GRAPHISOFT ARCHICAD and COBie 2

How to Prepare your ARCHICAD 19 Project for COBie 2 Documentation

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Introduction

COBie is the abbreviation of Construction Operations Building Information Exchange, a specification used in the handover of Facility Management information. It is a spreadsheet data format for the delivery of a subset of building model information, rather than geometric model information.

Although GRAPHISOFT ARCHICAD cannot export COBie spreadsheets directly, ARCHICAD's BIM-quality models and IFC data exchange capabilities produces data output that is easily converted into COBie documentation, with the help of free or commercial conversion programs.

What is the relationship between IFC and COBie?

The COBie spreadsheet is a mapping of the Basic FM Handover View Definition, which is a subset (so-called "Model View Definition"; MVD) of the current IFC 2x3 scheme. Basic FM Handover View Definition was developed by buildingSMART to exchange facility management information among building models. ARCHICAD's IFC 2x3 interface and database support the IFC data and model export requirements of the Basic FM Handover View Definition, so most of the values of the COBie spreadsheet cells are extracted from IFC models exported by ARCHICAD according to the Basic FM Handover MVD settings.

Hint For more information about the relationship between IFC 2x3 Basic FM Handover MVD and COBie, visit the buildingSMART website by clicking **here**.

This paper provides practical information on which data to add to an ARCHICAD project and how to export it as an IFC model, to obtain a format suitable for producing a COBie 2 spreadsheet. (The current version of COBie is 2.4.) The final chapter consists of a sample workflow using a free IFC → COBie conversion tool recommended by buildingSMART.

Hint For detailed documentation about ARCHICAD's IFC capabilities, read the ARCHICAD Help documentation or read the **IFC2x3 Reference Guide**.

Note This documentation was written based on the currently available COBie – IFC mapping rule called "Responsibility Matrix version 17" (published 30th April 2013).

ARCHICAD Model Preparation for COBie 2

The Basic FM Handover View Definition used by COBie 2 queries the following IFC data types from an architectural model and/or its elements:

- Owner History data
- IFC Attributes
- IFC Properties (standard IFC 2x3 and custom COBie 2-required properties)
- IFC Classification Reference data
- IFC Type Product entities
- IFC Zone assignments
- IFC System assignments
- Base quantities
- Space containment relation
- Space boundary relation

All of these data types are available in ARCHICAD as native ARCHICAD data. It is worth using ARCHICAD's predefined COBie scheme: this filters the IFC standard database to show, throughout the user interface, only those data fields required by COBie. Thus, both at the element level (in *Element Settings* dialog boxes) and at the project hierarchy level (in *IFC Manager*), you will display and fill out only the data fields that are relevant for COBie. This predefined scheme also defines the Category definitions for each entity type.

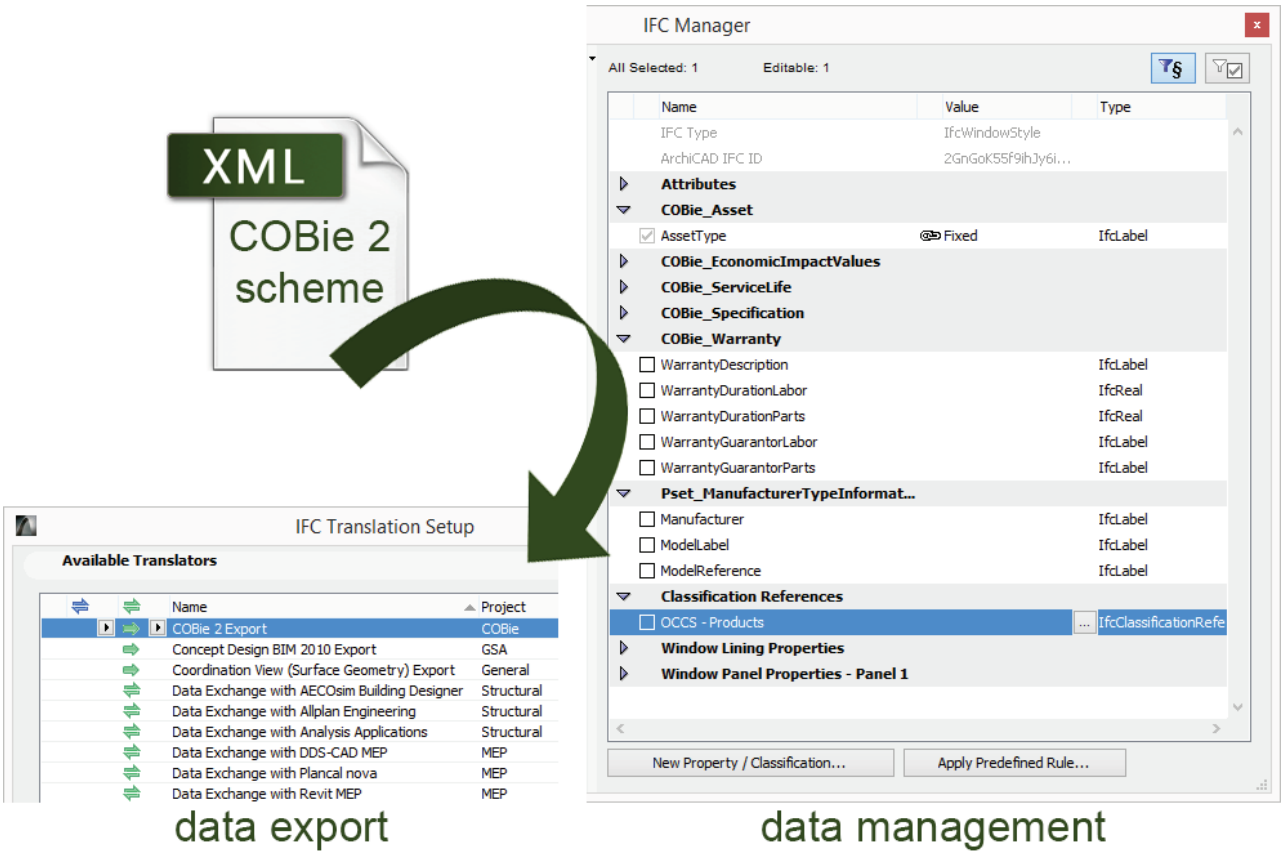


Figure 1 COBie scheme-driven data management

So, to display the COBie 2-required and relevant IFC data in IFC data management dialogs, load one of the proper “COBie 2 - … .xml” scheme template files into the ARCHICAD project with the *IFC Scheme Setup* command (*Import*, *File > File Special > IFC 2x3*).

Note The reason there are multiple COBie 2 scheme files is that the Category definitions required by COBie use different classification standards in different countries. For example, the U.S. uses the OmniClass standard to categorize Facility, Space and Type, while the UK uses Uniclass. (In the case of Uniclass 1.4, a given Category may use multiple classification tables.) Obviously, you should fill out only one Classification Reference data (since COBie requires one data) – the one which best expresses the Category definition required by COBie for the specific element.

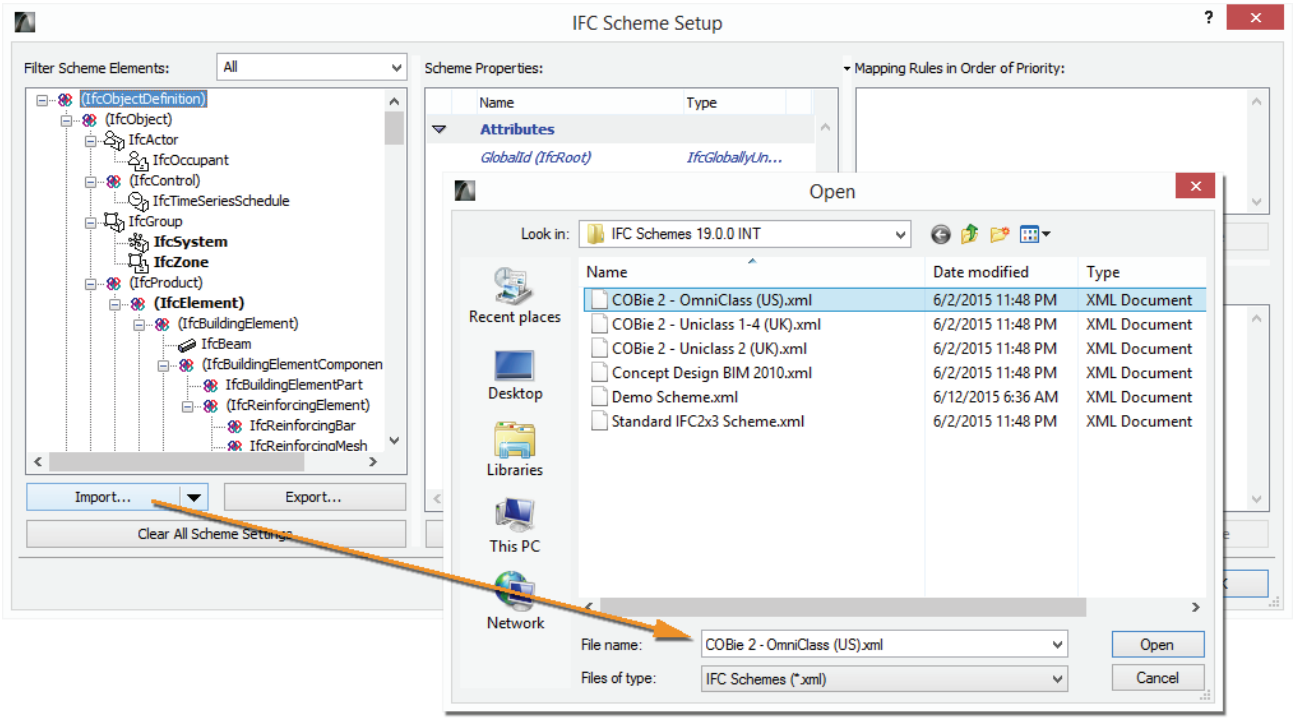
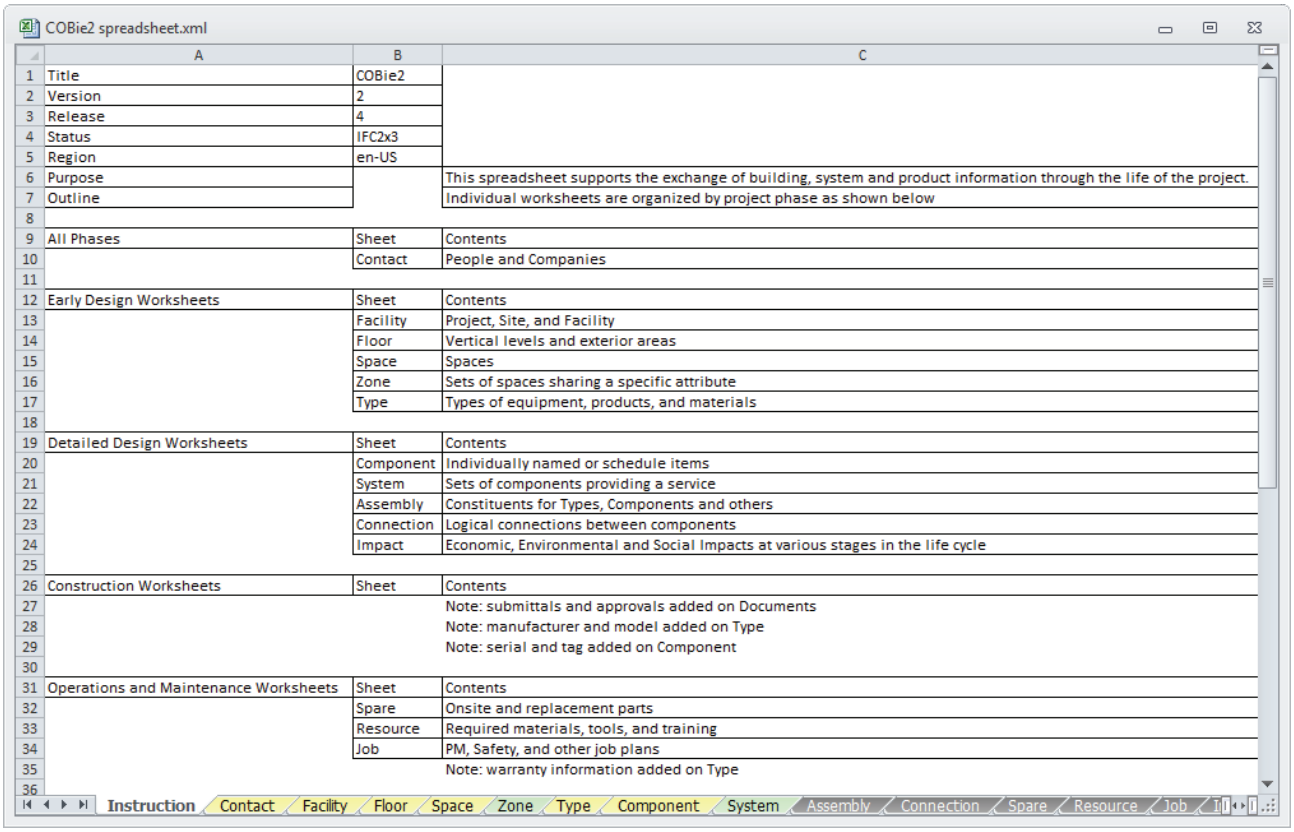


Figure 2 COBie-required properties loaded as a scheme template (*IFC Scheme Setup*)

In the IFC data management dialog boxes, click the *Show only Scheme items* icon  to filter the full IFC database to show only the loaded COBie scheme data. If this icon is activated, all data that are not part of the scheme definition are hidden on the interface: this helps you to fill out only the data relevant for COBie. For example, data inherited from ARCHICAD that are not part of the COBie scheme (such as “Structural Function”, “Position”, “Renovation Status”) will be hidden. The same is true of application-specific, custom IFC data which were added earlier to the project as a result of model exchange with other applications (e.g. structural or MEP), but which are irrelevant for COBie.

