INTEROPERABILITY WORKFLOW

SALLY STRUCK
PROFESSIONAL SERVICES CONSULTANT

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LEARNING OBJECTIVES

After attending this course, the attendee will have an understanding of the following:

1) Understand the content that is in an IFC Architectural and 2D format exchange
2) Expectations for data exchange of file types between Archicad and Revit
3) Reasons to create subsets of BIM IFC exports to Revit
4) Leveraging the strengths of each type of exchange to optimize results

AGENDA

PART 1 - OPEN BIM Concept Overview

PART 2 - Model Preparation & Basics of Classification

BREAK 1

PART 3 - Basic IFC Translator Setup

BREAK 2

PART 4 - Model Checking & Hotlinking

PART 5 - Other File Exchange

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OPEN BIM CONCEPT OVERVIEW

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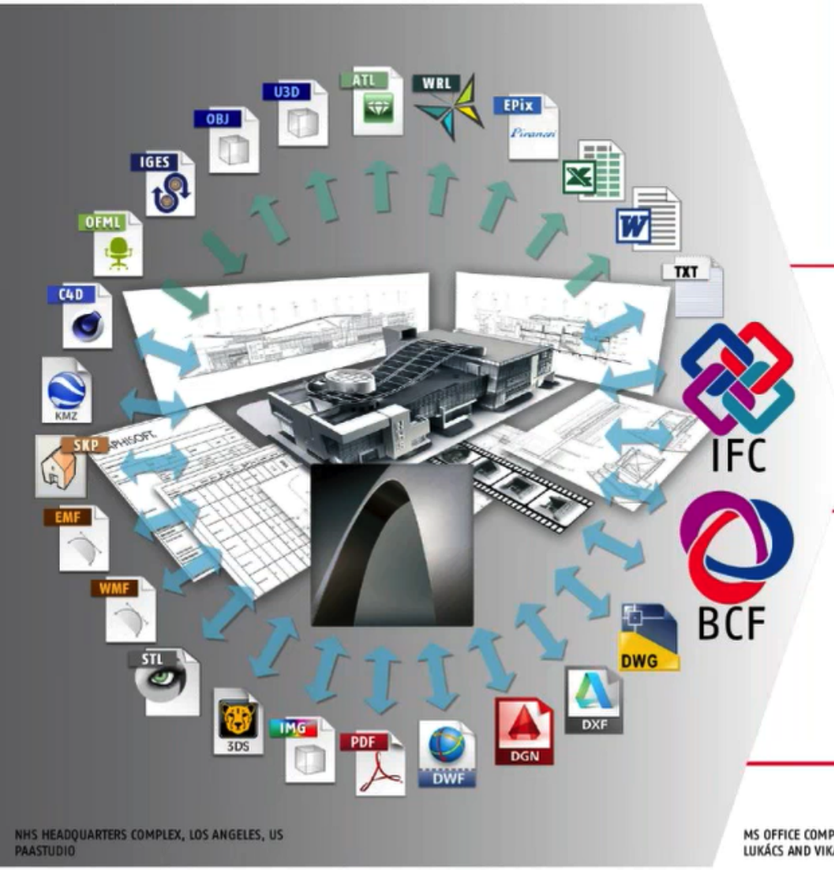
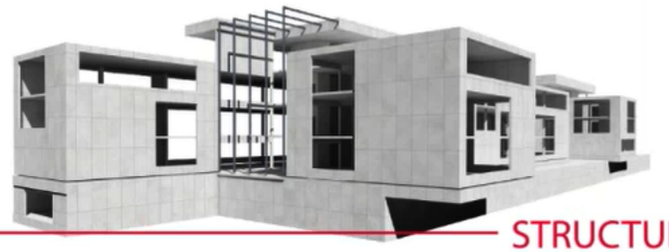
OPEN BIM™

OPEN BIM IS A UNIVERSAL APPROACH TO THE COLLABORATIVE DESIGN, REALIZATION, AND OPERATION OF BUILDINGS BASED ON OPEN STANDARDS AND WORKFLOWS.

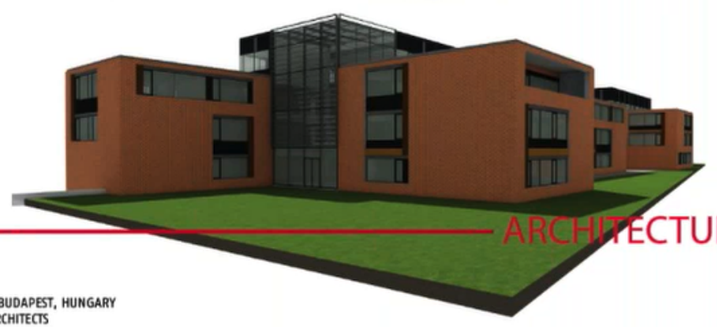


NHS HEADQUARTERS COMPLEX, LOS ANGELES, US
PAASTUDIO



STRUCTURAL

ANALYTICAL



ARCHITECTURAL

MS OFFICE COMPLEX, BUDAPEST, HUNGARY
LUKÁCS AND VIKÁR ARCHITECTS

BENTLEY AECOSIM
TEKLA STRUCTURES
REVIT STRUCTURE
DLUBAL RFEM
ALLPLAN PRECAST
ETABS

+ MORE THAN 160 APPLICATION SUPPORT IFC

ENERGY PLUS
SCIA ENGINEER
AUTOCAD MEP
DDS-CAD MEP
REVIT MEP
PLANCAL NOVA

"GIVEN THE NUMBER OF OTHERS INVOLVED AND THE VARIETY OF SOFTWARE AVAILABLE THE ONLY ANSWER IS TO HAVE A COMMON FORMAT FOR EXCHANGE OF DATA. FOR US AND OPEN BIM SOLUTION IS KEY AND WITH THAT THE IFC FORMAT." – ROB JACKSON, BIM MANAGER, BOND BRYAN ARCHITECTS, UK

SHARE GEOMETRY
DATA STORAGE
OPEN SOURCE
MODEL REFERENCING
COLLISION DETECTION
CHANGE MANAGEMENT

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BIM EXECUTION PLAN

Document designed to help internal and external teams work to the same project delivery standards

〉 Generally covers the following:

+ Ownership & Teams
+ Goals/Objectives
+ Roles
+ Responsibilities
+ BIM Deliverables
+ Level of Development (LOD)
+ Exchange Expectations
+ QA/QC

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IFC FILE EXCHANGE

IFC

(Industry Foundation Classes)

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OTHER FILE FORMATS

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MODEL PREPARATION & BASICS OF CLASSIFICATION

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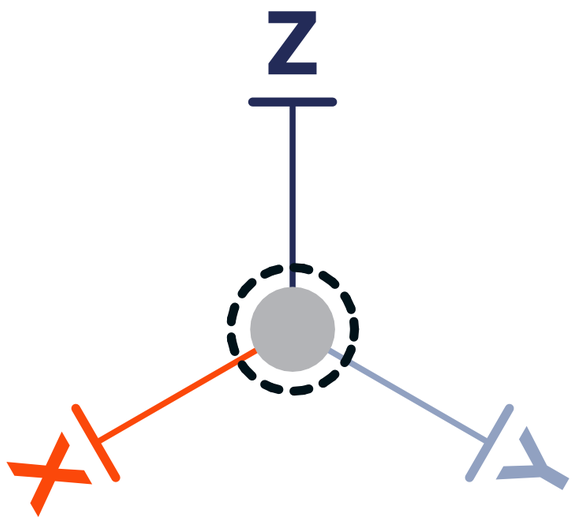
PROJECT LOCATION & ORIENTATION

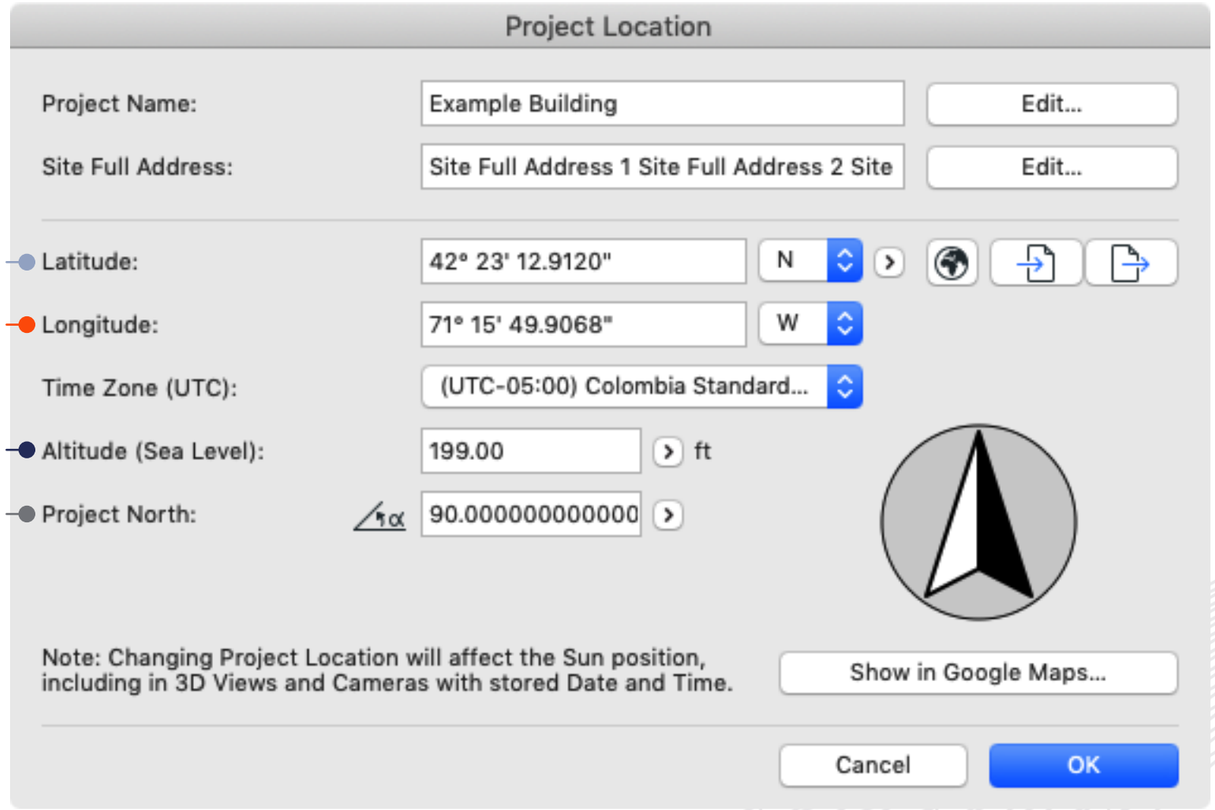


Y-Coordinate

X-Coordinate

Z-Coordinate

Orientation



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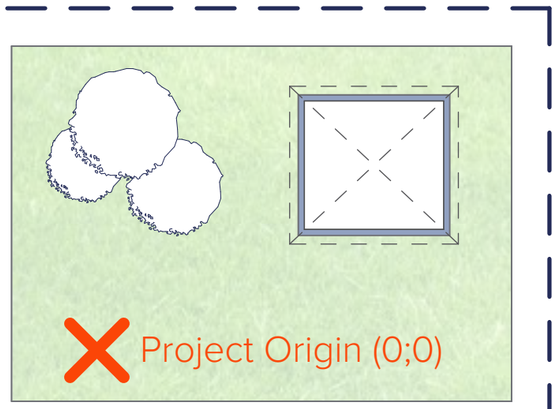
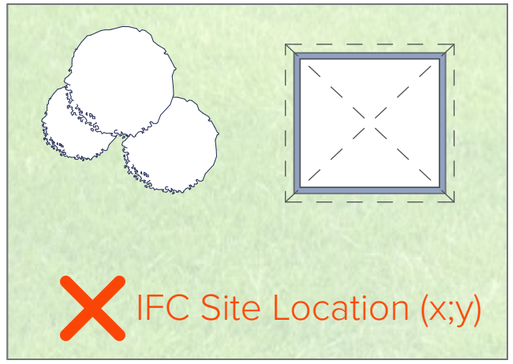
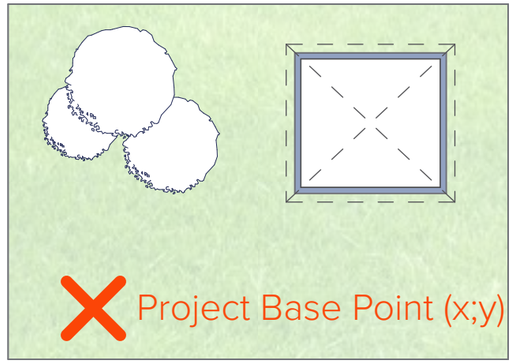
PROJECT LOCATION TRANSLATION



