TIMEPAC Academy

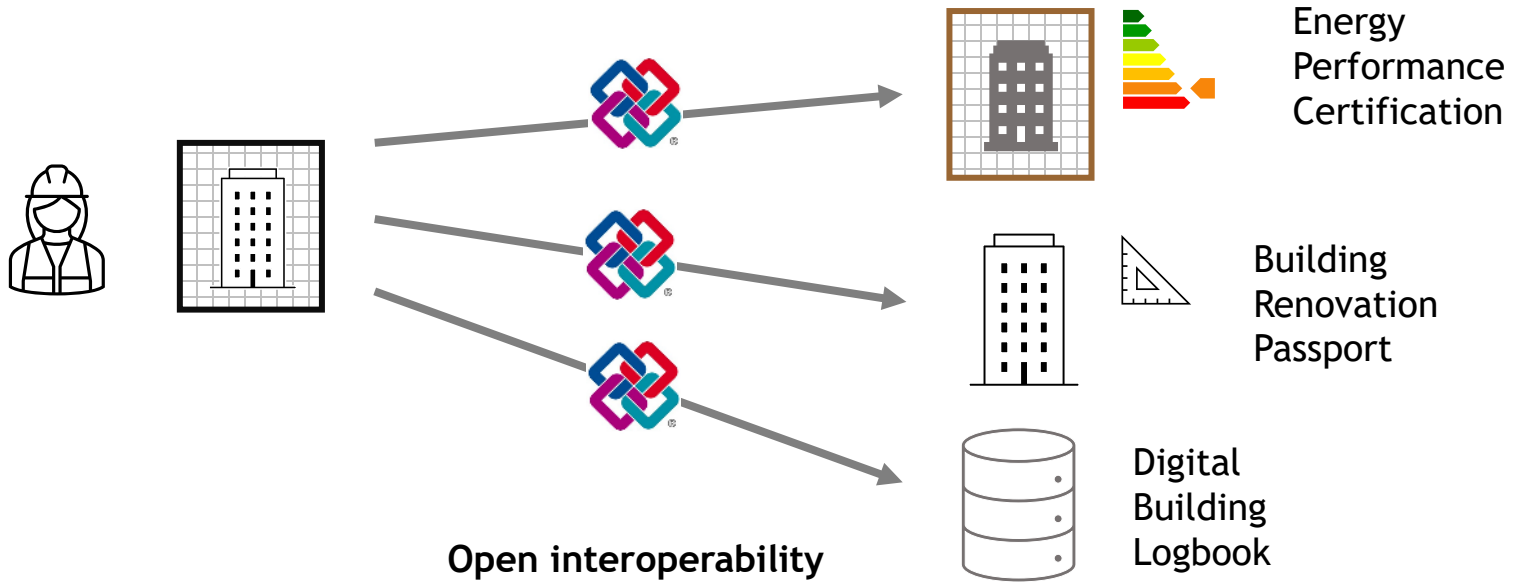
Session 4

Generating enhanced EPC with BIM data

Presenter: Álvaro Sicilia and Adirane Calvo (La Salle-URL)

5 March 2024

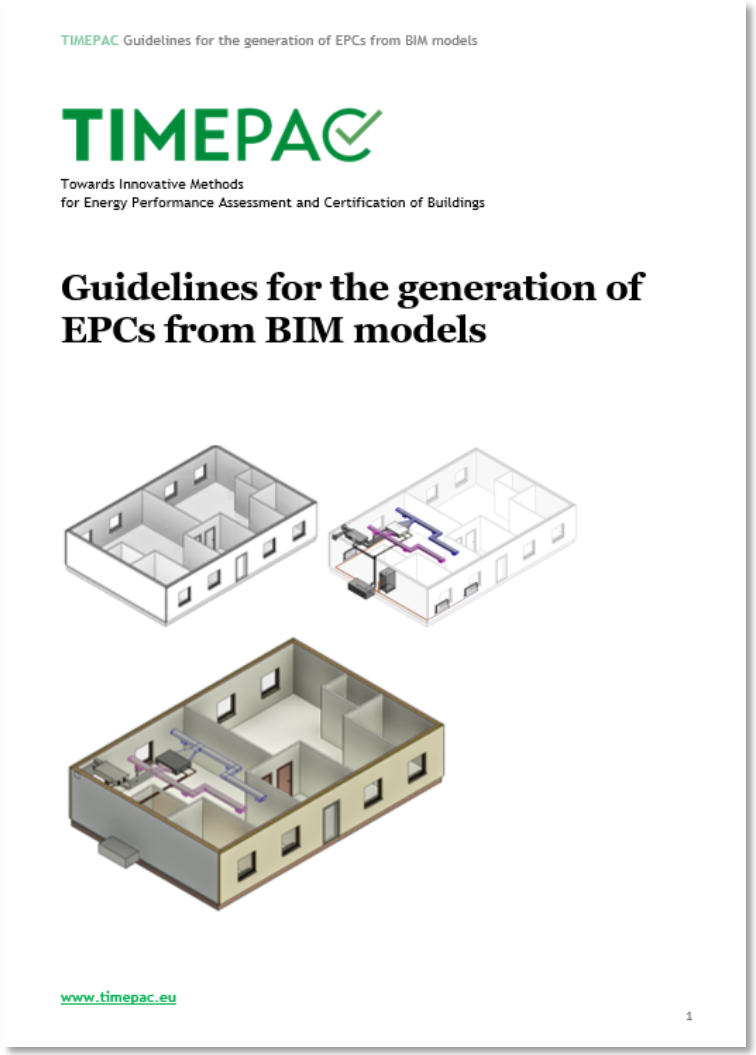
Generating enhanced EPC with BIM data



Generating enhanced EPC with BIM data

Guidelines for the generation of EPCs from BIM with a focus on open interoperability

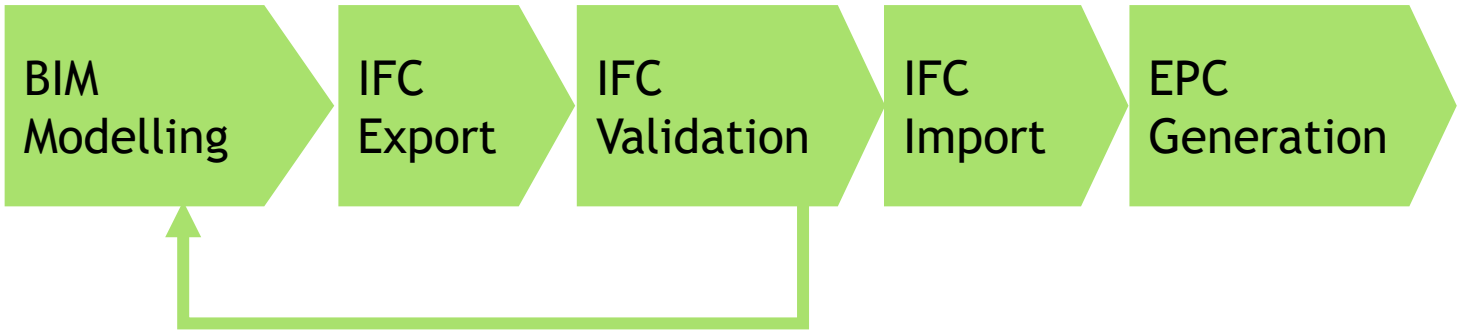
- Check that all data required for an EPC are present in the BIM model.
- Ensure that the BIM model has been generated in such a way that it can be imported by EPC tools.



BIM-EPC guidelines

Scenarios:

- A BIM model must be created
- A BIM model has already been created



Tools

BIM
- CYPE
- Revit

IFC Viewers
- usBIMviewer
- Solibri
- BIMserver.center

EPC
- CYPETHERM HE Plus
- Edilclima EC700
- ETU-Software

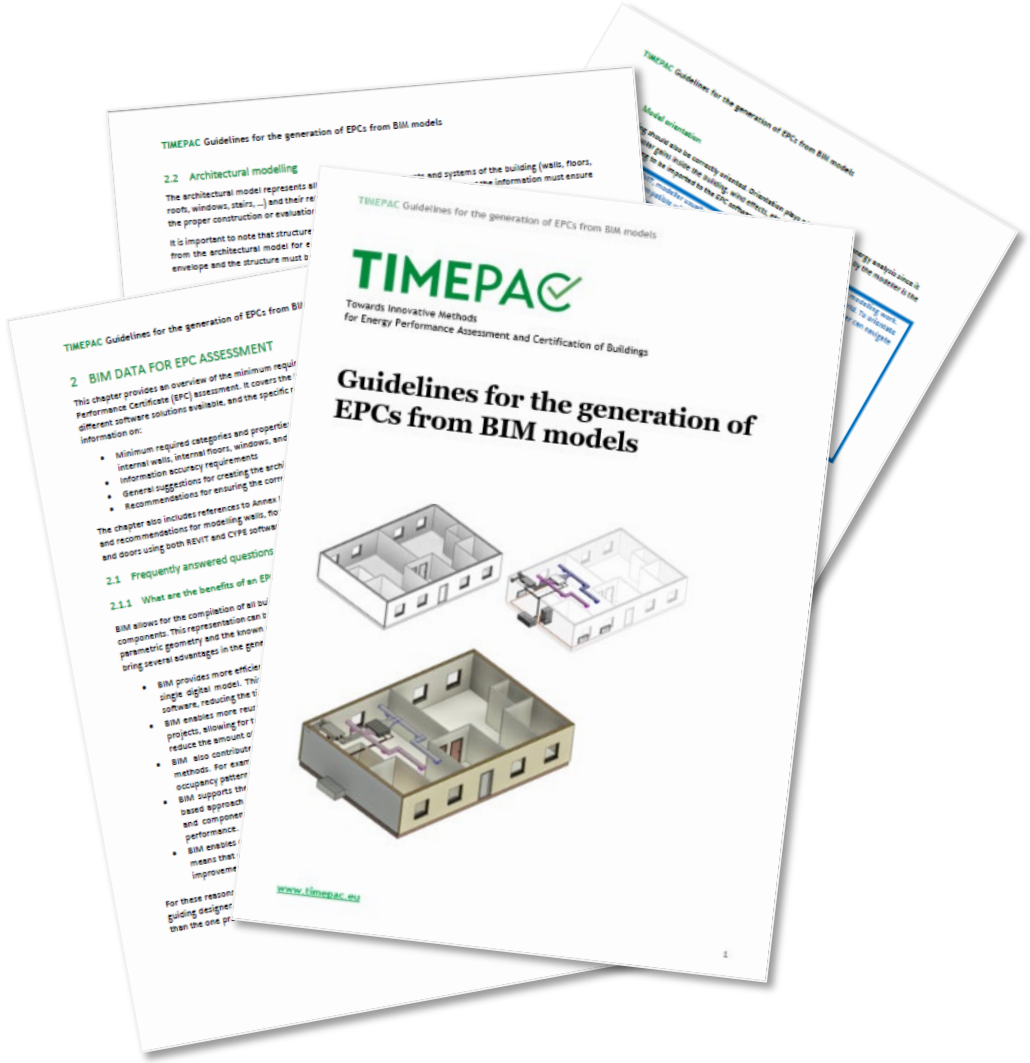
BIM-EPC guidelines

BIM data for EPC assessment

Information Exchange for EPC assessment

In Depth study

Annexes



BIM data for EPC assessment

FREQUENTLY ASKED QUESTIONS

ARCHITECTURAL MODEL

ANALYTICAL MODEL

MEP MODEL

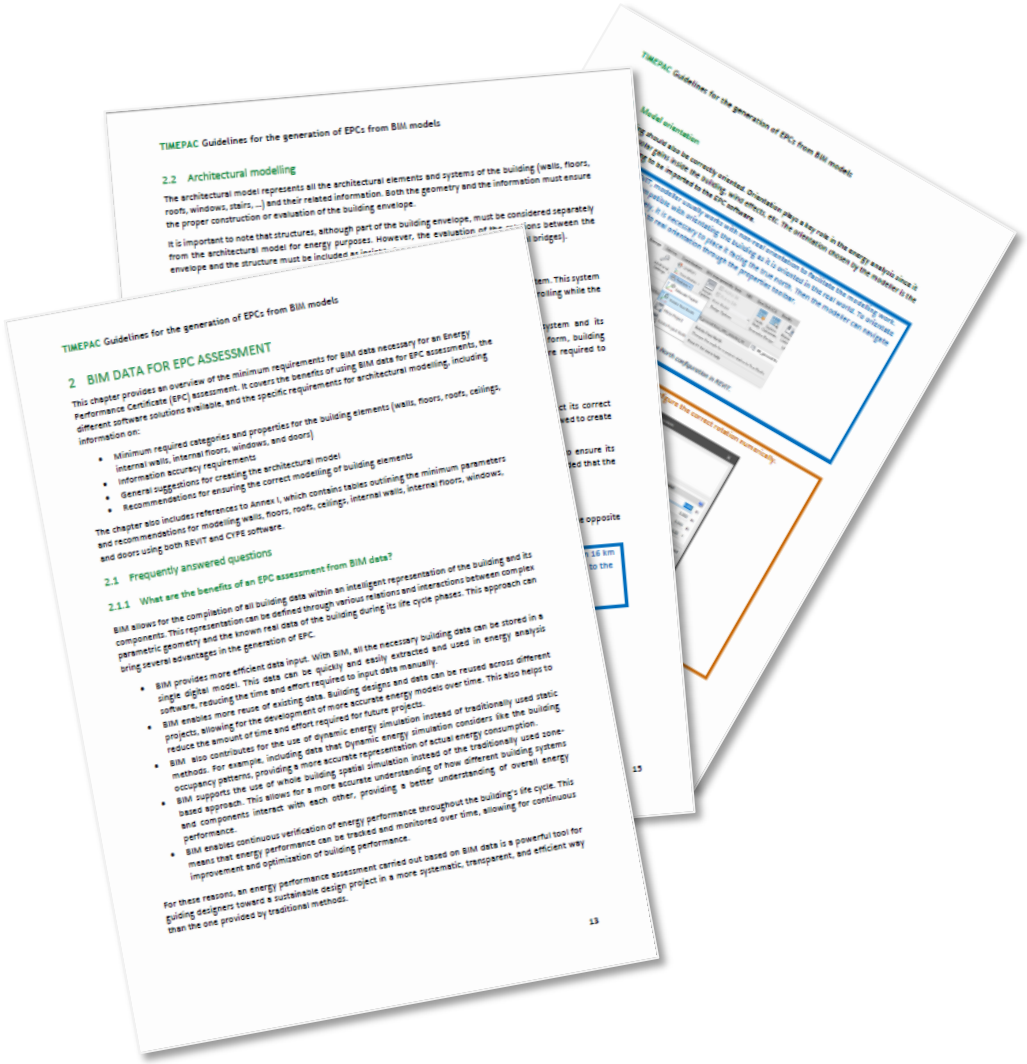
INTRODUCTION TO THE MODEL

GENERAL RECOMMENDATIONS

MINIMUM REQUIRED ELEMENTS

DEFINITION AND EXPLANATION

RECOMMENDATIONS



Guidelines: architectural / analytical / MEP modelling

2.2.4 Model orientation

The building should also be correctly oriented. Orientation plays a key role in the energy analysis since it defines the solar gains inside the building, wind effects, etc. The orientation chosen by the modeller is the one that is going to be imported to the EPC software.

In the case of REVIT, modeller usually works with non-real orientation to facilitate the modelling work. However, this is compatible with orientating the building as it is oriented in the real world. To orientate the building adequately, it is necessary to place it facing the true north. Then the modeller can navigate from REVIT orientation to real orientation through the properties toolbar.

Figure 5. True North configuration in REVIT.

In the case of CYPE Architecture it is necessary to configure the correct rotation numerically.

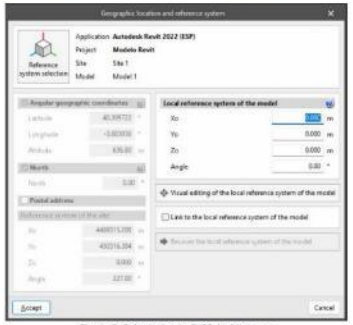


Figure 6. Orientation in CYPE Architecture.

2.2.5 Model division in levels

the building envelope (for example, thermal bridges). They are typically modelled with the BIM software tools for floors or roofs.

- Non-structural fixed solar protections: solar protections that are attached to the building structure, but they cannot be removed, such as slats. Some BIM software have special tools for modelling these solar protections, while with others, they must be modelled as a special family.
- Mobile solar protections: solar protections that are attached to the buildings structure or are part of the windows and have mechanisms to be deployed only when necessary, such as blinds or mobile canopies. These types of solar protections usually need to be modelled as a family or part of a family.

