How to do Revit to IFC properly!

Kevin Fielding

BIM Lead – Sheppard Robson LLP

Agenda

- What is IFC?
- Why IFC?
- How?
- Conclusions
- Questions

What is IFC?

What is IFC?

- Industry Foundation Class
- A global standard used to describe, share and exchange construction and facilities management information.
- Vendor neutral format
- Developed by BuildingSmart

GMS-SRA-BU-XX-M3-A-0001.ifc | LayerTestModel.ifc | AU_DemoModel.ifc

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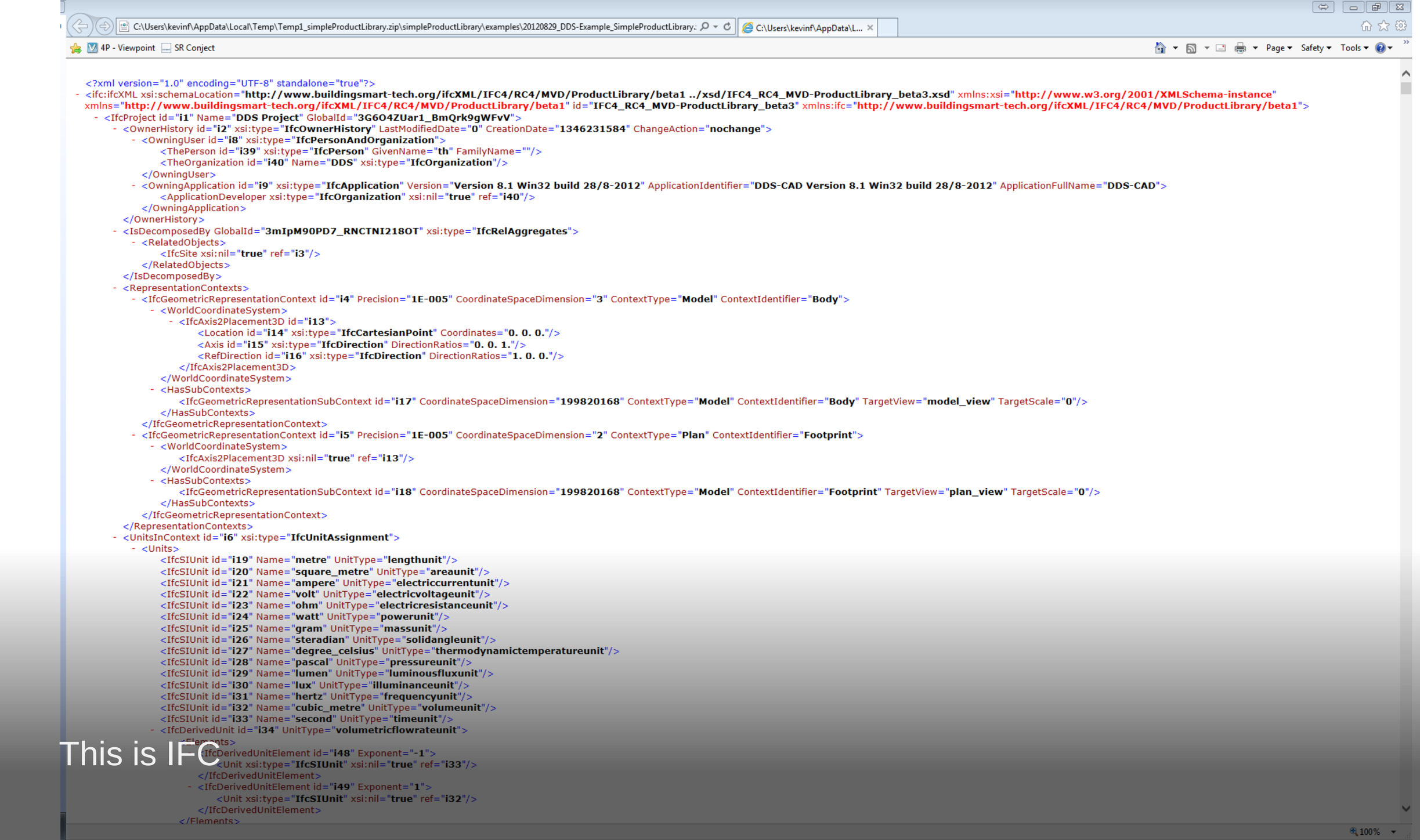
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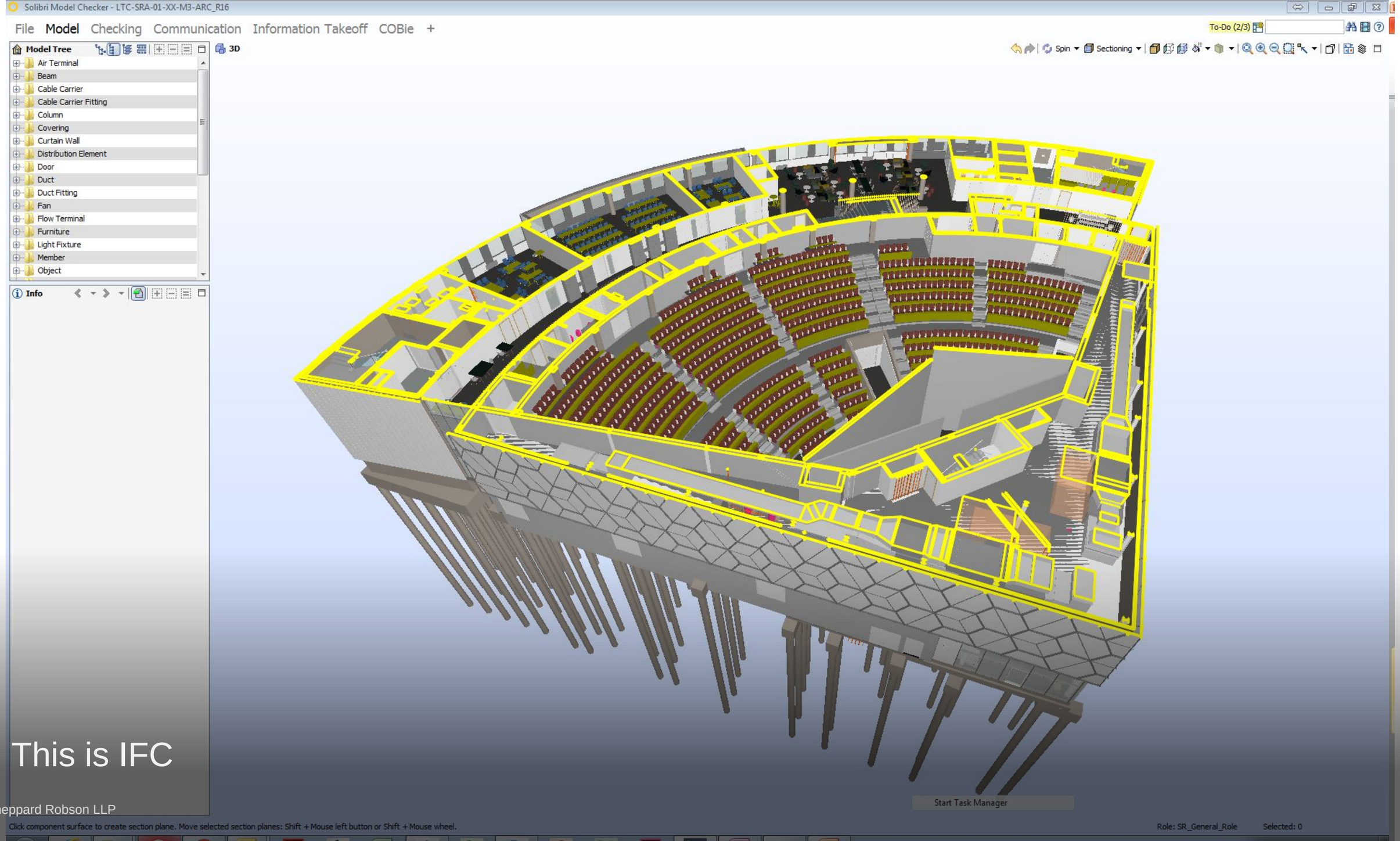

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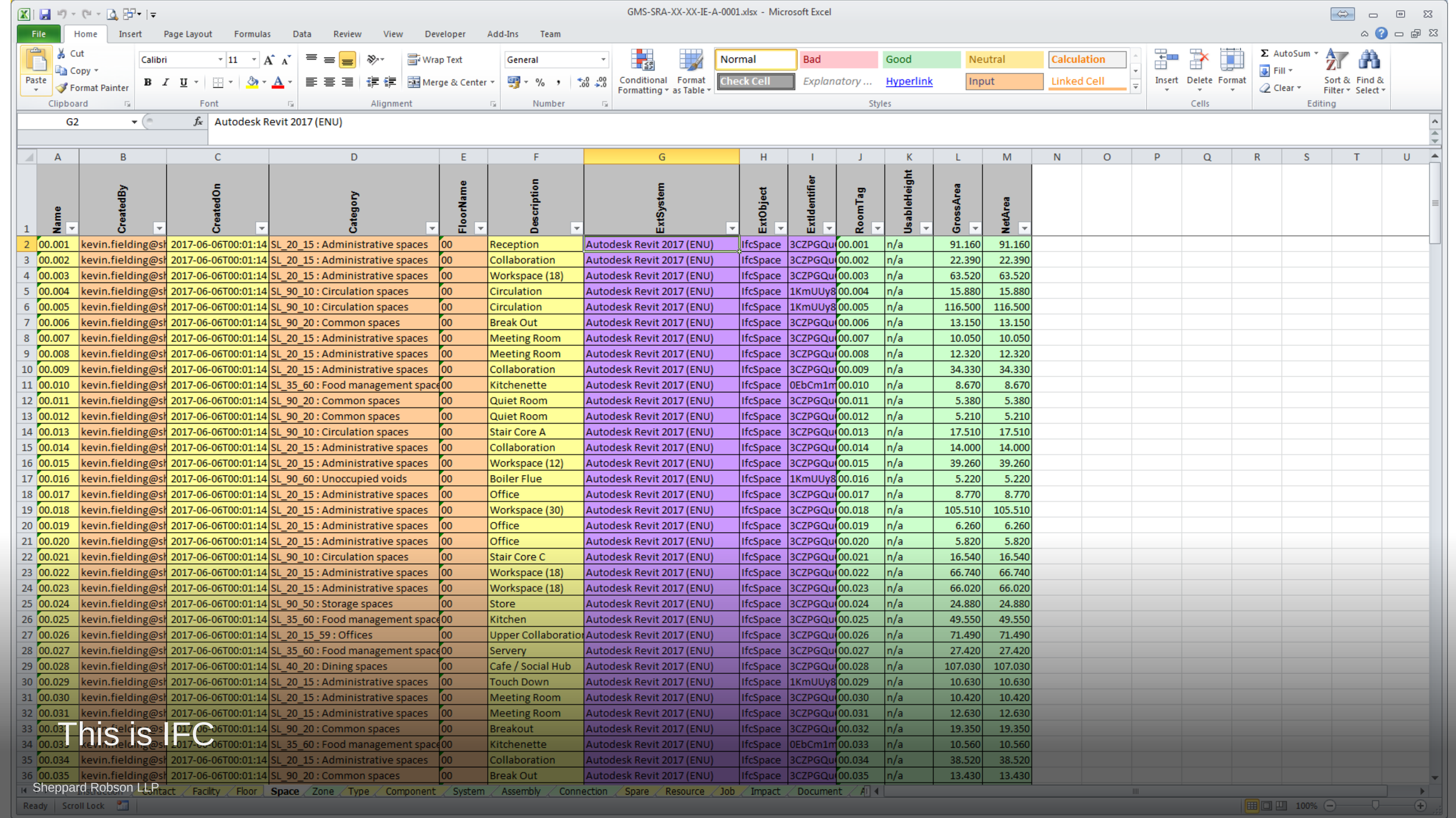

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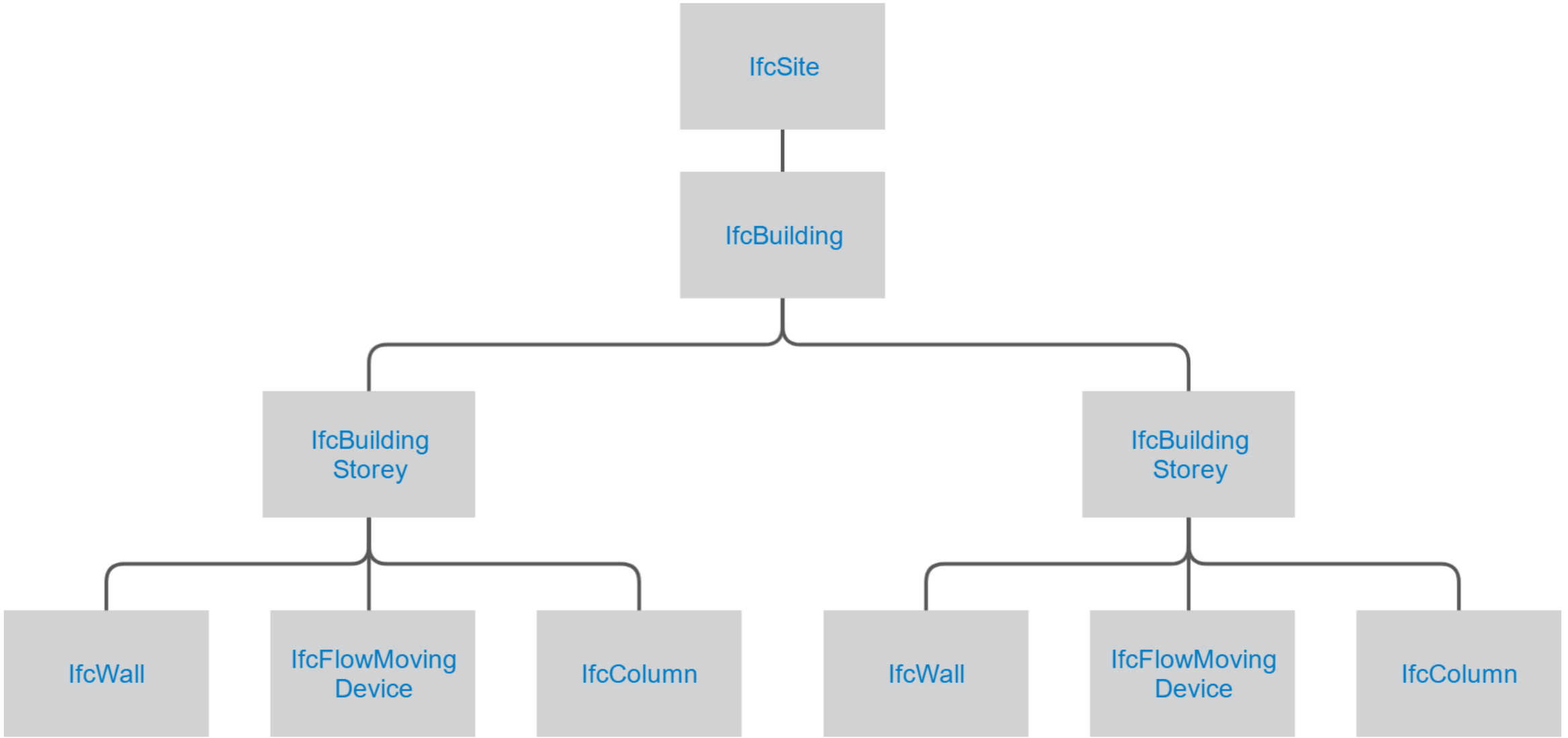
What is IFC?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IfcFlowMoving Device
IfcColumn

What is IFC?

- The IFC format is not designed for Round-tripping, or Design Transfer (Ifc2x3).
- It is an exchange format, to transfer information from Platform A to Platform B.

Why IFC?

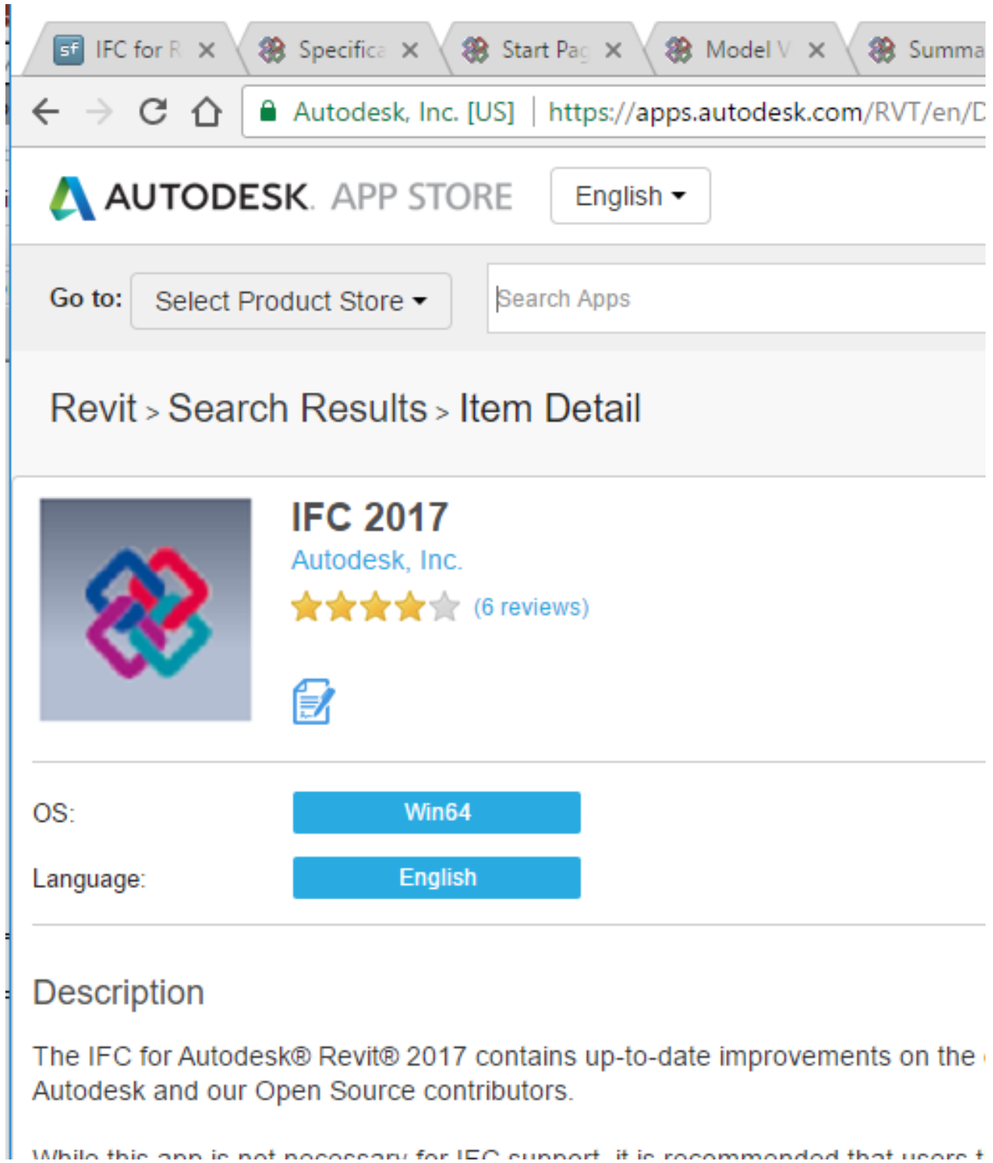
Why IFC?

- Interoperability and Collaboration
- To achieve the best outcome you need to use the most appropriate tool
- Not everyone uses Revit!
- Data rich format and extensible
- Established standard
- Loss of data using other formats (DWG & FBX)


How?

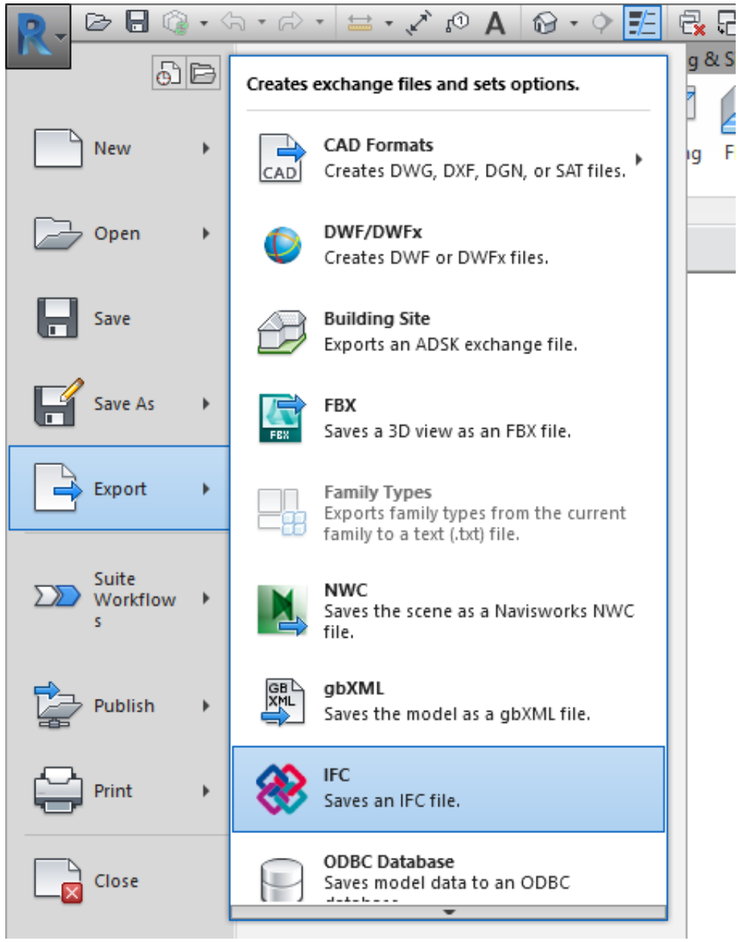
How to create an IFC?