Survey Point Object (x;y)



IFC Global Origin (0;0)



Survey Point (0;0)

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STORY COUNT & MAPPING

ARCHITECTURAL MODEL	STRUCTURAL MODEL	LANDSCAPE MODEL	MEP MODEL
	~~4. Roof~~		
3. Roof	3. Second Floor_T.O.F.	3. Roof	
2. Second Floor	2. Second Floor_B.O.F.	2. Second Floor	2. First Floor
1. First Floor	1. First Floor	1. First Floor	1. Ground Floor
-1. Basement	-1. Basement	-1. Basement	-1. Foundation

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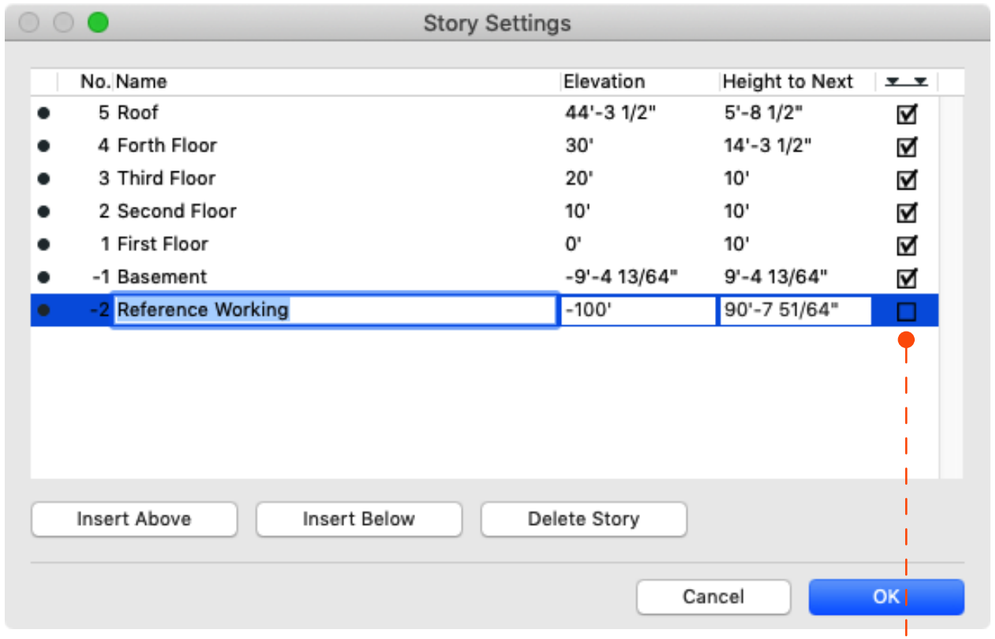
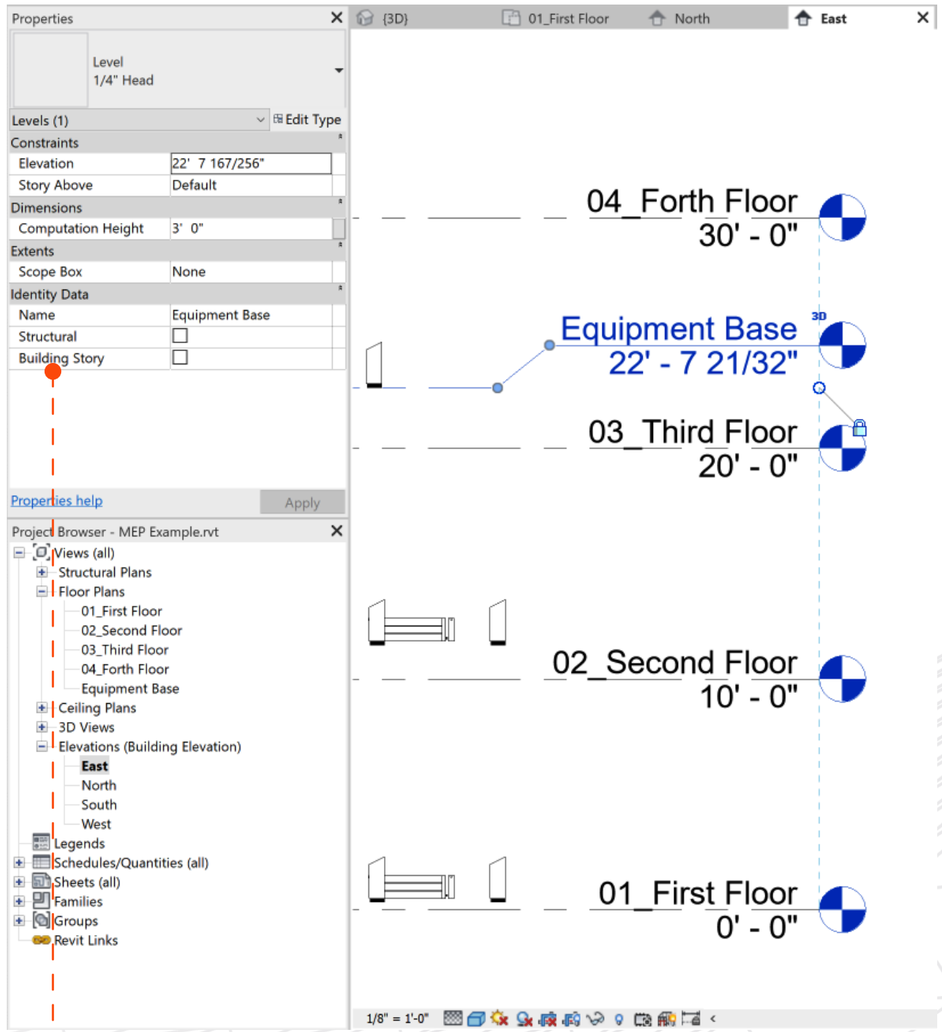
ALIGN STORY/LEVEL HEIGHTS



Controls section/elevation visibility & reference/building story

ARCHICAD

REVIT



Sets reference or building story

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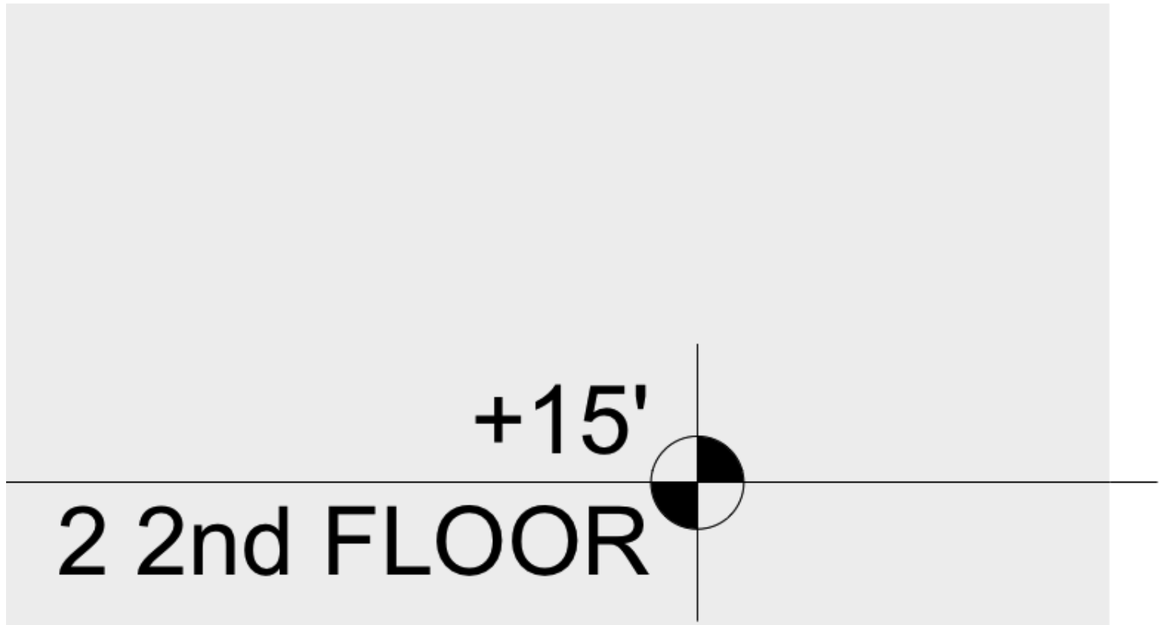
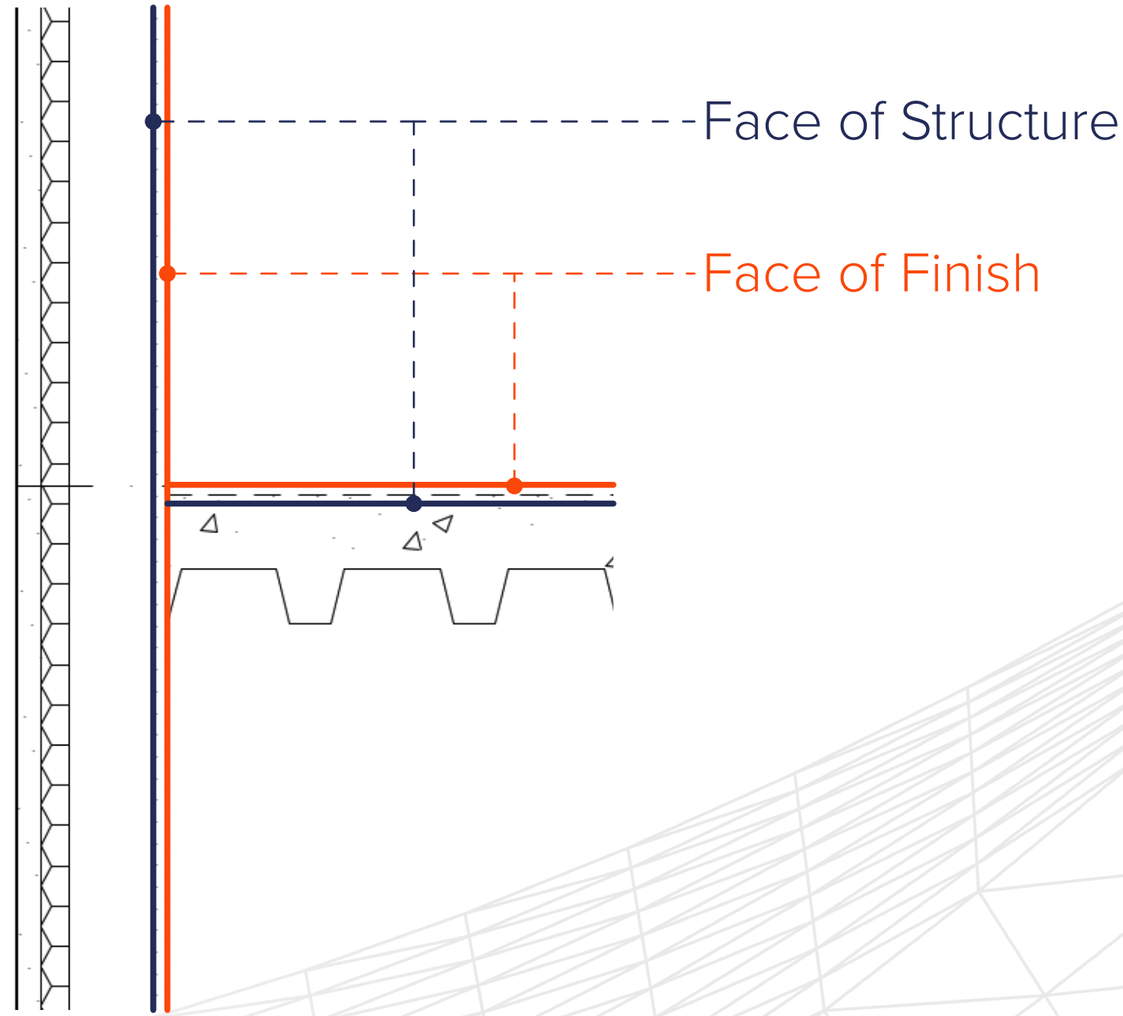
REFERENCE LINE LOCATION





