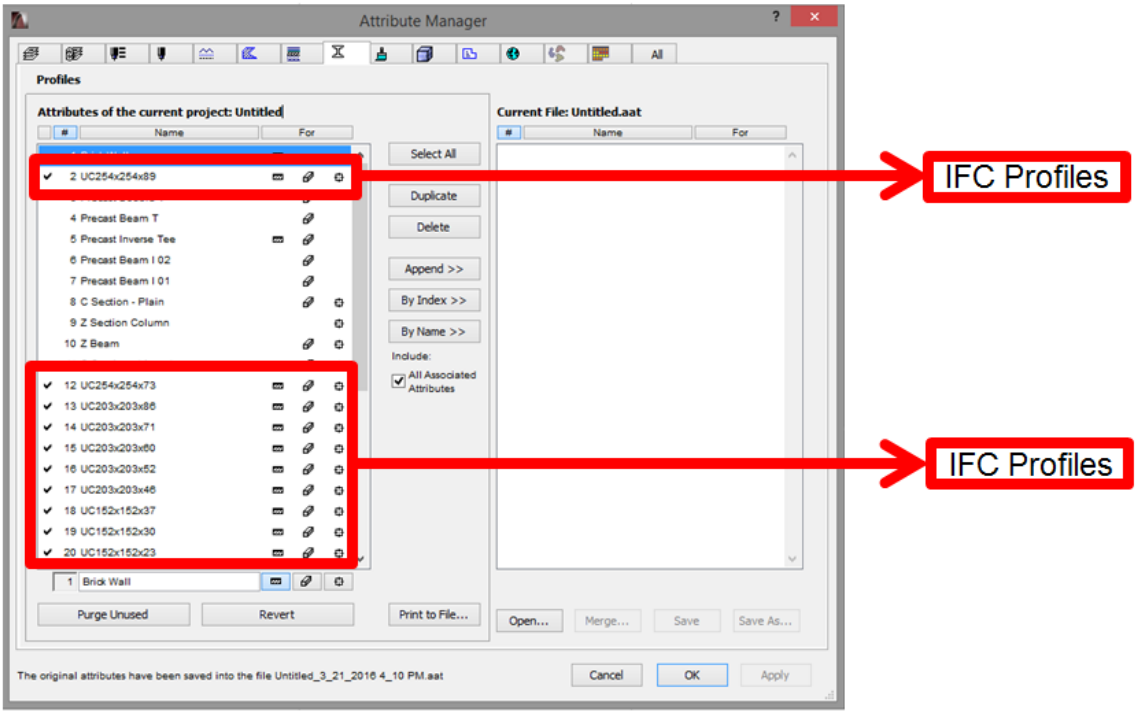


Conclusion

For structural imports we would recommend importing the .ifc converted to Morphs. This is partly because as an Architect you would not require the structural elements to be native and also the benefit of not having to manage attributes/libraries makes it easier to manage revised IFC models.

Managing attributes from IFCs

Introduction:
When an IFC is imported and you choose the option 'convert to construction elements, otherwise objects/morphs' then attributes will be created, from a structural file the attributes that will be created are mainly complex profiles/building materials.



How to manage complex profile attributes
A common issue when removing the attributes in order to place the revised .ifc model is that you may be using some of ARCHICAD's standard steels (Options Menu>Complex Profiles>Import Standard Steel Profile) This may be confusing for a user when they come to delete the complex profiles as they may not necessarily know what is an IFC Imported profile or an ARCHICAD imported profile. Therefore they're two suggestions to help manage attributes easier:

