



usBIM.planAI – User Manual

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usBIM.planAI

User Manual



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1 usBIM.planAI

usBIM.planAI is a cloud service used to 3D digitize projects and paper technical drawings of existing buildings and convert them into 3D/BIM models.

In fact, with usBIM.planAI it is possible to derive a 3D model from a two-dimensional plant such as a PDF, png , jpeg thanks to the automatic recognition of the elements exploiting the potential of **Artificial Intelligence** and an advanced editor that allows to improve the quality of the result.

With usBIM.planAI a 3D editor with special features is available that allows you to perfect the 3D digitization obtained through automatic recognition.


In particular, it is possible:

- add missing items
- convert erroneously recognized elements;
- manually perfect geometries
- make multiple selections to attribute a property

Assemble the 3D digitisations obtained from multiple plans forming a project and build up a complete 3D model of the entire building.

Once the changes are completed, export the model in the IFC format and view it on the usBIM online BIM viewer.

In addition to exporting the model in the **standard IFC format**, favouring transparent and open workflows thus allowing data to be exchanged with maximum freedom regardless of the software used, usBIM.planAI automatically extracts all the necessary measurements and exports them in quantitative tables in .xlsx or .csv format, in order to use them for **fast quotes**.

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2 Login

To access the usBIM.resolver application, it is necessary to log on to usBIM, the integrated system of Applications and Functions to manage the digitization of buildings and infrastructures in an easy and collaborative way and exclusively online with any device.

You can access usBIM via

<https://cloud.usbim.com/>

To access the platform you need to enter your Username and Password associated with your ACCA account. If you do not have this information, you can register by clicking on the "Register" button and follow the procedure for creating your MyACCA account.

It is also possible to access the platform by using the following accounts: Google, Twitter, Apple, Facebook e LinkedIn (Figure 1)

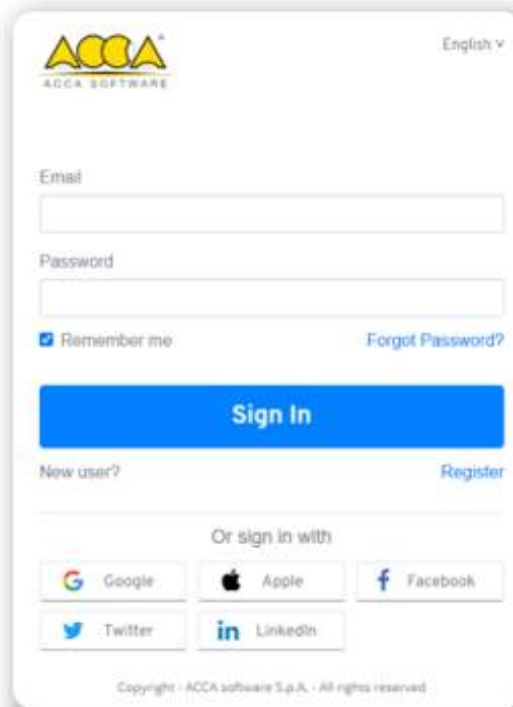




Figure 1. Login

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Once logged in to usBIM, in the applications panel (Figure 2) among the various applications belonging to the usBIM ecosystem, there is the icon relating to usBIM.planAI. By clicking on it, you can access the application that allows you to digitize paper technical documents in BIM models.



Figure 2. usBIM app menu

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3 Overview of functions

UsBIM.planAI is made up of 2 main user interfaces that are described below.

The EDM (Electronic Document Management) interface that allows to manage (Figure 3):

- Projects (creation, deletion, authorization),
- User (creation, role),
- Subscription and options,
- Documents (import, deletion).

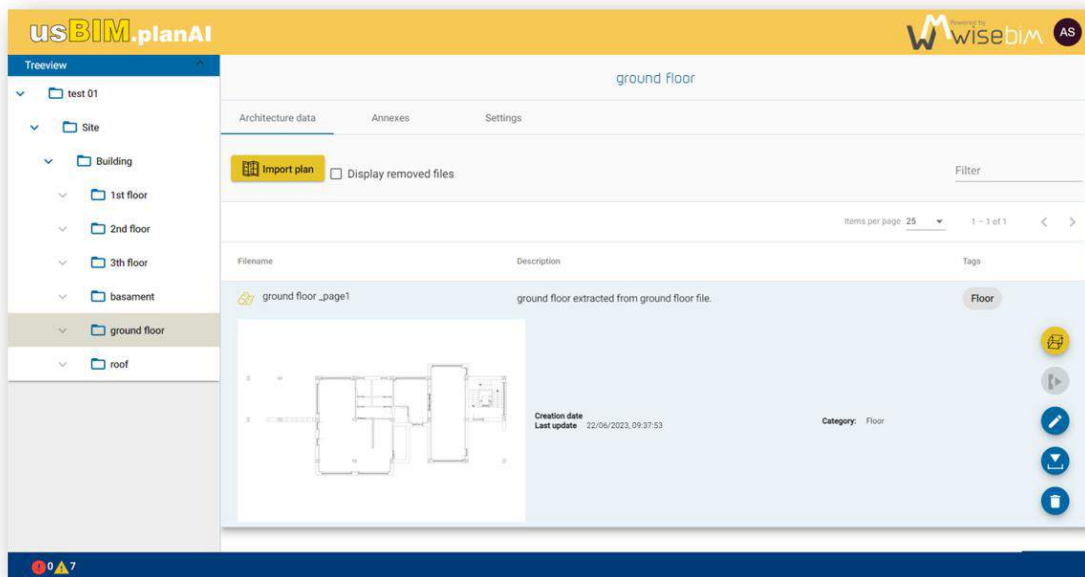


Figure 3. EDM interfaces:

The **Working area** to access the functions of (Figure 4):

- Automatic recognition,
- Geometry and properties edition,
- Result visualization,
- Backup and export of models.

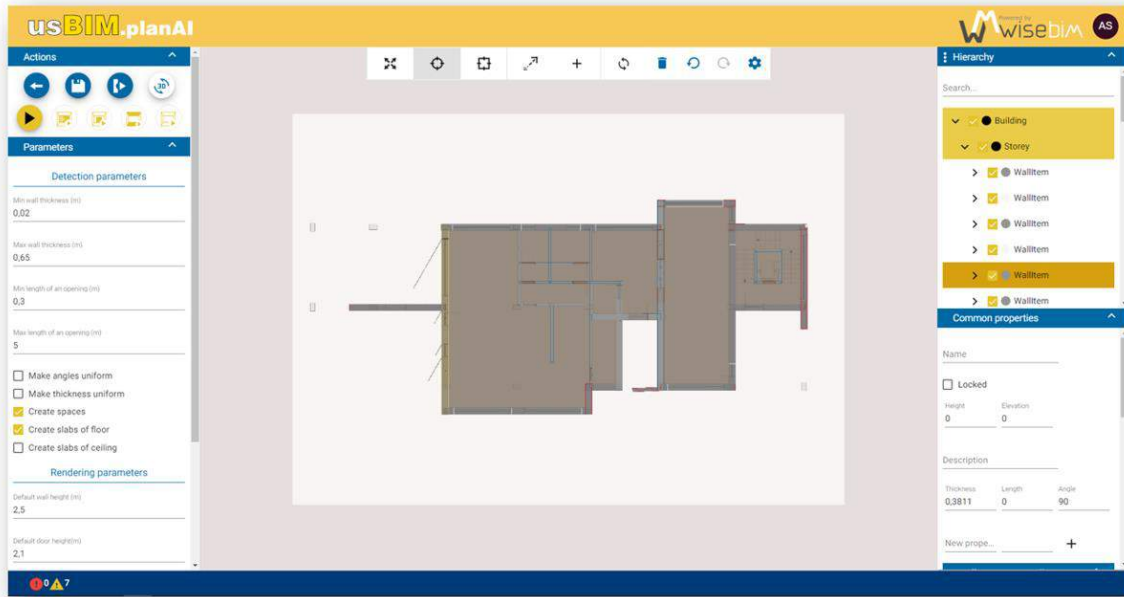



Figure 4. Working area

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4 Electronic Document Management

After login, the user is taken to the main project management page (Figure 5). This page is made up of several parts:

- A footer to display information (Figure 6).
- A central area to access project data (Figure 7).

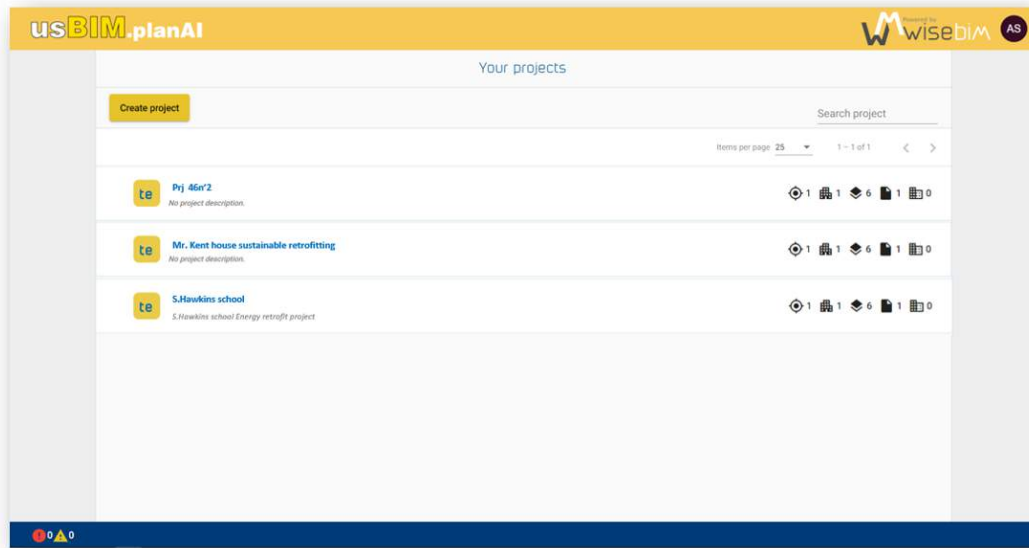


Figure 5. home page

4.1 Footer functions

At the bottom of the page, the footer displays the error or warning messages which may appear during the various operations carried out by the user (Figure 6). Links to the general conditions also provide access to these documents too.

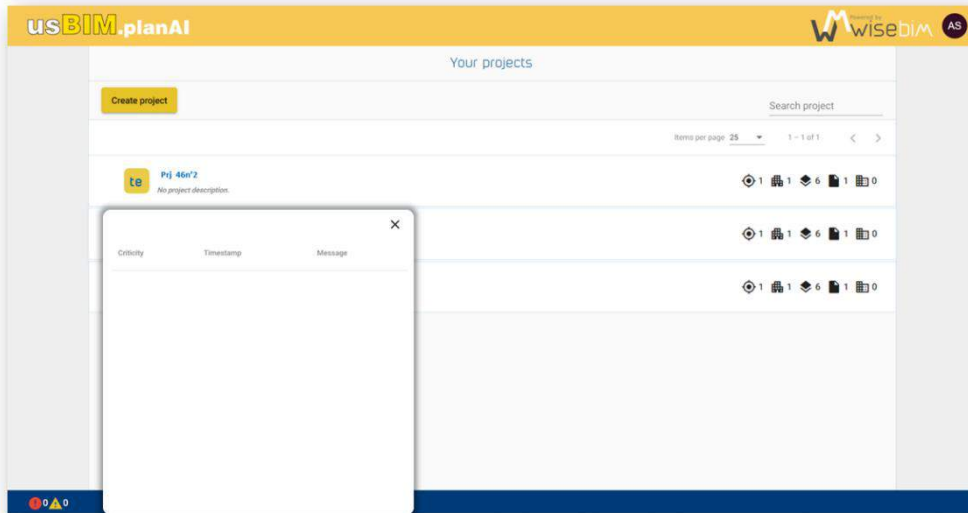


Figure 6. footer window

4.2 List of projects

The home page displays the list of projects that the user can access (Figure 7).

A project is not visible if it has been deleted or if the user is not an authorized member.

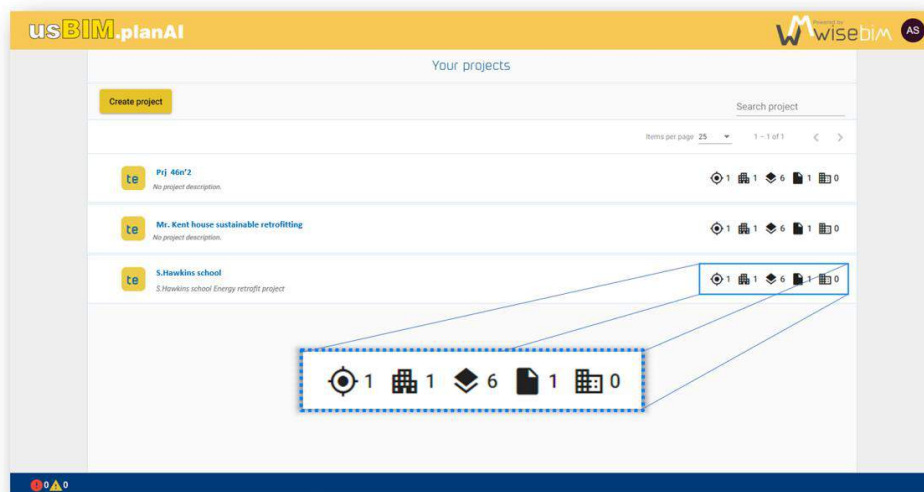


Figure 7. projects list

5 Modelling tool

The Working area is accessible from the EDM plans by clicking on the "Open in the modelling tool" button (Figure 8).



Figure 8. access the modelling tool

The modelling is carried out according to the following stages:

1. Scale and parameter setting
2. Launch of the algorithm
3. Modification of the result
4. Save and export

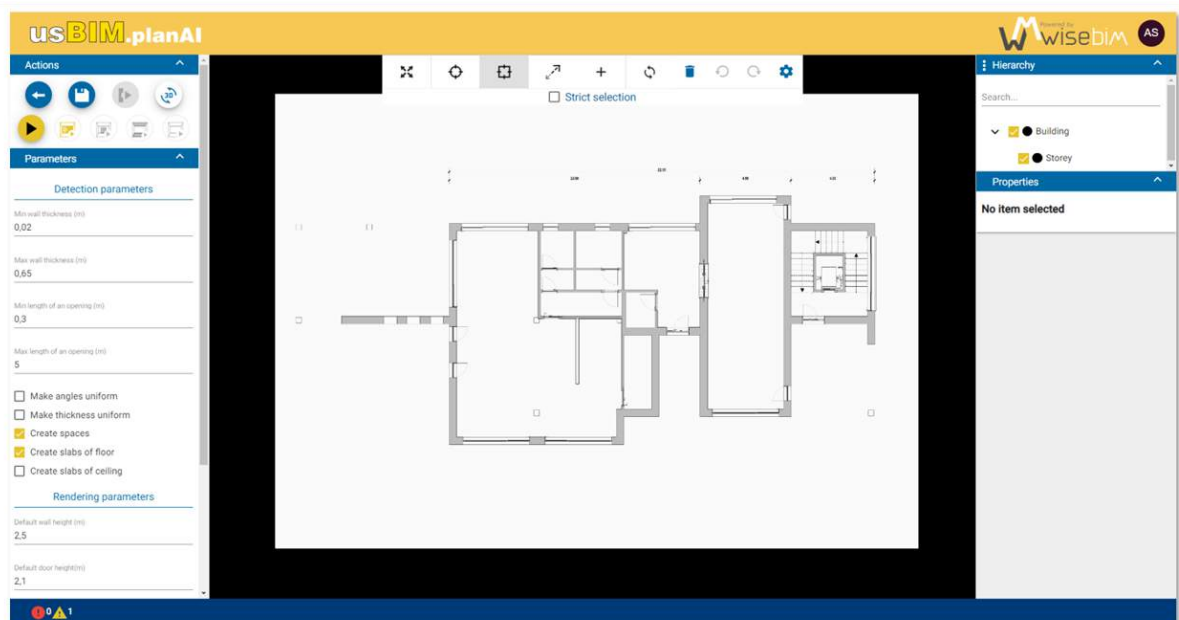



Figure 9. Working area

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The **Working area** (Figure 9) is divided into 3 sections:

1. The left panel groups together the parameters and access to the processing, saving and export functions.
2. The part in the centre display the plan in 2D or 3D and enable the access to edition functions.
3. The right panel displays the tree structure and the properties of the elements.

5.1 Access to parameters and functions

The left pane contains several panels (Figure 10):

- **Actions:** Access to automatic detection, save, export and view mode functions.
- **Parameters:** Displays all the parameters and options for the detection and the elevation values.
- **History:** List the several saved points.
- **Exports:** Displays all the parameters for the BIM export.

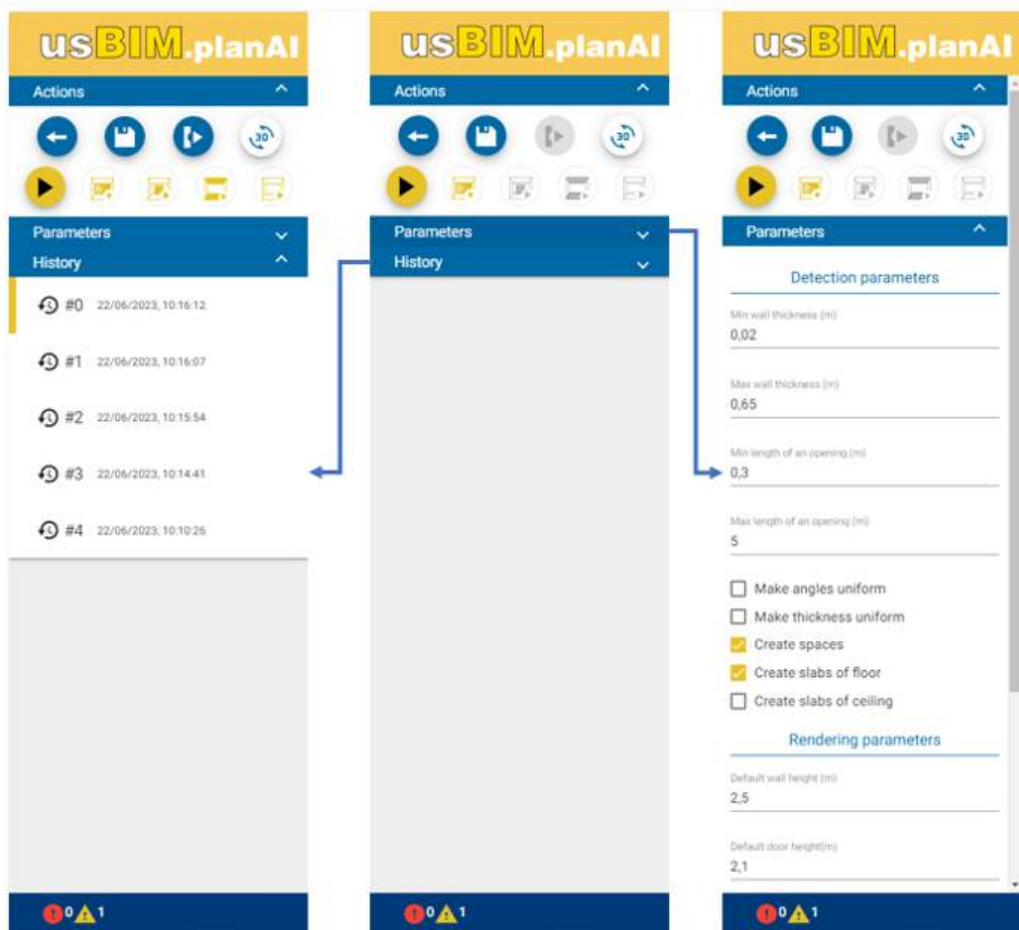


Figure 10. functions and parameters

5.2 Central workspace

The central part is used to visualize the plan and the superimposed elements in 2D or the 3D view of the generated model.

Each element (i.e. wall, opening, space) is individually modified, moved or deleted. In the upper part, a menu contains buttons for accessing the various functions (Figure 11):

- Moving
- Simple selection
- Rectangular selection
- Scale
- Item creation
- Rotation
- Deletion
- Undo / redo
- Configuration of display

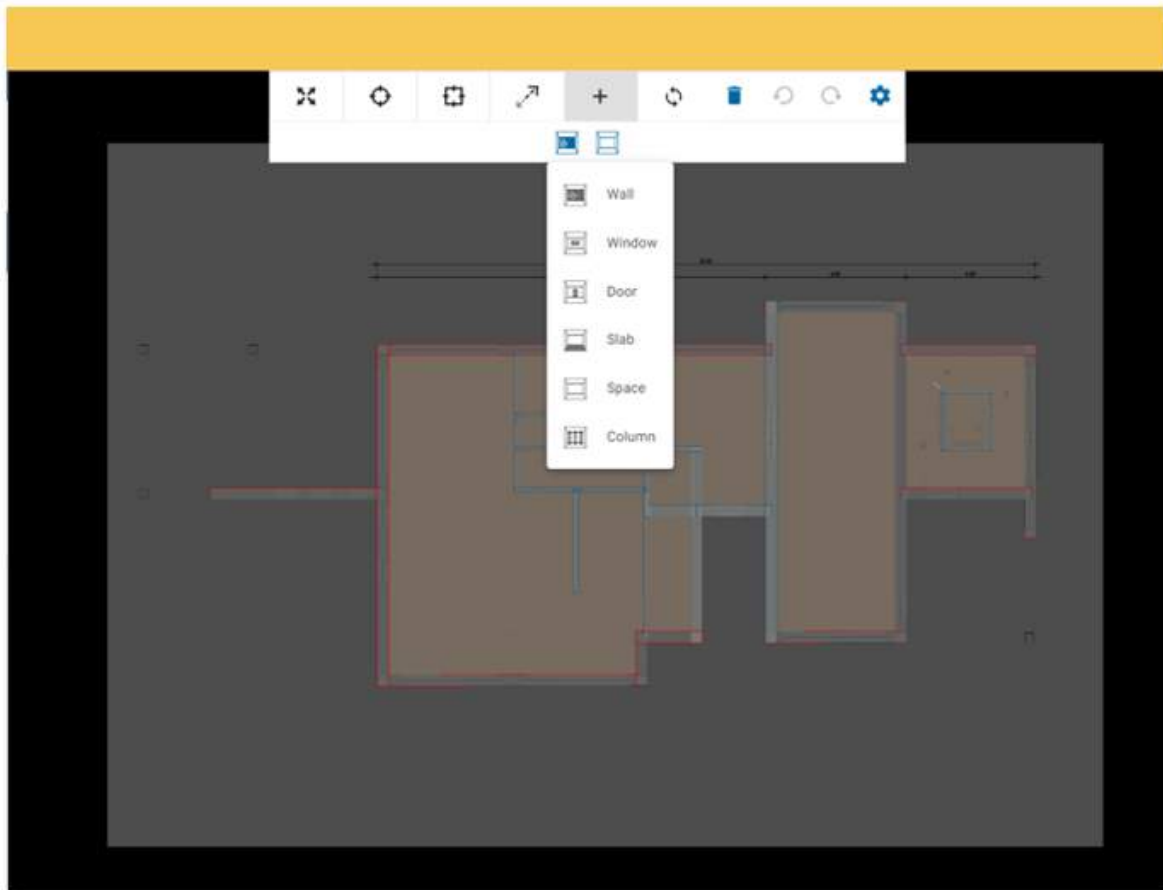


Figure 11. functions menu

5.3 Navigation and properties

The right pane contains two panels (Figure 12):

- **Navigation:** display of elements by a hierarchical tree structure or by category.
- **Properties:** display and modifications of the characteristics associated with a set of elements or an individual element.

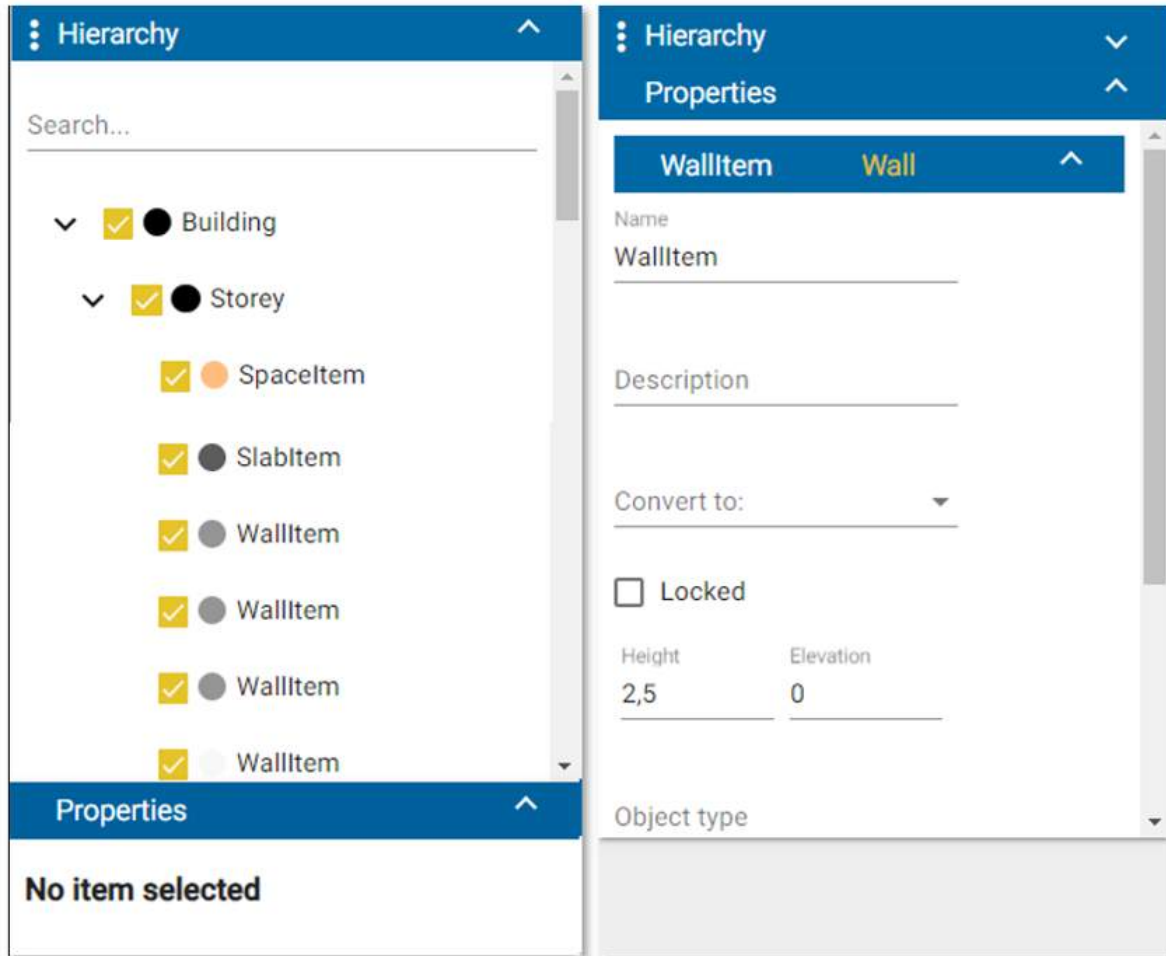



Figure 12. properties menu

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6 Projects

UsBIM.planAI enables one to structure the digitization process through projects. These projects bring together the architectural plans of one or more sites and buildings in order to generate the BIM model files.

The **Electronic Document Management interface** thus makes it possible to organize all the files available before initiating the modelling:

- Project creation
- Structuring and hierarchy of plans
- File management

6.1 Creation of a new project

The creation of a new project is carried out from page named "Your projects". Above the list of projects, a button allows you to create a new project (Figure 13). A pop-up window is displayed to enter the name of the project (required) and the description (optional).

After validation, a message is displayed to confirm the creation of the project.

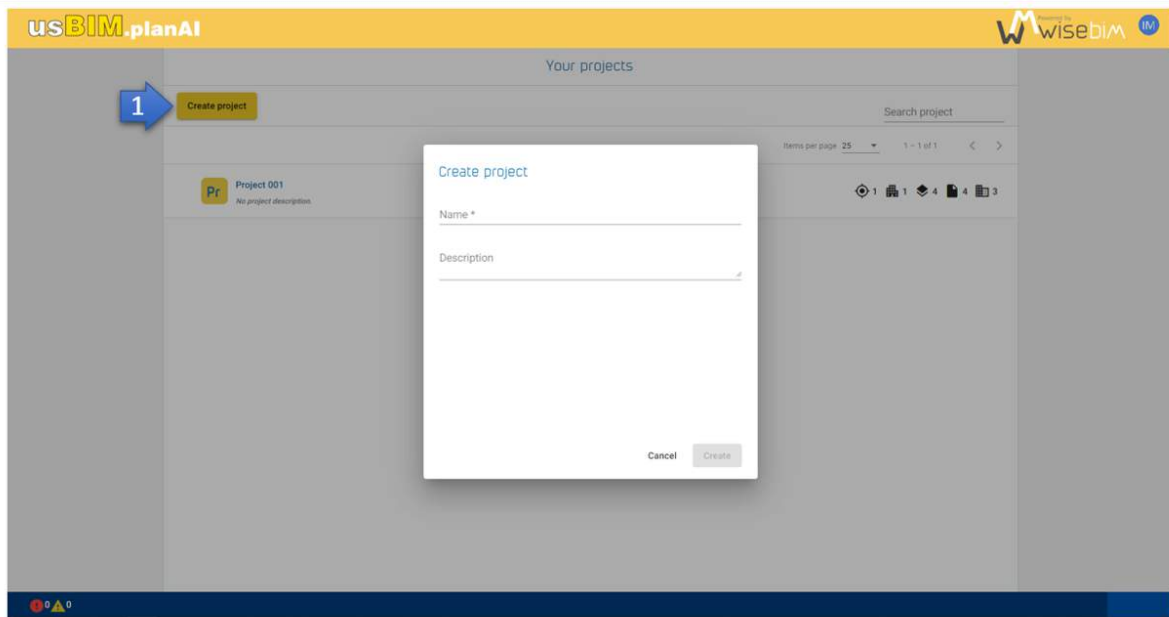



Figure 13. creating a new project

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The list of projects is then updated to display the new project (Figure 14).

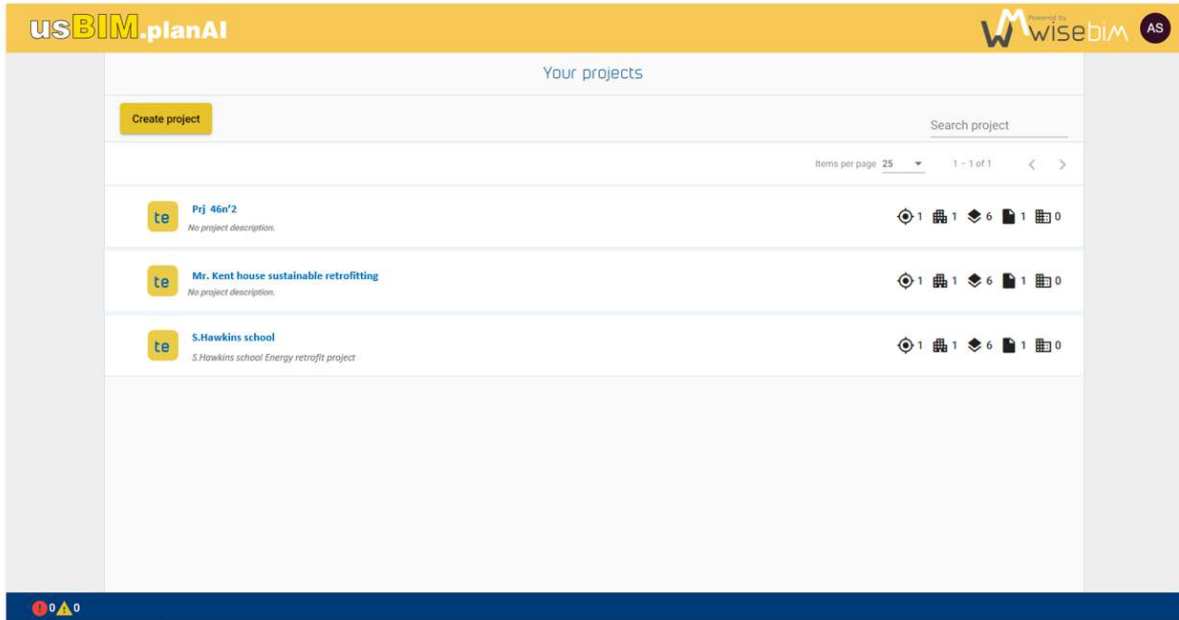


Figure 14. projects list

6.2 Project structuring


A project is accessible from the "Your Projects" page by selecting the line that referencing the project (Figure 14).

The interface then displays the page relating to the project. This page consists of 2 parts:

- on the left: a vertical banner displays the tree structure of the project
- in the centre: the content of the tree structure.

When creating a project, the tree structure is empty. If the project contains data, the default view is the root of the project. It is possible to import plans directly at the root of the project or to create a structure consistent with the project hierarchy:

- Site
 - o Building
 - Floor

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6.2.1 Site

To create a site, click on "Create a site" from the project root (Figure 15). A pop-up window is displayed to define the name of the site and its description. After validation, the project page is updated. Each project can contain one or more independent sites.