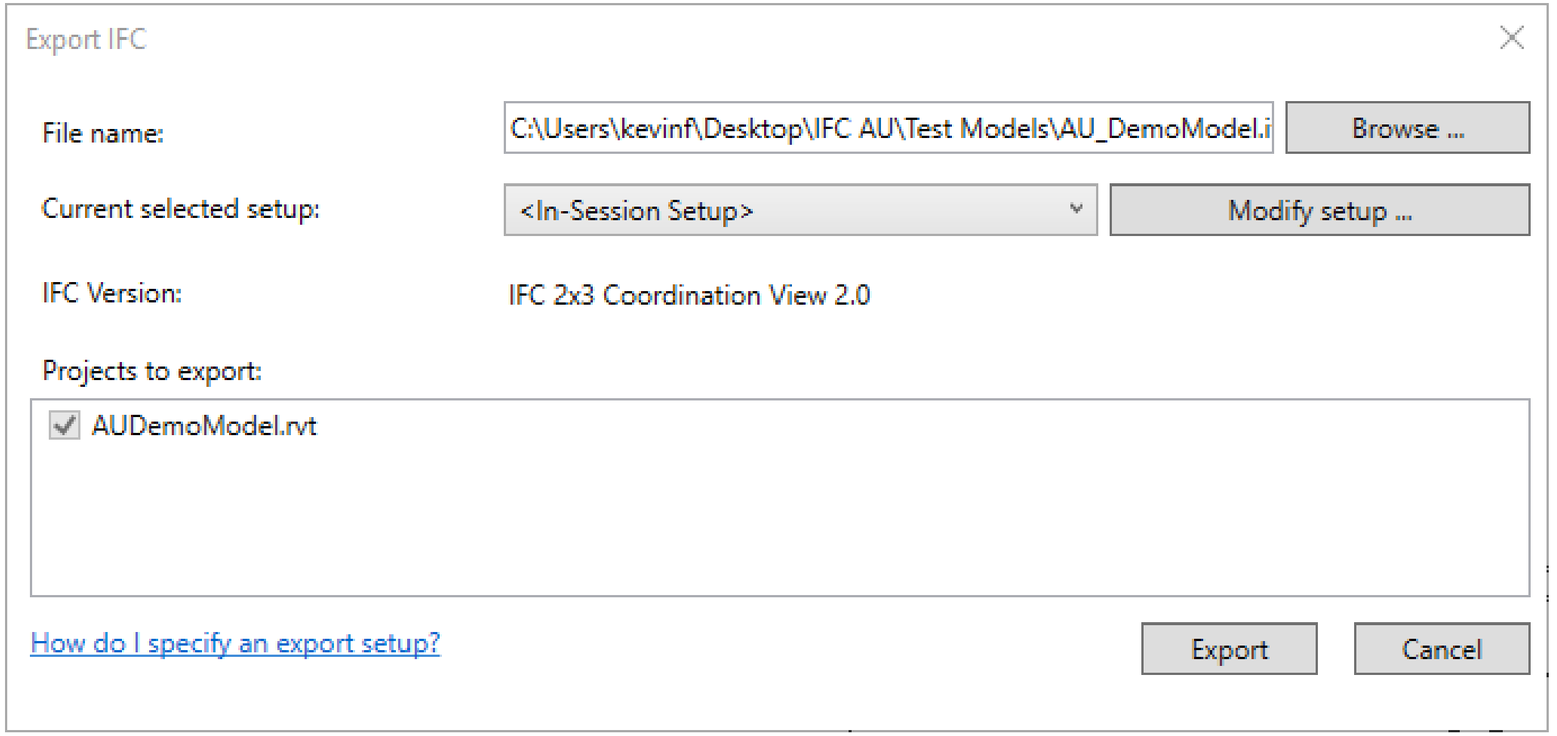
- IFC Exporter Plugin
- Free from Autodesk App Store
- Developed by Autodesk
- Adds additional functionality to the IFC Export Process



How to create an IFC?

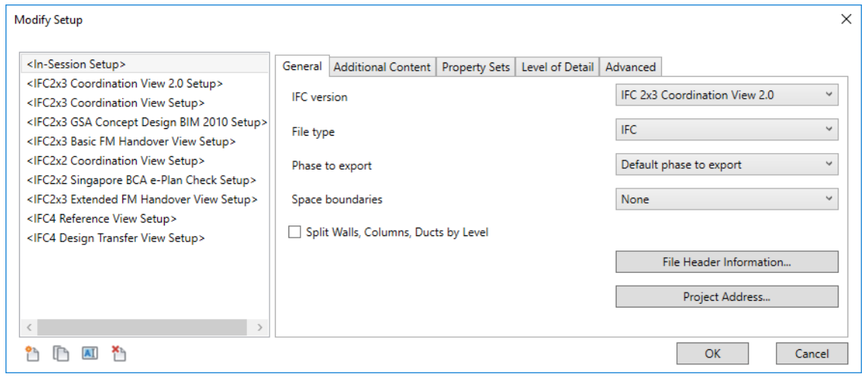
- Accessible through

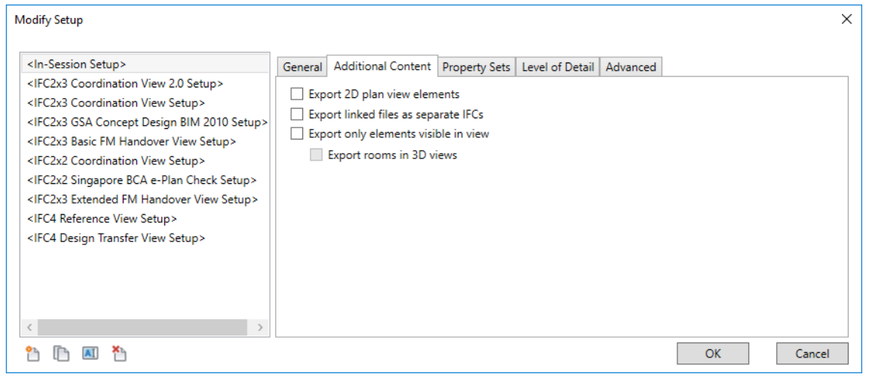


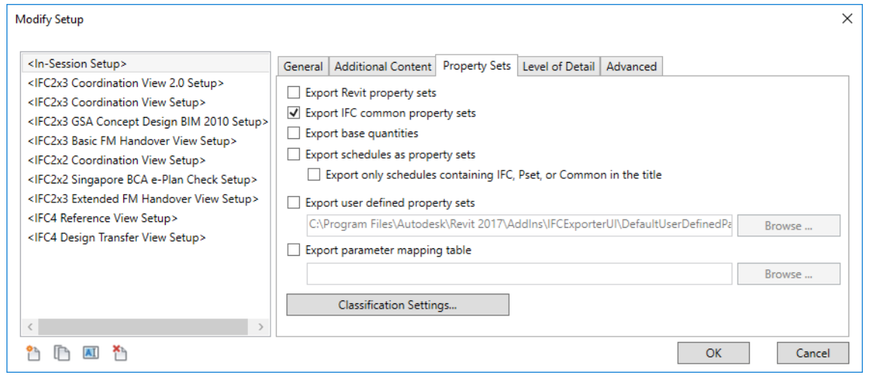


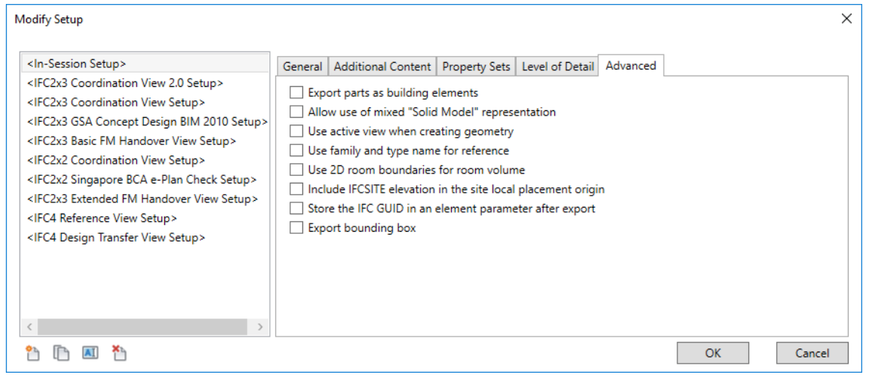
IFC Exporter

- Just hitting export won't do
- Configuration required



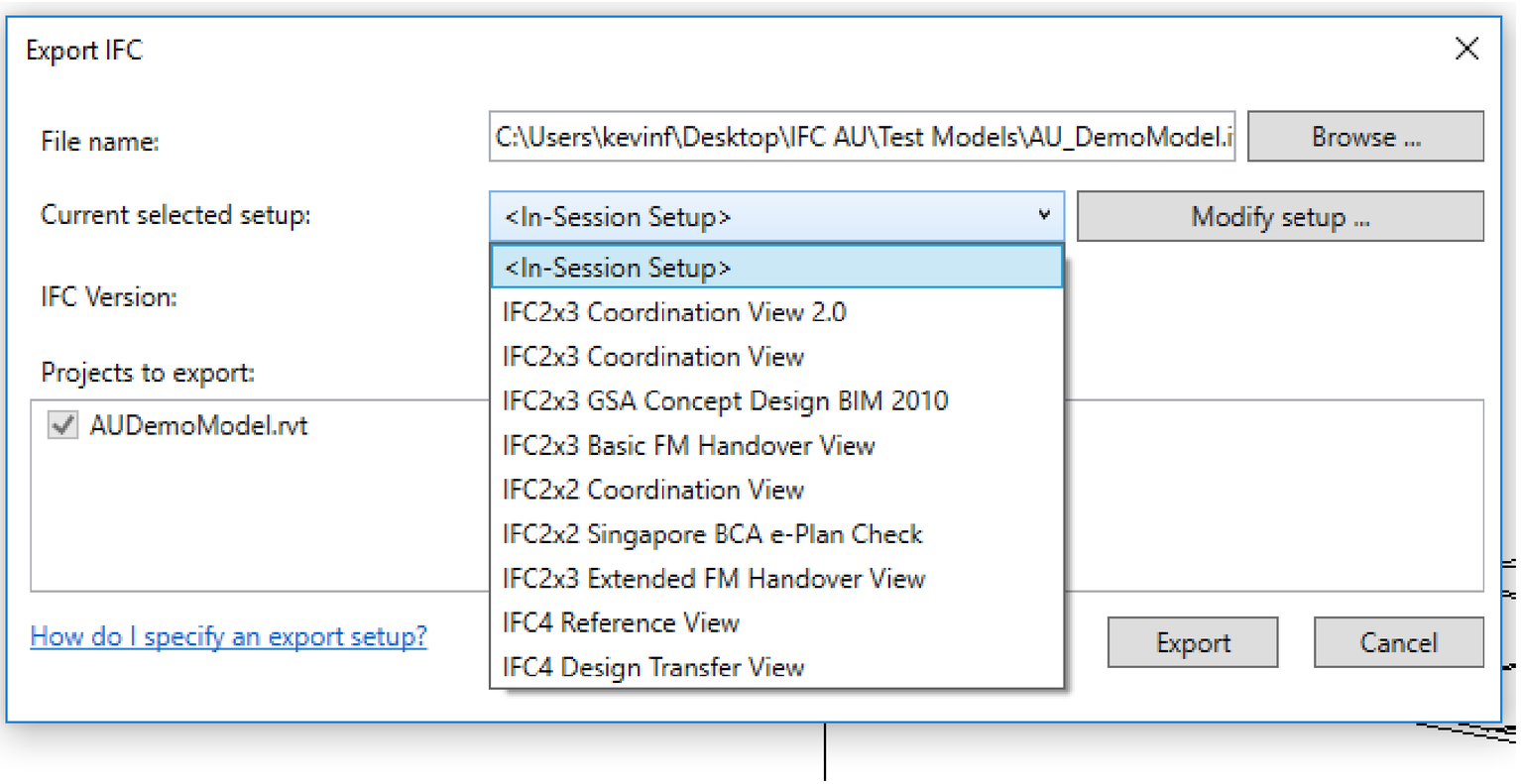






How to create an IFC?

- OOTB setups available to support standard Model View Definitions or MVDs



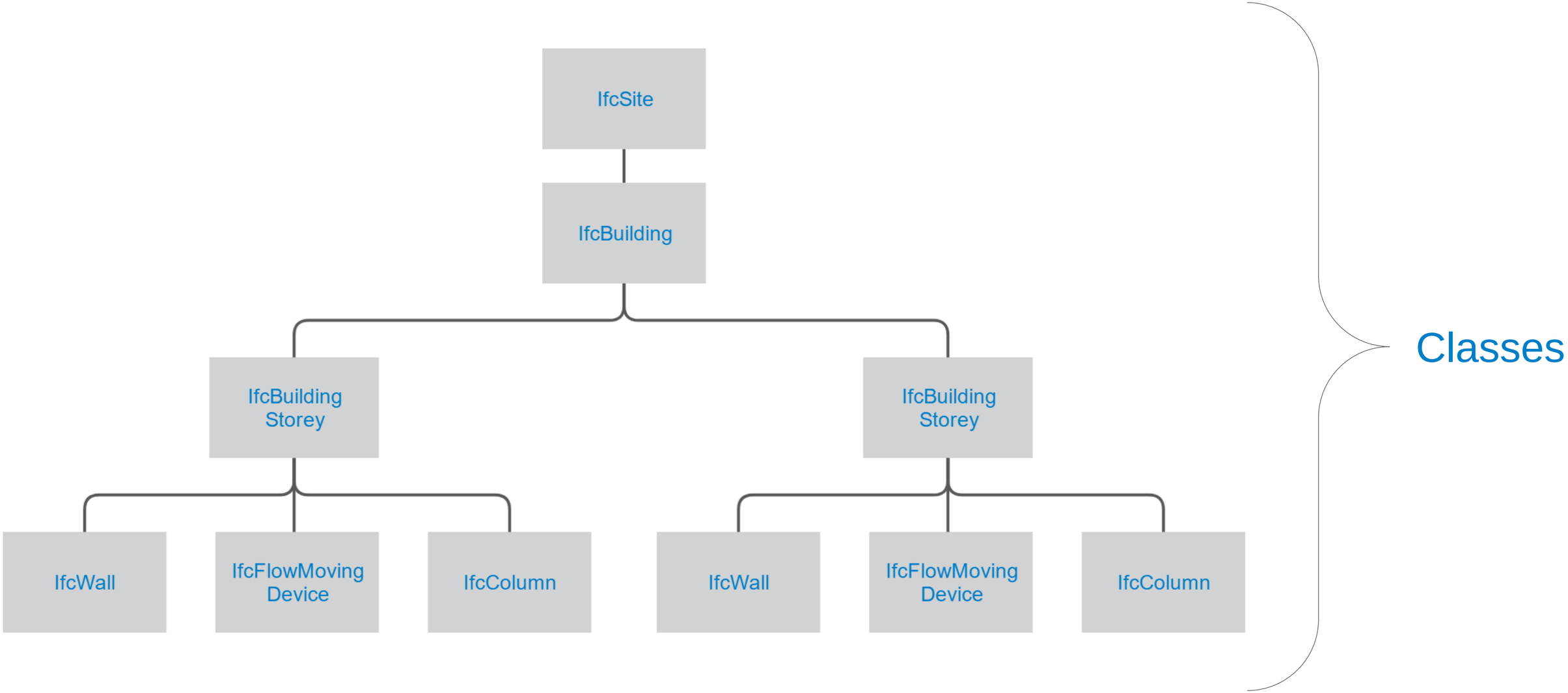
Model View Definitions

- Model View Definitions are a subset, or a selection of the IFC schema suitable for a particular purpose.
- Some of these are specific for the transfer of geometry.
- Others for specific schemas of data such as the Extended Handover View Definition for COBie to support Level 2 BIM in the UK.

Controlling the export

- Defining a MVD is fine, ensuring your export complies with it is another.
- Configuring your file if crucial, the following are additions to the IFC Exporter Setup
  - Class Mapping
  - Layer Mapping
  - Classification Assignment
  - Data Mapping

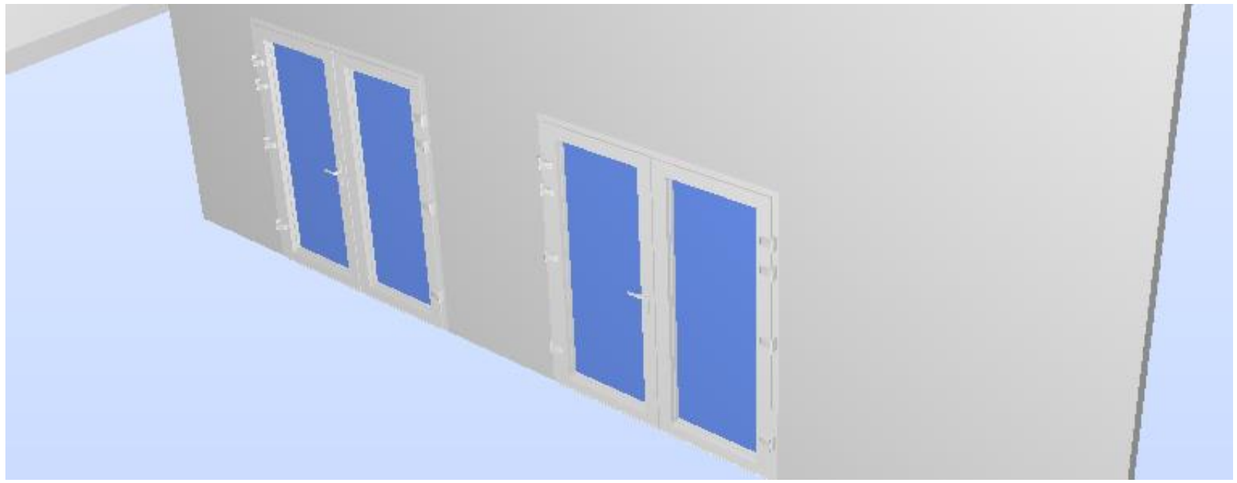
Class Mapping

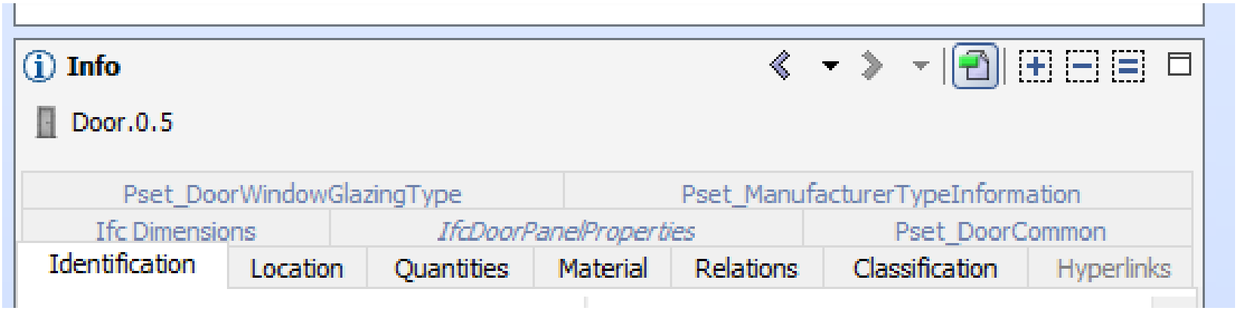


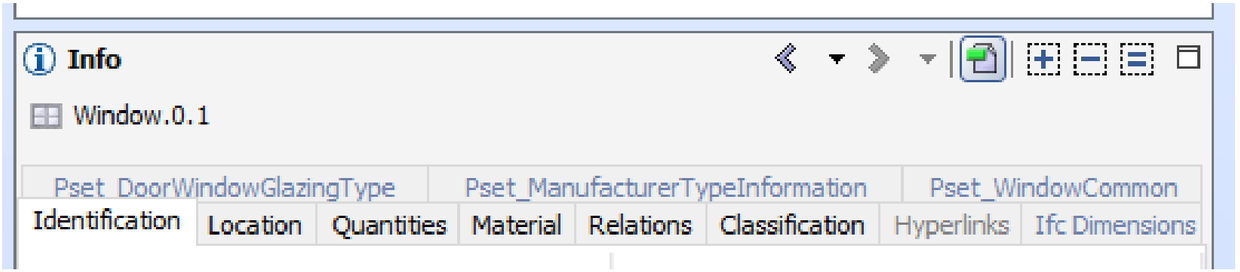
Class Mapping

- Classes are collections data and information.
- An IFC Class is like a Revit Category

- If you don’t get it right, it won’t contain the right information.