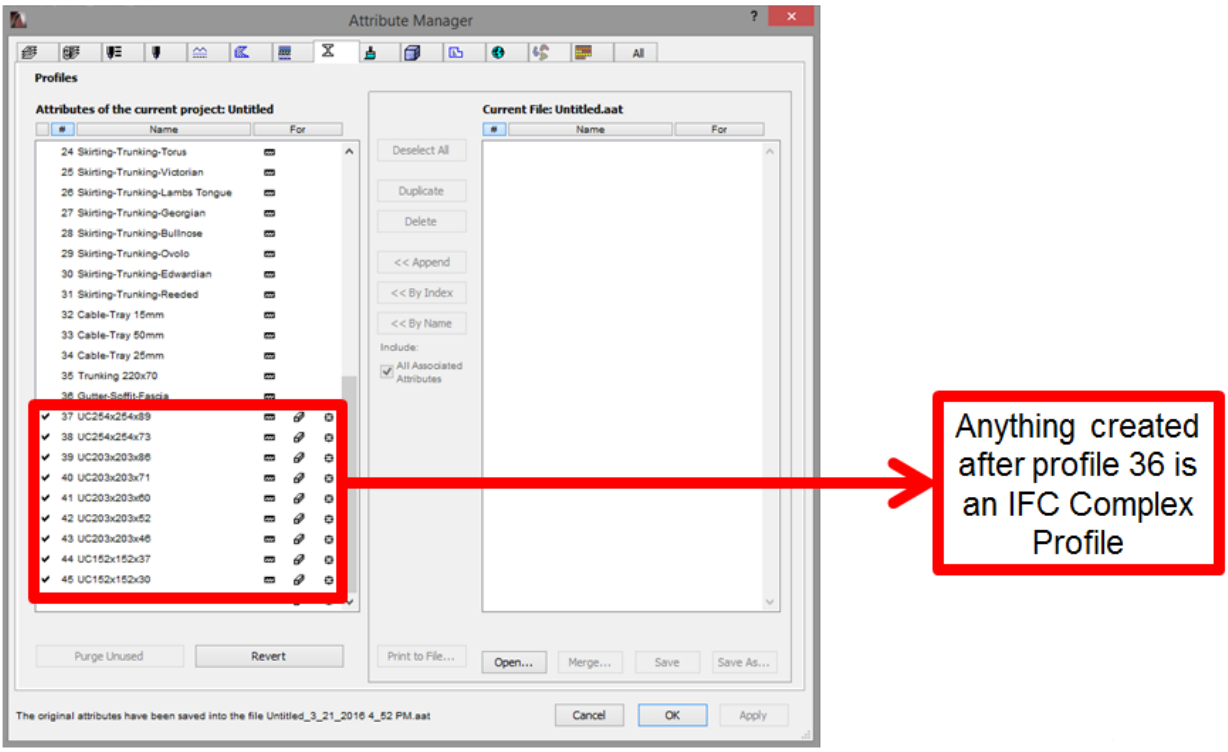
1. Prefix all ARCHICAD standard steel profiles (if they are in use) for example GSUK_UC254x254x89, due to the name differences you can then clearly see which is an imported IFC Profile (No prefix) and what is a standard AC profile.

This can also solve a common issue in which if the same profiles are loaded, the steels can rotate to a different position. For example an I beam becomes a H beam.

2. Make sure that the complex profiles list is fully populated in terms of their numbers. As you can see from the screenshot above I had a missing profile #3, due to the import of the IFC the profile has now taken this slot which on a large project

may make it difficult to find later to remove it for the revised IFC Import. If you wish to fill the gaps, then I recommend creating a 'dummy' complex profile attribute file in which all dummy profiles are numbered correctly. You can then load this dummy attribute file into the main project via Attribute Manager (Options Menu>Element Attributes>Attribute Manager) and use the <<By Index button to load these profiles in to populate the gaps. When all gaps are filled, when you next import the IFC all imported profiles will start after the final complex profile attribute.

For example:
36 profiles loaded into a project. When the IFC is imported I can now easily tell anything after profile 36 is an IFC profile.