The modelling of solar protections allows EPC software to consider the irradiation obstacles. In addition to their formal requirements and modelling (thickness, shape, dimensions, ...), EPC software often require other parameters. The minimum required parameters depend on the EPC software according to each country's regulations. However, some possible parameters are absorption coefficient, thermal transmission coefficient, and solar coefficient for non-structural fixed solar protections and mobile solar protections.

The general recommendations to ensure adequate modelling of the solar protections are as follows:

- Structural solar protections: It is recommended to model the structural solar protections in a way that reflects the reality of the construction. Some of the recommendations applicable to the floors and roofs also need to be applied here, especially those related to joints and encounters to define the thermal bridges.
- Non-structural fixed solar protections: It is recommended to model these kinds of protections to ensure that the correct shadowing patterns are assumed by the EPC software. Use the adequate modelling tools available in the chosen BIM software. If the BIM software has not a specific tool for modelling, use the appropriate family categories to model. If there is no specific family category for the solar protections, use nested families based on the generic metric family template and select the building element in which the solar protections will be placed (e.g., walls or windows) as host. If the solar protections can be adapted to the changes of the irradiation over time (e.g., adjustable slats), creating scheduling and positioning parameters is recommended to inform the EPC developer about the solar protection behaviours, since usually the EPC software cannot automatically read these parameters.
- Mobile solar protections: In contrast, modelling mobile solar protections is complicated. Moreover, since their protection usually depends on human behaviour, their evaluation is complicated and reduced only to specific periods of time when heat gains generate high levels of discomfort for users. Therefore, it is recommended only to model them only if strictly necessary. If they are not modelled, it is recommended to include some parameters to ensure the EPC developer is aware of their existence and con evaluate the best option to introduce them within the EPC software. An example of these parameters in the case of blinds could be: reference to the existence of blind within the window family, whether it is external or internal, whether it has insulation in the roller shutter box or not, the thermal transmittance correction factor of the blind, the solar transmission correction factor when the blind is used, and colour of the blind.

Annex I. The architectural model contains Table 1.1.3. which outlines all the minimum parameters and their recommendations for ensuring compliance during the modelling of solar protections using REVIT software.

Annex I. The architectural model contains Table 1.2.3. which provides the minimum parameters and recommendations necessary for ensuring compliance during the modelling of solar protections using CYPE software (including CYPE Architecture and Open BIM Construction systems).

5 ANEXOS

5.1 Anexo I – Information requirement for the architectural model

Note: The information shown in the following tables is an example of the basic geometrical and parametrical rules, tips, and tools to model a building with the minimum characteristics to ensure its evaluation with an EPC software. To learn how to model with REVIT or CYPE, please use the REVIT or CYPE guidelines for modelling.

5.1.1 Table 1.1.1 - Minimum required category for Building Envelope in REVIT

Minimum required category: Building Envelope
BUILDING WALLS (EXTERIOR AND INTERIOR)
CONSTRAINTS *Not all constraints will be explained, but the ones having a great impact in the IFC when exported if they are inadequately defined.
Location Line
The reference plan in which the wall is positioned. The importance of this line is related to the structure and insulation layer of the wall.
It is recommended to reference the wall to the exterior core layer plan of the walls in relation to the floors.
Base Constraint
The base level on which the wall resides.
It is recommended to split the walls by levels. Therefore, the wall in different levels will start in the immediate below level.
Top constraint
The level that the wall will reach.
It is recommended to split the walls by levels. Therefore, the wall will end in the immediate upper level.
Room Bounding
If selected, the wall will be used as room boundary.
It is recommended to check it in all walls (interior or exterior) that limit a space.
Cross Section
Defines the inclination of the wall. It could be chosen between Vertical (vertical walls), Inclined (inclined walls) and trapezoidal (walls inclined only in the exterior part, the interior part, or both). In CYPE architecture the inclination of the wall is defined manually by drawing the wall by points.
It is important to keep in mind that extremely inclined walls could cause problems with the unions between walls-windows/doors (see windows constraints for more information) and between walls-slabs/roofs. Besides, the trapezoidal option only will be available in case the variable parameters of the layers are checked within the *Structure* tab (See Structure Concept). It is recommended to check the joins with other elements for this type of walls. However, since some EPC software are not capable of evaluating trapezoidal walls, this option must not be chosen. In contrast, an equivalent thickness of a vertical wall must be defined.

Guidelines: architectural / analytical / MEP modelling

General recommendations

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Explanation

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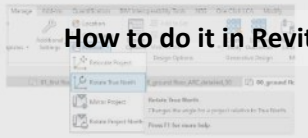

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How to do it in Revit

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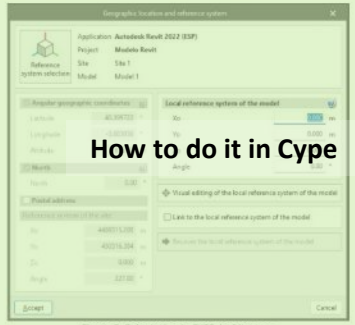

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How to do it in Cype

2.2.5 Model division in levels

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Minimum required elements

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Recommendations

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Detailed Modelling instructions

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Annexes

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Detailed Modelling instructions for Revit and Cype

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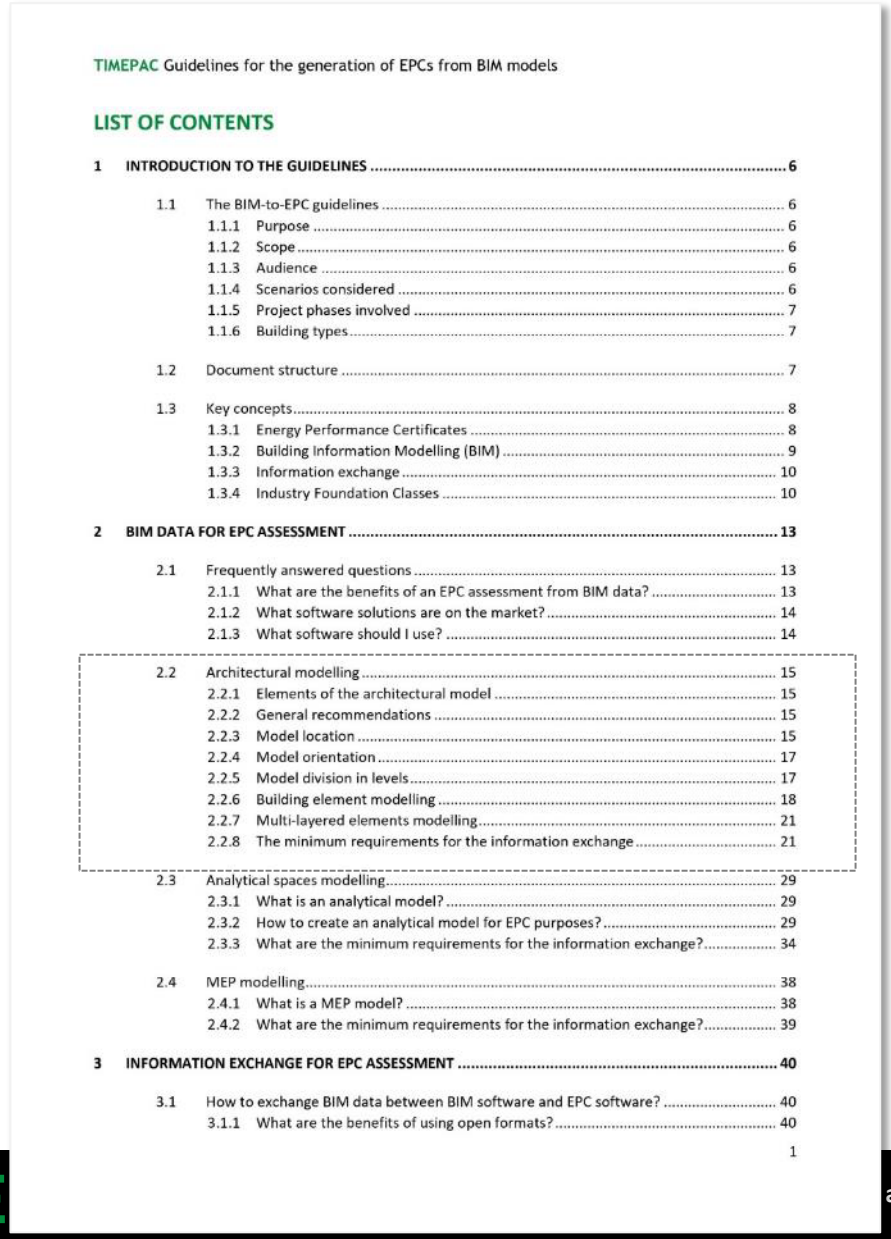
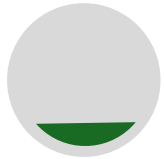
Guidelines: Architectural model



TIMEPAC Guidelines for the generation of EPCs from BIM models

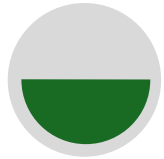
LIST OF CONTENTS

1



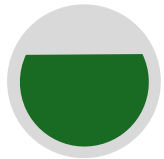
What is the architectural model?

Architectural elements and constructive systems of the building: **Geometry + Information**



General recommendations

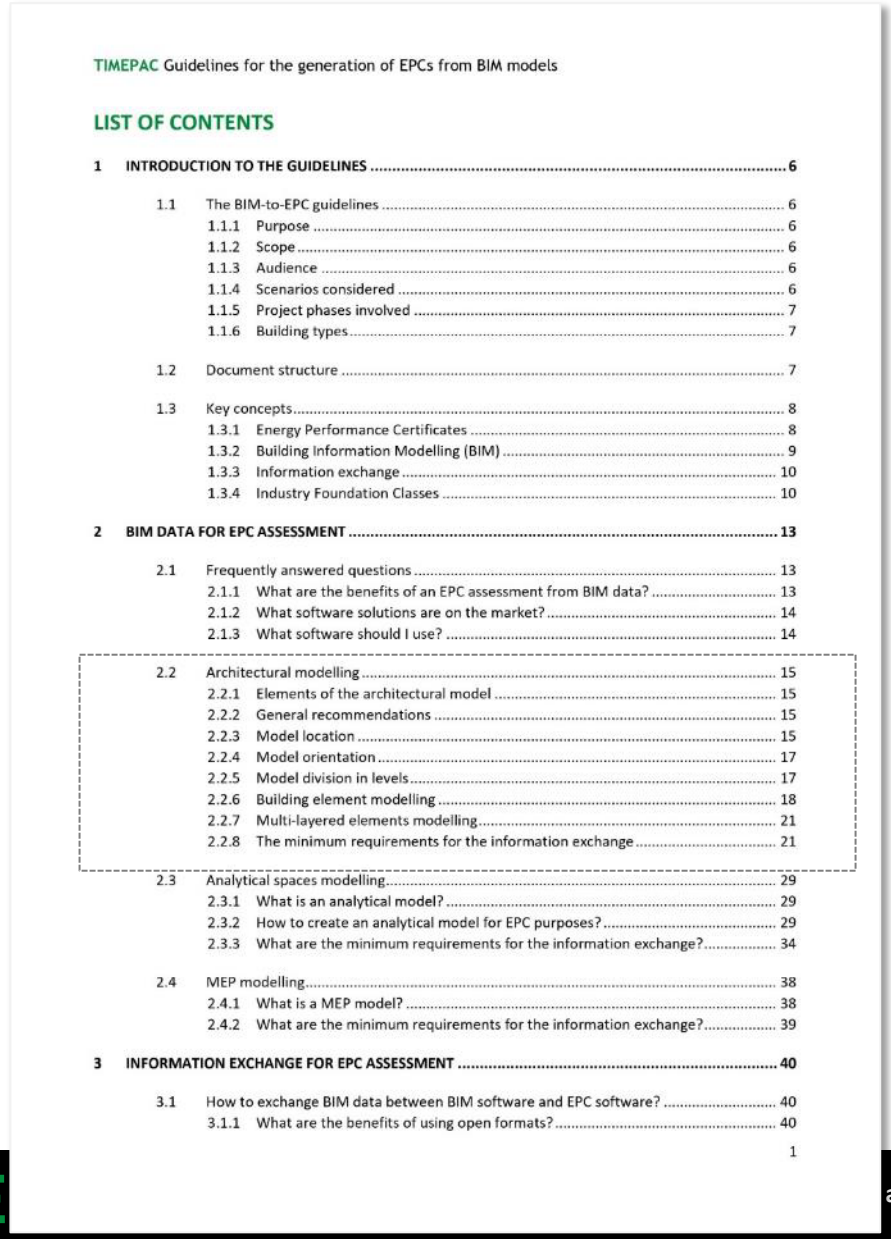
- Model location
- Model orientation
- Division in levels
- Elements' modelling
- Multi-layered elements' modelling



Minimum required elements

What are and how to model the architecture minimum required elements for energy purposes: **Geometry + Information + Detailed modelling**

Guidelines: Architectural model



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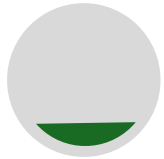

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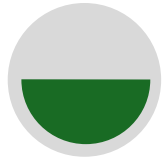

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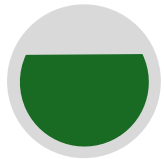

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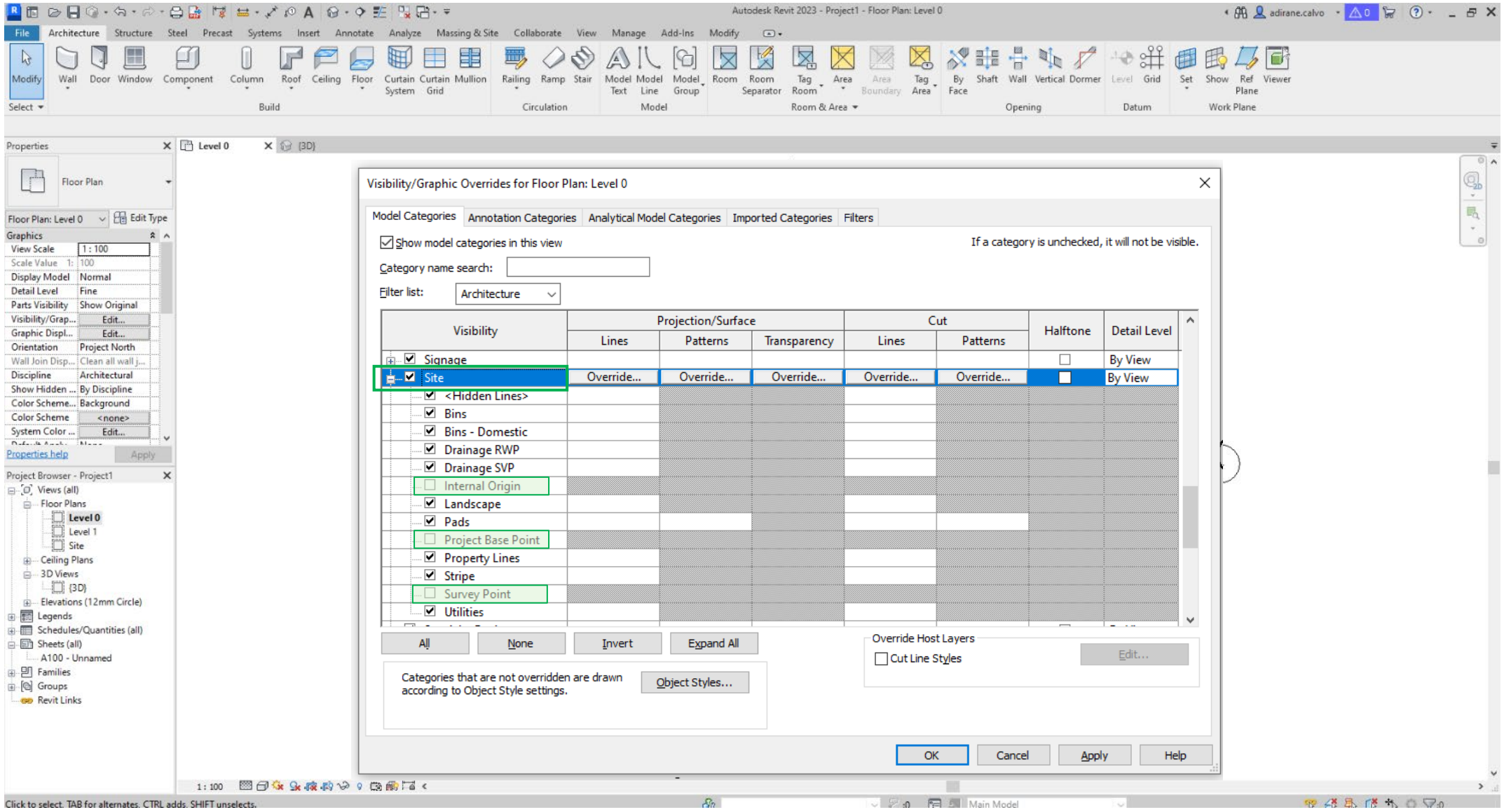
What are and how to model the architecture minimum required elements for energy purposes: **Geometry + Information + Detailed modelling**