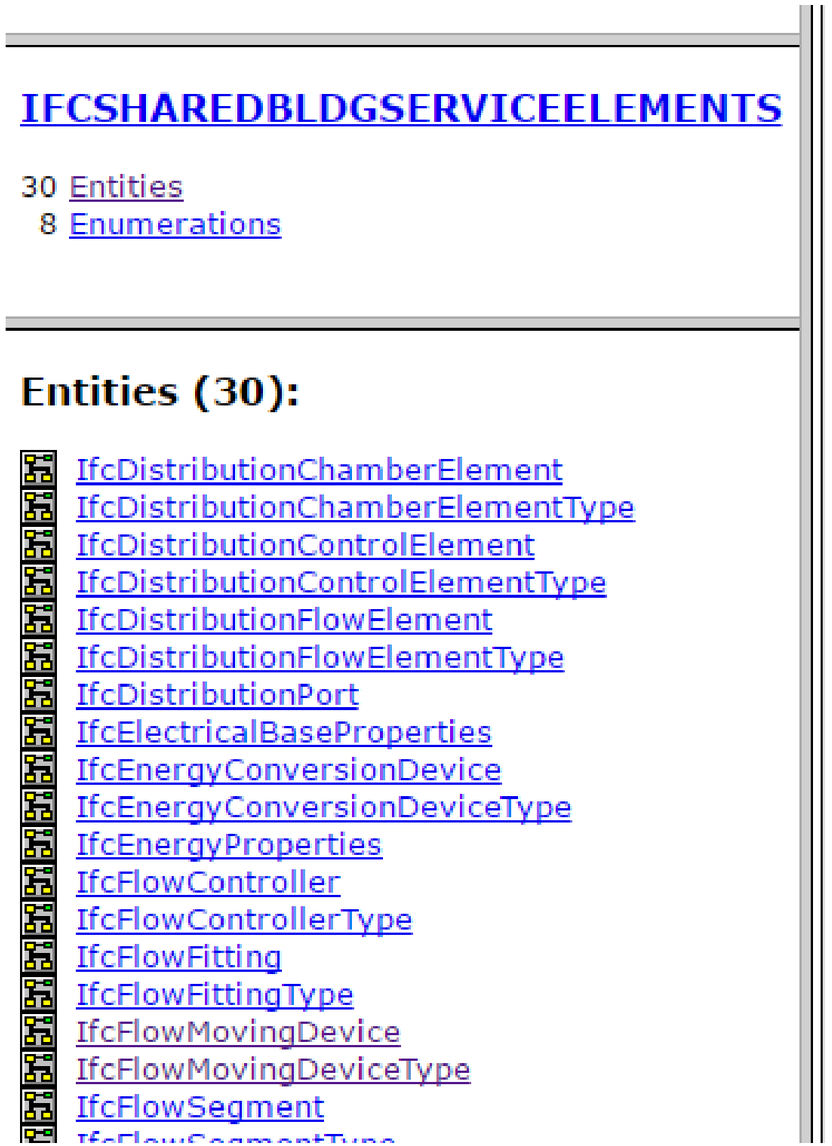




Class Mapping

- The BuildingSmart website defines all current IFC Classes and Types.

- http://www.buildingsmart-tech.org/ifc/IFC2x3/TC1/html/index.htm



IFCSHAREDBLDGSERVICEELEMENTS

30 Entities
8 Enumerations

Entities (30):

IfcDistributionChamberElement
IfcDistributionChamberElementType
IfcDistributionControlElement
IfcDistributionControlElementType
IfcDistributionFlowElement
IfcDistributionFlowElementType
IfcDistributionPort
IfcElectricalBaseProperties
IfcEnergyConversionDevice
IfcEnergyConversionDeviceType
IfcEnergyProperties
IfcFlowController
IfcFlowControllerType
IfcFlowFitting
IfcFlowFittingType
IfcFlowMovingDevice
IfcFlowMovingDeviceType
IfcFlowSegment

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IFCHVACDOMAIN

31 Entities
31 Enumerations

IfcAirTerminalType
IfcAirToAirHeatRecoveryType
IfcBoilerType
IfcChillerType
IfcCoilType
IfcCompressorType
IfcCondenserType
IfcCooledBeamType
IfcCoolingTowerType
IfcDamperType
IfcDuctFittingType
IfcDuctSegmentType
IfcDuctSilencerType
IfcEvaporativeCoolerType
IfcEvaporatorType
IfcFanType
IfcFilterType
IfcFlowMeterType
IfcGasTerminalType
IfcHeatExchangerType
IfcHumidifierType
IfcPipeFittingType
IfcPipeSegmentType
IfcPumpType
IfcSpaceHeaterType
IfcTankType
IfcTubeBundleType
IfcUnitaryEquipmentType
IfcValveType
IfcVibrationIsolatorType

Home Schema Express-g Definition Attribute Rule Inheritance References

IfcSpaceHeaterType

Definition from IAI: The element type *IfcSpaceHeaterType* defines a list of commonly shared property set definitions of a space heater and an optional set of product representations. It is used to define a space heater specification (i.e. the specific product information, that is common to all occurrences of that product type).

NOTE: This entity subsumes the entities *IfcHydronicHeater* and *IfcUnitHeater* from IFC R2x.

NOTE: The product representations are defined as representation maps (at the level of the supertype *IfcTypeProduct*, which get assigned by an element occurrence instance through the *IfcShapeRepresentation.Item[1]* being an *IfcMappedItem*.

A space heater type is used to define the common properties of a space heater device that may be applied to many occurrences of that type. Space heaters utilize a combination of radiation and/or natural convection using a heating source such as steam or hot water. Examples of space heaters include radiators, convectors, baseboard and finned-tube heaters, etc. Space heater types (or the instantiable subtypes) may be exchanged without being already assigned to occurrences.

The occurrences of the *IfcSpaceHeaterType* are represented by instances of *IfcEnergyConversionDevice* or its subtypes.

Property Set Use Definition:

The property sets relating to this entity are defined by the *IfcPropertySet* and attached by the *IfcRelDefinesByProperties* relationship. It is accessible by the inverse *IsDefinedBy* relationship. The following property set definitions specific to this entity are part of this IFC release:

- Pset_SpaceHeaterTypeCommon: common property set for all space heater types
  - Pset_SpaceHeaterTypeHydronic: property set for all hydronic space heater types

HISTORY: New entity in IFC Release 2x2.

EXPRESS specification:

```
ENTITY IfcSpaceHeaterType
    SUBTYPE OF (IfcEnergyConversionDeviceType);
        PredefinedType                  : IfcSpaceHeaterTypeEnum;
    WHERE
        WR1                 : (PredefinedType <> IfcSpaceHeaterTypeEnum.USERDEFINED) OR ((PredefinedType = IfcSpaceHeaterTypeEnum.USERDEFINED) AND EXISTS(SELF\IfcElementType.ElementType));
END_ENTITY;
```

Attribute definitions:

PredefinedType : Enumeration of

Inheritance graph

```
ENTITY IfcSpaceHeaterType;
    ENTITY IfcRoot;
        GlobalId
        OwnerHistory
        Name
        Description
    ENTITY IfcObjectDefinition;
    INVERSE
        HasAssignments              : SET OF IfcRelDecomposes FOR RelatingObject;
        IsDecomposedBy              : SET [0:1] OF IfcRelDecomposes FOR RelatedObjects;
        Decomposes                  : SET OF IfcRelAssociates FOR RelatedObjects;
        HasAssociations
    ENTITY IfcTypeObject;
        ApplicableOccurrence        : OPTIONAL IfcLabel;
        HasPropertySets             : OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
    INVERSE
        ObjectTypeOf                : SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
    ENTITY IfcTypeProduct;
```

- Pset_SpaceHeaterTypeCommon: common property set for all space heater types
  - Pset_SpaceHeaterTypeHydronic: property set for all hydronic space heater types

HISTORY: New entity in IFC Release 2x2.

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IFCHVACDOMAIN

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IfcDamperType
IfcDuctFittingType
IfcDuctSegmentType
IfcDuctSilencerType
IfcEvaporativeCoolerType
IfcEvaporatorType
IfcFanType
IfcFilterType
IfcFlowMeterType
IfcGasTerminalType
IfcHeatExchangerType
IfcHumidifierType
IfcPipeFittingType
IfcPipeSegmentType
IfcPumpType
IfcSpaceHeaterType
IfcTankType
IfcTubeBundleType
IfcUnitaryEquipmentType
IfcValveType
IfcVibrationIsolatorType

IFC2*x3* Property Set Definition Reference

PropertySet Definition:

PropertySet Name	Pset_SpaceHeaterTypeCommon
Applicable Entities	IfcSpaceHeaterType
Applicable Type Value	
Definition	Definition from IAI: Space heater type common attributes. SoundLevel attribute deleted in IFC2x2 Pset Addendum: Use IfcSoundProperties instead.

Property Definitions:

Name	Property Type	Data Type	Definition
TemperatureClassification	IfcPropertyEnumeratedValue	PEnum_SpaceHeaterTemperatureClassification • LOWTEMPERATURE • HIGHTEMPERATURE • OTHER • NOTKNOWN • UNSET	Enumeration defining the temperature classification of the space heater surface temperature. low temperature - surface temperature is relatively low, usually heated by hot water or electricity. high temperature - surface temperature is relatively high, usually heated by gas or steam.
HeatingSource	IfcPropertyEnumeratedValue	PEnum_HeatingSource • FUEL • GAS • ELECTRICITY • HOTWATER • STEAM • OTHER • NOTKNOWN • UNSET	Enumeration defining the heating source used by the space heater.
Material	IfcPropertyReferenceValue	IfcMaterial	Primary material from which the object is constructed.
BodyMass	IfcPropertySingleValue	IfcMassMeasure / MASSUNIT	Overall body mass of the heater.
ThermalMassHeatCapacity	IfcPropertySingleValue	IfcReal / USERDEFINED	Product of component mass and specific heat
OutputCapacity	IfcPropertySingleValue	IfcPowerMeasure / POWERUNIT	Total nominal heat output as listed by the manufacturer.
ThermalEfficiency	IfcPropertySingleValue	IfcPositiveRatioMeasure	Overall Thermal Efficiency is defined as gross energy output of the heat transfer device divided by the energy input.

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IfcFilterType
IfcFlowMeterType
IfcGasTerminalType
IfcHeatExchangerType
IfcHumidifierType
IfcPipeFittingType
IfcPipeSegmentType
IfcPumpType
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IfcTankType
IfcTubeBundleType
IfcUnitaryEquipmentType
IfcValveType
IfcVibrationIsolatorType

IFC2*x3* Property Set Definition Reference

PropertySet Definition:

PropertySet Name	Pset_SpaceHeaterTypeCommon
Applicable Entities	IfcSpaceHeaterType
Applicable Type Value	
Definition	Definition from IAI: Space heater type common attributes. SoundLevel attribute deleted in IFC2x2 Pset Addendum: Use IfcSoundProperties instead.

Property Definitions:

Name	Property Type	Data Type	Definition
TemperatureClassification	IfcPropertyEnumeratedValue	PEnum_SpaceHeaterTemperatureClassification • LOWTEMPERATURE • HIGHTEMPERATURE • OTHER • NOTKNOWN • UNSET	Enumeration defining the temperature classification of the space heater surface temperature. low temperature - surface temperature is relatively low, usually heated by hot water or electricity. high temperature - surface temperature is relatively high, usually heated by gas or steam.
HeatingSource	IfcPropertyEnumeratedValue	PEnum_HeatingSource • FUEL • GAS • ELECTRICITY	Enumeration defining the heating source used by the space heater.
Material	IfcPropertyReferenceValue	IfcMaterial	Primary material from which the object is constructed.
BodyMass	IfcPropertySingleValue	IfcMassMeasure / MASSUNIT	Overall body mass of the heater.
ThermalMassHeatCapacity	IfcPropertySingleValue	IfcReal / USERDEFINED	Product of component mass and specific heat
OutputCapacity	IfcPropertySingleValue	IfcPowerMeasure / POWERUNIT	Total nominal heat output as listed by the manufacturer.
ThermalEfficiency	IfcPropertySingleValue	IfcPositiveRatioMeasure	Overall Thermal Efficiency is defined as gross energy output of the heat transfer device divided by the energy input.

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IfcTankType
IfcTubeBundleType
IfcUnitaryEquipmentType
IfcValveType
IfcVibrationIsolatorType

Home Schema Express-g Definition Attribute Rule Inheritance References

IfcSpaceHeaterType

Definition from IAI: The element type *IfcSpaceHeaterType* defines a list of commonly shared property set definitions of a space heater and an optional set of product representations. It is used to define a space heater specification (i.e. the specific product information, that is common to all occurrences of that product type).

NOTE: This entity subsumes the entities *IfcHydronicHeater* and *IfcUnitHeater* from IFC R2x.

NOTE: The product representations are defined as representation maps (at the level of the supertype *IfcTypeProduct*, which get assigned by an element occurrence instance through the *IfcShapeRepresentation.Item[1]* being an *IfcMappedItem*.

A space heater type is used to define the common properties of a space heater device that may be applied to many occurrences of that type. Space heaters utilize a combination of radiation and/or natural convection using a heating source such as steam or hot water. Examples of space heaters include radiators, convectors, baseboard and finned-tube heaters, etc. Space heater types (or the instantiable subtypes) may be exchanged without being already assigned to occurrences.

The occurrences of the *IfcSpaceHeaterType* are represented by instances of *IfcEnergyConversionDevice* or its subtypes.

Property Set Use Definition:

The property sets relating to this entity are defined by the *IfcPropertySet* and attached by the *IfcRelDefinesByProperties* relationship. It is accessible by the inverse *IsDefinedBy* relationship. The following property set definitions specific to this entity are part of this IFC release:

- Pset_SpaceHeaterTypeCommon: common property set for all space heater types
  - Pset_SpaceHeaterTypeHydronic: property set for all hydronic space heater types

HISTORY: New entity in IFC Release 2x2.

EXPRESS specification:

```
ENTITY IfcSpaceHeaterType
    SUBTYPE OF (IfcEnergyConversionDeviceType);
        PredefinedType                  : IfcSpaceHeaterTypeEnum;
    WHERE
        WR1                 : (PredefinedType <> IfcSpaceHeaterTypeEnum.USERDEFINED) OR ((PredefinedType = IfcSpaceHeaterTypeEnum.USERDEFINED) AND EXISTS(SELF\IfcElementType.ElementType));
END_ENTITY;
```

Attribute definitions:

PredefinedType : Enumeration of possible types of space heater (e.g., baseboard heater, convector, radiator, etc.).

Inheritance graph

ENTITY IfcSpaceHeaterType
    SUBTYPE OF (IfcEnergyConversionDeviceType);
        PredefinedType : IfcSpaceHeaterTypeEnum;
    WHERE

```
        HasAssociations             : SET OF IfcRelAssociates FOR RelatedObjects;
    ENTITY IfcTypeObject;
        ApplicableOccurrence        : OPTIONAL IfcLabel;
        HasPropertySets             : OPTIONAL SET [1:?] OF IfcPropertySetDefinition;
    INVERSE
        ObjectTypeOf                : SET [0:1] OF IfcRelDefinesByType FOR RelatingType;
    ENTITY IfcTypeProduct;
```

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IfcEvaporatorType
IfcFanType
IfcFilterType
IfcFlowMeterType
IfcGasTerminalType
IfcHeatExchangerType
IfcHumidifierType
IfcPipeFittingType
IfcPipeSegmentType
IfcPumpType
IfcSpaceHeaterType
IfcTankType
IfcTubeBundleType
IfcUnitaryEquipmentType
IfcValveType
IfcVibrationIsolatorType

Home Schema Express-g Definition Rule References

IfcSpaceHeaterTypeEnum

Definition from IAI: Enumeration defining the functional type of space heater. The *IfcSpaceHeaterTypeEnum* contains the following:

- **SECTIONALRADIATOR**: Sectional type radiator typically fabricated from welded sheet metal sections and resembling free standing cast-iron radiators.
- **PANELRADIATOR**: Panel type radiator typically fabricated with flat panels, with or without an exposed extended fin surface attached to the rear for increased output.
- **TUBULARRADIATOR**: Tubular type radiator consisting of supply and return headers with interconnecting parallel tubes in a wide variety of lengths and heights.
- **CONVECTOR**: A heat-distributing unit that operates with gravity-circulated air.
- **BASEBOARDHEATER**: Baseboard heater designed for installation along the bottom of walls in place of the conventional baseboard.
- **FINNEDTUBEUNIT**: Fin-tube heater typically fabricated from metallic tubing, with metallic fins bonded to the tube.
- **UNITHEATER**: An assembly typically consisting of a fan, a motor, and a heating element.
- **USERDEFINED**: User-defined space heater type.
- **NOTDEFINED**: Undefined space heater type.

NOTE: This enumeration was renamed from *IfcHydronicHeaterTypeEnum* in IFC R2x.

HISTORY: New enumeration in IFC R2x.

EXPRESS specification:

```
TYPE IfcSpaceHeaterTypeEnum = ENUMERATION OF
    ( SECTIONALRADIATOR,
      PANELRADIATOR,
      TUBULARRADIATOR,
      CONVECTOR,
      BASEBOARDHEATER,
      FINNEDTUBEUNIT,
      UNITHEATER,
      USERDEFINED,
      NOTDEFINED);
END_TYPE;
```

- **SECTIONALRADIATOR**: Sectional type radiator t
- **PANELRADIATOR**: Panel type radiator typically f
- **TUBULARRADIATOR**: Tubular type radiator consi
- **CONVECTOR**: A heat-distributing unit that operate
- **BASEBOARDHEATER**: Baseboard heater designe
- **FINNEDTUBEUNIT**: Fin-tube heater typically fabr
- **UNITHEATER**: An assembly typically consisting o
- **USERDEFINED**: User-defined space heater type.
- **NOTDEFINED**: Undefined space heater type.

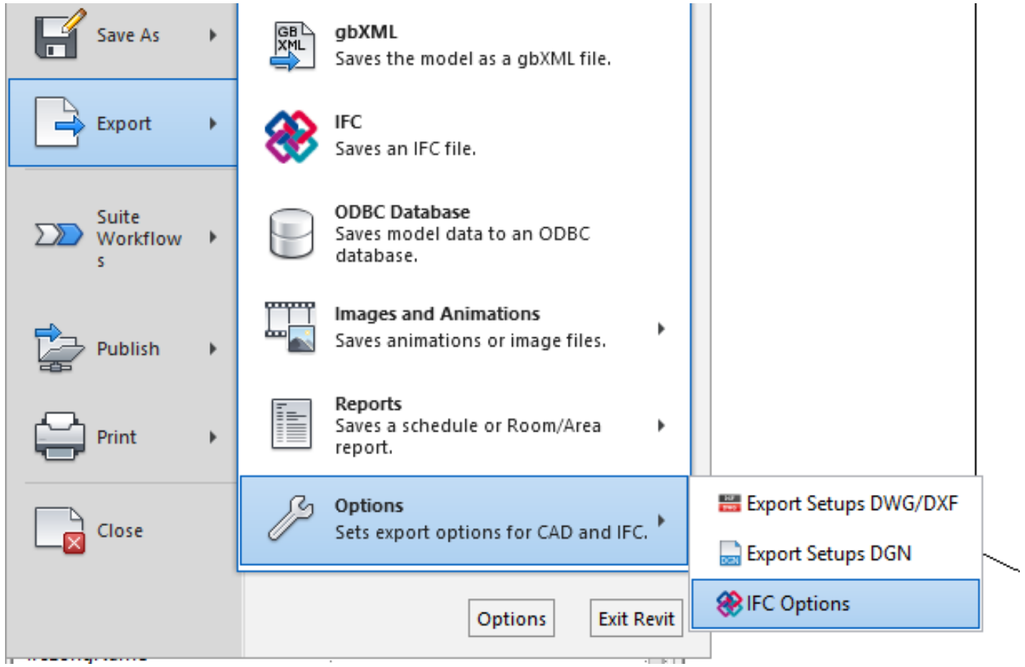
Class Mapping

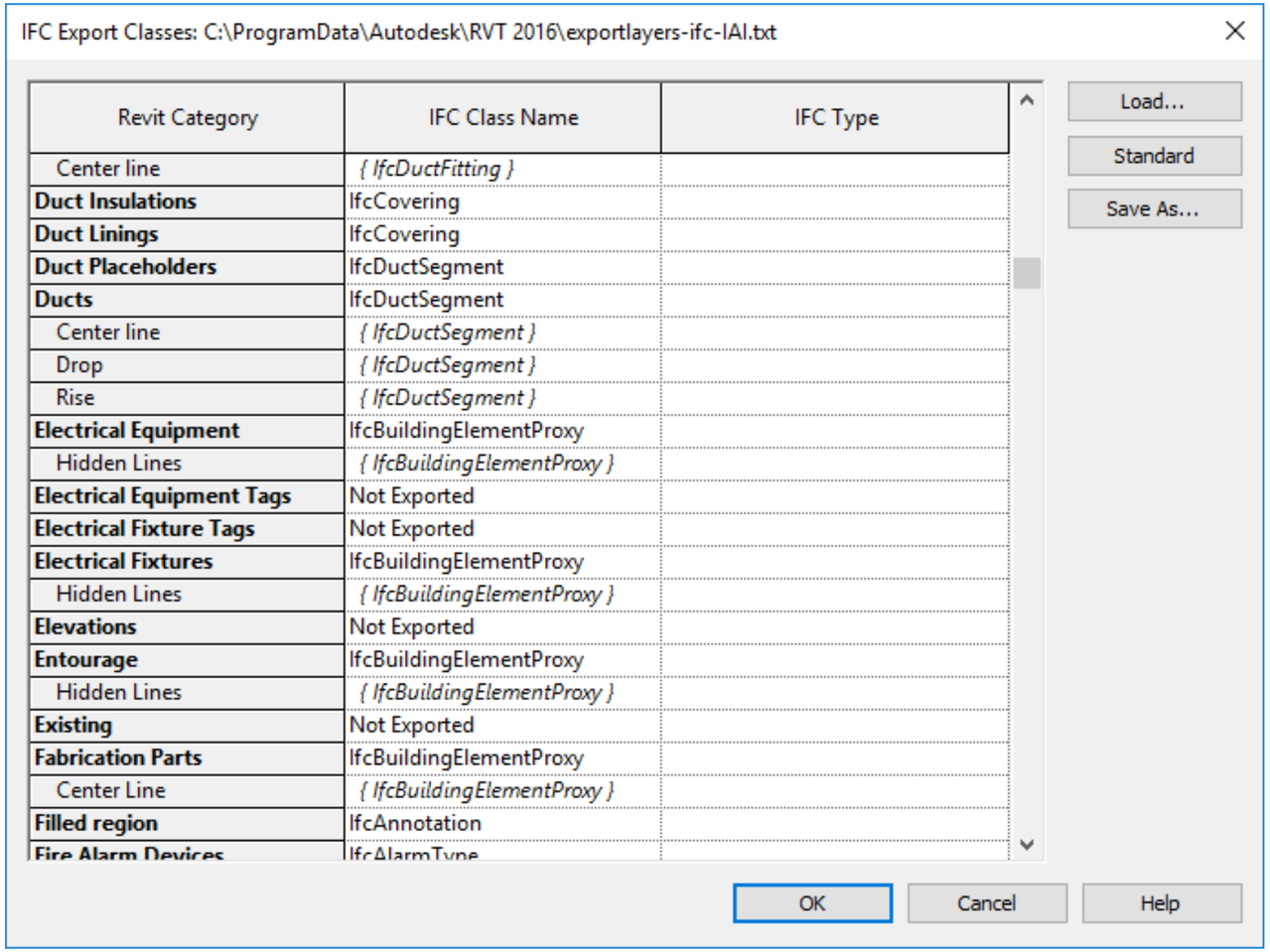
- Class Mapping is crucial for MEP objects. A mechanical equipment objects for example could be a host of elements such as

  - IfcEnergyConversionDevice IfcBoilerType
  - IfcFlowMovingDevice IfcFanType
  - *IfcEnergyConversionDevice* IfcSpaceHeaterType

Class Mapping

- IFC Exporter uses a Text file to map categories and subcategories to IFC Entities.