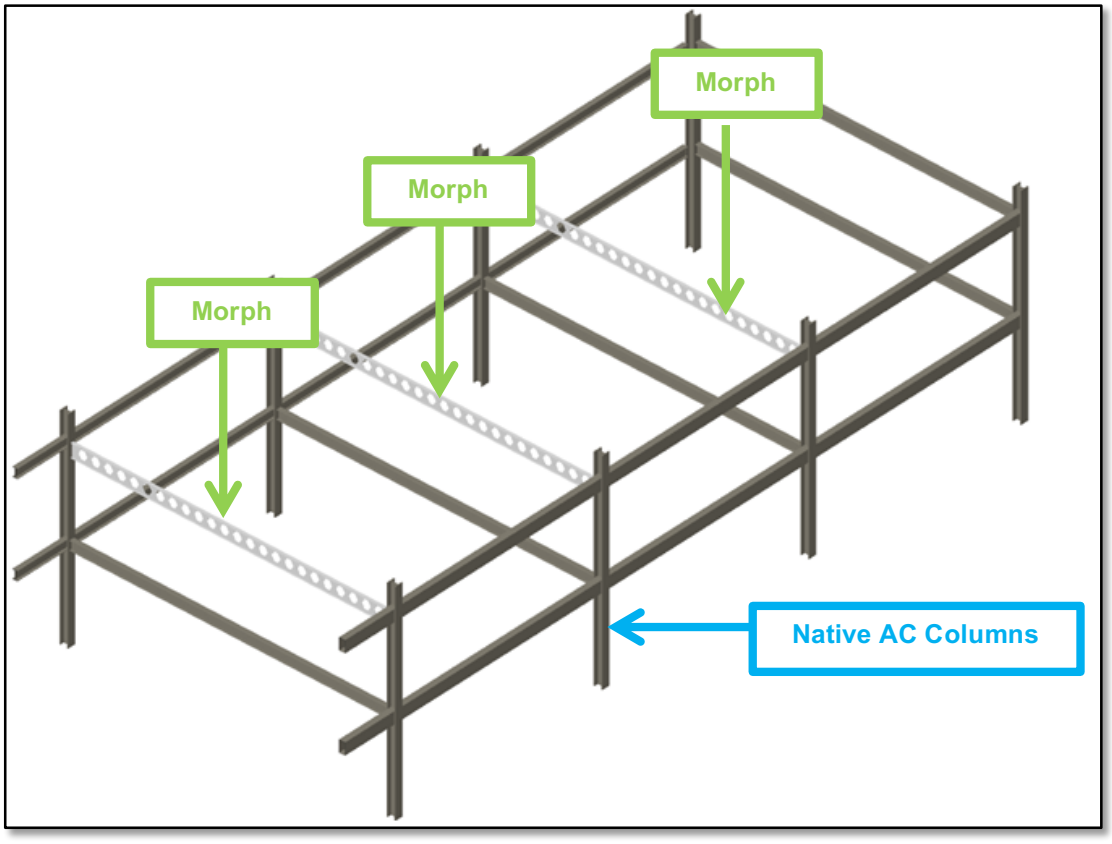
Geometry Conversion options

Firstly it is necessary to see how the geometry conversion from a structural IFC model is handled. The primary setting here will be the Building elements option within the IFC Translator – Import Options – Geometry Conversion Options.
The following options available are:

- Construction elements, otherwise Morphs
- Construction elements, otherwise Objects
- Morphs
- Objects
- From a structural IFC model the construction elements would be, Beams/Columns/Slabs/Walls/etc.

Construction elements, otherwise Morphs

Screenshot below shows a structural IFC imported into ARCHICAD.
Construction elements here are Beams and Columns therefore these elements will be converted into native ARCHICAD Beams and Columns. However the Castellated Beam will be converted into a Morph due to the complexity of the element.

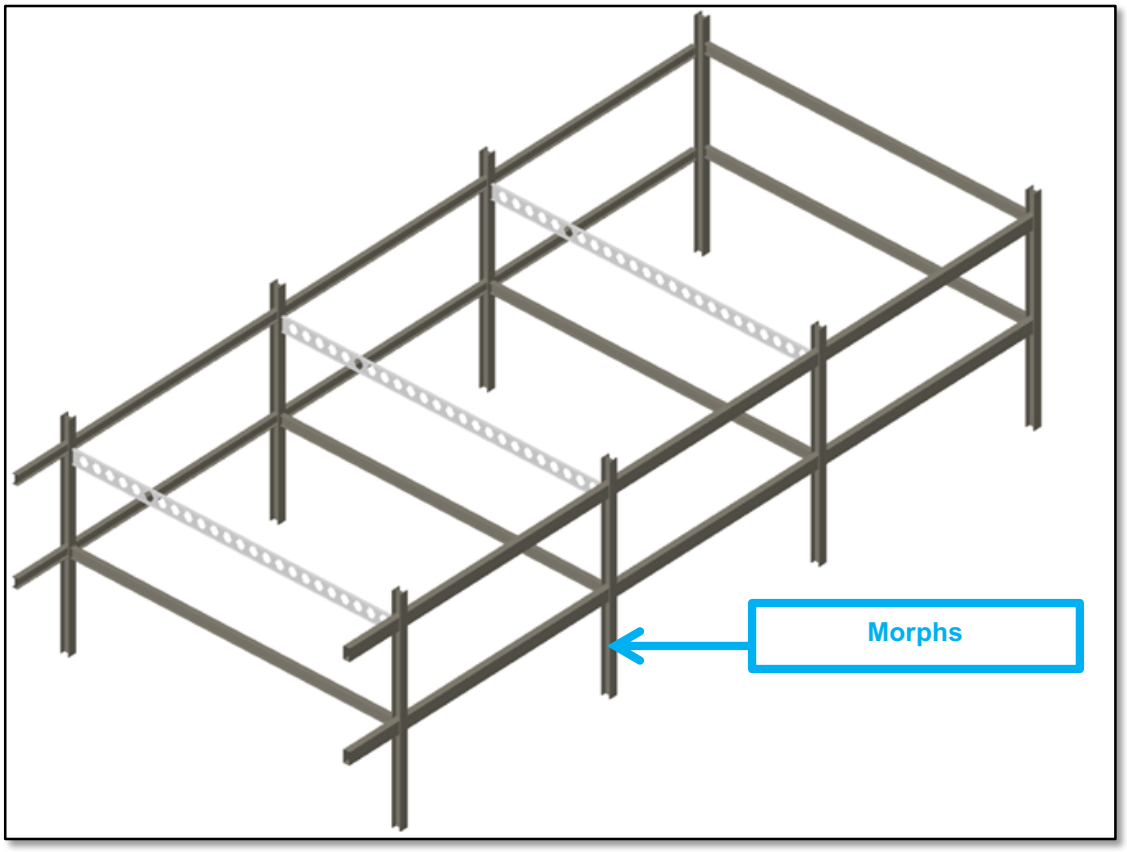


Construction elements, otherwise Objects

Imports in a similar way to Construction elements, otherwise Morphs but the complex elements (castellated beam) will be converted into an object. The standard beams and columns will be converted into native ARCHICAD elements.