The following chapters summarize the data (required from a design application) to be provided in ARCHICAD for use by the COBie 2 spreadsheet.



COBie2 spreadsheet.xml

	A	B	C
1	Title	COBie2	
2	Version	2	
3	Release	4	
4	Status	IFC2x3	
5	Region	en-US	
6	Purpose		This spreadsheet supports the exchange of building, system and product information through the life of the project.
7	Outline		Individual worksheets are organized by project phase as shown below
8			
9	All Phases	Sheet	Contents
10		Contact	People and Companies
11			
12	Early Design Worksheets	Sheet	Contents
13		Facility	Project, Site, and Facility
14		Floor	Vertical levels and exterior areas
15		Space	Spaces
16		Zone	Sets of spaces sharing a specific attribute
17		Type	Types of equipment, products, and materials
18			
19	Detailed Design Worksheets	Sheet	Contents
20		Component	Individually named or schedule items
21		System	Sets of components providing a service
22		Assembly	Constituents for Types, Components and others
23		Connection	Logical connections between components
24		Impact	Economic, Environmental and Social Impacts at various stages in the life cycle
25			
26	Construction Worksheets	Sheet	Contents
27			Note: submittals and approvals added on Documents
28			Note: manufacturer and model added on Type
29			Note: serial and tag added on Component
30			
31	Operations and Maintenance Worksheets	Sheet	Contents
32		Spare	Onsite and replacement parts
33		Resource	Required materials, tools, and training
34		Job	PM, Safety, and other job plans
35			Note: warranty information added on Type
36			

Instruction | Contact | Facility | Floor | Space | Zone | Type | Component | System | Assembly | Connection | Spare | Resource | Job

Figure 3 The worksheets of the COBie 2 spreadsheet

Key to tables displayed in the following sections of this document:

COBie2 data	COBie 2 data taken directly from data that was input in ARCHICAD. In other words, the ARCHICAD and IFC data types corresponding to these COBie data must be set or created in the ARCHICAD model.
COBie2 data	COBie 2 data that are automatically extracted from the ARCHICAD model, project settings and their IFC export. In other words, these COBie data are set automatically in ARCHICAD; no extra data definition is required from the ARCHICAD user.

Contact

The COBie 2 **Contact** worksheet summarizes the person and organization data of the project / model designer.

Contact COBie2 worksheet data	**ArchiCAD (IFC) data mapped to COBie data**	**ArchiCAD command**
Email	***Contact E-mail***	*File > Info > Project Info*
CreatedBy	***Contact E-mail***	*(File > Info > Project Info)*
CreatedOn	the ***creation date*** of the IFC file	
Category	***Contact Role***	*File > Info > Project Info*
Company	***Contact Company***	*File > Info > Project Info*
Phone	***Contact Phone Number***	*File > Info > Project Info*
ExtSystem	text: '***ArchiCAD-64***'	
ExtObject	text: '***IfcPersonAndOrganization***'	
ExtIdentifier	***Contact E-mail***	*(File > Info > Project Info)*
Department	***Contact Department***	*File > Info > Project Info*
OrganizationCode	***Contact Company Code***	*File > Info > Project Info*
GivenName	*Contact Full Name >* ***Given Name***	*File > Info > Project Info*
FamilyName	*Contact Full Name >* ***Family Name***	*File > Info > Project Info*
Street	*Contact Full Address >* ***Address***	*File > Info > Project Info*
PostalBox	*Contact Full Address >* ***Postal Box***	*File > Info > Project Info*
Town	*Contact Full Address >* ***City***	*File > Info > Project Info*
StateRegion	*Contact Full Address >* ***State/Province***	*File > Info > Project Info*
PostalCode	*Contact Full Address >* ***Postcode/ZIP***	*File > Info > Project Info*
Country	*Contact Full Address >* ***Country***	*File > Info > Project Info*

Figure 4 Mapping between ARCHICAD model data and the COBie 2 Contact worksheet data

ARCHICAD project data must be assigned to correspond with the COBie 2 items marked in green. All "Contact" data can be entered in ARCHICAD's *Project Info* (*File* > *Info*) dialog box.

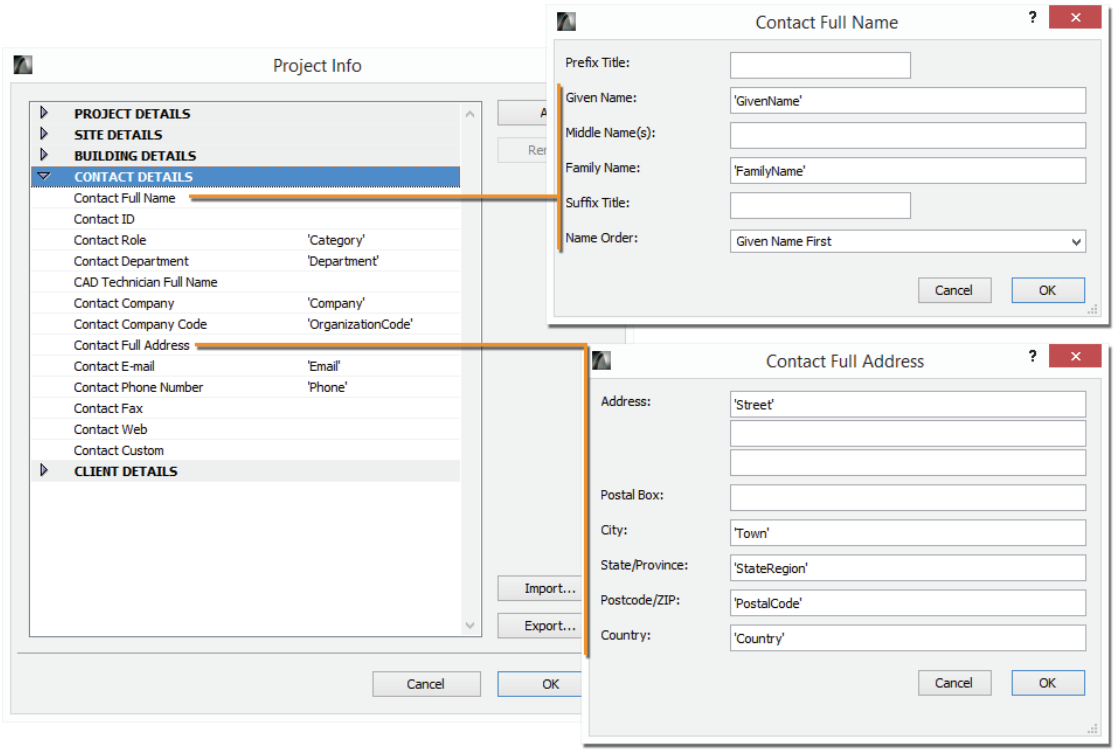


Figure 5 Contact data in ARCHICAD (*Project Info*)

Facility

The COBie 2 **Facility** worksheet summarizes the Facility (IfcBuilding), the Project (IfcProject) and the Site (IfcSite) data.

Facility COBie2 worksheet data	**ArchiCAD (IFC) data mapped to COBie data**	**ArchiCAD command**
Name	***Building Name***	*File > Info > Project Info*
CreatedBy	***Contact E-mail***	*(File > Info > Project Info)*
CreatedOn	the ***creation date*** of the IFC file	
Category	*Classification Reference* data assigned to IfcBuilding	*File > File Special > IFC 2x3 > IFC Manager*
ProjectName	***Project Name***	*File > Info > Project Info*
SiteName	***Site Name***	*File > Info > Project Info*
LinearUnits	*Export Options > IFC model units > Options >* ***Length Unit***	*File > File Special > IFC 2x3 > IFC Translation Setup*
AreaUnits	*Export Options > IFC model units > Options >* ***Area Unit***	*File > File Special > IFC 2x3 > IFC Translation Setup*
VolumeUnits	*Export Options > IFC model units > Options >* ***Volume Unit***	*File > File Special > IFC 2x3 > IFC Translation Setup*
CurrencyUnit	*Export Options > IFC model units > Options >* ***Currency Unit***	*File > File Special > IFC 2x3 > IFC Translation Setup*
AreaMeasurement	text: '***ArchiCAD BIM Base Quantities***'	
ExternalSystem	text: '***ArchiCAD-64***'	
ExternalProjectObject	text: '***IfcProject***'	
ExternalProjectIdentifier	***GlobalId*** Attribute of the IfcProject	*(File > File Special > IFC 2x3 > IFC Manager)*
ExternalSiteObject	text: '***IfcSite***'	
ExternalSiteIdentifier	***GlobalId*** Attribute of the IfcSite	*(File > File Special > IFC 2x3 > IFC Manager)*
ExternalFacilityObject	text: '***IfcBuilding***'	
ExternalFacilityIdentifier	***GlobalId*** Attribute of the IfcBuilding	*(File > File Special > IFC 2x3 > IFC Manager)*
Description	***Building Description***	*File > Info > Project Info*
ProjectDescription	***Project Description***	*File > Info > Project Info*
SiteDescription	***Site Description***	*File > Info > Project Info*
Phase	***Project Status***	*File > Info > Project Info*

Figure 6 Mapping between ARCHICAD model and the COBie 2 Facility worksheet data

All major Facility data can be defined in the Project Info dialog (*File* > *Info*). These data can also be managed in the *IFC Manager* as the main Attributes of the IfcProject, IfcSite and IfcBuilding entities.

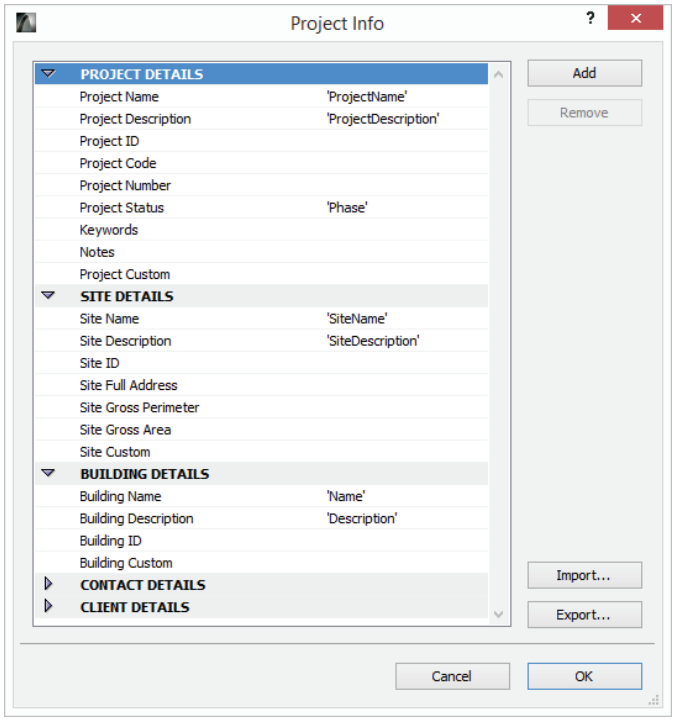


Figure 7 Facility data in ARCHICAD (*Project Info*)

To set the Facility “Category”, provide the proper Classification Reference value in the *IFC Manager*. COBie requires IfcBuilding classification by OmniClass table 11, entitled “Construction Entities by Function” (in US) or by the Uniclass system (in UK). Both systems are available as built-in classification rules in ARCHICAD under the *Apply Predefined Rule* option in the *IFC Manager*.

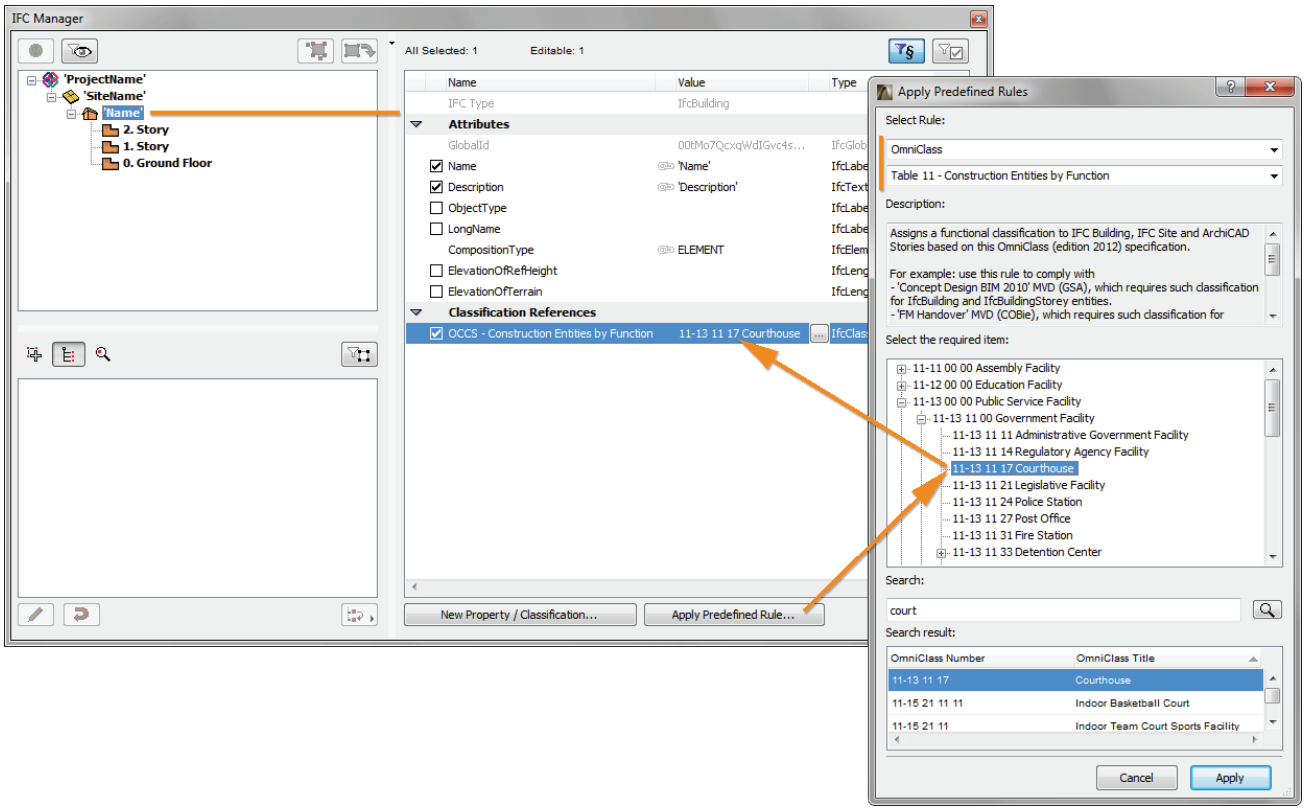


Figure 8 COBie Facility Category set by the proper OmniClass or Uniclass classification system (*IFC Manager*)

The COBie-required unit systems of the Facility can be set at *Export Options*. There is a predefined settings package (so-called “IFC Translation Setup” in ARCHICAD) which contains export options optimized for the COBie-required IFC export. It is called “COBie 2 Export” IFC Translator (see chapter COBie 2-enabled IFC Model Export).