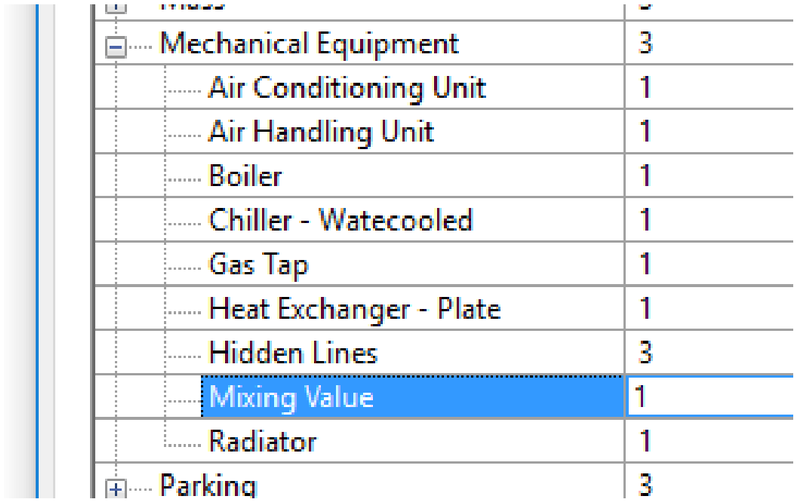




Revit Category	IFC Class Name	IFC Type
Center line	*{ IfcDuctFitting }*	
Duct Insulations	IfcCovering	
Duct Linings	IfcCovering	
Duct Placeholders	IfcDuctSegment	
Ducts	IfcDuctSegment	
Center line	*{ IfcDuctSegment }*	
Drop	*{ IfcDuctSegment }*	
Rise	*{ IfcDuctSegment }*	
Electrical Equipment	IfcBuildingElementProxy	
Hidden Lines	*{ IfcBuildingElementProxy }*	
Electrical Equipment Tags	Not Exported	
Electrical Fixture Tags	Not Exported	
Electrical Fixtures	IfcBuildingElementProxy	
Hidden Lines	*{ IfcBuildingElementProxy }*	
Elevations	Not Exported	
Entourage	IfcBuildingElementProxy	
Hidden Lines	*{ IfcBuildingElementProxy }*	
Existing	Not Exported	
Fabrication Parts	IfcBuildingElementProxy	
Center Line	*{ IfcBuildingElementProxy }*	
Filled region	IfcAnnotation	
Fire Alarm Devices	IfcAlarmType	

Class Mapping

- The OOTB Class mapping cover only a small percentage of scenarios. Mechanical Equipment can have many variations.



Mechanical Equipment	3
Air Conditioning Unit	1
Air Handling Unit	1
Boiler	1
Chiller - Watecooled	1
Gas Tap	1
Heat Exchanger - Plate	1
Hidden Lines	3
Mixing Value	1
Radiator	1
Parking	3

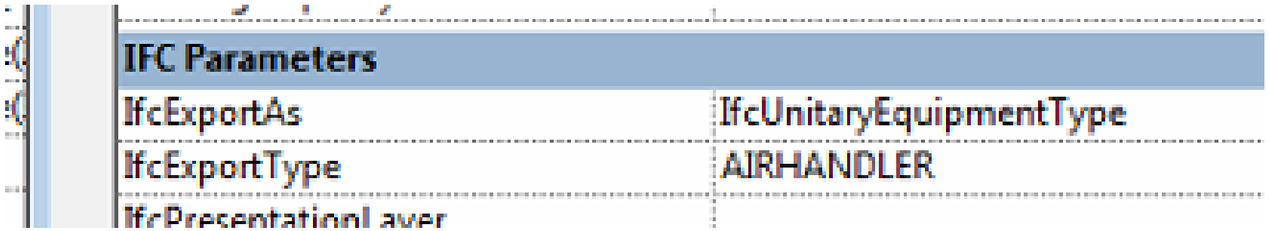
IFC Export Classes: C:\Users\kevinf\Desktop\IFC AU\ExampleClassExport.txt

Revit Category	IFC Class Name	IFC Type
Mass Skylight	Not Exported	
Mass Zone	Not Exported	
Nodes	Not Exported	
Pattern Fill	Not Exported	
Pattern Lines	Not Exported	
Massing	IfcBuildingElementProxy	
Mechanical Equipment	IfcBuildingElementProx	
Air Conditioning Unit	IfcUnitaryEquipmentType	AIRCONDITIONINGUNIT
Air Handling Unit	IfcUnitaryEquipmentType	AIRHANDLER
Boiler	IfcBoilerType	WATER
Chiller - Watercooled	IfcChillerType	WATERCOOLED
Gas Tap	IfcValveType	GASTAP
Heat Exchanger - Plate	IfcHeatExchangerType	PLATE
Hidden Lines	Not Exported	
Mixing Value	IfcValveType	MIXING
Radiator	IfcSpaceHeaterType	SECTIONALRADIATOR
Mechanical Equipment Tags	Not Exported	
MEP Fabrication Containment	IfcBuildingElementProxy	
Center Line	Not Exported	
Drop	Not Exported	
Rise	Not Exported	
Symbology	Not Exported	

OK

Class Mapping

- This can be controlled at element level.
- Add the following parameters to your model, and assign them to all model elements.

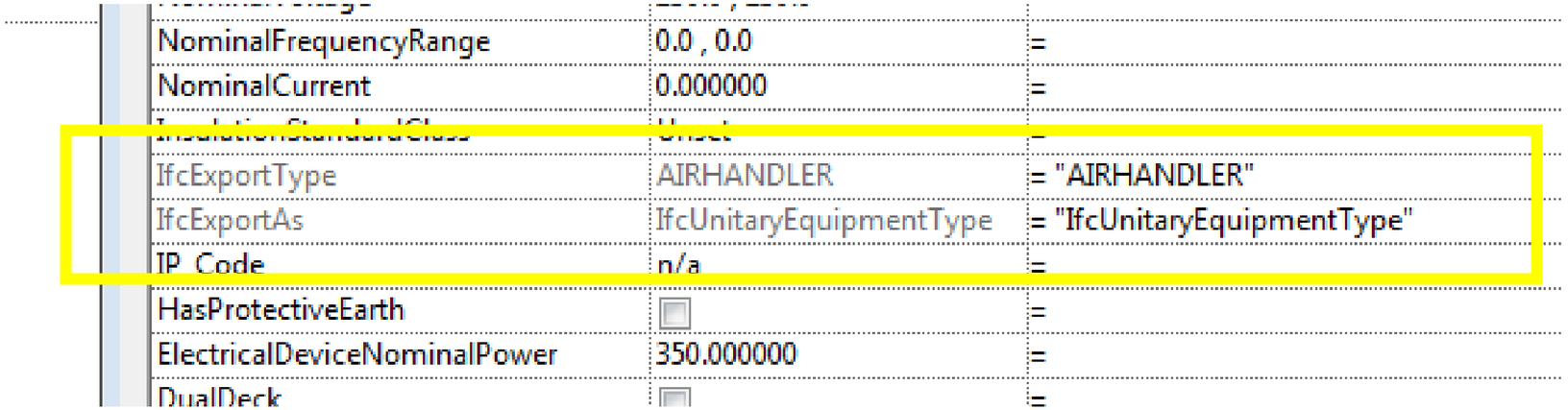


IFC Parameters	
IfcExportAs	IfcUnitaryEquipmentType
IfcExportType	AIRHANDLER
IfcPresentationLayer	

- These parameters override the IfcElement Class and export Type information.

Class Mapping

- Values should be pre-populated in your Company Libraries



Class Mapping

- Revit Component Elements can be mapped to most IFC Elements.
- Systems families are not as flexible.

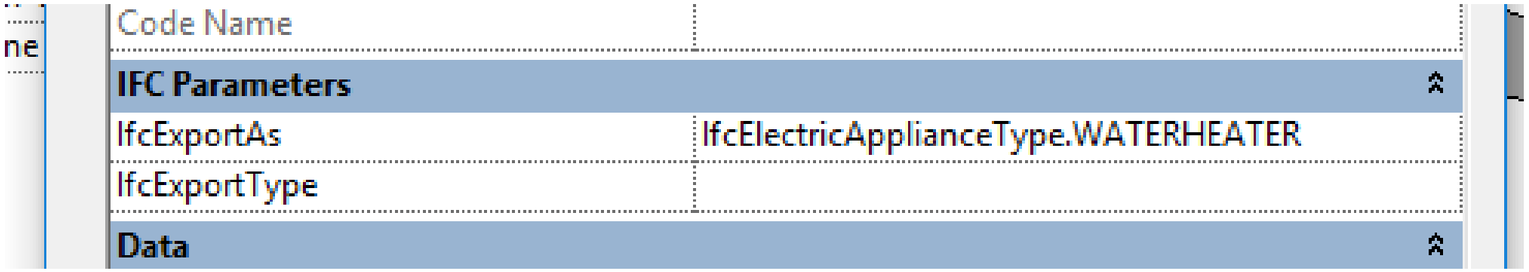
Ceilings	IfcCovering
Roof	IfcRoof
Wall	IfcFooting
	IfcWall
	IfcWallStandardCase

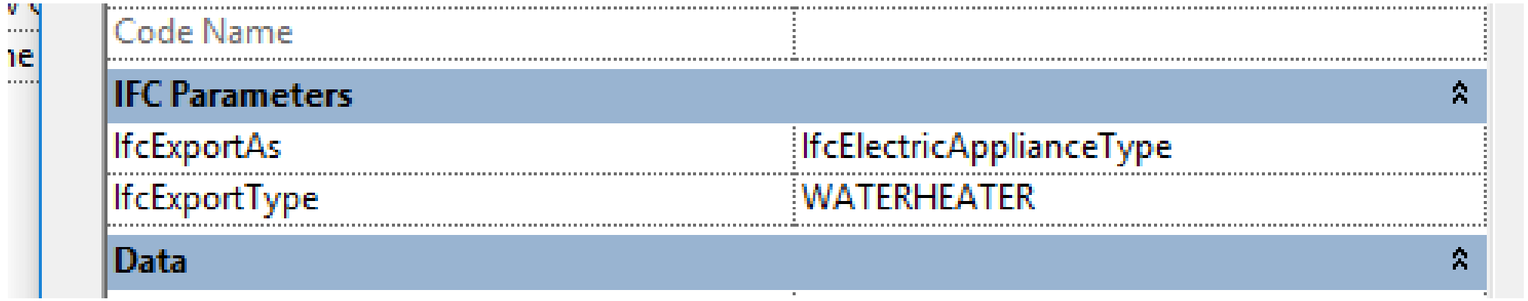
Stairs	IfcStair
Ramps	IfcRamp
Curtain Panels (System Panels)	IfcPlate
	IfcObject

Curtain Panels (Component Panels)	IfcObject
	IfcPlate
	IfcDoor
	IfcWindow

Class Mapping

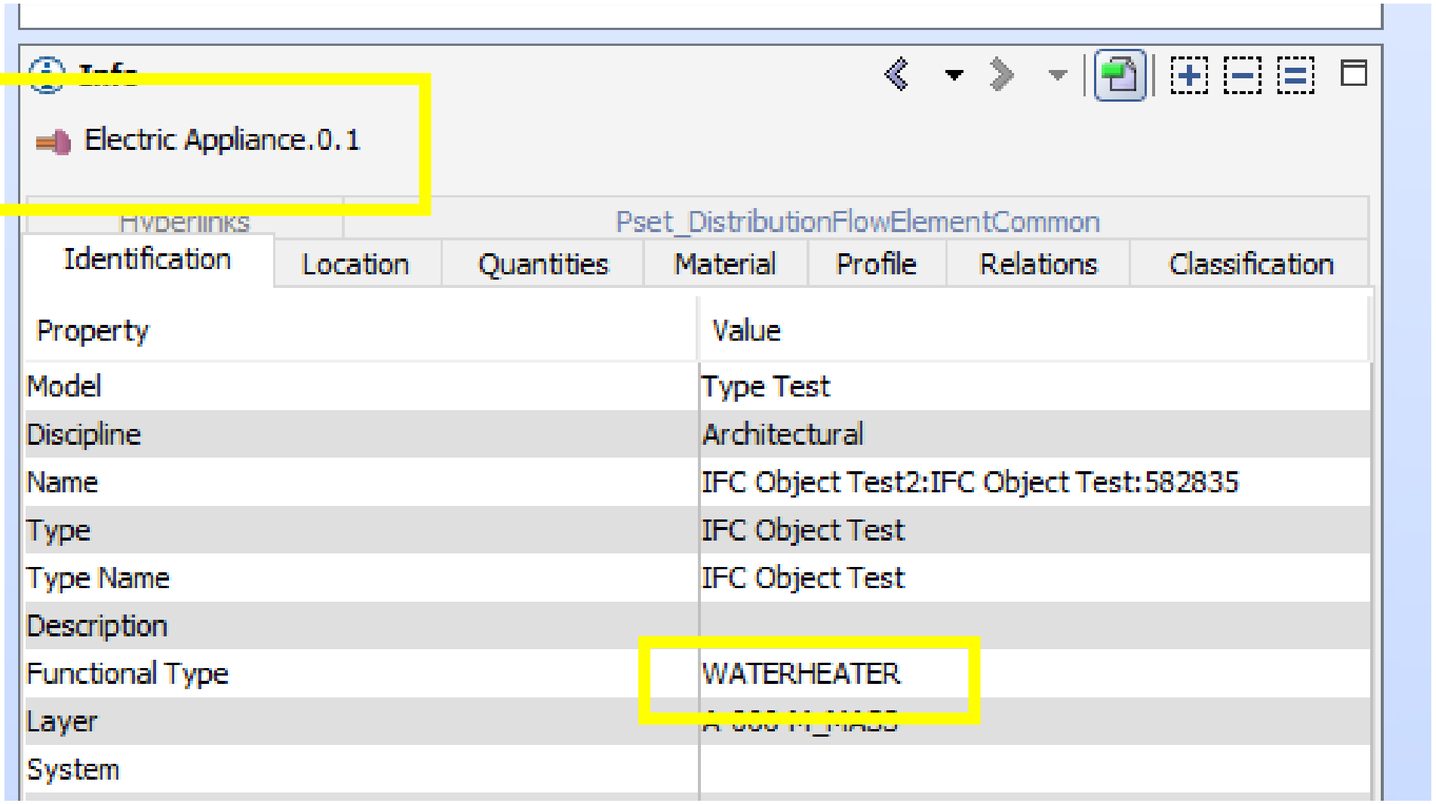
- There are multiple methods of entering the IFC Type, and Pre-defined types.





Class Mapping

- In this instance, both are valid, achieve the same results



Layer Mapping

- Revit doesn’t use layers to organise object within Revit, it uses Categories.
- Layers required for effective collaboration with partners using tools such as ArchiCAD, and Tekla
- Layers need to conform to Project Standards, to ensure efficient import mapping.

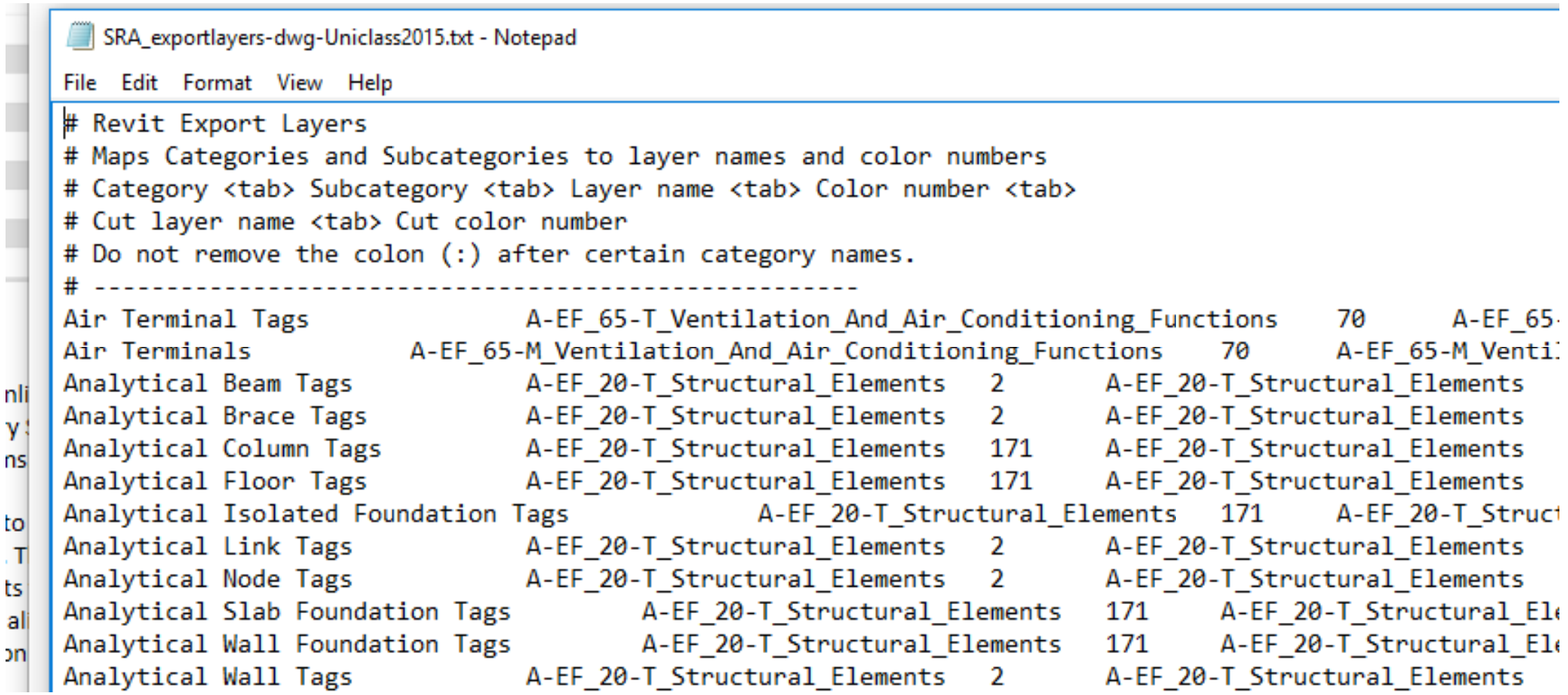
Layer Mapping

- Revit will map objects to layers by default
- Default Template aligned to BS1192 1997 and CSIfB.
- Use Uniclass 2015 instead.

Curtain Wall	A-214-M_CURT_WALL	A-Ss_25_60_35-M_GlazingSystems
Structural Frame	S-280-M_STRUCT_FRAME	S-EF_20_10-M_Frames
Duct	M-287-M_DUCT	E-EF_65-M_VentAndAitCon

Layer Mapping

- Layer Mapping in Revit is controlled by a layer export file.
- This is a Tab delimited txt file.



Layer Mapping

- It is faster authoring and editing the file in excel.