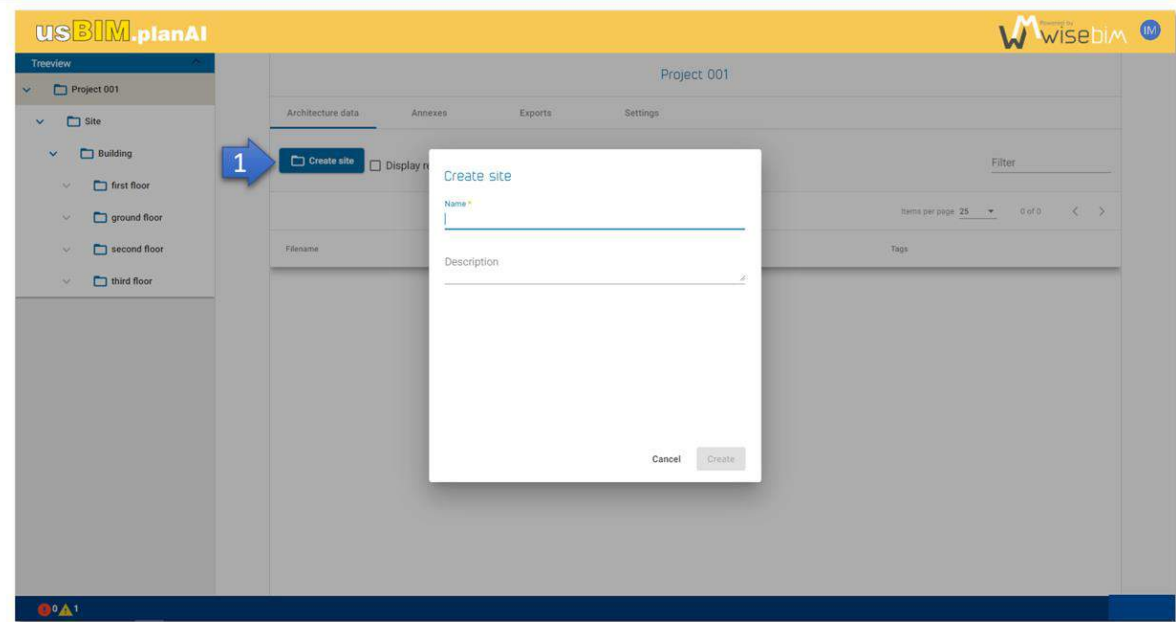


Figure 15. site creation

6.2.2 Building

To create a building, position yourself in the tree structure at a site level, click on the "Create a building" button (Figure 16). A pop-up window is displayed to define the name of the building and its description. After validation, the project page is updated. Each site can contain one or more independent buildings.

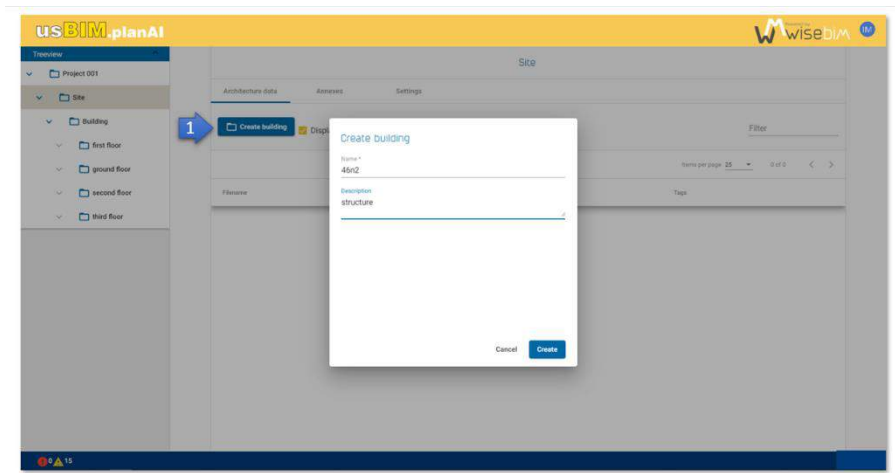


Figure 16. creating a building

6.2.3 Floor

To create a floor, position yourself in the tree structure at a building level, click on the "Create a floor " button (Figure 17).

A pop-up window is displayed to define the name of the floor and its description. After validation, the project page is refresh and updated. Each building can contain one or more independent floor s. The floor is the lowest level in the tree structure, no additional level can be created.

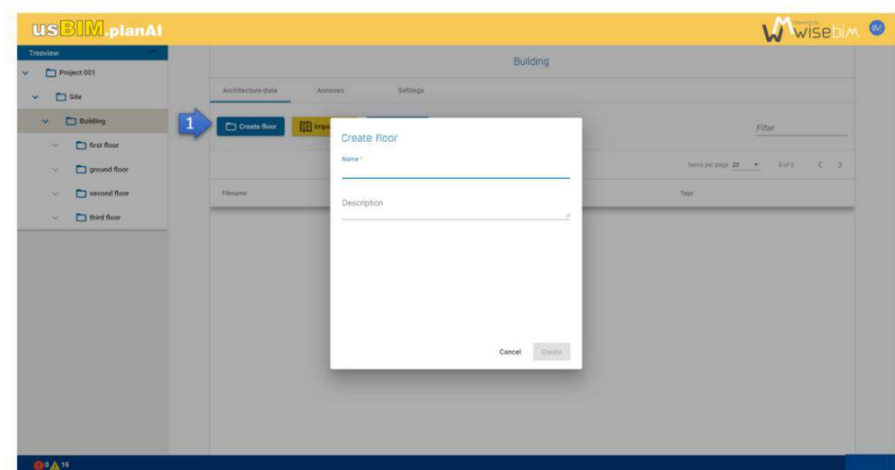



Figure 17. creating a floor

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6.3 Project management access

Once the folder of the project is created, the properties can be modified from the user interface.

By selecting the project in the tree structure, the page displays in the central area several tabs for accessing the files. The last tab provides access to project properties and management functions. It is thus possible to rename the project or modify its description (Figure 18).

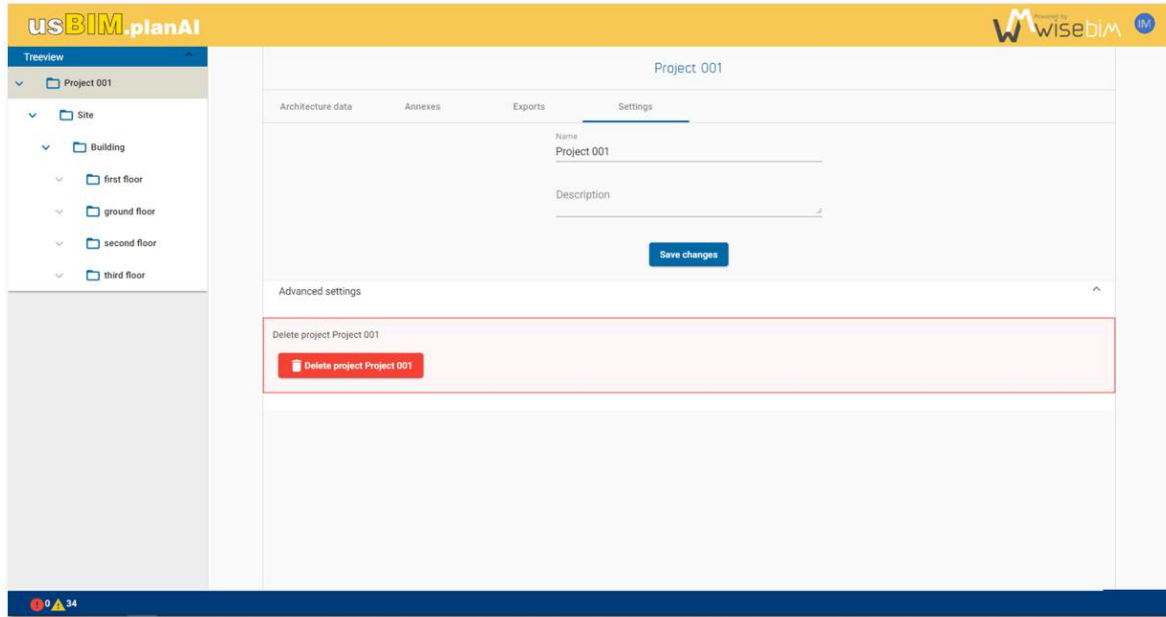



Figure 18. projects management

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6.3.1 Delete the project

The delete function erases the entire project: structure, files and models (Figure 19). This operation is irreversible and definitive.

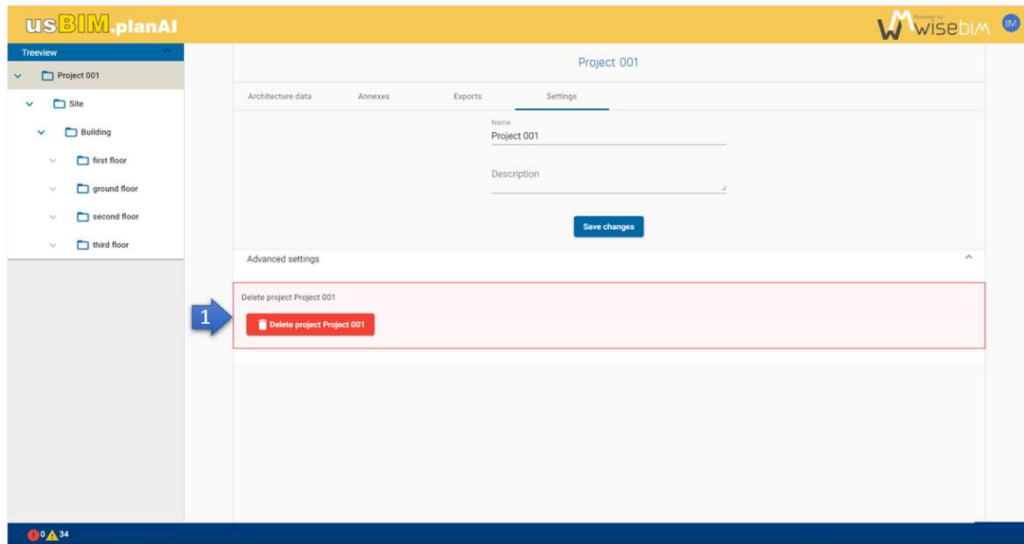


Figure 19. deleting a project

7 Import of new files

The modelling is carried out from documents in PDF, PNG or JPEG format which must be saved before in the project.

7.1 Plans

From the tree structure, you must import the data in the "Architecture" tab using the "Import" function which opens a dialog window (Figure 20). This window allows you to select the file on the hard drive.

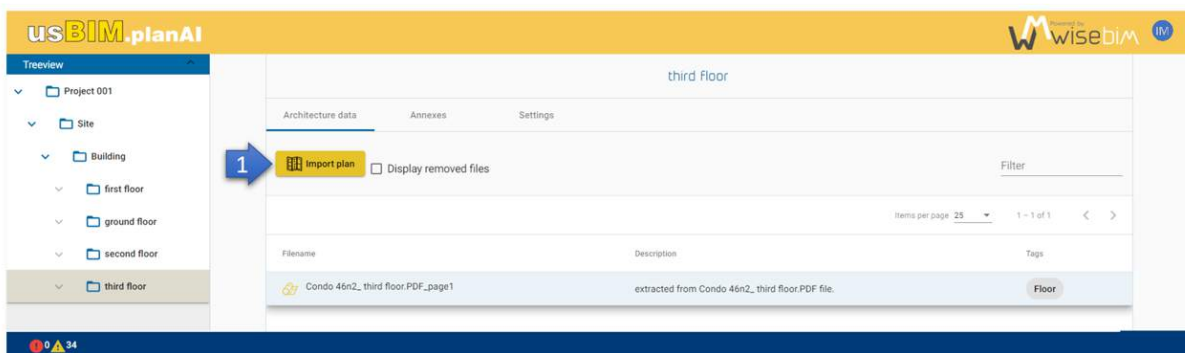


Figure 20. import a plan

Additional information is required:

- File name, filled in automatically but modifiable,
- Description of the file (optional),
- Type of plan: Floor plan, Front, Floor (mandatory).

The file is imported after clicking on the "Import" button at the bottom of the window (Figure 21).

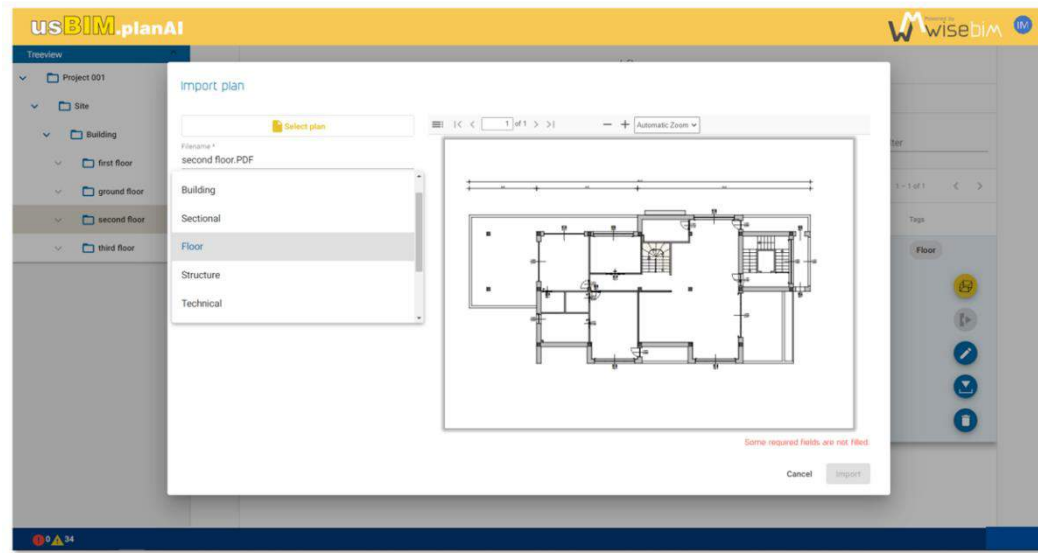


Figure 21. single importation

The plans must be imported into UsBIM.planAI as a PDF, JPEG or PNG file format. In the case of a PDF file, it is possible to extract several pages which will be saved separately in the current folder (Figure 22).

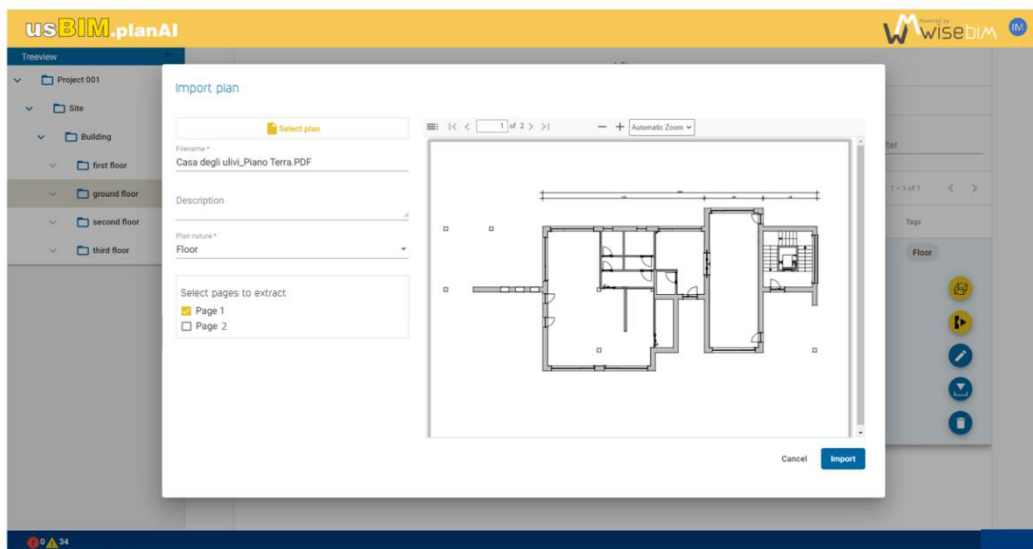



Figure 22. multiple importation

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7.2 File property

When a file has properties, it is possible to modify them by clicking on the “Edit” button in the row of the selected file. Plans have the following properties (Figure 23):

- **Name** (mandatory), defined by default using the name of the imported file
- **Description** (optional), allows you to add textual information to the file
- **Nature** (mandatory), to define the type of plan: Ground plan, Floor, Facade, Technical

Other information is displayed, such as creation or access dates, but cannot be modified.

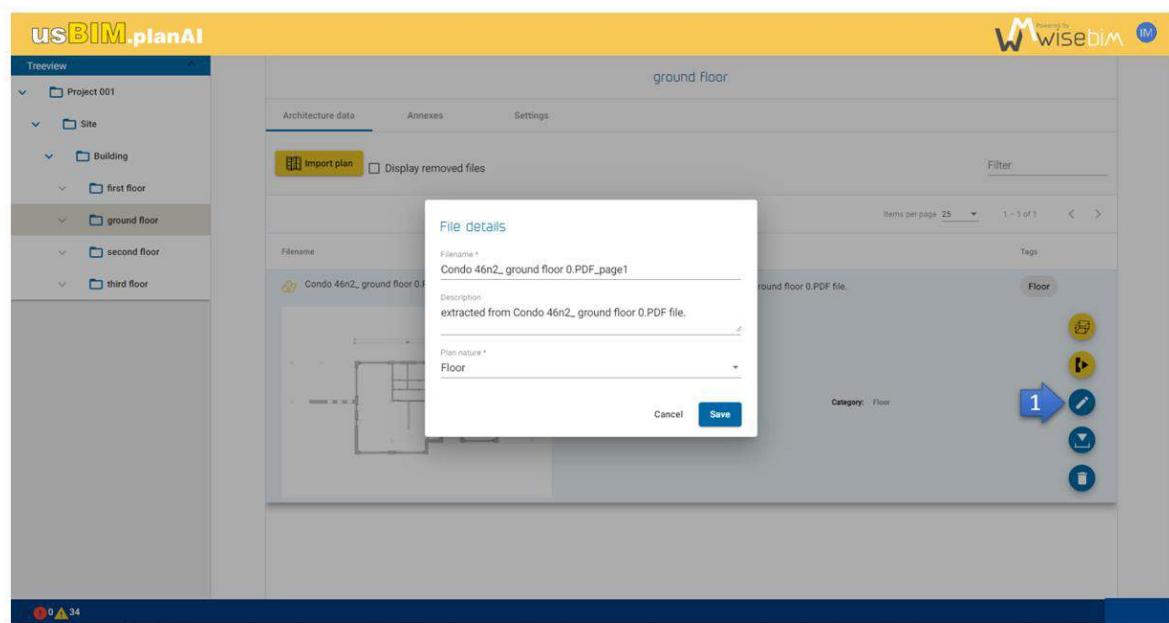


Figure 23. data editing

7.3 Document deletion

Each document imported or created can be deleted.

7.4 Deleting plans

From the EDM interface, after selecting the plan to be deleted, you must click on the "Delete" button (Figure 24).

A recycle bin mechanism is used to avoid handling errors.

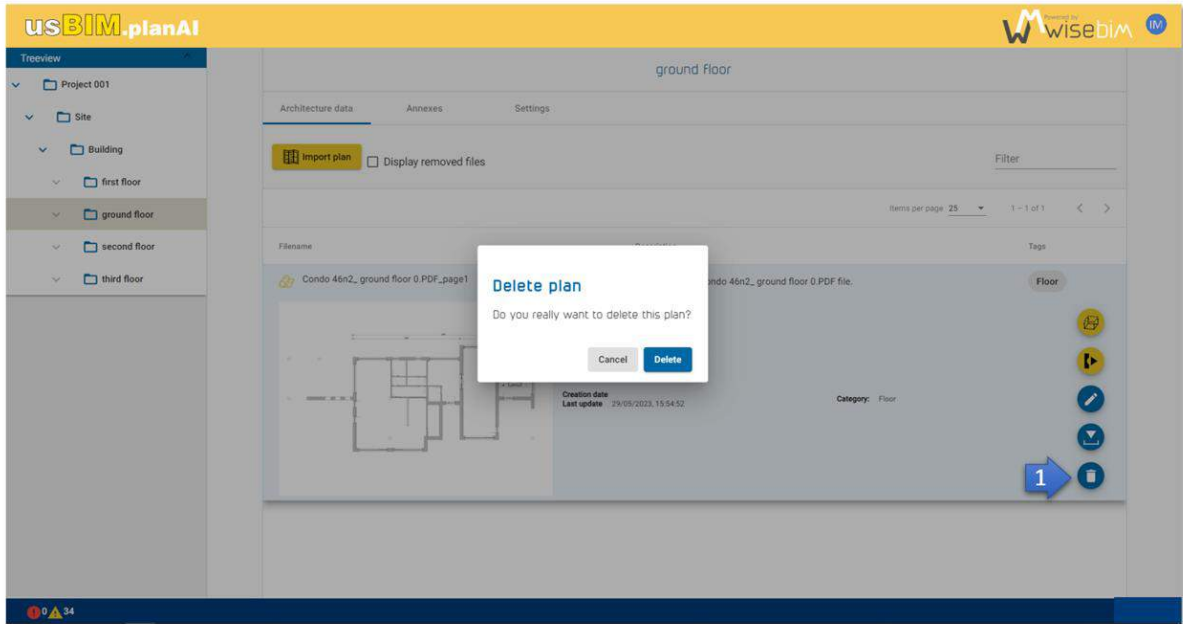


Figure 24. deleting a plan

The plan is no longer visible in the folder but is not permanently deleted. The data associated with the plan, in particular the model, is also kept. The document can be restored by viewing the trashed files. To do this, you must check the box "Show deleted files". To restore the plan file, click on the "Restore" button located in the row of the selected file (Figure 25).

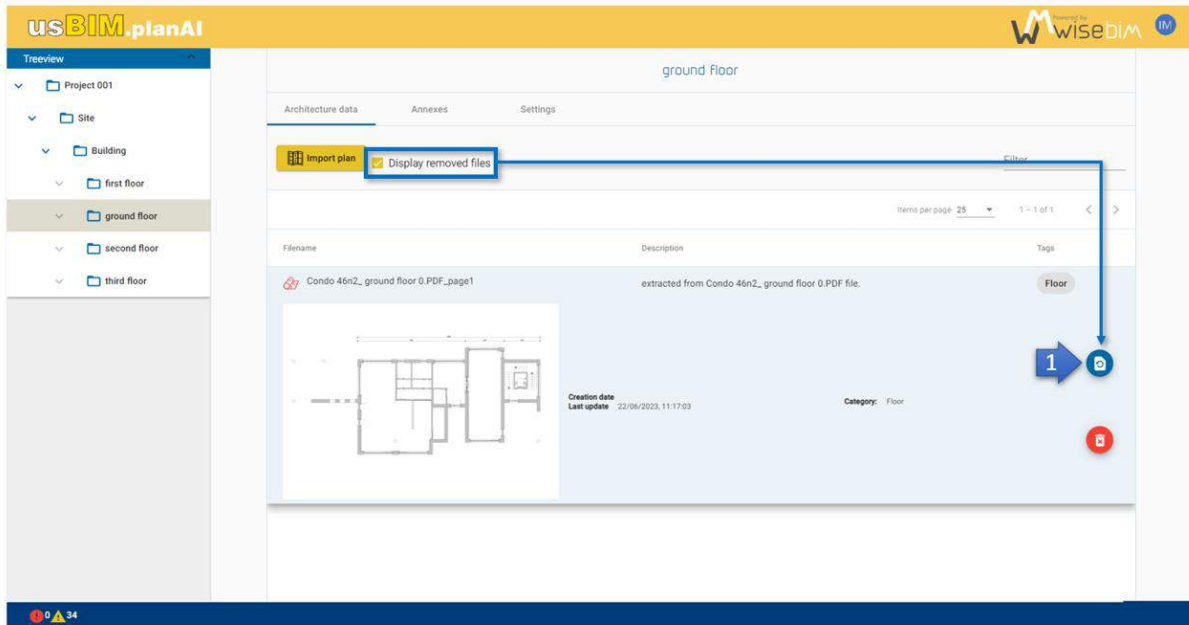


Figure 25. restore the plan

To confirm the deletion of the file, click on the "Delete permanently" button . If models have been generated from this file, a pop-up window is then displayed to ask confirmation to also delete the model files or to keep them (Figure 26).

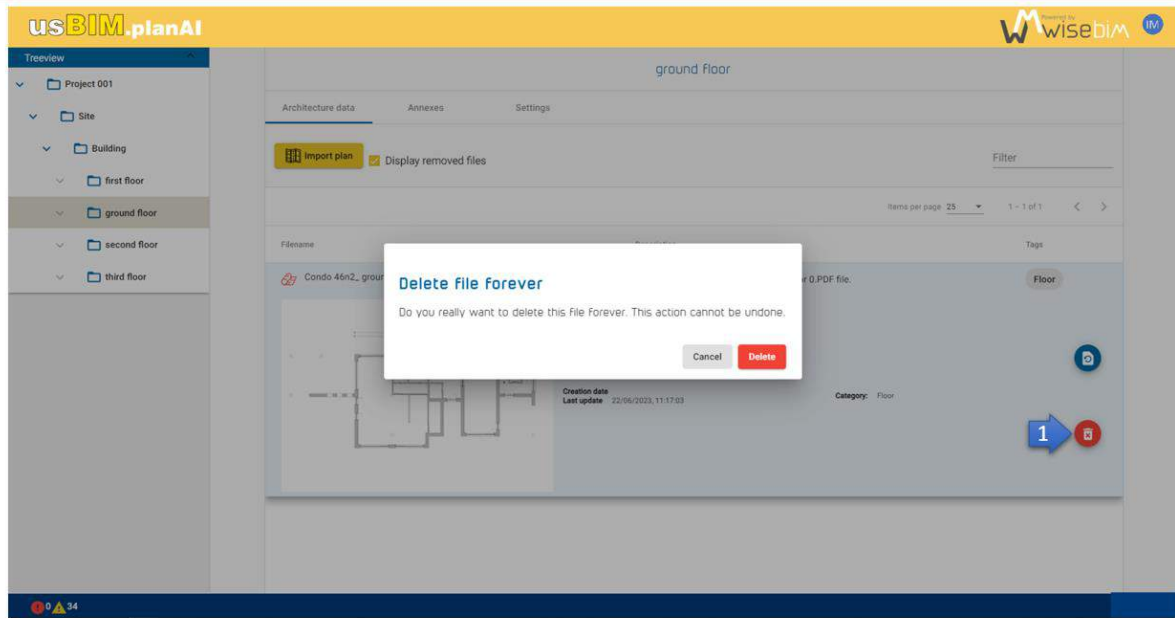


Figure 26. permanent deletion

7.5 Deleting model file

BIM model files can be deleted independently of the plan file. To do this, you must click on the "Delete" button in the row of the selected model (Figure 27). The deletion is permanent, there is no trash mechanism for models.

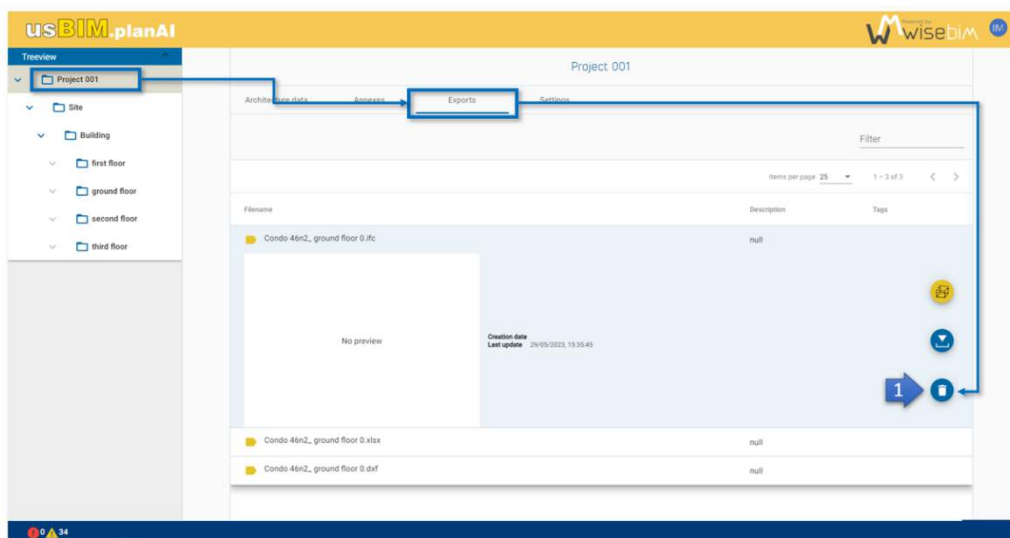



Figure 27. deleting a model file

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8 Conversion and modelling of a plan

Steps:

1. Access to the Work Area
2. Scaling
3. Automatic recognition

9 Modelling interface: Work Area

The **Working area** is the user interface dedicated to creating and modifying models.

9.1 Access to Work Area

Access to the Working area is possible from the EDM by selecting a plan, then clicking on the "Open in the modelling tool" button (Figure 28).

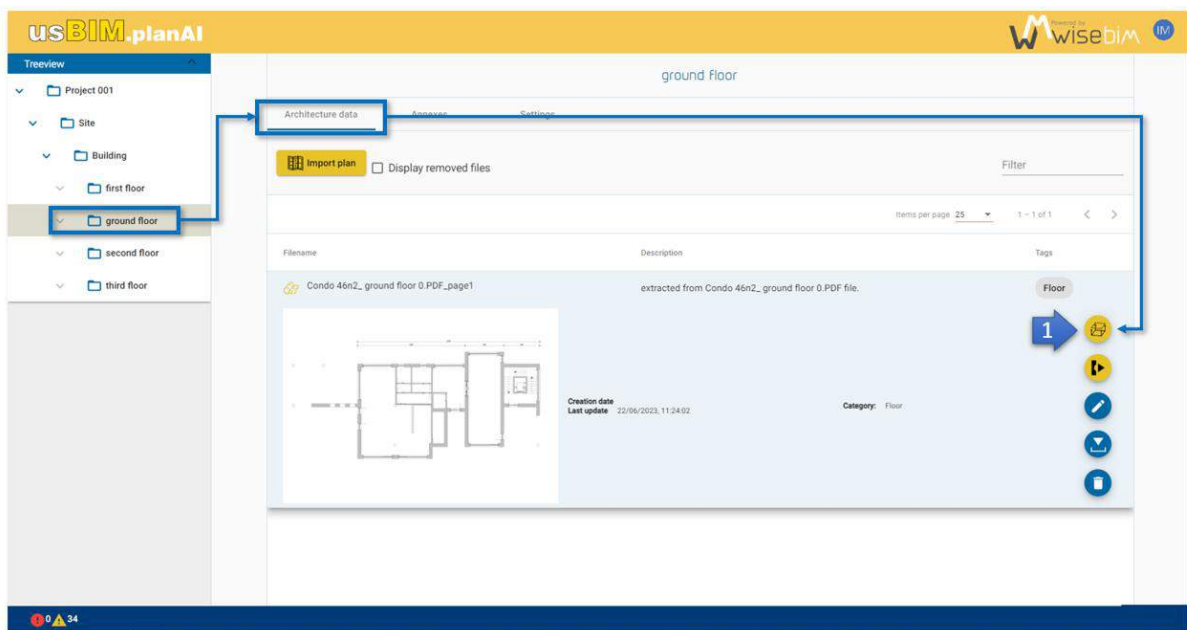
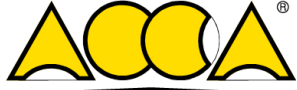


Figure 28. accessing the editing environment

The modelling process is carried out according to the following steps:

1. Loading the plan in Work Area
2. Generation of the model
 - 2.1. Scaling
 - 2.2. Parameters settings
 - 2.3. Run the automatic detection
3. Visualization of the result
4. Editing and modifying the result
5. Saving and export

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9.2 Working area layout

The Working area is divided into 3 parts:

1. The left panel groups together the parameters and access to the processing, saving and export functions.
2. The central part displays the plan in 2D or 3D and the functions for editing the elements.
3. The right panel displays the tree structure and the properties of the selected elements.

9.3 Parameters

The pane on the left is composed of several panels (Figure 29):

- **Actions:** Access to automatic detection, save, export and display mode functions.
- **Parameters:** Displays all the parameters and options for the detection and the height values of the structure.
- **History:** List the saved points made.