Note By default, ARCHICAD assigns identical “GlobalId” Attributes to IfcProject (Project), IfcSite (Site), IfcBuilding (Facility), and IfcBuildingStorey (Floor). More precisely: the “GlobalIds” will be identical, provided that the respective ID fields, defined at ARCHICAD’s *Project Info* dialog box (*File > Info*) contain identical keywords (or no value at all). However, you can alter these keywords in the *Project Info* dialog box to control whether the spatial entities have identical or different “GlobalIds”.

Suppose you have two separate buildings (stored in two different ARCHICAD projects). You want both projects and both sites to share the same “GlobalId”; yet you want the various buildings on each site to have different “GlobalIds”.

To achieve this, enter the same keyword in the “Project ID” and “Site ID” fields of both projects. Enter different keywords for the “Building ID” fields.

IfcBuildingStorey (Floor) entities have no corresponding ID field in the *Project Info* dialog box. The "GlobalIds" of IfcBuildingStorey entities are derived from their "Building ID". If two buildings in two different ARCHICAD projects have the same "Building ID", then all stories of those buildings which have the same Story number ("No.") will have the same "GlobalId".

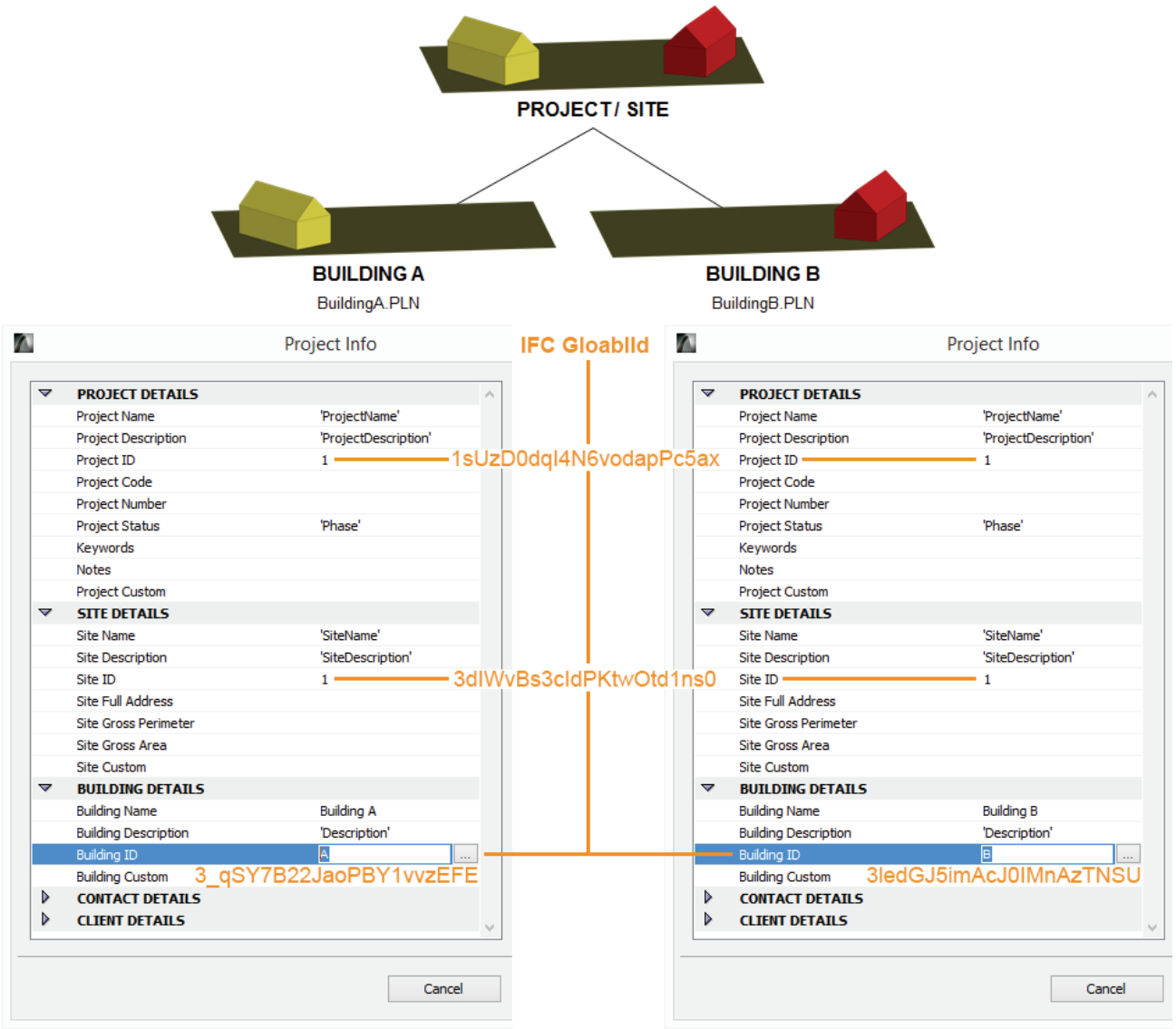


Figure 9 Multi-building definition in ARCHICAD (*Project Info*)

Floor

The COBie 2 **Floor** worksheet summarizes data of the building stories (IfcBuildingStorey).

Floor COBie2 worksheet data	ArchiCAD (IFC) data mapped to COBie data	ArchiCAD command
Name	***Name***	*Design > Story Settings*
CreatedBy	***Contact E-mail***	*(File > Info > Project Info)*
CreatedOn	the ***creation date*** of the IFC file	
Category	*Classification Reference* data assigned to an IfcBuildingStorey	*File > File Special > IFC 2x3 > IFC Manager*
ExtSystem	text: '***ArchiCAD-64***'	
ExtObject	text: '***IfcBuildingStorey***'	
ExtIdentifier	***GlobalId*** Attribute of an IfcBuildingStorey	*(File > File Special > IFC 2x3 > IFC Manager)*
Description	***Description*** Attribute of an IfcBuildingStorey	*File > File Special > IFC 2x3 > IFC Manager*
Elevation	***Elevation***	*Design > Story Settings*
Height	***Height***	*Design > Story Settings*

Figure 10 Mapping between ARCHICAD model and the COBie 2 Floor worksheet data

The "Floors" are interpreted as Stories in the ARCHICAD project. The story names (COBie "Name"), the elevation (COBie "Elevation") and the height (COBie "Height") can be defined in the *Story Settings* dialog (*Design* > *Story Settings*).

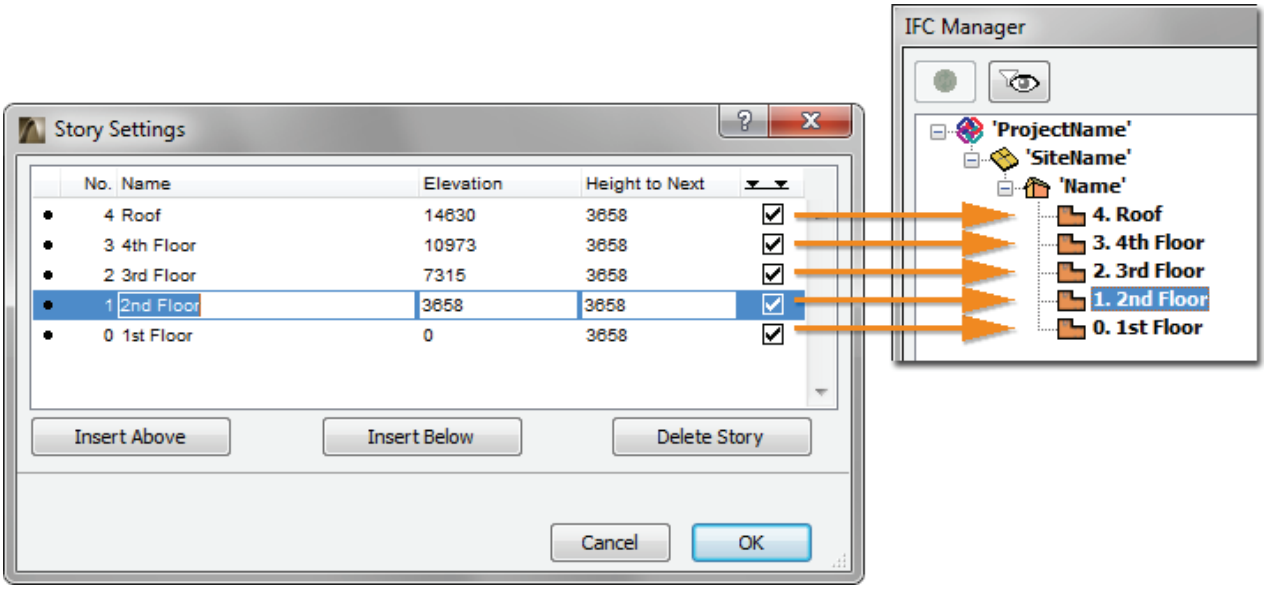


Figure 11 Story settings define the major COBie Floor data in ARCHICAD

To set the Floor "Category", choose the proper "Floor Type" Classification Reference data in the *IFC Manager*. Just choose the "COBie Floor and Zone Categories" (Floor Types) predefined rule with the *Apply Predefined Rule* tool. The "Description" attribute of an ARCHICAD Story (IfcBuildingStorey) can also be set via the *IFC Manager*.

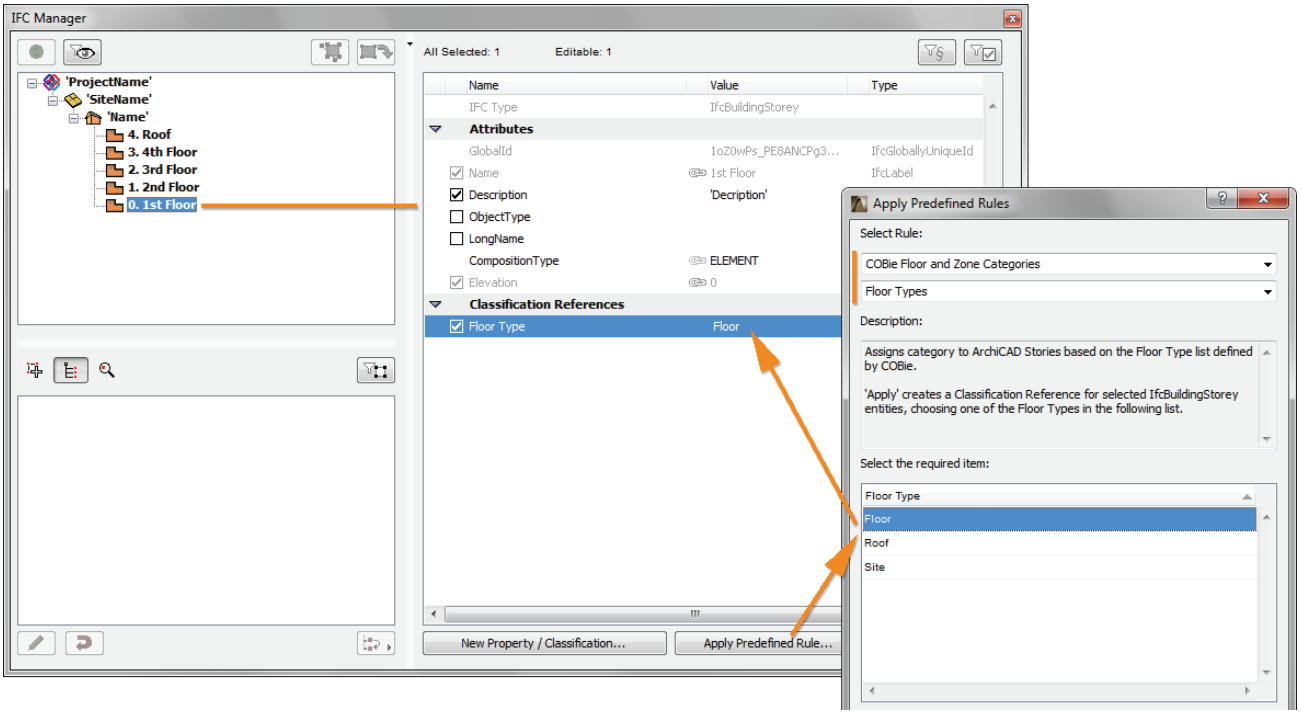


Figure 12 Floor Type definition in the *IFC Manager*

Space

The COBie 2 **Space** worksheet summarizes data of the Spaces (IfcSpace) of the project.