A7 | Air Terminal Tags

	A	B	C	D	E	F	G
1	# Revit Export Layers						
2	# Maps Categories and Subcategories to layer names and color numbers						
3	# Category <tab> Subcategory <tab> Layer name <tab> Color number <tab>						
4	# Cut layer name <tab> Cut color number						
5	# Do not remove the colon (:) after certain category names.						
6	# ----------						
169	Floors	Surface Pattern	A-EF_30_20-M_Floors	190	A-EF_30_20-M_Floors	190	
170	Floors	Thermal/Air Layer [3]	A-EF_30_20-M_Floors	192	A-EF_30_20-M_Floors	192	
171	Floors		A-EF_30_20-M_Floors	192	A-EF_30_20-M_Floors	192	
172	Foundation Span Direction Symbol		A-Zz_60_50_85-M_Span_Direction_Marke	171	A-Zz_60_50_85-M_Span_Direction_Marker	171	
173	Furniture	Clearance Zones	A-EF_40-M_Signage_Fittings_Furnishings	30	A-EF_40-M_Signage_Fittings_Furnishings_	30	
174	Furniture	Overhead Lines	A-EF_40-M_Signage_Fittings_Furnishings	30	A-EF_40-M_Signage_Fittings_Furnishings_	30	
175	Furniture		A-EF_40-M_Signage_Fittings_Furnishings	30	A-EF_40-M_Signage_Fittings_Furnishings_	30	
176	Furniture System Tags		A-EF_40-T_Signage_Fittings_Furnishings_	211	A-EF_40-T_Signage_Fittings_Furnishings_A	211	
177	Furniture Systems	Clearance Zones	A-EF_40-M_Signage_Fittings_Furnishings	30	A-EF_40-M_Signage_Fittings_Furnishings_	30	
178	Furniture Systems	Hidden Lines	A-EF_40-M_Signage_Fittings_Furnishings	30	A-EF_40-M_Signage_Fittings_Furnishings_	30	
179	Furniture Systems		A-EF_40-M_Signage_Fittings_Furnishings	30	A-EF_40-M_Signage_Fittings_Furnishings_	30	
180	Furniture Tags		A-EF_40-T_Signage_Fittings_Furnishings	211	A-EF_40-T_Signage_Fittings_Furnishings_A	211	

Layer Mapping

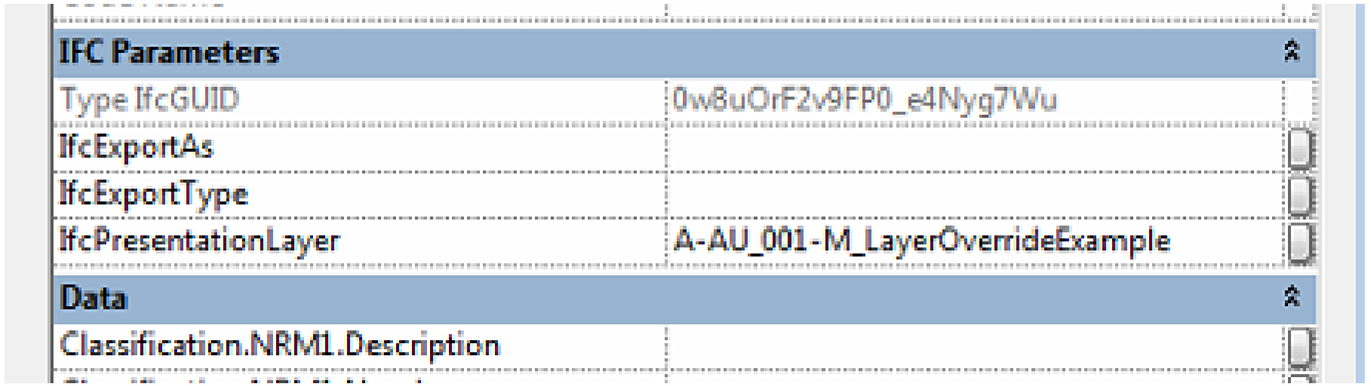
- Mapping Table defined in Revit through a Revit.ini variable.

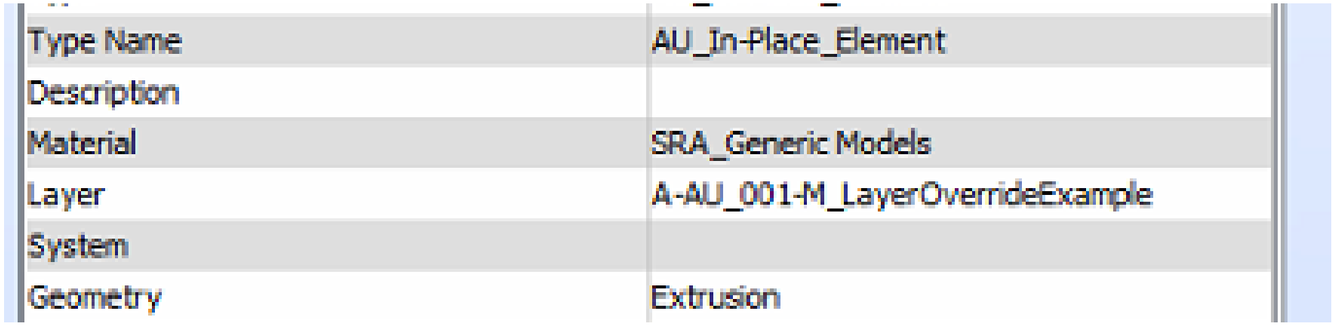
  ExportLayersNameDGN="P:\Autodesk\Revit\2017\<Company>-exportlayers-dwg-Uniclass2015.txt“

  Note - it is best to use quotation marks for paths in case spaces exist.

Layer Mapping

- Similar to Class Mapping, elemental overrides are possible through the custom parameter IfcPresentationLayer.





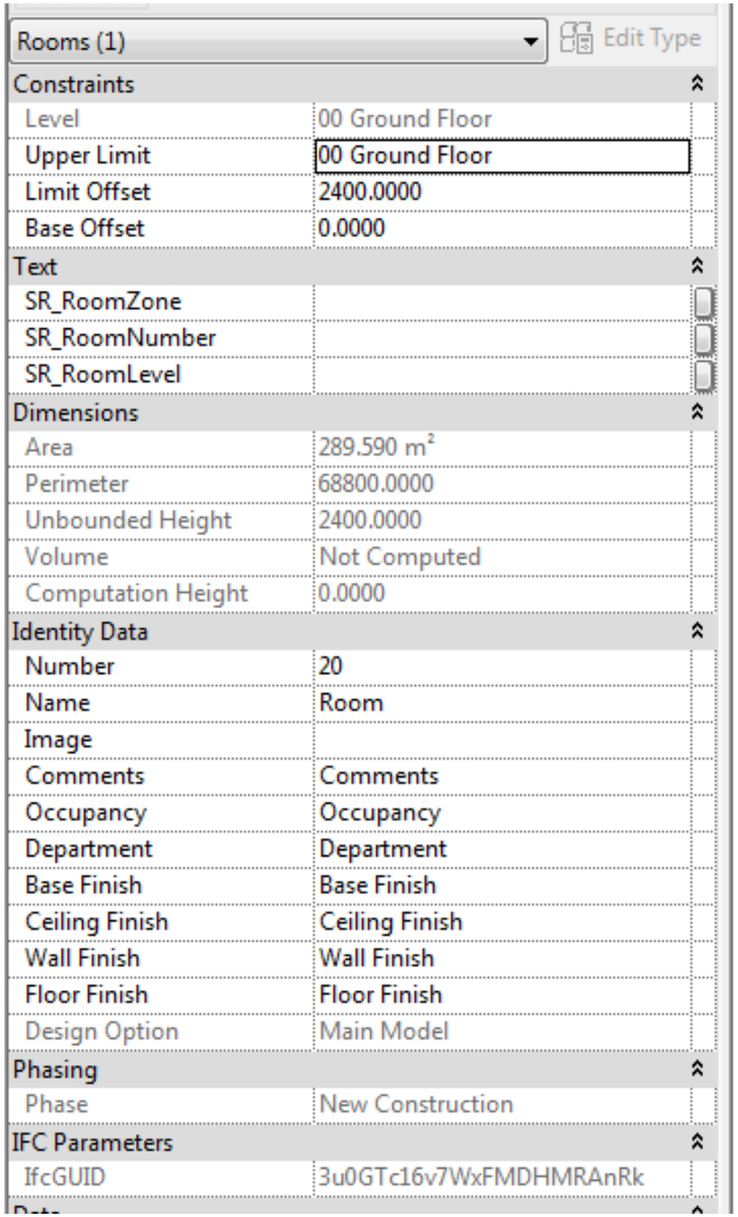
Data Mapping

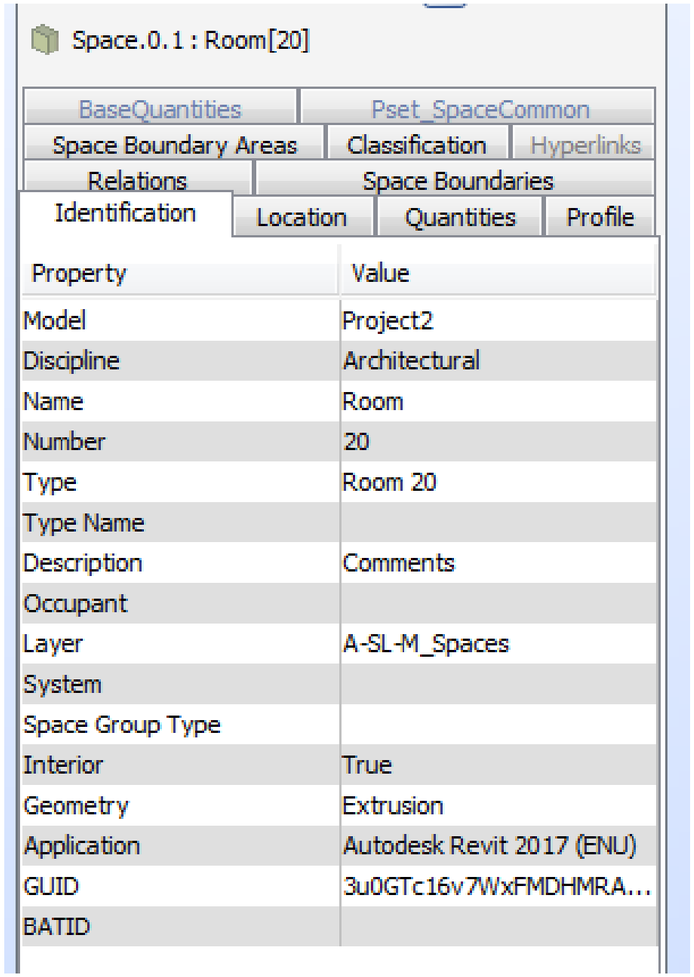
- Data is key in a BIM project, it’s location within the file is almost as important as its existence.
- Many BIM Uses utilise IFC exchanges for the transfer of Project Information.
  - Clash detection
  - Quantity Take-off and Costing
  - Sequencing
  - COBie
  - CAFM Handover

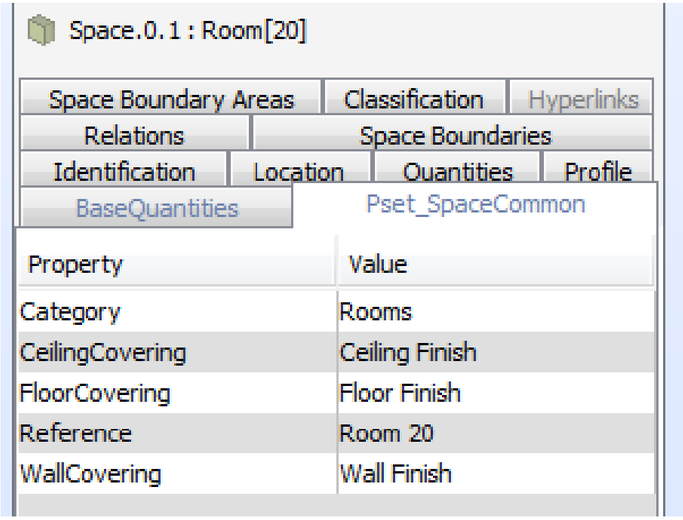
Data Mapping

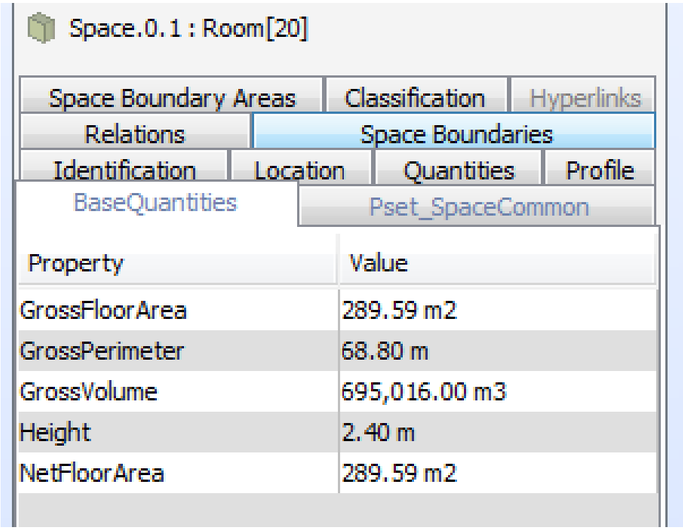
- The IFC Exporter will automatically map some built-in Revit Parameters to IFC properties.
- The majority of these can be overridden if necessary.

Data Mapping









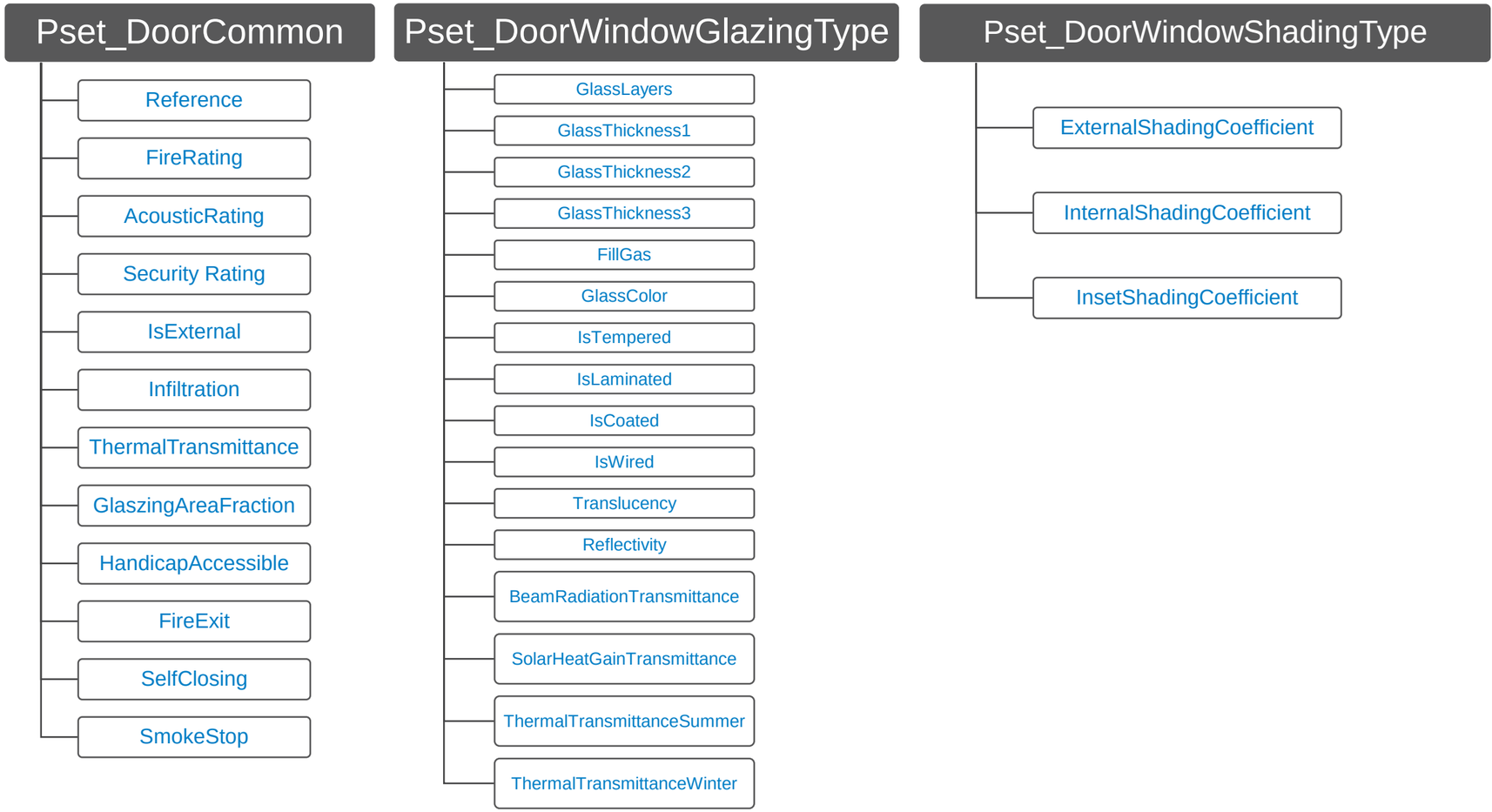
Data Mapping

- Adding a series of shared parameters to your model, it is possible to override the standard IFC Exporter parameters.

IFC Parameter Name	Override Shared Parameter
Name	IfcName or NameOverride
LongName	IfcLongName or LongNameOverride
ObjectType	IfcObjectType or ObjectTypeOverride
Description	IfcDescription
Element Tag	IfcTag

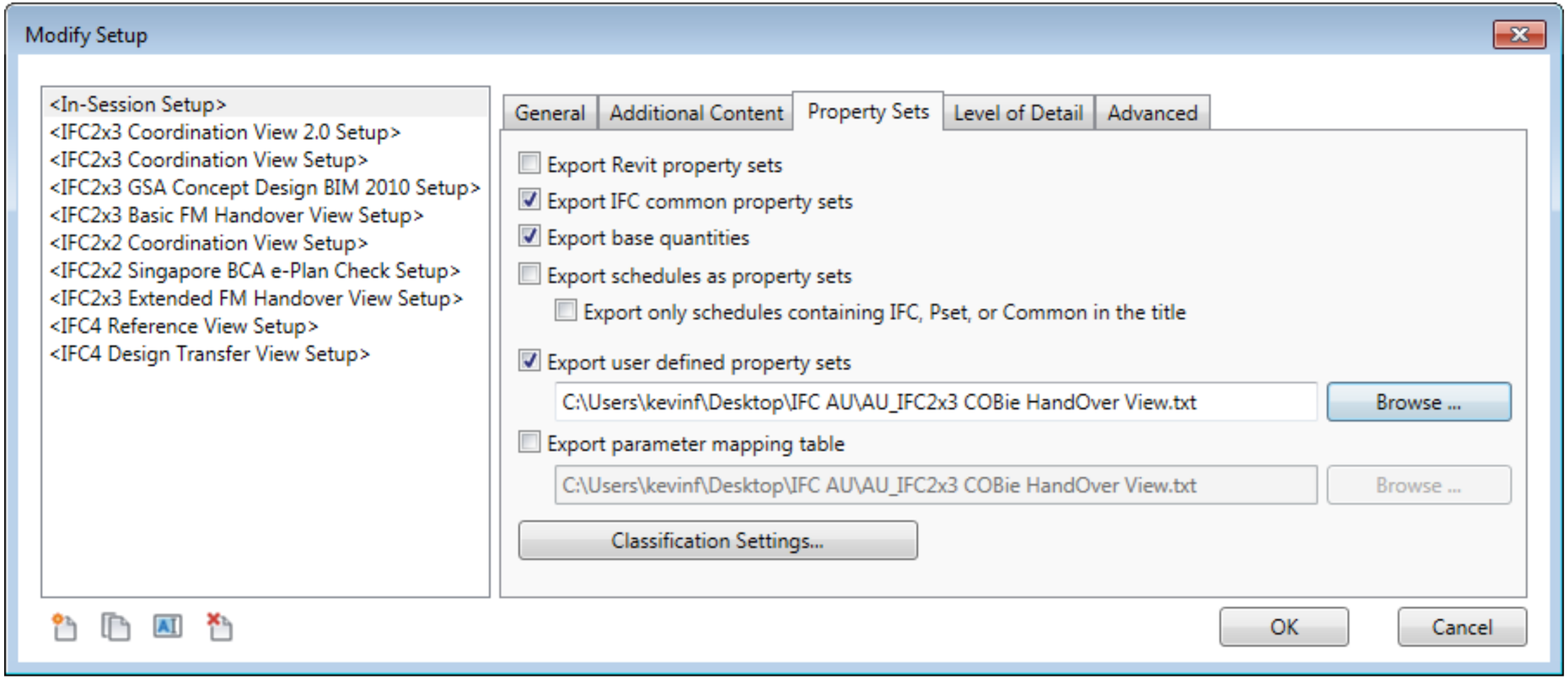
Data Mapping

- Most IFC Classes have associated Property Sets (Psets) containing attributes specific to that class or with similar elements.
- Pset viewable on the BuildingSmart website



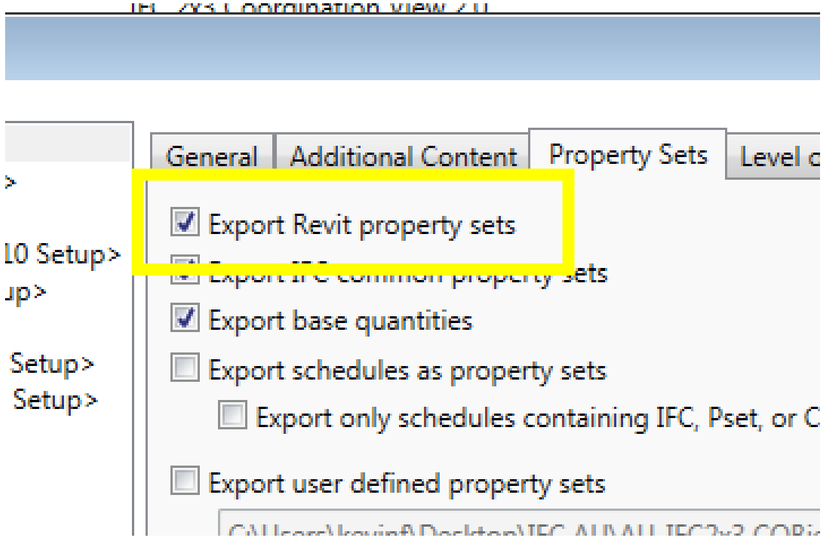
Data Mapping

- What data you export from you BIM depends on your Export Settings



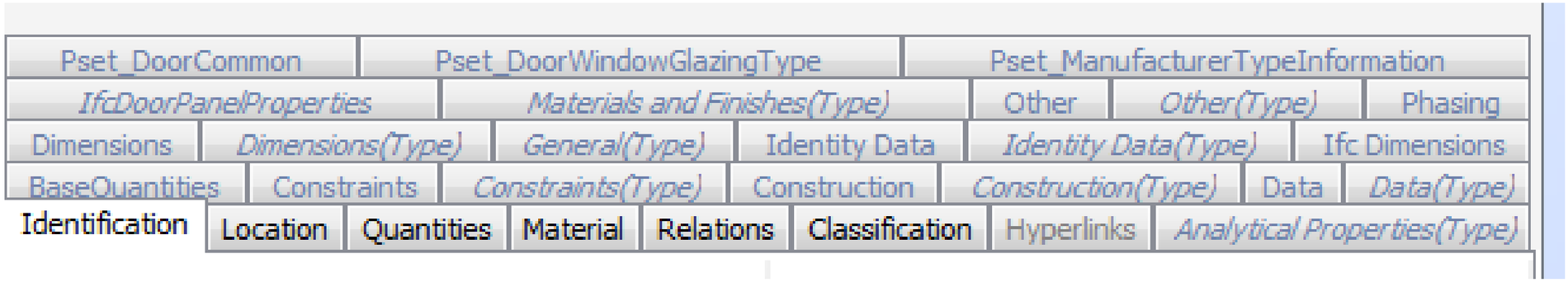
Data Mapping

- Inexperienced users will check “Export Revit property sets”
- This will export all parameters associated to the family.