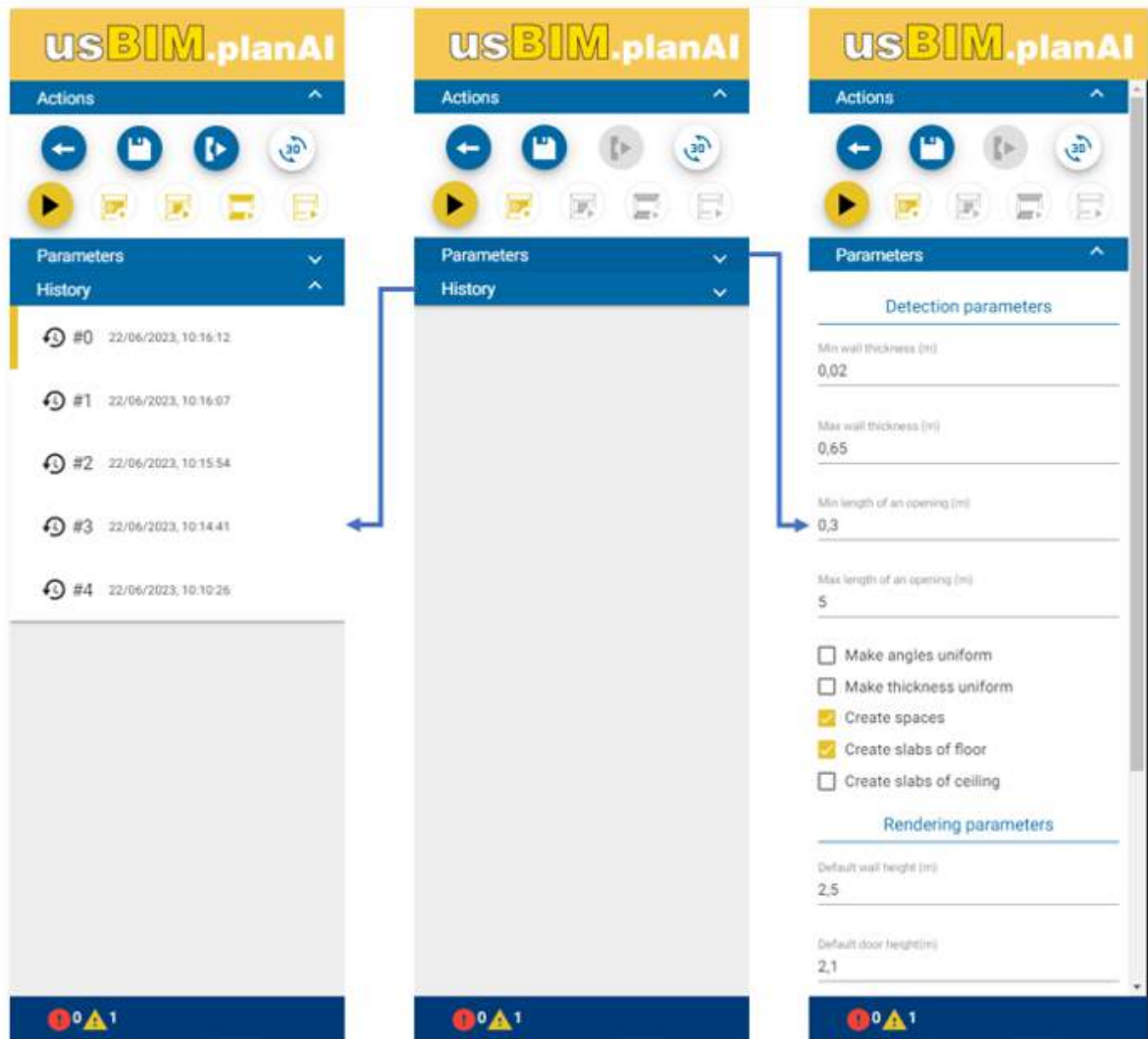


Figure 29. parameter definition

9.4 Central view

The central part makes it possible to visualize the plan and the superimposed elements in 2D or the 3D view of the generated model.

Each element (wall, opening, space) is individually accessible to be modified, moved or deleted.

In the upper part, a menu contains buttons for accessing the various functions (Figure 30):

- Moving
- Simple selection
- Rectangular selection
- Scaling
- Item creation

- Rotation
- Deletion
- Undo / redo
- Display configuration

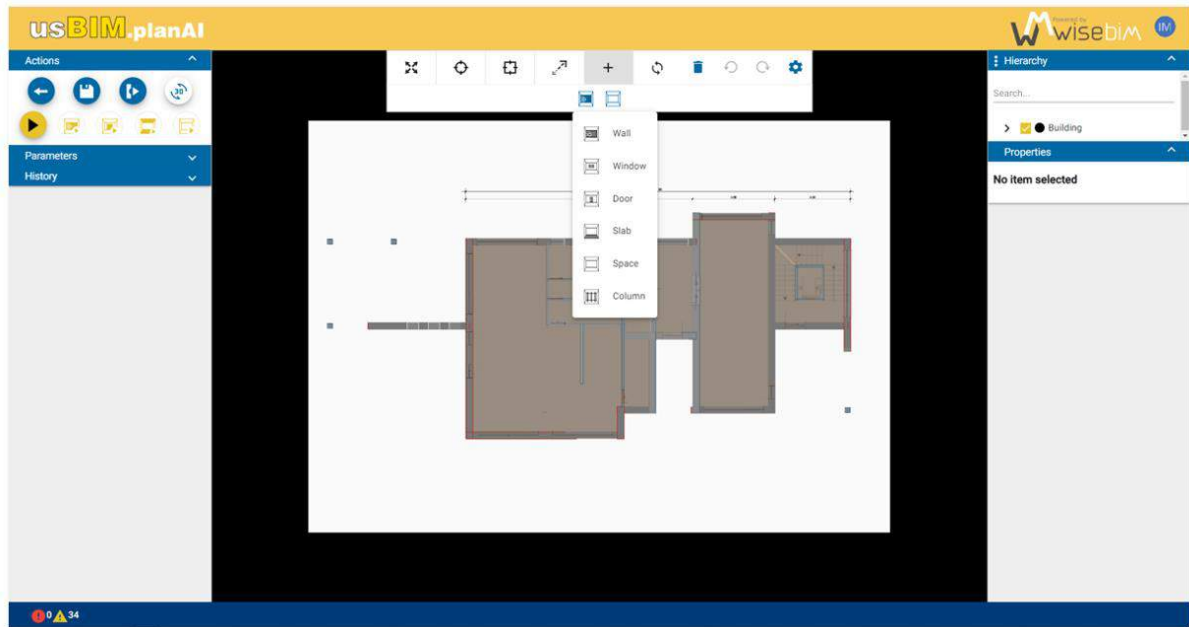


Figure 30. main window

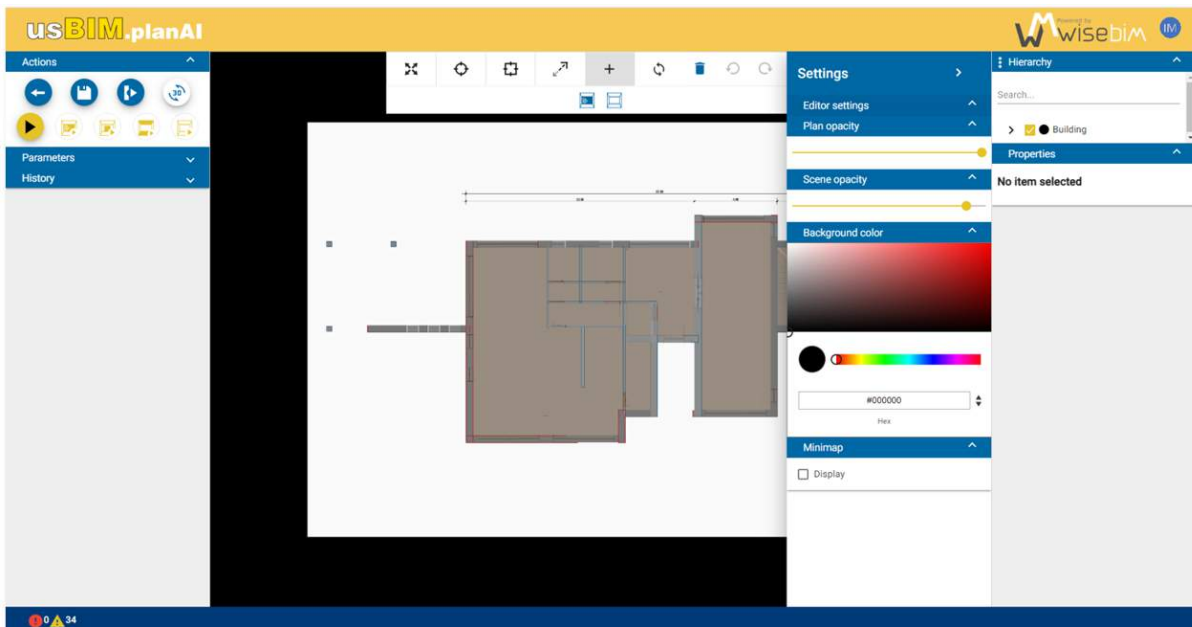



Figure 31. editor panel

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9.5 Navigation and properties

The pane on the right contains two panels (Figure 32):

- **Navigation:** display of elements in the form of a hierarchical tree structure or by category.
- **Properties:** display and modifications of the characteristics associated with a set of elements or an individual element.

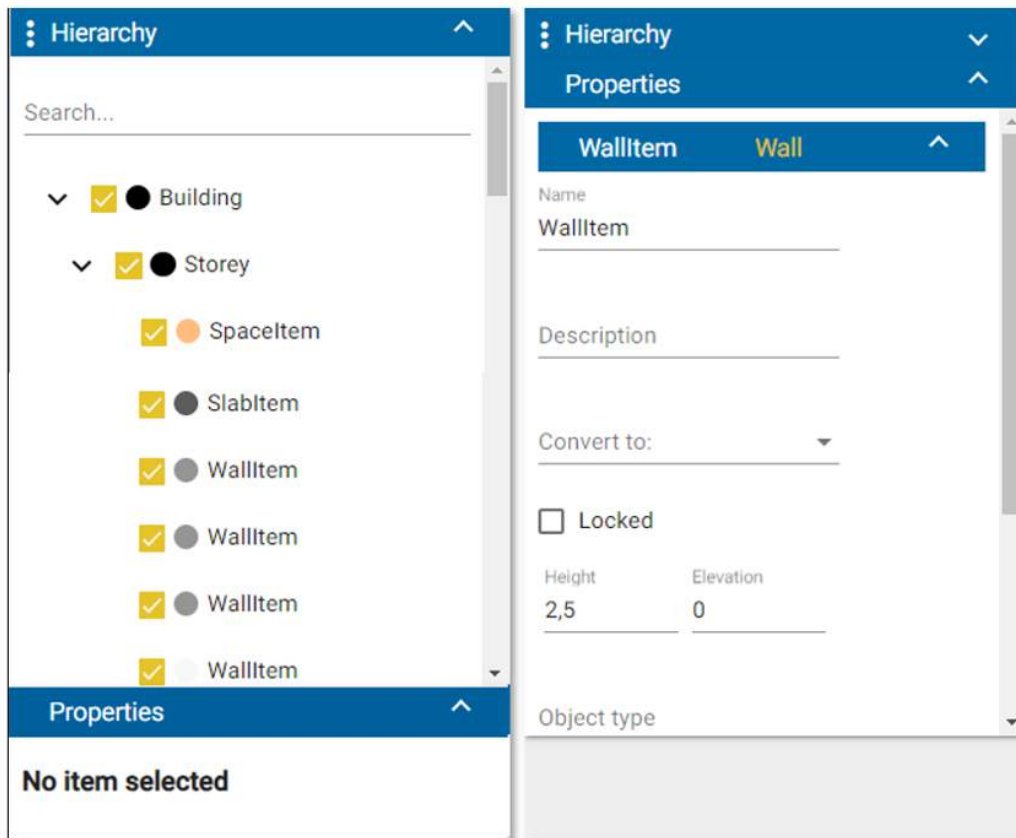


Figure 32. navigation and properties

10 Automatic recognition of plan

usBIM.planAI integrates automatic recognition algorithms able to identify various components of the building architecture on a plan image:

- Walls,
- Doors, windows,
- Slabs,
- Spaces.

11 Scaling the floor plan

The first step in the process is to scale the image plan, that is to say to define on the image a known measurement.

You must first access the scaling function from the menu bar in the upper part. The scale tool is displayed by default in the centre of the plan.

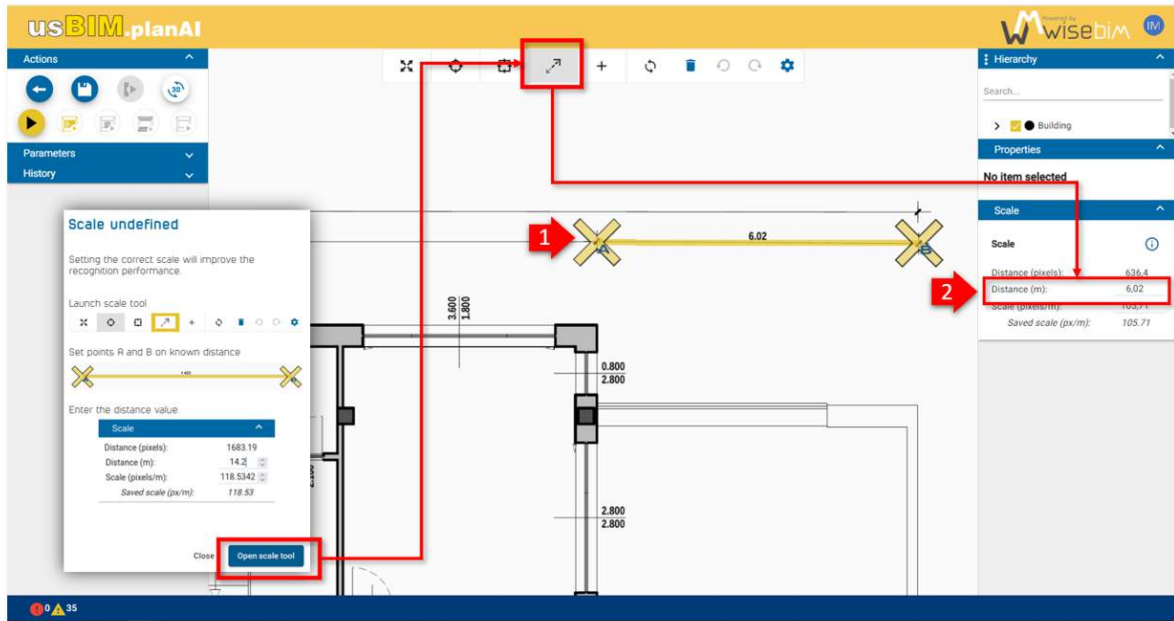


Figure 33. scaling the floor plan

It consists of 2 points: A and B, which must be positioned at each end of a known distance on the plan.

When the points are correctly positioned in the image, you must enter the corresponding distance in meters, in the right panel (Figure 33).

After validation, the scale value is updated (the initial default value is equal to 100).

For optimized processing, it is recommended to obtain a scale greater than 100 pixels per meters.

If the value is lower, the reconstruction quality of the model will be poorer because the dimensions will be less precise. At 50 pixels/m, the precision cannot be less than 2 cm.

Once the scaling is complete, it is best to switch to the default selection mode (Simple selection) (Figure 34).

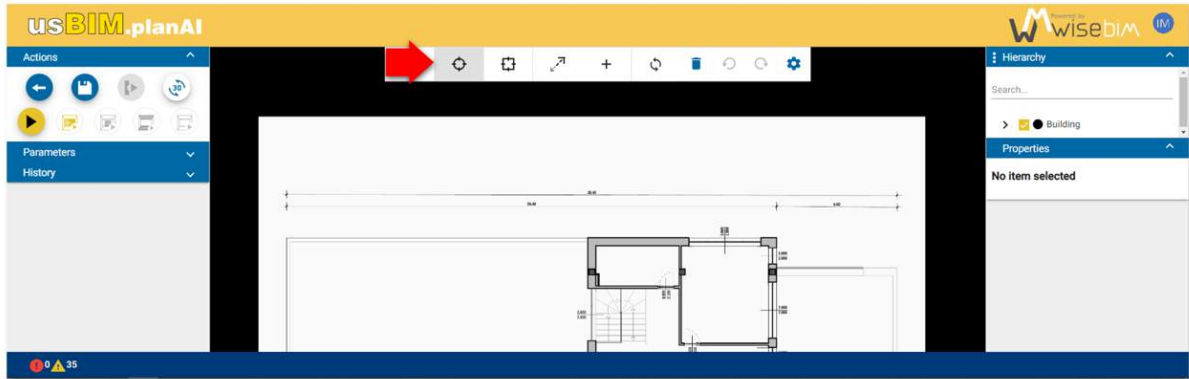


Figure 34. simple selection

12 Parameter setting

Recognition algorithms involve some parameters which can be modified by the user.

They are grouped into 2 categories:

- Detection parameters,
- Render settings.

All the parameters are displayed and accessible from the "Parameters" left panel (Figure 35).

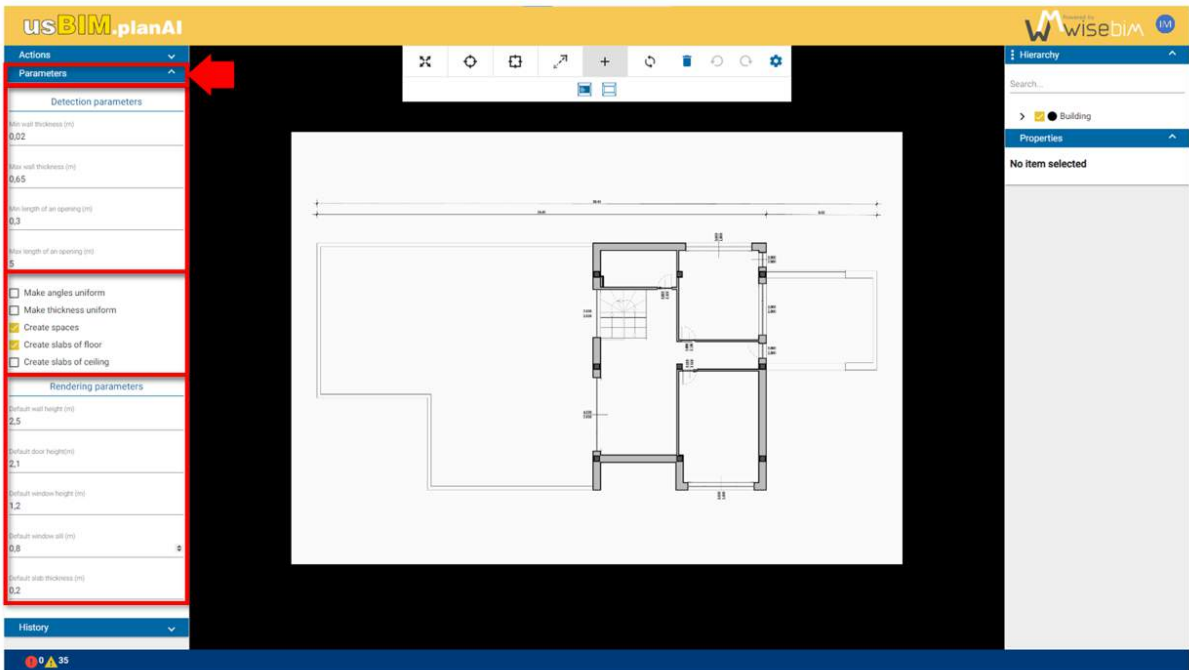



Figure 35. settings and parameters

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The detection parameters must be defined before the execution of the recognition function in order to be taken into account by the algorithm.

Any modification of one or more parameters implies to restart the algorithm and losing the existing data that have been already created.

The detection parameters are as follows:

- **Min wall thickness** (m): minimum thickness, in meters, of the walls (0.02m by default)
- **Max wall thickness** (m): maximum thickness, in meters, of the walls (0.65m by default)
- **Min opening length** (m): minimum length, in meters, of doors or windows (0.3m by default)
- **Max opening length** (m): maximum length, in meters, of doors or windows (5m by default)

The default values set for the 4 parameters above are suitable for most plans. It is possible to modify them if the configuration of the plan involves particular walls, for example with a thickness of 0.7m, or in order to improve the result obtained, for example by increasing the minimum value to 0.05m if too many thin walls are detected by mistake.

Options are associated with the calculation:

- **Make the angles uniform:** homogenize the orientations of the detected walls
- **Make the thicknesses uniform:** homogenize the thicknesses of the walls detected
- **Create spaces:** add spaces corresponding to rooms
- **Create the low floor:** add a slab corresponding to the floor
- **Create the upper floor:** add a slab corresponding to the upper floor or the roof.

The second set of parameters defines the heights associated with the elements.

The rendering settings are as follows:

- Default wall height (m)
- Default door height (m)
- Default window height (m)
- Default window sill (m)
- Slab thickness (m)

12.1 Detection algorithm

When scaling and setting have been completed, automatic recognition can be applied. This function is accessible from the "Run" (Figure 36) button at the top of the left panel (Actions).

12.1.1 Detection of all elements at once

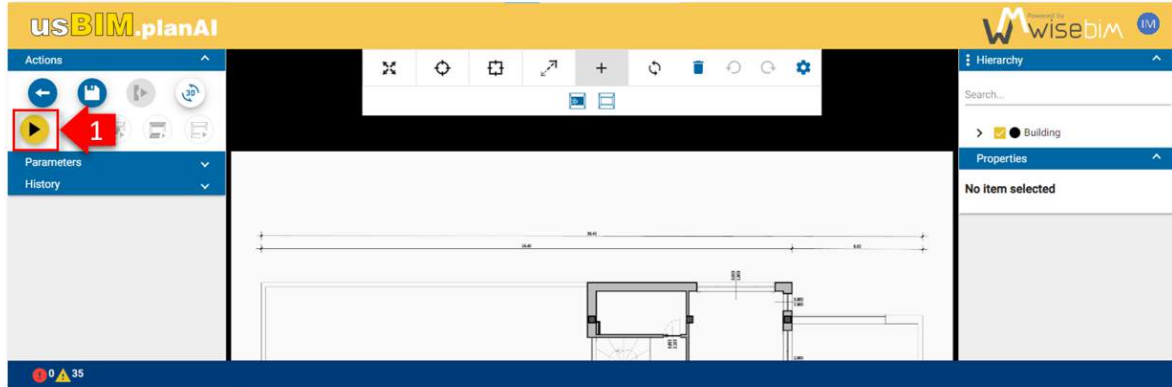


Figure 36. automatic detection of the elements

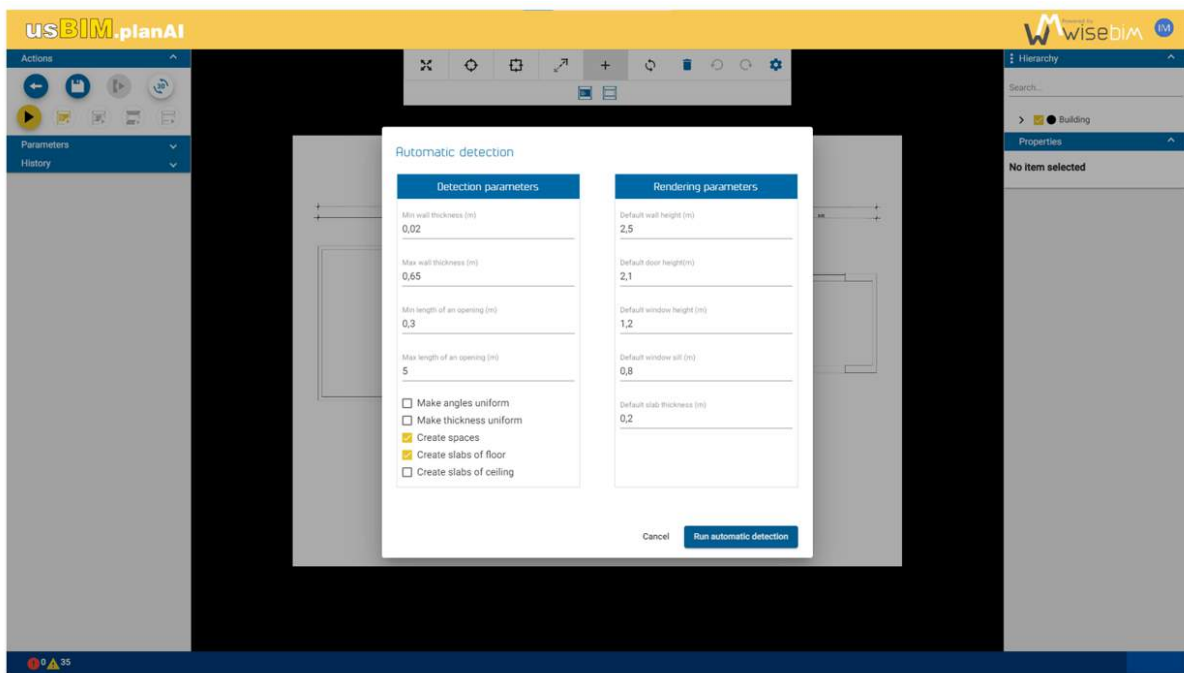


Figure 37. detection parameters

If the scale has not been set, a warning message is displayed to cancel the recognition phase and define the scale or launch the process with the default scale (Figure 38).

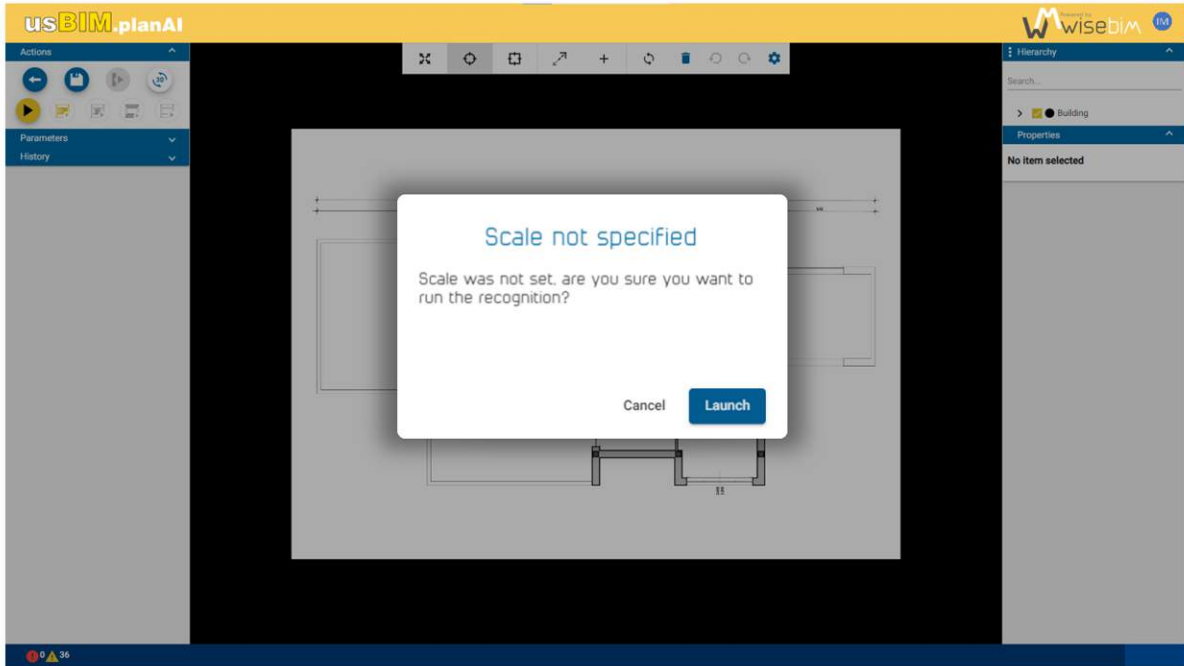


Figure 38. request for scaling

A message is superimposed on the floor plan to inform the user of process progression and the estimated remaining time.

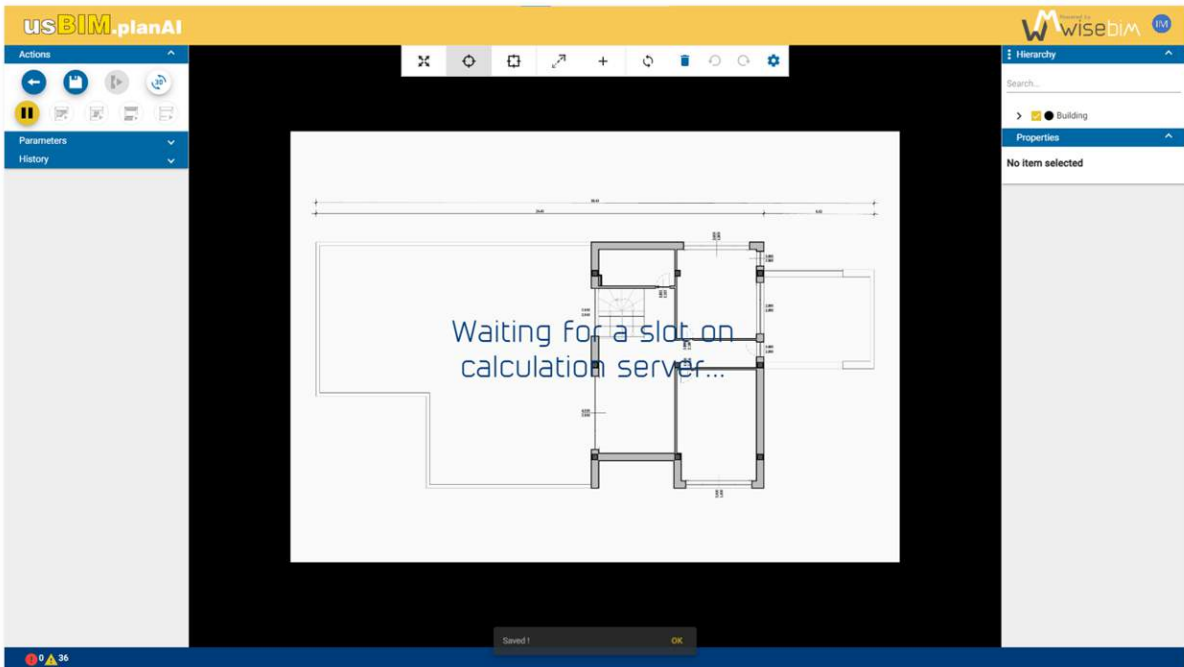



Figure 39. detection of the plan

A progress bar is also visible above the menu.

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At the end of the detection, a confirmation message is displayed at the bottom of the scene (Figure 40).

The central part is updated with the elements detected. The hierarchy is also updated.

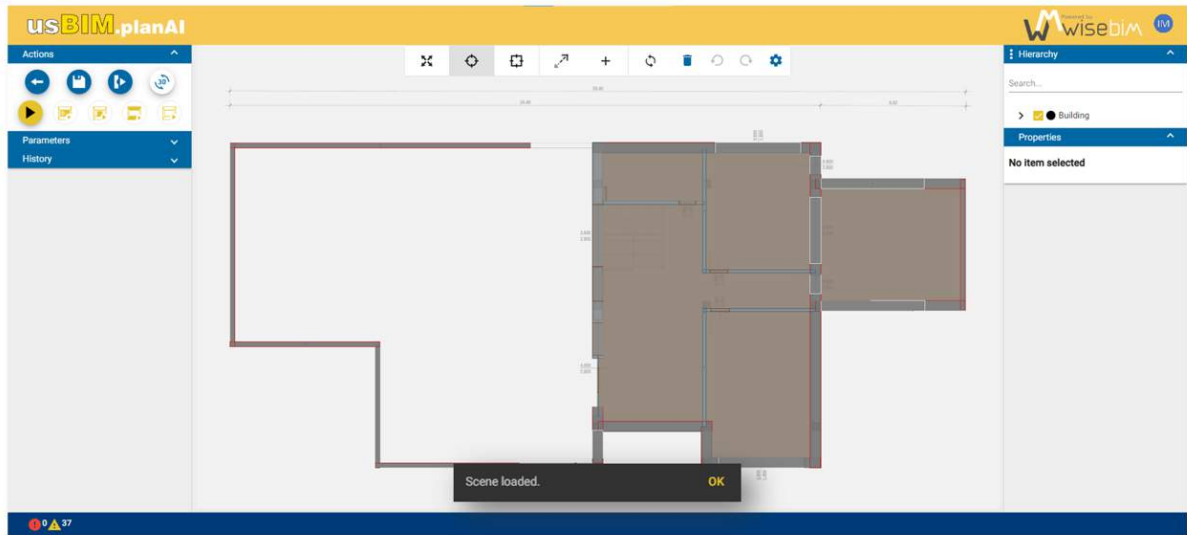


Figure 40. plan loaded

If the scene does not contain any items, the detection may not have worked properly. If an error occurs during the detection, a warning is displayed in the footer (Figure 41). The mention "Internal Server Error" is generally linked to an internal error, it is recommended to check the detection parameters before restarting the detection. If the error occurs again, it is best to contact support.

