



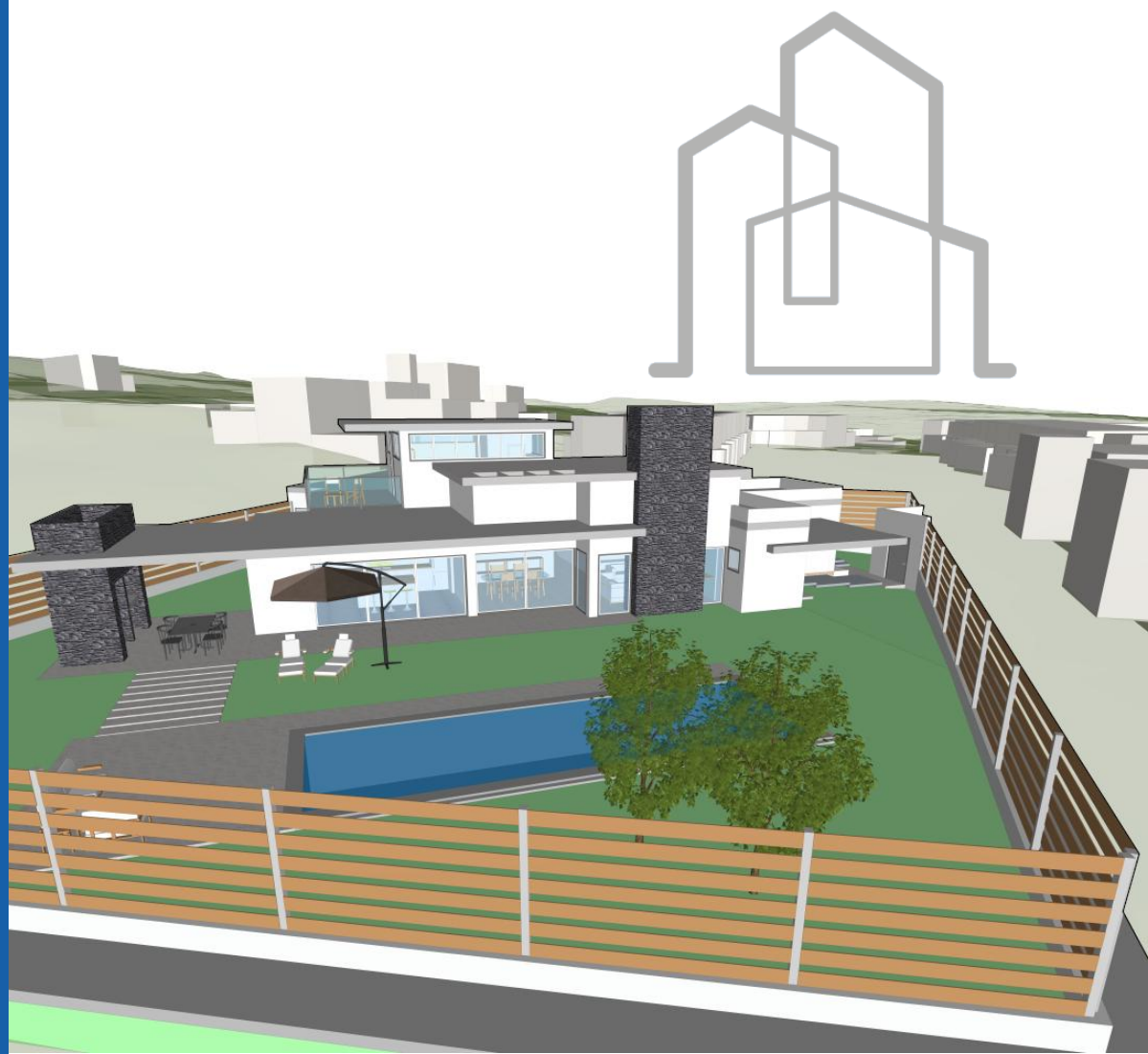
Software para Arquitectura,
Ingeniería y Construcción



CYPE Architecture

User's Manual

*3D architectural modelling software, specifically
designed for multidisciplinary collaboration*



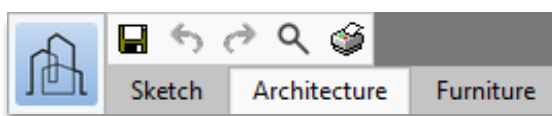


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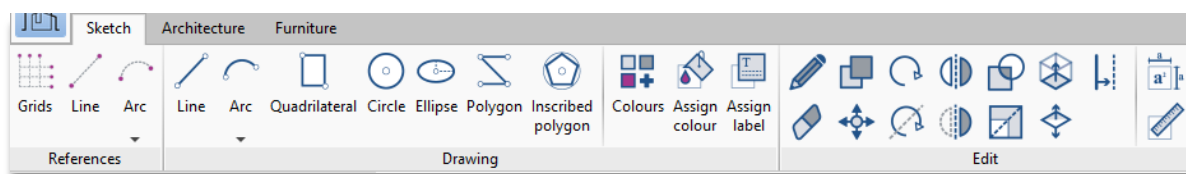
1 Main functions of the programme

CYPE Architecture is a **free architectural BIM-3D modelling tool** designed specifically for multidisciplinary collaboration via its integration in the Open BIM workflow, facilitating the design and modelling of buildings using a 3D work environment. The application allows exports to the standard IFC file format.