Space COBie2 worksheet data	ArchiCAD (IFC) data mapped to COBie data	ArchiCAD command
Name	***No*** (Number)	*Zone > Settings Dialog > Name and Positioning*
CreatedBy	***Contact E-mail***	*(File > Info > Project Info)*
CreatedOn	the **creation date** of the IFC file	
Category	*Classification Reference* data assigned to an IfcSpace	*Zone > Settings Dialog > Tags and Categories* , or
		File > File Special > IFC 2x3 > IFC Manager
FloorName	***Name*** of the ArchiCAD Zone's Home Story	*(Design > Story Settings)*
Description	***Name***	*Zone > Settings Dialog > Name and Positioning*
ExtSystem	text: '***ArchiCAD-64***'	
ExtObject	text: '***IfcSpace***'	
ExtIdentifier	***GlobalId*** Attribute of an ArchiCAD Zone	*(File > File Special > IFC 2x3 > IFC Manager)*
RoomTag	*COBie_Space* Property Set: ***RoomTag***	*Zone > Settings Dialog > Tags and Categories* , or
		File > File Special > IFC 2x3 > IFC Manager
UsableHeight	***Zone Height***	*Zone > Settings Dialog > Name and Positioning*
GrossArea	***GrossFloorArea*** IFC base quantity	
NetArea	***NetFloorArea*** IFC base quantity	

Figure 13 Mapping between ARCHICAD model and the COBie 2 Space worksheet data

The “Spaces” are interpreted as Zones (IfcSpaces) in the ARCHICAD project. Thus, the COBie 2-required data can be set in ARCHICAD Zone Settings. IFC data can be set using the *Manage IFC Properties* option (*Tags and Categories* tab).

Note Each COBie Space (ARCHICAD Zone) has to have a unique COBie “Name”, that is, a unique ARCHICAD Zone number (“No”).

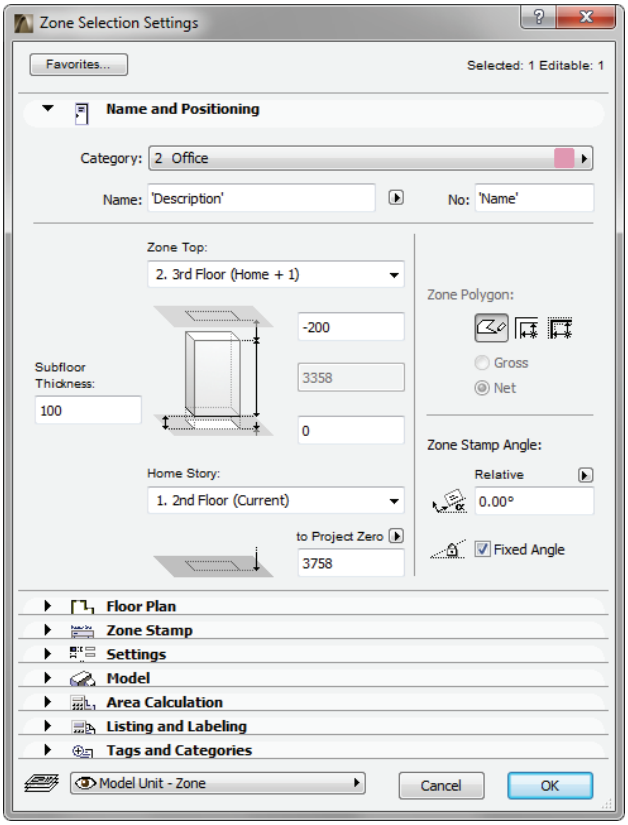


Figure 14 Space settings in ARCHICAD

To set the Space “Category”, select the proper Classification Reference data in the *Zone Settings* dialog (*Tags and Categories* > *Manage IFC Properties*) or in the *IFC Manager*. COBie requires IfcSpace classification by the OmniClass table 13 called “Space by Function”(in the U.S.) or by the Uniclass system (in UK). Both systems are available as built-in classification rules in ARCHICAD under the *Apply Predefined Rule* option.

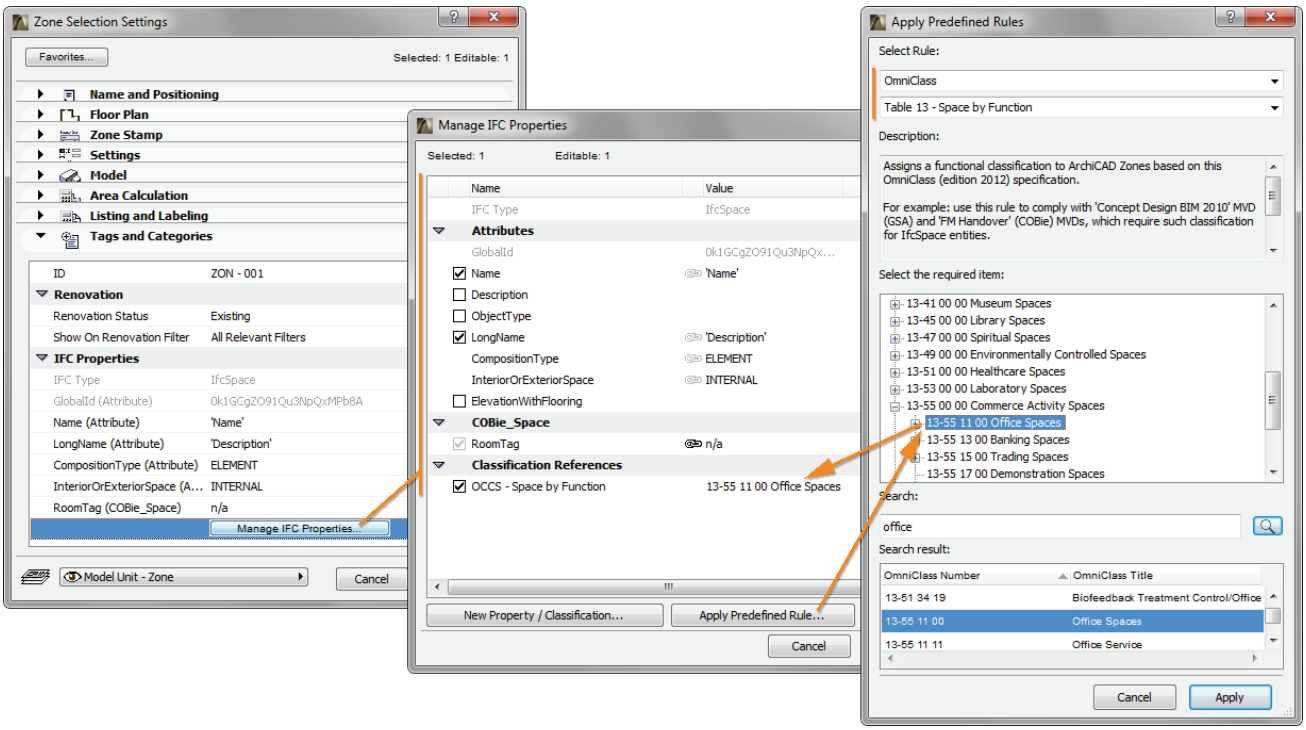


Figure 15 Space Category definition

Zone

The COBie 2 **Zone** worksheet summarizes the sets of spaces sharing a specific attribute in the project. In other words, it summarizes the data of the groups (IfcZones) of COBie Spaces (IfcSpaces).

Zone COBie2 worksheet data	**ArchiCAD (IFC) data mapped to COBie data**	**ArchiCAD command**
Name	***Name*** Attribute of an IFC Zone	*File > File Special > IFC 2x3 > IFC Manager*
CreatedBy	***Contact E-mail***	*(File > Info > Project Info)*
CreatedOn	the **creation date** of the IFC file	
Category	*Classification Reference* data assigned to an IfcZone	*File > File Special > IFC 2x3 > IFC Manager*
SpaceNames	***No*** data of the ArchiCAD Zones assigned to an IFC Zone	*(Zone > Settings Dialog)*
ExtSystem	text: '***ArchiCAD-64***'	
ExtObject	text: '***IfcZone***'	
ExtIdentifier	***GlobalId*** Attribute of an IFC Zone	*(File > File Special > IFC 2x3 > IFC Manager)*
Description	***Description*** Attribute of an IFC Zone	*File > File Special > IFC 2x3 > IFC Manager*

Figure 16 Mapping between ARCHICAD model and the COBie 2 Zone worksheet data

COBie "Zones" are interpreted as IFC Zone Assignment (IfcZone) entities in the ARCHICAD project. An IfcZone entity is a group of ARCHICAD Zone (IfcSpace) entities. IFC Zone entities with their COBie 2-required data can be defined and managed only in the *IFC Manager*.

A COBie "Zone" (IfcZone) can be defined with the *New* command by applying it to the "IFC Zones" member of the "Assignments" tree. Set the COBie "Name" and the "Description" data at the attributes of the same name.

To set the Zone "Category", choose the proper "Zone Type" Classification Reference data in the *IFC Manager*. Just choose the "COBie Floor and Zone Categories" (Zone Types) predefined rule with the *Apply Predefined Rule* tool.

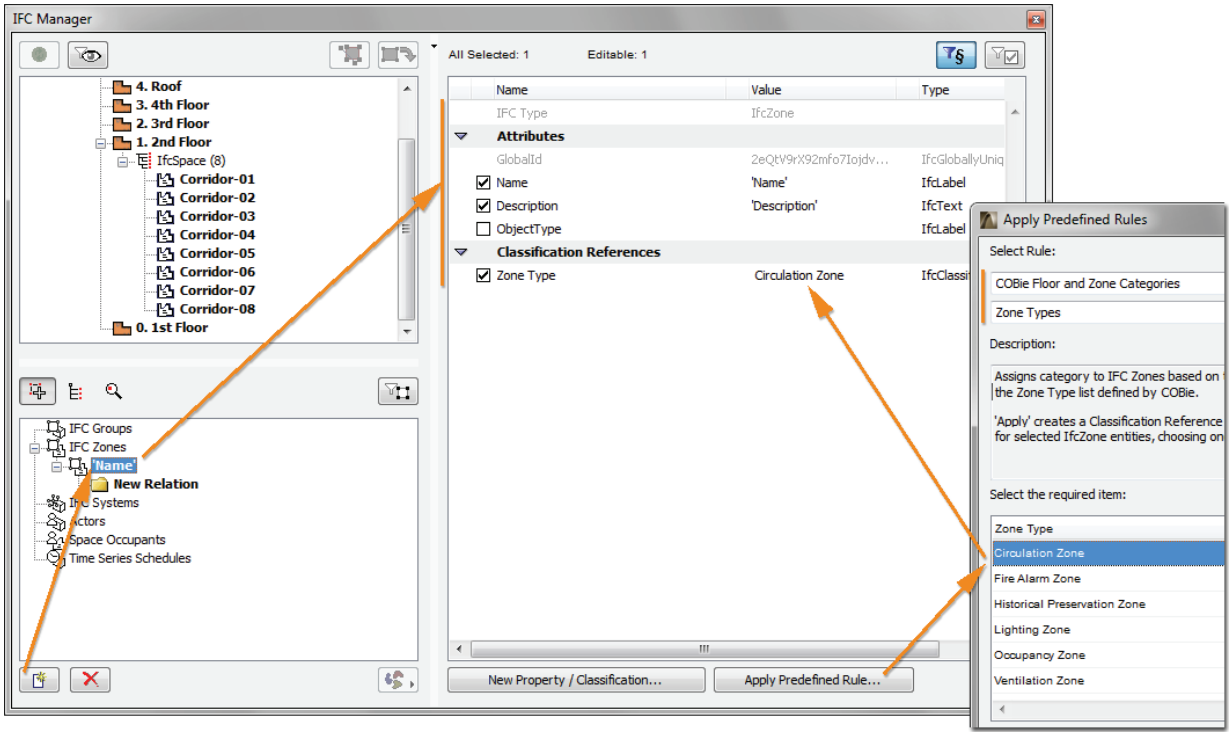


Figure 17 COBie 2 Zone (IFC Zone) definition in the *IFC Manager*

To assign several ARCHICAD Zones (IfcSpaces) having the same function (for example circulation zones) to a newly created IFC Zone entity, just drag and drop them to the “New Relation” folder of the IFC Zone entity.

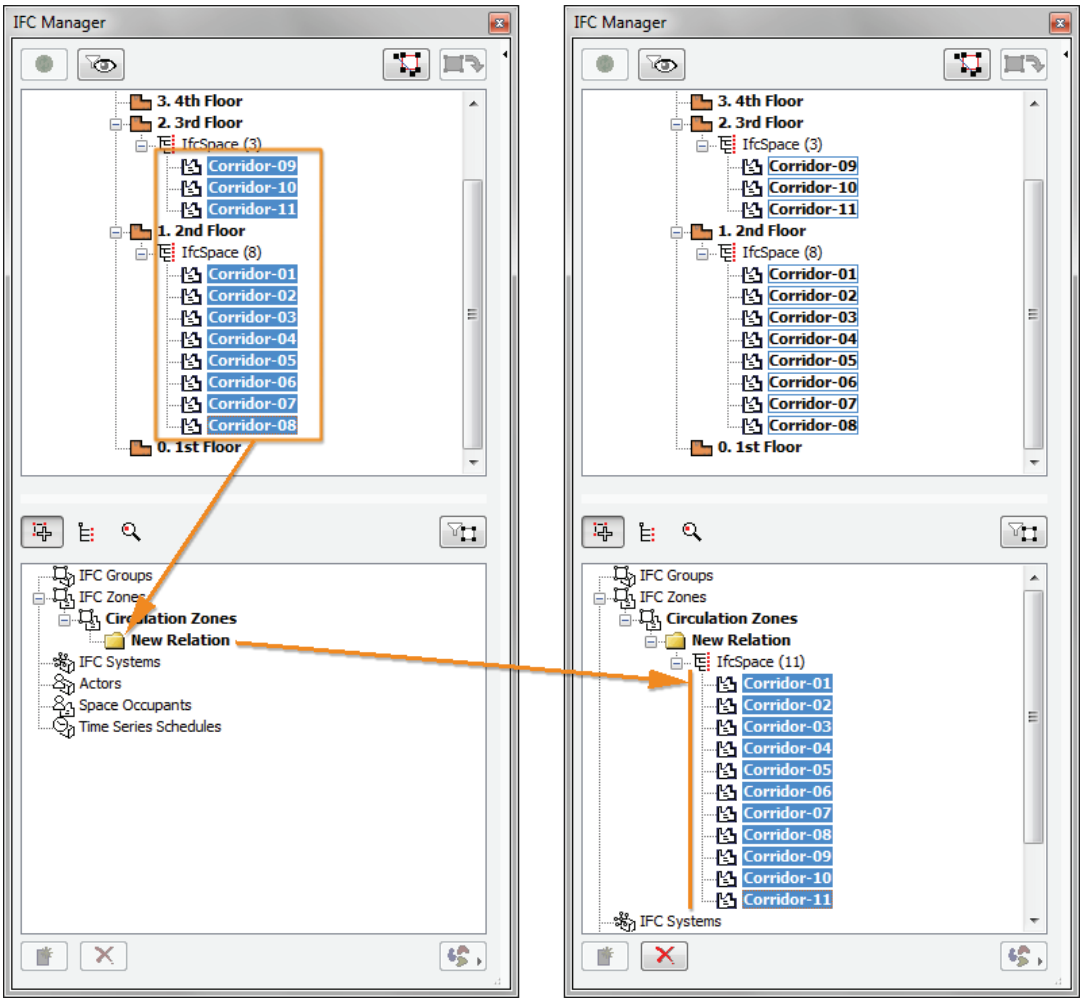


Figure 18 Grouping ARCHICAD Zones in an IFC Zone (*IFC Manager*)

Note Hotlinked ARCHICAD Zone entities cannot be grouped in IFC Zones. To assign an IFC Zone entity to these Zones, you must first break their Hotlink module connection.