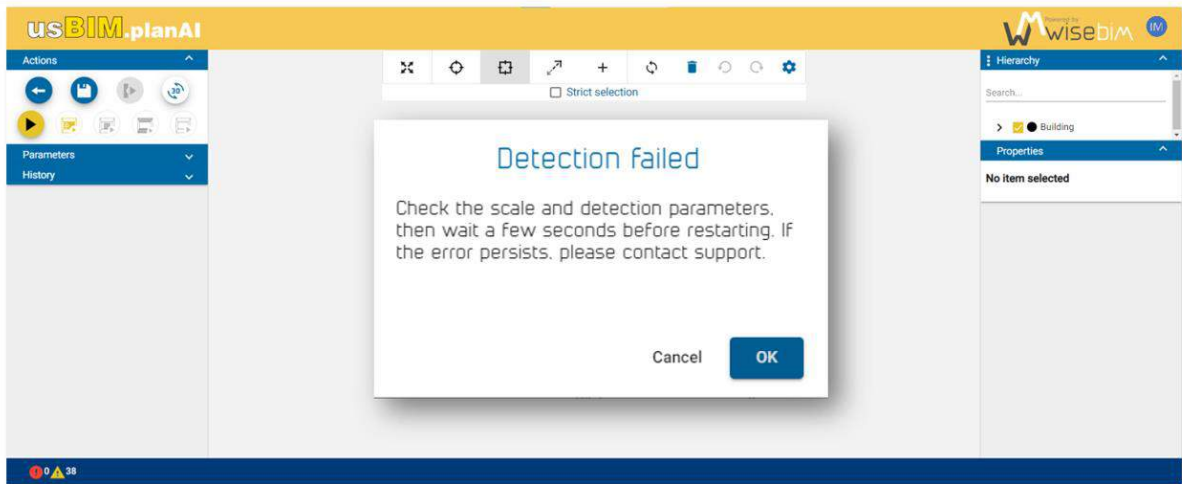



Figure 41. detection failed

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12.1.2 Step by step detection

Detection works in several steps.

The recognition of the walls is a prerequisite to launch the detection of the other elements (openings, slabs, spaces). The precision of the wall recognition could improve the precision of the other detections.

The step-by-step detection mode makes it possible to correct the result of a reconstruction step before being able to perform the recognition of another category.

Wall detection is started by clicking on the "Run wall detection" button (Figure 42).

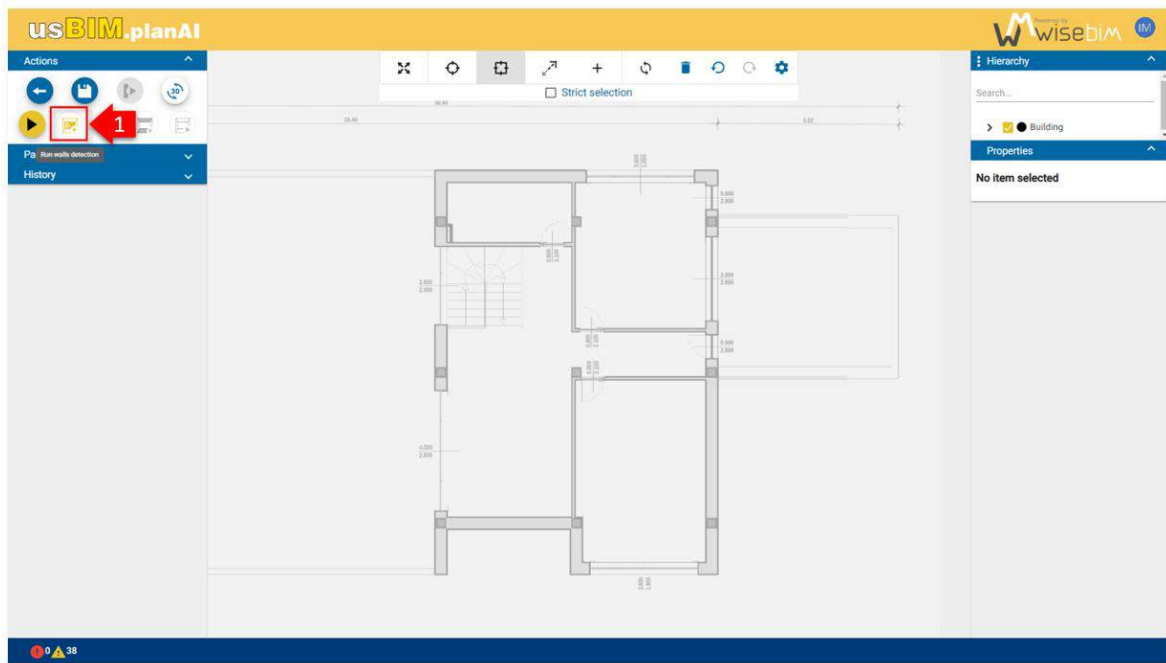


Figure 42. wall detection

A window is displayed to specify the parameters concerning the detection of the walls. These parameters come from all the parameters and their modification affects the defined parameters (Figure 43).

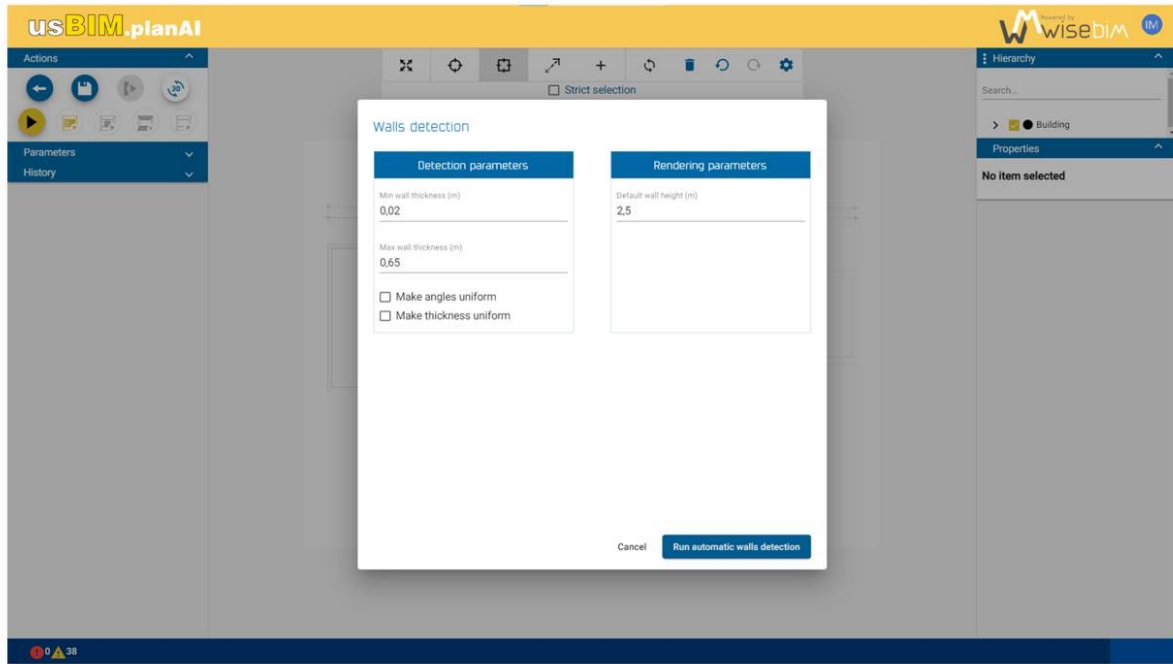


Figure 43. wall detection parameters

At the end of the detection, the visualization scene is updated with the detected walls. The further detection functions (openings, slabs, spaces) are then activated.

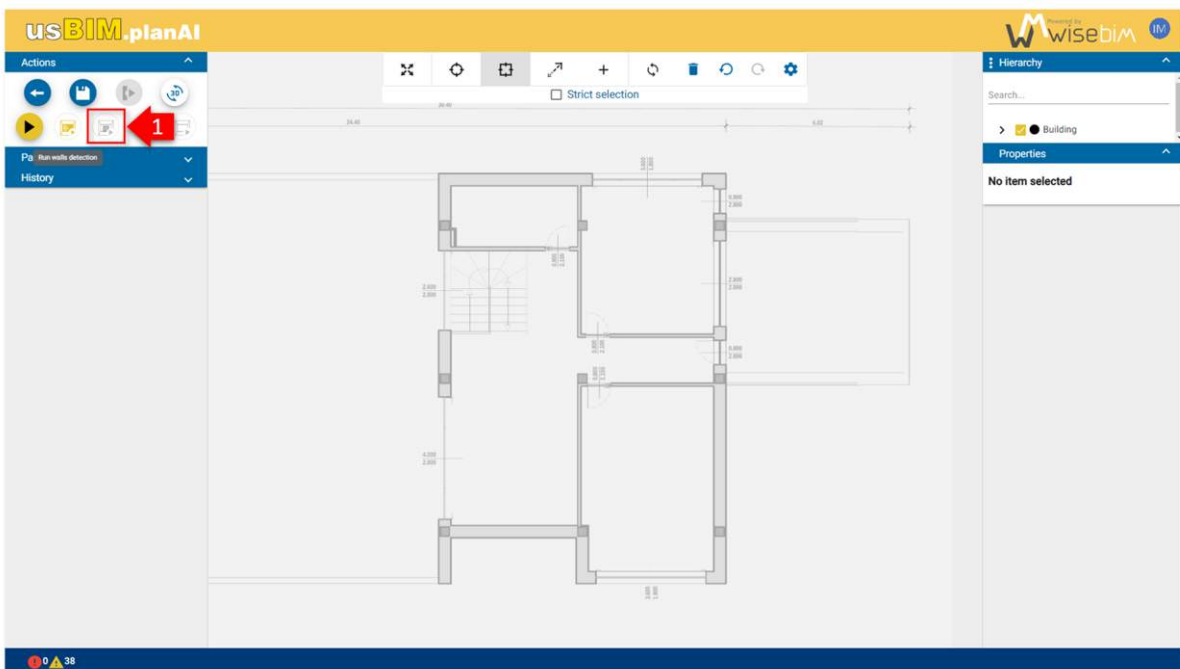



Figure 44. opening detection

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In order to optimize the recognition performance, it is recommended to carry out at this stage the check and the modification of the walls using edit functions.

The detection of the walls is started by clicking on the button "Run the openings detection procedure" (Figure 44).

A window is then displayed to specify the parameters concerning the detection of doors and windows (Figure 45).

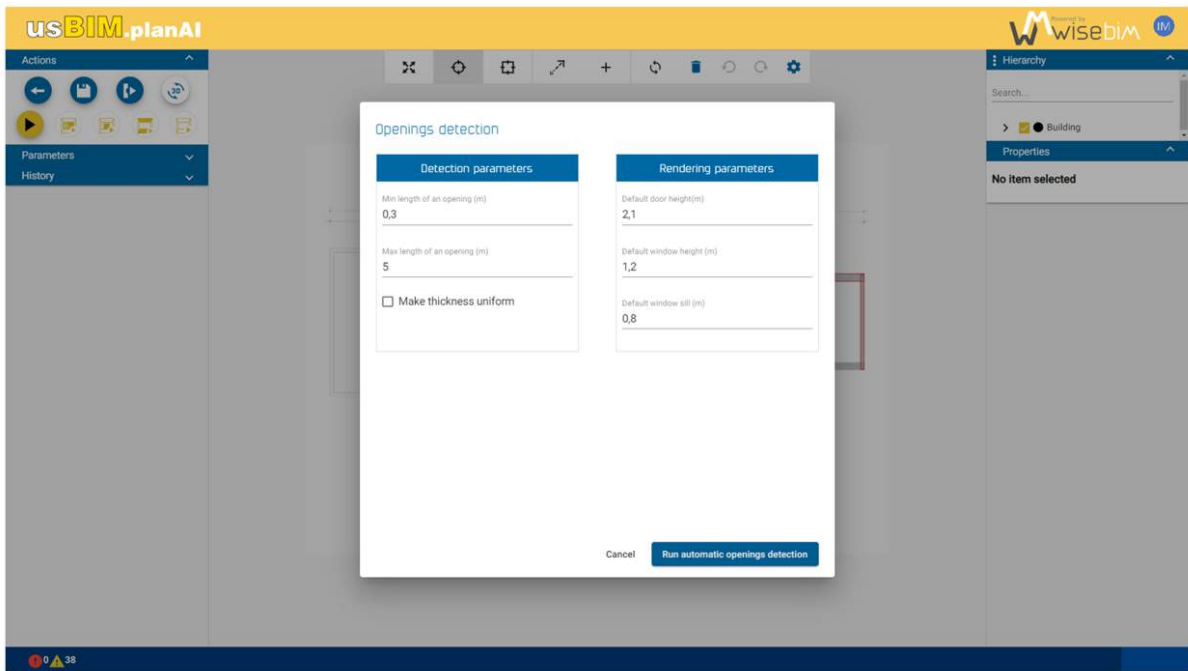


Figure 45.opening detection parameters

At the end of the detection, the visualization scene is updated with the detected openings (doors and windows).

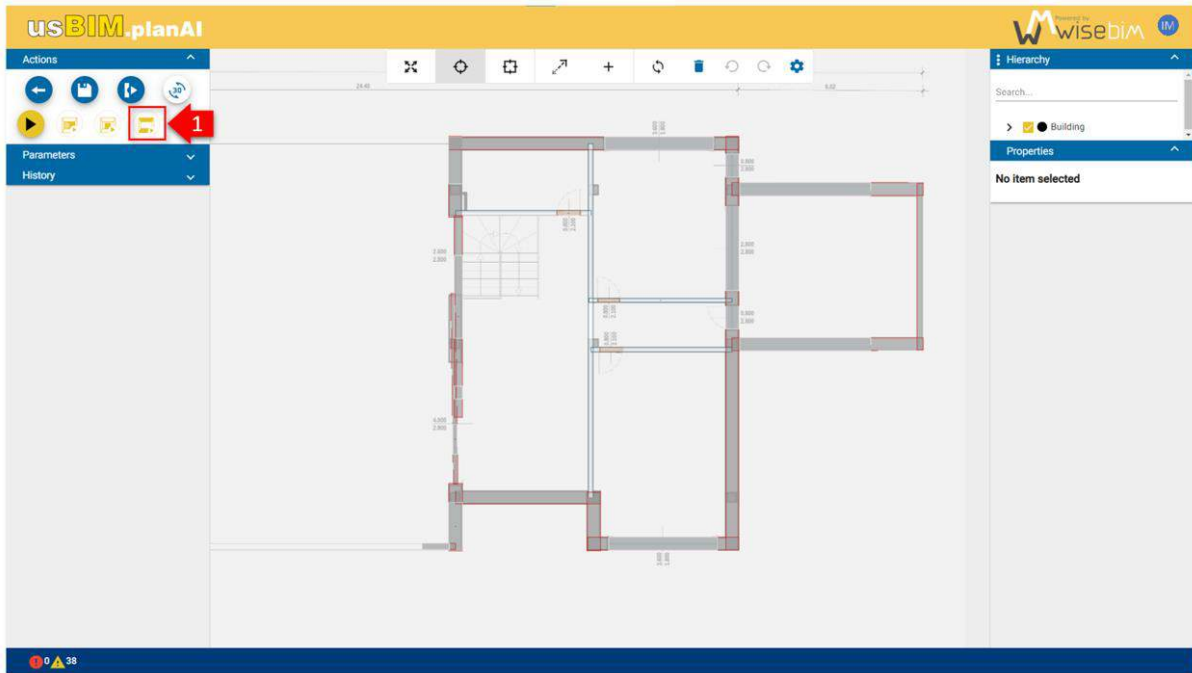


Figure 46. space detection

The operation is achieved similarly to detect spaces or slabs. A dialog window is displayed to validate the parameters (Figure 46).

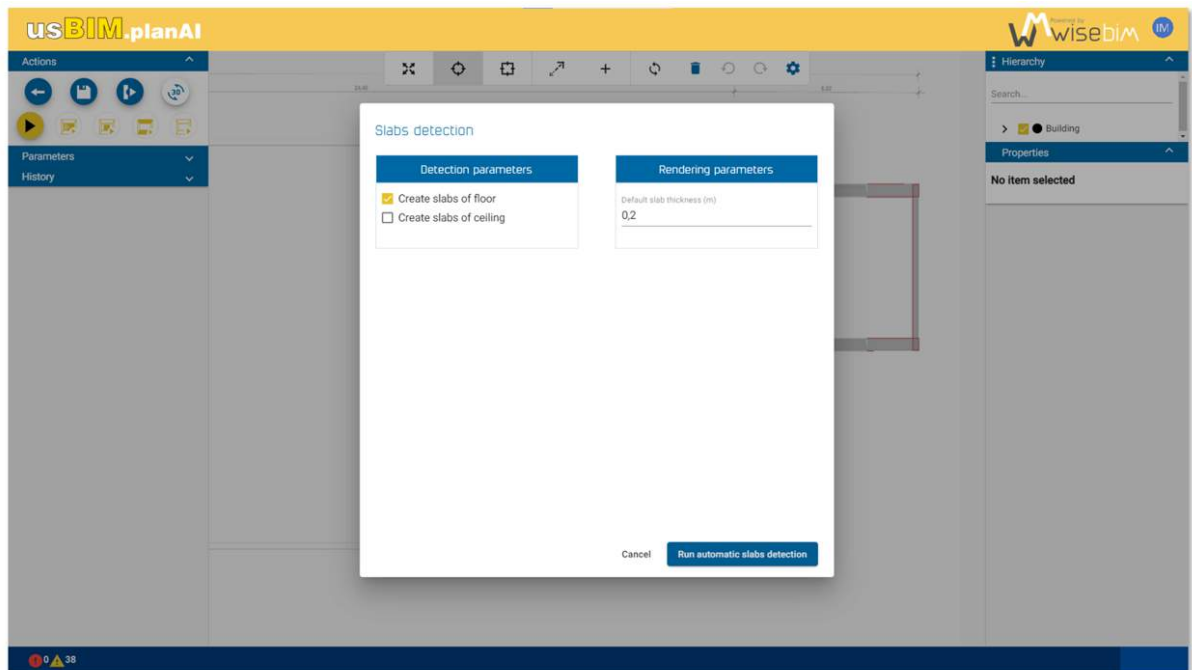



Figure 47. space detection parameters

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If no option is chosen, the detection cannot be started.

This mode also makes it possible to restart the detection separately from a specific category, in order to update the model. It is thus possible to carry out a first complete detection, then to run each detection separately. If elements impacted by this detection are present, they will be deleted. In this case, a message is displayed in the settings window.

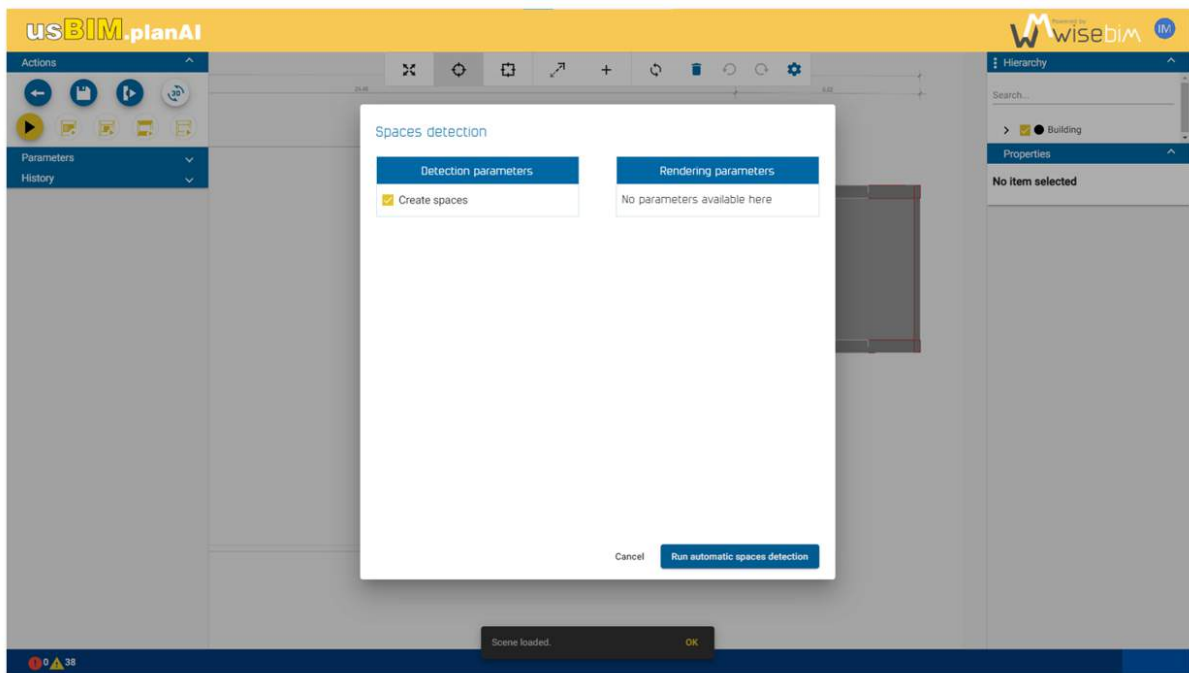
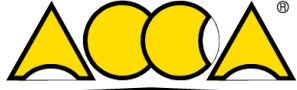


Figure 48. space detection parameters

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13 Model visualization

Different functionalities are integrated within usBIM.planAI in order to display the obtained result and allow the user to visualize the geometry of the elements and the associated information.

14 Result view

The central part is used to display the result of the modelling in 2D or 3D.

14.1 2D view

The 2-dimensional view contains the image of the plan on which all the elements of the 2D model are superimposed. This visualization mode is accessible by default when loading the plan. To return to this view, you must select the "2D" function in the left panel (Figure 49). This visualization represents for each element its footprint on the ground, by associating a colour for each type:

- **Exterior wall:** red
- **Interior wall:** blue
- **Window:** green
- **Door:** purple
- **Slab:** orange
- **Post:** blue
- **Space:** yellow

The 2D mode allows you to modify and move independently each element of the model. Navigation is performed using the mouse:

- by clicking and dragging if the cursor is not above an element,
- by selecting the "Moving" mode from the top menu, which avoids selecting a building element,
- by zooming using the wheel.

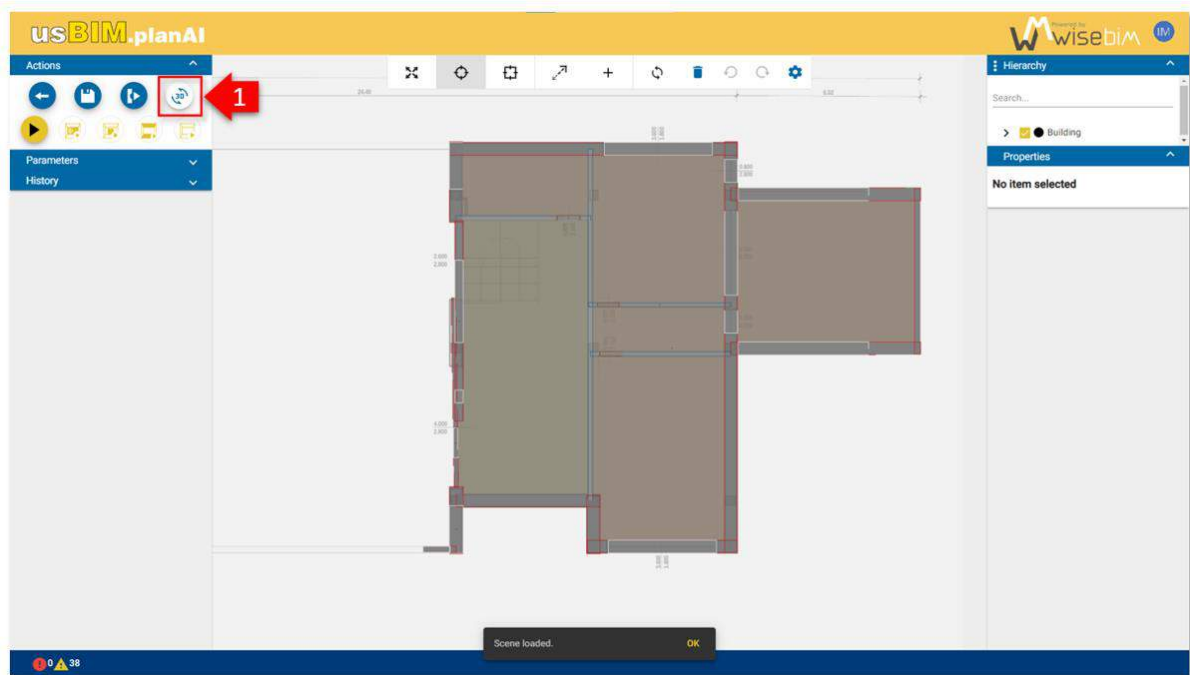


Figure 49. swap visualization 2D - 3D

14.2 Opacity

It is possible to change the transparency of the elements displayed on the scene:

- background image of plan,
- 2D elements superimposed on the plan.

This function is accessible from the menu at the top of the central scene (Figure 50).

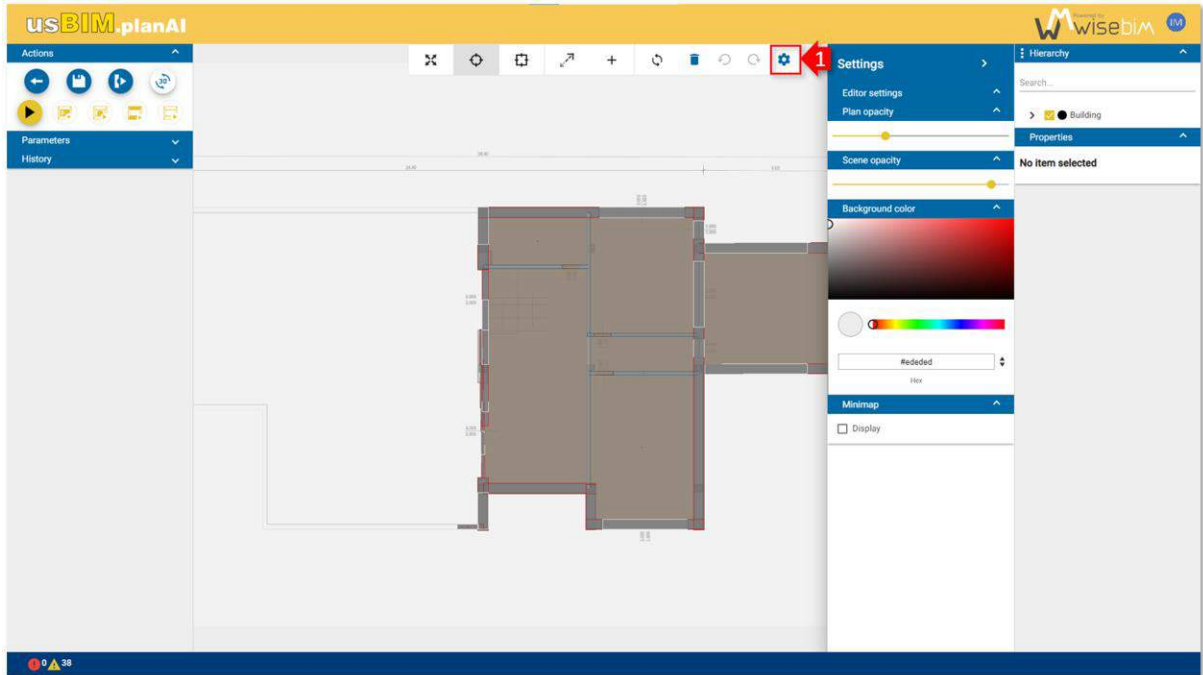


Figure 50. setting menu

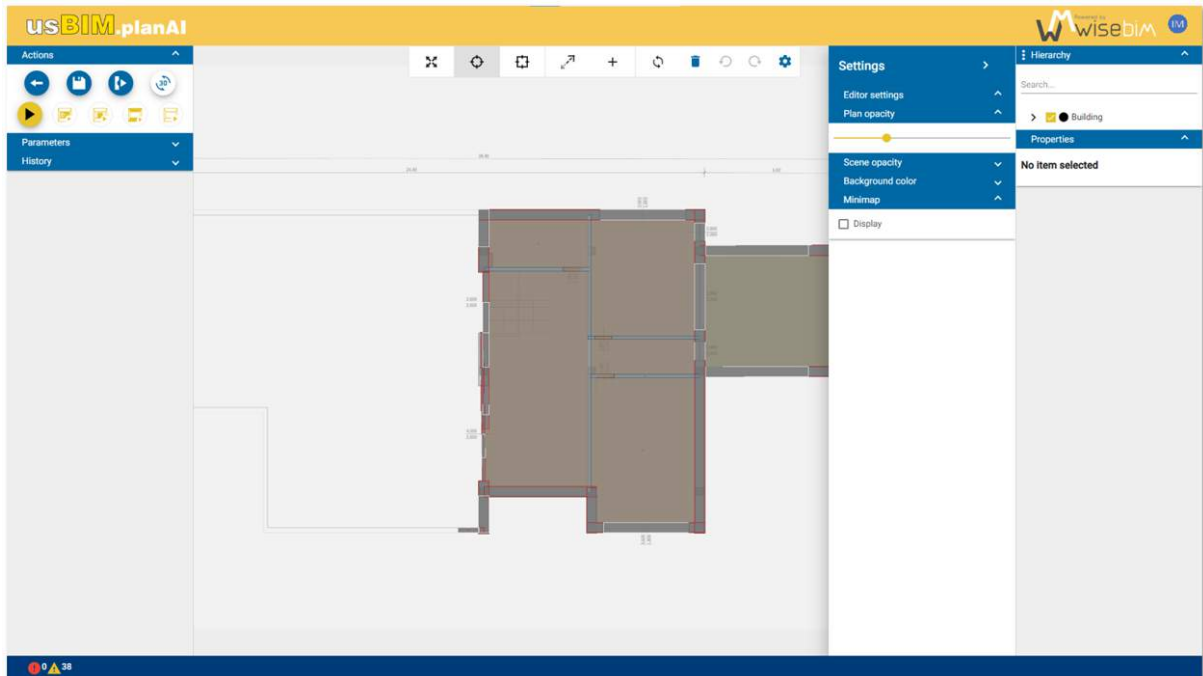



Figure 51. plan opacity

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14.3 Background image

By modifying the opacity value of the plan image, it becomes more or less transparent to highlight the elements of the model (Figure 51).

14.4 Model

By modifying the opacity value of the scene, the graphic objects of the model are more or less transparent to visualize the background image of plan.

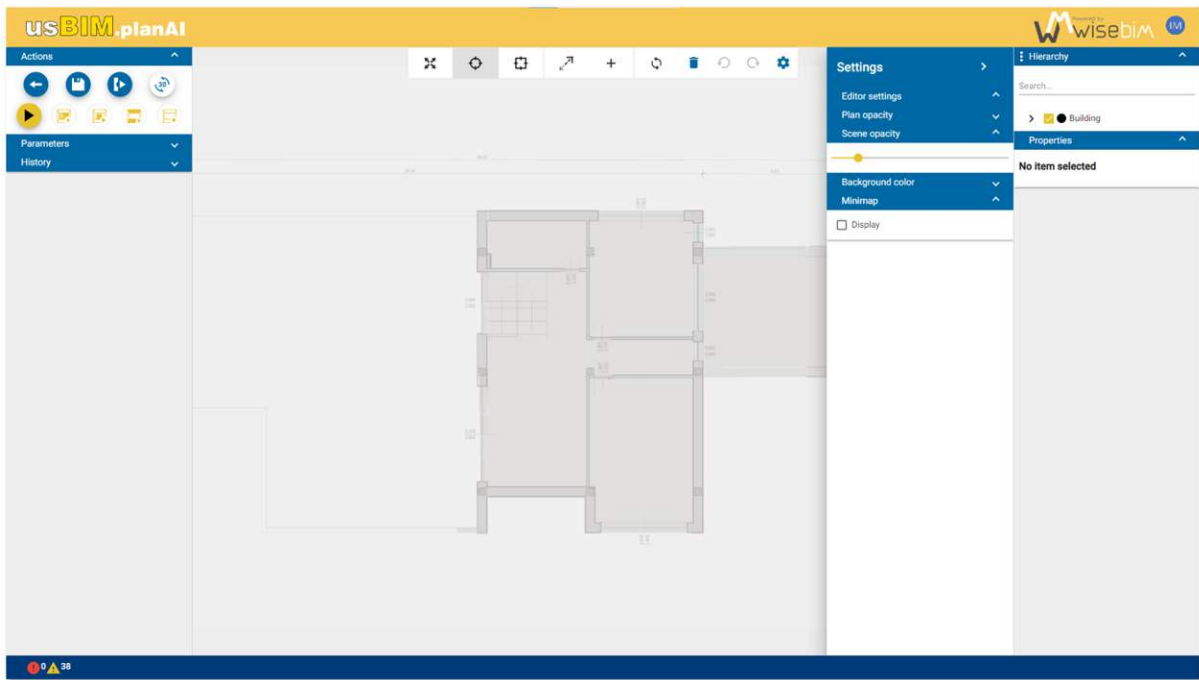



Figure 52. scene opacity

14.5 Colour of background

To improve the readability of the plan, it is possible to modify the background colour (white by default). You must select the "Background colour" function from the menu at the top of the scene (Figure 53).