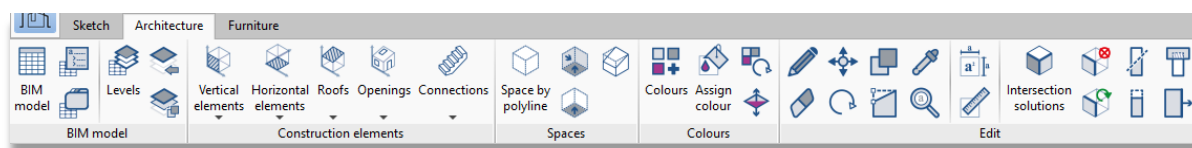


The application's tools are divided into three main tabs or groups: **Sketch**, **Architecture** and **Furniture**. Although there are no limits for the direct and immediate use of the tools for creating construction elements, the application will propose a possible approach using the so-called "sketch" tools, i.e., lines, contours, plans, etc., in which the subsequent introduction of architectural elements and furniture can be based. Two possible options or strategies for developing a project are therefore proposed: direct 3D/BIM modelling and sequential modelling, preceded by a traditional geometric design process.

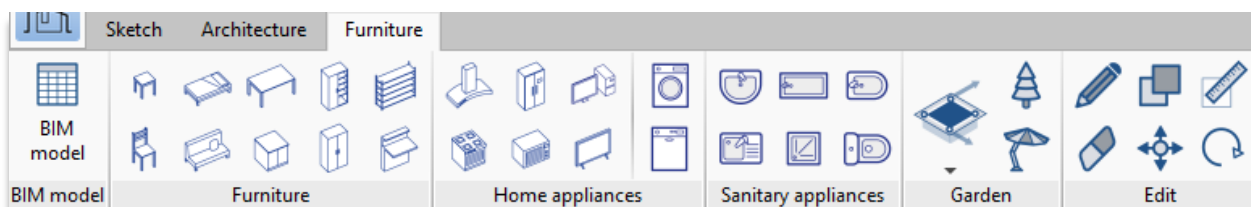
On the one hand, the programme has been equipped with tools that come from traditional modelling (surfaces, edges, intersections, extrusions, curves, etc.) and, on the other, with tools that come from the BIM modelling environment (walls, floor slabs, roofs, columns, etc.); both combined, they allow users to switch from the conceptual to the architectural in a simple way.



The **Sketch** tab includes creation and editing tools typically found in traditional design programmes such as straight lines, curves, polygons, extrusions, offsets, intersections, etc. These tools will allow flat or three-dimensional geometries to be created which can then be the base of the subsequent developments of floor plan layouts or three-dimensional envelopes, in this case, making use of the tools included in the **Architecture** tab.



The **Architecture** tab includes all the tools for entering and editing the elements that will make up our architectural BIM model. Among the tools for creating construction elements, we find drop-down menus for **vertical elements** (walls, curtain walls, lattices, columns, railings), **horizontal elements** (floor slabs, suspended ceilings, beams), **roofs** (tiles, slope formation), **openings** (windows, doors, skylights, etc.) or **vertical connections** (stairs, ramps, and lifts). The editing tools will include, on the one hand, traditional tools such as **edit**, **move**, **copy**, **rotate**, and, on the other hand, specific tools for geometry editing and **intersection solutions**. We also find other groups for creating spaces or creating and managing reference elements and organising the model (levels, types, or labels).



Lastly, and second in importance, the **Furniture** tab includes the necessary tools to provide context to our model and assist when distributing and organising spaces and uses. The different groups will help enter and edit furniture elements, home appliances, sanitary appliances, and garden elements.



2 QuickStart

2.1 Creating a new project and a new file in CYPE Architecture

Project should not be confused with File. When using an application integrated in **BIMserver.center**, users will have the chance to create a new job (file) integrated in a **BIMserver.center** project.

CYPE Architecture is no exception. When launching the application and clicking on **New**, you will be offered the possibility of creating a new *project* and then integrating it into an existing *project* in **BIMserver.center**. You will also have the option of creating a *new project*, in which case the project created will be visible from **BIMserver.center** from that moment onwards.

If linked to an existing project, the programme will offer the possibility to include files that already exist in that project (models that will be visible and can be used as a reference in CYPE Architecture).

In any case, once the work file has been created, the blank canvas can be accessed, allowing users to start entering information.

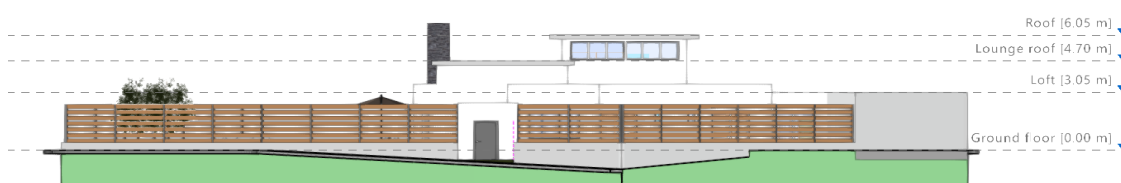
2.2 Reference elements: grids, lines and arcs

If the project being developed requires a certain structural order, we may want to create some reference elements; in CYPE Architecture, these reference elements are called **Grids**. During the design phase, these grids can be used to draw any construction or sketch elements. Flat or three-dimensional grids can be generated, this way, users can have a common reference in all levels of the project. As well as grids, the programme allows a freer introduction of reference lines and arcs.

References are not model elements and will only support the 2D/3D drawing and creation of construction elements. All references (grids, lines or arcs), can be created in the **Reference** group in the **Sketch** tab.