Type

COBie 2 **Type** worksheet summarizes the types of equipment and products.

Type COBie2 worksheet data	ArchiCAD (IFC) data mapped to COBie data	ArchiCAD command
Name	***Name*** Attribute of an IFC Type Product	*File > File Special > IFC 2x3 > IFC Manager*
CreatedBy	***Contact E-mail***	*(File > Info > Project Info)*
CreatedOn	the **creation date** of the IFC file	
Category	*Classification Reference* data assigned to an IFC Type Product	*File > File Special > IFC 2x3 > IFC Manager*
Description	***Description*** Attribute of an IFC Type Product	*File > File Special > IFC 2x3 > IFC Manager*
ExtSystem	text: '***ArchiCAD-64***'	
ExtObject	text: the type of an IFC Type Product (e.g. '***IfcFurnishingElementType***	*(File > File Special > IFC 2x3 > IFC Manager)*
ExtIdentifier	***GlobalId*** Attribute of an IFC Type Product	*(File > File Special > IFC 2x3 > IFC Manager)*
AssetType	*COBie_Asset* Property Set: ***AssetType***	*File > File Special > IFC 2x3 > IFC Manager*
ReplacementCost	*COBie_EconomicImpactValues* Property Set: ***ReplacementCost***	*File > File Special > IFC 2x3 > IFC Manager*
ExpectedLife	*COBie_ServiceLife* Property Set: ***ServiceLifeDuration***	*File > File Special > IFC 2x3 > IFC Manager*
AccessibilityPerformance	*COBie_Specification* Property Set: ***AccessibilityPerformance***	*File > File Special > IFC 2x3 > IFC Manager*
CodePerformance	*COBie_Specification* Property Set: ***CodePerformance***	*File > File Special > IFC 2x3 > IFC Manager*
Color	*COBie_Specification* Property Set: ***Color***	*File > File Special > IFC 2x3 > IFC Manager*
Constituents	*COBie_Specification* Property Set: ***Constituents***	*File > File Special > IFC 2x3 > IFC Manager*
Features	*COBie_Specification* Property Set: ***Features***	*File > File Special > IFC 2x3 > IFC Manager*
Finish	*COBie_Specification* Property Set: ***Finish***	*File > File Special > IFC 2x3 > IFC Manager*
Grade	*COBie_Specification* Property Set: ***Grade***	*File > File Special > IFC 2x3 > IFC Manager*
Material	*COBie_Specification* Property Set: ***Material***	*File > File Special > IFC 2x3 > IFC Manager*
NominalHeight	*COBie_Specification* Property Set: ***NominalHeight***	*File > File Special > IFC 2x3 > IFC Manager*
NominalLength	*COBie_Specification* Property Set: ***NominalLength***	*File > File Special > IFC 2x3 > IFC Manager*
NominalWidth	*COBie_Specification* Property Set: ***NominalWidth***	*File > File Special > IFC 2x3 > IFC Manager*
Shape	*COBie_Specification* Property Set: ***Shape***	*File > File Special > IFC 2x3 > IFC Manager*
Size	*COBie_Specification* Property Set: ***Size***	*File > File Special > IFC 2x3 > IFC Manager*
SustainabilityPerformance	*COBie_Specification* Property Set: ***SustainabilityPerformance***	*File > File Special > IFC 2x3 > IFC Manager*
WarrantyDescription	*COBie_Warranty* Property Set: ***WarrantyDescription***	*File > File Special > IFC 2x3 > IFC Manager*
WarrantyDurationLabor	*COBie_Warranty* Property Set: ***WarrantyDurationLabor***	*File > File Special > IFC 2x3 > IFC Manager*
WarrantyDurationParts	*COBie_Warranty* Property Set: ***WarrantyDurationParts***	*File > File Special > IFC 2x3 > IFC Manager*
WarrantyGuarantorLabor	*COBie_Warranty* Property Set: ***WarrantyGuarantorLabor***	*File > File Special > IFC 2x3 > IFC Manager*
WarrantyGuarantorParts	*COBie_Warranty* Property Set: ***WarrantyGuarantorParts***	*File > File Special > IFC 2x3 > IFC Manager*
Manufacturer	*Pset_ManufacturerTypeInformation* Property Set: ***Manufacturer***	*File > File Special > IFC 2x3 > IFC Manager*
ModelNumber	*Pset_ManufacturerTypeInformation* Property Set: ***ModelLabel***	*File > File Special > IFC 2x3 > IFC Manager*
ModelReference	*Pset_ManufacturerTypeInformation* Property Set: ***ModelReference***	*File > File Special > IFC 2x3 > IFC Manager*
DurationUnit	*Export Options > IFC model units > Options >* ***Time Unit***	*File > File Special > IFC 2x3 > IFC Translation Setup*
WarrantyDurationUnit	*Export Options > IFC model units > Options >* ***Time Unit***	*File > File Special > IFC 2x3 > IFC Translation Setup*

Figure 19 Mapping between ARCHICAD model and the COBie 2 Type worksheet data

COBie "Types" are interpreted as IFC Type Product entities in the ARCHICAD project. IFC Type Products and their COBie 2-requested data can be defined in the *IFC Manager* only. ARCHICAD automatically generates IFC Type Product entities for all ARCHICAD element types. The following table shows naming examples of the automatically generated IFC Type Products.

ArchiCAD element type (IFC entity)	IFC Type Product (= COBie Type)	'Name' Attribute of Type Product derived from
Column (IfcColumn)	IfcColumnType	'Profile/Building Material name' and 'Profile size'
Beam (IfcBeam)	IfcBeamType	'Profile/Building Material name' and 'Profile size'
Wall (IfcWall)	IfcWallType	'Building Material/Composite name' and 'Thickness'
Slab (IfcSlab)	IfcSlabType	'Building Material/Composite name' and 'Thickness'
Curtain Wall (IfcCurtainWall):	IfcCurtainWallType	Text: '**Curtain Wall Type**'
- CW Panel (IfcPlate)	- IfcPlateType	Panel Type: 'Main' or 'Distinct' and 'Panel size'
- CW Frame (IfcMember)	- IfcMemberType	Frame Type: 'Boundary', 'Mullion' or 'Transom' and 'Profile size'
Door (IfcDoor)	IfcDoorStyle	'Library Part Name' - 'Building Material/Composite Name' - 'Width' X 'Height'
Window (IfcWindow)	IfcWindowStyle	'Library Part Name' - 'Building Material/Composite Name' - 'Width' X 'Height'
GDL-based Objects	IfcFurnitureType, IfcRailingType, IfcRampFlightType, etc.	'Library Part Name'

Figure 20 Naming rule examples of IFC Type Product entities

In the *IFC Scheme Setup* (*File > File Special > IFC 2x3*) command dialog, you can override the Type naming with mapping rules. For example, the COBie 2 Scheme XML loaded into ARCHICAD gives a complex naming rule for IfcWindowStyle (Window Type) and IfcDoorStyle (Door Type) naming that contains the “Library Part Name”, the “Building Material”, the “Width” and “Height” parameters and some static texts among the data values.

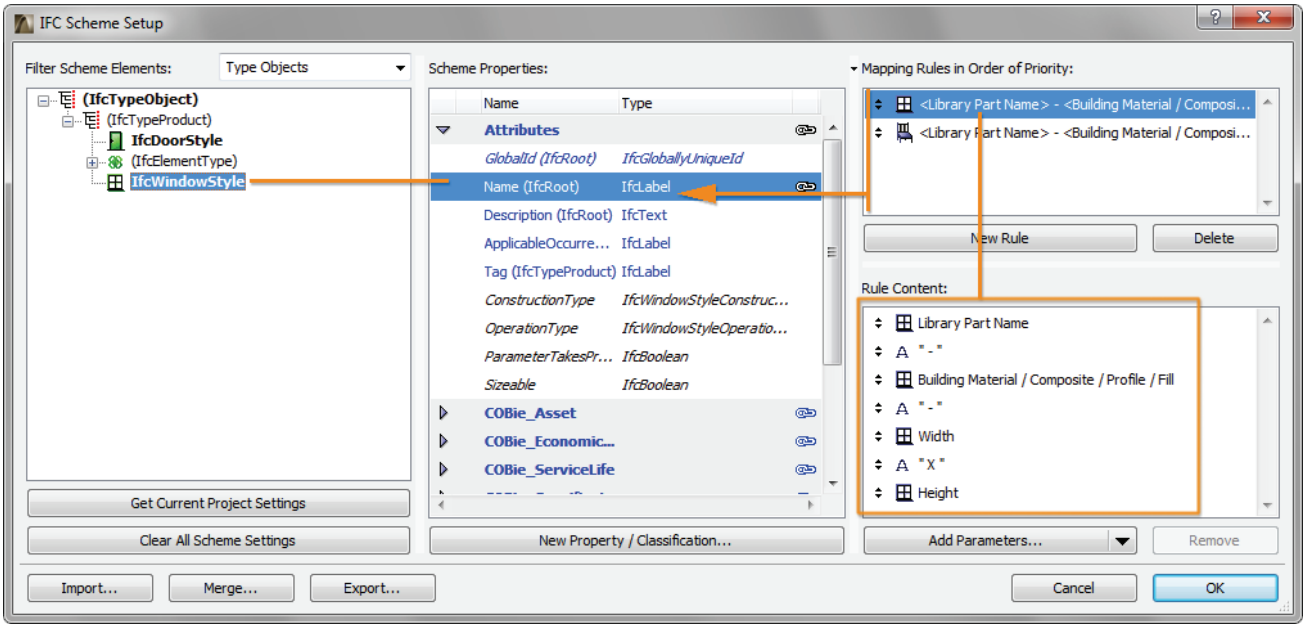


Figure 21 Name mapping by the *IFC Scheme Setup* command

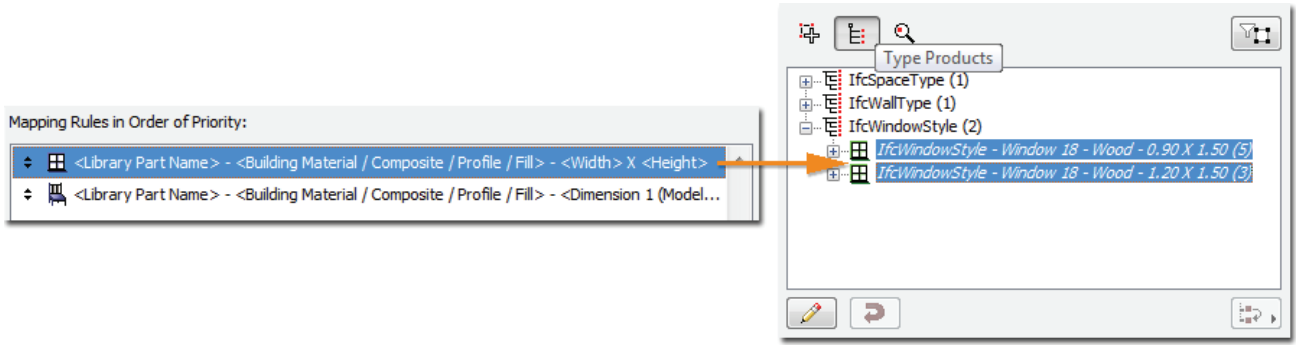


Figure 22 The effect of the scheme-driven WindowStyle mapping (*IFC Manager*)

Of course, Type names can be modified manually. To modify the predefined name of a Type and/or to manage the COBie-required attributes, properties and classification reference (COBie Category) of a Type, first you have to set IFC Type Product entity to be editable. Apply the *Edit/New Type* command on the selected Type Product item, and manage its properties in its property table (right hand side).