Morphs

Screenshot below shows the same structural IFC imported into ARCHICAD, this time however all construction elements have been converted to Morphs.



Objects

Imports in a similar way to Morphs but all construction elements will be converted into Objects.

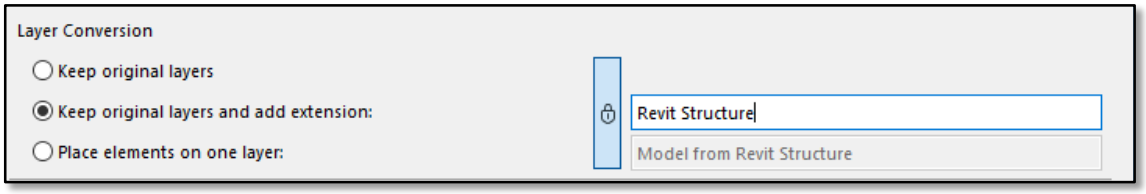
Notes

Even though we convert all construction elements to Morphs/Objects the elements are left intact.

IFC Data (Property Sets/Properties) are also left intact during the construction element conversion to Morphs/Objects.

Layer Conversion

We recommend using the following setup for Layer Conversion:



Notes

The main option here is 'Keep original layers and add extension' This will import the layers stored in the IFC but ARCHICAD will add an extension (which can be edited) to all imported IFC layers allowing for easier management of IFC Layers and ARCHICAD model layers.

However if BS1192 compliant layer naming is used as the discipline code, that is the discipline code at the beginning of each layer name, this will help to differentiate the layers between the Structural Engineer and the Architect.

Material and Surface Conversion

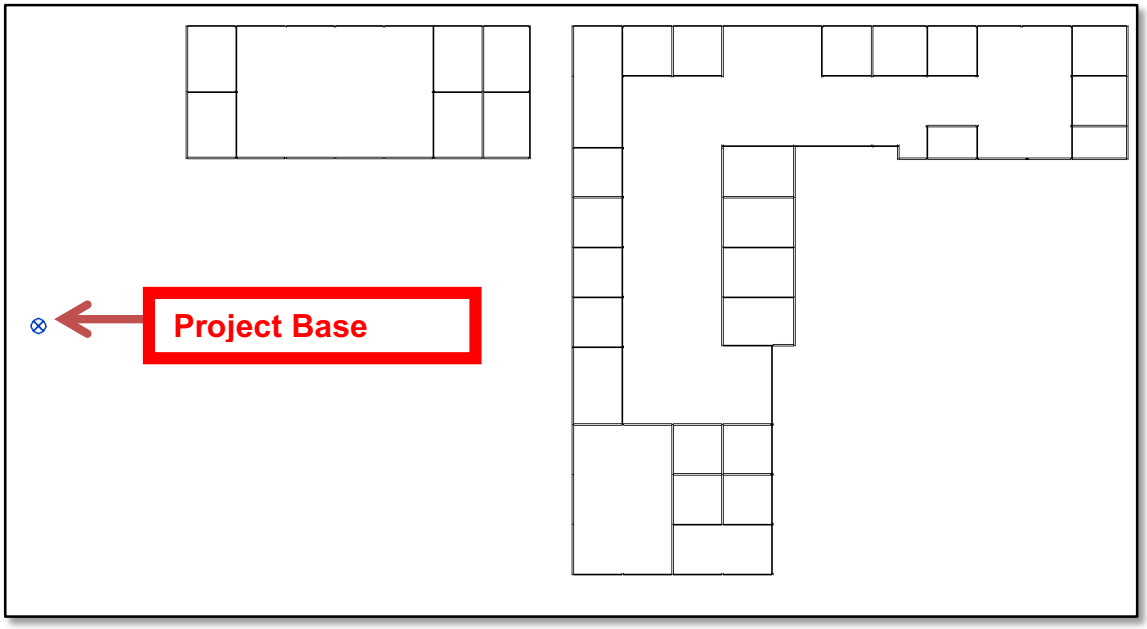
Material and Surface Conversion is personal preference but can be useful to eliminate any additional building materials from being added to the ARCHICAD model.

You can read more about the Material and Surface Conversion on pages 2487-2491 of the ARCHICAD 20 Reference Guide.