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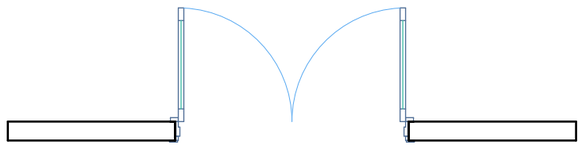
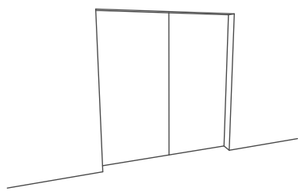
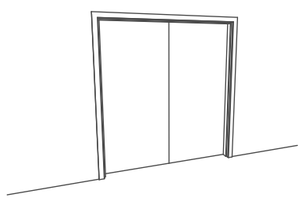
LEVEL OF DEVELOPMENT (LOD)







LOD 100 - Conceptual

Model Element may be graphically represented with a symbol or other generic representation

LOD 200 - Approximate Geometry

Model Element may be graphically represented within model as a generic system, object, or assembly with approximate quantities, size, shape, location, and orientation

LOD 300 - Precise Geometry

Model Element may be graphically represented within model as a specific system, object, or assembly in terms of quantities, size, shape, location, and orientation

LOD 350 - Precise Geometry with Connections

Same as LOD 300, but also includes how they interface with other building systems

LOD 400 - Fabrication-Ready Geometry

Extension of LOD 300 with the addition of detailing, fabrication, assembly, and installation information

LOD 500 - Operational/As-Built Model

Model Element is a field verified representation in terms of size, shape, location, quantity, and orientation

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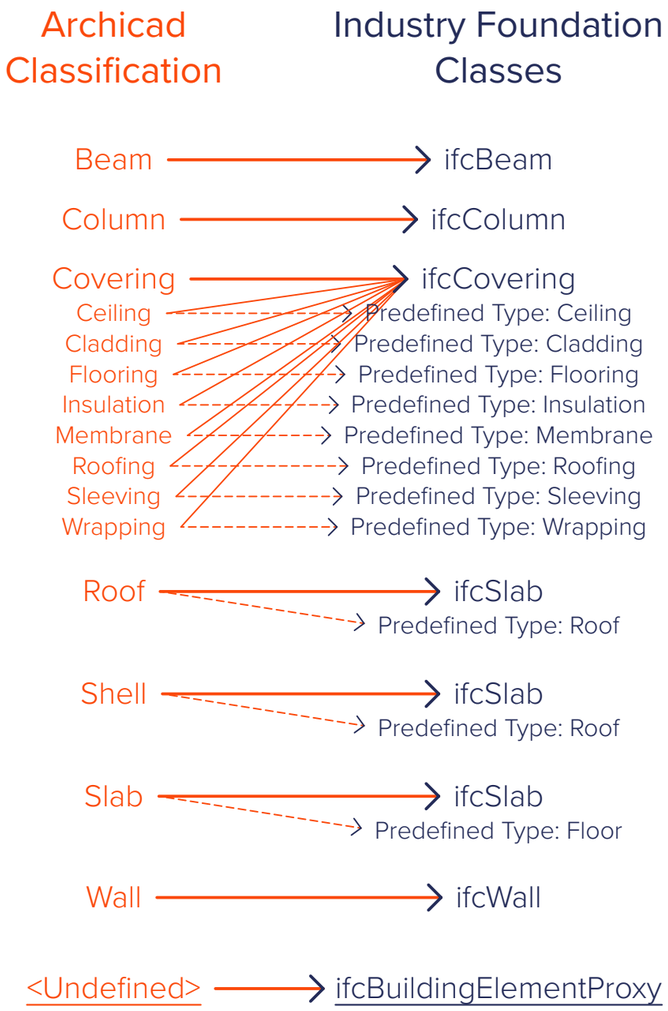
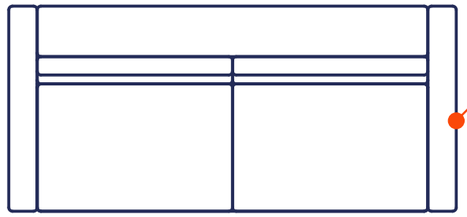
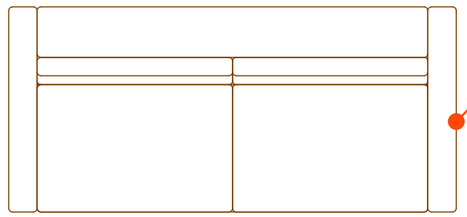
BASICS OF CLASSIFICATION

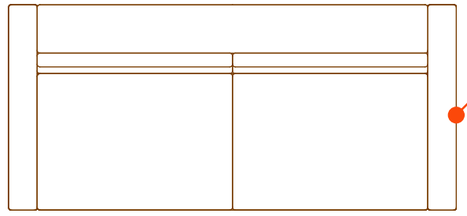




Tool Used: Object
Archicad Classification: <Undefined>



Tool Used: Object
Archicad Classification: Furniture



Tool Used: Morph
Archicad Classification: Furniture

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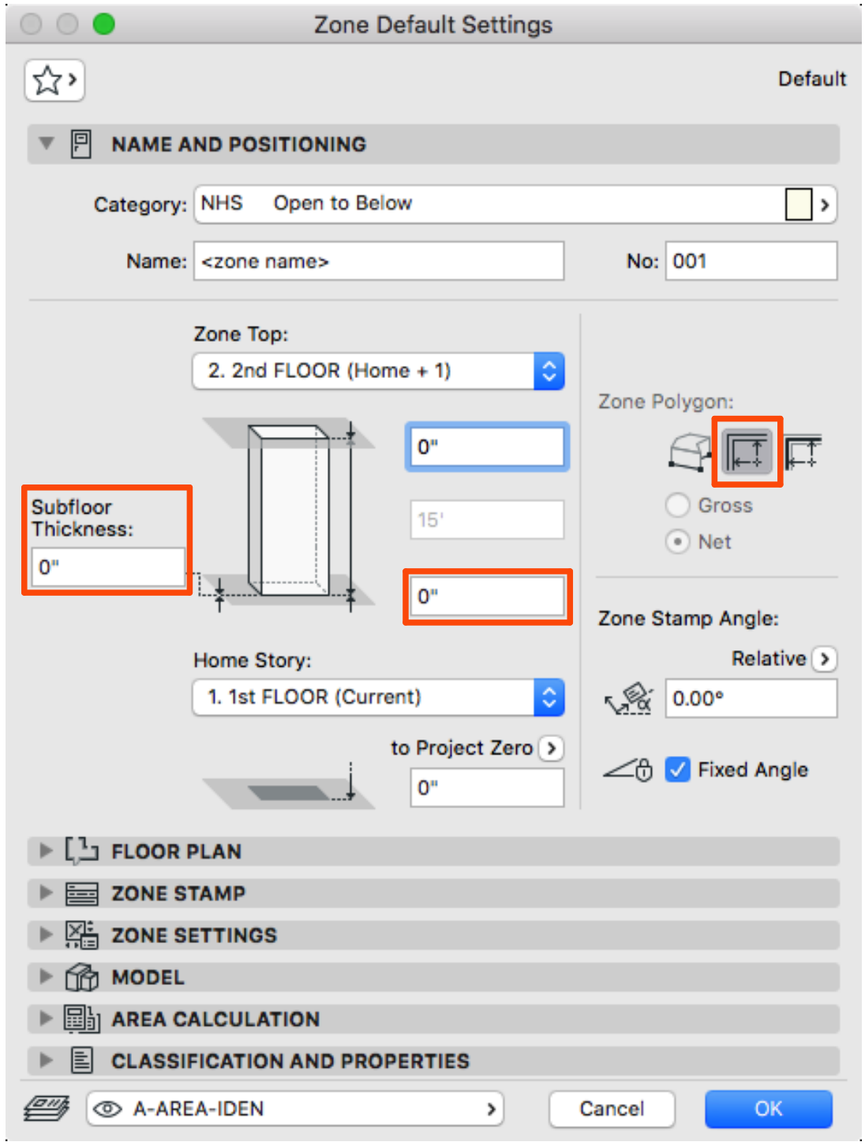
OTHER IFC CONSIDERATIONS



- IFC Schema
  - These are global standards that all BIM platforms must abide by
  - Current IFC Schema Options:
    - IFC4.1: Newest standard
    - IFC2x3: Current standard being used
  - Important for consistent IFC interpretations for all BIM platforms
- Zones to Rooms
  - Match settings here for all Zones
- Renovation & Structural Status
  - Renovation & Structural Status of element will translate through IFC
- Created Dedicated IFC Views in Project
  - Each BIM platform has a different processing power
  - Should create smaller packages filtered with only applicable elements

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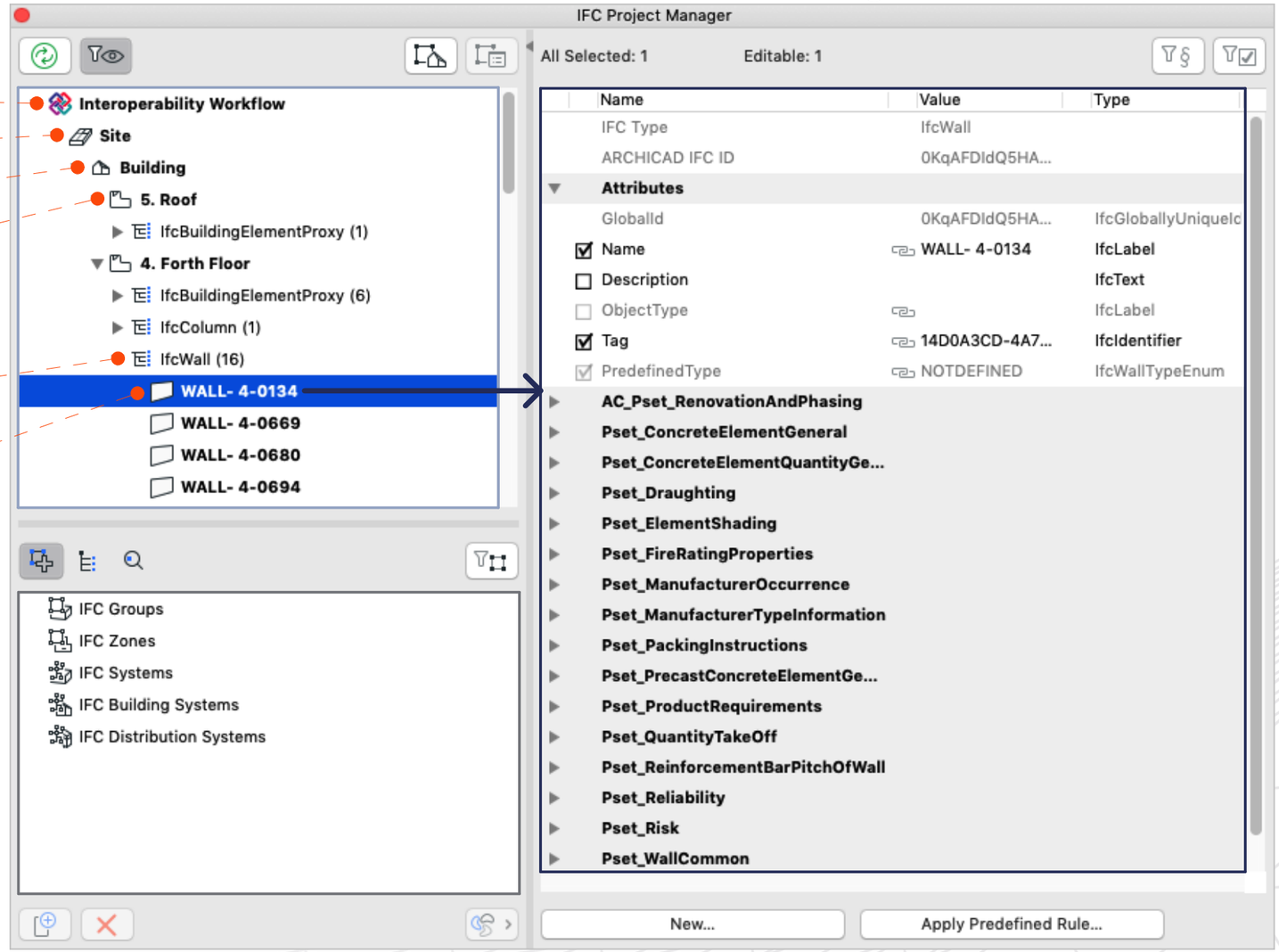
IFC PROJECT MANAGER

IFC Structure Hierarchy

- Project
  - Site
    - Building
      - Story #
        - Element Type
          - Building Element #
          - Building Element #
          - Building Element #
        - Element Type
          - Building Element #
      - Story #

IFC Structure

Building Element Properties



Assignments

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BASIC IFC TRANSLATOR SETUP

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IFC TRANSLATOR LOCATION

File => Interoperability => IFC => IFC Translators...