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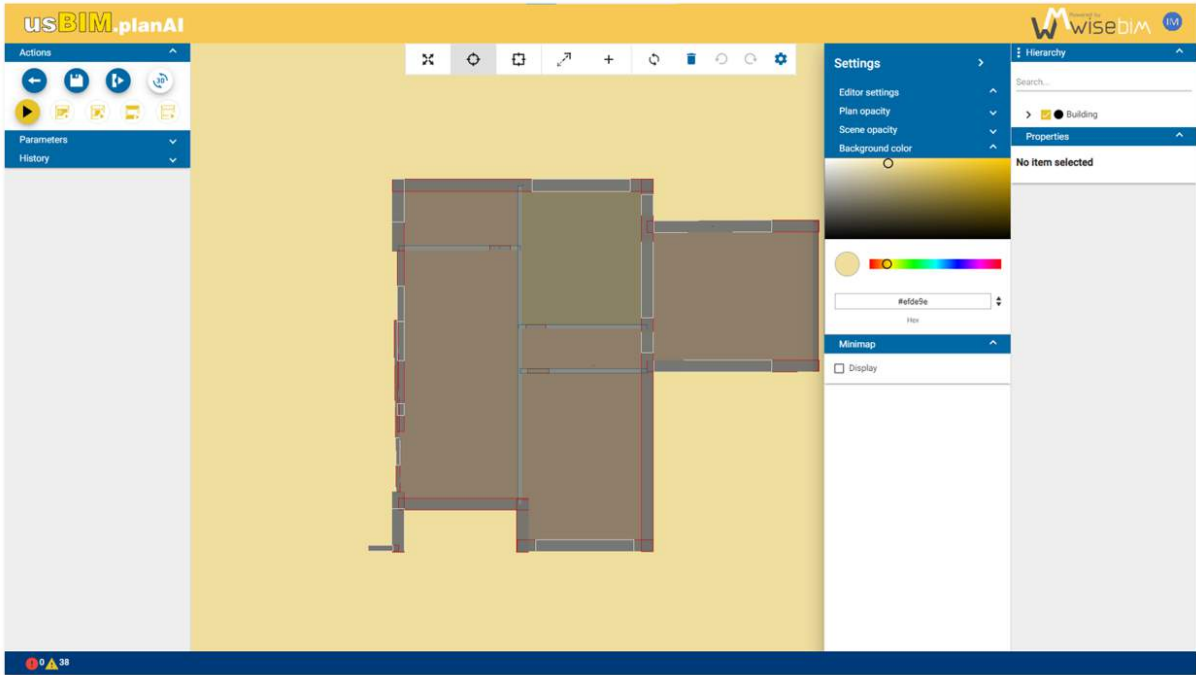



Figure 53. changing background colour

14.6 3D view

The 3D view is the second visualization mode, which is a simple visualization mode. The selection of items is possible but does not allow to move the elements. Navigation is performed using the mouse:

- main button click: rotate
- secondary button click: translation
- click wheel or wheel button: zoom

If modifications are not visible, it is possible to force synchronization using the button located at the top of the 3D view (Figure 54). This action will refresh the 3D view.

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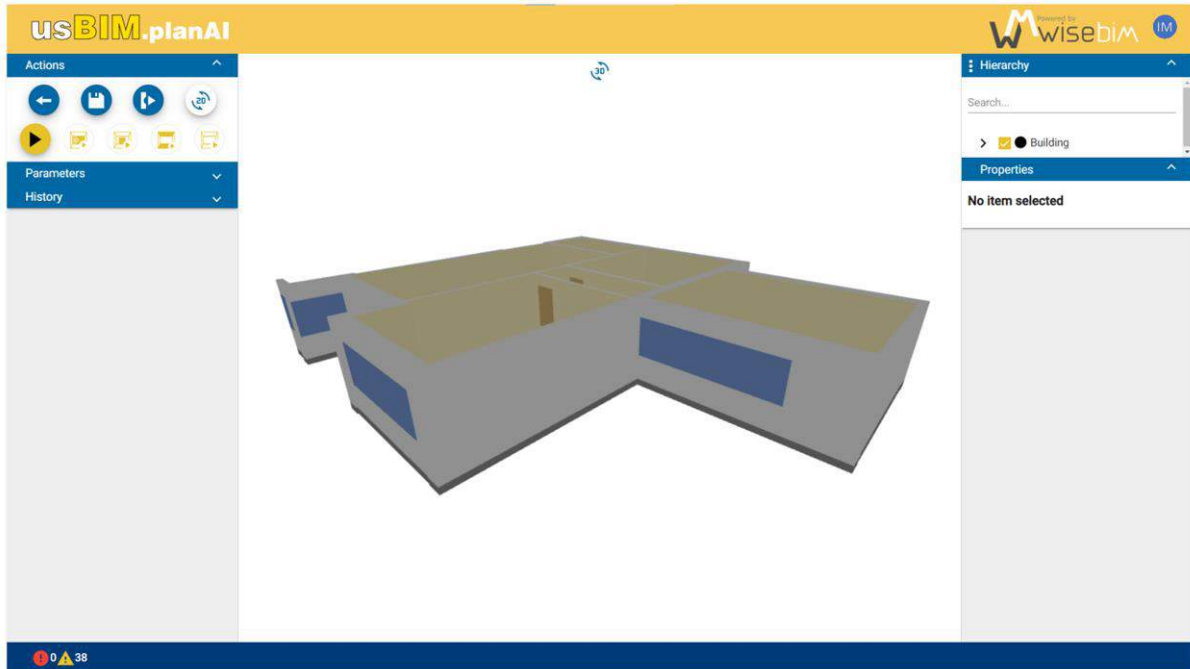


Figure 54. 3D view

15 Navigation in tree structure

A tree structure displayed in the right panel allows the user to navigate in the list of building elements (Figure 55).

This list can be displayed in 2 formats:

- by hierarchy
- by category

The display mode change is made by clicking on the drop-down title of the "Hierarchy" tab. The current selection is kept when changing mode.

15.1 Hierarchical tree

The elements are displayed in list according to their membership constraint. For example, the openings are referenced in the parent wall. It is possible to select or deselect one or more elements of different categories. An element can be hidden by unchecking the box in front of the name. It will be visible again by checking the box.

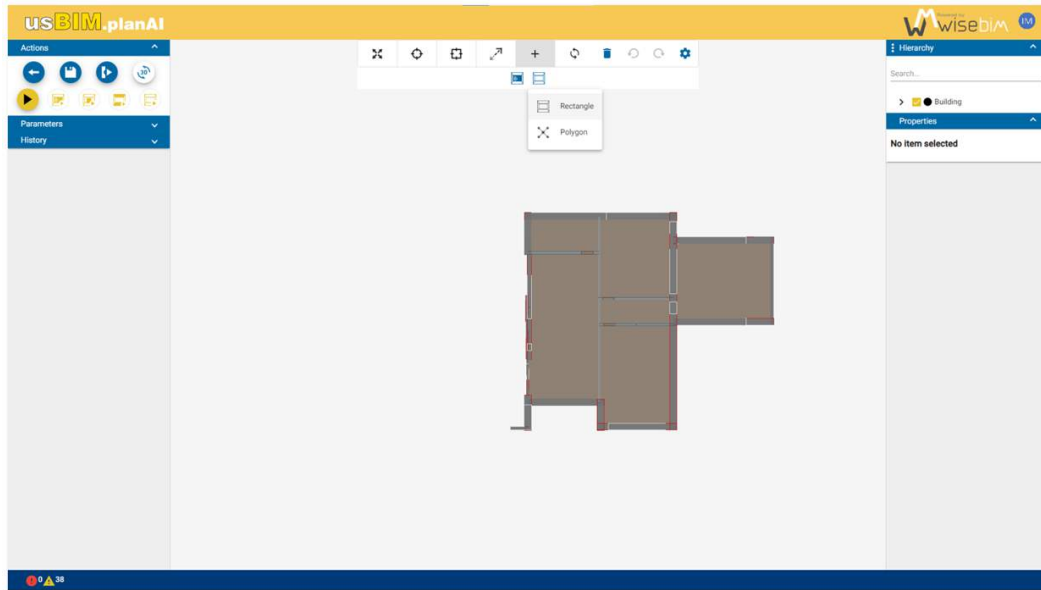


Figure 55. hierarchical tree

15.2 Tree structure by category

The elements are grouped according to their type, for example all the wall elements (Figure 56). It is possible to hide all the elements of a category by unchecking the box in front of the category name. It is possible to select or deselect all the elements of a category by clicking on the name of the category.

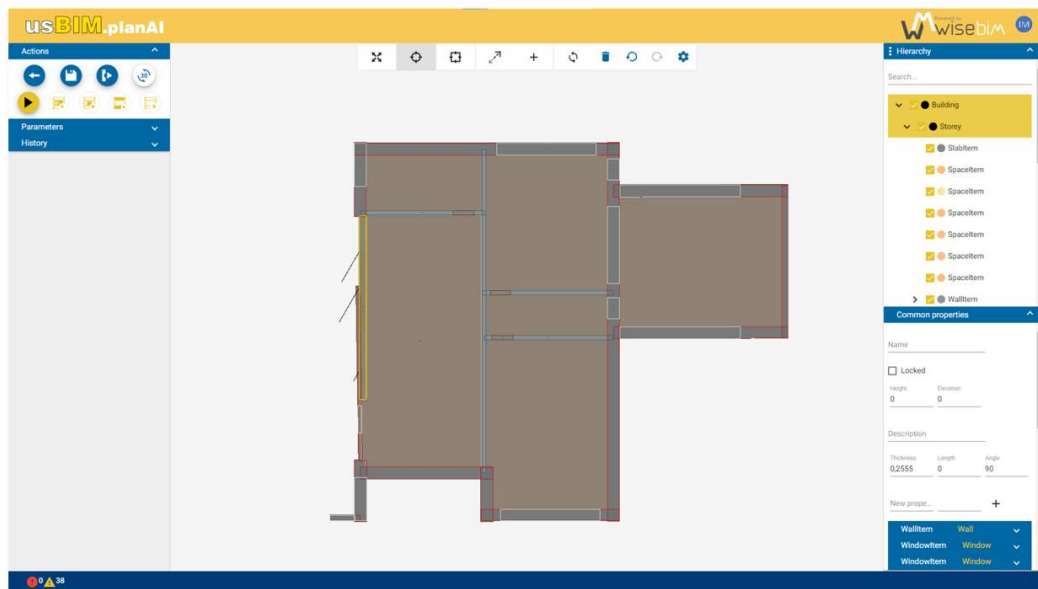


Figure 56. structure by category

16 Display properties

The display of the properties associated with the selected elements is carried out in the panel located to the right of the scene (Figure 57). If the selection contains several elements, the panel first displays the common properties of the selected elements and then lists the properties of each element separately

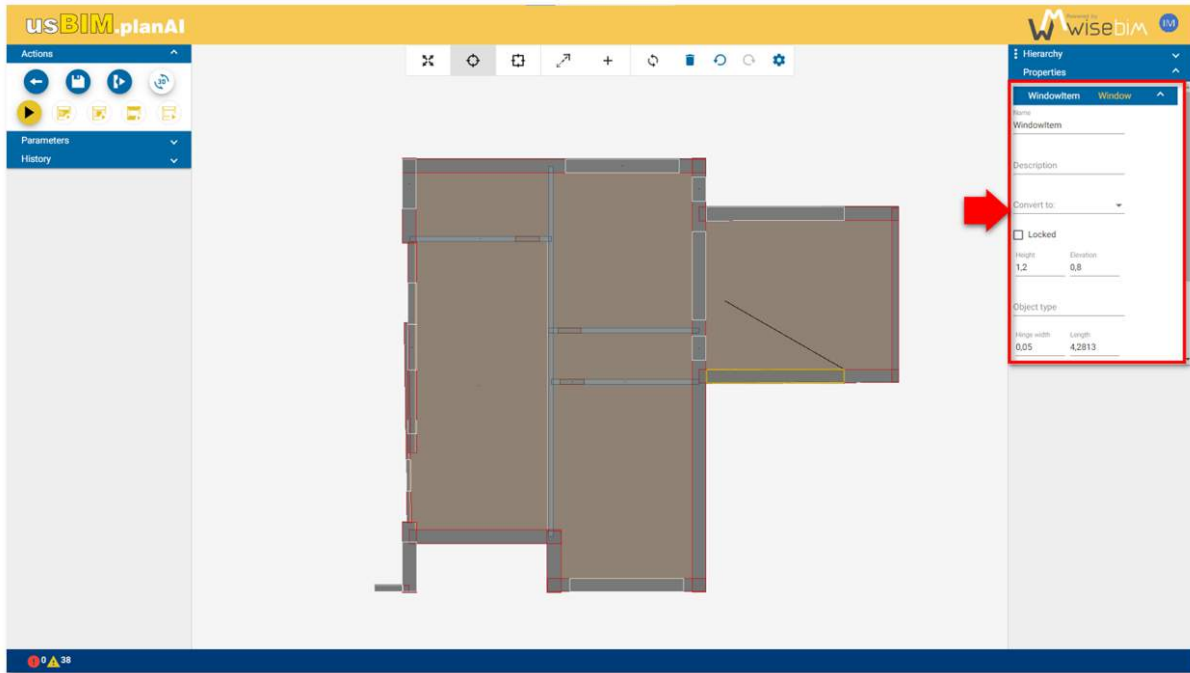



Figure 57. properties

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17 Editing and modifying the result

Editing functions are integrated within usBIM.planAI in order to facilitate the check of the model generated by the algorithms. These functions are used to:

- Modify the geometry of existing elements
- Create new items
- Update properties

17.1 Selection

There are several ways of selecting elements of the 2D scene.

17.1.1 Simple selection

The simple selection mode is the default mode (Figure 58). Items are selected or deselected with a single click. Multiple selection is possible by holding the Ctrl key.

This is the preferred mode for performing most modification operations.

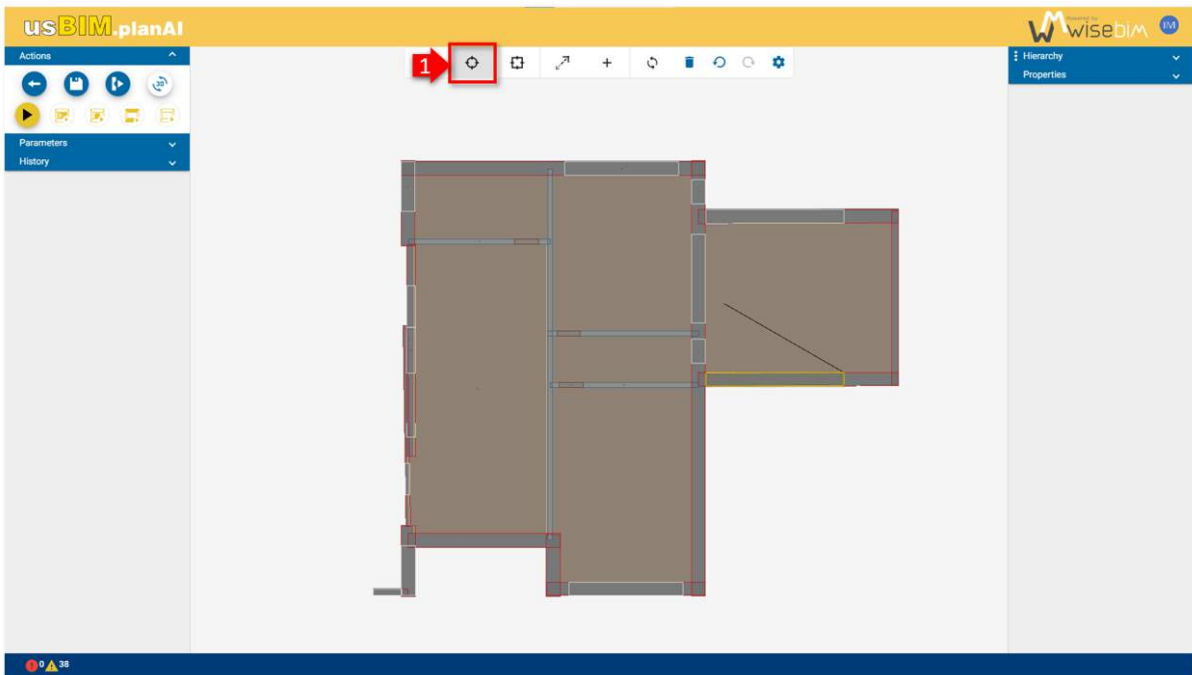


Figure 58. simple selection

17.1.2 Rectangular selection

The rectangular selection is used to define a selection containing several elements visible in the scene (Figure 59).

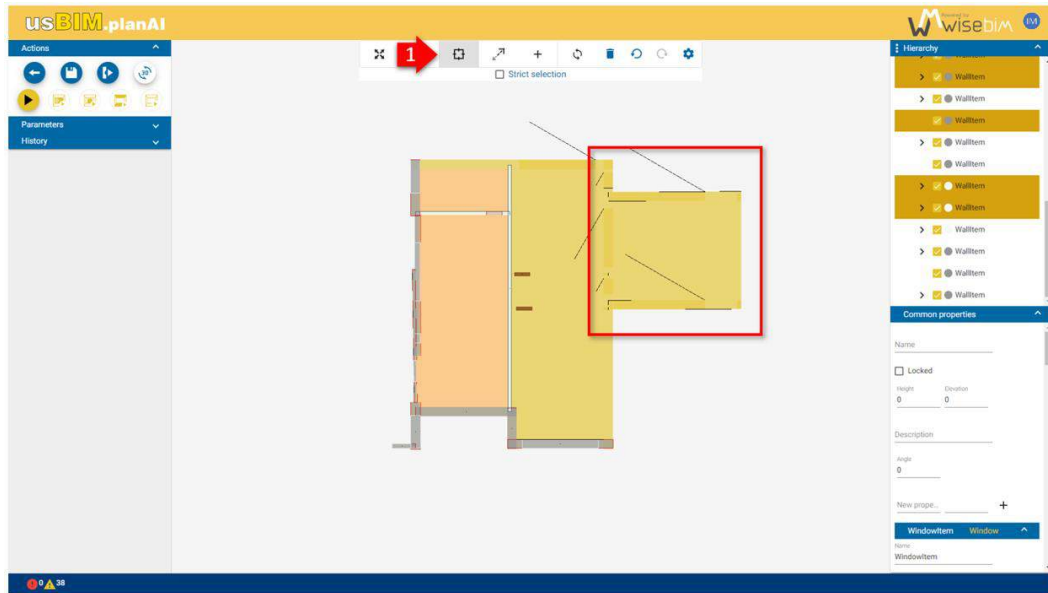


Figure 59. rectangular selection

The "Strict selection" option limits the selection to only the elements completely contained in the selection rectangle (Figure 60).

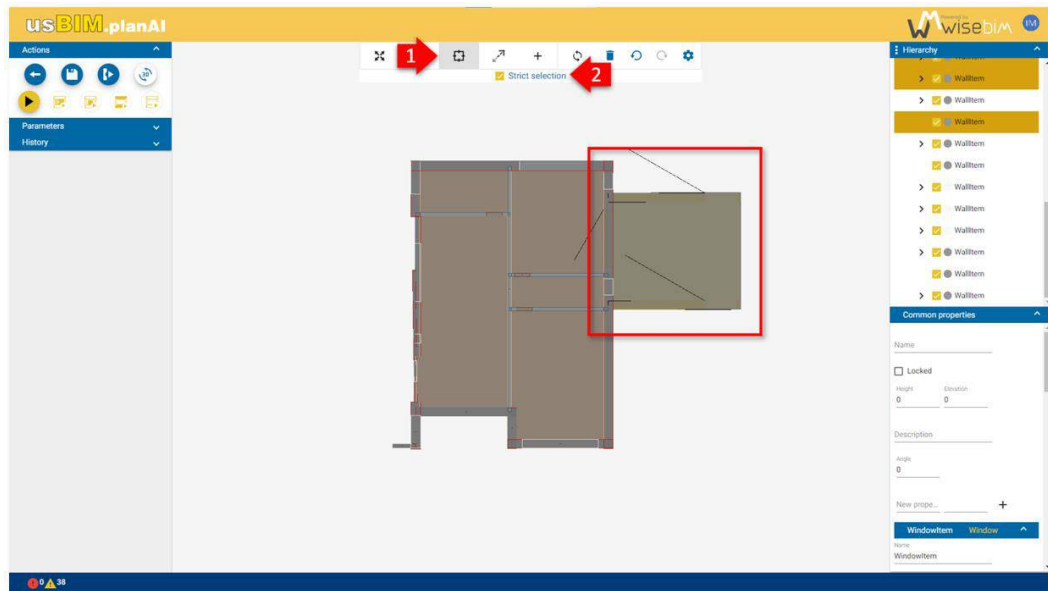



Figure 60. Strict selection

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17.1.3 Inversion of selection

The selection can be inverted by selecting the "Inverse selection" line in the context menu.

The selection then contains all other visible elements (Figure 61).

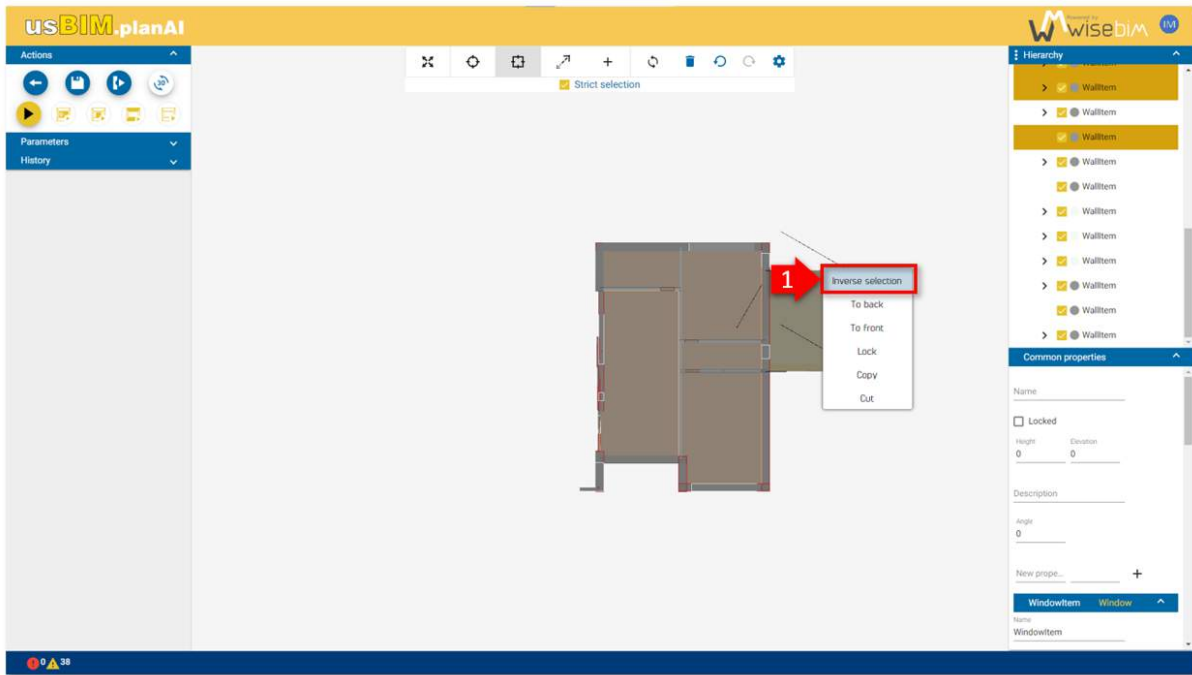


Figure 61. Inverse selection

18 Functions and tools

Interface management functions exist to facilitate the handle and modification of the models.

18.1 Depth of view

The contextual menu of the 2D scene allows you to modify the depth of view to change the display of the selection. The **“To back”** function changes the view order so that the selected items are in the background (Figure 62).

The **“To front”** function changes the view to display the selected items in the foreground.

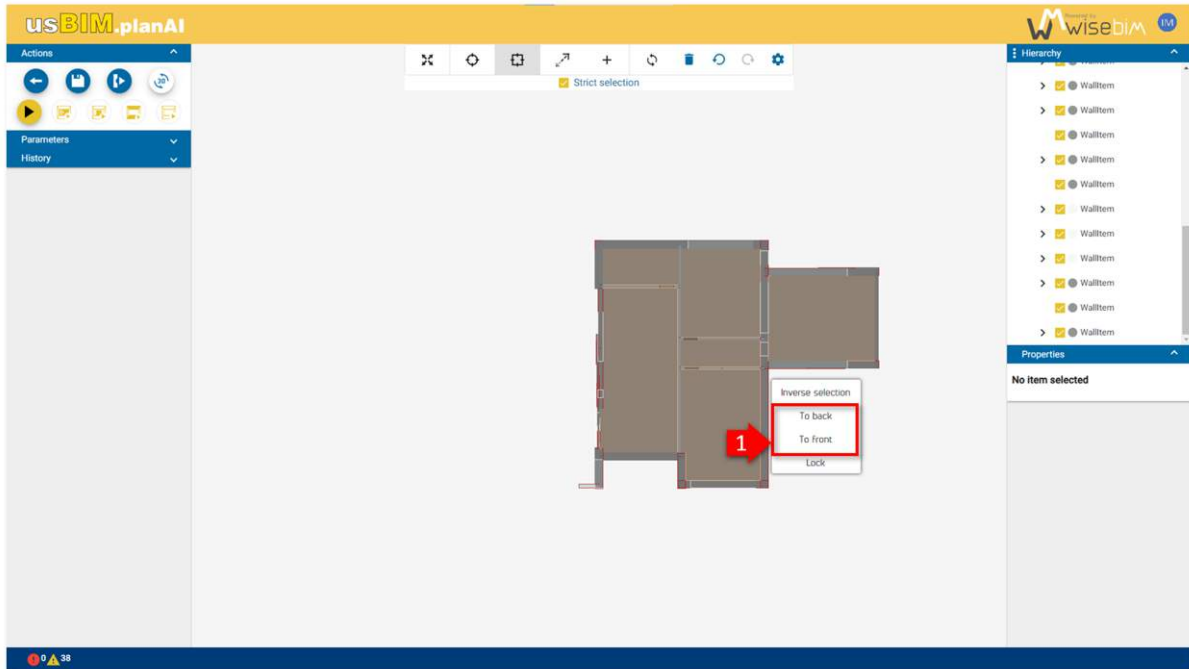


Figure 62. depth of view

The items displayed in the foreground are those that are visible and selected. The default display order is as follows (from foreground to background):

1. Opening (windows and doors),
2. Walls,
3. Columns,
4. Spaces,
5. Slabs.

A selected item temporarily comes to the foreground, as long as the selection is active (Figure 62).

18.2 Copy-paste

Copying an element is accessible by selecting an element then the "Copy" function from the contextual menu (Figure 63).

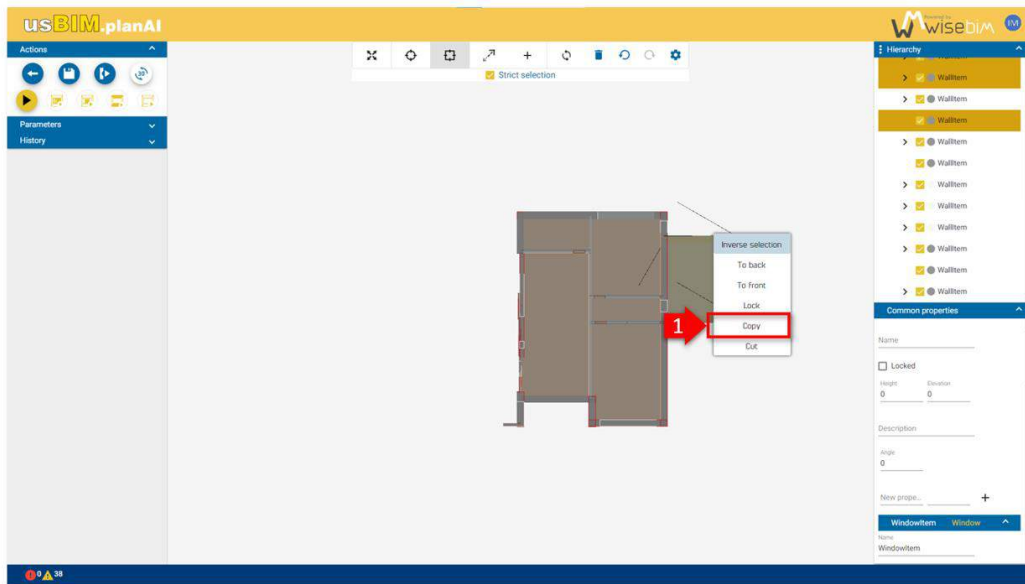


Figure 63. 18.2 Copy-paste (a)

You must then select "Paste" from the contextual menu at the desired location (Figure 64).

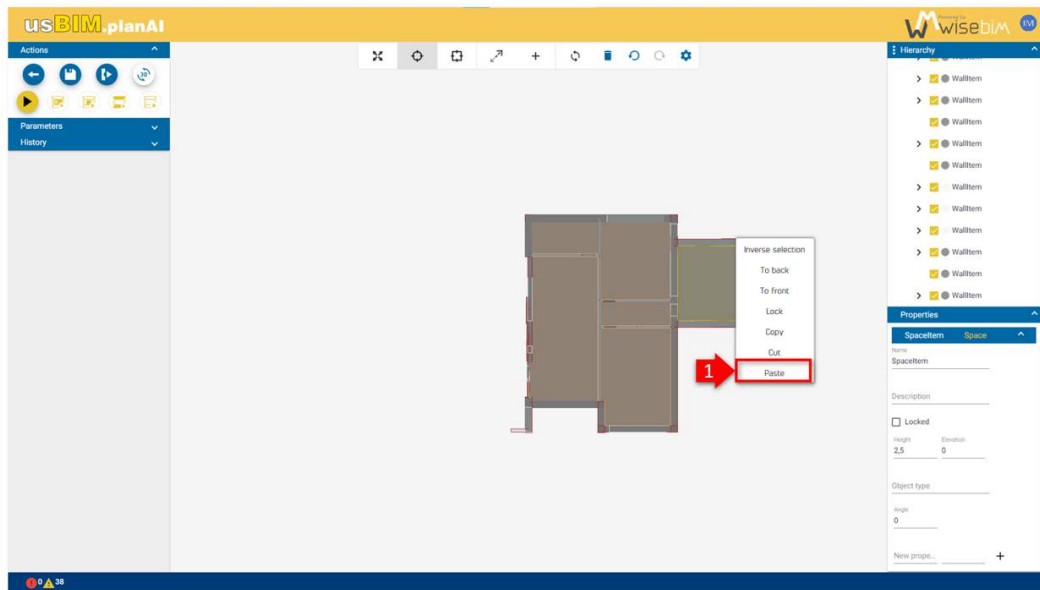



Figure 64. 18.2 Copy-paste (b)

A new element which is a copy of the selected element is created. In the case of copying an opening, the "paste" function will only operate when hovering over a wall.

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18.3 Undo/Redo

The Undo/Redo function allows you to cancel or replay one or more previous actions (Figure 65). If a wall is deleted, the "Undo" function will have the effect of cancelling this deletion, the wall will therefore be visible again.

When an action is not present in the history, the buttons are greyed out and inactive.

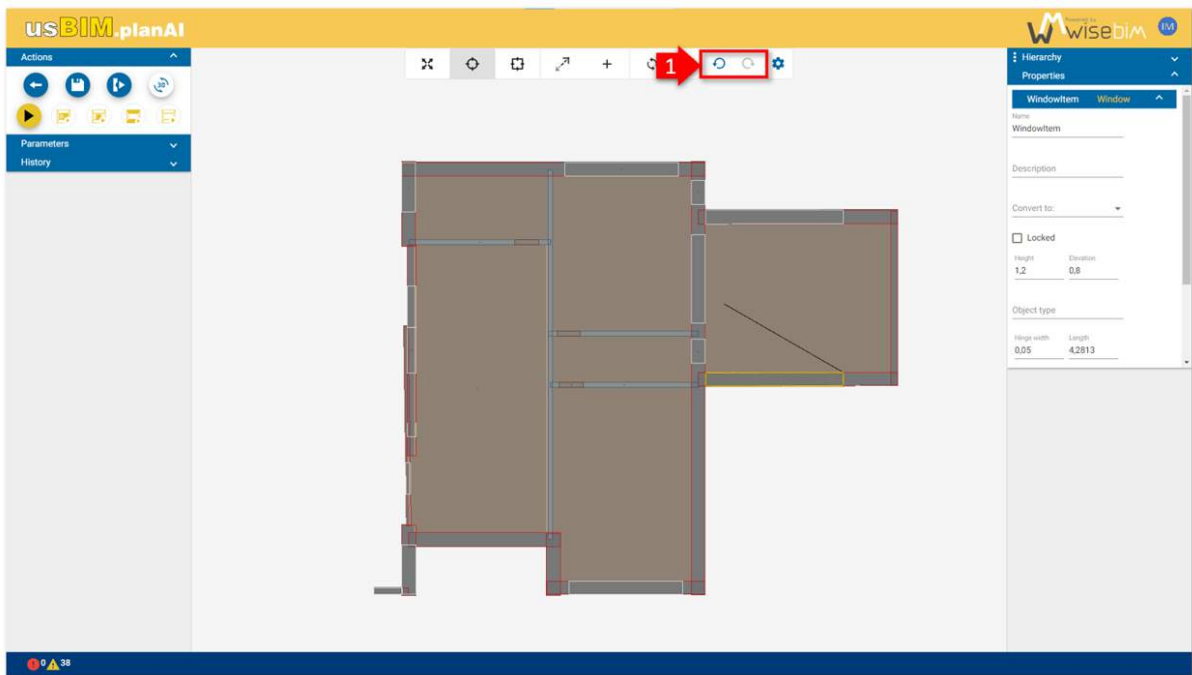


Figure 65. Undo/Redo

18.4 Keyboards shortcuts

Some functions are associated with keyboard shortcuts:

- **ctrl-a**: select all elements
- **ctrl-z**: undo
- **ctrl-y**: redo
- **del**: delete the current selection

19 Modifying the geometrical shape

Each element is associated with a 2D shape footprint which is either rectangular or polygonal.