Revit structural model setup for IFC Export to ARCHICAD

Coordinates and Orientation

Create the Revit model close to the Project Base Point which is indicated as a circle with a cross through it. Create the Revit model orthogonally.



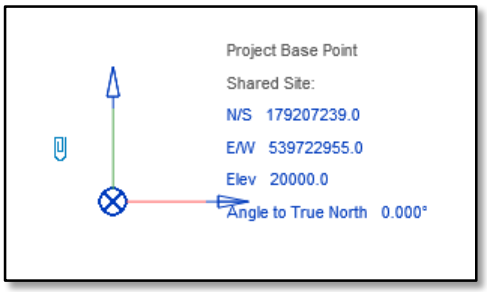
Notes

- Project Base Point may be hidden by default, to show it at all times press VG to open the Visibility/Graphic Overrides settings. Then navigate to the Site subheading followed by Project Base Point, put a check into the box to show the Project Base Point.
- Project Base Point is equal to ARCHICAD's origin (black cross – 0,0,0)
- Do not move the Project Base Point from its start-up location as this will cause differences in origin placement between Revit and ARCHICAD. To check if the Project Base Point has been moved from start-up location, unclip the Project Base Point, then use right click followed by Move to Start-up Location from the context menu.

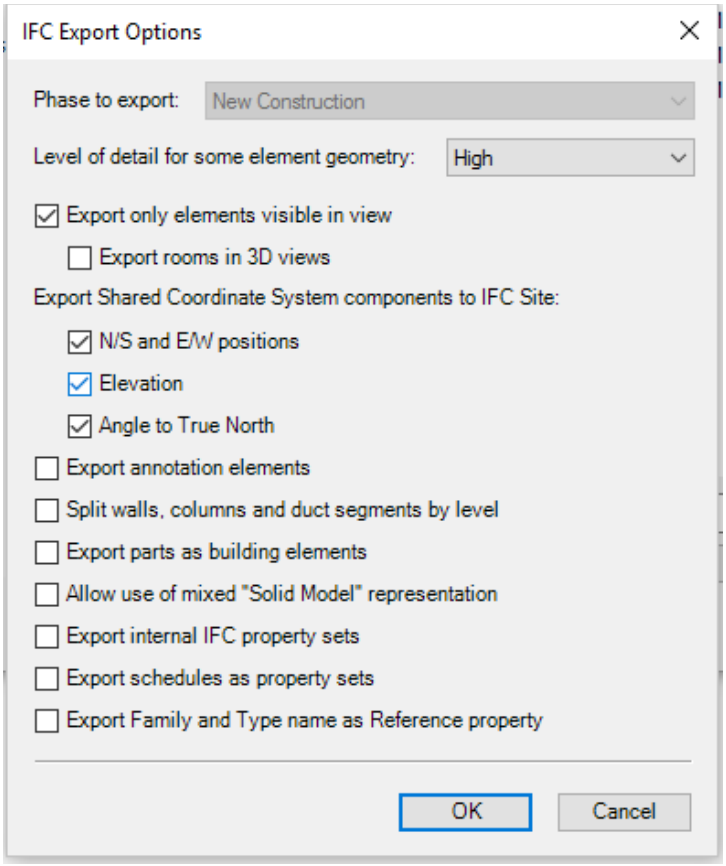
Coordinates and Orientation – Real World

To export the Revit IFC model to a real world location for it to be imported into an **analysis** application (Navisworks,Solibri) we would recommend the following:

1. Add the agreed X/Y/Z positions to the Project Base Point.



2. Export the Revit model to IFC using the Graphisoft Add-In with the following options checked:



Notes

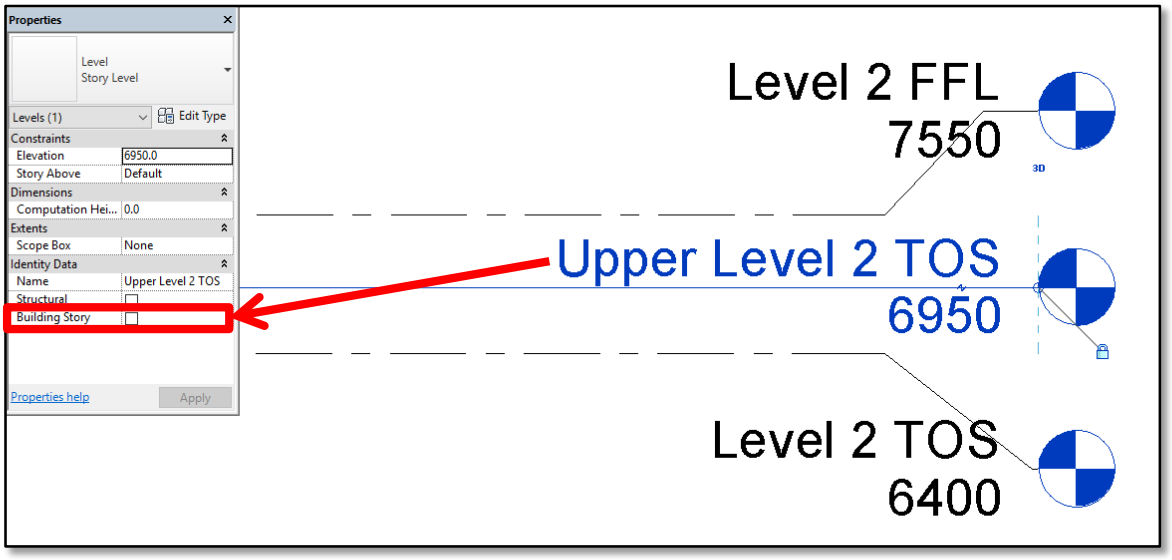
By checking the options:
N/S and E/W positions
Elevation
Angle to True North