Architectural model: General recommendations – Location



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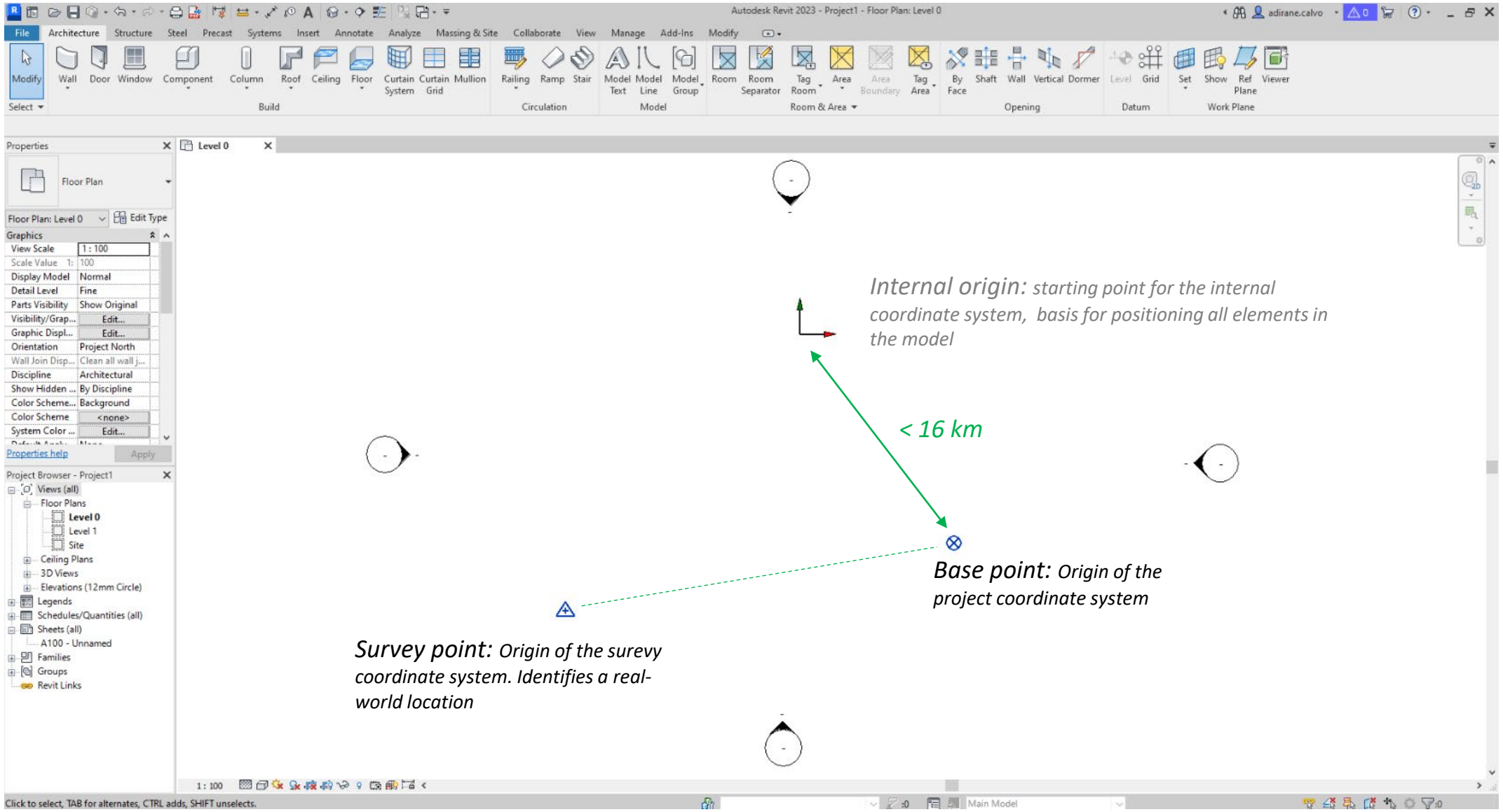

Architectural model: General recommendations – Location

TIMEPAC Guidelines for the generation of EPCs from BIM models

2.2.3 Model location

In addition, the model must be located as close as possible to the internal origin of the software. The opposite can cause problems with the correct functioning of the software.

In the case of REVIT, it must be placed with the appropriate reference to the base point (less than 16 km from the base point). It must also be correctly located to the agreed survey point geo-referenced to the real site of the building based on the coordinate system, to place the building within the correct geolocation.

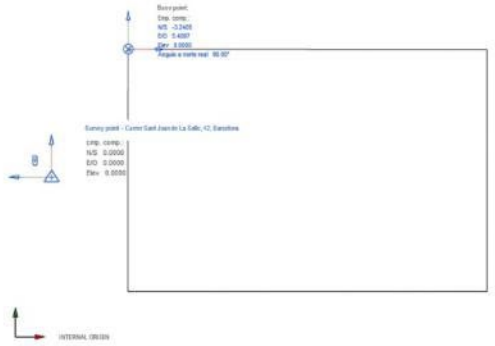

Figure 3. Internal Origin, Survey point, and Base point in REVIT.

Figure 4. Coordinates point and origin in CYPE Architecture.

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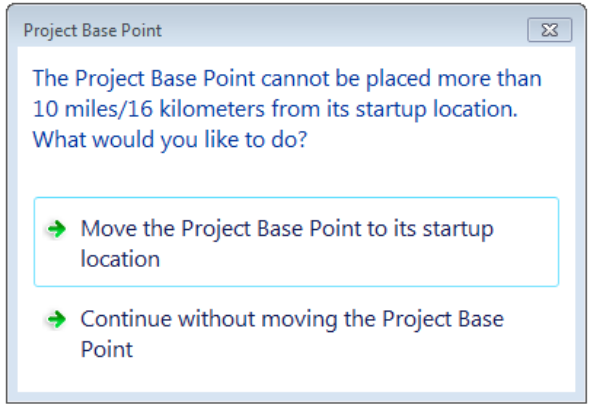
Why?

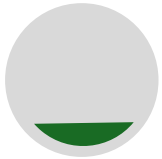
Functioning problems: calculation and display of the geometry.

The software will notify with the following message:



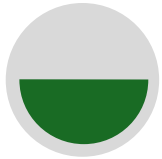
Guidelines: Architectural model

Architectural model minimum categories, elements, and Information Accuracy		
Minimum Required Categories	**Minimum Required Elements**	**Information Accuracy**
Building envelope	• Exterior walls, Floor in contact with the ground (ground slabs), Roof • Ceilings, Interior floors, Interior walls • Windows, Doors	High - Including detailed and accurate geometry, and detailed information about its physical and thermal characteristics
Materials	• Material layers of each part of the building envelope	High - Including detailed and accurate information of its physical and thermal characteristics
Solar protections	• Overhangs • Slats • Other exterior solar protection	Low - Including general geometry and some physical information



What is the architectural model?

Architectural elements and constructive systems of the building: **Geometry + Information**



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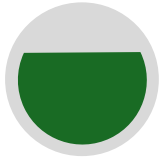
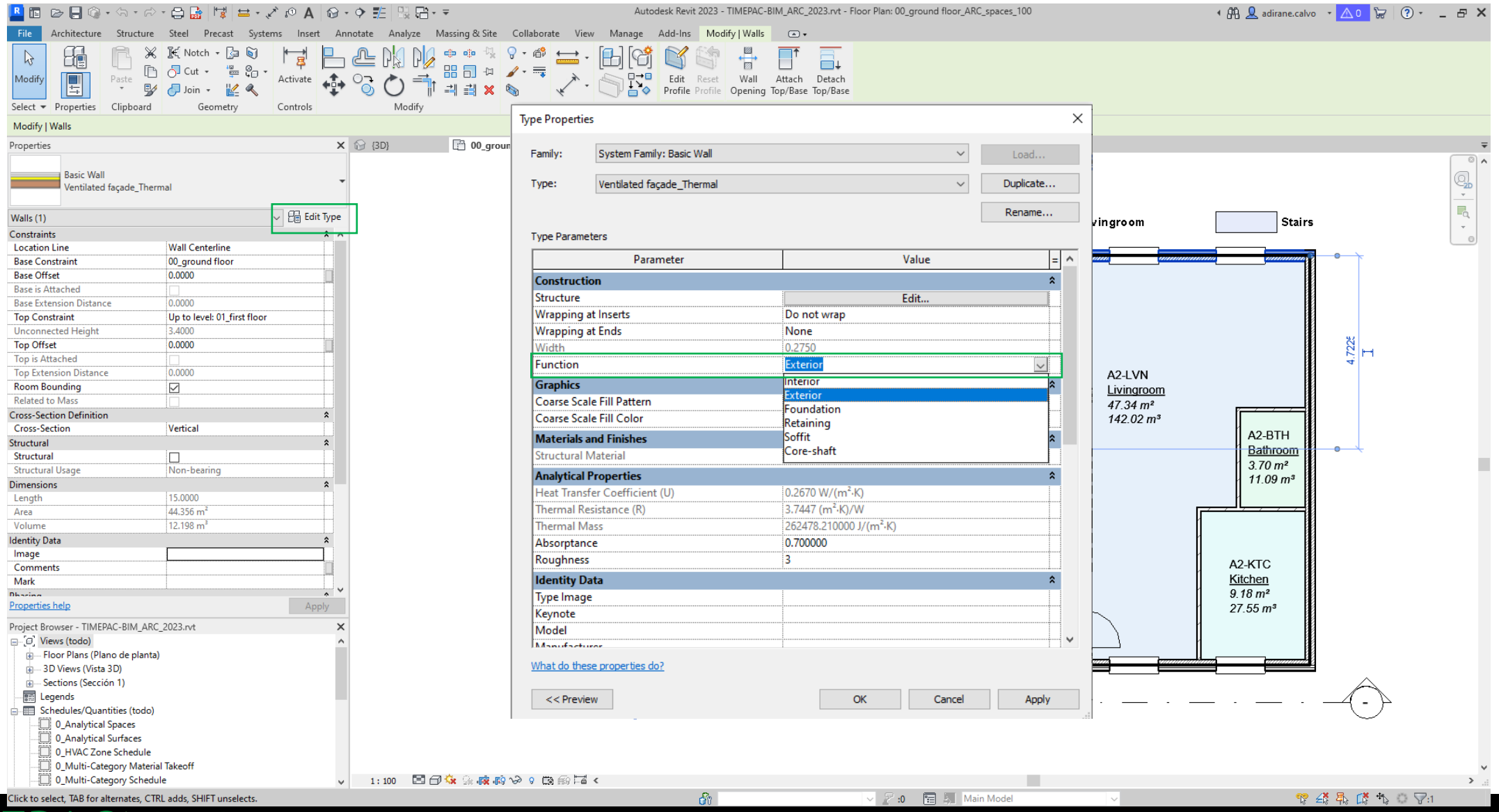


Minimum required elements

What are and how to model the architecture minimum required elements for energy purposes: **Geometry + Information + Detailed modelling**

Architectural: Minimum Required Elements – Wall Function



Architectural: Minimum Required Elements – Wall Function

2.2.8.1 Exterior walls, external floors, and roofs

Walls, floors and roofs, among others, define the building envelope. Exterior walls, floors, and roofs define the passive system of the building. Besides, interior walls and floors contribute to separate different inner conditions with different comfort requirements. An adequate passive system of the building can protect the users from exterior conditions while adequate interior partitions can ensure individual comfort. When modelling the building envelope, the modeler must ensure that the model represents the reality of the construction; otherwise, the results from the EPC will not correspond to real perceptions inside the building.

However, for energy purposes, the model of a wall must not have a large quantity of information within it, as this would be impractical for the EPC developer. That is because the EPC software are made thinking on specific criteria of the construction elements that can be useful for simulation purposes, while other information that does not apply within the simulation is ignored and, therefore, not read.

To avoid the time-consumer process of modelling according to the exact characteristics of the real walls, and to ensure the EPC software is capable of reading the information within the model, it is necessary that the envelope contain certain minimum information. This minimum information is the basic one to being able to develop an energy analysis within the EPC software. This information is usually modelled in the form of parameters for the elements (walls, floors, and roofs), but it can also be the result of the modelling process.

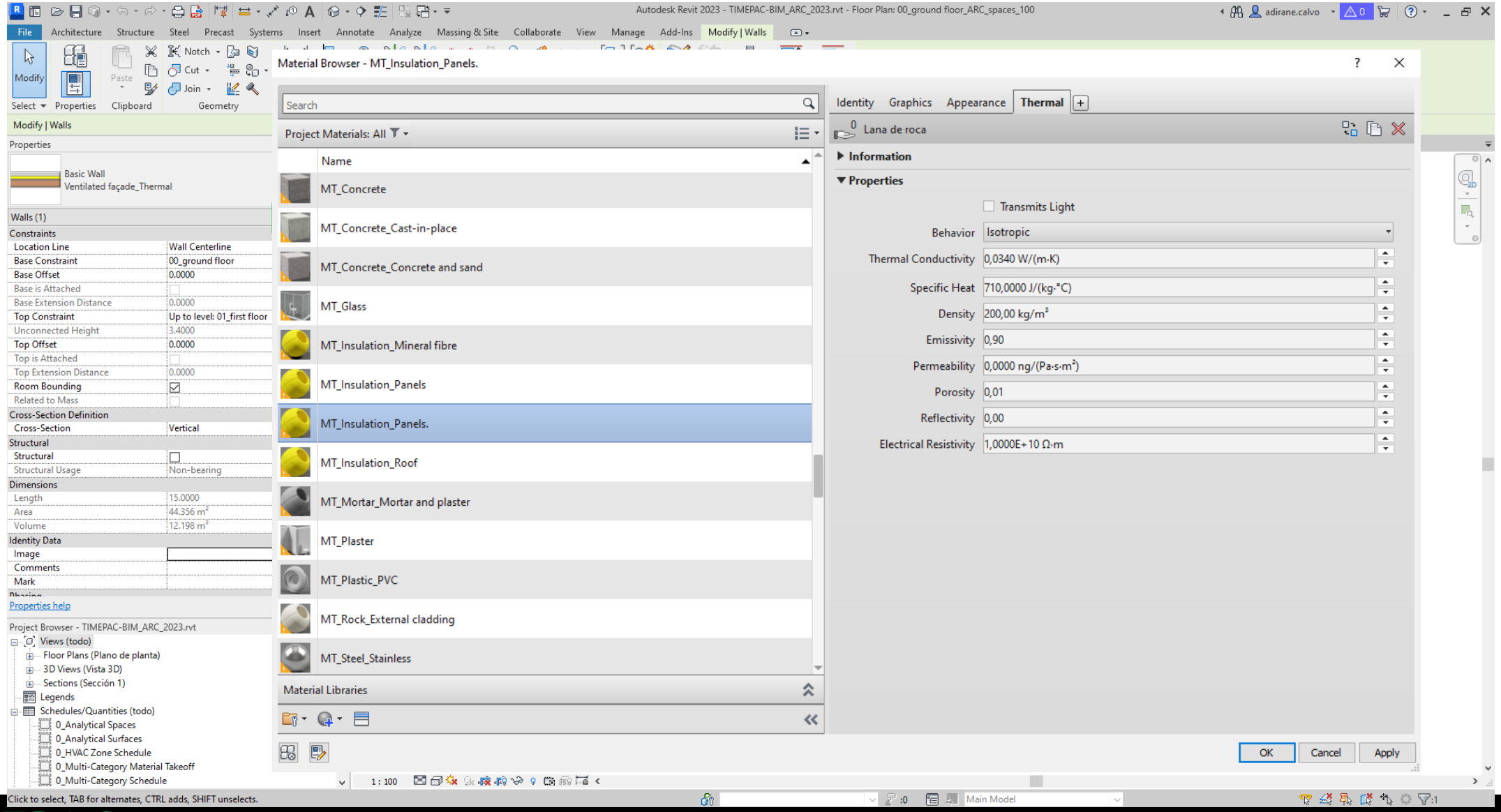
- Specification of what kind of environment the elements is separating. In this case, most software divide the elements into exterior or interior elements. By ensuring this, the modelling software can communicate with the simulation software to define the interior limits.
- Incorporation of thermal and physical properties of the element. Is not necessary to include all properties of the element in the energy model, but only those necessary to develop the EPC. The data included depends entirely on the EPC software to be used and whether it can automatically introduce the information within the EPC model. If this is the case, the physical and thermal data introduced in each element of the architectural model must be those that are required by the EPC software. However, if the EPC software cannot automatically include these data, the situation of the architectural model information must be the same to ensure the EPC developer can read all the information in the IFC file without making any assumptions. In general, minimum physical and thermal properties for walls, floors, and roofs that most software require are: thickness, density and/or mass, thermal transmittance, heat capacity per unit area, specific heat, and absorption coefficient.
- Incorporation of thermal and physical properties of each layer of the element, in the case of multi-layered elements. As with the elements' properties, the data included depends entirely on the EPC software to be used and whether it can automatically introduce the information within the EPC model, or the EPC developer needs to know them to manually introduce them. In general, the minimum physical and thermal properties required by most software for each layer of the walls, floors, and roofs are: type of layer (air chamber, water barrier, structure…), thickness, density and/or mass, specific heat, conductivity and/or thermal resistance, vapour resistance, and absorption coefficient.
- Continuity and representation of joints are important considerations for the building envelope. The building envelope must ensure continuity to enclose inner spaces like in real construction. Gaps in the modelled envelope can produce different problems with the simulation software and can result in incorrect EPC results. On the other hand, different encounters between elements must be solved representing real construction since they are key to defining construction thermal bridges. Even though the EPC software usually cannot interpret the exact composition and layers order of the joints, it can consider that a thermal bridge can occur at a specific point. Thus, the BIM modeller must ensure that both elements producing the encounter are correctly defined for two reasons: (1) the modeller needs to ensure that the EPC software recognizes the joint in the model as a thermal bridge in the case the software does it automatically, and (2) the modeller needs to ensure that the EPC developer knows the

Why?