2.3 Creating Levels and Types

Levels can be introduced from the **Architecture** tab. Creating levels is fundamental for the correct use of the application, levels will allow work planes and work views and will usually correspond to the different architectural levels or floors of the buildings. For the correct management and export of the model, all the elements in the Architecture tab should be associated to a level. When a new level is created, the programme will offer the chance to create *plan views* associated with them.

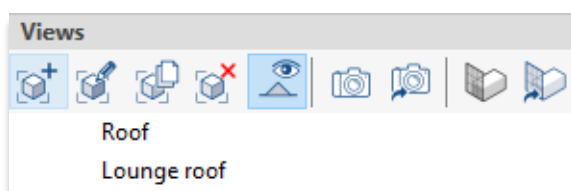


Also, if desired, the programme will allow templates from external files to be imported so they can be inserted in each of the previously created levels (both image and CAD files, with *.dxf, *.dwg or *.dwf formats).

Once the levels have been created, **Types** should be created for defining common construction elements (typology of external walls, floor slabs, etc.). The definition of types will simplify the introduction of common use elements (which will adopt the type's properties) and will facilitate later editing.



2.4 Creating views and using the graphic window



The CYPE Architecture graphical environment includes some side panels. One of them is the **Views** panel. From this panel, the work views for our project can be created and managed. We should recall that, in the previous section, the possibility of creating plan

views associated with the created levels was mentioned. The views created by this procedure will be visible in this panel.

The panel has tools in its top bar. This bar contains the following tools, among others:

- **Create.** With this tool, users can create views for floors, reflected ceilings, elevations, sections, generic (plane defined by three points) or 3D views
- **Edit.** Allows the existing views to be edited (double clicking on the selected view will have the same effect). Editing allows the reference (name) or the planes that define the cutting height or visible ranges to be modified and also allows imported levels or files to be associated with them, when available.
- **Save the start scene.** The views offered by CYPE Architecture are not static, meaning, the model can be orbited to facilitate its modification in any view; however, the views will have a reference or start scene (i.e., in the case of a floor view, this view will coincide with a plane perpendicular to the z-axis). This tool will allow that start scene to be defined.
- **Go to start scene.** Allows the defined start scene to be recovered by using the aforementioned tool.

2.5 Viewing control and selecting objects

The CYPE Architecture graphic window will occupy most of our screen; in this window, the interaction with the model will take place and both **Sketch** and **Architecture** elements, will be introduced.

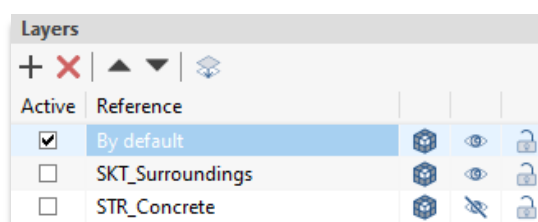
Its use is intuitive and analogous to that of any other three-dimensional modelling or design programme. Using a three-button mouse with a scroll wheel eliminates the need to use specific tools; scrolling with the wheel allows users to zoom into the model, pressing the centre button and moving the mouse will allow the scene to be framed, lastly, the previous action along with simultaneously pressing the *SHIFT* key allows the scene to be rotated.

Clicking the left mouse button allows users to select objects and clicking the right mouse button allows them to cancel selections or actions that are in progress. Their selection along with holding down the *CTRL* key allows multiple selections whilst holding down the *CAPS LOCK* button will allow previously selected elements to be deleted. Clicking the left mouse button will allow the crossing method to be used, depending on the direction in which the frame is created, it will be possible to select contained or intersected elements, the type of line shown by the frame itself will indicate whether we are in the first or second case.

2.6 Creating and managing layers

The different elements of the model, both those from the **Sketch** tab and those from the **Architecture** tab, can be classified via an editable layer system by the user. The aim is to allow a classification that facilitates the users' 3D modelling of the building.

The **Layers** panel, besides showing the list created, will allow the visibility, transparency or locking of each one to be activated. A top toolbar allows users to create, delete, sort the list, or assign the selected elements on the model to a previously defined layer.

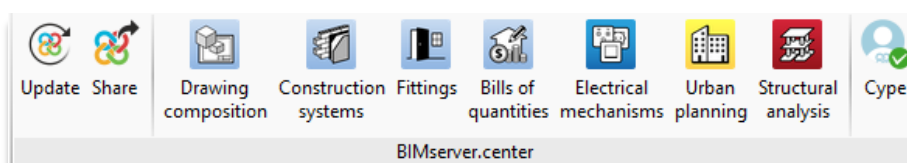


2.7 Connecting to BIMserver.center

While it makes little sense to export to upload information once our CYPE Architecture model has been started (and linked to a **BIMserver.center** project) until we have made progress in its development, the **Update** button will allow us to know the status of the project and the different files linked to that project (dates, changes, source applications, etc.) at all times; in addition, and above all, it will allow us to import and/or update any of the files linked to that project. Having external reference files will allow a coordinated design to be carried out. These files can be used as a sort of "three-dimensional template" to facilitate coordination. In fact, by editing each of the existing views in the file, you can activate the visibility (opaque or transparent) of any of the imported models.