This will export the Revit model to the correct real world location as defined by the Project Base Point.

If you have the option checked ‘Export only elements visible in view’ this will only export one storey if you are viewing the Revit model in a floor plan view. Therefore use this option only within a 3D View.

Storeys/Levels

- Set the Revit Levels so that they are calculated from 0.
- Prior to exporting an IFC file from Revit make sure all additional structural levels. (TOS, TOC, TOB, etc) are not set as Building Storey. Secondly, add additional Levels to match the agreed level structure on the BEP and set these to be Building Storey.
- To turn off additional structural levels, open up a section/elevation view then highlight the level you do not wish to export and uncheck the option Building Storey within the Properties dialogue.
- Only the defined levels in the BEP should have the option Building Storey checked.



Notes

Additional levels for Finish Floor Levels can be added without affecting geometry positions in Revit. To add additional levels to coordinate with ARCHICAD users, open up a section/elevation view and then navigate to the Structure tab on the ribbon followed by level.

Storeys/Levels – Real World

As mentioned on **page 19** by defining an elevation value within Project Base Point this will export the model to the real world Z height, when the option Elevation is checked within the Graphisoft Revit Add-In.

Exporting to IFC from Revit

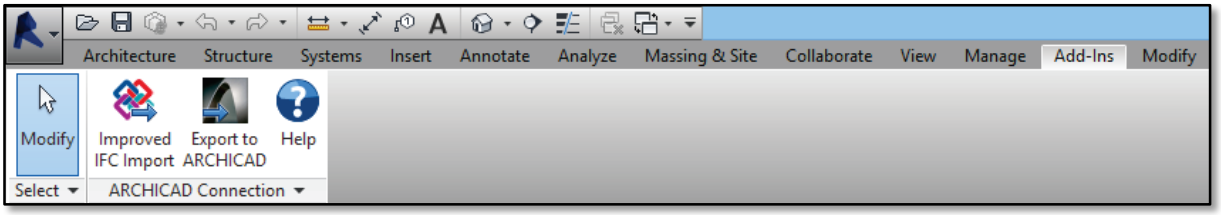
Before exporting a Revit model to IFC please ensure that the following plugins/updates are installed.

Graphisoft's ARCHICAD Connection for Revit Add-In
http://www.graphisoft.com/downloads/interoperability.html
Autodesk's IFC import-export app for Revit
https://sourceforge.net/projects/ifcexporter/
Latest Service Pack for Revit
https://knowledge.autodesk.com/support/revit-products/downloads

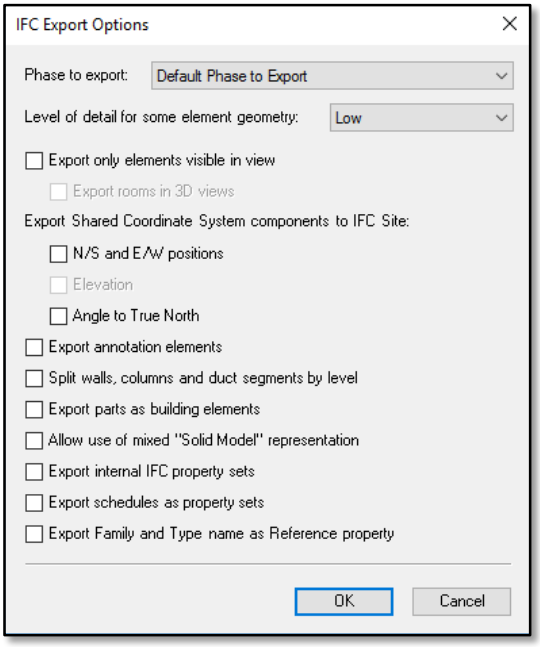
Notes
It is recommended to always use the Graphisoft ARCHICAD connection for Revit Add-In for both export/import of IFC files from Revit.