EPC software needs the function to evaluate and simulate heat transfer parameters.

Communication with the simulation software: avoid to consider the wrong requirements for the wall and will cause some errors (i.e. not including the element).

Architectural: Minimum Required Elements – Materials' Data



Architectural: Minimum Required Elements – Materials' Data

2.2.8.4 Materials

Knowledge of the properties of the material is necessary to define the layers of each building element. The physical and thermal properties of the materials, along with the thickness of the layer of the material forming the element, define the element thermal behaviour.

Typically, BIM software provide material libraries from which the modeller can choose different options. However, these options can generally be modified to adapt the material to reality.

To correctly developing an EPC, the BIM modeller must ensure that all materials information is present and visible in the model after export. Generally, minimum information about materials mostly coincides with the requirements for the layers of the element.

- The incorporation of thermal and physical properties of each material that compose each layer of each building element is necessary. The data included depends entirely on the EPC software used, and whether it can automatically introduce the information into the EPC model or if the EPC developer needs to manually input the data. In general, the minimum physical and thermal properties for materials are the type of material, density and/or mass, specific heat, conductivity, permeability, and absorptivity or emissivity.

The general recommendations to ensure adequate modelling of the materials are:

- Use the most similar materials from the material library if the specifications of the material used in the building element are unknown. In some cases, the material libraries offer BIM modeller complete construction systems that can also be used to approximate BIM construction to reality.
- If the material is well-known to the BIM modeller, use the most similar material within the library to create a personalised material based on the general parameters of the library material. This ensures the creation of an adequate material.
- If the material documentation is sent by the material producer, upload it to the library material of the BIM software to include it in the model. This option is only possible in that BIM software that allow loadable material elements. Ensure that all the required physical or thermal parameters are included, and if not, include them with the options of each software.
- Some BIM software still cannot export the material characteristics to IFC. On the other hand, some EPC software use the material characteristics to compound and transform the IFC building elements into their internal building elements. If this is the case, two recommendations can be followed. This option can be used inform the EPC developer of the material characteristics, but they will not be automatically exported to the EPC software. Therefore, manual work must be done by the EPC developer.
  - Create parameters associated with the building elements with the minimum required information that the material must have. The way to do this depends on the BIM software used. Please refer to the IFC exportation chapter for the REVIT exportation following this option.
  - Change the reference name of the material to include minimum information about the specific material or to allow the EPC developer to choose from the existing materials library in the EPC software. The reference name of the material is always exported; therefore, it can be a great reference for the EPC developer to choose the correct material in the EPC software. An example of a possible material name structure is:

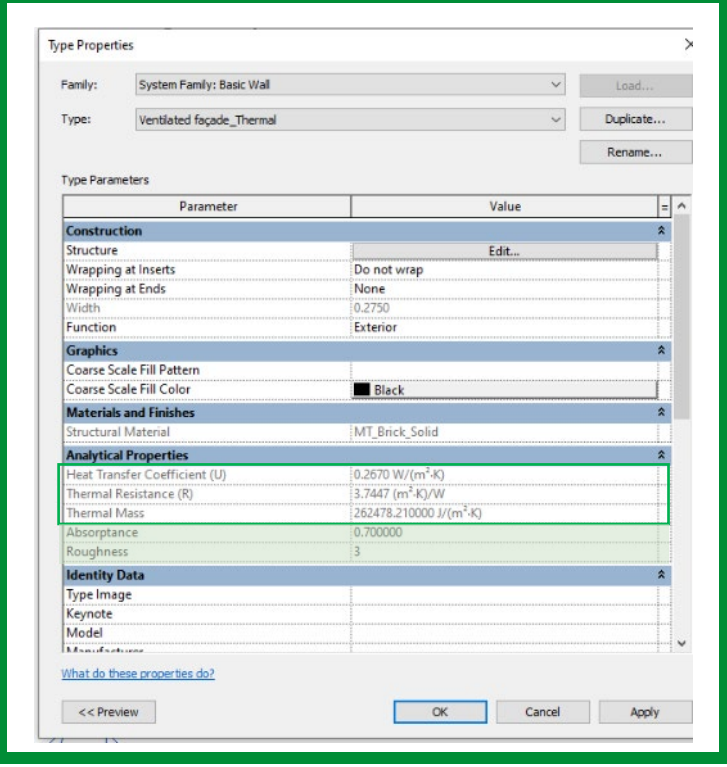
ID_Material category_Material Type_Description
MT_Insulation_EPS_d23,λ0.035,c1740

d: Density: 23 kg/m³

Why?

Analytical properties of the envelope are automatically calculated and added to the element properties.

This information can be then shared and exchanged.



Architectural: Minimum Required Elements – Detailed modelling

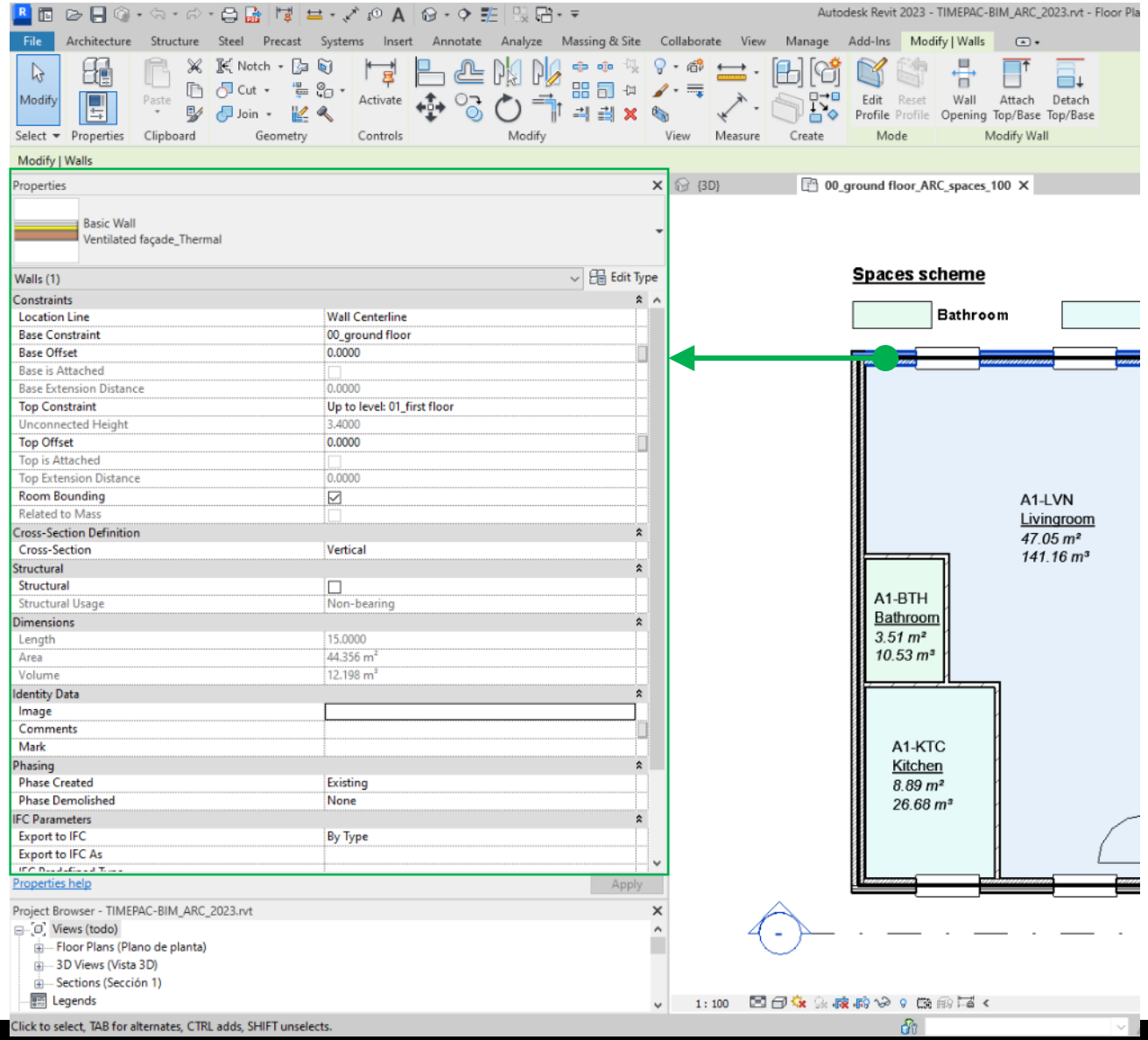
5 ANEXOS

5.1 Anexo I – Information requirement for the architectural model

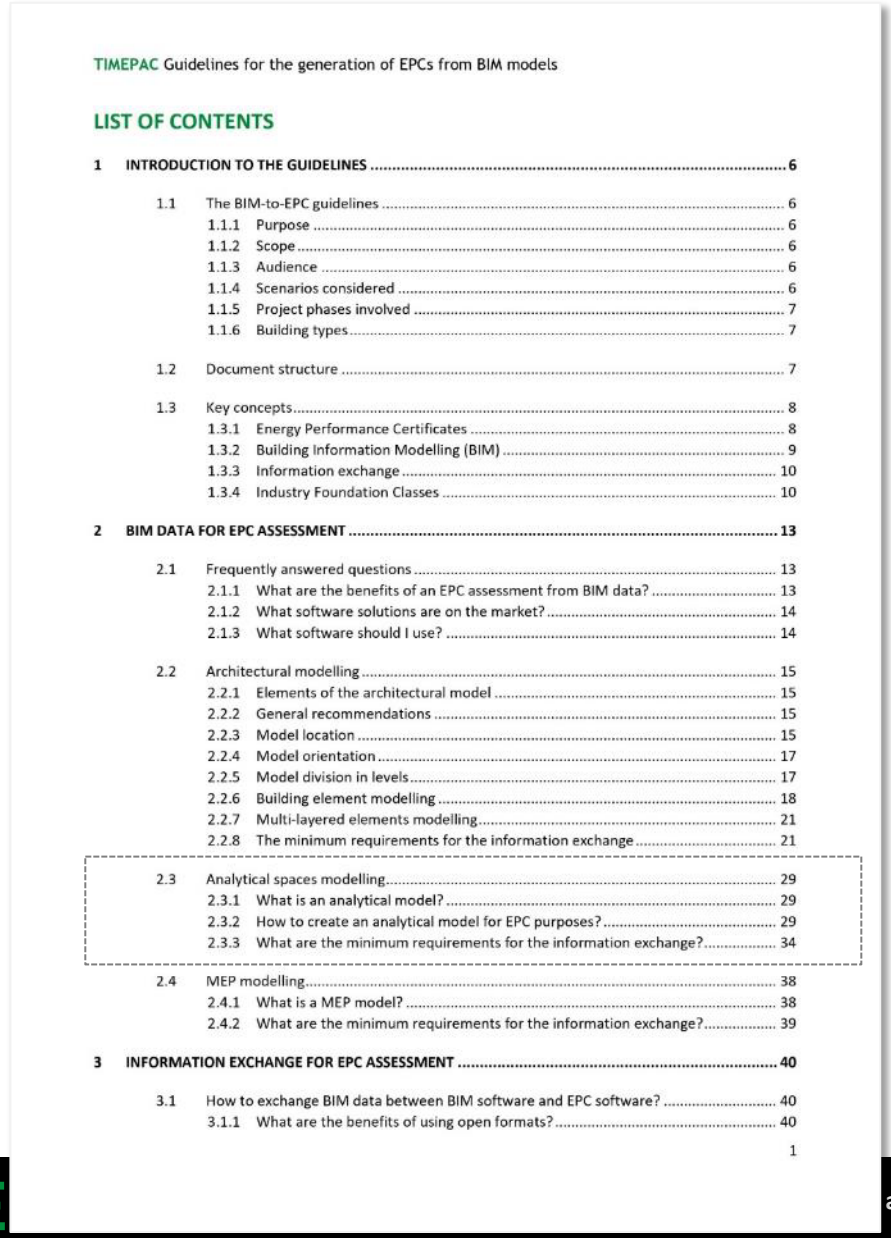
Note: The information shown in the following tables is an example of the basic geometrical and parametrical rules, tips, and tools to model a building with the minimum characteristics to ensure its evaluation with an EPC software. To learn how to model with REVIT or CYPE, please use the REVIT or CYPE guidelines for modelling.

5.1.1 Table 1.1.1 - Minimum required category for Building Envelope in REVIT

Minimum required category: Building Envelope
BUILDING WALLS (EXTERIOR AND INTERIOR)
CONSTRAINTS *Not all constraints will be explained, but the ones having a great impact in the IFC when exported if they are inadequately defined.
Location Line
The reference plan in which the wall is positioned. The importance of this line is related to the structure and insulation layer of the wall.
It is recommended to reference the wall to the exterior core layer plan of the walls in relation to the floors.
Base Constraint
The base level on which the wall resides.
It is recommended to split the walls by levels. Therefore, the wall in different levels will start in the immediate below level.
Top constraint
The level that the wall will reach.
It is recommended to split the walls by levels. Therefore, the wall will end in the immediate upper level.
Room Bounding
If selected, the wall will be used as room boundary.
It is recommended to check it in all walls (interior or exterior) that limit a space.
Cross Section
Defines the inclination of the wall. It could be chosen between Vertical (vertical walls), Inclined (inclined walls) and trapezoidal (walls inclined only in the exterior part, the interior part, or both). In CYPE architecture the inclination of the wall is defined manually by drawing the wall by points.
It is important to keep in mind that extremely inclined walls could cause problems with the unions between walls-windows/doors (see windows constraints for more information) and between walls-slabs/roofs. Besides, the trapezoidal option only will be available in case the variable parameters of the layers are checked within the *Structure* tab (See Structure Concept). It is recommended to check the joins with other elements for this type of walls. However, since some EPC software are not capable of evaluating trapezoidal walls, this option must not be chosen. In contrast, an equivalent thickness of a vertical wall must be defined.



Guidelines: Analytical model



TIMEPAC Guidelines for the generation of EPCs from BIM models

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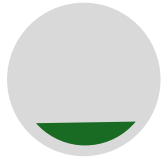
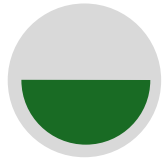


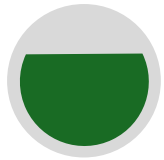
What is the analytical model?