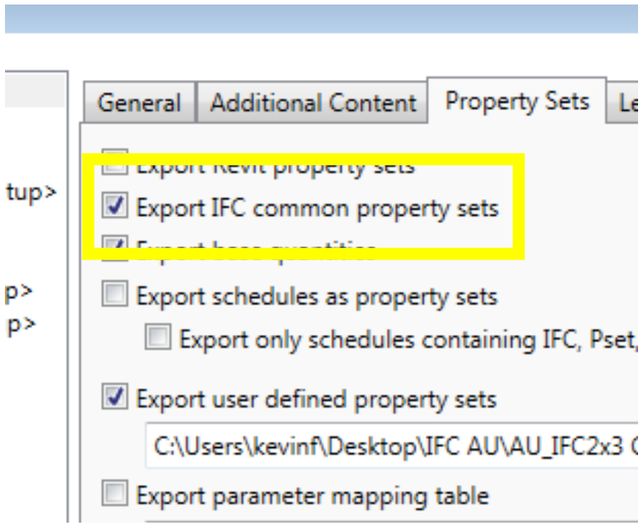
Data Mapping

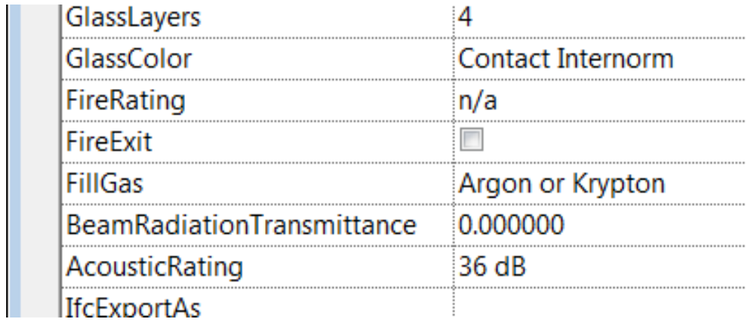
- No consistency
- Not aligned with IFC Psets
- The file sizes are unnecessarily large.
- This is an example of Bad IFC!

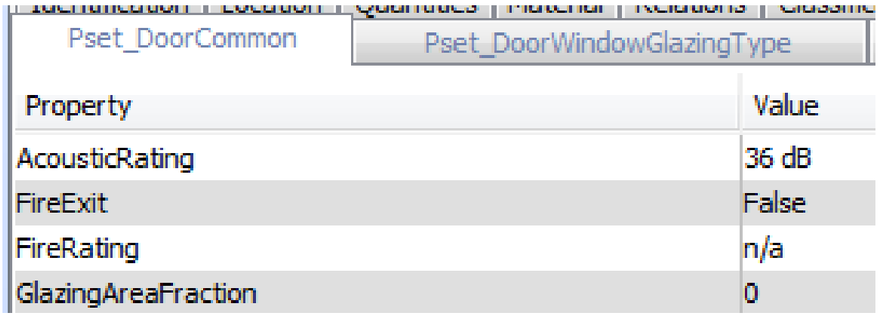


Data Mapping

- Use “Exporting IFC common property sets”
- The Exporter will map all parameters matching the attribute names to the correct Property Set.
- This is Good IFC!

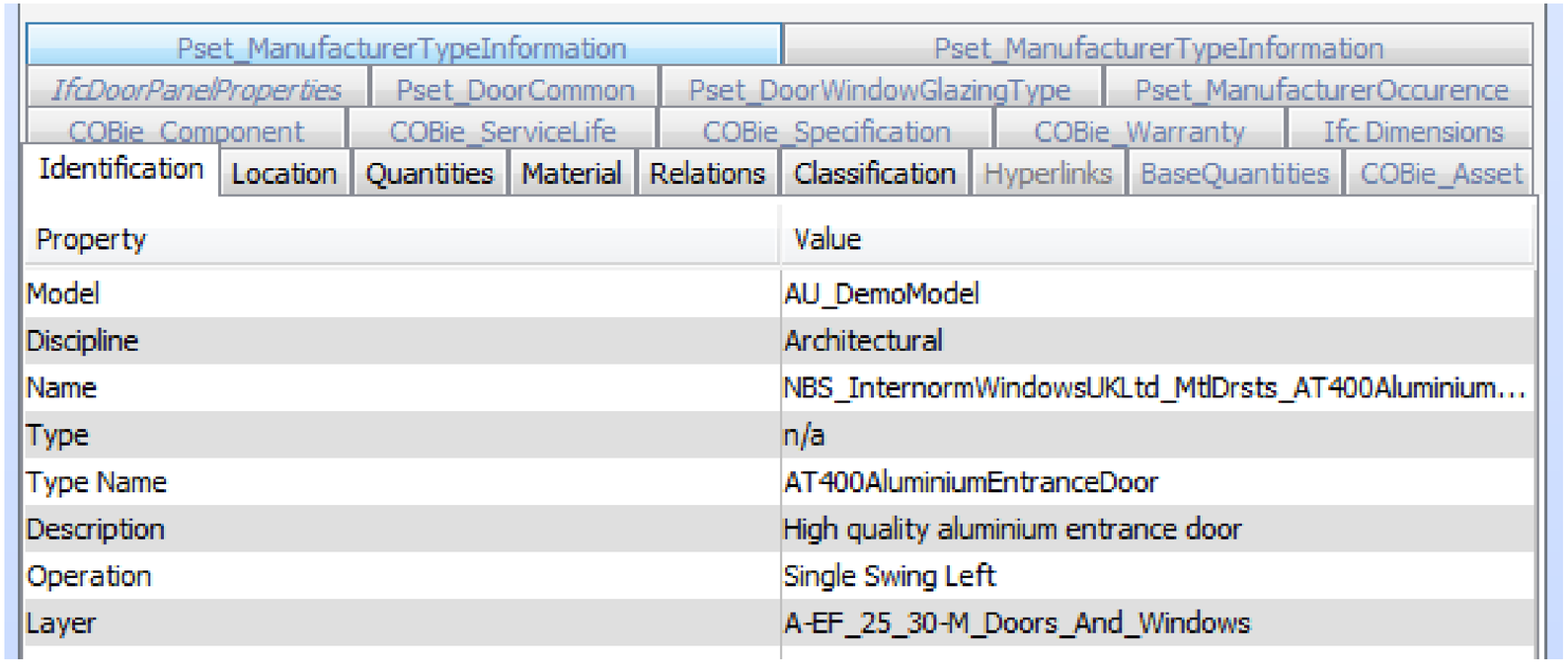






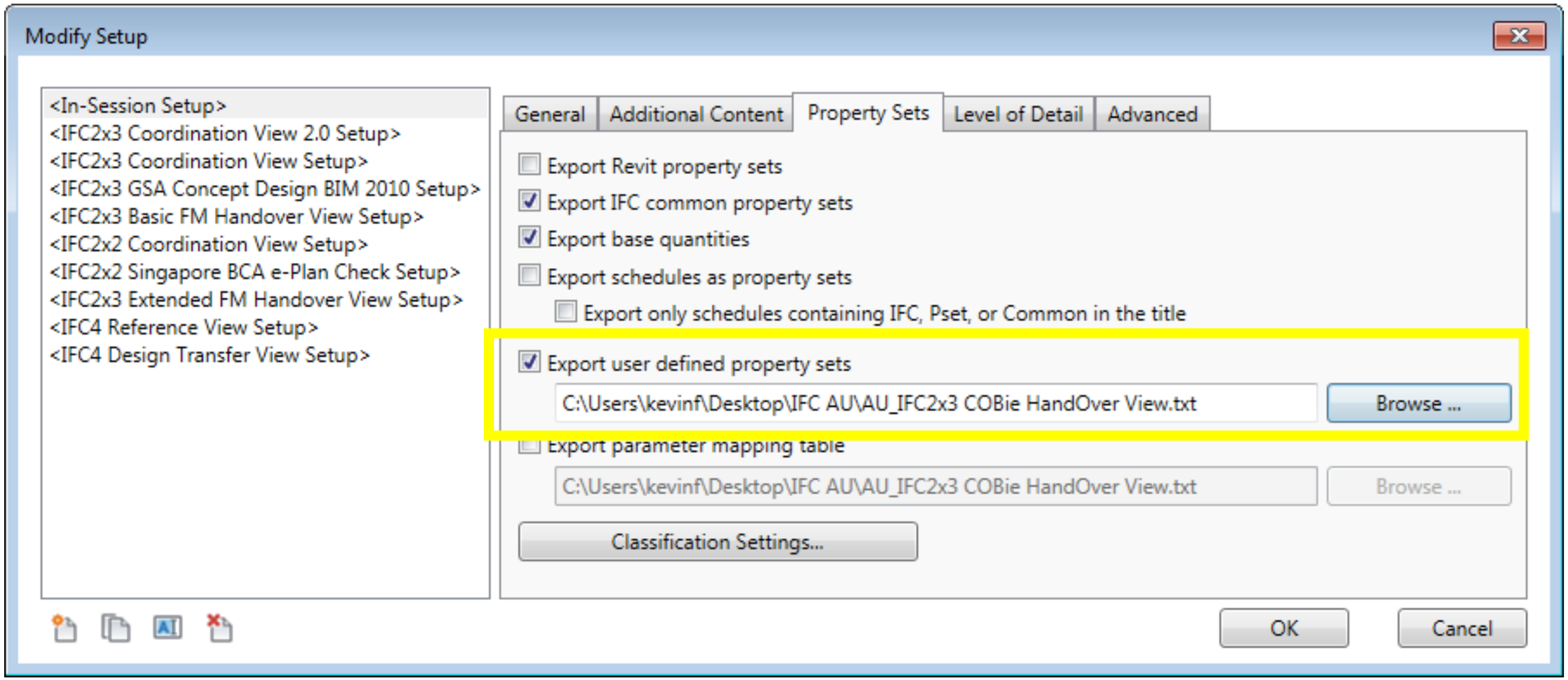
Data Mapping

- User defined property sets can also be created using custom Pset Mapping files.
- The below example has resulted in the creation of several COBie Psets.



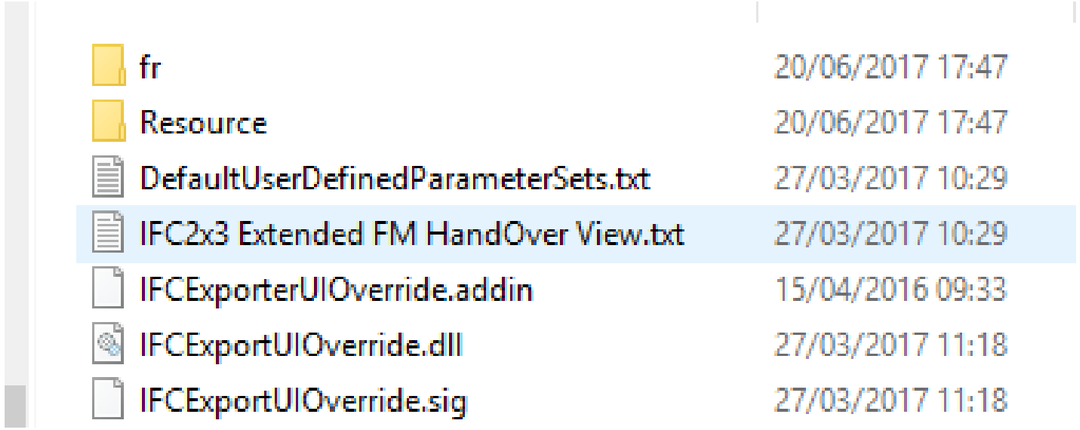
Data Mapping

- Exporting user defined property sets can be defined within the IFC Exporter setup



Data Mapping

- The standard MVD for COBie is the Extended FM Handover
- The exporter setup for this MVD uses a Data Mapping file to populate the attributes required into the correct property sets.
- Found in C:\ProgramData\Autodesk\ApplicationPlugins\IFC 2017.bundle\Contents\2017



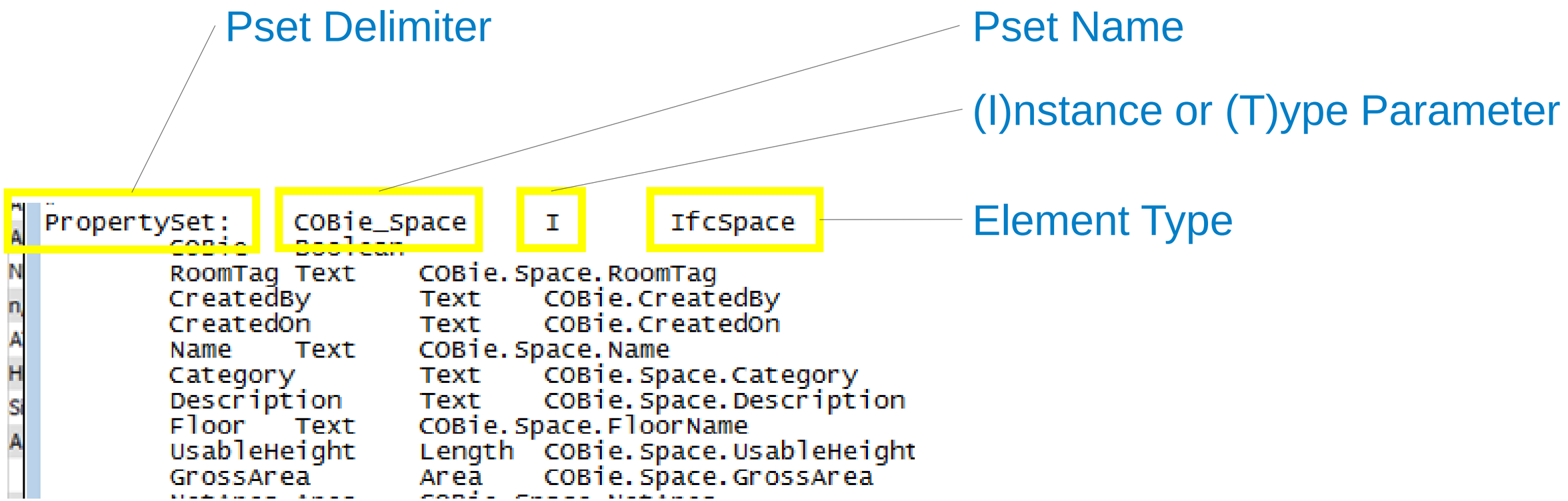
Data Mapping

- This mapping file is tab delimited

```
#
# User Defined PropertySet Definition File
#
# Format:
#       PropertySet:    <Pset Name>     I[nstance]/T[ype]       <element list separated by ','>
#                               <Property Name 1>       <Data type>     <Revit parameter name (if different from property name)>
#                               <Property Name 2>       <Data type>     <Revit parameter name (if different from property name)>
#                               ...
# Data type supported currently are only the primitive types: Text, Real, Integer and Boolean
#
# PropertySet definition for COBie
#
PropertySet:    COBie_Specification     T       IfcElementType
        NominalLength   Real    COBie.Type.NominalLength
        NominalWidth    Real    COBie.Type.NominalWidth
        NominalHeight   Real    COBie.Type.NominalHeight
        Shape           Text    COBie.Type.Shape
        Size            Text    COBie.Type.Size
        Color           Text    COBie.Type.Color
        Finish          Text    COBie.Type.Finish
        Grade           Text    COBie.Type.Grade
        Material        Text    COBie.Type.Material
```

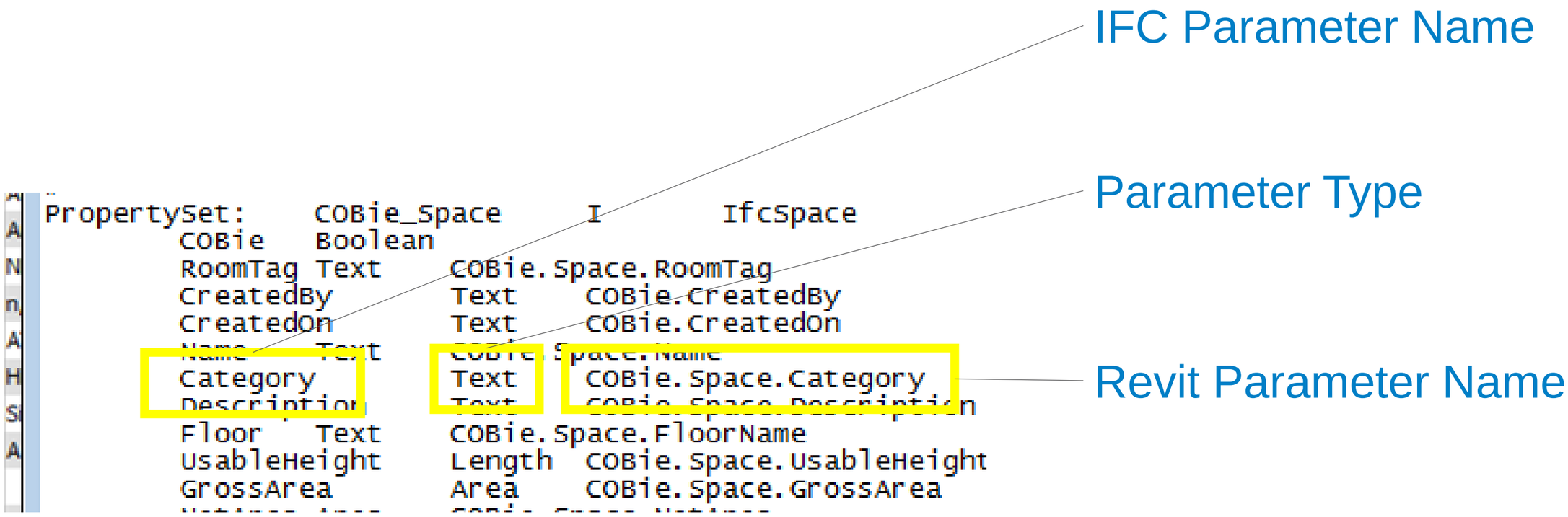
Data Mapping

- There are two parts; the Pset definition, and the parameter definition.



Data Mapping

- There are two parts; the Pset definition, and the parameter definition.