Walls are most often represented by rectangular shapes, while spaces and slabs have more varied shapes in both rectangular or polygonal form.

19.1 Rectangular shape

An element in rectangular form can be modified either by clicking on an outline of the shape or by modifying a property (Figure 66).

For example, to adjust the thickness of a wall, it is possible to handle one of the length edge or to modify the "Thickness" value in the properties pane on the right.

In the latter case, the value is modified relative to the median axis of the current wall. The displacement of a contour must be carried out by activating the "Simple selection" mode.

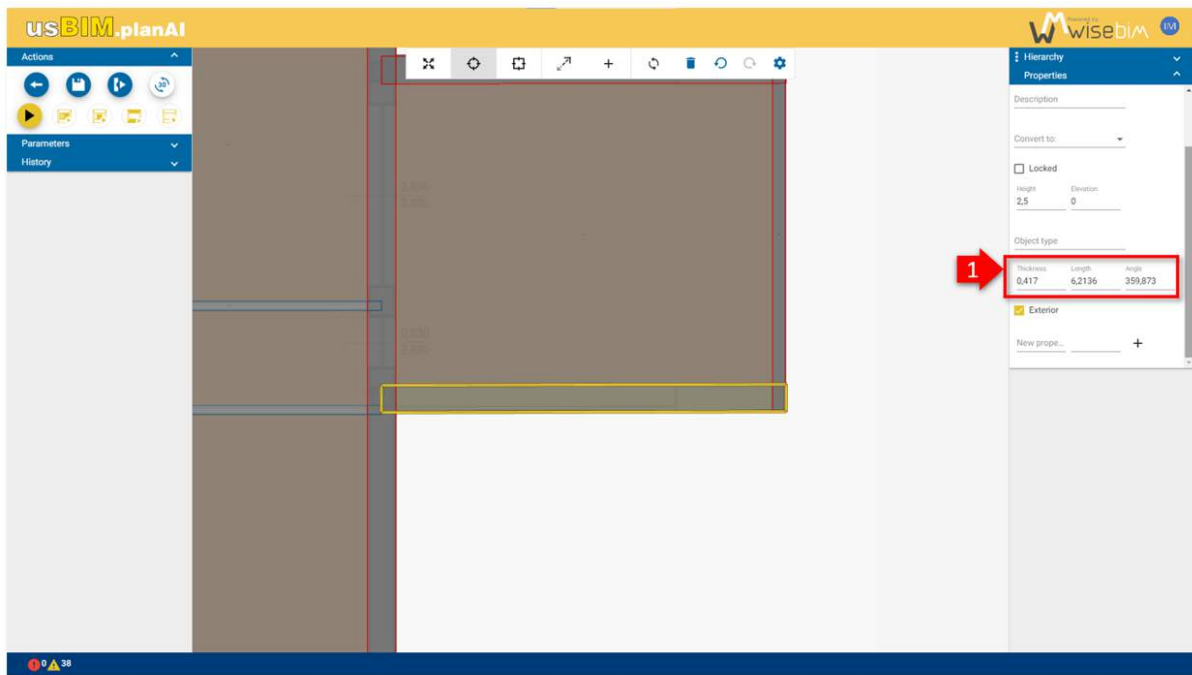


Figure 66. modifying an element property

In the case of openings, which are rectangular shapes, they are constrained by the parent wall. It is therefore only possible to modify the length, according to the above principles.

19.2 Polygonal shape

It is possible to modify the contour of a polygonal shape by moving either the segments or the points of the outline (Figure 67). The modification of a contour must be carried out by activating the "Simple selection" mode.

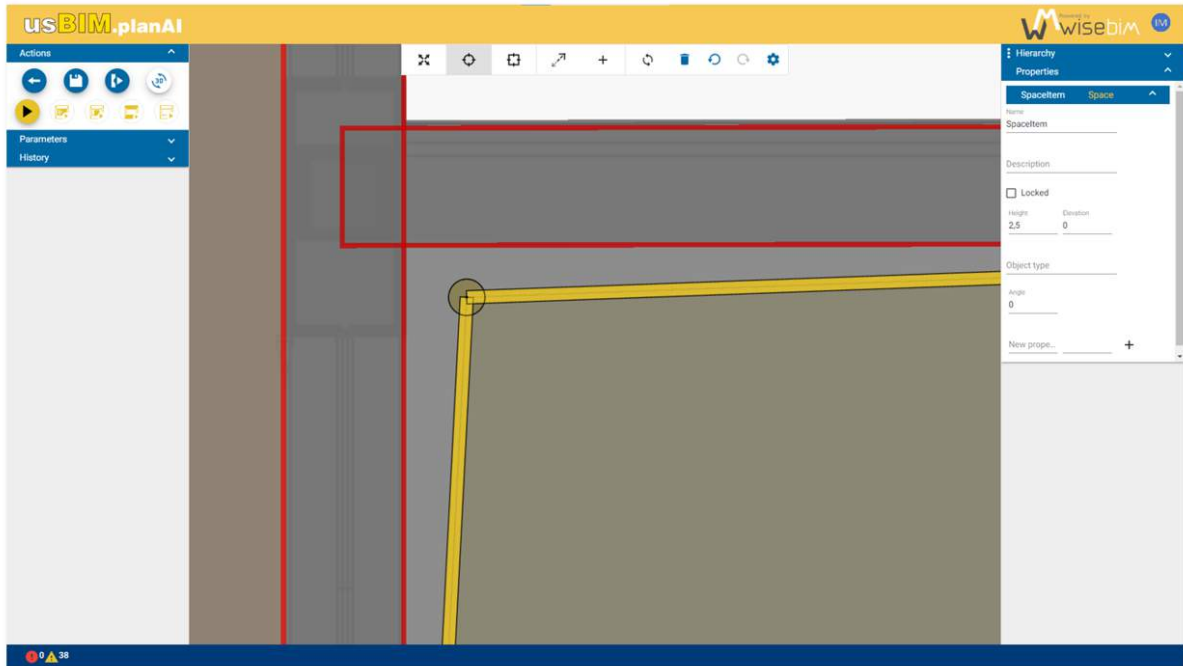


Figure 67. modifying a polygon shape

A contour point can be deleted using the "Remove node" function of the contextual menu (Figure 68). A polygon must contain at least 3 points to be a valid shape.

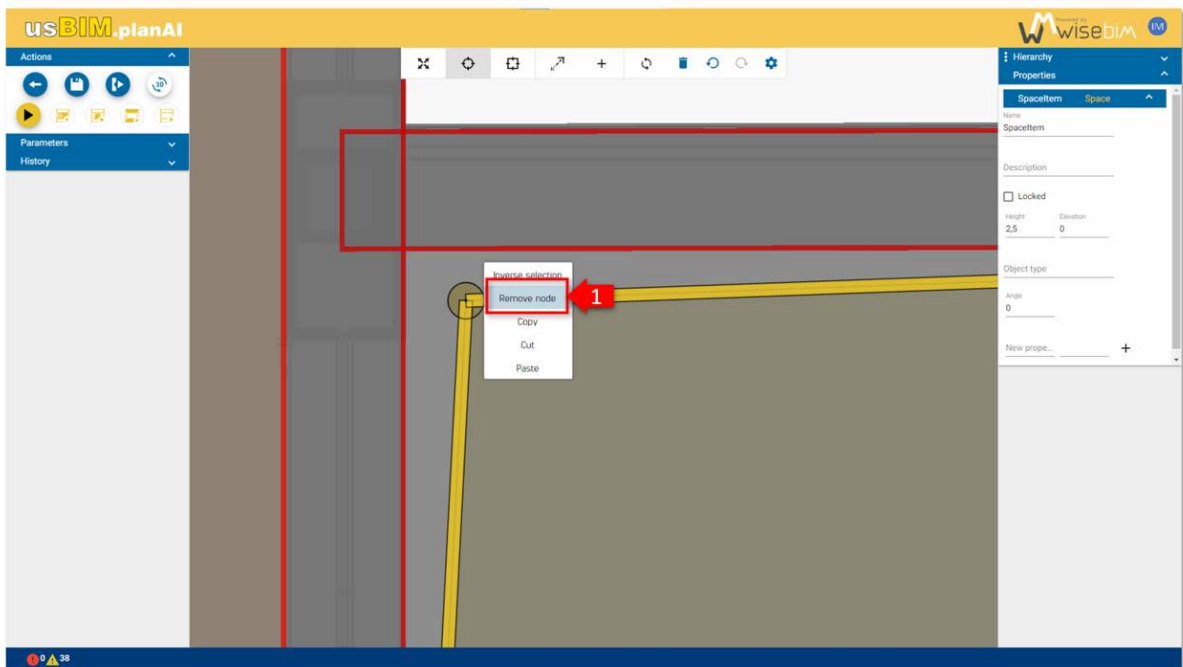



Figure 68. remove node

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To add points or segments to an existing polygon, you must select a segment, then access the "Split edge" function from the contextual menu (Figure 69).

A new point is created in the middle of the segment.

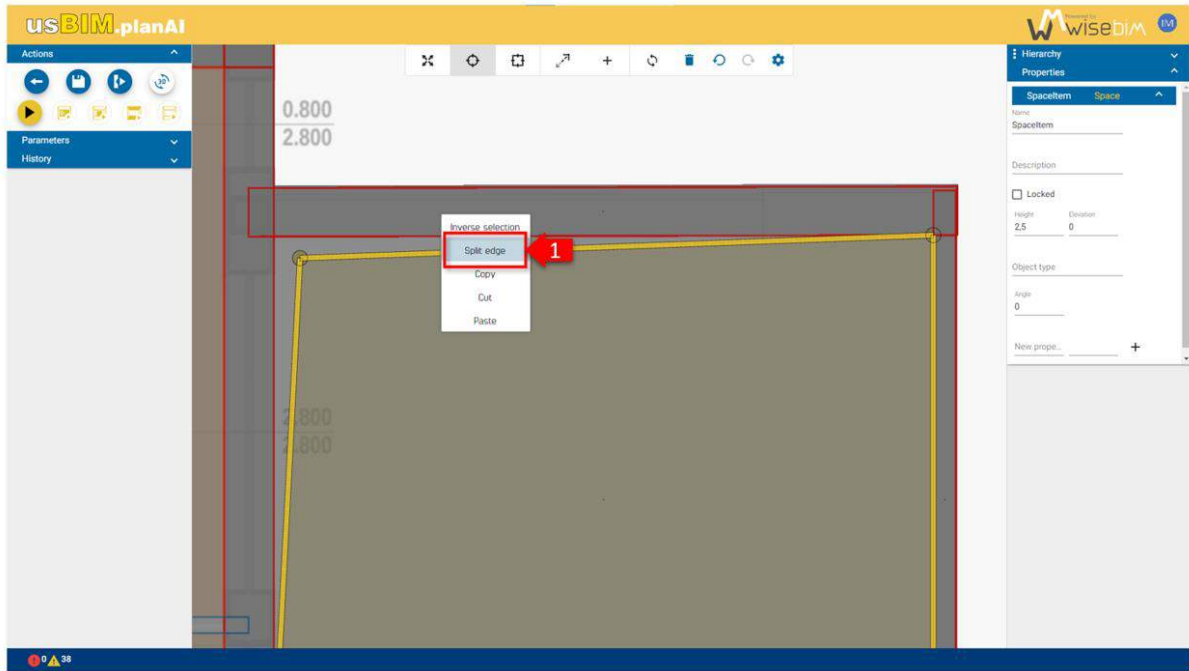


Figure 69. Split edge

20 Creation of a new building element

The creation of a new element is carried out by choosing "Creation" mode in the upper menu of the 2D scene (Figure 70). A drop-down menu allows you to select the category of element to create:

- Wall
- Window
- Door
- Slab
- Space
- Column

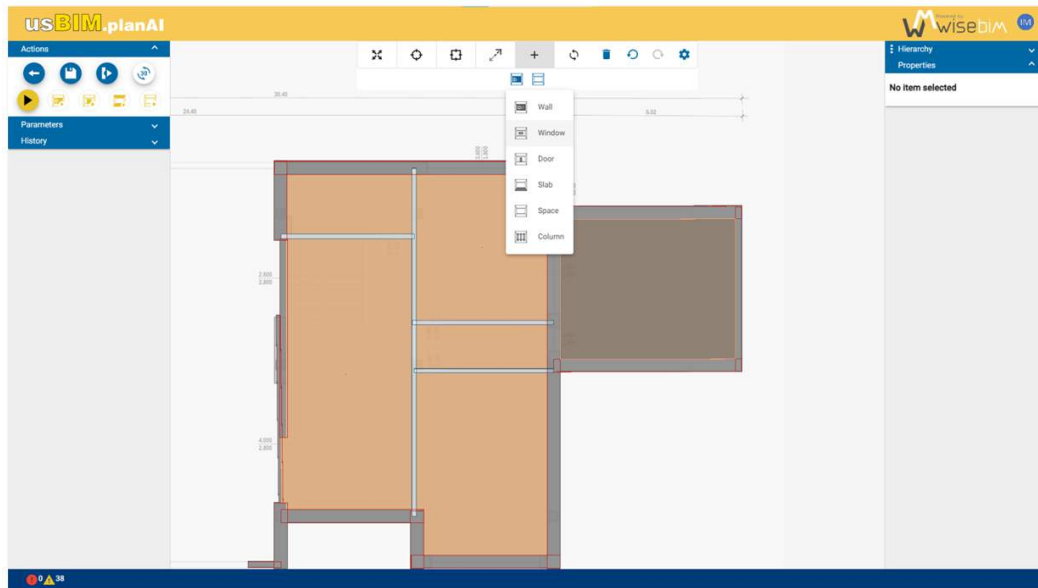


Figure 70. drop-down menu

Depending on the type of element, it is possible to choose the 2D footprint shape of the element(Figure 71):

- rectangular
- polygonal

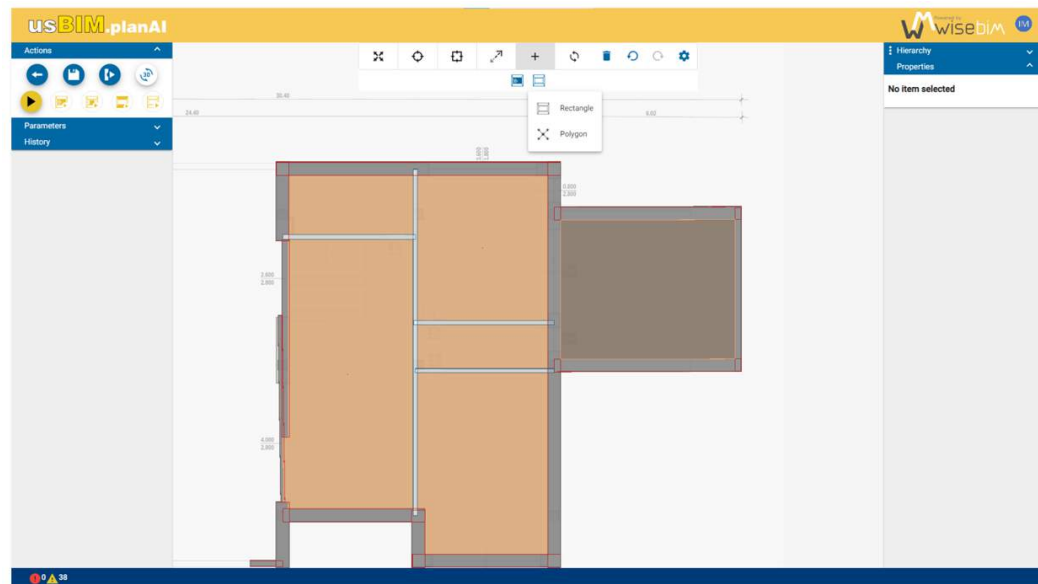


Figure 71. shape of the element

In the case of a rectangular shape, creation is carried out by clicking a first time at the location of the beginning of the element, then a second time to complete the creation of the element.

The location corresponds to the medial axis of the shape (Figure 72). Once creation is complete, you must return to "Simple selection" mode to modify and access the element.

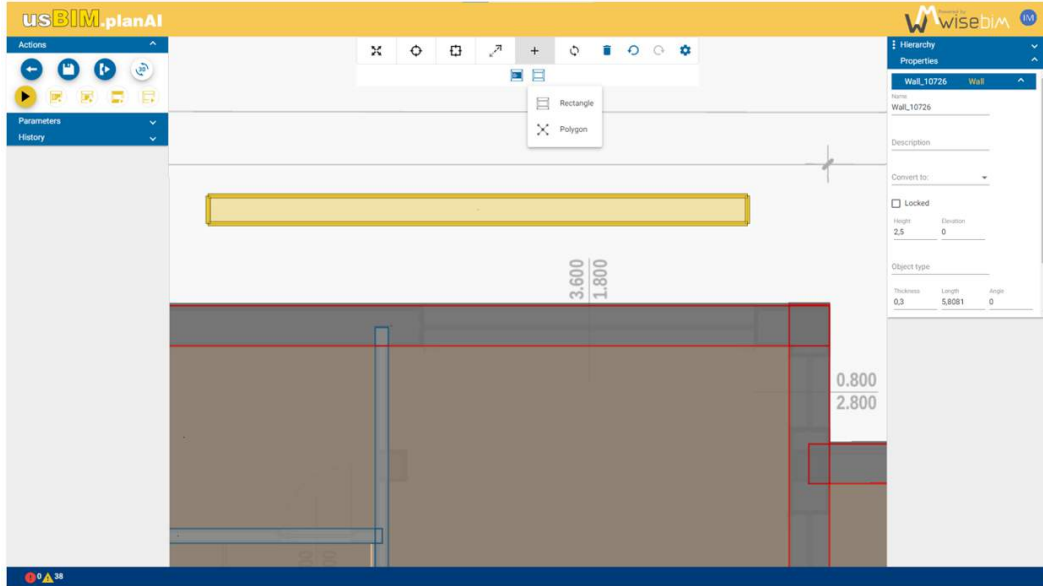


Figure 72. Simple selection

In the case of a polygonal shape, a point of the polygon is added for each click in the scene. The creation is completed with a double click (Figure 73). If the polygon is not correct, for example if segments are intersecting, an error message is displayed. Once creation is complete, you must return to "Simple selection" mode to modify and access the element.

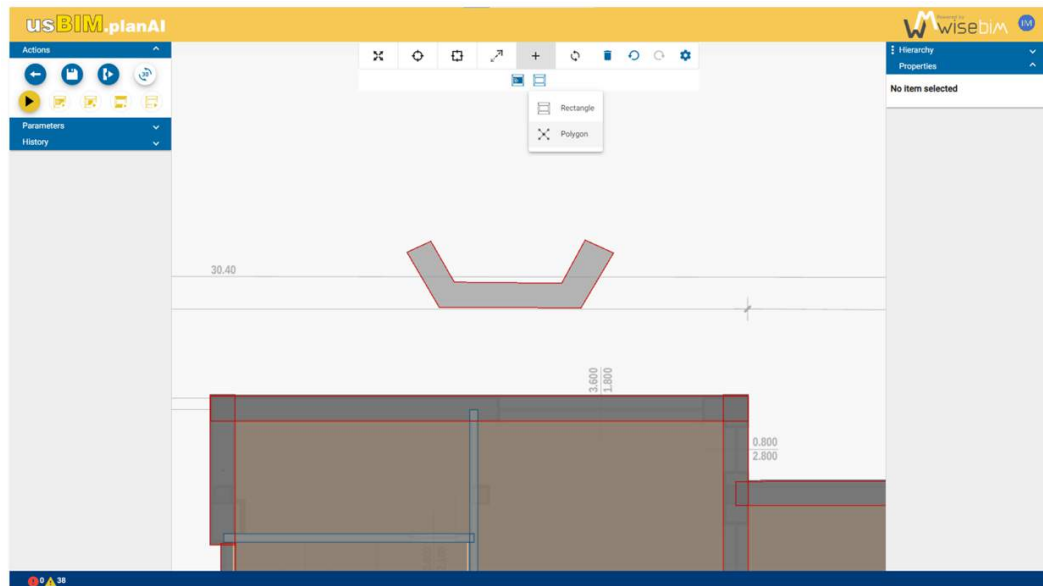


Figure 73. polygonal shape

21 Properties of elements

Each element (wall, opening, ...) is characterized also by properties that add semantic information. All of these properties are visible and modifiable from the "Property" right panel (Figure 74). If the selection contains several elements, a "Common properties" tab first displays the fields and values that are shared by all the selected elements. Below, a tab is displayed for each element of the selection.

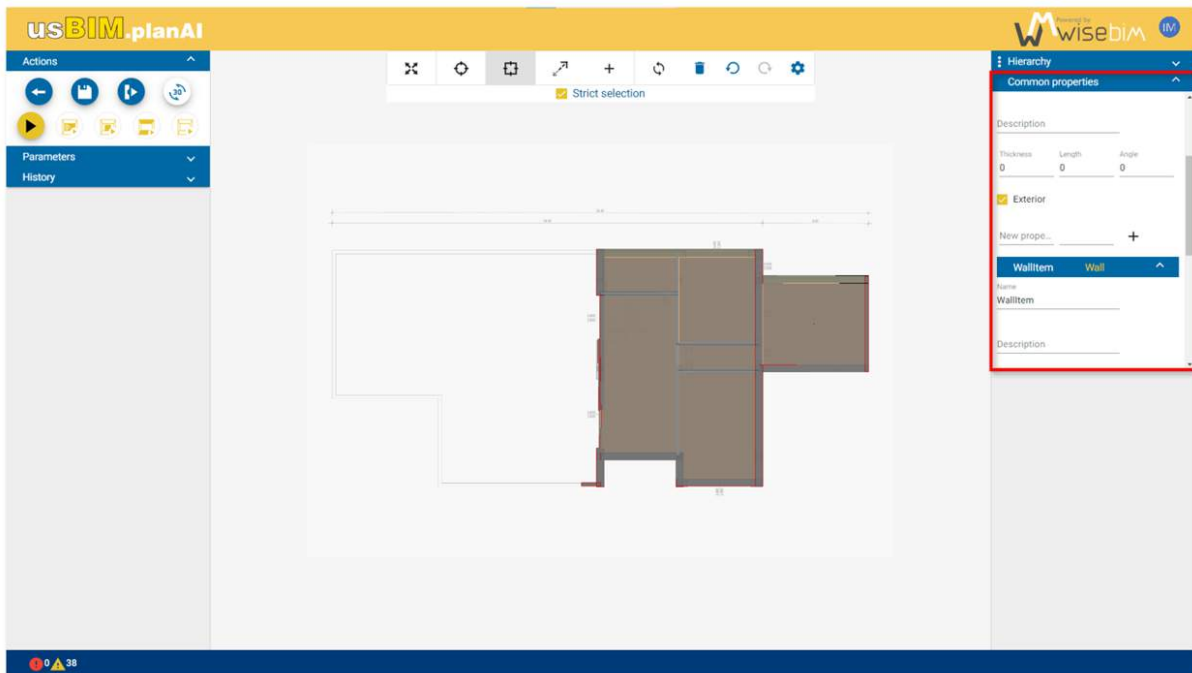


Figure 74. properties panel

It is possible to create a new property by defining the name of the field, the value and validating by clicking on the "+" button. Depending on the value entered, the type will be automatically recognized: number, string or Boolean (Figure 75). To define a Boolean, you must enter the value "true" or "false".

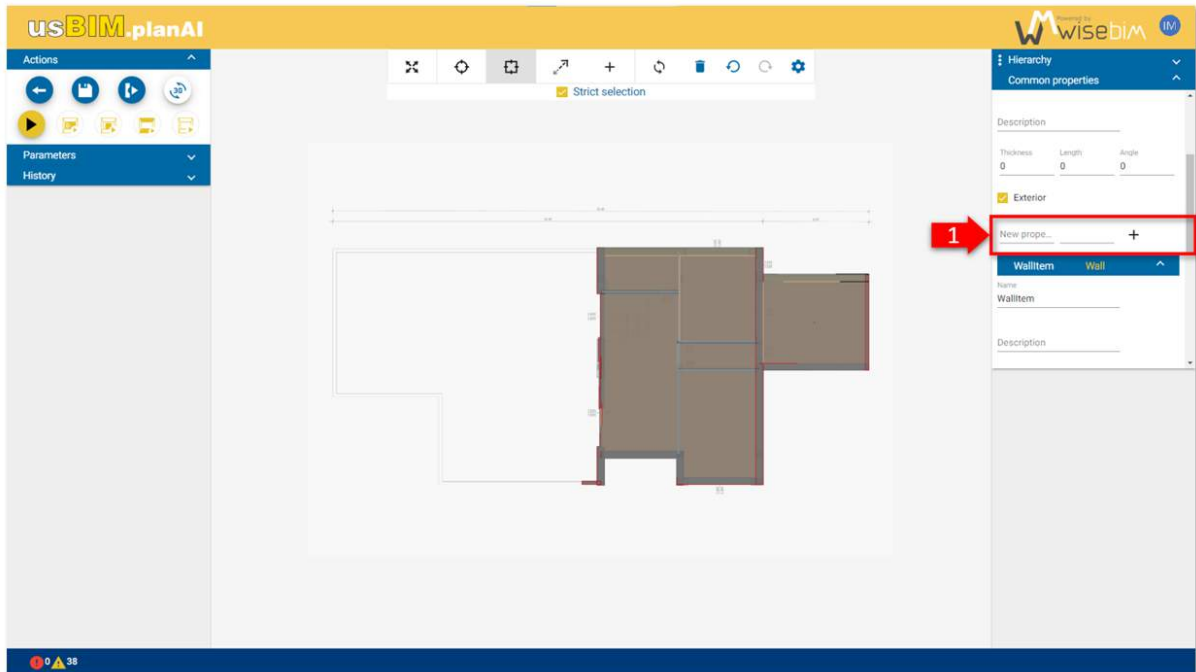


Figure 75. new property

Once created, only the value of a property can be modified, the fieldname cannot be modified. Until a backup has been made, changes are not saved. In order not to modify an element, it is possible to lock it by checking the "Locked" box.

22 Save work

Each plan file is associated with a modelling result that can be saved for a future use. The result is saved and can only be accessed from the Work Area. If the plan file is deleted, all the results associated with this plan are also deleted. To save a current result, you must click on the "Save" button in the left panel of the Working area (Figure 76). The backup is not performed automatically.

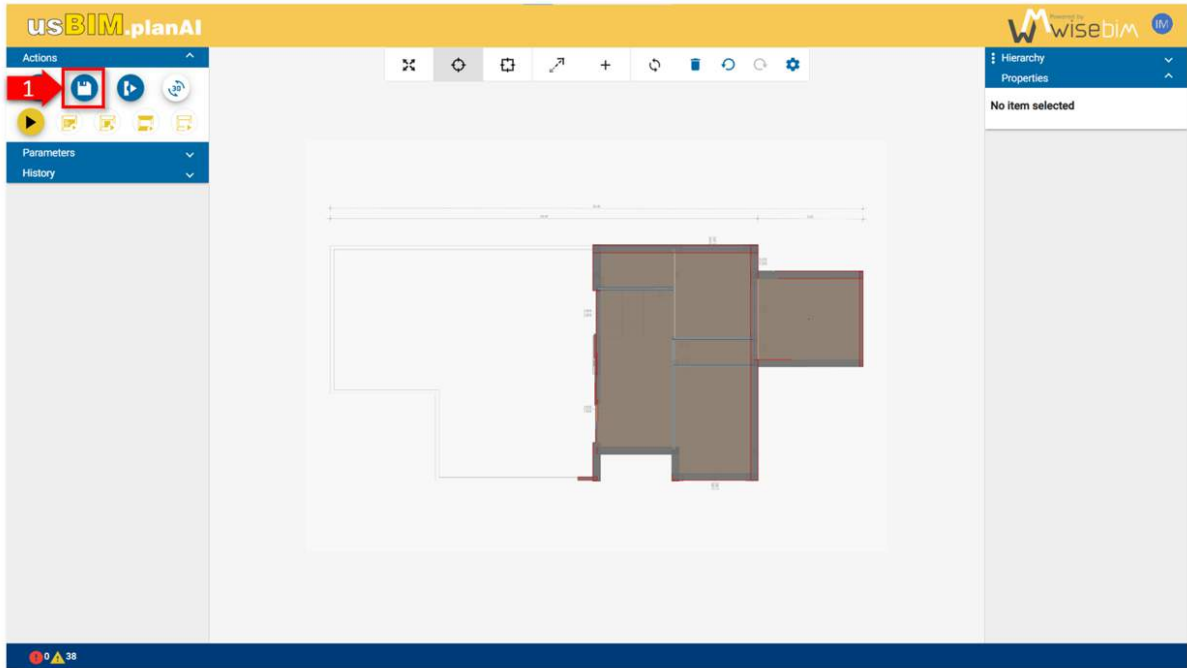


Figure 76. save

A history of the last saved results lists the last 10 backup. The most recent result is the one displayed at the top of the list (Figure 77).

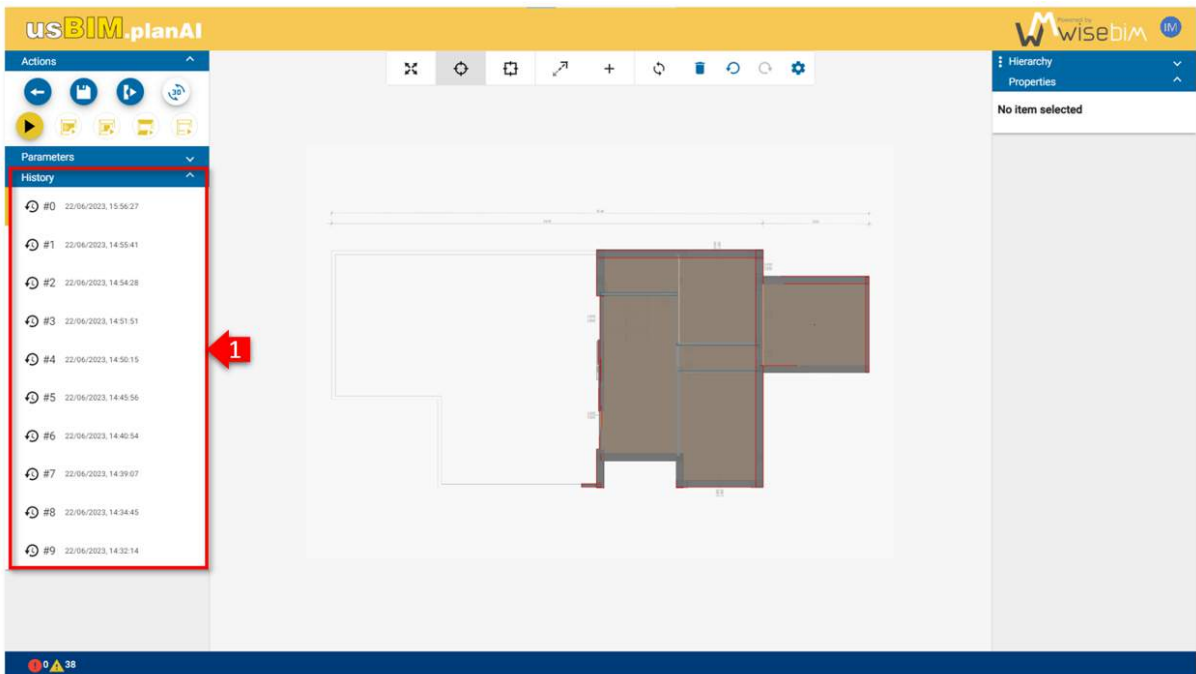


Figure 77. history of the last saved results

It is possible to load a previous result by selecting it in the history. If modifications have been made to the current result, they are not saved automatically (Figure 78).