Simplified digital representation of a building and its physical and functional characteristics.



General recommendations

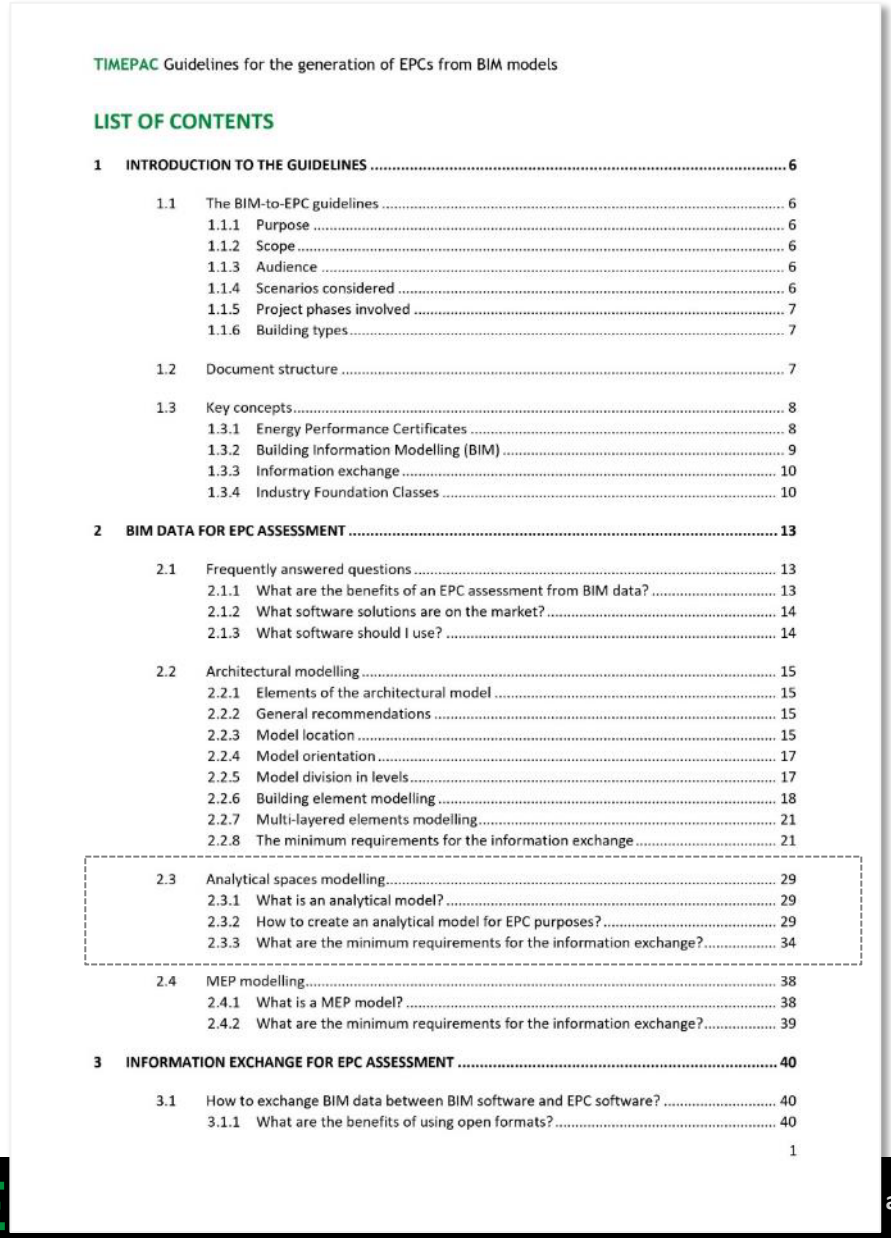
- Spaces
- Thermal Zones



Minimum required elements

What are and how to model the analytical minimum required elements for energy purposes: **Geometry + Information + Detailed modelling**

Guidelines: Analytical model



TIMEPAC Guidelines for the generation of EPCs from BIM models

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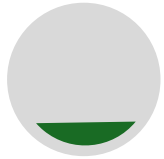

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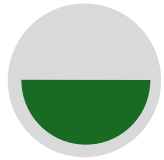
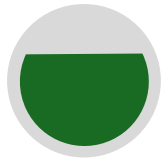


General recommendations

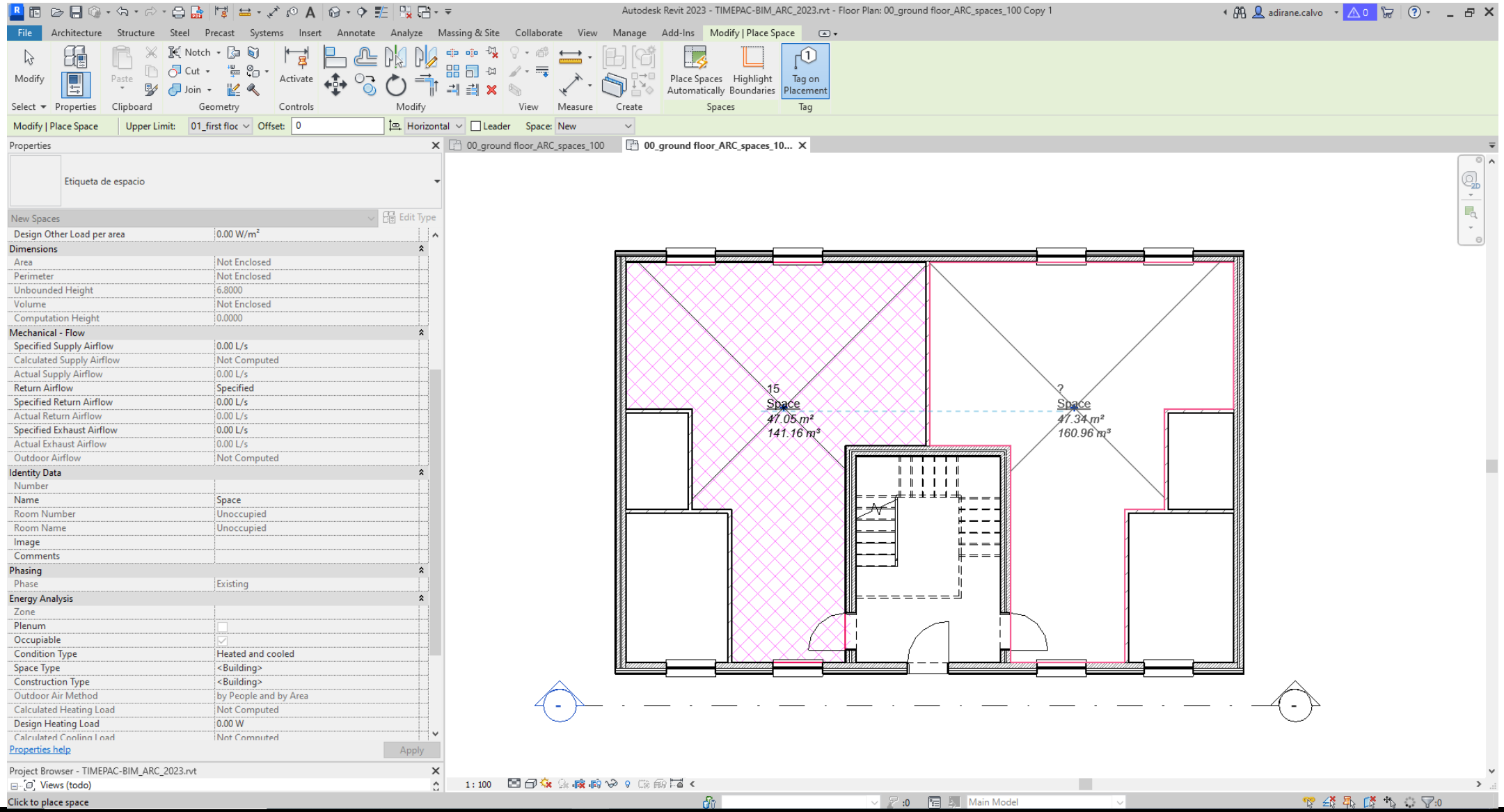
- Spaces
- Thermal Zones



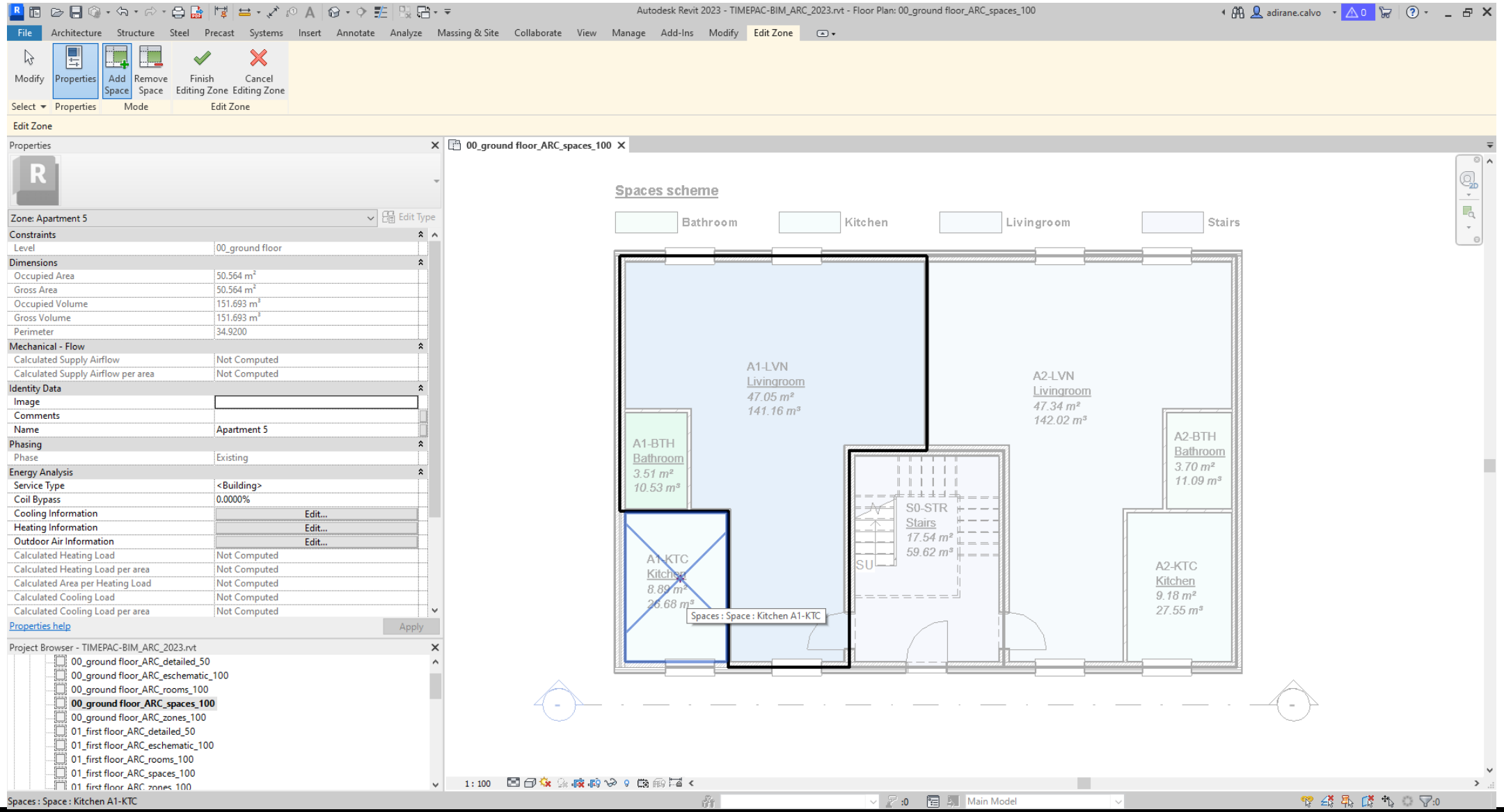
Minimum required elements

What are and how to model the analytical minimum required elements for energy purposes: **Geometry + Information + Detailed modelling**

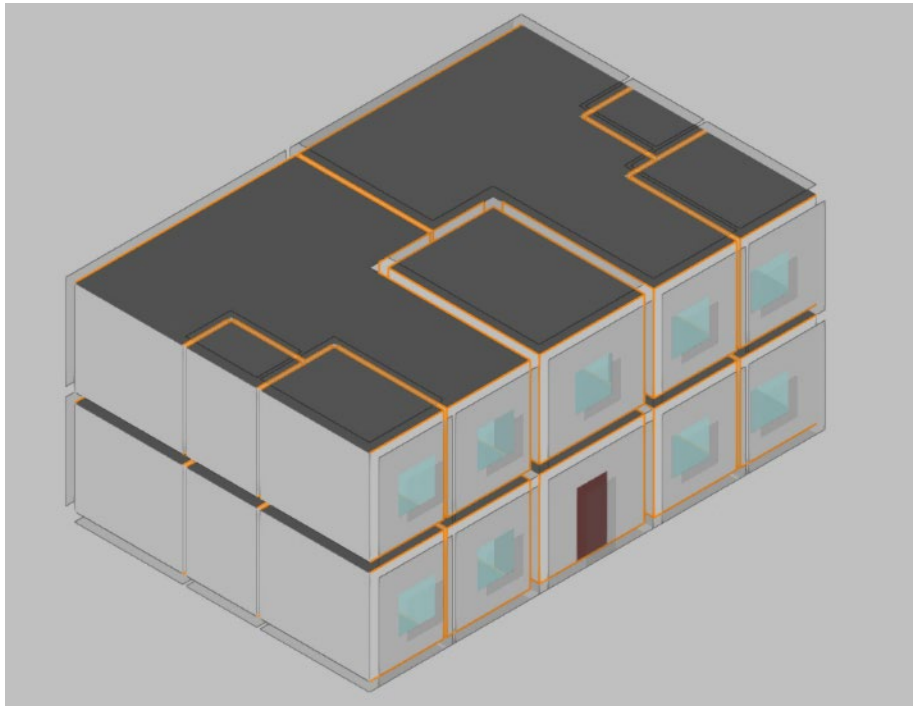
Analytical: General recommendations – Spaces



Analytical: General recommendations – Zones



Analytical: General recommendations – Spaces and Zones



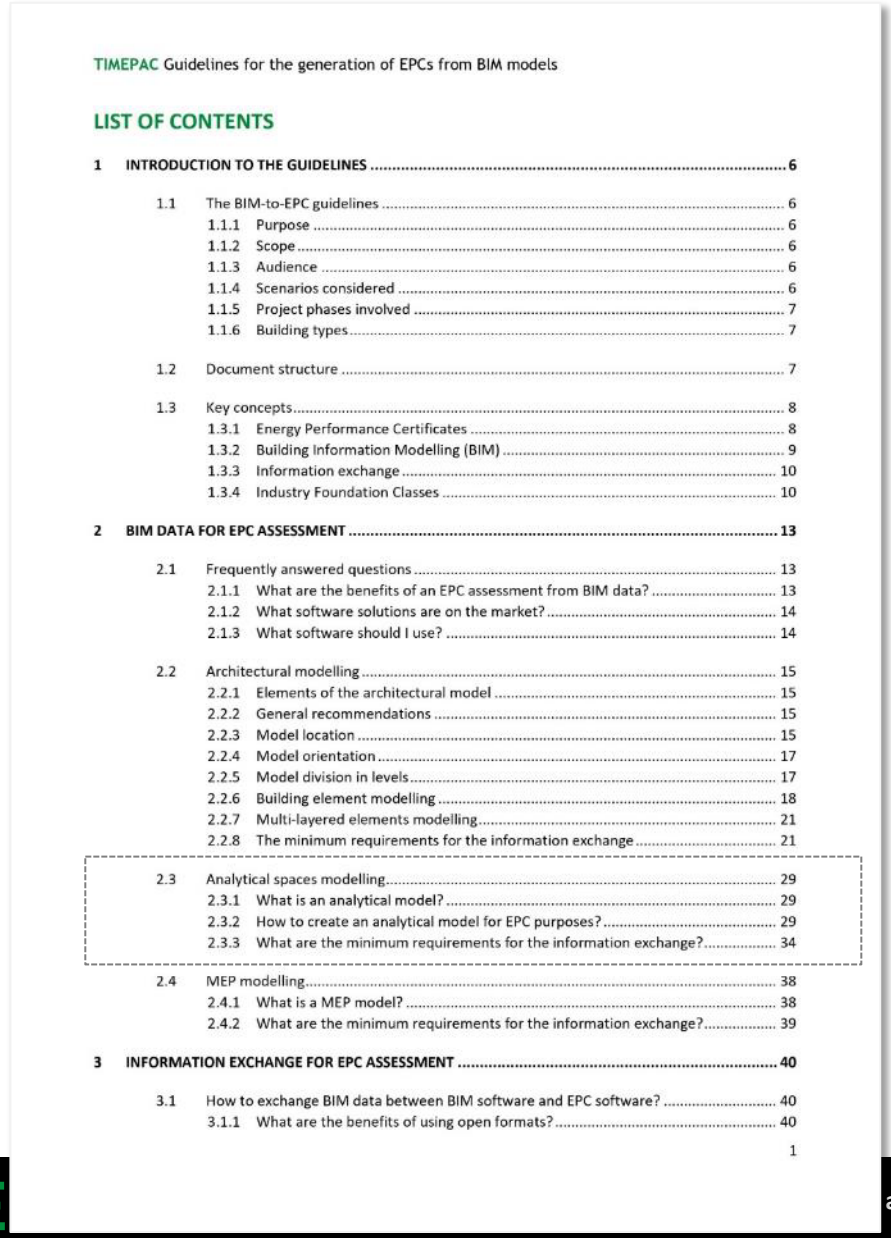
Why?