- General Notes
  - + Not Accessible From The Following Views:
    - Sections/Elevations/Interior Elevations
    - Layout Book
    - Schedules
    - Worksheets
    - 3D Documents

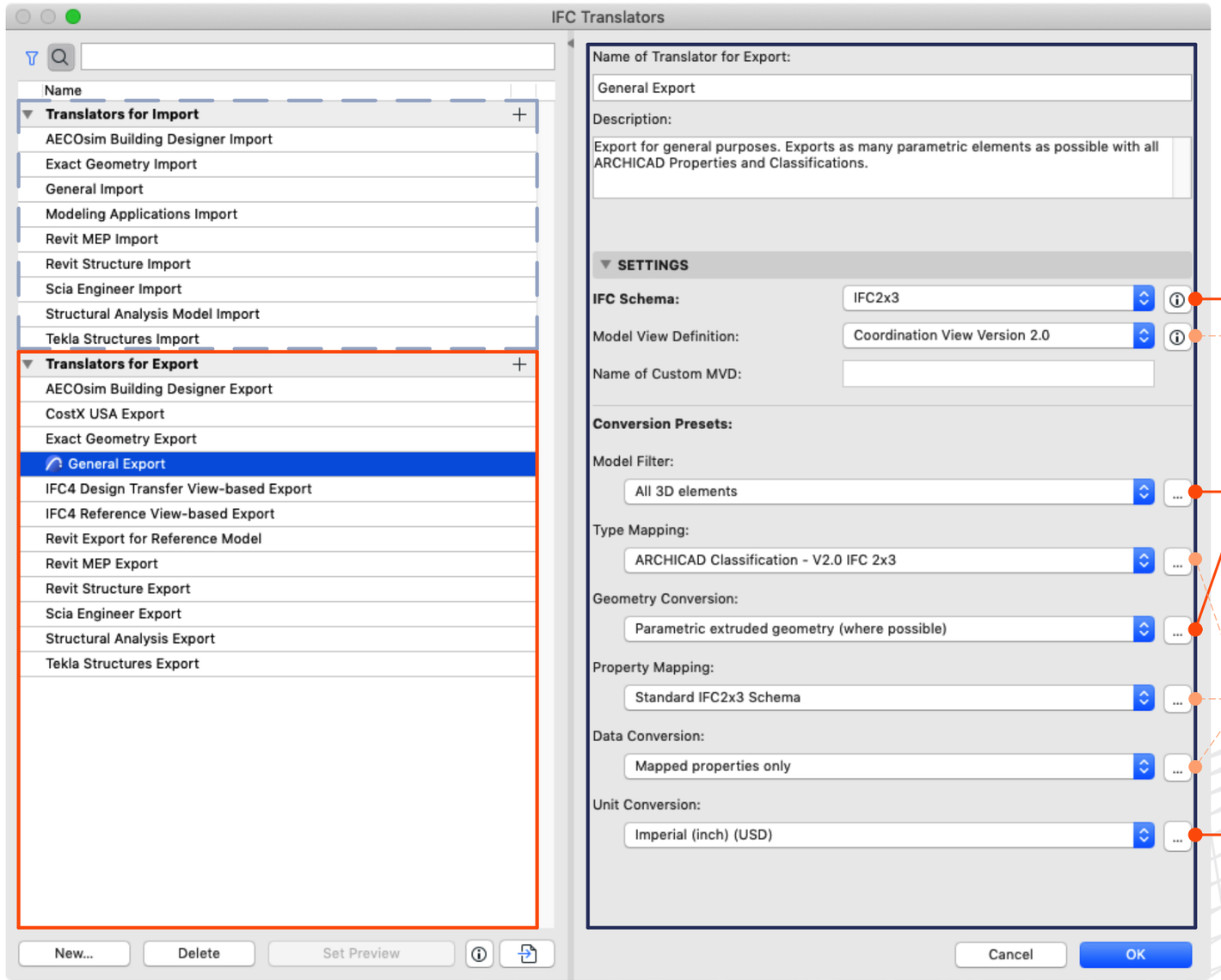
Template Location MAC: Applications => GRAPHISOFT => Archicad ## => Defaults => Archicad

Template Location PC: OS (C:) => Program Files => GRAPHISOFT => Archicad ## => Defaults => Archicad

TRANSLATOR BREAKDOWN

Import Translator

Export Translator



Settings

IFC Version
Model View Definition

Geometry Related Options

Property & Attribute Related Options

Important to Always Set

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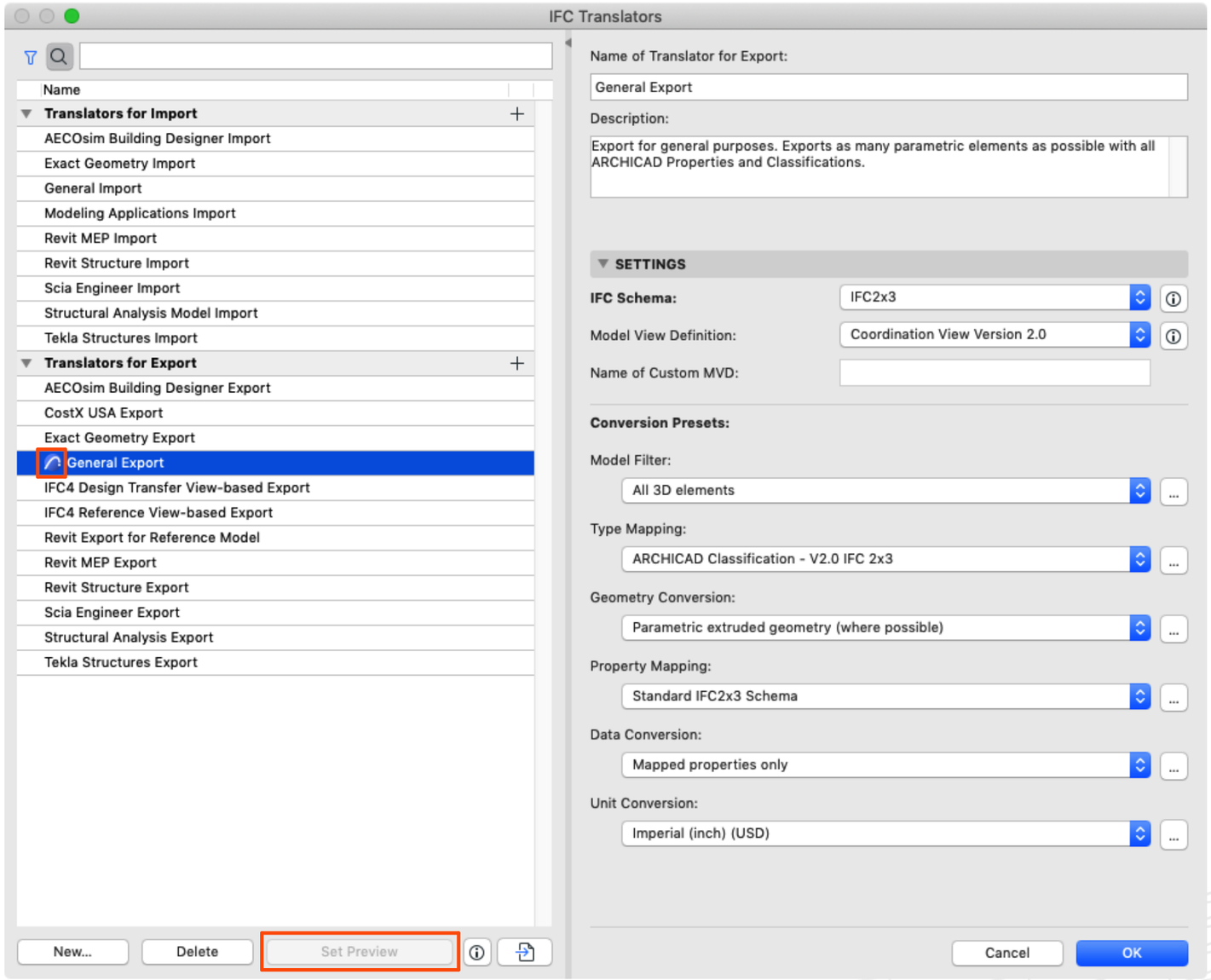
SET PREVIEW



〉What does it do?

+ Sets the 'Default' Translator for export
+ Controls how one sees IFC information

〉When can it be set?

+ Only from the Export Translator

〉How does it work?

+ It changes the information one sees based on the classification of elements

〉Why is this important?

+ It give the user accurate expectations of what elements will become in IFC

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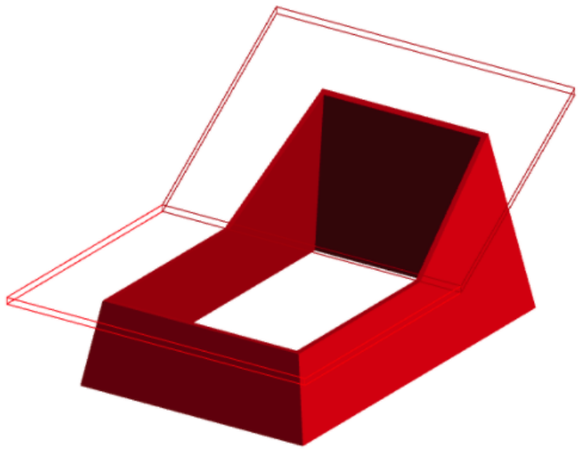
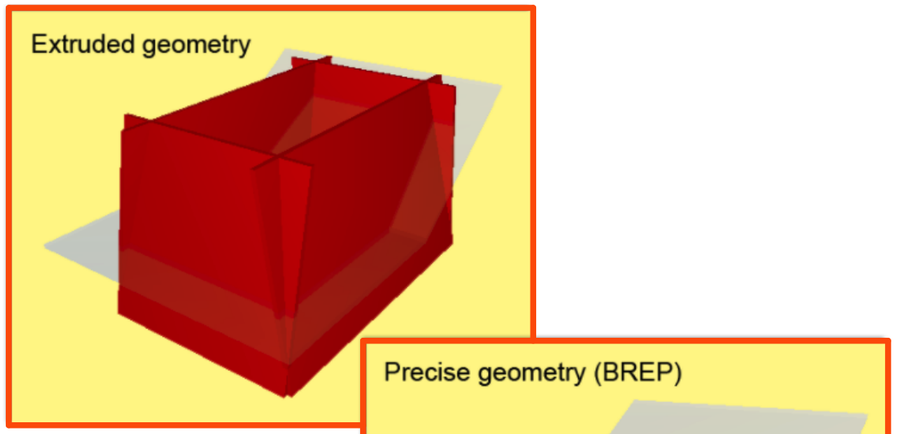
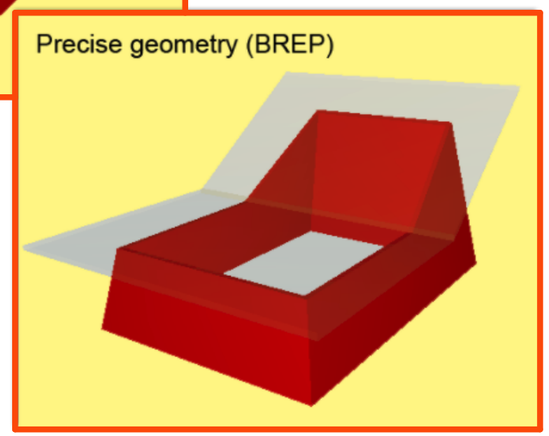
GEOMETRY EXPORT METHODS



Simple Geometry





Complex Geometry

- Extruded/Revolved
  - + Preserves Parameters
    - Profile
    - Reference Line
    - Etc...
  - + Composite
    - Material Layerset
      - + Direction
      - + Thickness
  - + Import Result
    - Editable
    - Parametric Element

- Boundary Representation (BREP)
  - + Exact Geometry
    - Polygon Parameters Lost
  - + Composite
    - Material List
      - + Skin Names
  - + Import Result
    - Non-Editable
    - Simple Solid Object
      - + Object
      - + Morph