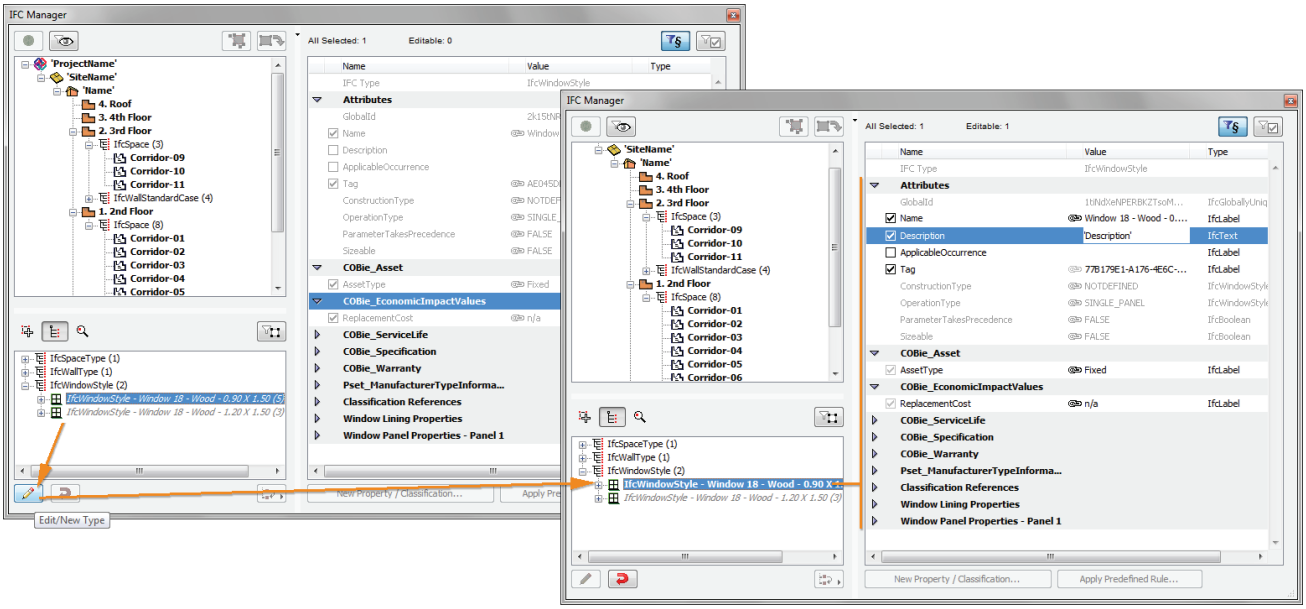


Figure 23 How to make a Type Product entity editable (*IFC Manager*)

If an IFC Type Product is editable, the following functions become available:

- renaming (modification of the “Name” attribute),
- setting COBie attributes and properties,
- setting Type Category, and
- modifying its member content by moving the members into another type.

To set the Type “Category”, select the proper Classification Reference data in the *IFC Manager*. COBie requires IFC Type Product classification by the OmniClass table 23 called “Products” (in the U.S.) or by the Uniclass system (in UK). Both systems are available as built-in classification rules in ARCHICAD under the *Apply Predefined Rule* option.

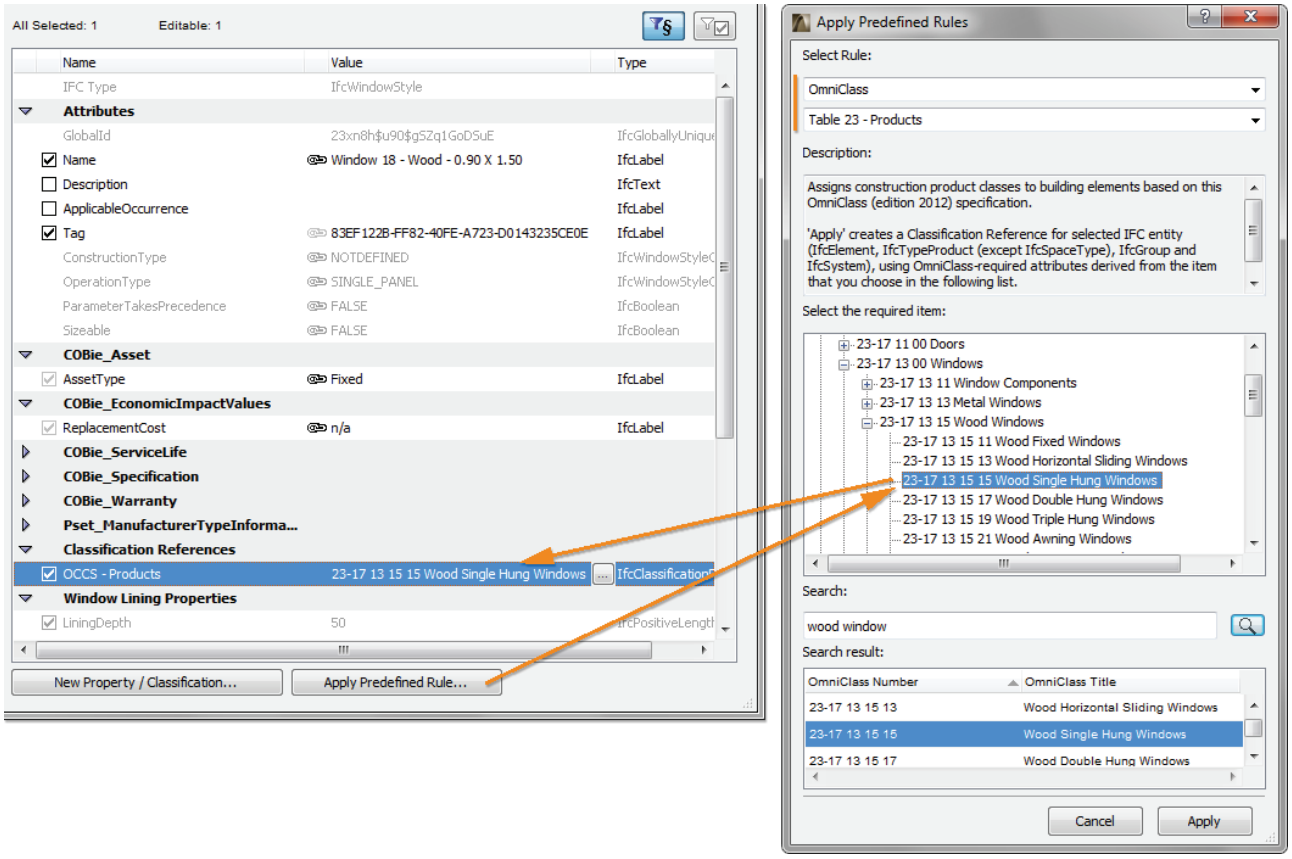


Figure 24 COBie Category definition for Window Type (IfcWindowStyle) entity (*IFC Manager*)

The COBie-required duration unit can be set in *Export Options*. There is a predefined settings package (so-called "IFC Translation Setup" in ARCHICAD) which contains export options optimized for the COBie-required IFC export. It is called "COBie 2 Export" IFC Translator (see chapter COBie 2-enabled IFC Model Export).

Note If you create a new Component in your model after Type definition, you can easily drag and drop the new Component onto an edited Type in the "Type Products" dialog of the *IFC Manager*.

If you have same type Components in two different Hotlinked modules, you can unify them in one common Type (within one COBie Type "ExtIdentifier" (IFC "GlobalId")) only after you break their Hotlink module connection.

Component

The COBie 2 **Component** worksheet summarizes the individually named items of the project.

Component COBie2 worksheet data	**ArchiCAD (IFC) data mapped to COBie data**	**ArchiCAD command**
Name	***ID***	*Settings Dialog* of an ArchiCAD element
CreatedBy	***Contact E-mail***	*(File > Info > Project Info)*
CreatedOn	the **creation date** of the IFC file	
TypeName	***Name*** of the IFC Type Product assigned to an ArchiCAD element	*(File > File Special > IFC 2x3 > IFC Manager)*
Space	***No*** data of the ArchiCAD Zones assigned to an ArchiCAD element	*(Zone > Settings Dialog)*
Description	***Description*** Attribute of an ArchiCAD element	*Settings Dialog > Tags and Categories , or* *File > File Special > IFC 2x3 > IFC Manager*
ExtSystem	text: '***ArchiCAD-64***'	
ExtObject	text: the entity type of an ArchiCAD element (e.g. '***IfcFurnishingElement***')	*(File > File Special > IFC 2x3 > IFC Manager)*
ExtIdentifier	***GlobalId*** Attribute of an ArchiCAD element	*(File > File Special > IFC 2x3 > IFC Manager)*
AssetIdentifier	*COBie_Component* Propert Set: ***AssetIdentifier***	*Settings Dialog > Tags and Categories , or* *File > File Special > IFC 2x3 > IFC Manager*
InstallationDate	*COBie_Component* Propert Set: ***InstallationDate***	*Settings Dialog > Tags and Categories , or* *File > File Special > IFC 2x3 > IFC Manager*
TagNumber	*COBie_Component* Propert Set: ***TagNumber***	*Settings Dialog > Tags and Categories , or* *File > File Special > IFC 2x3 > IFC Manager*
WarrantyStartDate	*COBie_Component* Propert Set: ***WarrantyStartDate***	*Settings Dialog > Tags and Categories , or* *File > File Special > IFC 2x3 > IFC Manager*
BarCode	*Pset_ManufacturerOccurrence* Property Set: ***BarCode***	*Settings Dialog > Tags and Categories , or* *File > File Special > IFC 2x3 > IFC Manager*
SerialNumber	*Pset_ManufacturerOccurrence* Property Set: ***SerialNumber***	*Settings Dialog > Tags and Categories , or* *File > File Special > IFC 2x3 > IFC Manager*

Figure 25 Mapping between ARCHICAD model and the COBie 2 Component worksheet data

The “Name” data are derived from the ARCHICAD “ID” of the element, so you can set them in the element Settings dialogs. All IFC data can be set using the *Manage IFC Properties* option (*Tags and Categories* tab) of the Settings dialog or in the *IFC Manager*.

Note Each Component has to have a unique COBie “Name” (ARCHICAD “ID”). If you did not assign unique (different) ID’s to your ARCHICAD elements, you can do so at any time, for example using the *Element ID Manager* function (*Document > Schedules and Lists*).

The “Space” data describes the ARCHICAD Zone (IfcSpace) assigned to a Component. This data is automatically calculated, if the IFC export uses the *Space containment* and the *IFC Space boundaries* functions (see chapter COBie 2-enabled IFC Model Export).

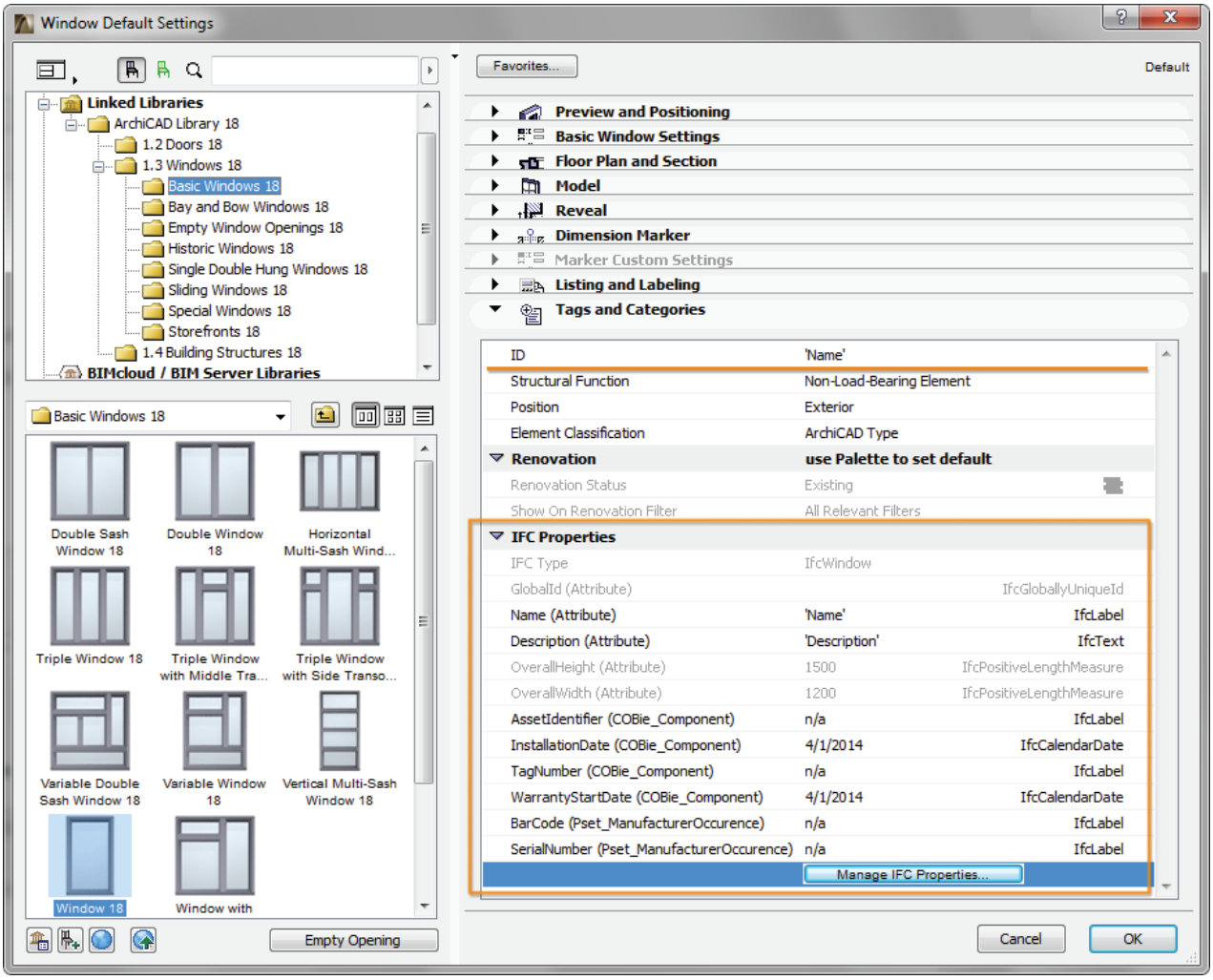


Figure 26 COBie-required Component data set in the *Window Settings* dialog

System

The COBie 2 **System** worksheet summarizes the sets of Components providing a service. In other words, it summarizes the data of the systems (IfcSystem) of the project elements.