Data Mapping

Info

Door.0.2

Hyperlinks | BaseQuantities | COBie_Asset | COBie_Component

Identification | Location | Quantities | Material | Relations | Classification

Pset_ManufacturerTypeInformation | Pset_ManufacturerTypeInformation

Pset_DoorWindowGlazingType | Pset_ManufacturerOccurence

COBie_Warranty | Ifc Dimensions | *IfcDoorPanelProperties* | Pset_DoorCommon

COBie_EconomicalImpactValues | COBie_ServiceLife | COBie_Specification

Property	Value
AccessibilityPerformance	n/a
CodePerformance	n/a
Color	Ral 9010
Constituents	n/a
Features	Externally fitted with single colour
Finish	Standard Ral Paint Finish
Grade	n/a
Material	Aluminium alloy 6063 T5 and T6
NominalHeight	2.10 m
NominalLength	0 mm
NominalWidth	1.80 m
Shape	n/a
Size	1800x2100mm
SustainabilityPerformance	Extruded from recycled aluminium to 6...

Type Properties

Family: NBS_ArchitecturalAndMetalSystemsLtd_MtlD | Load...

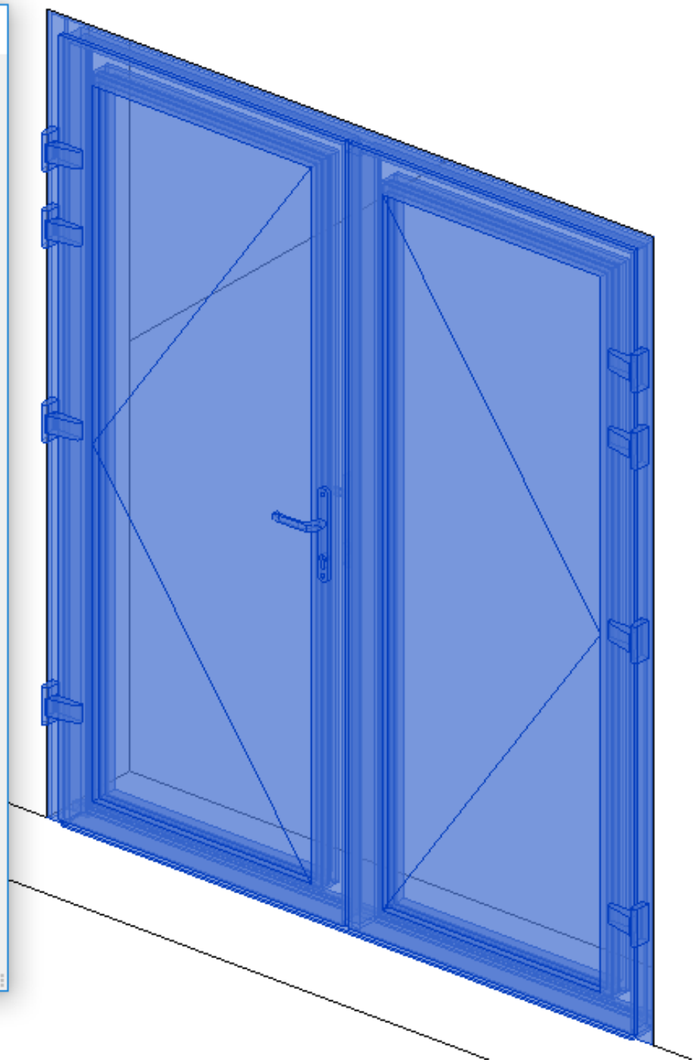
Type: 1800x2100mm | Duplicate...

Rename...

Type Parameters

Parameter	Value
Shape	n/a
ReplacementCost	2450
NominalWidth	1800.0000
NominalLength	0.0000
NominalHeight	2100.0000
Name	MetalDoorsets_DoubleDoors:DoorC
ModelReference	Double Doors: Door Configuration
ModelNumber	n/a
Material	Aluminium alloy 6063 T5 and T6
Grade	n/a
Finish	Standard Ral Paint Finish
Features	Externally fitted with single colour
ExpectedLife	n/a
DurationUnit	year
Constituents	n/a
Color	Ral 9010
CodePerformance	n/a
Category	Pr_30_59_24_52:Metal doorsets

<< Preview | OK | Cancel | Apply



Data Mapping

- This approach means that the Revit parameter names are irrelevant for the exports as the mapping table and IFC Exporter standardise them.
- Each Company could prefix their parameters as necessary

  Category Text CompanyA.Space.Category

  Category Text CompanyB.Space.Category

- By creating a project specific Pset mapping file and defining specific settings for the IFC Exporter, you are essentially creating a Project specific Model View Definition.

Classifications

- Classification is the categorization of objects based on specific criteria.
- Classifications are the backbone to data interoperability
- Crucial for Costing, Clash Detection, and COBie

  - Uniclass 2015 Tables En, SL, Ss, Pr, ZZ, Ef (Currently)
  - BS1192:2007
  - NRM1
  - SFG20

Defining Classifications

- You can define object level classifications inside Revit
- Each Element can be classified multiple times.
- The IFC exporter will convert the parameter to a Classification Reference.
- The parameters need to be named based on the following convention.

ClassifcationCode

ClassifciationCode(2)

ClassifciationCode(3)

ClassifciationCode(4)

Defining Classifications

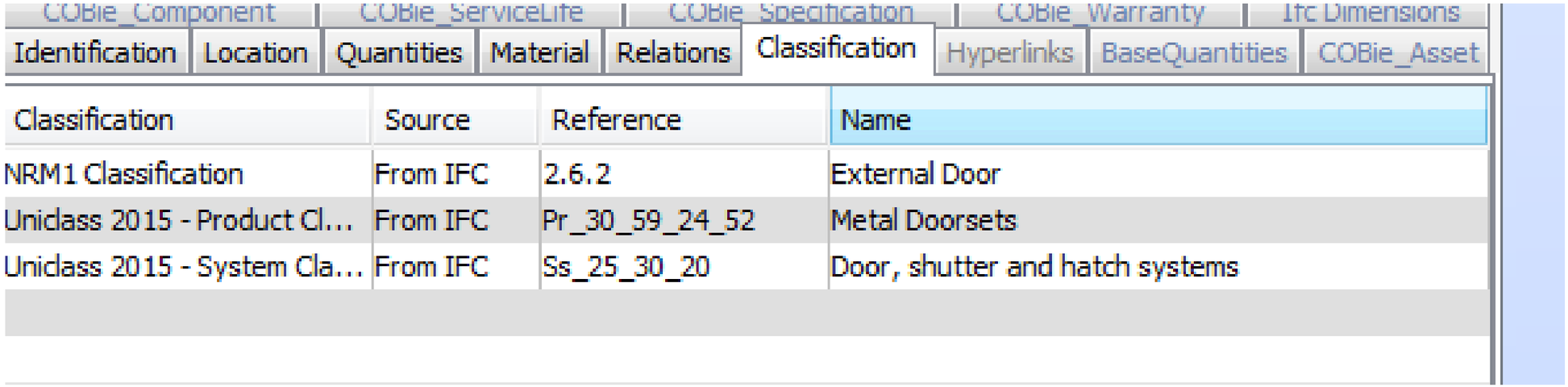
- The data format is as follows

  [ClassificationName] Value : Description

IFC Parameters	
IfcGUID	3kFQ9W8IzABhEaGokvf2Er
ClassificationCode	[Uniclass 2015 - Product] Pr_30_59_24_52 : Metal Doorsets
ClassificationCode(2)	[Uniclass 2015 - System] Ss_25_30_20 : Door, shutter and hatch systems
ClassificationCode(3)	[NRM1] 2.6.2 : External Door

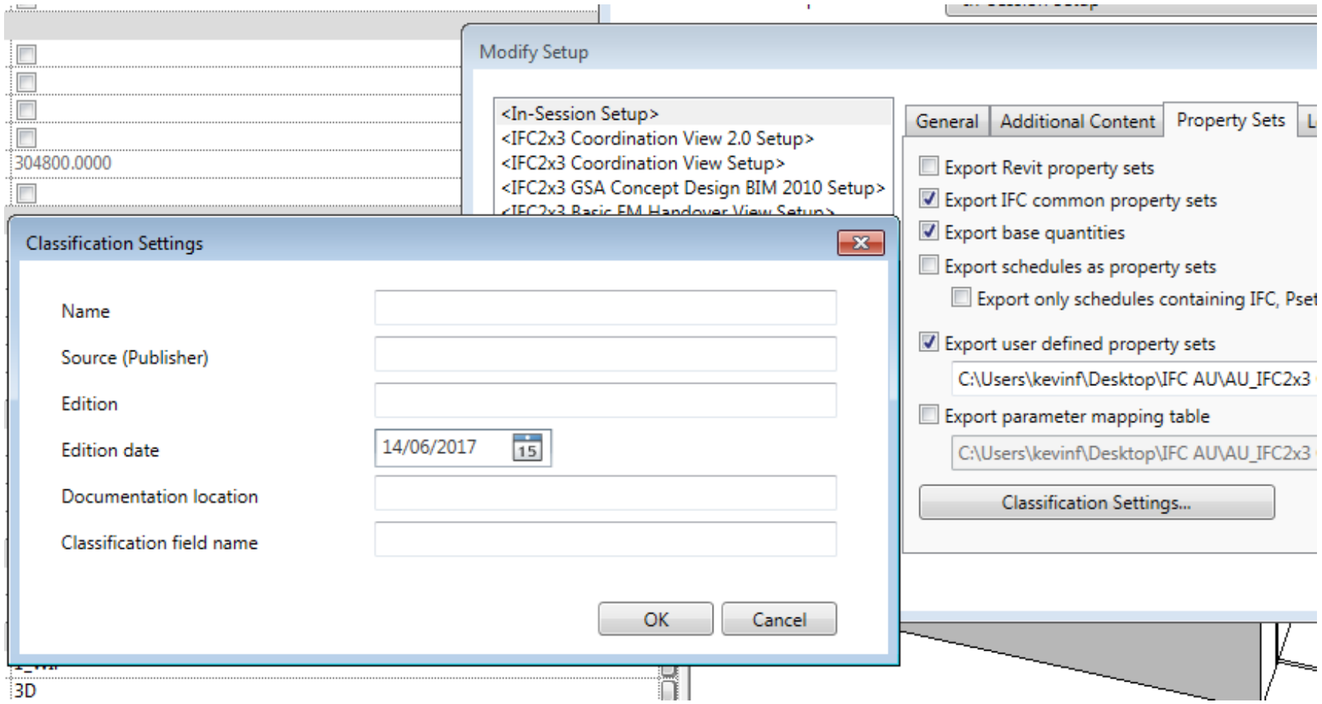
Defining Classifications

- In Solibri Model Checker this is represented as



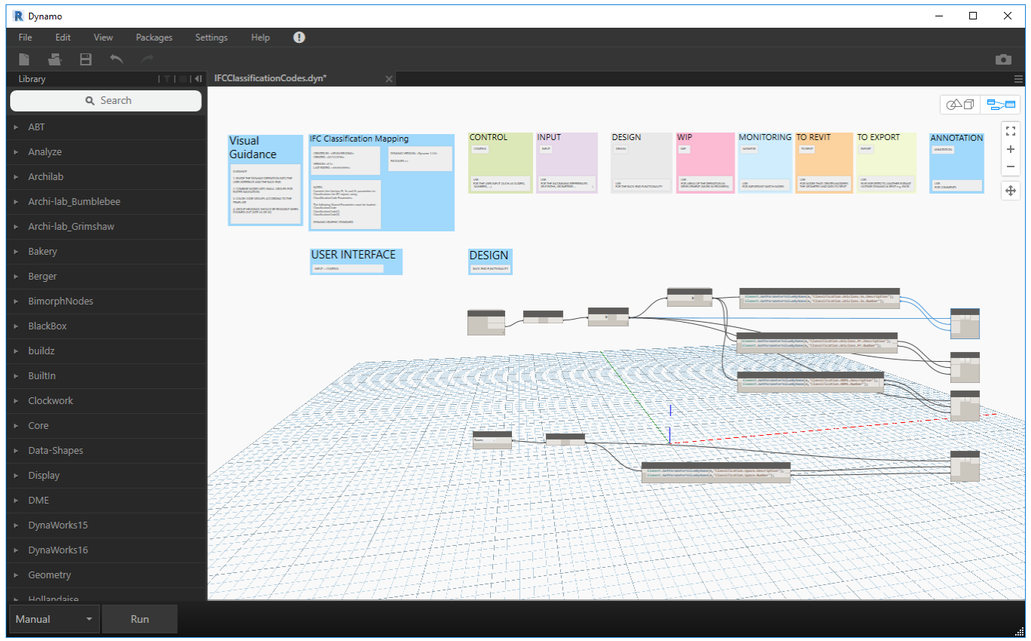
Defining Classifications

- The classification references, belong to a IfcClassification which contains information regarding its source.
- Using the IFC Exporter you can currently only define one IfcClassifcation.



Defining Classifications

- The Interoperability Tool, the Classification Manager can be used to add classification values into the model,
- No integration with the IFC Exporter.
- Parameters need to me mapped using tools such as Ideate BIM Link or Dynamo.



Identifying zoning

- IfcZones are the ability to group spaces depending on function.
- A space can belong to multiple Zones.
- Zones may exist for Circulation, Lettable zones, Habitable rooms, or Fire Compartmentation.

Identifying zoning

- The concept of Zones don't exist within Revit
- You can define for export to IFC using the IFC Exporter.
- Using a similar concept to Classifications you need to add a series of parameters to your model

ZoneName

ZoneDescription

ZoneObjectType

Identifying zoning

- Multiple zones per element require extra parameters within your model

ZoneName 2

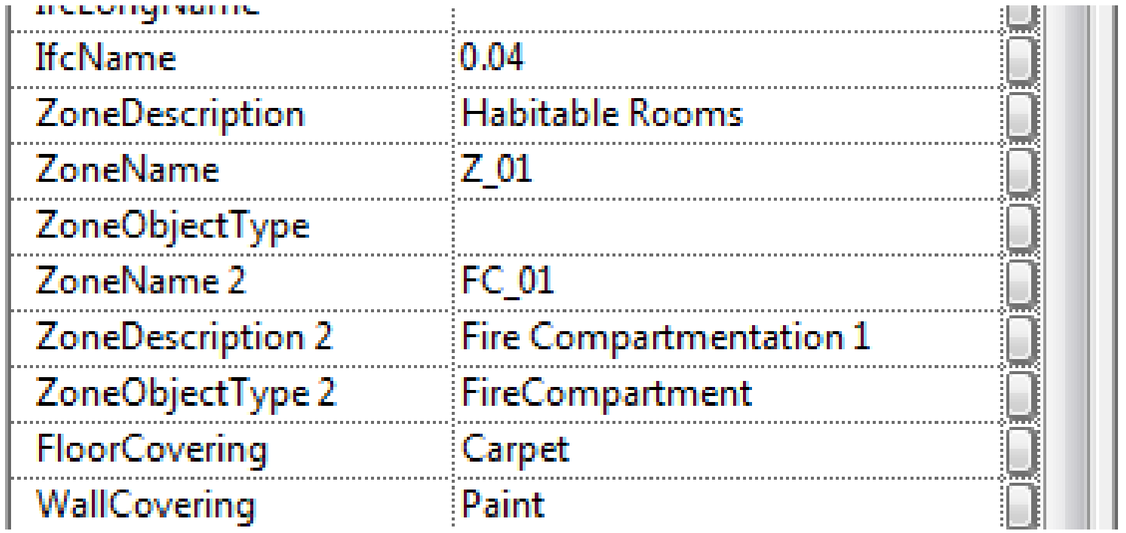
ZoneDescription 2

ZoneObjectType 2

ZoneName 3

ZoneDescription 3

ZoneObjectType 3



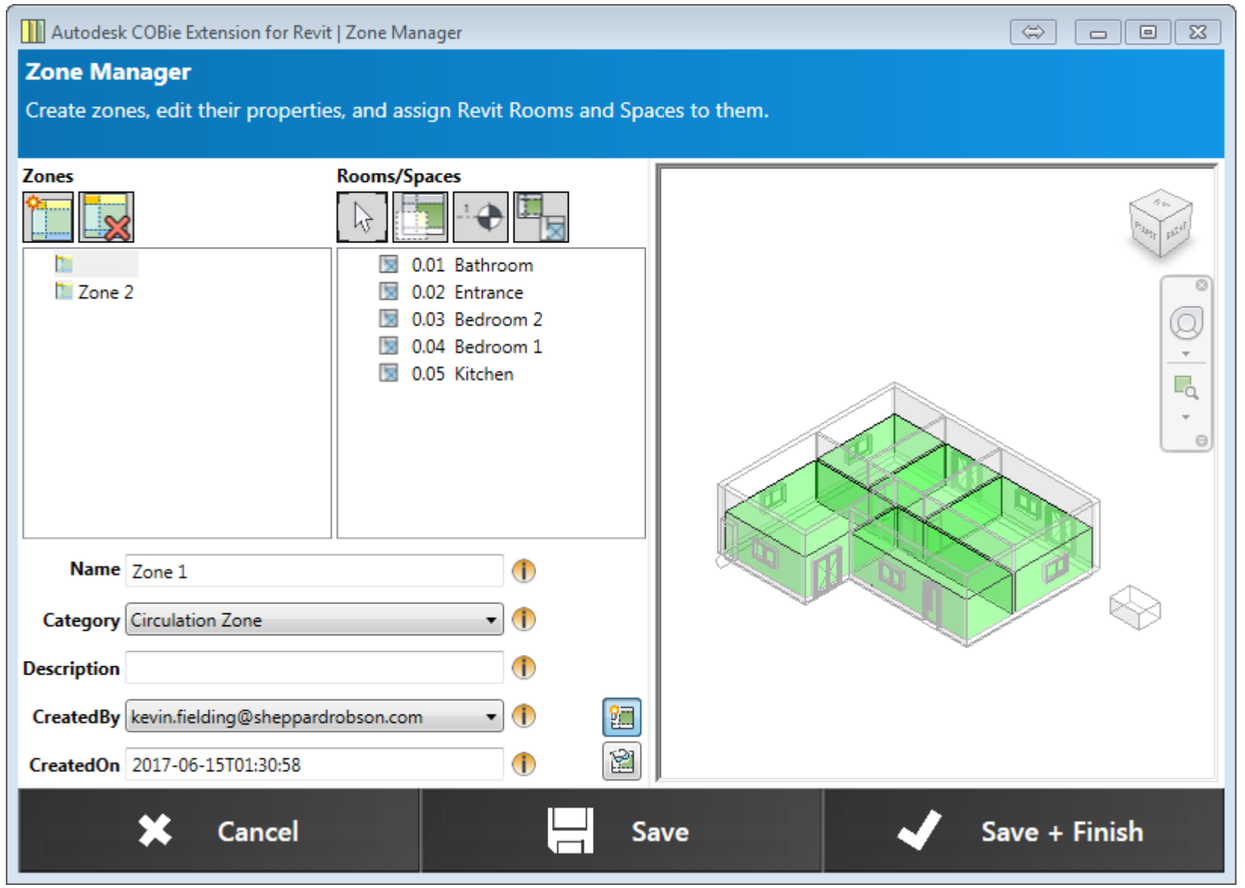
IfcName	0.04
ZoneDescription	Habitable Rooms
ZoneName	Z_01
ZoneObjectType	
ZoneName 2	FC_01
ZoneDescription 2	Fire Compartmentation 1
ZoneObjectType 2	FireCompartment
FloorCovering	Carpet
WallCovering	Paint

IfcZone Limitations

- The concept of zones doesn’t exist within Revit. There is no object to attach data.
- It is not possible using the IFC Exporter to attached additional zone information or attributes to the zones such as Pset_ZoneCommon attributes

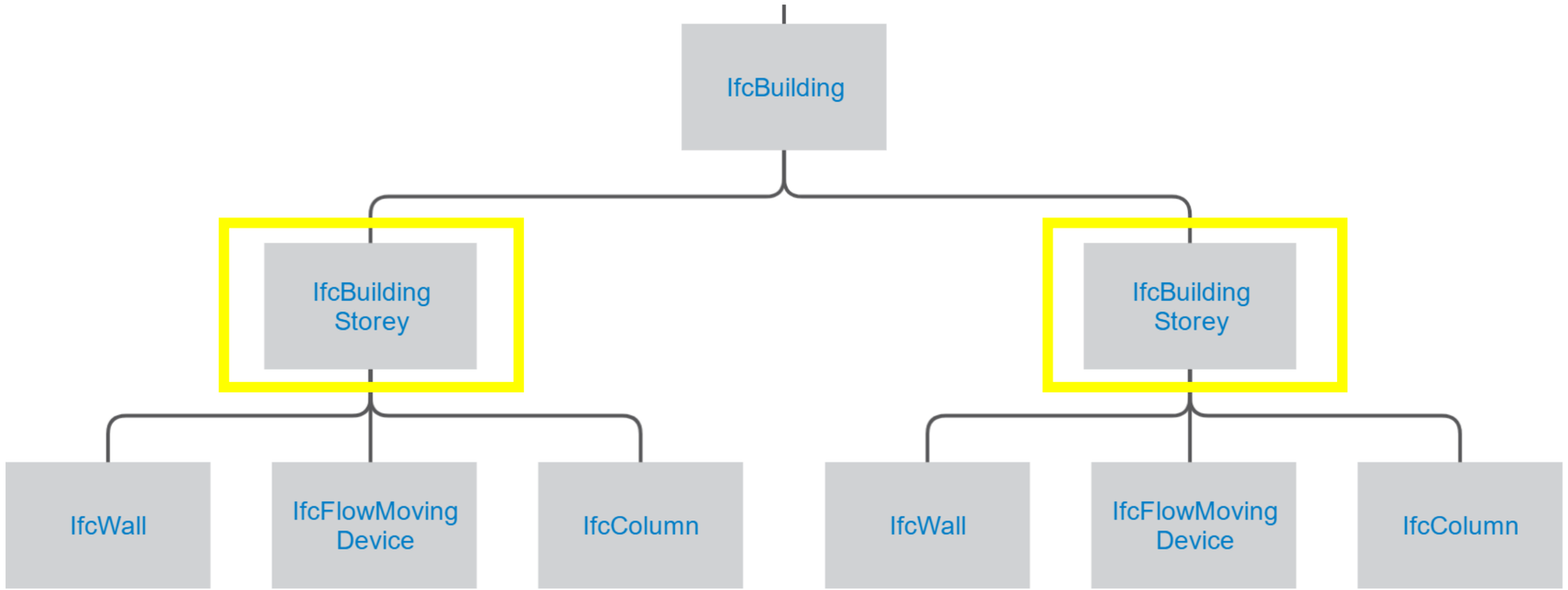
IfcZone Limitations

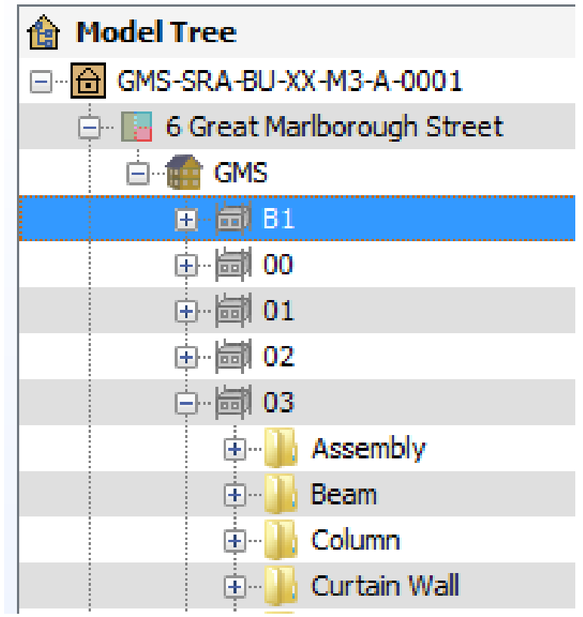
- For better results, the COBie Toolkit Zone Manager should be integrated into IFC Exporter in future IFC development.