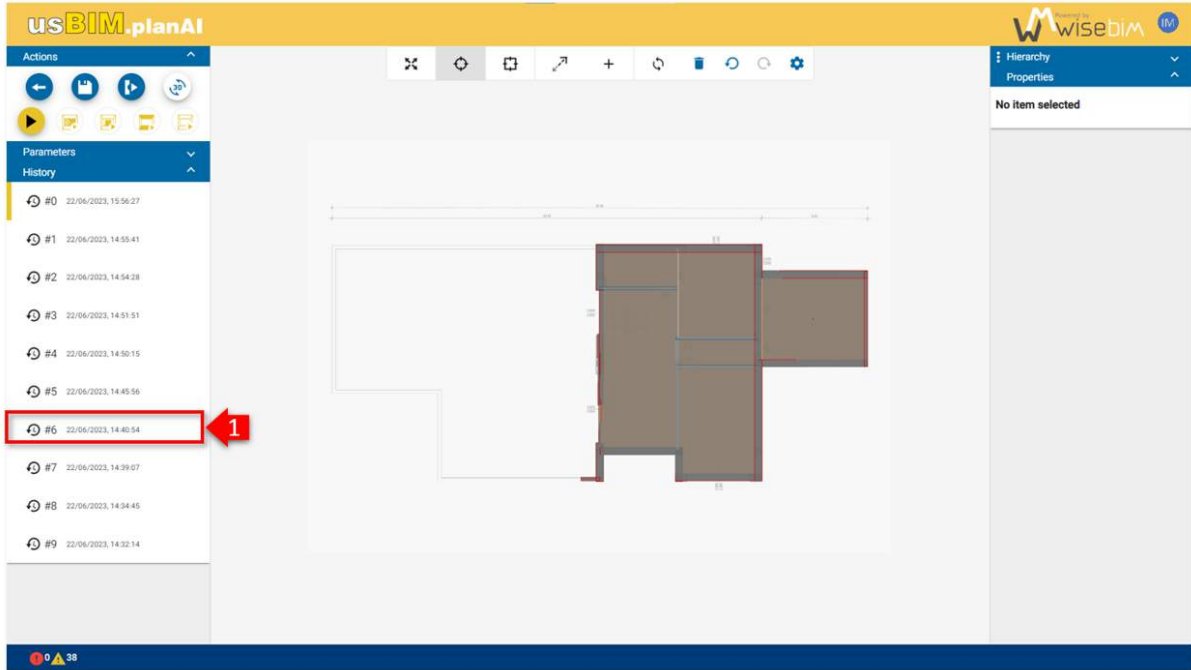



Figure 78. loading older versions

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23 Export of BIM file

In order to be able to use the result of the modelling outside of usBIM.planAI, the model must be exported into a file (Figure 79).

Several output formats are available:

- **Geometric model** (BIM) file in IFC or DWG
- **Quantities** in CSV or XLSX file

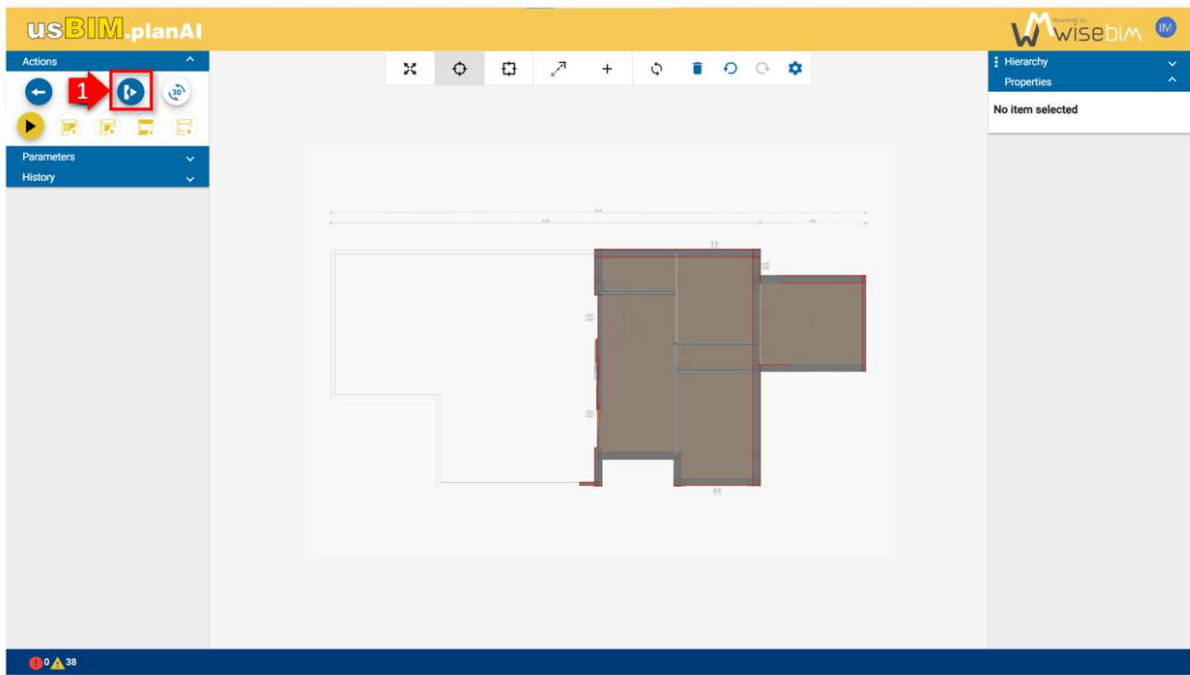


Figure 79. export

24 IFC model generation

The current format available for the export is IFC 2x3, compatible with most BIM software. The model is exported from the Work Area, by clicking on the "Export" button in the left panel (Figure 80).

It is possible to modify the name of the exported file by changing this parameter in the "Export" tab of the left panel.

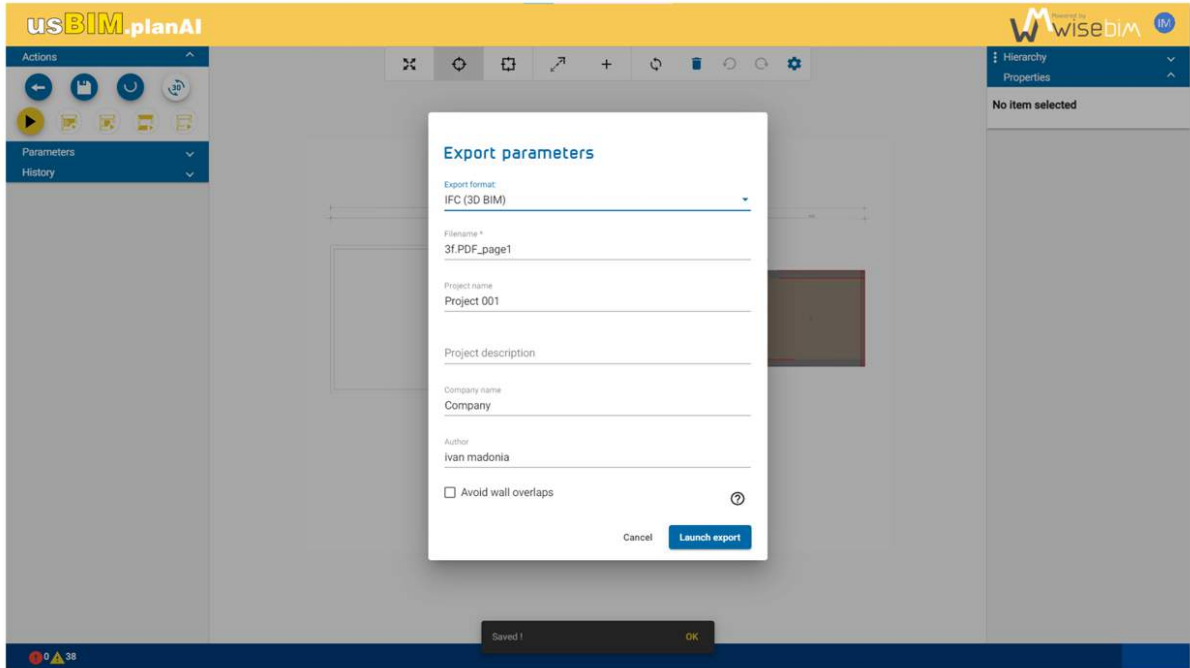


Figure 80. launch export process

An option allows to manage the walls clashes during the export, that is to say the overlaps between the walls. By default: box unchecked, overlaps are not detected, and walls keep their initial shape (Figure 81).

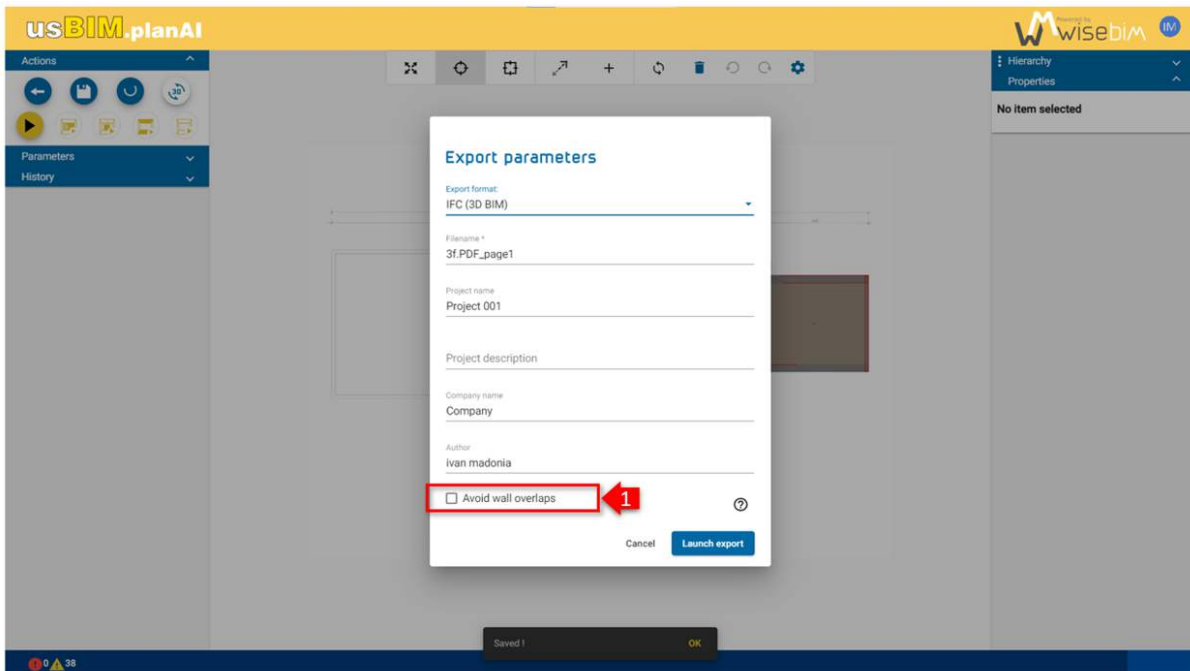



Figure 81. manage the walls overlaps

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When the box is checked, the shape of the walls is modified in order to avoid wall overlaps.

In order to improve the compatibility of generated IFCs with some editors, such as Autodesk Revit, it is recommended not to manage clashes (box unchecked).

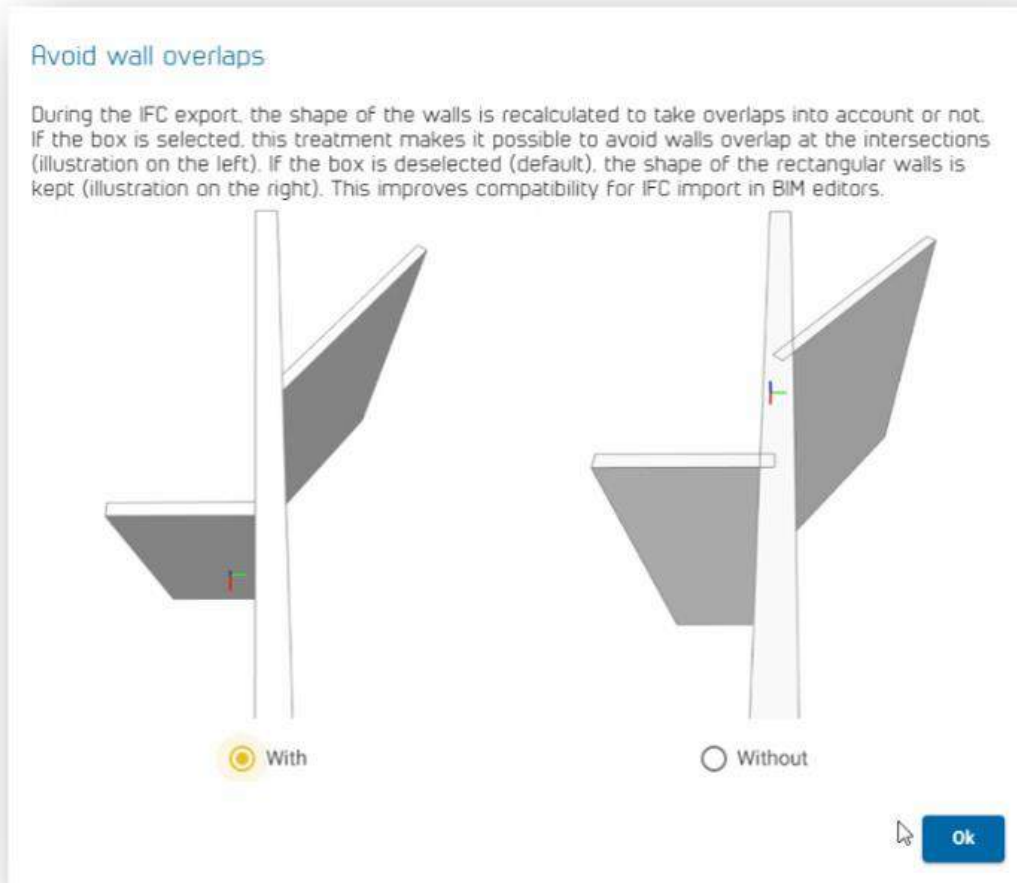


Figure 82. wall overlaps

25 Quantities and metrics

Relative quantities of the model extracted in tabular files in CSV or XLSX format (Figure 83).

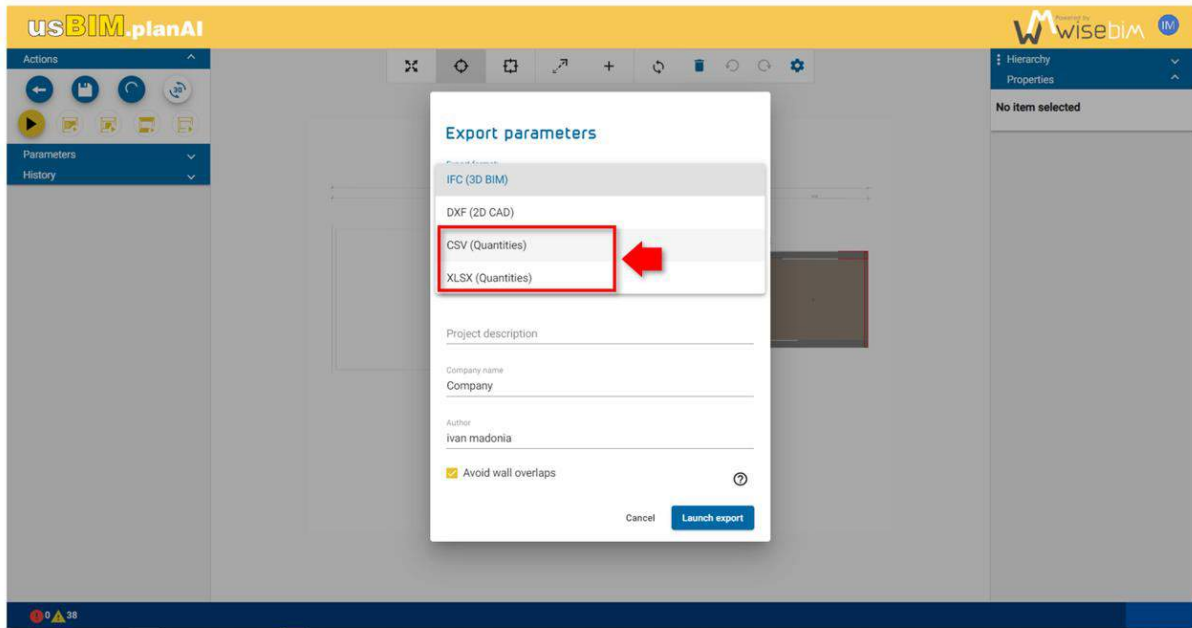


Figure 83. exporting different file formats

- Space walkable floor (m²)
- Volume of walls, slabs and spaces (m³)
- Length of walls - raw and net (m)
- Surface of walls - raw and net (m²)
- Number of doors and windows
- Surface of doors and windows (m²)

26 Management of exported files

Each generated file is kept on the usBIM.planAI website in the project folder associated with the plan. It is possible to download the data associated with a plan, by selecting the plan file and then clicking on the "Download the model" button (Figure 84).

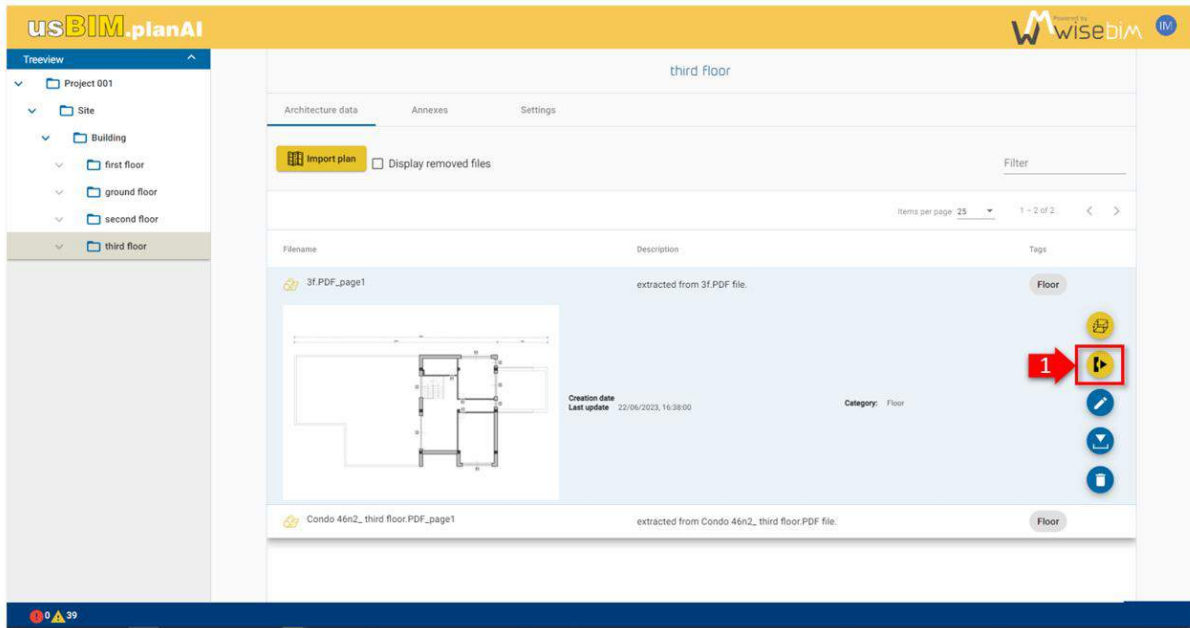


Figure 84. Download the model

A pop-up is displayed to choose the exact file version desired by the user from the list of saved models (Figure 85).

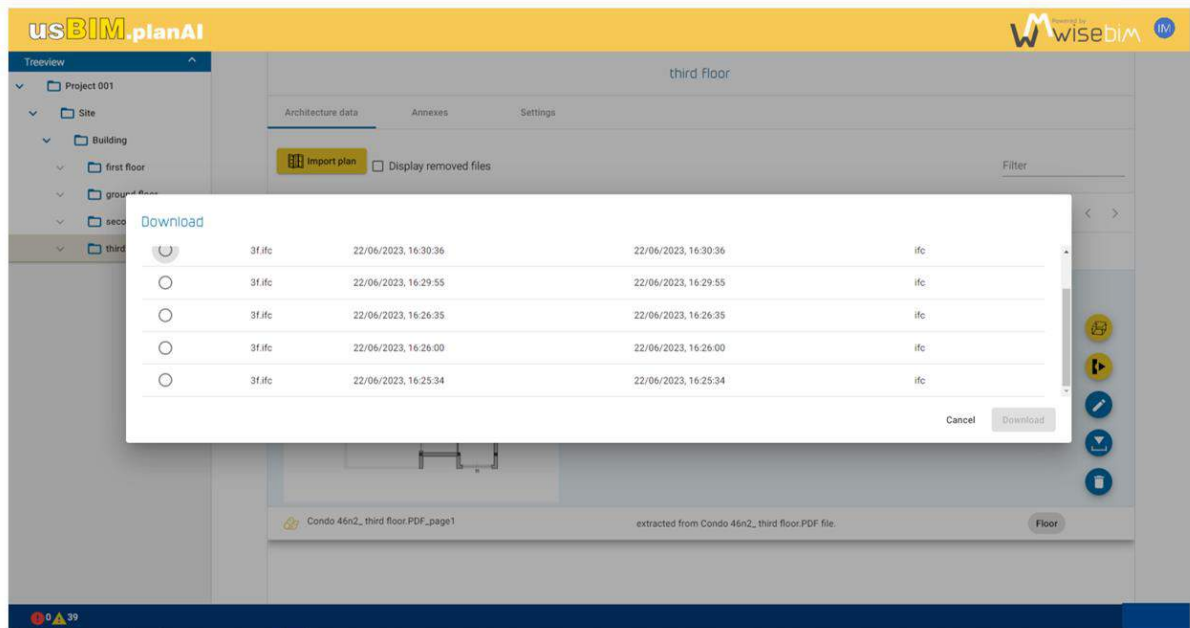


Figure 85. download a different version of the model.

All the models of a project are accessible in the EDM interface by selecting the root folder of the project (Figure 86) and displaying the "Export" tab (Figure 86). It is thus possible to recover each BIM file or to delete them.

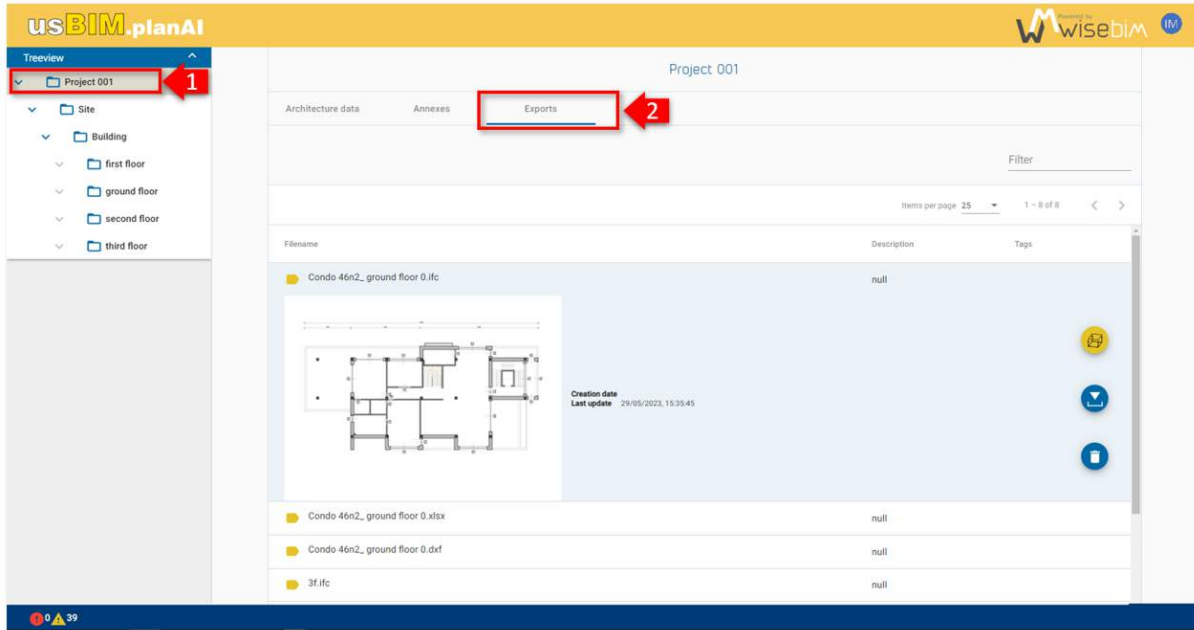


Figure 86. export model tab

27 Building model

The assembly function help to obtain a full model of a building by merging several floor plans.

27.1 Project structure

The assembly function could be reached from the file manager at the building level of the project using **Assembly** button.


The project has to comply with the following hierarchy:

- Project
 - Site
 - Building
 - Plan 1
 - Plan 2

Or

- Project
 - Site
 - Building
 - Floor 1
 - Plan 1
 - Floor 2
 - Plan 2

It is important to fill this structure in order to add a set of plans to the building model.

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The order or the name of the plan does not matter since they could be changed later.

Every plan file has to be associated with the **FLOOR name** that has been defined during the import or through the function named **Edit file data**.

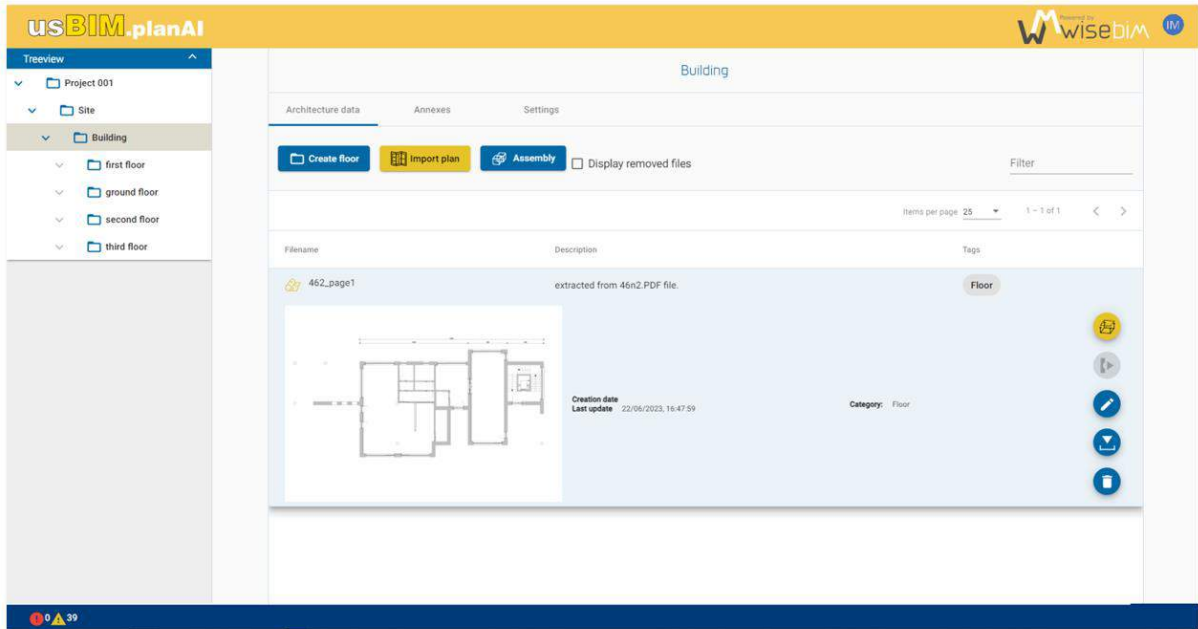


Figure 87. floor plan importation

28 Graphical interface

The assembly of the floors coming from different file plans within the same model is carried out thanks to a specific graphical interface. This interface displays all the plans making up a building so that the user can check the vertical alignment of each level in order to generate the complete 3D model.

28.1 Overview

The interface is composed of 3 main parts (Figure 88):

- Left pane containing access to the main management and backup functions, as well as the list of plans.
- Right pane to display the properties of the selected plan
- Central scene that displays the images and models of the plans.

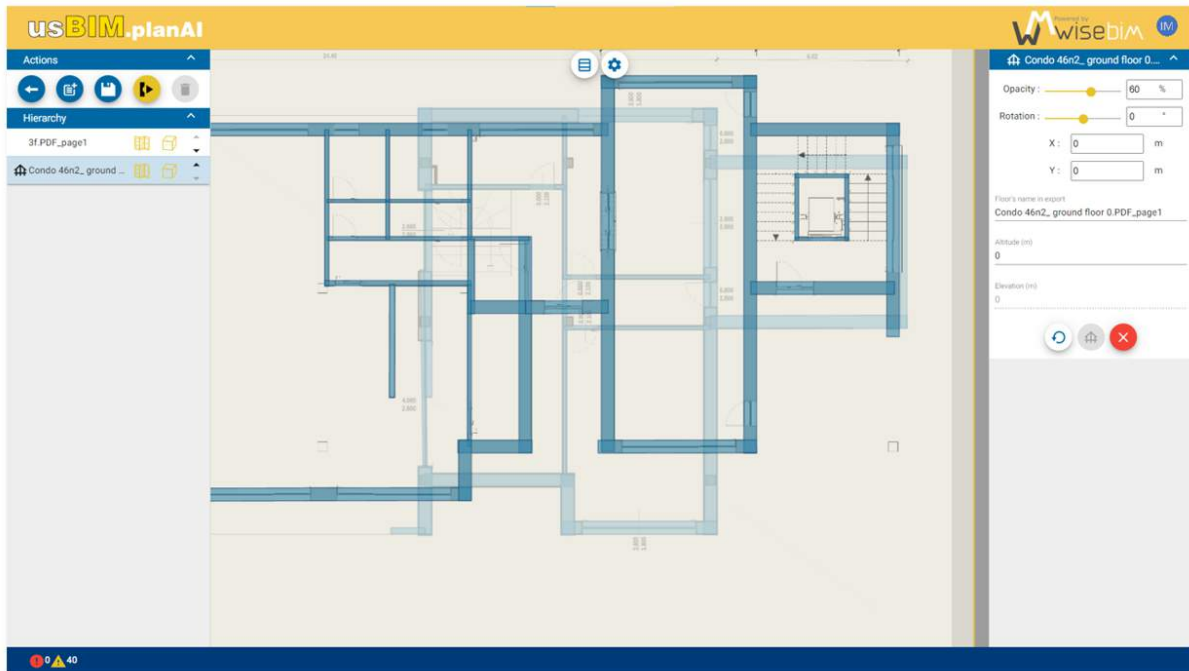


Figure 88. alignment of levels

28.1.1 Selection of plans

The assembly function is accessible at the level of a building in the structure of the project and makes it possible to manage all the **Floor plans** which are at the same level in the tree structure (Building) or in directories in a lower level (Floor). When launching the interface, if the project is empty, a pop-up window is displayed to allow the selection of plans (Figure 89).

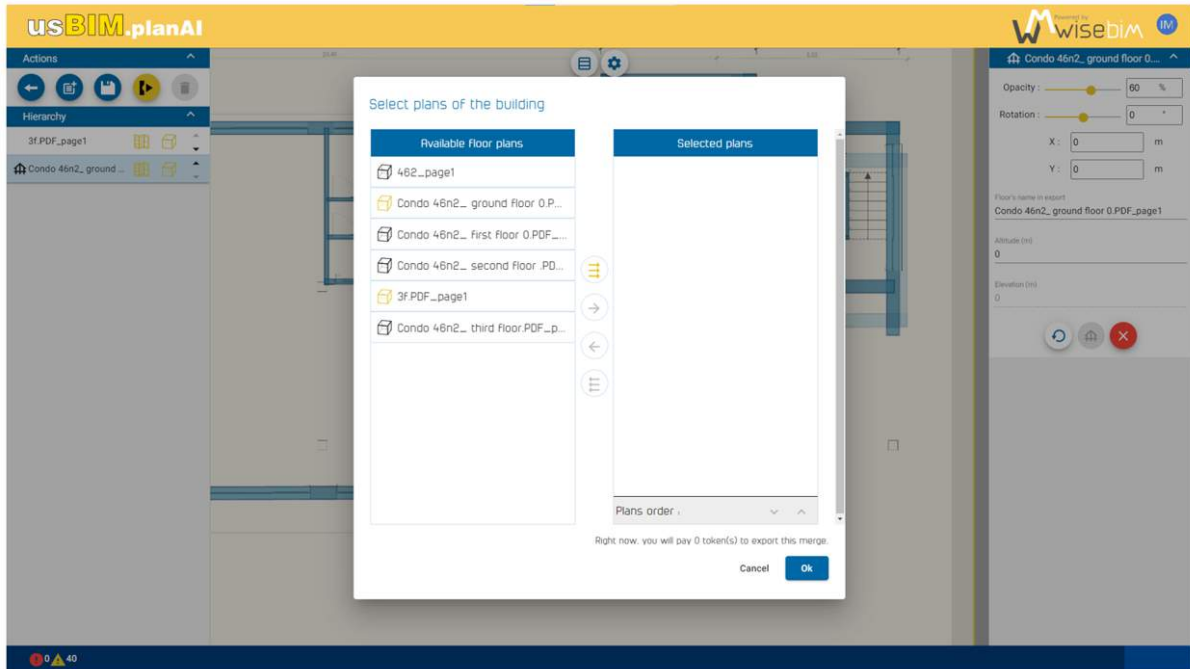


Figure 89. floor plan selection

It is possible to modify the list of plans contained in the building model at any time during the assembly process (Figure 90).

The selection window displays a list on the left containing all the **Floor plans** available for the model.

An icon displays the presence of a model for each plan. It is also possible to add the same file several times in a building model at different levels. The list on the right contains all the plans that contributes to the assembly. The display order corresponds to the level in the building. The plan at the bottom of the list corresponds to the plan of the lowest level in the building. Arrows below the list allow you to change the order of the plans. The action buttons located in the middle allow respectively:

- to add to the assembly all the plans listed on the left,
- to add to the assembly all the plans selected from the left list,
- to remove from the assembly the plans selected in the right list,
- to remove all the plans from the assembly.

When a plan is removed from the assembly, the information relating to this plan, in particular the model, is preserved. Only information relative to this plan in the assembly (order, elevation) is cleared.