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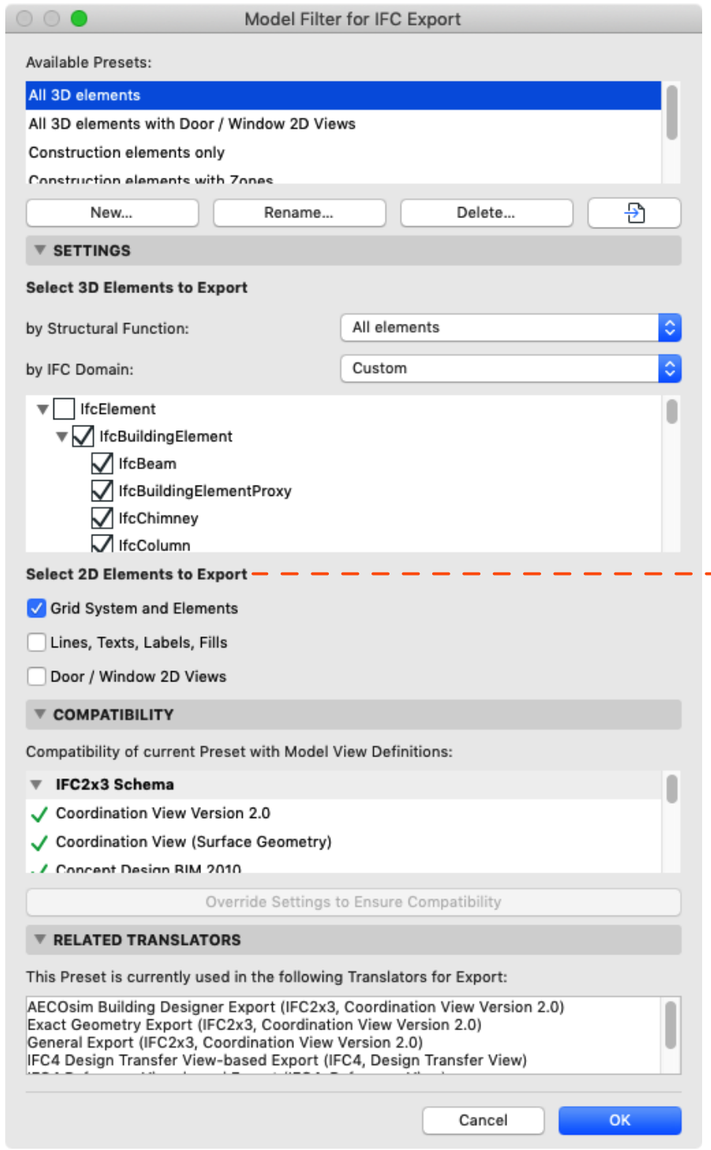
EXPORT SETTINGS: MODEL FILTER



〉What does this setting do?

+ Controls IFC categories that are exportable
+ Send some 2D information

〉How does it work?

+ Class is Visible in View + Class Checked = Exports
+ Class is Visible in View + Class Unchecked = Doesn't Export
+ Class not Visible in View + Class Checked = Doesn't Export
+ Class not Visible in View + Class Unchecked = Doesn't Export

〉2D Elements to Export

+ Main purpose of IFC is to exchange 3D geometry with pertinent information
+ Checking the 'Lines, Texts, Labels, Fills' or 'Door/Window 2D Views' box does not guarantee that the selected 2D elements will be exported properly
  - 〉Recommend sending a supplemental DWG/PDF with 2D information

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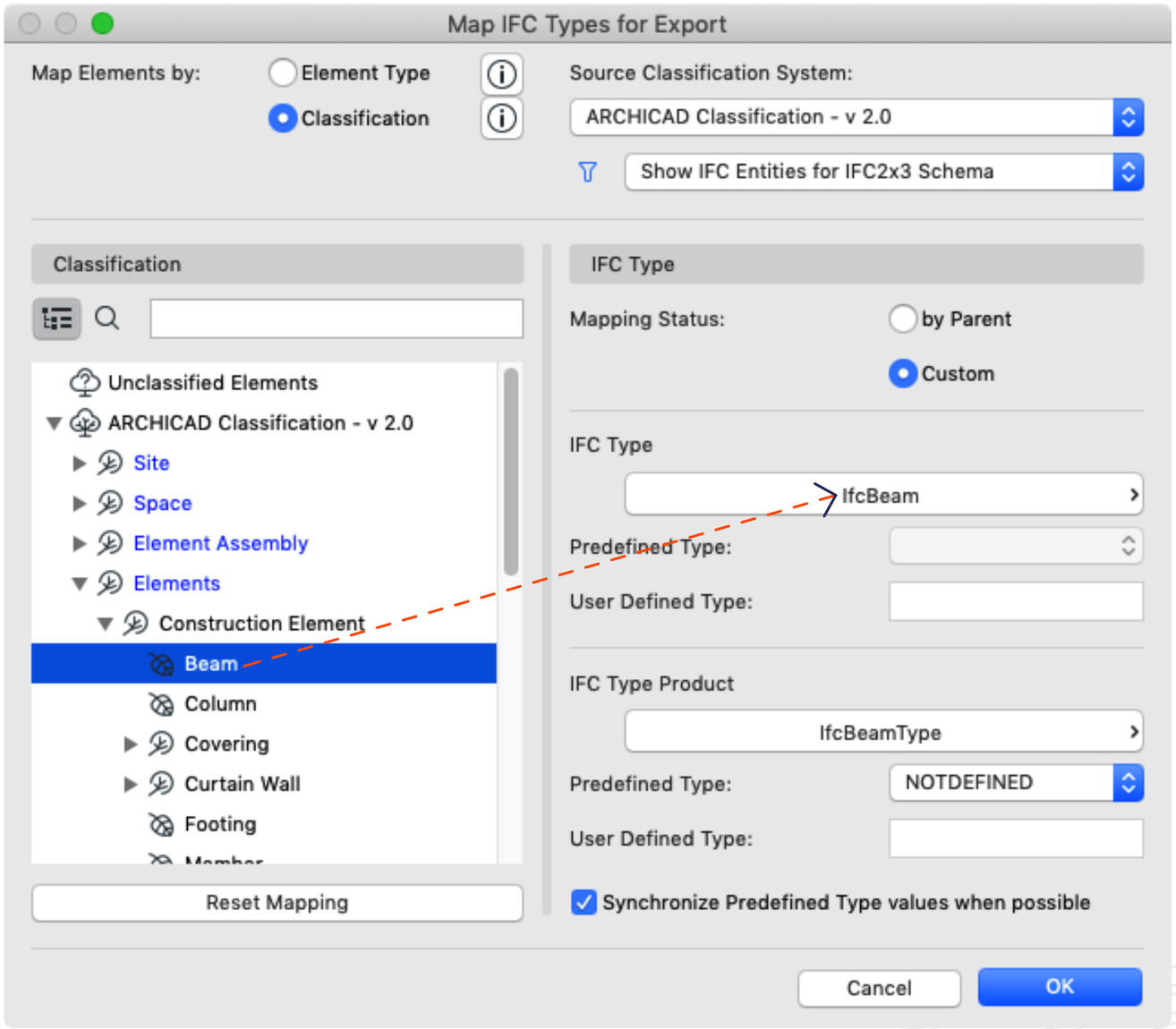
EXPORT SETTINGS: TYPE MAPPING



〉What does this setting do?

+ Maps Classification Systems to IFC
+ Gives user an understanding of what the classified element will become in IFC

〉How does it work?

+ Source Classification System is chosen by user
+ Classifications in system show up in list
+ User maps Classification to IFC category

〉How to Type Map easily?

+ Import Archicad Classification System + IFC Types for Export settings from Archicad Template

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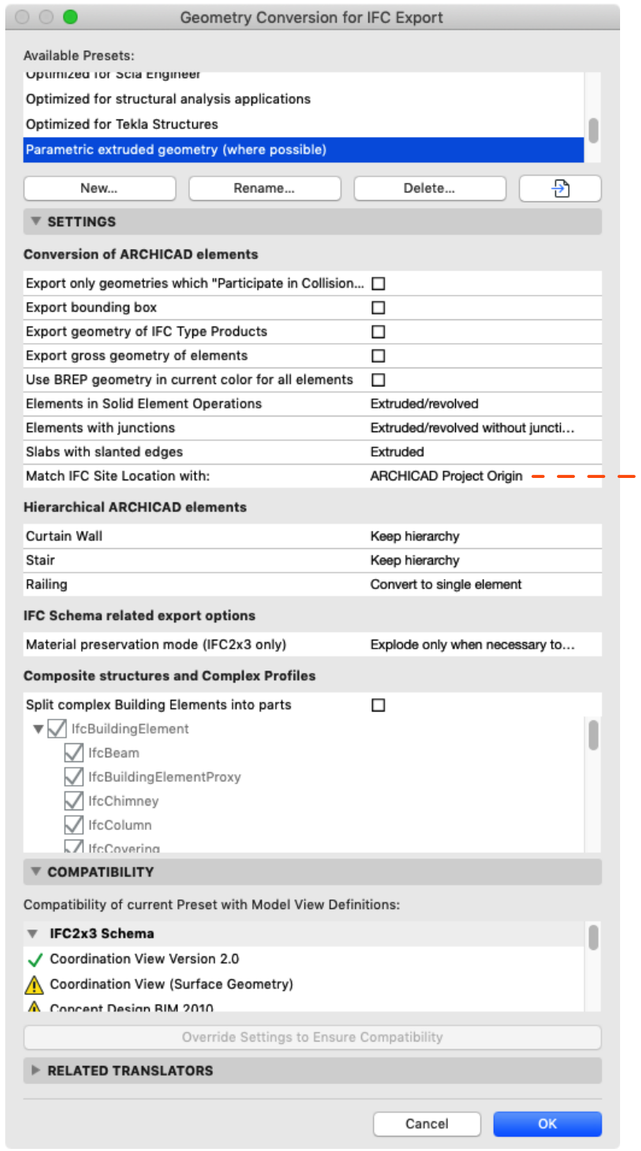
EXPORT SETTINGS: GEOMETRY CONVERSION



What does this setting do?

- Gives user the ability to customize the method elements in the project will export as
  - Elements impacted by Solid Element Operations (SEOs)
  - Elements with junctions
  - Slab edges
  - Composite elements
  - Hierarchical elements
- Set the IFC Site Location to be the Project Origin or Survey Point Object

Breakdown of some settings

- Export only geometries which "Participate in Collision Detection": Looks at Building Materials
- Use BREP geometry in current color for all elements: Defaults all elements to BREP and allows the color displayed in the current Archicad view export as defined by the following:
  - Graphic Overrides
  - Renovation Status
  - Mark-Up Corrections
  - Highlights
- https://helpcenter.graphisoft.com/user-guide/128918/