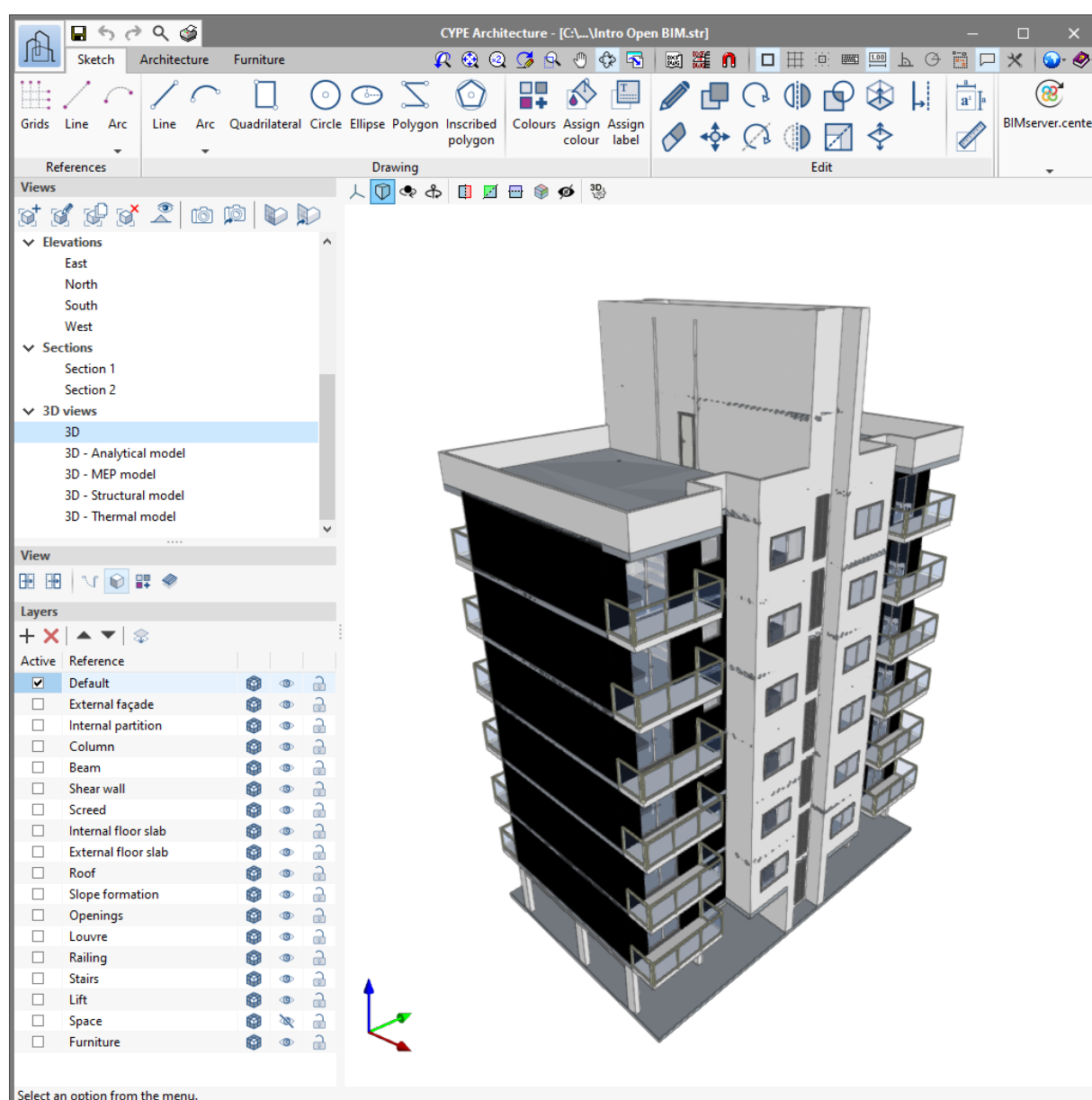
With all the aforementioned points in mind, the modelling process can begin. Once the modelling has been totally or partially completed, the model can be shared and made available to all collaborators by simply clicking on the **Share** tool. Clicking on this button will trigger a series of operations transparent to the user (generating an IFC file and uploading this file and any associated files to **BIMserver.center**, thanks to the preinstalled **BIMserver.center Sync** application) that will simply add (or update) the IFC version of the model hosted in the cloud, i.e., on **BIMserver.center**.

It should be noted that the native file is protected at all times; this process does not share any native information, only a screenshot of the model in standard IFC format, which is enough for the development process to continue in other software applications.



The group of tools called **BIMserver.center** also contains a series of direct connections to other programmes; clicking on these buttons will not only launch the corresponding application but will also create a file linked to the project.

At the end of the group the user is displayed; clicking on this symbol offers a direct link to the **BIMserver.center** cloud.