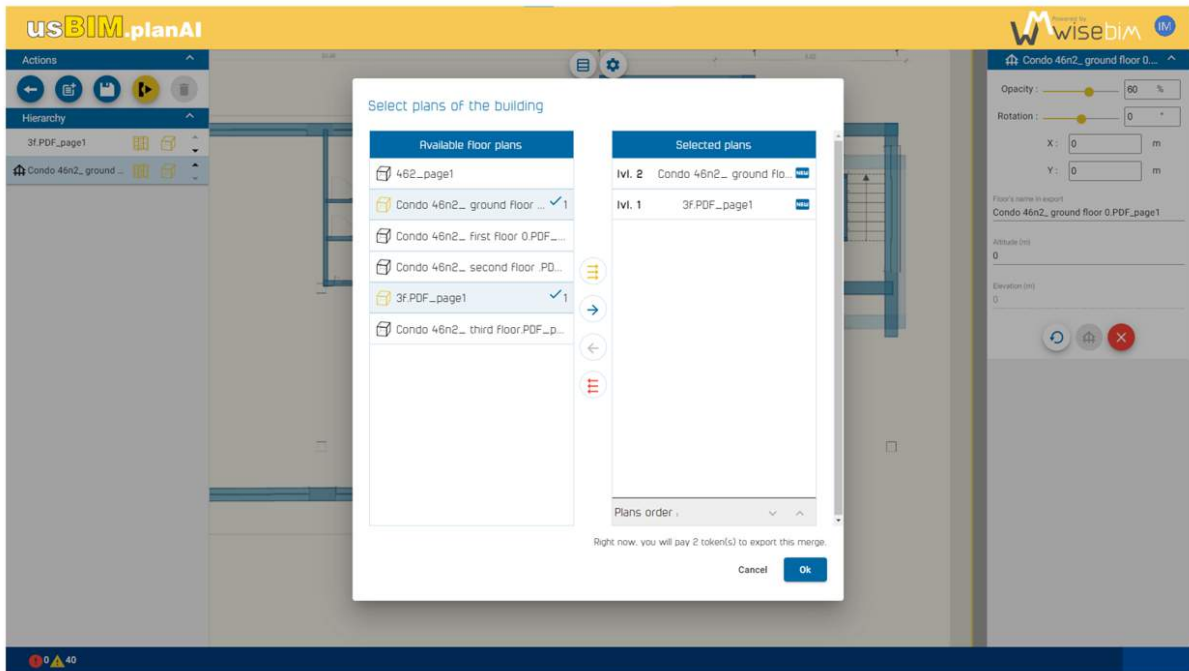


Figure 90. customize the plan selection

If a plan file contributes to an assembly model, it cannot be deleted. The delete button in the file management is thus disabled (Figure 91). To delete the file, one should first remove it from the list of assembly plans.

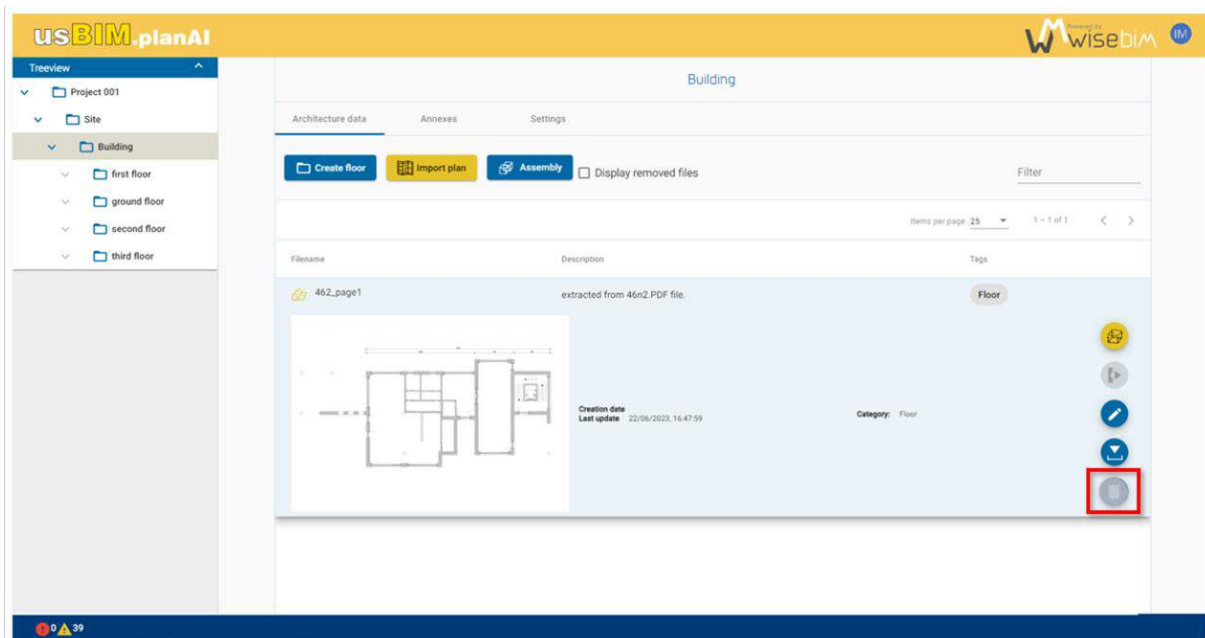



Figure 91. model deletion disabled

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28.2 Settings

Some interface settings can be modified by the user to manage the visibility, for example the background colour. The settings panel is accessible from the central menu at the top of the 2D viewer and expands or collapses to the right of the scene (Figure 92).

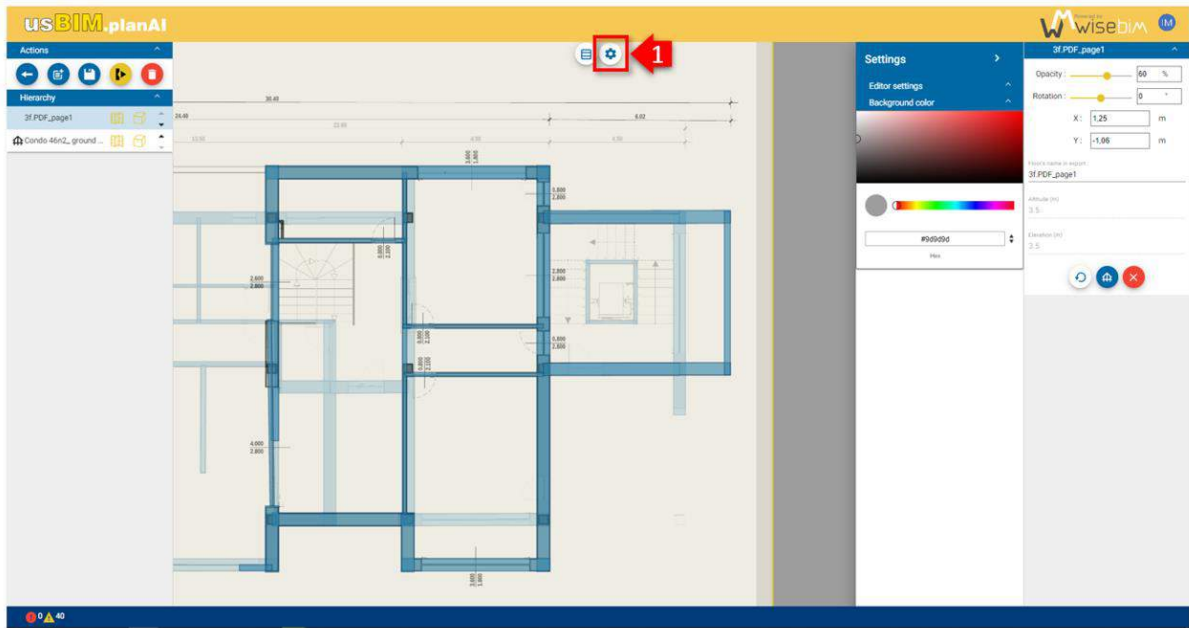


Figure 92. settings

29 Modification of assembly

After having selected the plans in the model, several functions help to modify the structure or to adjust the alignment, modify the names and also modify the order of the levels.

29.1 Order of levels

The default order of the levels corresponds to the order of the plans displayed in the list on the left (Figure 93).

The plan at the bottom of the list corresponds to the lowest level in the building model.

To modify the order of a plan, one can use the buttons located to the right of the line of the plan concerned (up or down arrow). The order of the plans can also be modified through the selection window (Figure 93).

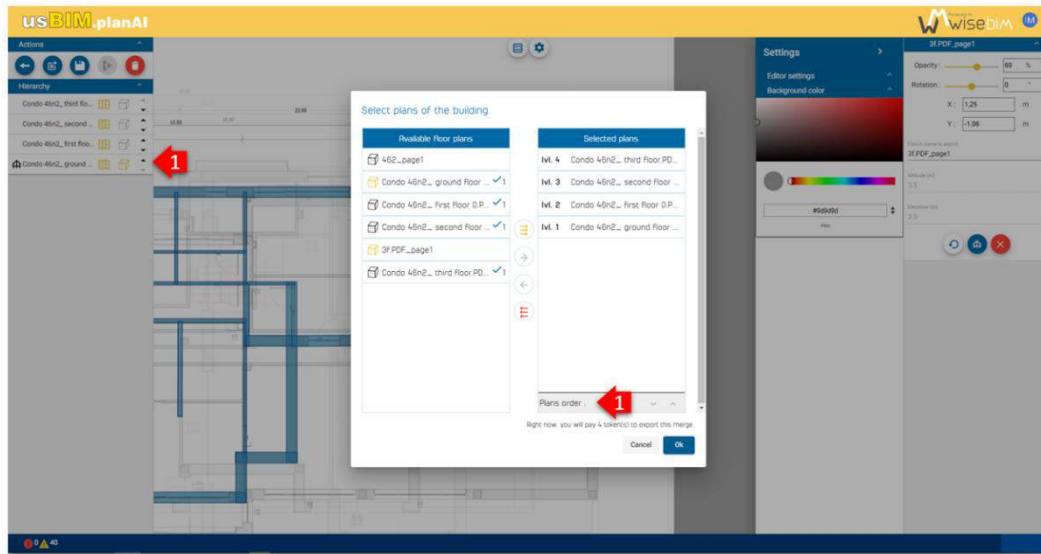


Figure 93. plans ordering

29.2 Elevation and height

The elevation of each floor is automatically computed regarding the height of the stories below.

This value cannot be modified by the user. The elevation view, accessible from the menu at the top of the 2D viewer, displays in a table all the values for each floor (Figure 94).

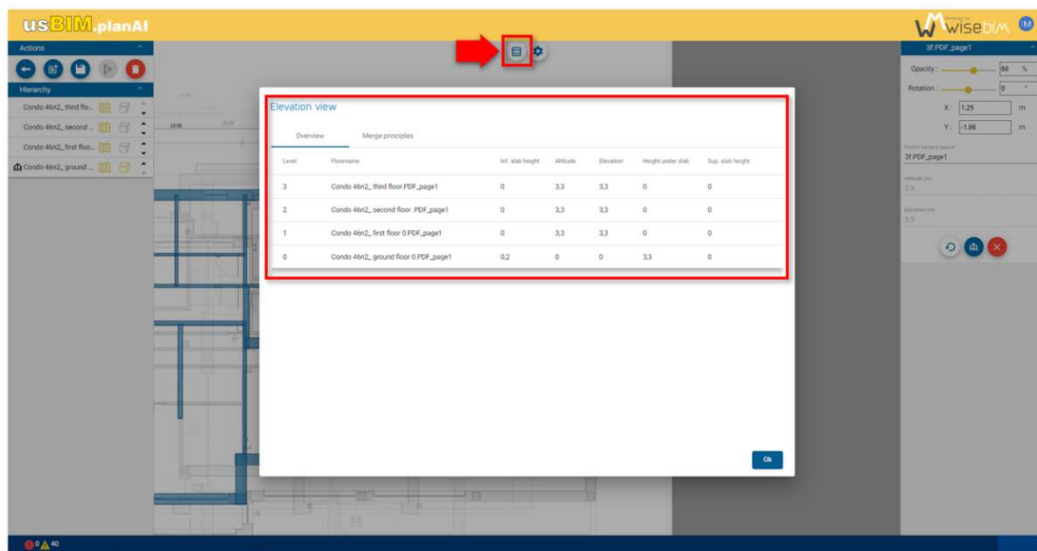


Figure 94. floor elevation

The actual height of each level is also calculated relative to the reference level (Figure 95).

Only the elevation of the reference level can be edited in the properties panel, by selecting

the reference level from the list of planes.

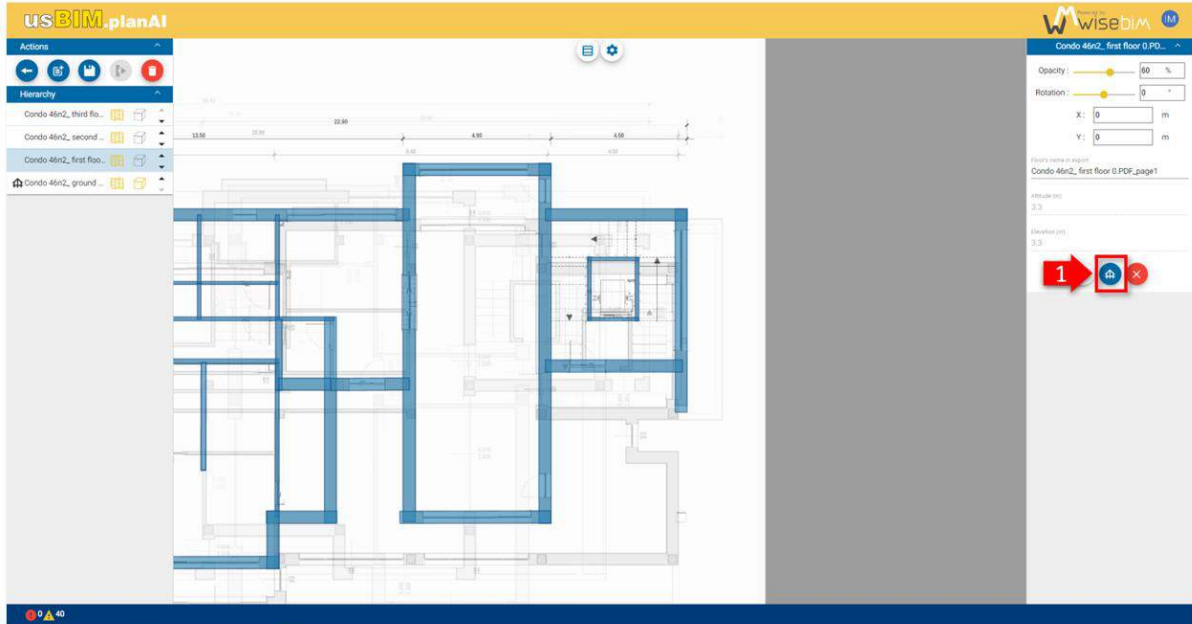


Figure 95. level height

29.3 Scale of the plans

The size of the displayed image takes into account the scale defined during modelling of the plan. The dimensions of the model of each level displayed in the 2D scene are comparable and consistent with the building model that will be generated. If the scale is modified in the modelling interface (Work Area), the position (X,Y) in the assembly is therefore modified (Figure 96).

It is possible to add a plan without an associated model, but the image will be displayed with a default scale of 100 pixels/meter.

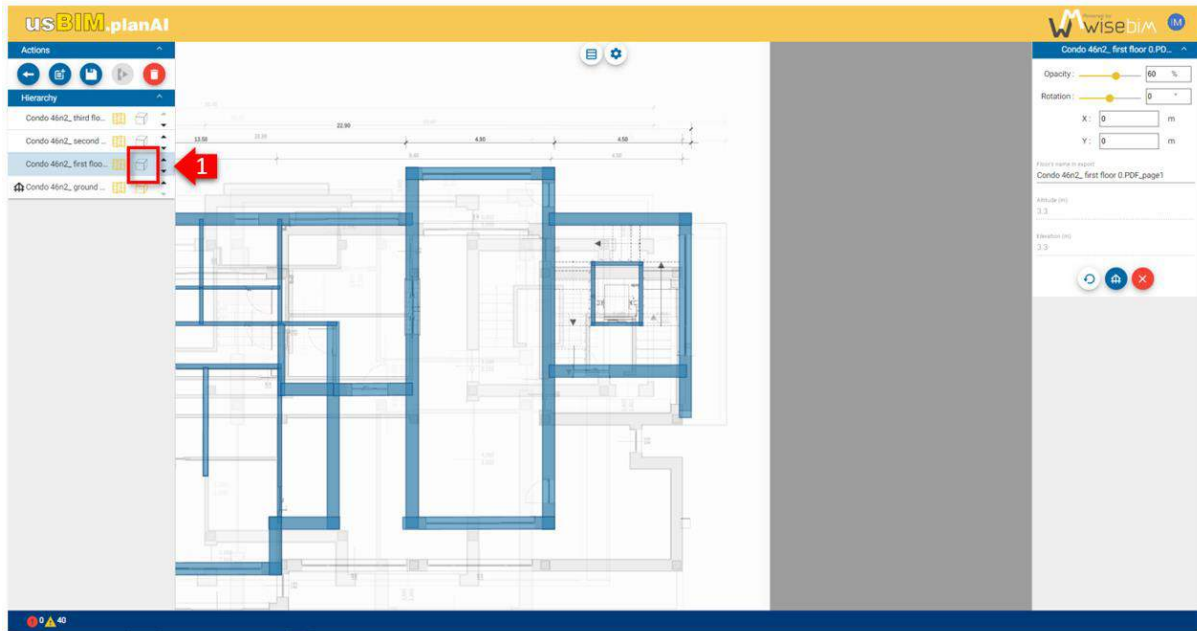


Figure 96. level scale

29.4 Alignment

If the initial images of the different levels are not perfectly aligned, it is possible to modify the (X,Y) position and orientation for each plan. The best alignment can be achieved visually by overlapping the selected levels against a reference level.

In order to facilitate moving and obtain better adjustment, it is possible to hide the image or the model of one or more levels (Figure 97).

The alignment of the images makes it possible in particular to check the scale difference between the levels, as well as the orientation difference.

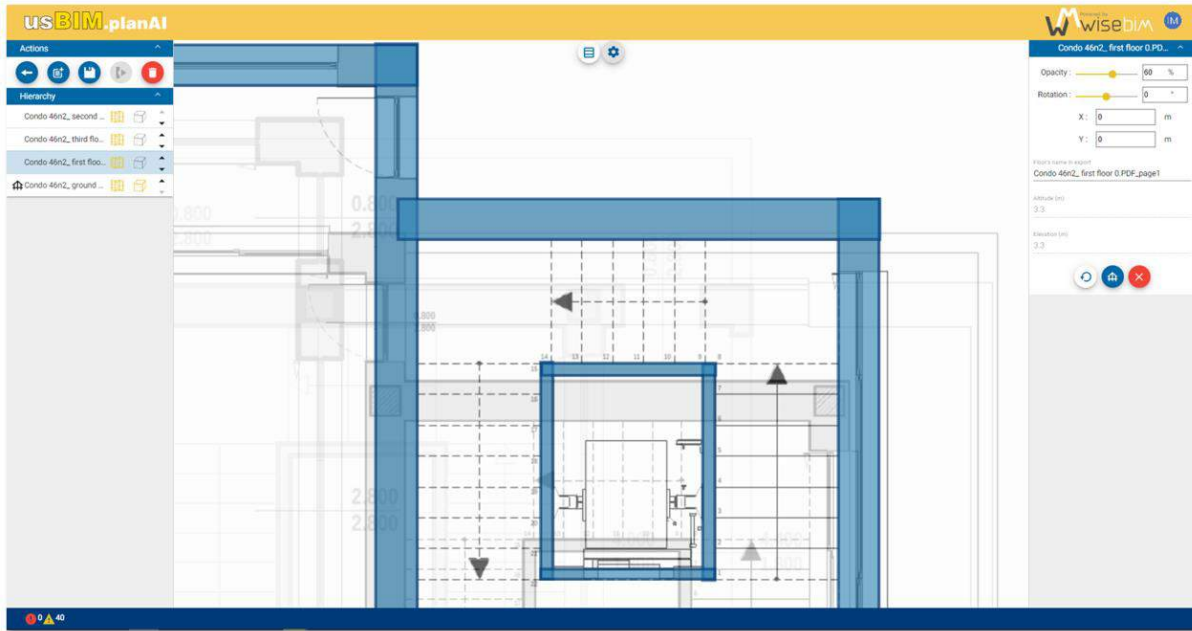


Figure 97. plan alignment

The alignment of the models makes it possible to control the differences between each level model (Figure 98).

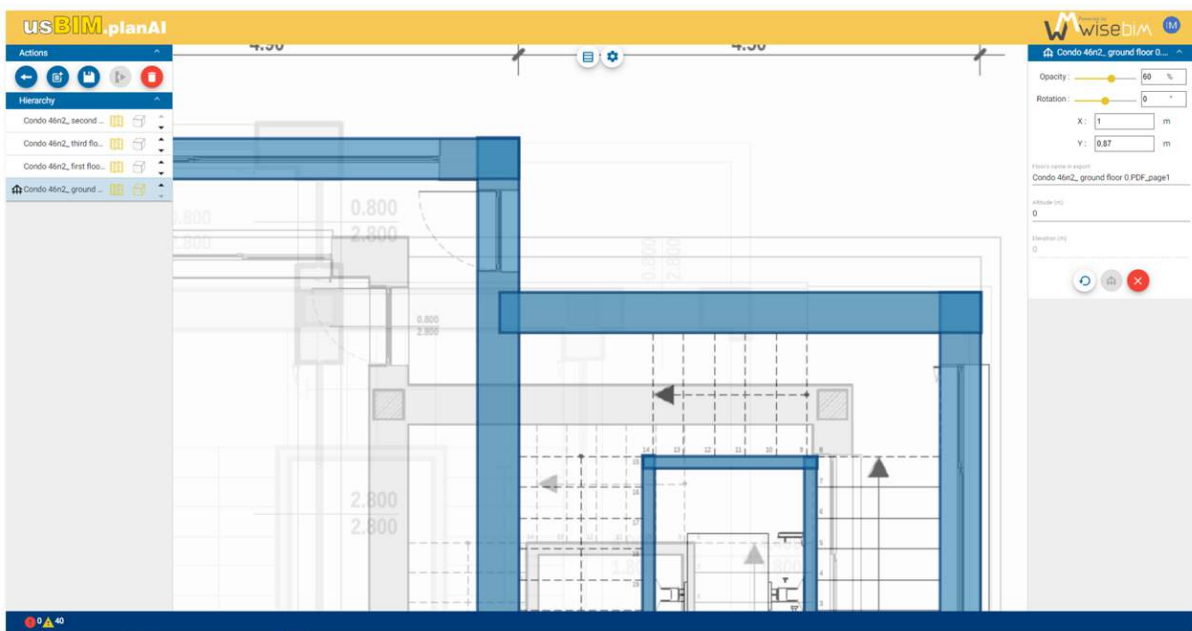


Figure 98. model alignment

29.5 Name of floors

The names of the levels are initialized with the name of the imported plan file. This name can be changed for each level from the properties panel when only one level is selected.

The name is associated with the floor during the export (Figure 99).

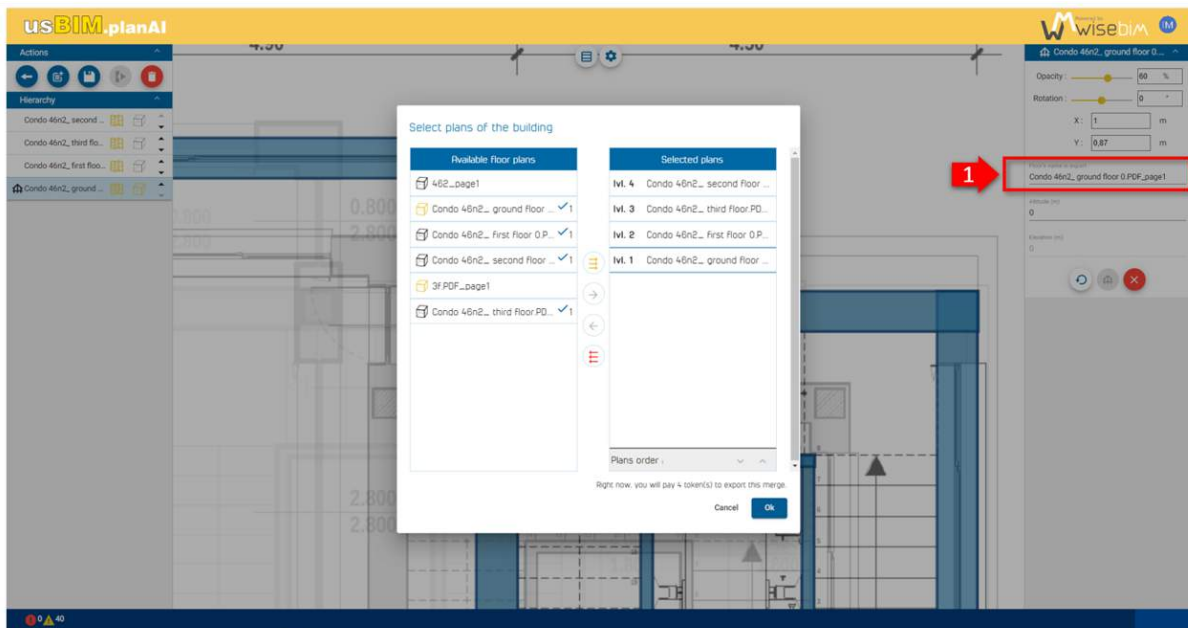


Figure 99. plan name

29.6 Modification of a level model

The geometry for each level is not editable in this interface. If modifications are made in the modelling interface, they will be taken into account when reloading the assembly project.

29.7 Save

The save function of result is accessible from the actions menu in the left panel. Saving memorizes the configuration and modifications made by the user: order of levels, name of floors, elevation or position.

Once saved, it is possible to later open the assembly project to bring new modifications or perform a new export.

29.8 Export

To generate an export of the project result, one should access the export function from the Action menu.

The export requires that all the plans are associated with a model, that is to say a detection result. In order to verify this information, an icon associated with each plan indicates the presence of this mode (Figure 100). If at least one plan does not provide a model, the export button is disabled (Figure 100).

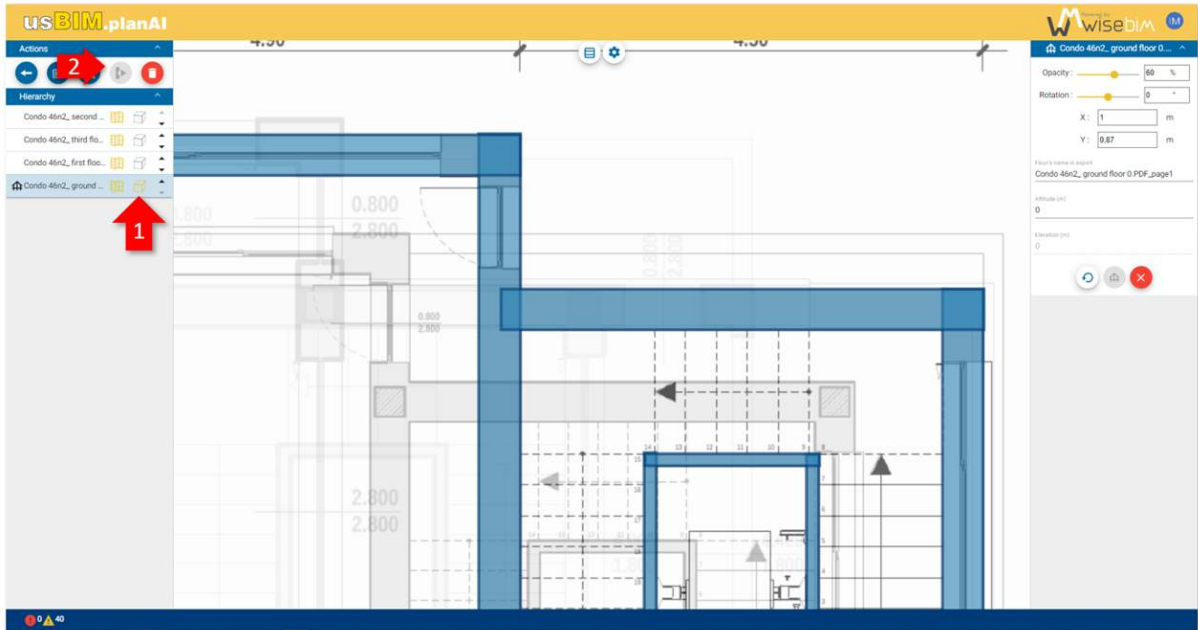


Figure 100. exportation disabled

The export possibilities for a building are the same as for a single plan and allow you to generate:

- a BIM model in IFC 2x3 format,
- dwg
- a table of quantities in CSV format.

Depending on the chosen format, additional options are required, for example the management of wall overlaps for the IFC. One should also set the name of the output file (Figure 101).

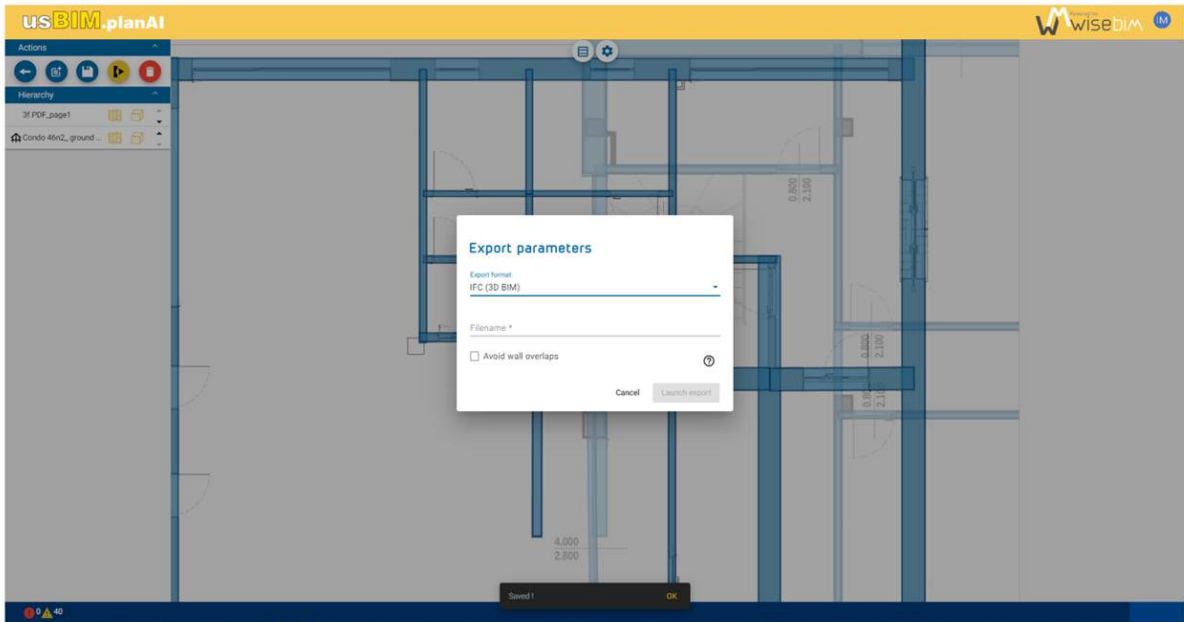


Figure 101. export parameters

29.9 Assembly deletion

The assembly project is linked to a building. To permanently delete this project, one should access the assembly interface to delete the project from the **Action** menu located at the top of the left panel.

This deletion only impacts the data related to the assembly and does not bring any changes user guide

Deleting an assembly project is not reversible.

30 Required configuration

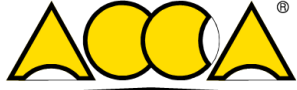
The usBIM.planAI application is a web application that runs without local installation of a software. It only works using a standard web browser.

30.1 Hardware requirements

As the computations are carried out on remote server, the hardware needs are mainly linked to the display of the model elements.

For ease of use, it is recommended to operate on a computer with:

- Processor: latest multicore generation (Intel I5, I7, I9 model or equivalent).
- RAM: 8GB minimum
- Network connection (Internet): Upload / Download speed at minimum 8MB/s.

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30.2 Supported browsers

The application works on the most recent browsers. The list of supported versions for each browser is as follows:

- Chrome 89, 88, 87
- Edge 89, 88
- Firefox 86, 85, 78 (ESR)
- Opera 73, 72
- Safari 14, 13.1

Compatibility is not guaranteed on an older version or another browser, but the application can work on any browser supporting Javascript (ES5).

31 Glossary

- **Administrator:** user with access rights to manage the subscription, projects or users
- **Annex:** technical document stored in the EDM
- **BIM or Building Information Model:** digital model of the building
- **Project manager:** user who can create and manage projects
- **EDM or Electronic Document Management:** sets of functionalities used to manage projects and files
- **IFC or Industry Foundation Classes:** BIM file format generated by Plans2BIM
- **Model:** digital building model containing elements defined by their geometry and properties
- **Plan:** source file containing the image of the architectural plan in 2D
- **Project:** structure grouping together a set of files for a building digitization process
- **User:** person with an account (username and password) to access Plans2BIM
- **Work Area:** usBIM.planAI interface dedicated to conversion and modelling