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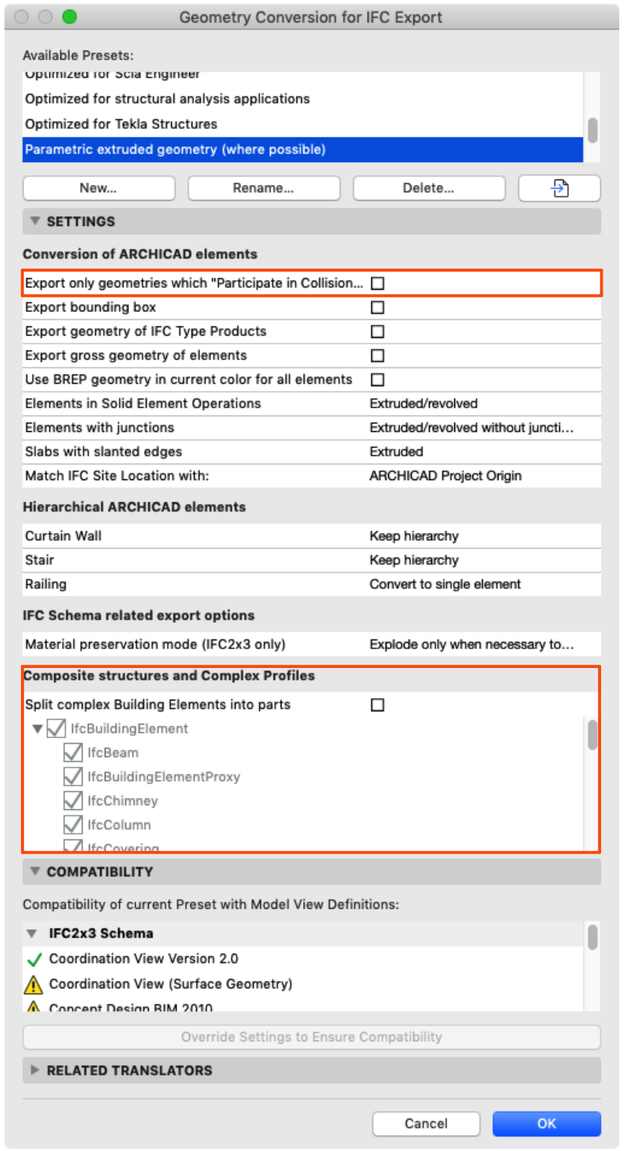
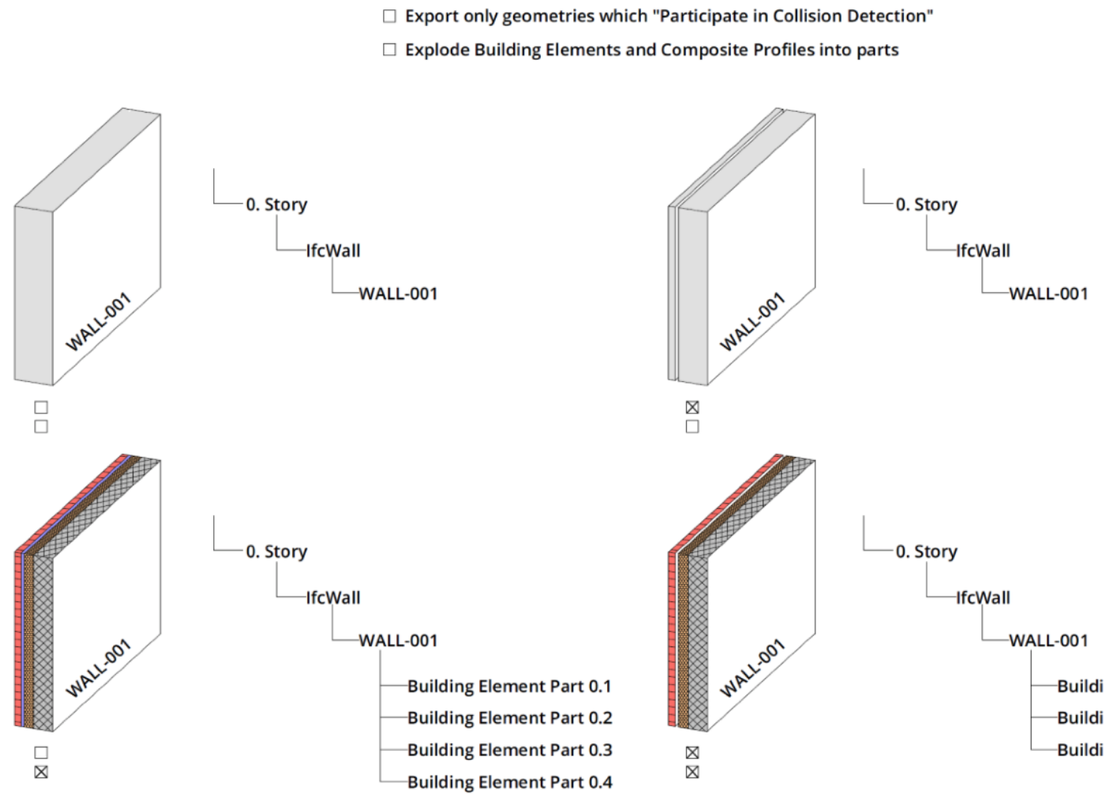
DECOMPOSITION OF COMPLEX BUILDING ELEMENTS





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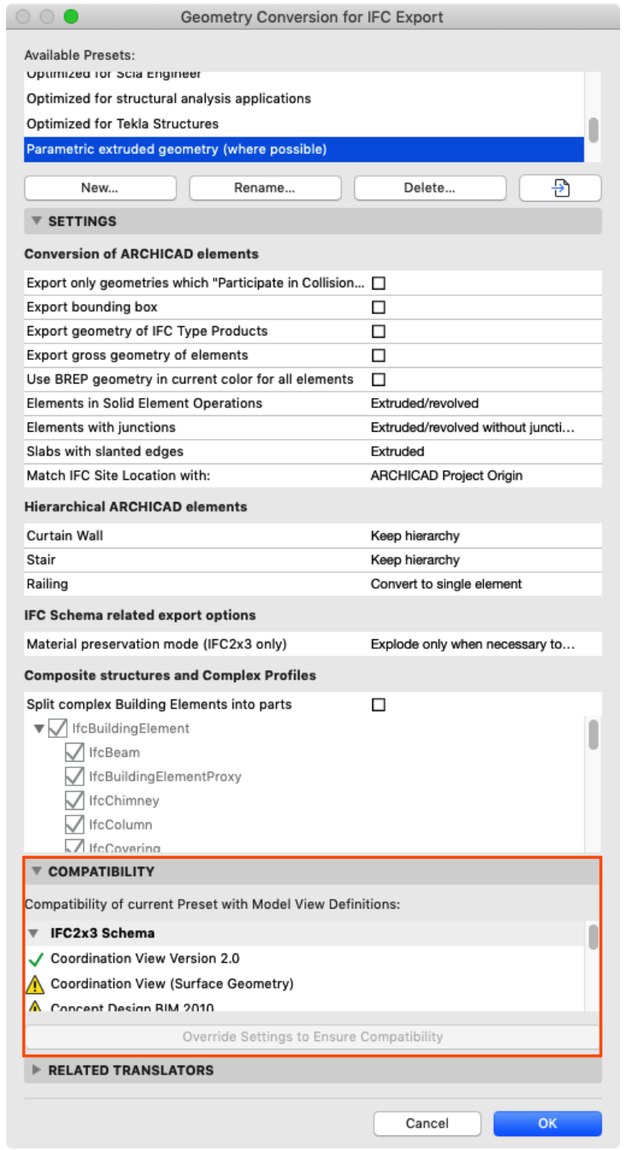
MVD COMPATIBILITY CHECK & KEY POINTS



What does this setting do?

+ Gives the user the ability to understand if the settings they are changing will still meet Model View Definition standards
+ Compatibility isn't important if Model View Definition standards aren't required to be met

Key Points

+ Create dedicated IFC views in View Map from 3D or Floor Plan that has visibility of elements controlled by:
  - Layer Combinations
  - Filter & Cut Elements in 3D
  - Find & Select Tool
+ To further control of IFC category exports, check Model Filter settings in the export translator
+ Confirm that Classifications are mapped properly to IFC
+ Use 'Set Preview' to understand how elements will export to IFC and set as default
+ Check the IFC file manually

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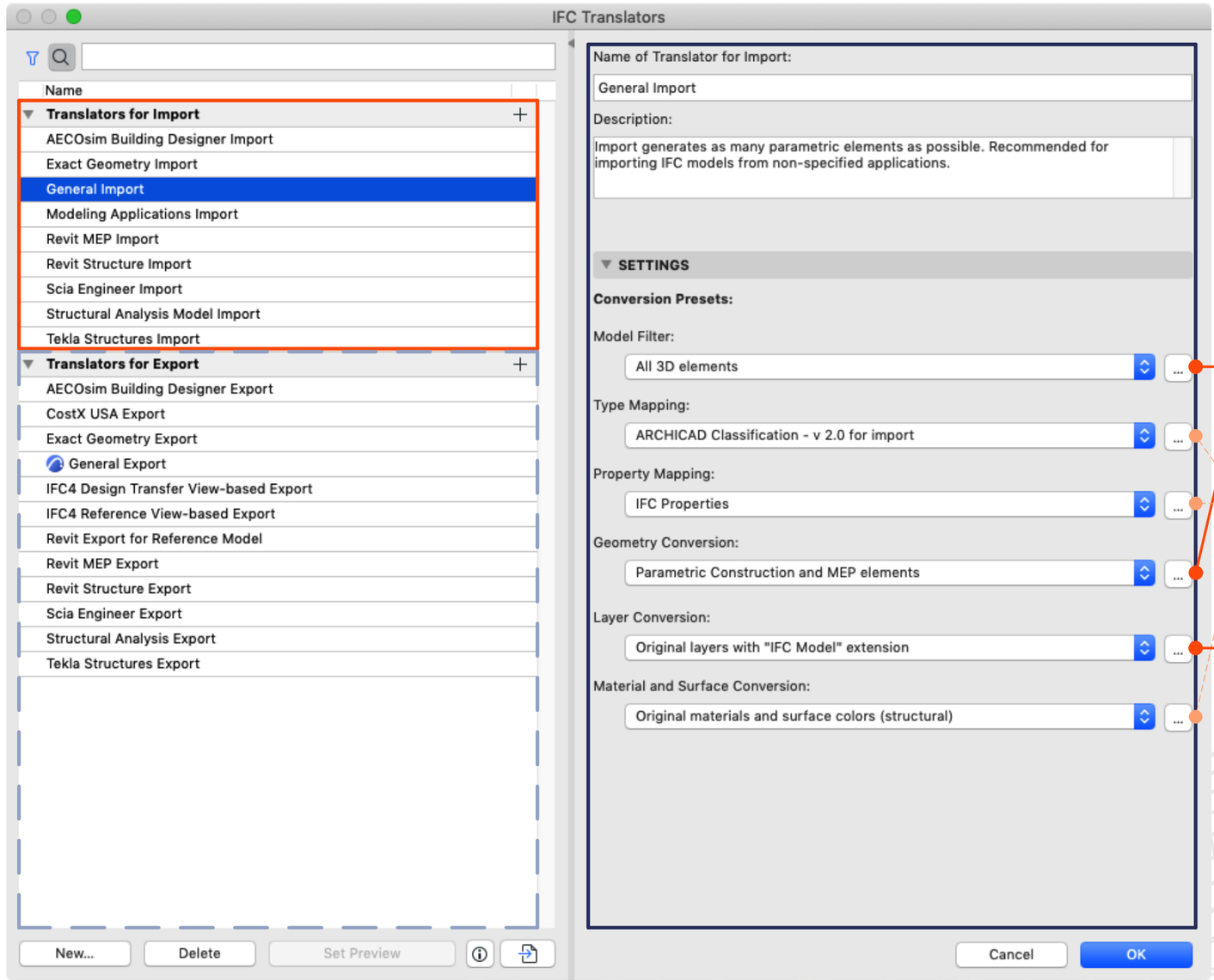
IMPORT TRANSLATOR BREAKDOWN

Import Translator

Export Translator



Settings

Geometry Related Options

Property & Attribute Related Options

Important to Always Set

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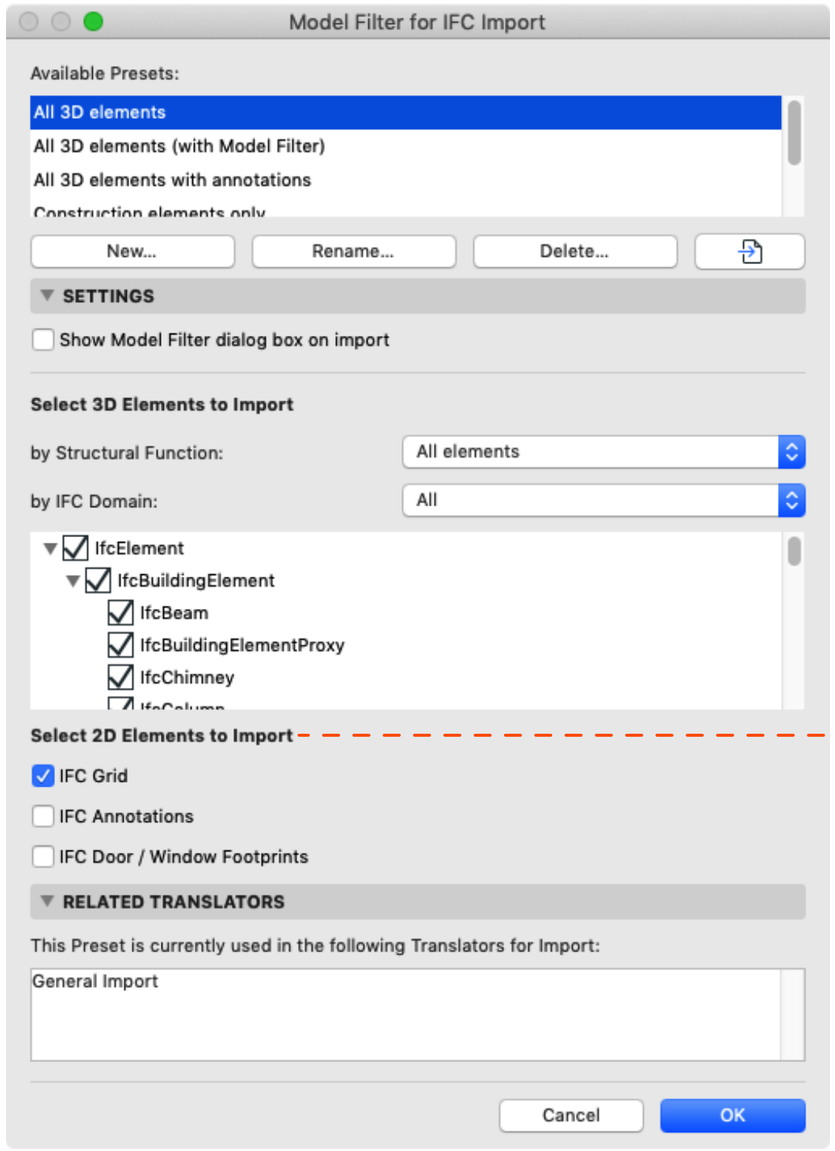
IMPORT SETTINGS: MODEL FILTER



〉What does this setting do?