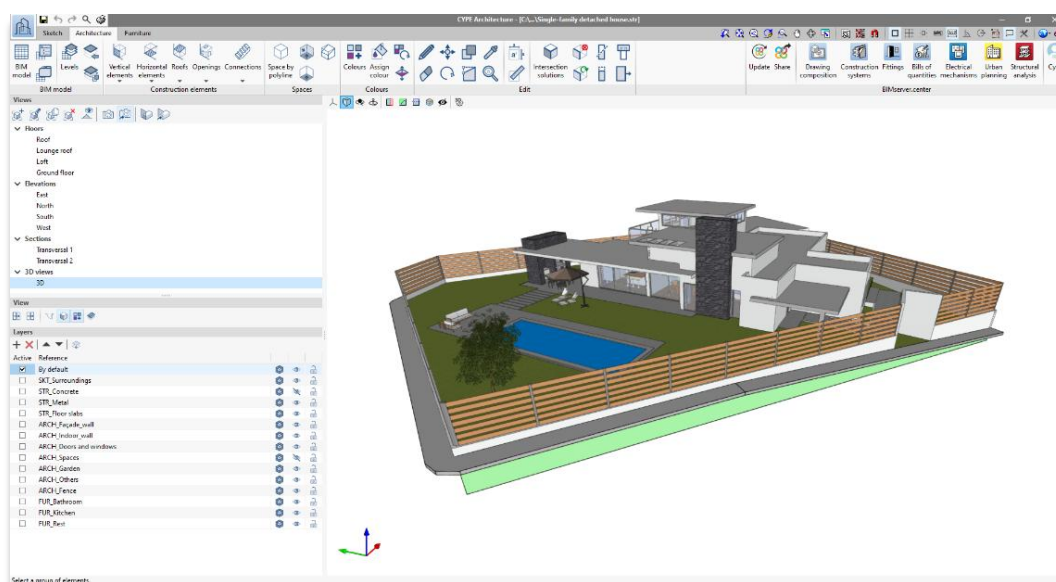


3 Step by step

3.1 A walkthrough of the interface

CYPE Architecture presents a simple and intuitive interface oriented towards creating a BIM model, which is naturally three-dimensional, consisting of correctly classified and parameterised elements.

The graphical environment is divided into three main parts: the top toolbar, the side panels on the left and the graphical window occupying the largest area.



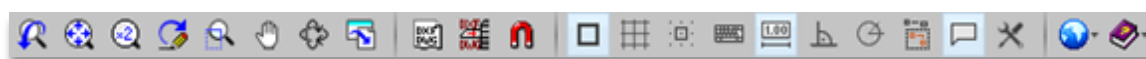
- **Toolbar.** This bar contains all the creating and editing tools; it contains three tabs which in turn hold the tools for creating and editing **Sketch**, **Architecture** and **Furniture** elements. Activating each tab opens the groups of tools related to that type of object; it is important to note that the editing tools will be specific to that type of object (an architectural object cannot be edited with the sketch editing tool and vice versa).
- **Side panels (Views, Layers and View).** It contains two main panels with two specific functions: creating and managing project views and the layers in which the model elements can be organised. There is also a third linear panel with display options; this panel allows individual objects or those belonging to specific categories (symbols, sketches, textures, or tiles) to be hidden.



- **Graphic window.** It will be the main window for designing and interacting with the model. In the top part there is a series of options and tools that allow the projection and type of projection to be defined, the model to be sectioned or the representation type to be chosen.



- **Other bars.** There is a small bar at the top of the program and a dialogue line at the bottom; both bars are common to all CYPE programs and contain various functions, including the following: importing and activating CAD or image templates, activating the options for **Object snap**, **Draw grid**, (absolute, relative, and polar) **Coordinate introduction**, **Orthogonality**, etc. They are of significant help when entering data and allow the geometry introduction mode to be personalised. Lastly, a general **Configuration** option is included that allows users to configure project units or background colours, for example.



3.2 Creating a new job and linking to a new project

Project should not be confused with file. When starting the application and clicking on New, a new job will be created and then integrated into an existing project in **BIMserver.center**. Users will also have the option of creating a new project in **BIMserver.center**, in which case, the project created will be visible on the platform from that moment onwards.

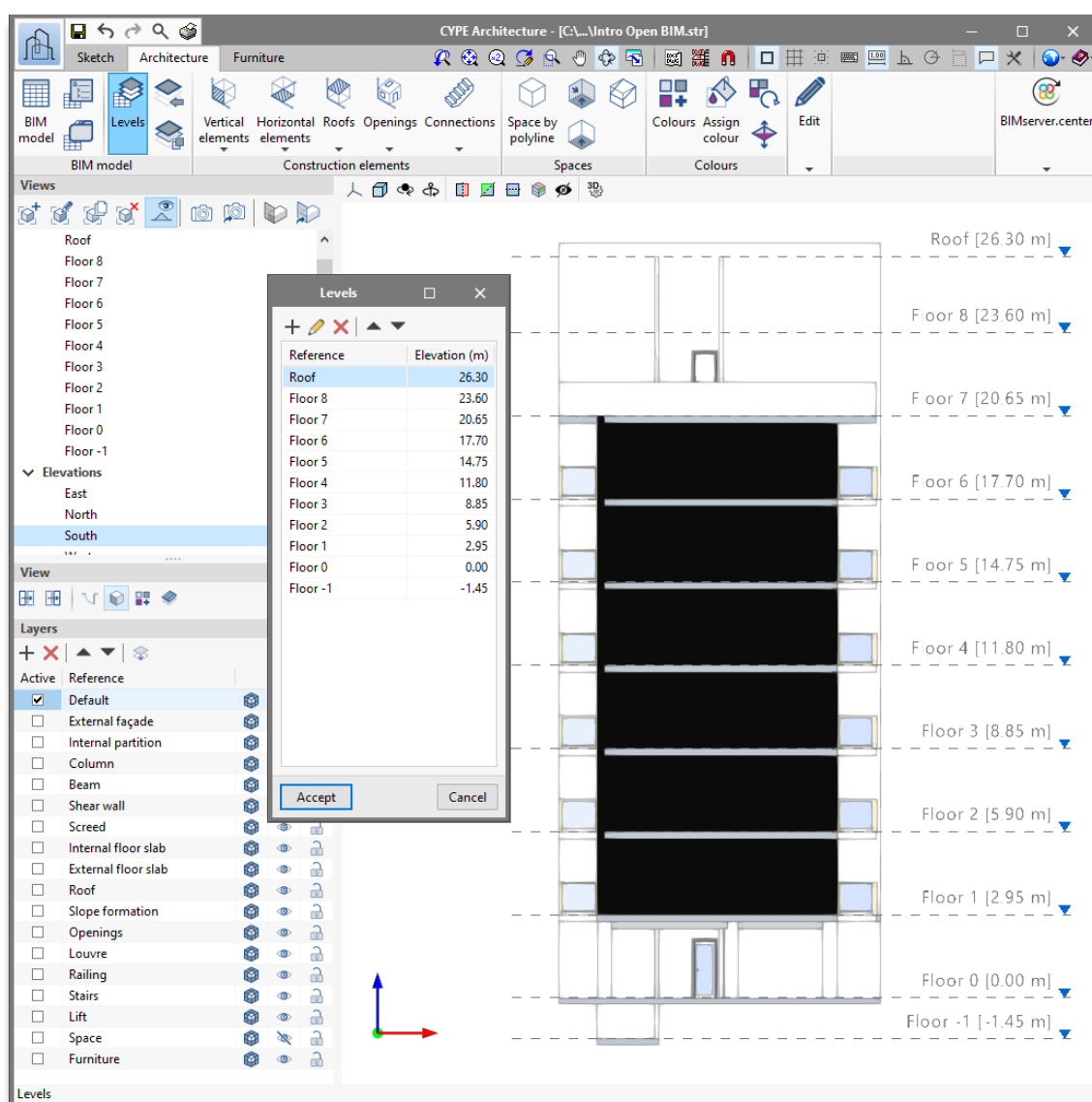
Steps to follow to create a new job:

1. Click on the application icon and **File > New**. Complete the **File name** and **Description** information. If necessary, enter an alternative path to the one provided with the **Examine** button.
2. Click on **Create a new project** to generate a new project in **BIMserver.center** (alternatively, an existing project may be selected, and the new CYPE Architecture model may be linked).
3. Enter the requested information for defining the new Project.
4. Once the data has been entered and the **Accept** button has been selected, users will access the graphical environment with a blank graphic window, showing the existing level with elevation 0.00.

In order to link to a project with BIMserver.center you will need to have an account. Registration can be done quickly and free of charge at <https://bimserver.center/en>.

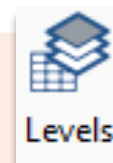
3.3 Levels

The **Levels** tool will allow planes and work views that would normally correspond to the floor plans of the building to be created (although users can create as many as they desire). While creating them, the programme will offer the chance to create associated plan views.



The tool is available in the **Architecture** tab in the **BIM model** group. The menu will allow the associated levels and elevations to be created and managed.

Steps to follow for creating **new levels**:



1. Click on the **Architecture** button > **Levels**.
2. Click on the + sign to add a new level; next, enter a reference, an associated elevation and activate the corresponding checkbox if you wish to **Create** (an associated) **floor view** (this action will add a new view to the **Views** side panel).
3. Once it has been created, the view can be edited or repositioned with the tools available in the menu.

If associated views have been created, they can be edited from the view panel; to do so, simply double-click on the name of the view.

There is a powerful tool in the BIM model group of tools: Copy from another level. This tool, as its name suggests, will allow elements to be copied from one reference level to another.

Steps to follow for **copying elements from one level to another**:

1. Click on the **Copy from another level** tool.
2. In the dialogue box, select the levels to and from the one where you wish to copy the objects.
3. Filter the categories of the objects to be copied and click **Accept**.

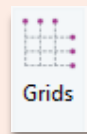
Once the objects belonging to a specific category have been copied, you will see that, despite maintaining their shared features, the new elements created will be assigned to the target level and will have adopted a new individual reference.

3.4 Grids and other references

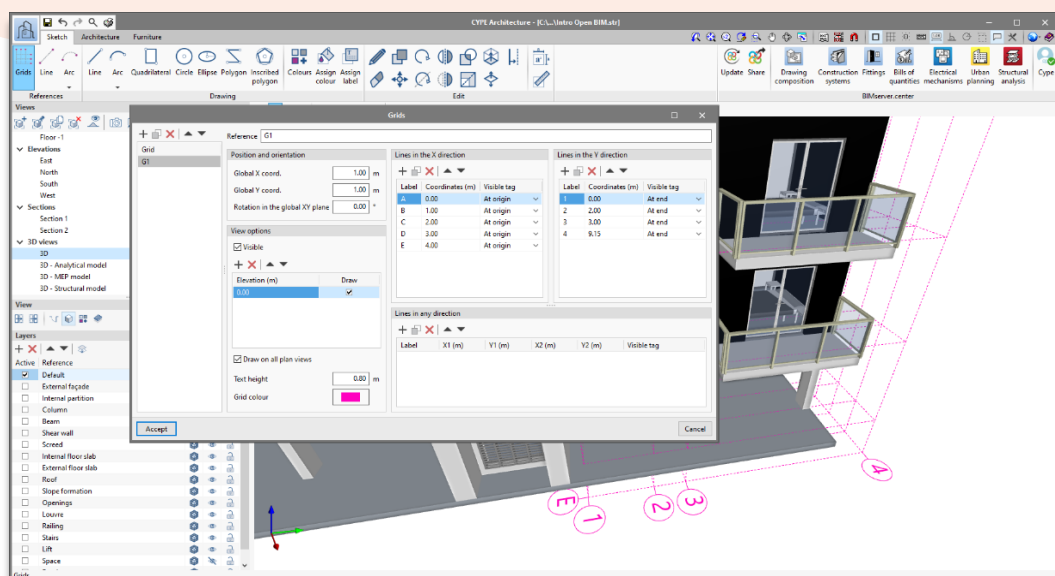
Grids facilitate structured geometric modelling. During the design phase, you can use these grids to draw any construction or sketch element.