Revit Levels and IfcBuildingStorey

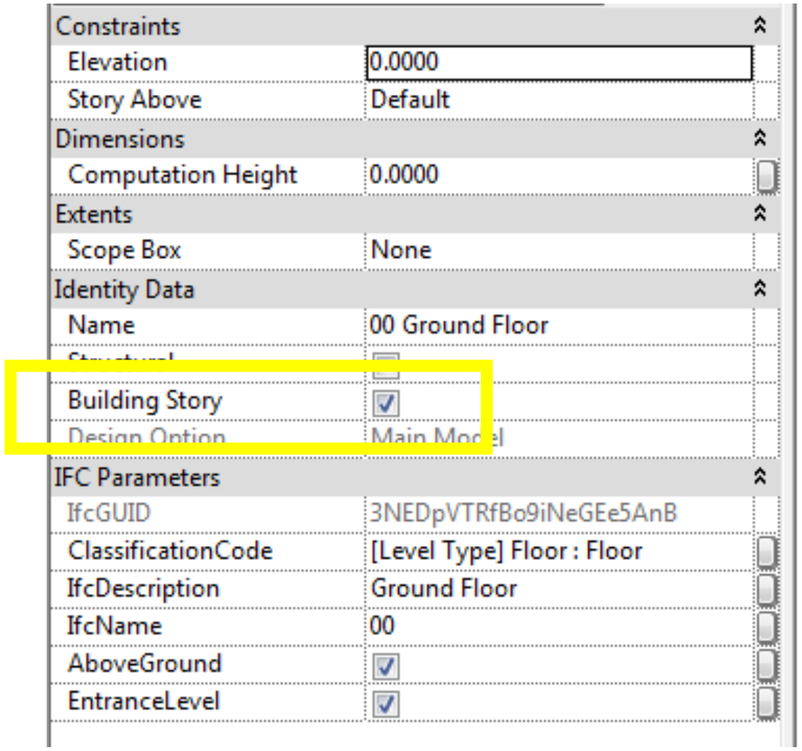
- Levels are fundamental to the structure of the IFC file, they are known as IfcBuildingStoreys
- All elements, including spaces are assigned a building storey.

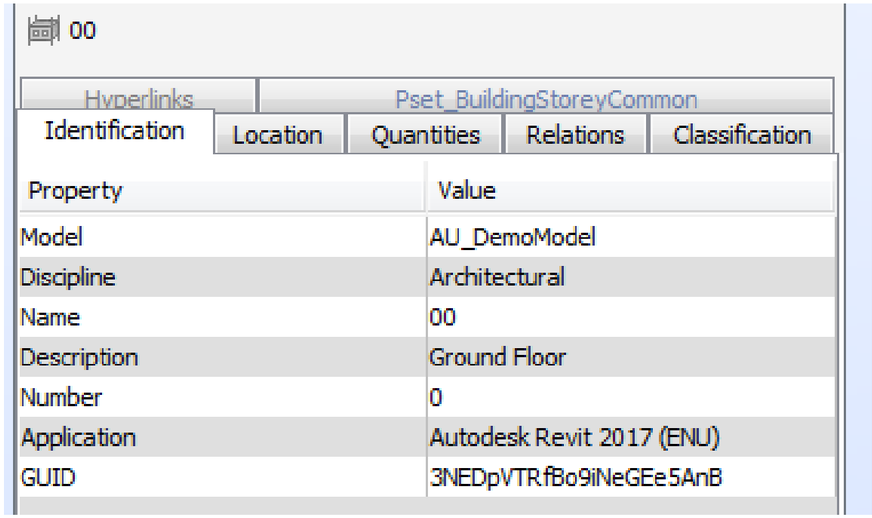




Revit Levels and IfcBuildingStorey

- Like other processes additional parameters are required for effective export.



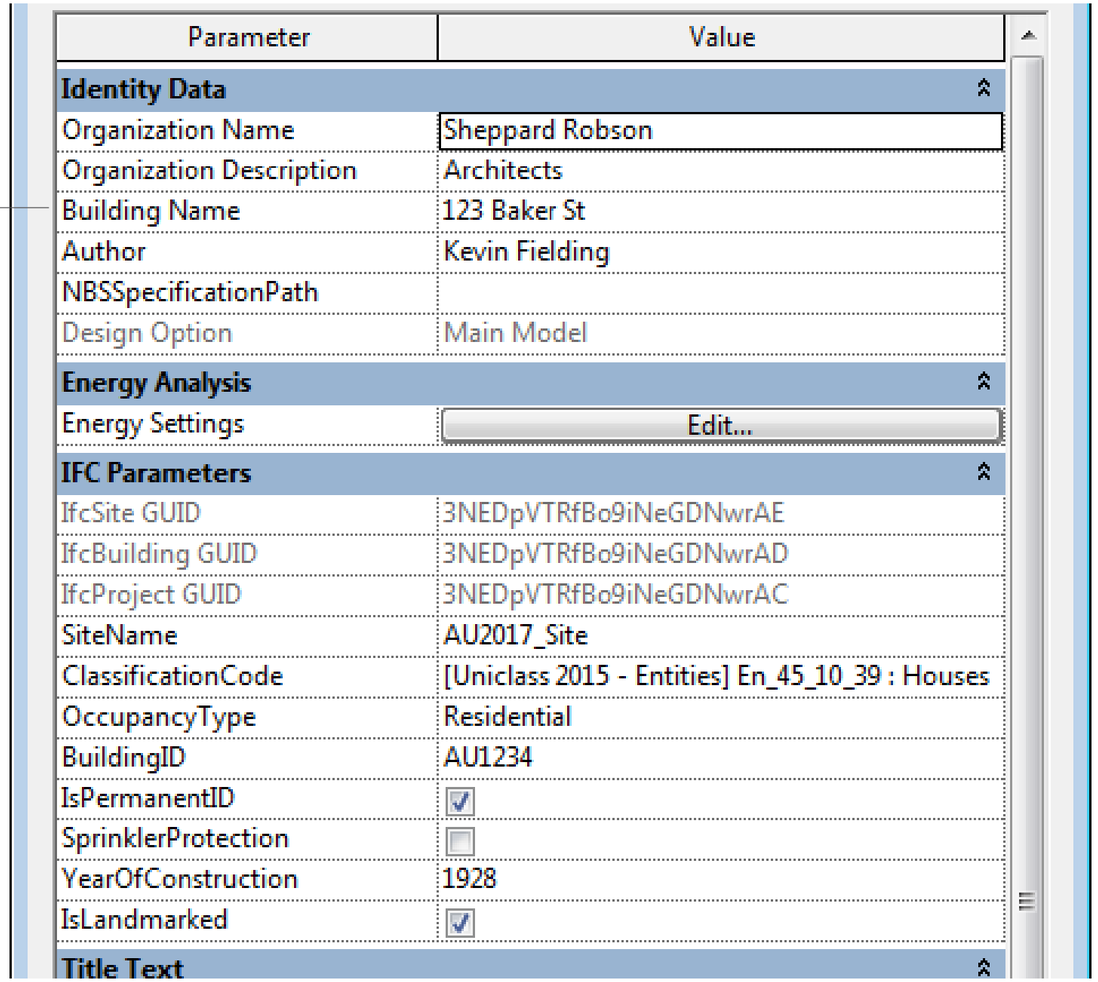


IfcSite & IfcBuilding

- Populated through Project Information within the Revit Model.

IfcBuilding Name

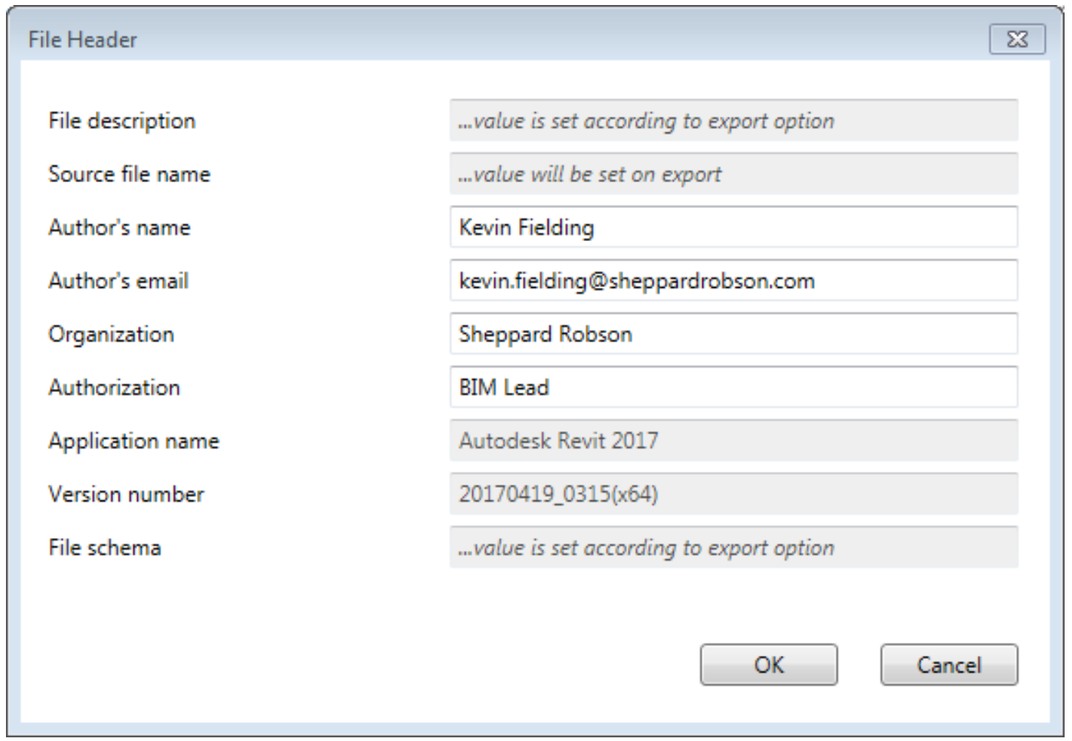
Site and Building IFC Parameters

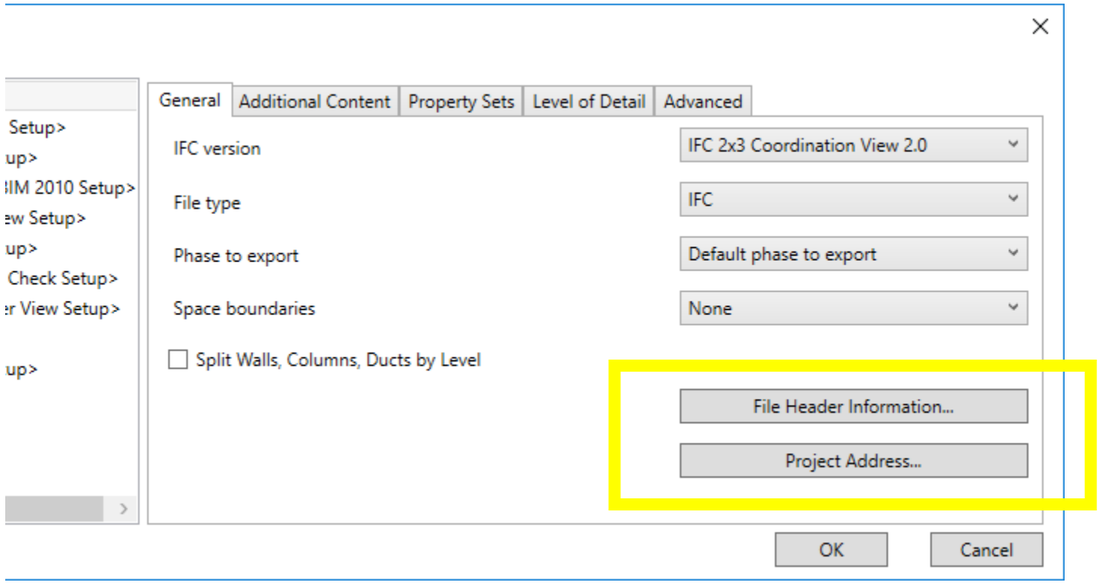


Parameter	Value
Identity Data	
Organization Name	Sheppard Robson
Organization Description	Architects
Building Name	123 Baker St
Author	Kevin Fielding
NBSSpecificationPath	
Design Option	Main Model
Energy Analysis	
Energy Settings	Edit...
IFC Parameters	
IfcSite GUID	3NEDpVTRfBo9iNeGDNwrAE
IfcBuilding GUID	3NEDpVTRfBo9iNeGDNwrAD
IfcProject GUID	3NEDpVTRfBo9iNeGDNwrAC
SiteName	AU2017_Site
ClassificationCode	[Uniclass 2015 - Entities] En_45_10_39 : Houses
OccupancyType	Residential
BuildingID	AU1234
IsPermanentID	☑
SprinklerProtection	☐
YearOfConstruction	1928
IsLandmarked	☑
Title Text	

IfcSite & IfcBuilding

- Additional attributes can be assigned within the IFC Exporter, these are saved into the Revit File.





Watch Points and Good Practice

Watch points

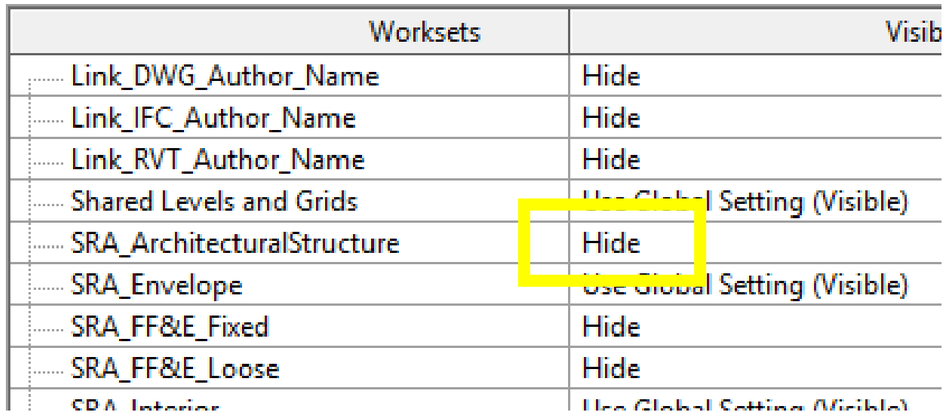
- Shared nested elements
- Upgrading between versions of the IFC Exporter.
- Complex geometry or facades may not export correctly
- Large models may need to be exported in sections.
- Structural Connections don’t export

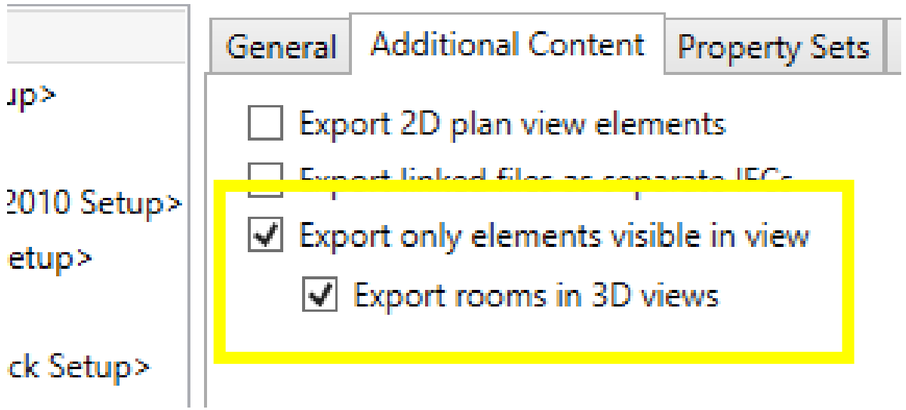
Watch points

- Shared parameters are not standardised across the industry.
- Revit doesn’t fully support IfcSystems or IfcZones
- Revit System Family Mapping is limited

Good Practice

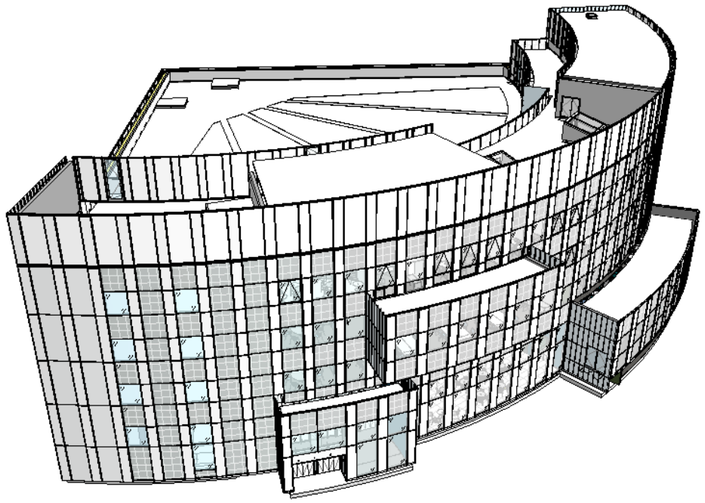
- Only export what you need – Data and Geometry
- Use Worksets to control visibilities and ‘Export only elements visible in view’.

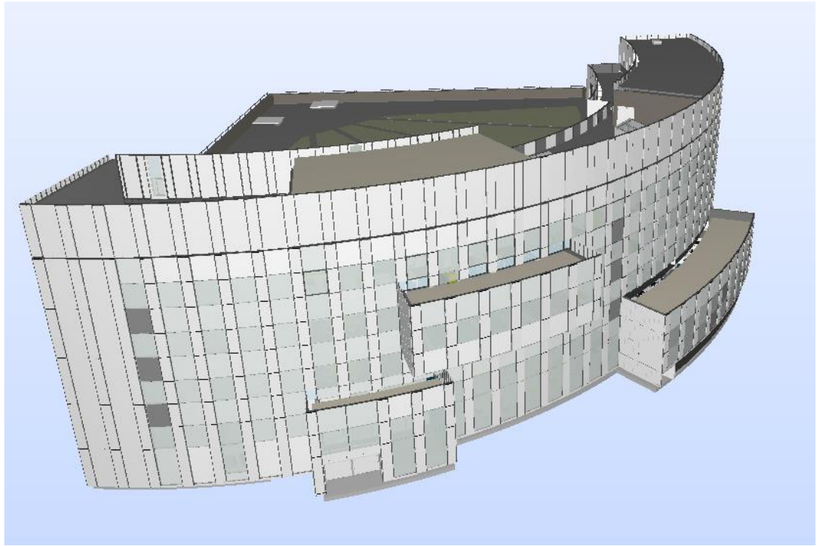




Good Practice

- Open the export in an IFC Viewer – Check for completeness





Good Practice

- Ensure your machine has enough RAM
- Use IFC Parameters as you Company default for scheduling
- Standardise your mapping tables for layers
- Collaboratively generate Pset mapping files on Projects
- Document and agree process, and settings within BEP
- Report issues to Autodesk

Conclusions

Conclusion

- With a well developed Revit Template, it is possible to embed all the necessary parameters for a data rich IFC file with very little additional parameter mapping.

- The IFC standard is robust enough to support the majority of building data requirements, and interoperability purposes.

- Revit can export IFC Properly, if you are patient.


Questions?

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Make anything.