System COBie2 worksheet data	ArchiCAD (IFC) data mapped to COBie data	ArchiCAD command
Name	***Name*** Attribute of an IFC System	*File > File Special > IFC 2x3 > IFC Manager*
CreatedBy	***Contact E-mail***	*(File > Info > Project Info)*
CreatedOn	the **creation date** of the IFC file	
Category	*Classification Reference* data assigned to an IFC System	*File > File Special > IFC 2x3 > IFC Manager*
ComponentNames	***ID*** of the ArchiCAD elements assigned to an IFC System	*(Settings Dialog* of an ArchiCAD element*)*
ExtSystem	text: '***ArchiCAD-64***'	
ExtObject	text: '***IfcSystem***'	
ExtIdentifier	***GlobalId*** Attribute of an IFC System	*(File > File Special > IFC 2x3 > IFC Manager)*
Description	***Description*** Attribute of an IFC System	*File > File Special > IFC 2x3 > IFC Manager*

Figure 27 Mapping between ARCHICAD model and the COBie 2 System worksheet data

COBie "Systems" are interpreted as IFC System Assignment (IfcSystem) entities in the ARCHICAD project. An IfcSystem entity is a group of ARCHICAD elements. IFC System entities with their COBie 2-required data can be defined and managed only in the *IFC Manager*.

A COBie "System" (IfcSystem) can be defined with the *New* command by applying it to the "IFC Systems" member of the "Assignments" tree. Set the COBie "Name" and the "Description" using the attribute fields of the same name.

To set the System "Category", select proper Classification Reference data in the *IFC Manager*. COBie requires IFC System classification by the OmniClass table 21 called "Elements" (in the U.S.) or by the Uniclass system (in UK). Both systems are available as built-in classification rules in ARCHICAD under the *Apply Predefined Rule* option.

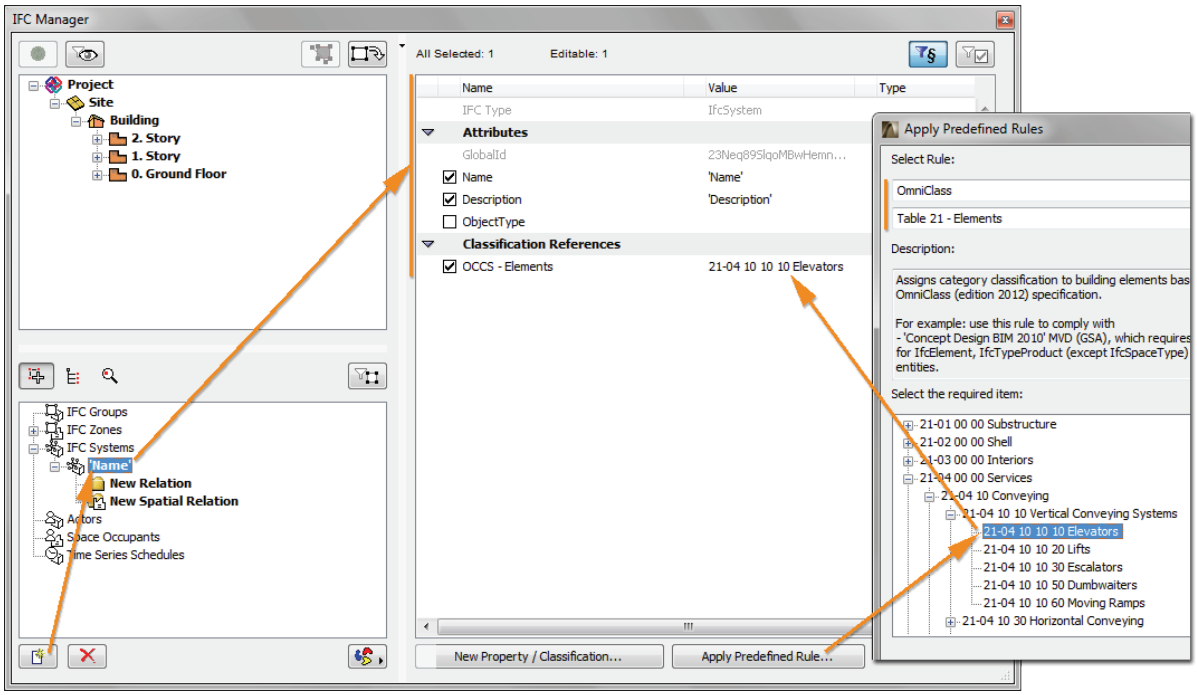


Figure 28 COBie 2 System (IFC System) definition in the *IFC Manager*

To assign ARCHICAD elements having the same function (for example elevators) to a newly created IFC System entity, just drag and drop them to the “New Relation” folder of the IFC System entity.

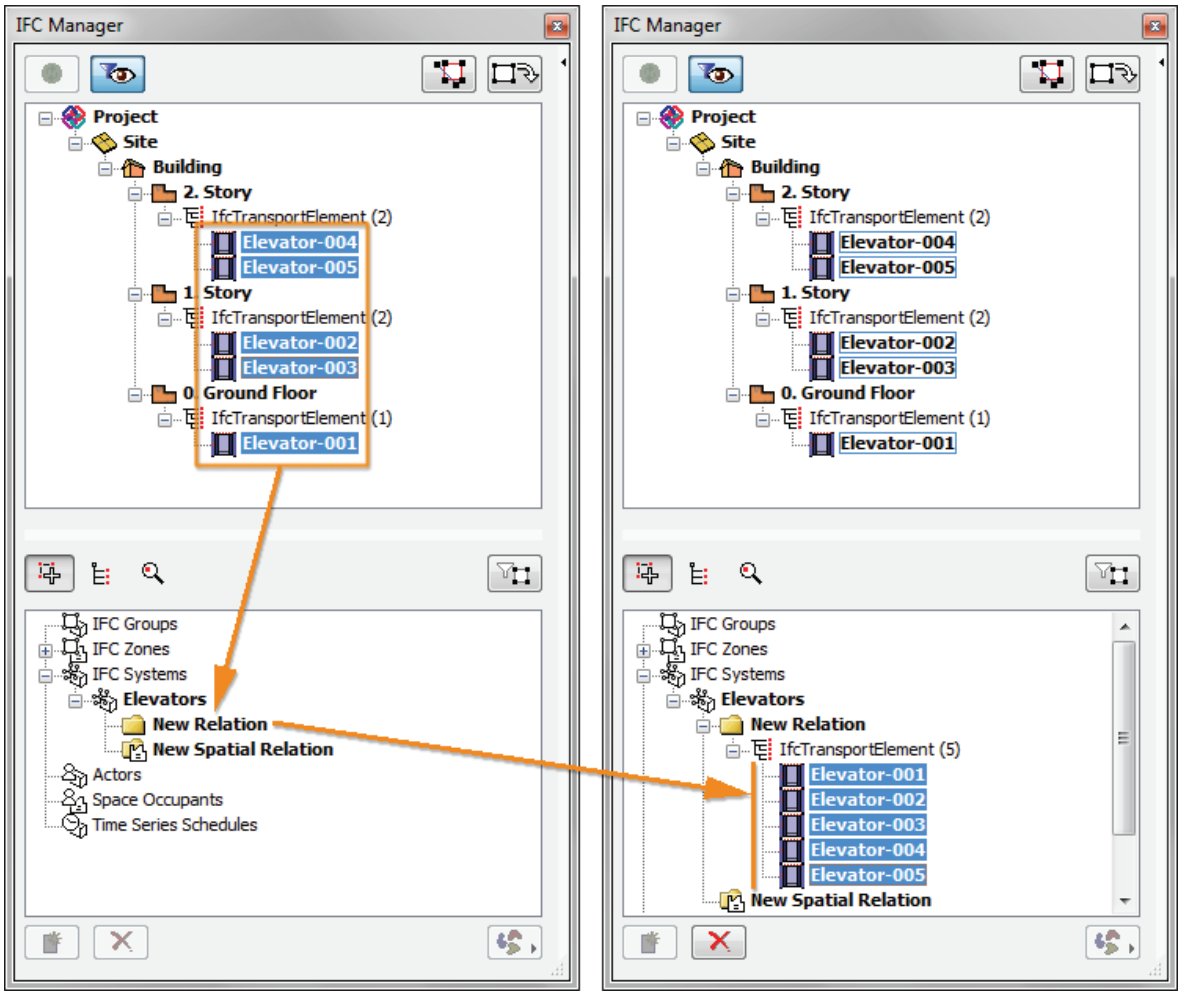


Figure 29 Grouping ARCHICAD elements in an IFC System (*IFC Manager*)

Note Hotlinked Components (ARCHICAD elements) cannot be grouped in IFC Systems. To assign an IFC System entity to these elements, you must break their Hotlink module connection.

MEP Systems defined with the GRAPHISOFT MEP Modeler Add-On can be also handled as IfcSystem inside an ARCHICAD project. Just create a new IfcSystem (as mentioned above) and choose the predefined MEP System name from the available list  .

If an IFC model exported by an MEP application is merged to an ARCHICAD project, you can also manage its MEP systems and their properties in the *IFC Manager*.

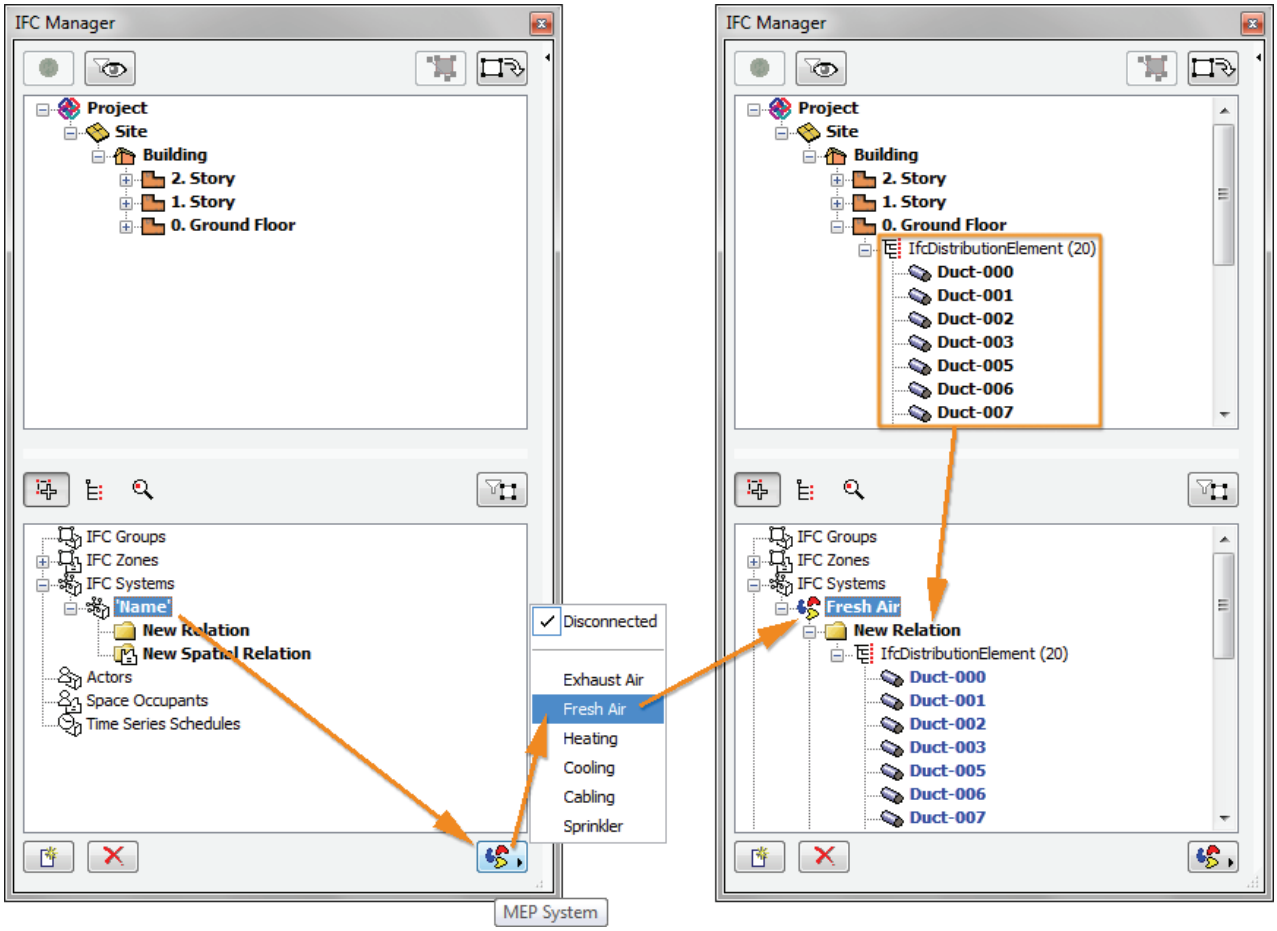


Figure 30 Conversion of a MEP Modeler System to an IFC System (*IFC Manager*)

Document / Attribute / Coordinate / PickLists

Data are extracted automatically from the IFC model exported by ARCHICAD.

Assembly / Connection / Spare / Resource / Job / Impact / Issue

These data types are not requested from a design application by the COBie 2 rules, and they are not available in ARCHICAD projects either. The table contents should be manually filled out in the spreadsheet, if they are required.

COBie 2-enabled IFC Model Export

The COBie-required IFC model/file can be exported easily by using the export set (so-called “IFC Translator”) optimized for the COBie 2 requirements. Just use the *Save as* command (*File* menu) together with the translator called “COBie 2 Export” from either a Floor Plan or a 3D window.