Spaces and zones in the BIM model define the thermal characteristics of the areas within the building.

Analytical models encompass spaces, zones, surfaces, edges, junctions, and all existing relationships between the elements.

EPC software engines require analytical models to simulate.

Guidelines: Analytical model



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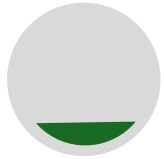

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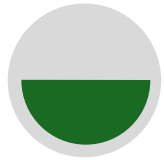

General recommendations

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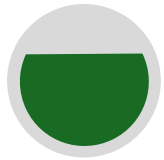
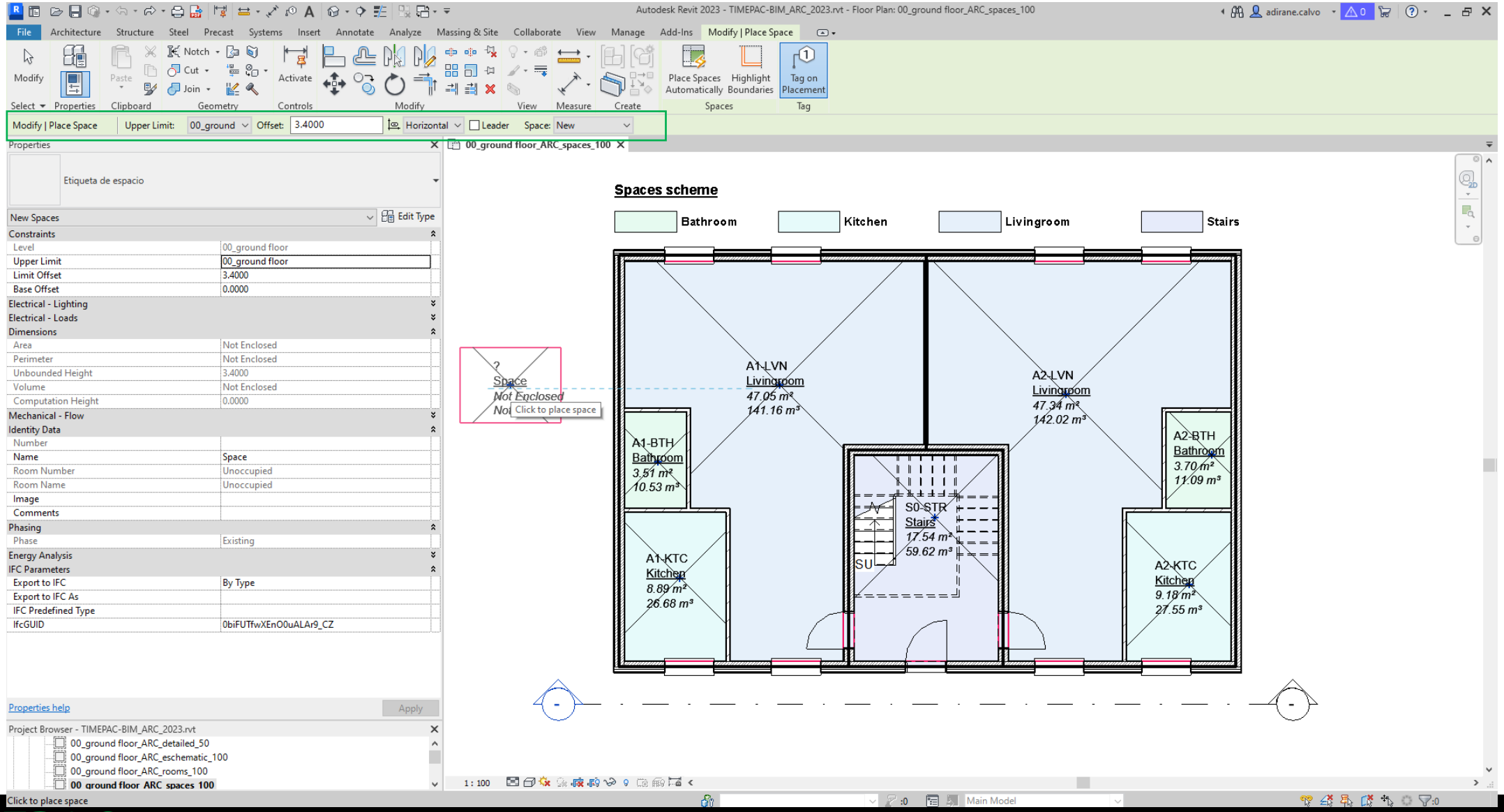


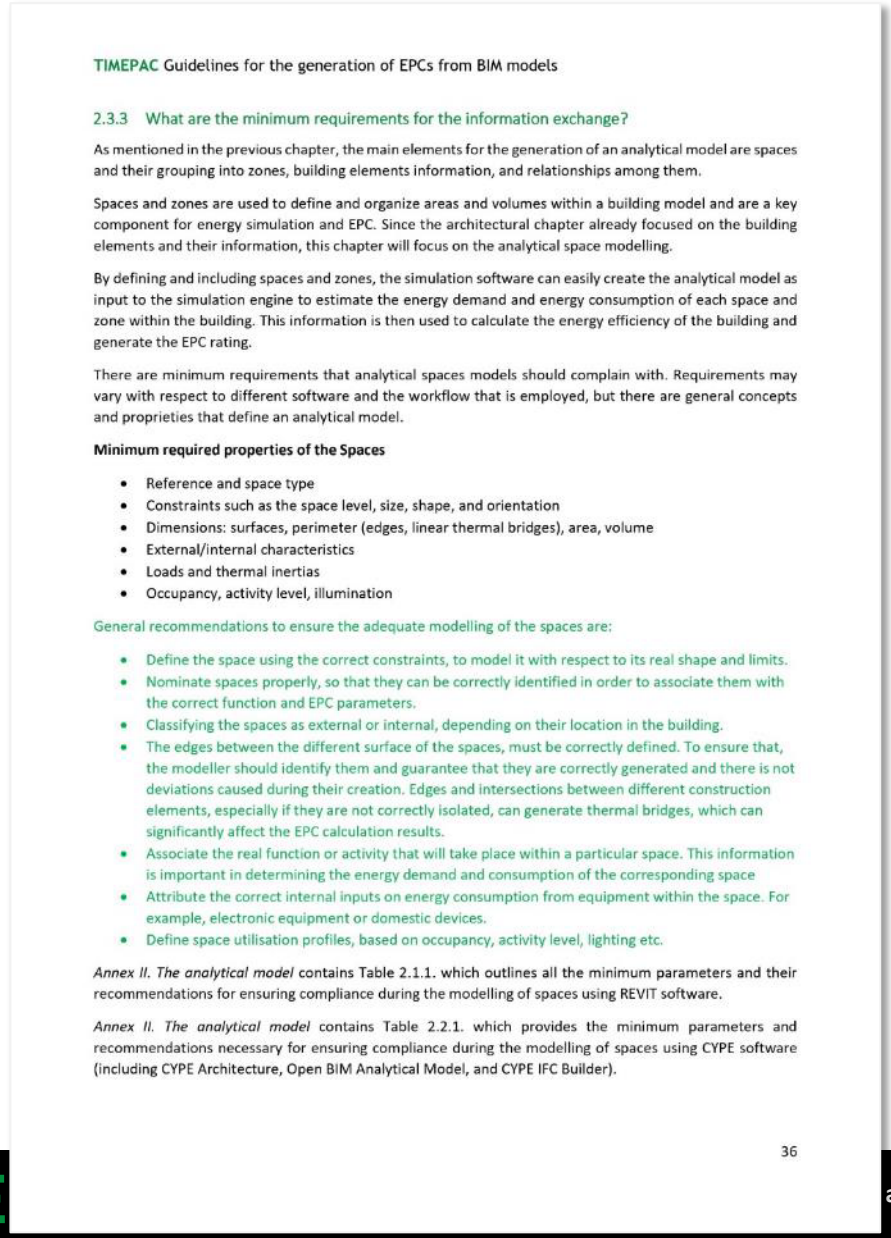
Minimum required elements

What are and how to model the analytical minimum required elements for energy purposes: **Geometry + Information + Detailed modelling**

Analytical: Minimum required elements – Spaces definition



Analytical: Minimum required elements – Spaces definition



TIMEPAC Guidelines for the generation of EPCs from BIM models

2.3.3 What are the minimum requirements for the information exchange?

As mentioned in the previous chapter, the main elements for the generation of an analytical model are spaces and their grouping into zones, building elements information, and relationships among them.

Spaces and zones are used to define and organize areas and volumes within a building model and are a key component for energy simulation and EPC. Since the architectural chapter already focused on the building elements and their information, this chapter will focus on the analytical space modelling.

By defining and including spaces and zones, the simulation software can easily create the analytical model as input to the simulation engine to estimate the energy demand and energy consumption of each space and zone within the building. This information is then used to calculate the energy efficiency of the building and generate the EPC rating.

There are minimum requirements that analytical spaces models should complain with. Requirements may vary with respect to different software and the workflow that is employed, but there are general concepts and proprieties that define an analytical model.

Minimum required properties of the Spaces

- Reference and space type
- Constraints such as the space level, size, shape, and orientation
- Dimensions: surfaces, perimeter (edges, linear thermal bridges), area, volume
- External/internal characteristics
- Loads and thermal inertias
- Occupancy, activity level, illumination

General recommendations to ensure the adequate modelling of the spaces are:

- Define the space using the correct constraints, to model it with respect to its real shape and limits.
- Nominate spaces properly, so that they can be correctly identified in order to associate them with the correct function and EPC parameters.
- Classifying the spaces as external or internal, depending on their location in the building.
- The edges between the different surface of the spaces, must be correctly defined. To ensure that, the modeller should identify them and guarantee that they are correctly generated and there is not deviations caused during their creation. Edges and intersections between different construction elements, especially if they are not correctly isolated, can generate thermal bridges, which can significantly affect the EPC calculation results.
- Associate the real function or activity that will take place within a particular space. This information is important in determining the energy demand and consumption of the corresponding space
- Attribute the correct internal inputs on energy consumption from equipment within the space. For example, electronic equipment or domestic devices.
- Define space utilisation profiles, based on occupancy, activity level, lighting etc.

Annex II. The analytical model contains Table 2.1.1. which outlines all the minimum parameters and their recommendations for ensuring compliance during the modelling of spaces using REVIT software.

Annex II. The analytical model contains Table 2.2.1. which provides the minimum parameters and recommendations necessary for ensuring compliance during the modelling of spaces using CYPE software (including CYPE Architecture, Open BIM Analytical Model, and CYPE IFC Builder).

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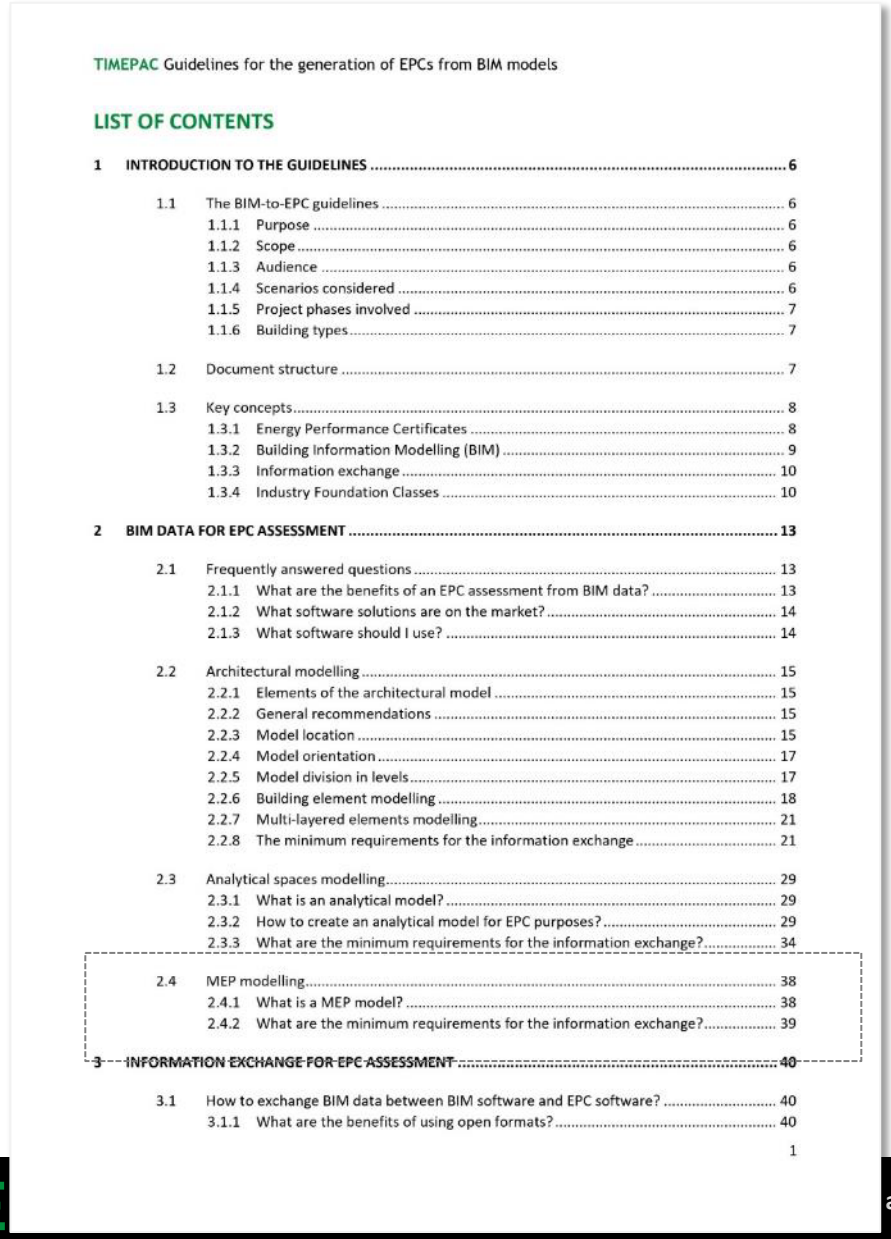
Why?

EPC software reads spaces to define the analytical model conditioned volumes to feed the simulation engine.

Ensuring adequate thermal loads and heat exchange calculations through partitions and between spaces: avoid deviations in the calculation or errors within the software.

Guidelines: Mechanical, electrical and plumbing model



TIMEPAC Guidelines for the generation of EPCs from BIM models

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What is the MEP model?

Building Information Model that includes the Mechanical, Electrical, and Plumbing (MEP) systems of a building.

Minimum required elements

How to model the MEP model for energy purposes: **N/A**

Guidelines: Mechanical, electrical and plumbing model

2.4 MEP modelling

2.4.1 What is a MEP model?

A BIM MEP model is a Building Information Model that includes the Mechanical, Electrical, and Plumbing (MEP) systems of a building. BIM MEP models are digital representations of the MEP systems that allow for collaborative design, construction, and operation of a building.

The mechanical systems can include HVAC (heating, ventilation, and air conditioning), elevators, and escalators, while the electrical systems can include lighting, power distribution, and fire protection. The plumbing systems can include water supply, drainage, and waste management.

BIM MEP models are created by using specialized software that allows architects, engineers, and contractors to work collaboratively in a virtual environment. The models can be used for clash detection, energy analysis, and simulation, which can help to improve the efficiency and sustainability of a building. Additionally, BIM MEP models can be used for facility management and maintenance after construction is complete.