+ Controls IFC categories that are imported into the project
+ Possibly import some 2D information

〉How does it work?

+ Class is in IFC file + Class Checked = Imports
+ Class is in IFC file + Class Unchecked = Doesn't Import
+ Class is not in IFC file = Doesn't Import

〉2D Elements to Import

+ Main purpose of IFC is to exchange 3D geometry with pertinent information
+ Checking the 'IFC Annotations' or 'IFC Door/Window Footprints' box does not guarantee that the selected 2D elements will be imported properly
  〉Recommend sending a supplemental DWG/PDF with 2D information to reference
+ If IFC file was sent without any 2D elements, they will not appear

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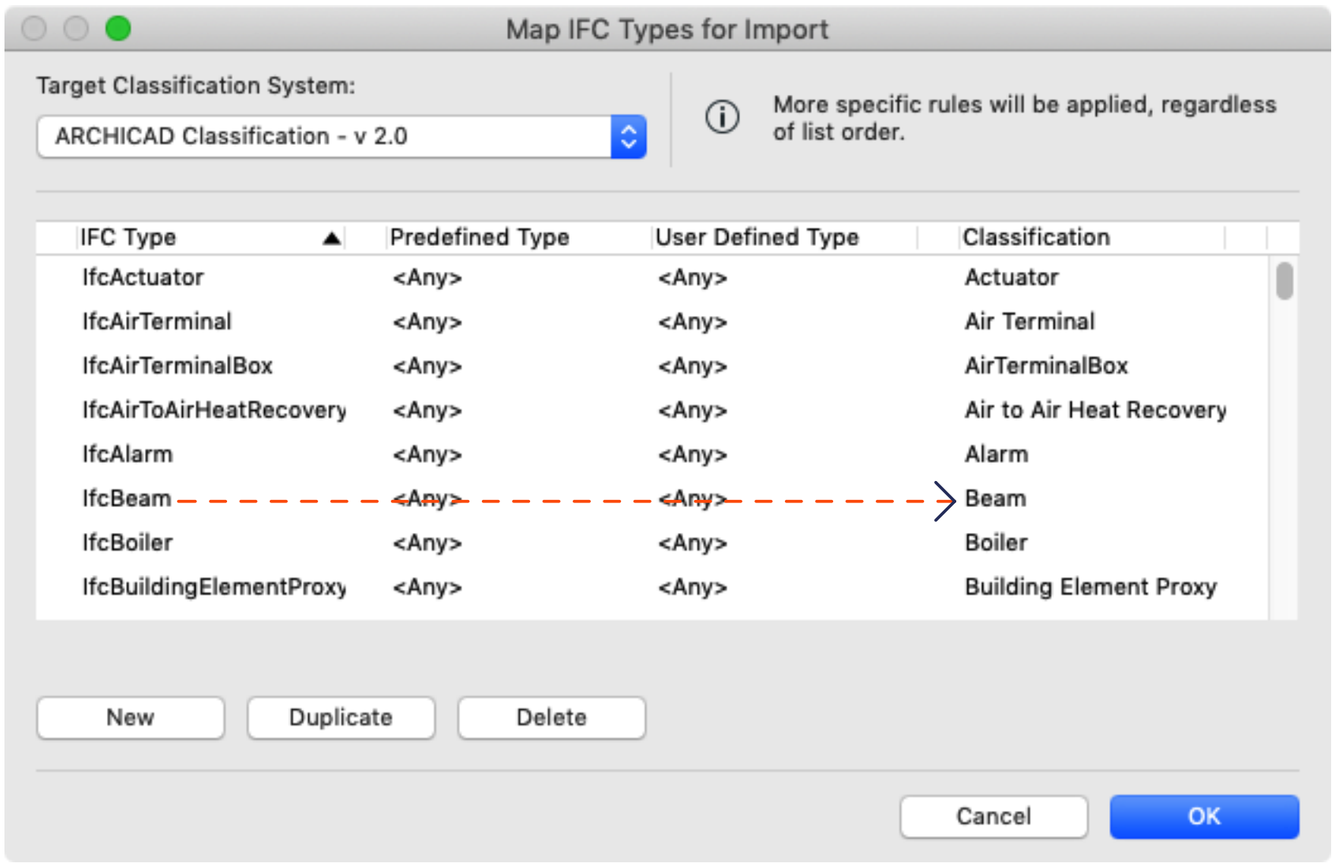
IMPORT SETTINGS: TYPE MAPPING



〉What does this setting do?

+ Maps IFC to Classification Systems
+ Gives user an understanding of what the IFC element will become in Archicad

〉How does it work?

+ Target Classification System is chosen by user
+ Classifications in system show up in list
+ User maps IFC category to Classification

〉How to Type Map easily?

+ Import Archicad Classification System + IFC Types for Import settings from Archicad Template

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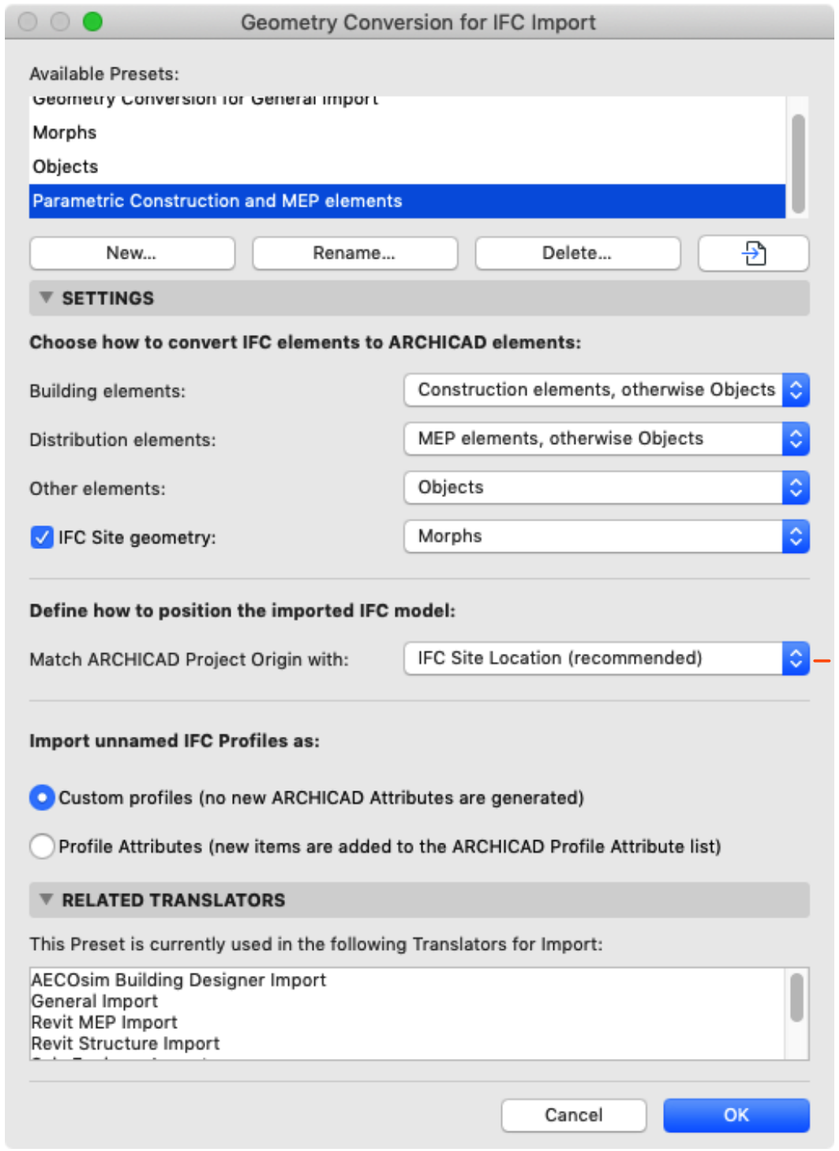
IMPORT SETTINGS: GEOMETRY CONVERSION



What does this setting do?

- Gives user the ability to customize how the following elements will import:
  - Building Elements
  - Distribution Elements
  - Other Elements
  - IFC Site
- Set the Project Origin to match with IFC Site Location or IFC Global Origin upon import

IFC Export Translator	IFC Import Translator
BREP	Morph/Object
Extruded/Revolved	Building Element

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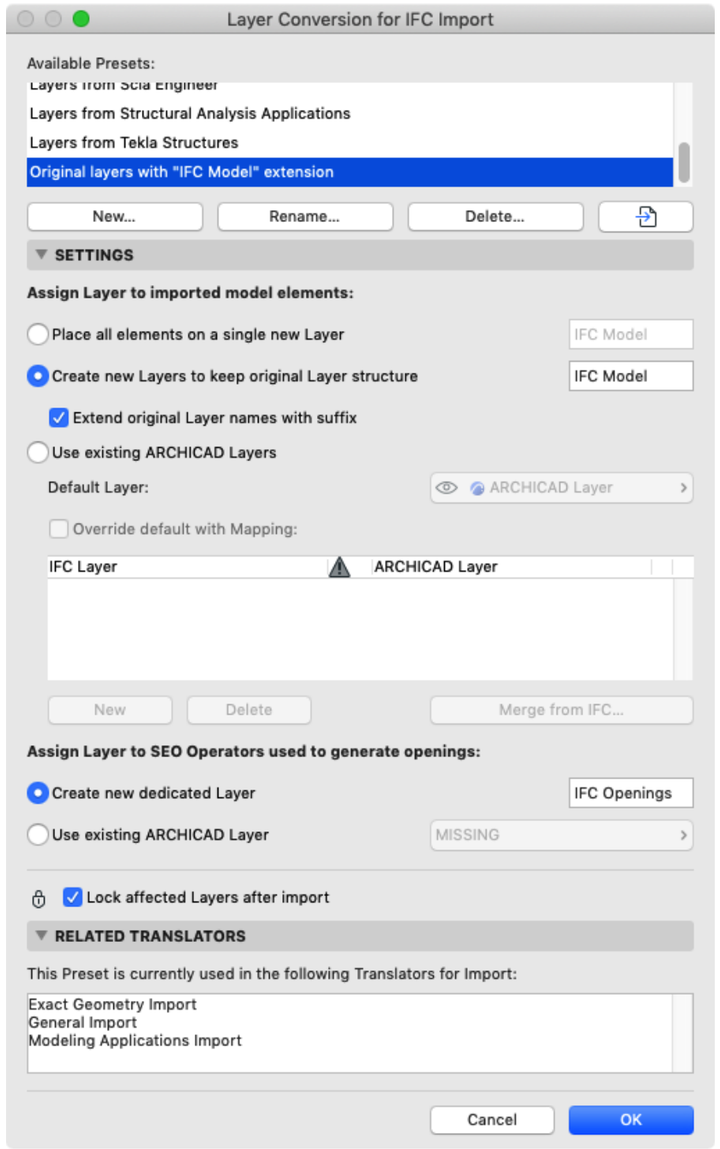
IMPORT SETTINGS: LAYER CONVERSION



What does this setting do?