Graphisoft's ARCHICAD Connection for Revit Add-In setup

Once installed, the Graphisoft Add-In can be located on the ribbon under Add-Ins.



Due to both the Revit model and ARCHICAD model being coordinated near project origin (0,0,0) then we would recommend having the following options unchecked:



Notes
We would only recommend checking the options under Export Shared Coordinate System components to IFC Site when models are required to be federated at global

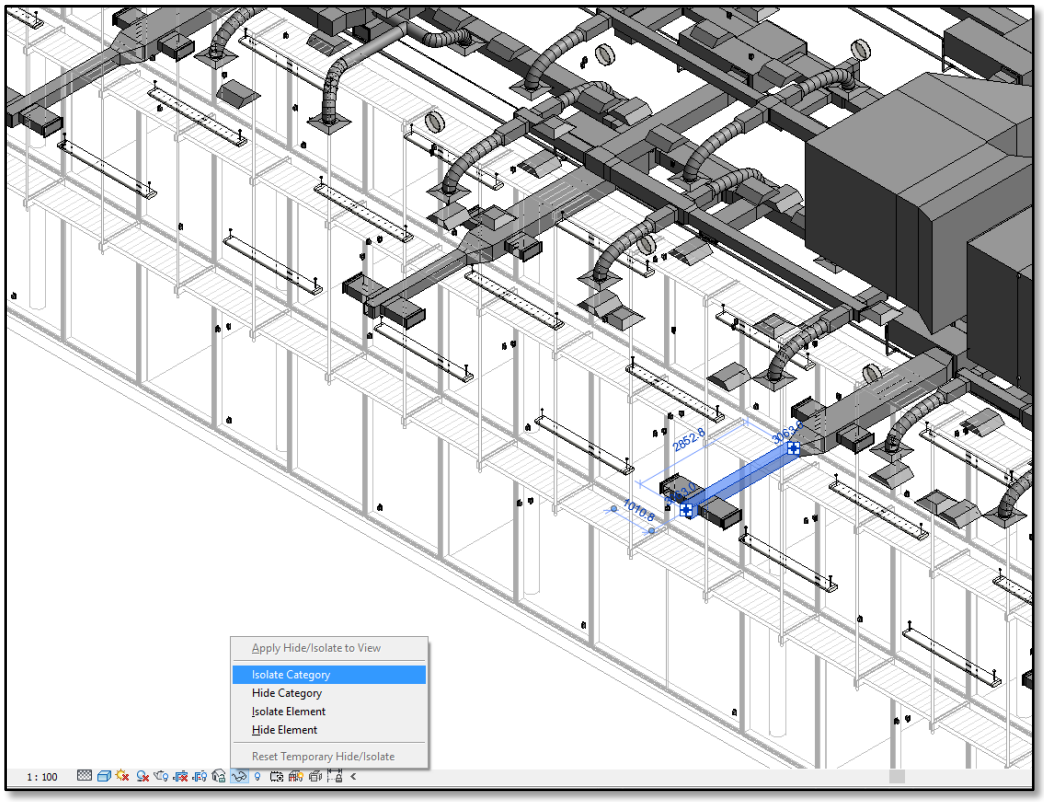
coordinates. (This workflow is quite common when IFC models need to be issued to contractors who may federate in Solibri/Navisworks/etc)
The option Export only elements visible in view when used in conjunction with temporary isolate/visibility/graphic override filters to stop the IFC from exporting unnecessary data.
Some design teams may require further information about the elements contained in the IFC, this can be achieved by checking the option Export internal IFC Property sets. This will add further IFC properties to each IFC element.
For more information about the options available in the Graphisoft Revit Add-In please read the following reference guide - http://tinyurl.com/hoe3fp9

Additional step for Revit MEP model export

Architects may not necessarily require all of the intricate fittings/components for coordination purposes. Therefore it is wise to hide these elements prior to export. This can be achieved in two ways.