What are the MEP elements?

A MEP (Mechanical Electrical Plumbing) element is a BIM object that represent an installation system element and has one or more connectors to link with the corresponding system(s). This means that these connectors will be used to create from them the facility networks.

The elements of the installation systems can be any HVAC, mechanical, plumbing, electrical or lighting system, such as, ventilation equipment, boilers, air conditioning systems... . On the other hand, the connectors can be electrical, ducts, pipes, cable trays, conducts...

- HVAC (Heating, Ventilating and Air Conditioning): The model of the ducts and terminal units of a heating, ventilation and air conditioning installation.
- Mechanical: The model of the mechanical installation system with its equipment and connections. For example, a fan-coil.
- Plumbing and pipes: The model of the water systems, with their respective elbows and fittings.
- Electricity: the model of the electrical installation of a building.

As happen with the construction elements, the MEP elements must be associated with their corresponding families depending on the software used. Besides, they must be modelled as installation system objects that each software is capable of interpretate.

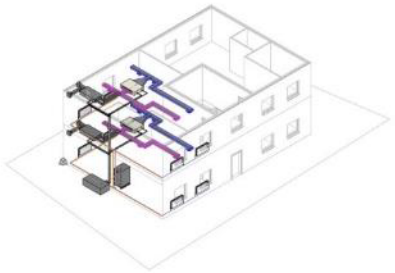


Figure 25. Example of MEP model

Why?

Currently, EPC software does not read MEP elements.

Various EPC software programs require different definitions of MEP elements.

Provide information that assists the EPC developer.

Information exchange for EPC assessment

BIM DATA BETWEEN BIM SOFTWARE AND EPC SOFTWARE

IFC EXPORTATION AND EXCHANGE

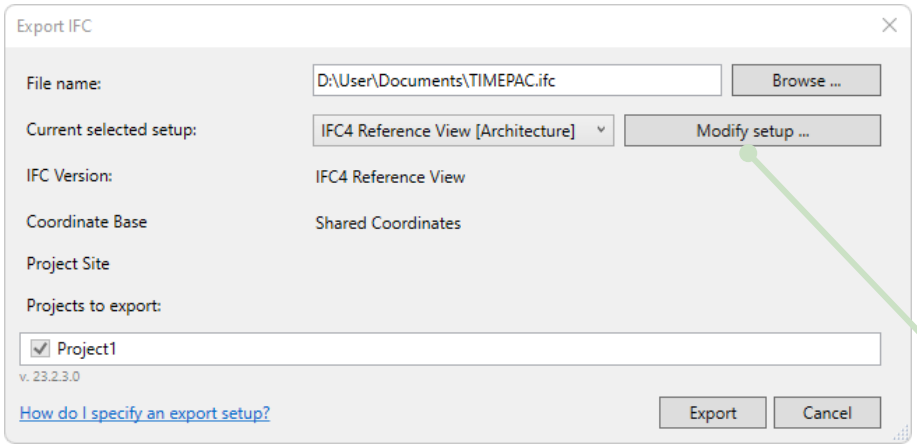
- FROM REVIT TO IFC
- USING CYPE

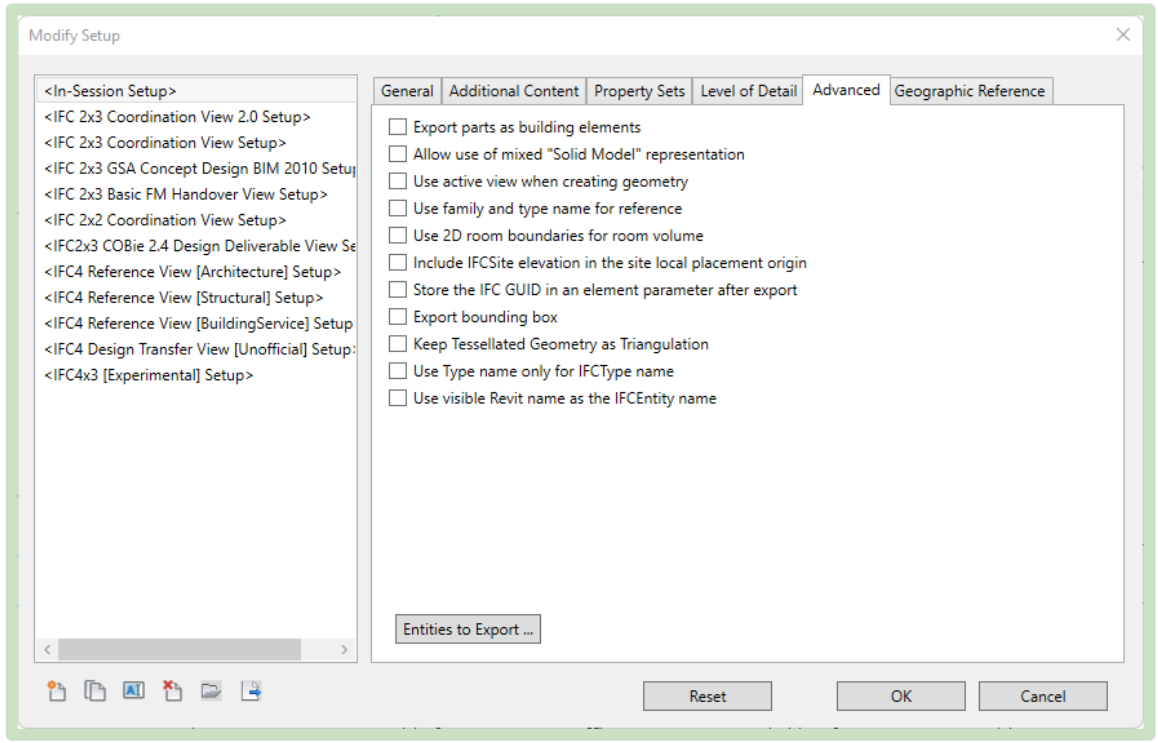
IFC VALIDATION

IFC IMPORTATION TOOLS IN EPC TOOLS

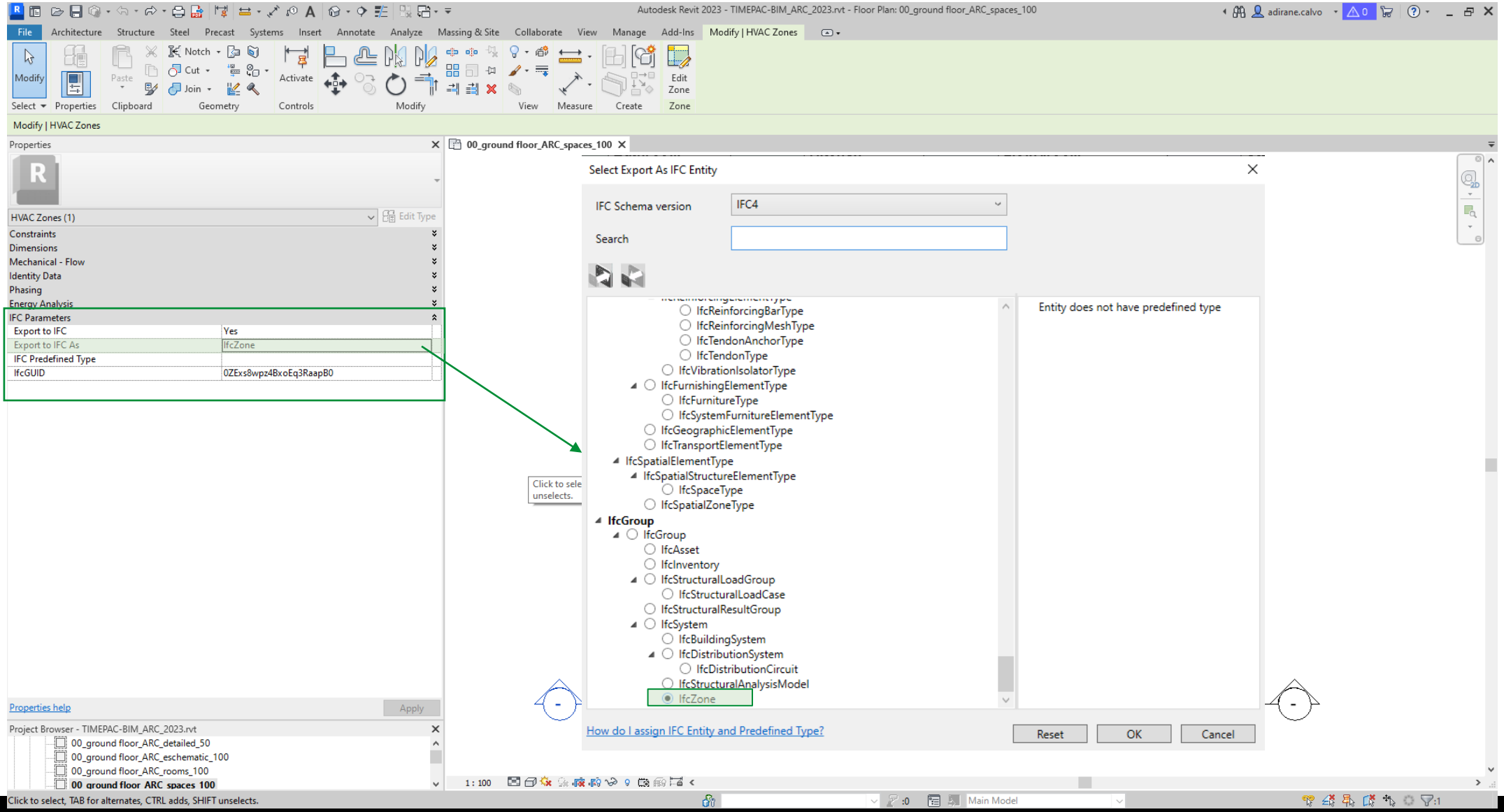
- CYPETERM HE
- EDILCLIMA EC700
- ETU

Information exchange for EPC assessment – Exportation example

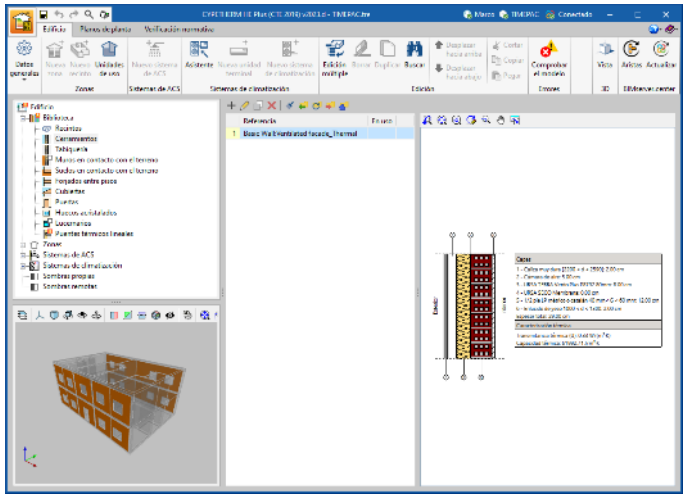




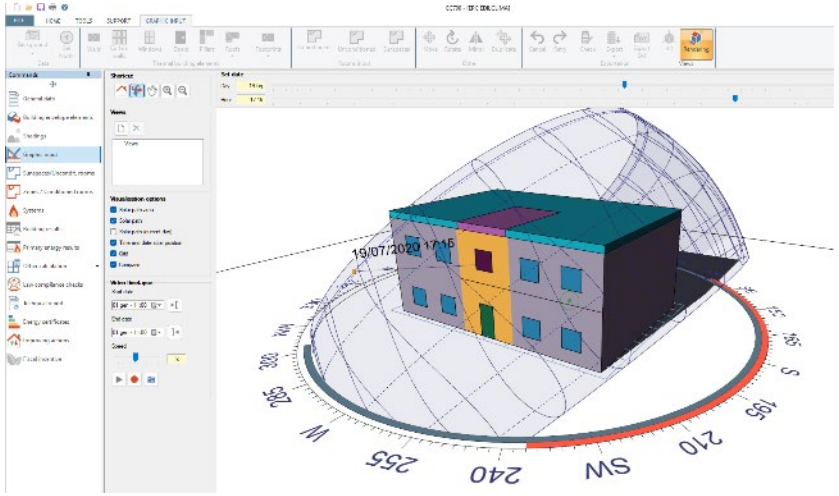
Information exchange for EPC assessment – Exportation example



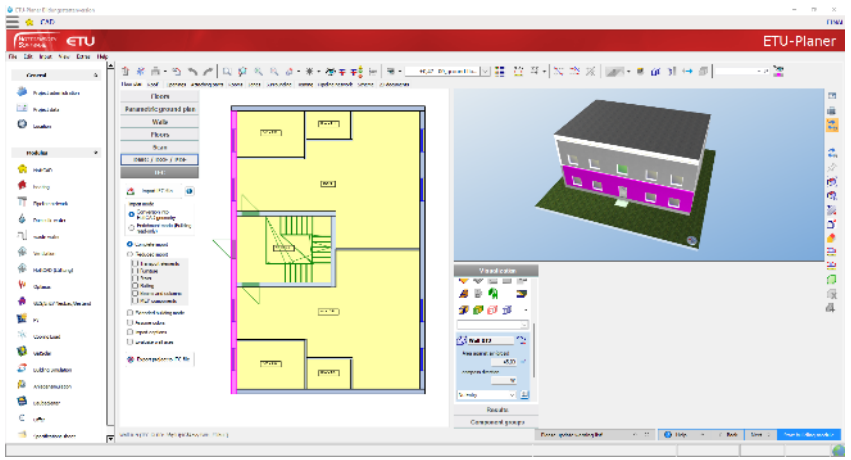
Information exchange for EPC assessment – Importation



CYPETHERM HE PLUS (SPAIN)

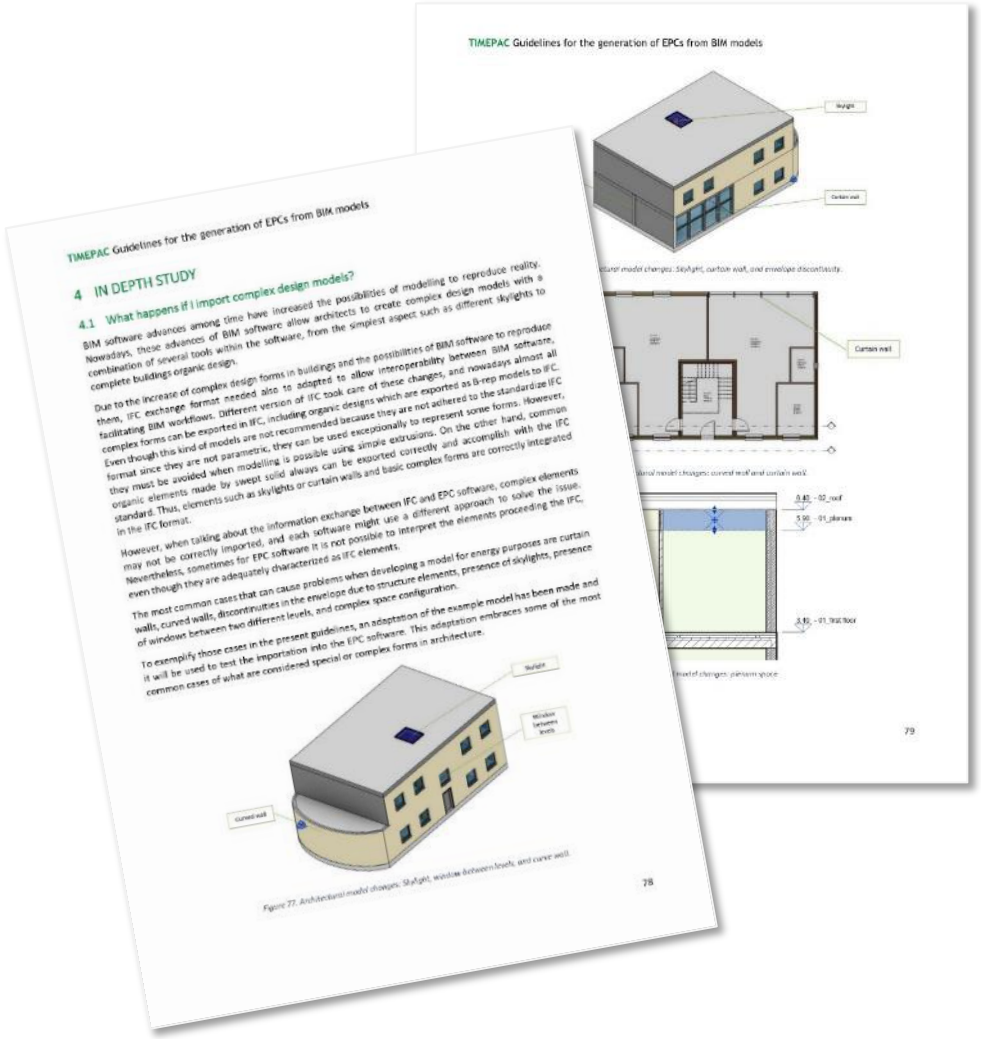


EDILCLIMA EC700 (ITALY)



ETU (AUSTRIA)

Guidelines: In depth study



What happens if I import complex design models?