If several grids have been created, their visibility can be controlled individually by activating/deactivating the Visible checkbox in the View options section.

Steps to follow for creating grids:



1. Click on the **Sketch** button > **Grids**.
2. Click on the + sign to add a new grid, next, enter a reference.
3. The grid can be freely positioned and aligned; to modify its origin and orientation, enter the relevant coordinate and rotation data in the **Position** and **Orientation** section.
4. Aside from its position in the XY plane, the grid can be located at a specific elevation, adopt a specific colour and text height. All these options must be configured in the **View options** section. A checkbox can activate or deactivate the visibility of the new created grid (without affecting the visibility of the others).
5. Add lines in the X direction. The + sign will allow new lines to be placed in a specific (absolute) coordinate to be entered freely.
6. Add lines in the Y direction.
7. Add lines in any direction. To do this, simply define the coordinates of the ends and the label.

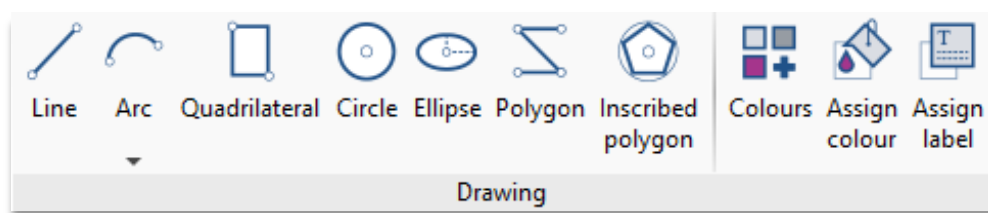


3.5 The **Sketch** tab

The **Sketch** tab includes features and tools found in traditional modelling programmes.

In addition to the aforementioned **References** group, there are two groups of drawing and editing tools; these editing tools are specifically for sketch elements (they cannot be used for editing architectural elements and vice versa).

The **Drawing** group includes the following tools: **Line**, **Arc** (given centre, start and end and 3-point), **Quadrilateral**, **Circle**, **Ellipse**, **Polygon**, and **Inscribed polygon**.



Depending on the drawing tool activated, a series of options will appear to graphically define the element to be created; for a **Line** simply enter a start and end point (each new point will define a new segment from the end point of the previous section), right clicking the mouse will allow disconnected elements to be entered, right clicking again will deactivate the tool. Other elements will require supplementary data to be entered; the **Arc** will need to be defined by three points or by the centre, start and end; the **Quadrilateral** can be defined by three points, diagonally or by width and height parameters; the **Circle** requires a centre and a radius; the **Ellipse** requires a centre and two radii; the **Polygon** requires the continuous entry of the points defining the vertices (right clicking the mouse will close the polygon) and the **Inscribed polygon** requires a circle and number of sides to be defined.

Once any of the aforementioned tools has been activated and during the introduction by points, the usual options will be displayed; on the one hand, there will be an **Entry mode** bar that will allow the 3D or 2D entry mode to be chosen, the latter based on a reference plane and a possible vertical displacement from the previous one. Choosing the appropriate entry mode is crucial for entering the points in the workspace correctly. On the other hand, a small floating toolbar allows users to **Erase the last introduced point** or simply **Erase all introduced points**.

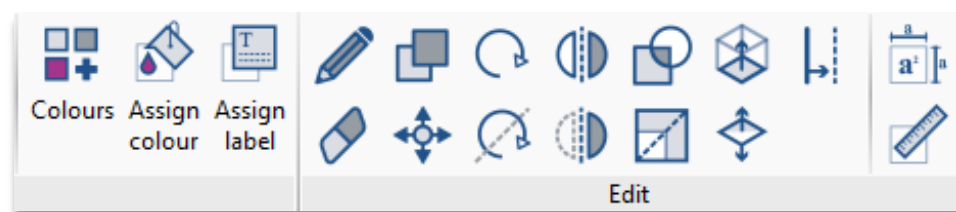
A defining feature of the procedures proposed by CYPE Architecture is the following: any closed outline will cause the automatic creation of a surface; this surface can be used for creating three-dimensional elements, both architectural (such as walls and floor slabs) and sketch (using the **Extrude** tool). Using surfaces opens a door to freedom in element design that will be discussed further on. In the same way that closing an outline creates a surface,

erasing one of the elements that defines that outline will result in the elimination of that surface; to recreate a surface, the outline must simply be closed again.

Another peculiar feature is that any intersected line will produce two independent lines.