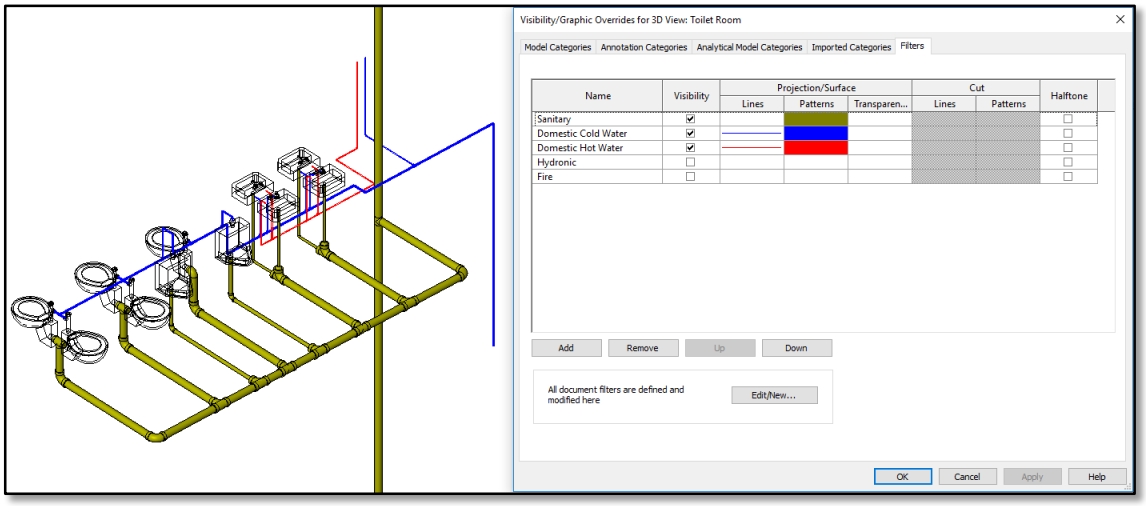
Temporary hide/isolate command

An easy way of isolating Ducts/Pipes is to use Revit's temporary hide/isolate command. View the Revit MEP model within a 3D View, highlight a duct then use the sunglasses icon followed by isolate category.
This will now only show ductwork in the 3D View everything else will be temporarily hidden.
You can also select two different categories i.e. Ductwork and Pipework then use the Isolate Category command to only isolate elements of that type.



Filters

Another way of isolating elements is to create filters. Filters can be created within Visibility/Graphic Overrides (Press VG on the keyboard!)
A key benefit with filters is that you can create rules to show/hide specific elements whereas with the temporary hide/isolate command it's all or nothing.
Screenshot below shows an isolated bathroom using filters to isolate the Revit MEP elements.



References

You can read more about Temporary hide/isolate and Filters via the following reference guides:

- Temporary hide/isolate

https://knowledge.autodesk.com/support/revit-lt/learn-explore/caas/CloudHelp/cloudhelp/2017/ENU/RevitLT-DocumentPresent/files/GUID-A5E51D5E-8E18-4834-8A2F-8B4E3E6379A1-htm.html

- Filters

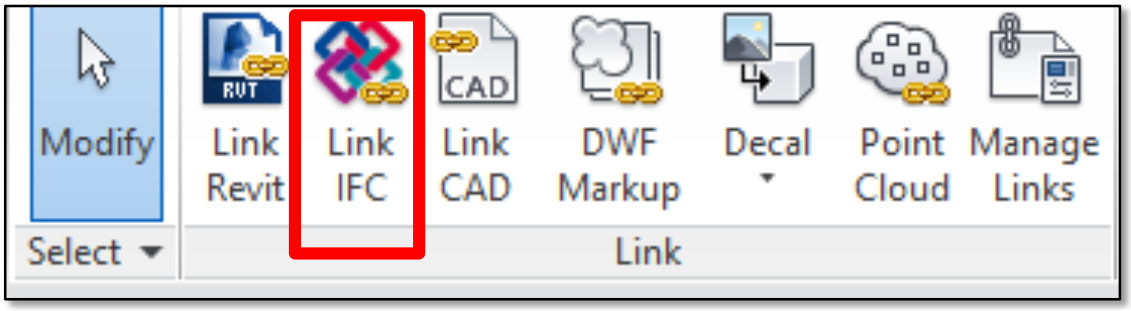
https://knowledge.autodesk.com/support/revit-products/learn-explore/caas/CloudHelp/cloudhelp/2015/ENU/Revit-DocumentPresent/files/GUID-B451C74B-9214-4974-9A49-2B46A9F6D822-htm.html

IFC Import into Revit

There are two ways to import an .IFC file into Revit. Link .IFC and Link .RVT.

Link .IFC

Click the insert tab followed by Link IFC, select the IFC Model followed by Open.



Limitation

We found when using Link IFC rooms may not be imported into the main Revit model whereas if the IFC is first converted to a Revit model and Link Revit is used instead then this can import the rooms. This is mainly a requirement for Revit MEP users. --- Need this checking by Autodesk.

Link .RVT

1. Firstly import the IFC using the Graphisoft Revit connection Add-In (Click the Add-Ins tab followed by Improved IFC Import)
2. Save the IFC as a .RVT file.
3. Open up the main Revit model and click on the insert tab followed by Link Revit command.
4. A benefit of using Link Revit is that Rooms (ARCHICAD zones) can be seen when linked into the main Revit model. If the converted Rooms cannot be seen they can be shown with the help of the following guide:
5. http://blogs.rand.com/support/2013/01/revit-cannot-see-the-linked-models-room-tags.html