- Gives user the ability to customize the layers an IFC import will be associated with
  - Put entire import on a single new layer
  - Separate out IFC categories into new Archicad layers
    - Recommended for referencing into your own project
  - Separate/map out IFC categories into existing Archicad layers
    - Recommended if you are taking over the project

How does it work?

- If creating new layers, extending the layer names with a suffix will help users identify what is from the IFC file
  - Recommend creating new presets for each IFC hotlink brought into the project
- If mapping to existing layers, press the 'Merge from IFC...' button and search for the IFC file in question to map to the layers in the open project
  - This will be specific to the selected IFC file and if ran with other IFC files, will need to be remapped

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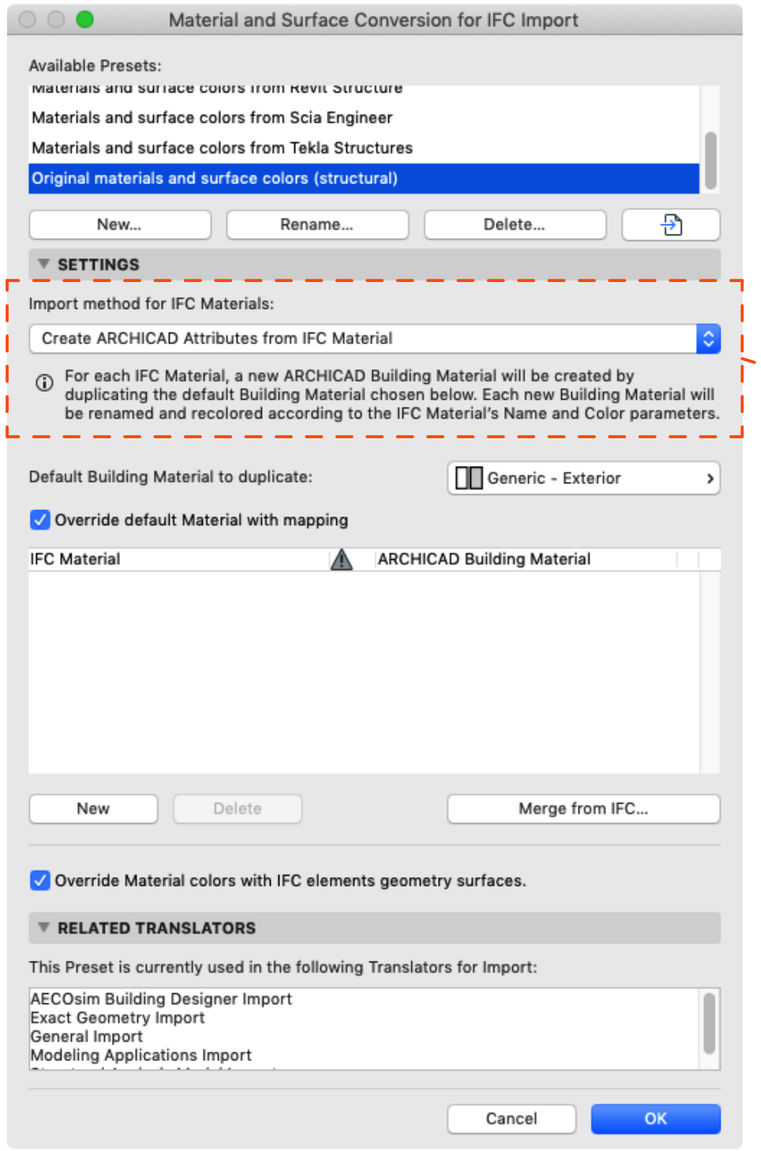
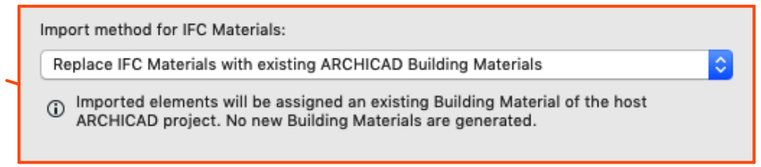
IMPORT SETTINGS: MATERIAL & SURFACE CONVERSION



What does this setting do?

+ Gives user the ability to customize the building material & surface an IFC import will be associated with
  - Create new attributes
  - Replace with existing attributes



Important Options to Understand

+ Override Default Material with Mapping
  - If box is checked, then IFC Building Materials can be mapped to Building Materials in the project
  - If box is unchecked, then either new IFC Building Materials are created with Default Building Material or replaced with Default Building Material
+ Override Material Colors with IFC Elements Geometry Surfaces
  - If box is checked, then IFC Surface will override any Building Material assigned
  - If box is unchecked, then the Building Material will appear as assigned

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MODEL CHECKING & HOTLINKING

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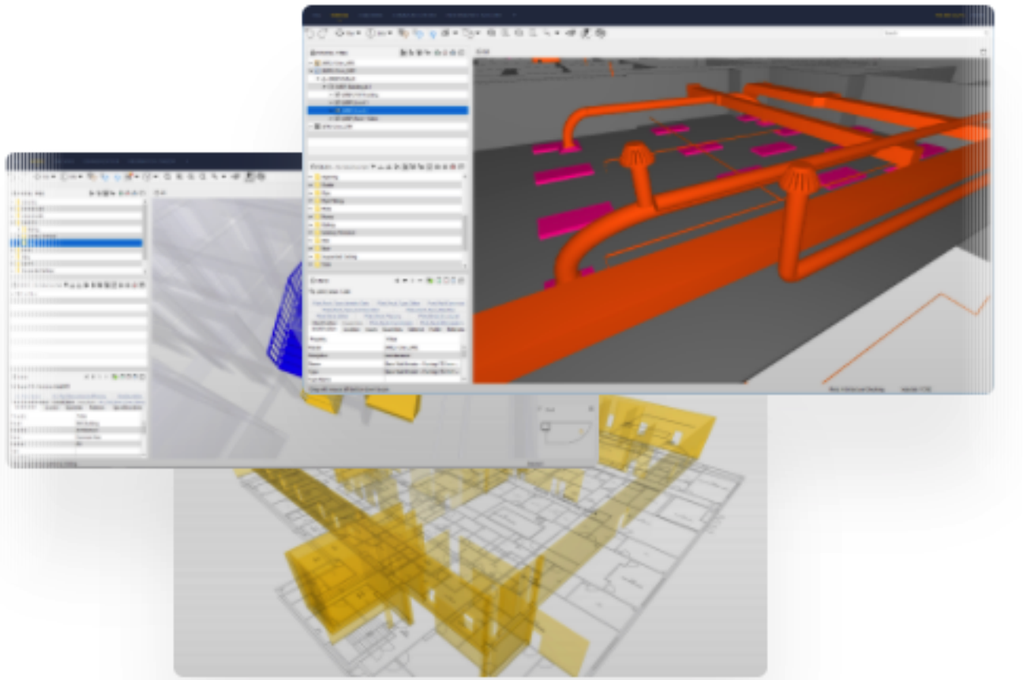
IFC VIEWER: SOLIBRI



Solibri Anywhere

+ Is free for everyone
+ Allows one to check the IFC file

Solibri Office

+ Is a paid solution
  - Advanced Model Checking
  - Information Takeoffs
  - Visualization of Data
  - User Rulesets
  - Etc...

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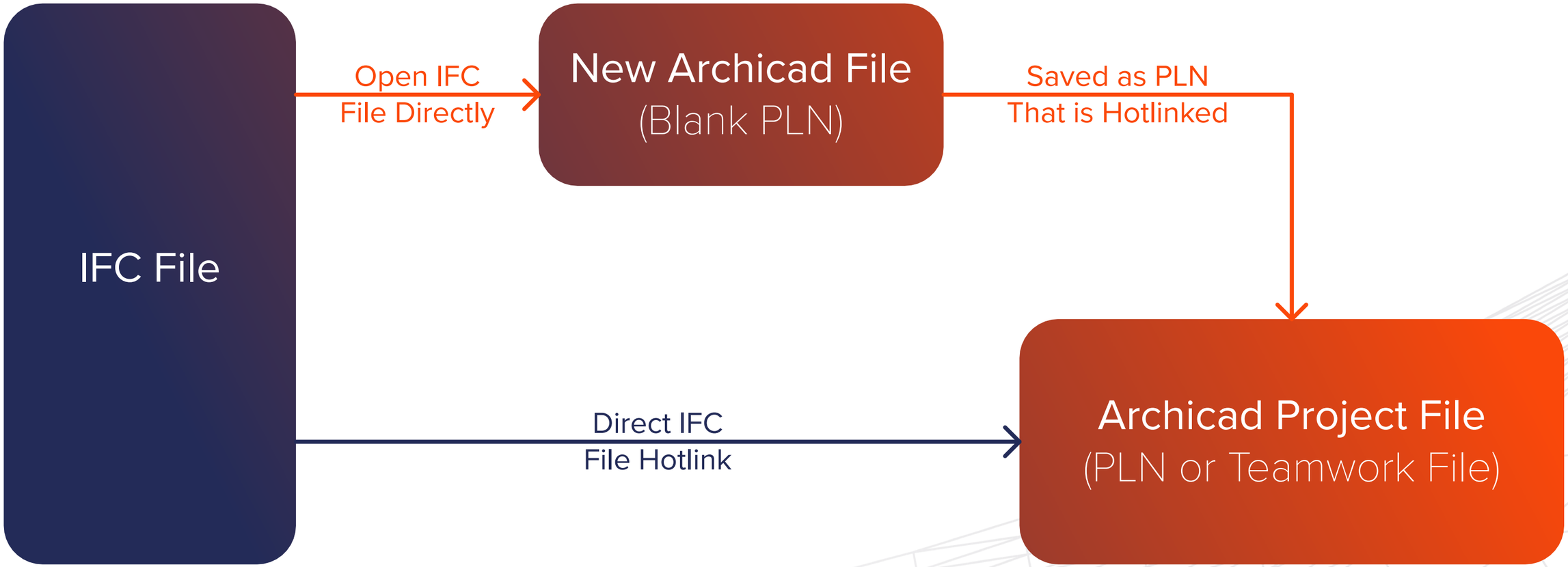
IMPORTING & HOTLINKING METHODS

Consultant's Model

Your Project



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ADD-INS FOR REVIT

IFC Model Exchange with Archicad for Revit

- Free Add-in for Autodesk Revit that improves IFC model-based bi-directional data exchange with Archicad
- Main Functions:
  - "Improved IFC Import" tries to translate the IFC model as Extruded/Revolved
  - "Link IFC" imports IFC model as BREP
  - "Export to Archicad" exports an IFC file that is specifically enhanced for Archicad
- https://graphisoft.com/us/downloads/interoperability

Autodesk Classification Manager for Revit

- Free tool from Autodesk that allows one to apply data from multiple classification systems to all of the elements
- https://www.biminteroperabilitytools.com/classificationmanager.php

OTHER FILE EXCHANGE

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PDF

PDF Exploded

Original PDF

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SKETCHUP (SKP)

Table & Chair Object

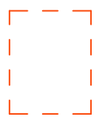
Workflow

- Download SKP file from Sketchup Warehouse
- Find location of file and drag-drop into Archicad
- SKP converted to GDL object

General Considerations

- Drag-drop onto a floor plan view
- Number of polygons in SKP file
  - If unsure of polygon size, for safe measure, open it in a blank instance of Archicad
- Will be found in the Embedded Library

RFA & RVT GEOMETRY EXCHANGE



RFA Workflow

+ Expand File => Libraries and Objects => Import RFA as GDL Object...
+ Select Object Tool and look in the Embedded Library

RVT Workflow

+ Import RVT: hotlink file directly by enabling Revit Project File Format

Download Link

+ https://graphisoft.com/downloads/addons/rfa

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DWG IMPORT METHODS

- **Drag & Drop OR Place External Drawing**
  - \+ Brings in DWG as a Drawing
    - Linked to an external file & doesn't use translators
    - Changes made to external file can be updated in project
    - No additional layers added to project
    - Can be scaled and frame adjusted
  - \+ Can be made editable by Exploding into view
- **XREF**
  - \+ Brings in DWG as External Reference File
    - Linked to external file & uses translators
    - Changes made to external file can be updated in project
    - Layers are added to the project
    - Not editable
  - \+ Can be made editable by Binding the file
- **Merge**
  - \+ Brings in DWG as Archicad Elements
    - Not linked to external file & uses translators
    - Changes made to external file will not have impact to project
    - Layers are added to the project
    - Editable from the start
  - \+ Can bring in elements from Model Space or Paper Space

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THANK YOU

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