Common cases of *complex* designs that cannot be correctly imported or converted.

IFC importation of the complex design models

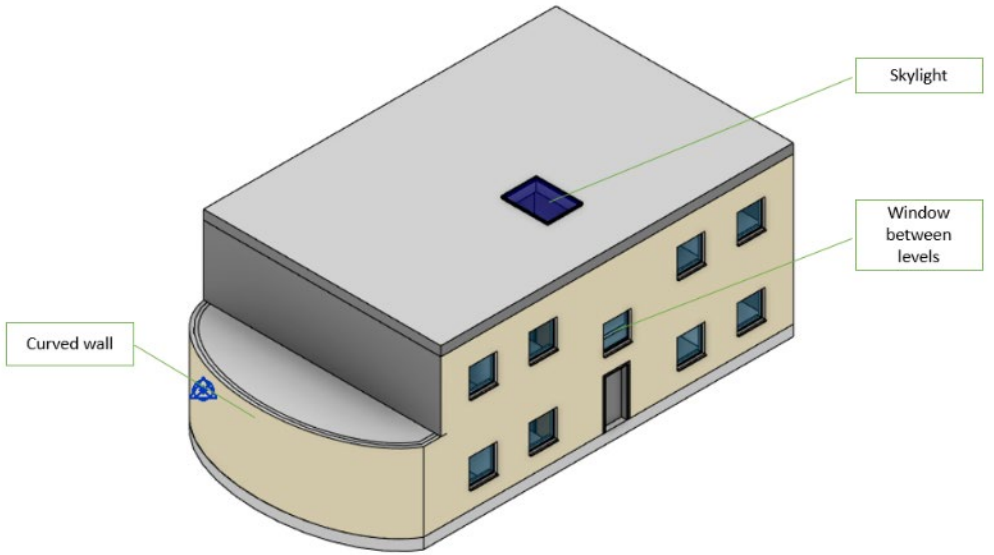
- CYPE IFC BUILDER
- EDILCLIMA EC 700
- ETU-SOFTWARE

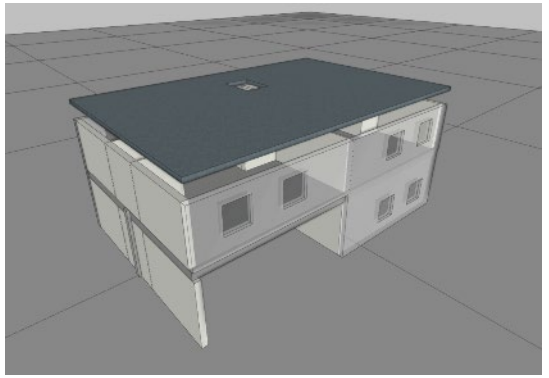
Guidelines: In depth study - example

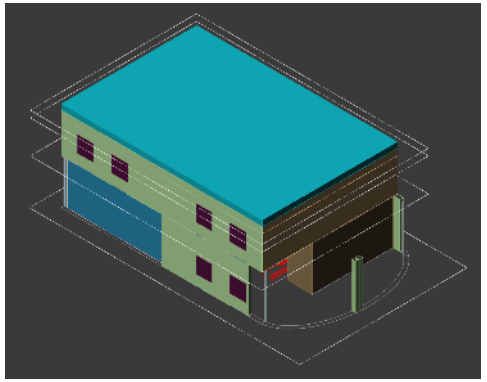
	Imported	*Converted*	*Solutions*
Architectural model			
Curved wall	✓	✗	• model the curved wall as segments in Revit and export the IFC file • model the curved wall as segments directly in IFC Builder • model the curved wall as segments in CYPE Architecture
Curtain wall	✗	✗	• model the curtain wall as windows in Revit and export the IFC file • model the curtain wall as windows directly in IFC Builder • model the curtain wall in CYPE Architecture
Skylight window	✓	✓	
Windows between levels	✓	✗	• move the window to the upper or lower level • divide the window into two corresponding windows for each level
Discontinuity (column)	✓	✗	• the column can be modelled as a thermal bridge in Open BIM Analytical Model

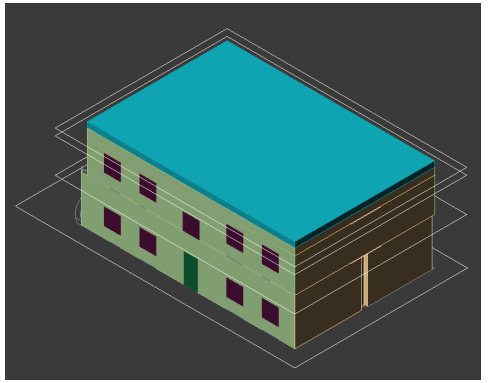
	Imported	*Converted*	*Solutions*
Analytical model			
Plenum space	✗	✗	• use Open BIM Analytical Model to model the plenum space
Virtual space partition	✗	✗	• use Open BIM Analytical Model to model the virtual space partition

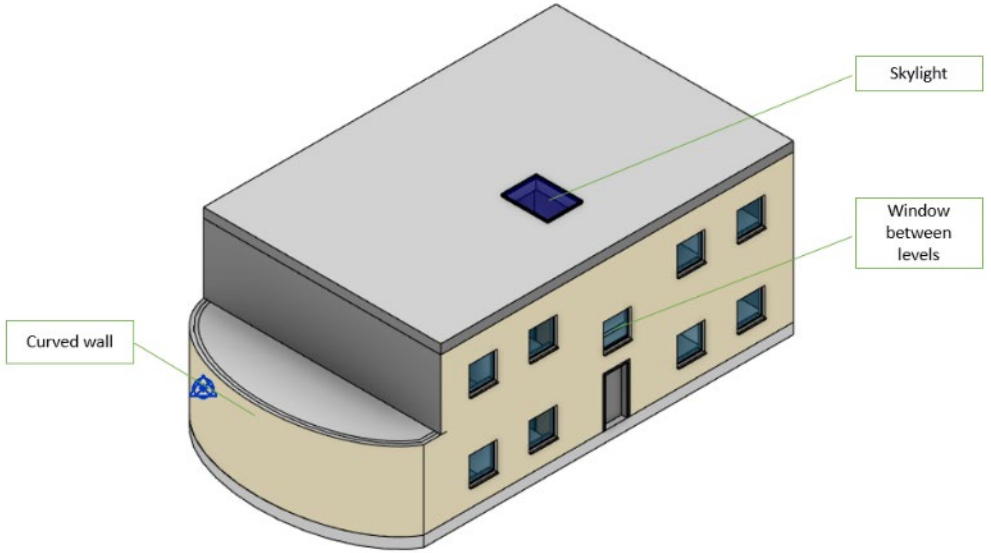
Guidelines: In depth study - example

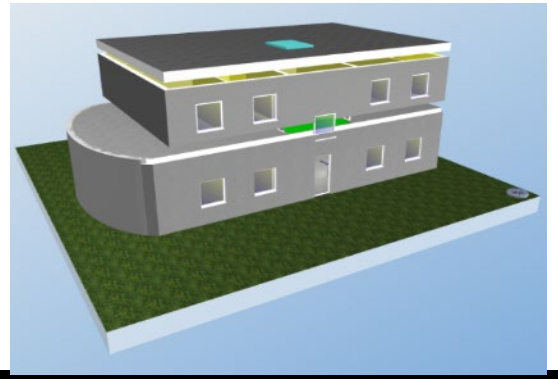


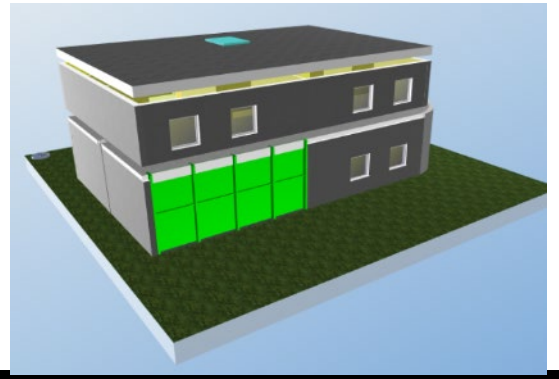












Application cases

Austria Croatia Cyprus Italy Slovenia Spain

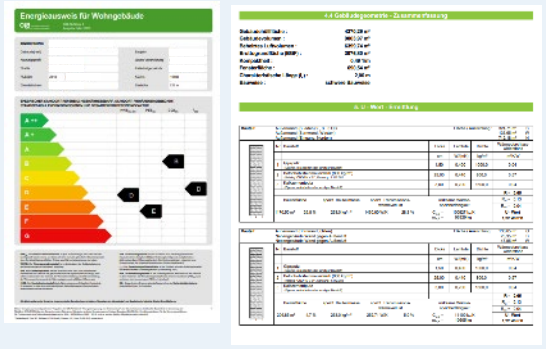
Cases
- 30 buildings in 6 countries
- BIM from scratch
- BIM model validation

Uses:
- Residential
- Tertiary

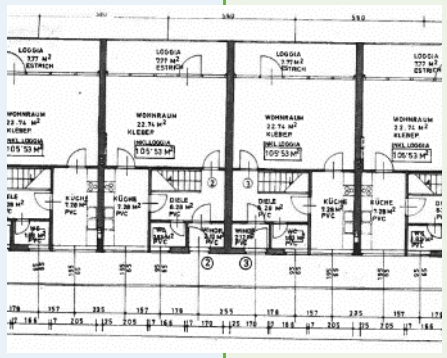
Input data:
- Floor plans
- EPCs
- BIMs

Time:
- BIM: ~ 8 hours
- No BIM: ~ 12 hours

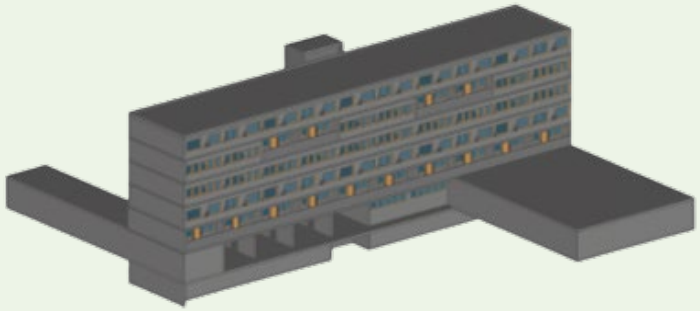
Reliability assessment



EPC

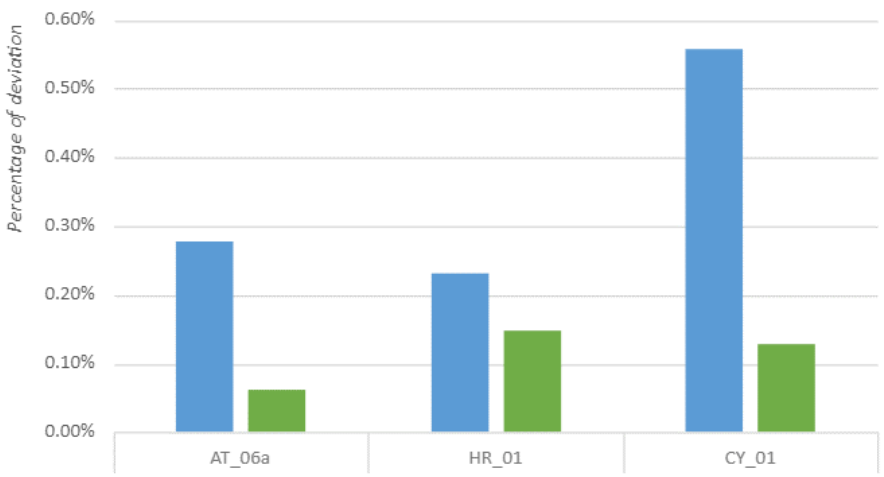


architectural drawings

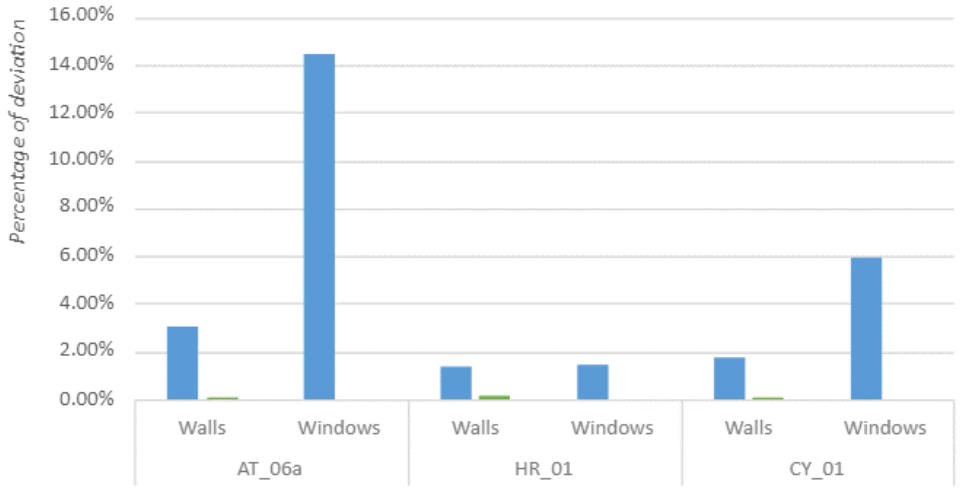


BIM model

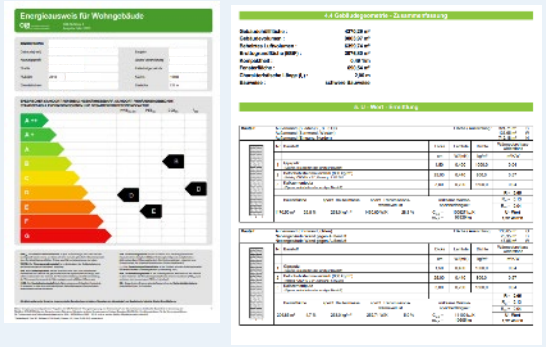
Reliability assessment



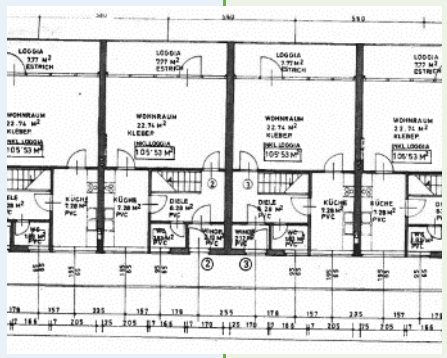
Building surface



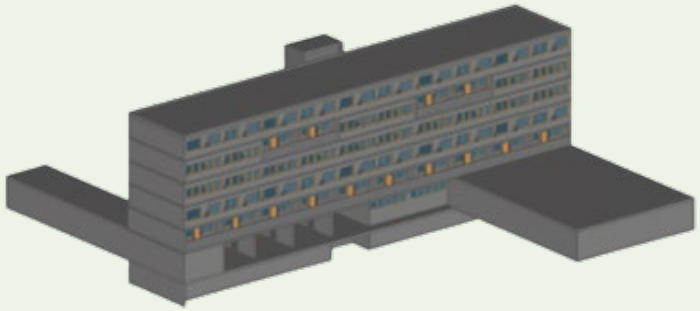
Building elements surface



EPC



architectural drawings



BIM model

Take aways

We have proposed guidelines for the generation of EPCs from BIM with a focus on open interoperability.

Using BIM models to generate EPC improves the quality of the input data for EPC generation.

Data interoperability is the key challenge, requires the collaboration of multiple stakeholders.

Building a BIM solely for EPC might seem like a short-term solution → BIM created now becomes an asset for future renovations.

TIMEPAC The new EPC for Europe

If you would like more information, please visit www.timepac.eu or contact us at

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