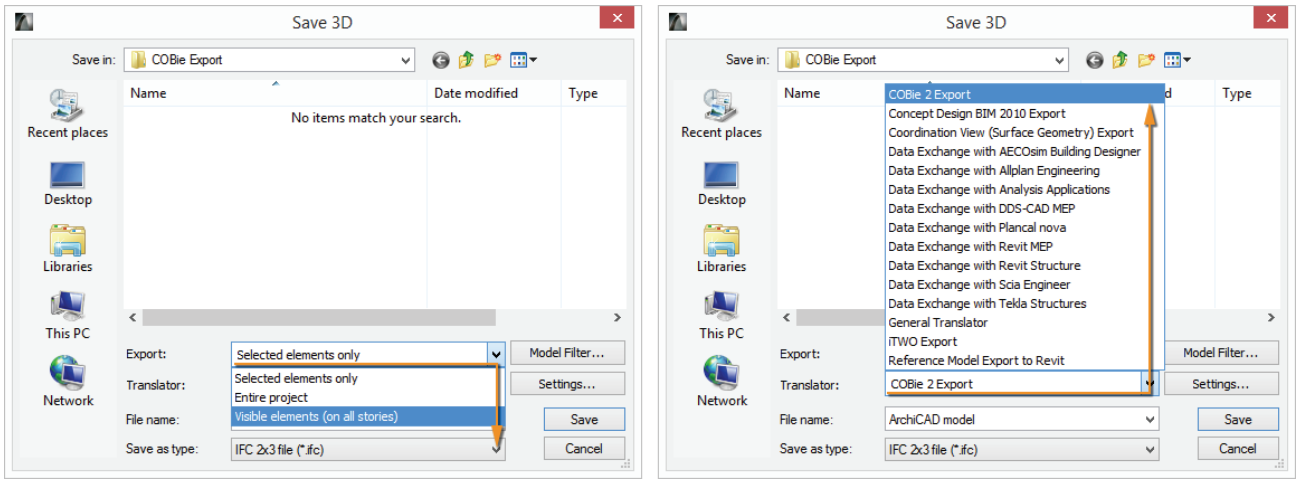


Figure 31 IFC model export optimized for COBie 2 requirements (*Save as*)

The steps of IFC model export to COBie 2:

1. Filter elements for the export (use the following options):
   - *Selected elements only* (available only if elements have been selected):
     elements selected in the current view (the view that was open when you issued the *Save as* command) will be exported.
   - *Entire project*:
     entire model (regardless of any selection, and regardless of the shown/hidden status of the elements’ layers) will be exported.
   - *Visible elements*:
     the visible elements in the current view will be exported, regardless of any selection. “Visible” means all elements that are set to be displayed (due to *Layer Settings*, *Model View Options*, *Partial Structure Display*, etc.).

   Note If you issue the export command from Floor Plan view (“Visible elements (on all stories)”), this choice includes all elements currently displayed on every story of the project.

   If you choose “Visible elements”, make sure that ARCHICAD Zones are set to be displayed in the current view. For example, if you are saving from the 3D window, make sure that Zones are “on” in the *Filter and Cut Elements in 3D* dialog box (*View* > *Elements in 3D View*).

2. Choose the “COBie 2 Export” Translator, in which export settings are fine-tuned for the COBie 2 requirements. The meaning of the major export options (*Derived model data to export* options) of the “COBie 2 Export” Translator is the following (check *Data Settings*):

- *Space containment*:
  It exports the relationship between ARCHICAD Zones (IfcSpaces) and their contained Object (Furnishing, MEP Equipment, etc.) and Morph elements. “Contained” means that the midpoint of an Object or Morph is within an ARCHICAD Zone in the 3D space. This option is required for exporting COBie “Space” data of the Component worksheet.
- *IFC base quantities (size, area and volume):*
  It exports elements’ base quantities required by COBie 2.
- *IFC Space boundaries*:
  It exports the logical connection between ARCHICAD Zones (IfcSpace) and the building elements that enclose them. This option is also required for exporting COBie “Space” data of the Component worksheet.

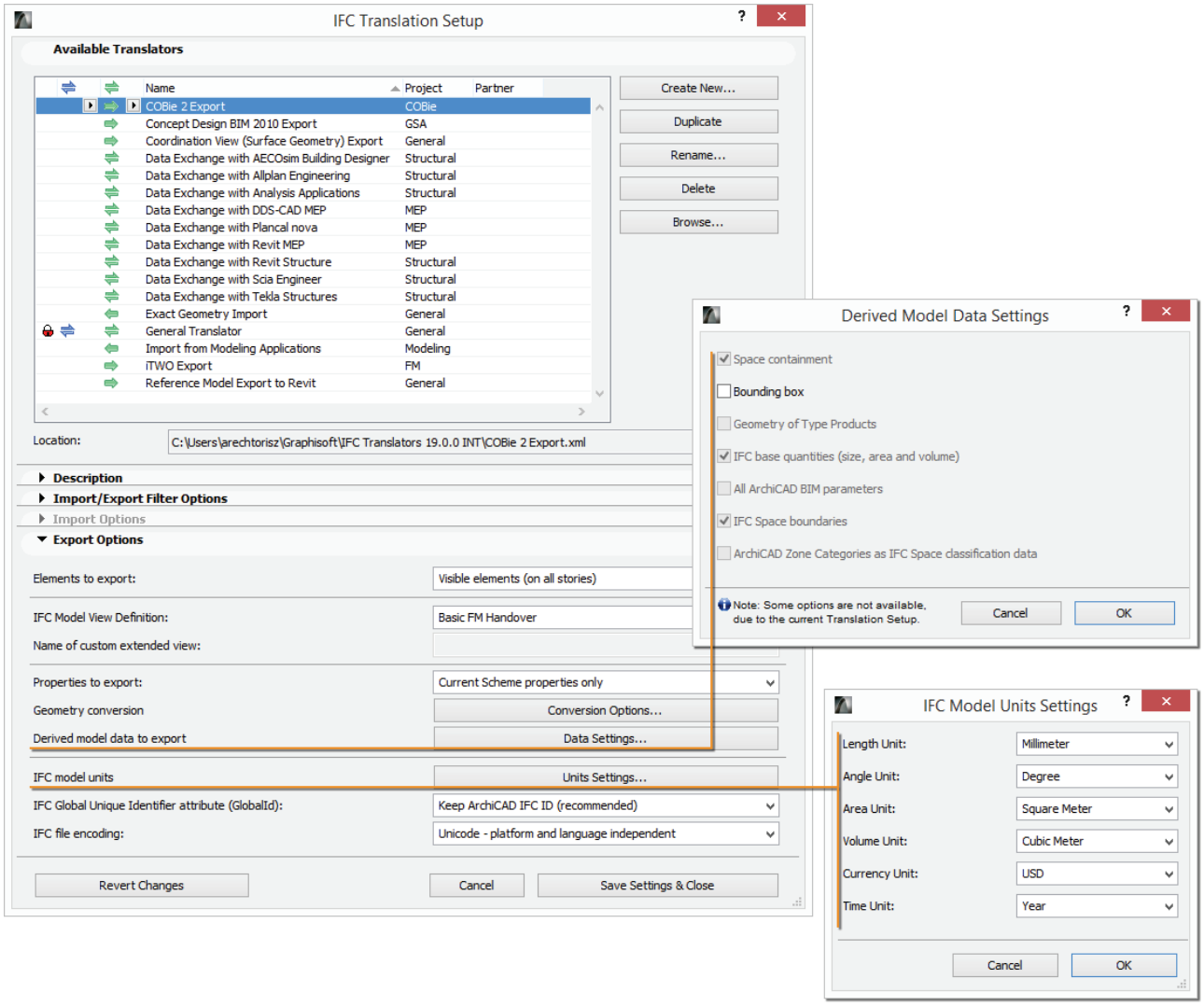


Figure 32 Major export options of the “COBie 2 Export” IFC Translator (*IFC Translation Setup*)

3. Set the model units (“IFC model units”).

4. Define file name.

5. Set the file format to .IFC (or .IFCXML depending on the file support of the COBie 2 spreadsheet converter programs). See the How to Create a COBie 2 Spreadsheet chapter.

6. Click *Save*.

How to Create a COBie 2 Spreadsheet

An external application is needed to convert an ARCHICAD IFC file to an XML-type COBie 2 spreadsheet format.

The IFC and COBie 2 spreadsheet formats for the IFC 2x3 Basic FM Handover MVD capture the same information content and can be transformed forth and back across the different formats. COBie from IFC transformations are implemented according to the so-called "COBie Responsibility Matrix" document. This document defines the mapping rules between the IFC file and the COBie spreadsheet and which IFC entity types are allowed to be converted to COBie Component and Type entities ("Type Assets" and "Component Assets" tables).

A number of dedicated tools can be used to execute the transformations, such as the free *COBie Toolkit* application, developed by Engineer Research and Development Center (ERDC). The COBie Toolkit can be downloaded from here.

ERDC COBie Toolkit, developed for the COBie FM Handover project, includes the transformer tool and the configurations to map IFC data to COBie 2. The conversion can be done in two easy steps.

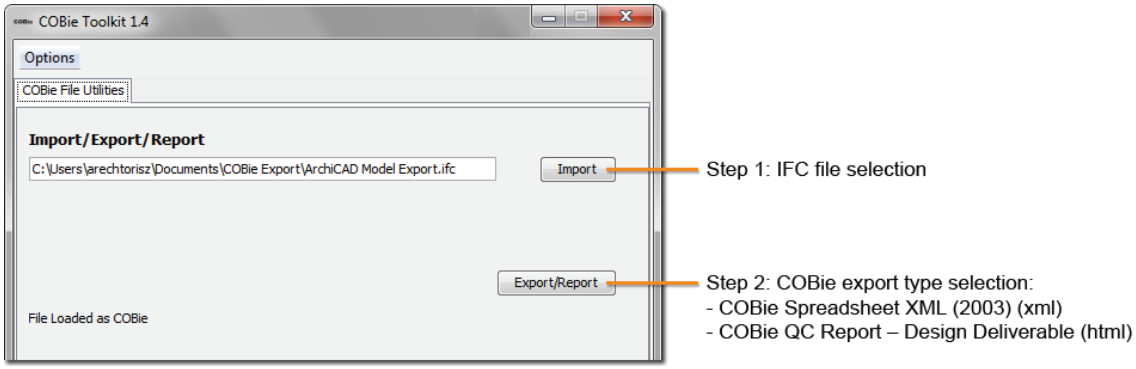


Figure 33 The steps of IFC to COBie conversion (*COBie Toolkit*)

Hint If you choose the "COBie QC Report - Design Deliverable" export format, the application checks for any missing items in your IFC model. This quality check presents a summary of various checks performed on the COBie data: e.g. at least one Component for each Type, unique names for Types, at least one Floor, etc.

In case of very large IFC models, modify the memory options (by increasing the "Max Heap Size", "Max Perm Size" and "Stack Size") in the COBie Toolkit Starter dialog.

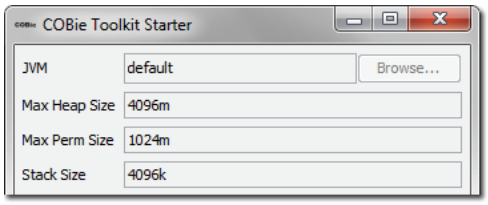


Figure 34 An example for memory settings

Based on the COBie Responsibility Matrix ("Type Assets" and "Component Assets" tables), the COBie Toolkit ignores some IFC entity types (e.g. IfcWallType, IfcWall, IfcWallStandardCase) by default. If you

would like to allow all IFC entity type conversion to COBie Types and Components, change the "COBieIDMPlugin" mode to "None" at "Options".

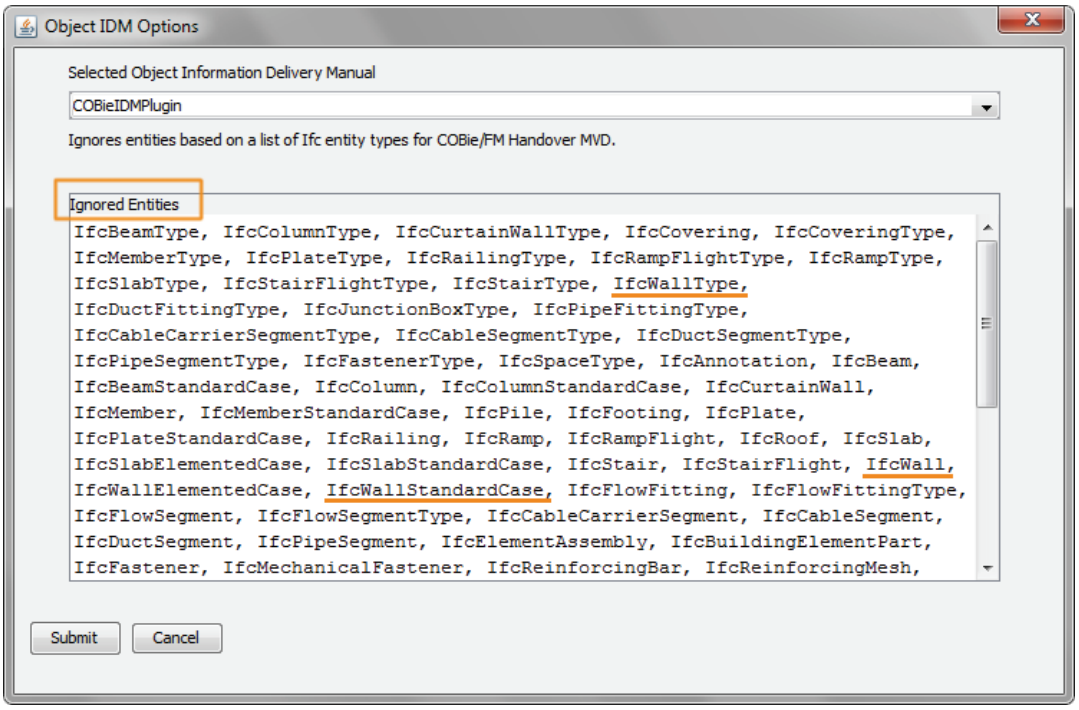


Figure 35 IFC Entity and Type Products ignored in the IFC to COBie conversion by default