Sketch elements created with the tools in the **Sketch** group can be edited with the tools included in the Edit group. This group includes the following tools: **Edit**, **Delete**, **Copy**, **Move element group**, **Rotate**, **Rotate about an axis defined by two points**, **Symmetry** (with and without copy), **Intersect**, **Scale**, **Extrude**, **Invert**, **Offset**. Given that these tools are the usual ones in any design programme, we will only comment on some interesting differences:

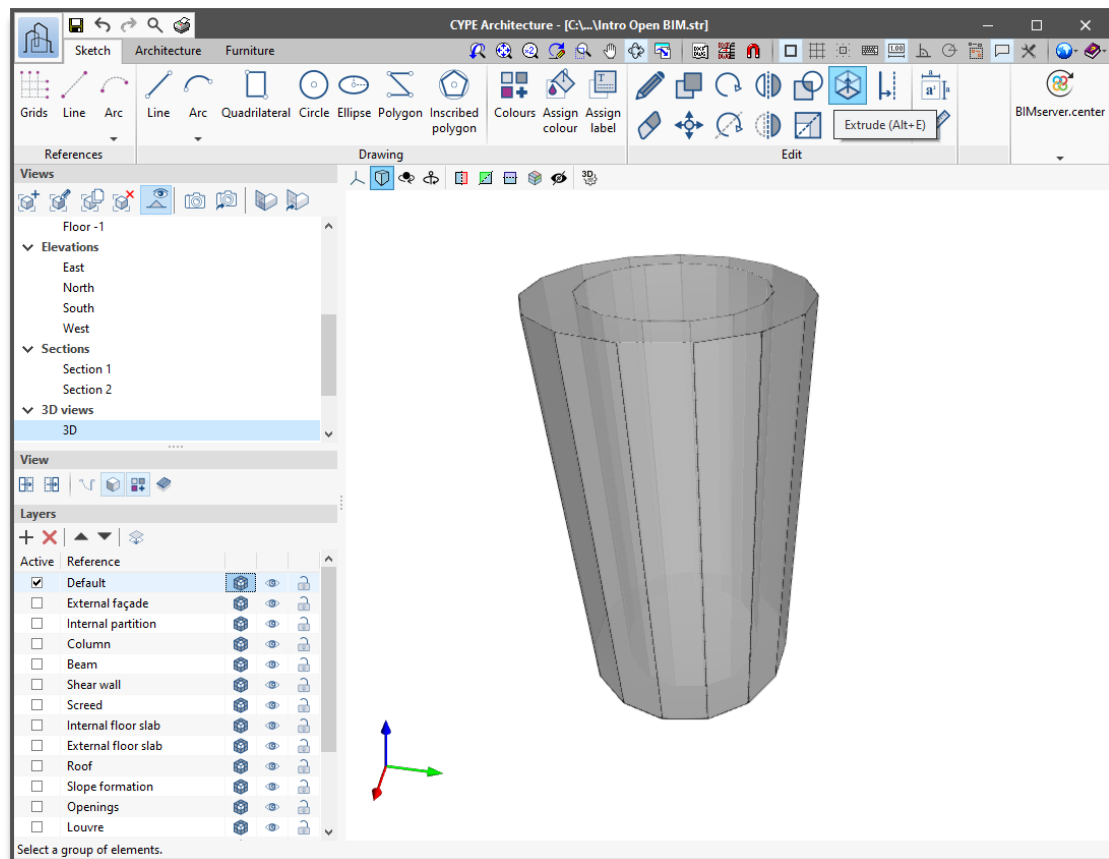
- **Intersect**. When applied on two surfaces it will generate a new surface as a result of the intersection.
- **Extrude**. Will allow volumes delimited by sketch surfaces to be obtained from the extrusion of surfaces.
- **Invert**. Will modify the normal direction of a surface plane; this could modify the assigned colour and direction of growth (for example, when used as the generator or an architectural element).
- **Offset**. When applied on a surface it will allow a new equidistant contour to be obtained, either interior or exterior.



Lastly, as with architectural elements, sketch elements can be associated to a colour, a label, or they can be measured (linearly or superficially); the tools related to these functions complete the main toolbar.

Steps to follow for creating cylindrical walls using **Sketch** tools:

1. Select an appropriate view and layer for working.
2. Click on the **Circle** tool that can be found in the **Sketch** tab, in the **Drawing** group.
3. Once the tool has been activated, a small floating menu will appear that allows the properties of the circle to be defined:
 - **Number of sides.** The circumference that borders the circle will be represented by a polygon; the value of this parameter will allow the precision of that polygon to be defined
 - **Radius.** If this parameter is activated, the radius of the element can be defined parametrically; otherwise, it can be defined graphically in the graphic window
4. Once the geometry of the circle has been defined, it is time to place it in the graphic window. The centre and, if necessary, the window, can be defined by clicking on the graphic window. To do this, it is important to note the following:
 - **3D/2D mode.** A floating window will allow activating both the **2D mode** and the reference to a work plane (if users are working on a view associated to a level, the choice of work plane will be determined by the view itself and the selector will remain inactive), and the **3D mode** (in this case, the element can be freely located in space, in the dimension associated to the selected point). The **2D mode** will also allow the entry of a vertical displacement, measured from the reference plane.
 - Once the circle has been created, as it is a closed outline, a surface delimited by the outer polygon will be created at the same time.
5. Click on the **Offset** tool which can be found in the **Sketch** tab in the **Edit** group and click on the inner surface of the circle.
6. Move to the inside or outside and see how the shape equidistant to the original has been updated; click on the desired point (if the **Allows for dimensions to be defined when introducing each element** option is activated, the offset can be entered numerically).
7. Click on the **Extrude** tool, which can be found in the **Sketch** tab, **Edit** group, and click on the surface between the two polygons created.
8. Move along the axis perpendicular to the surface to define the height of the extrusion and click on the desired point (if you have enabled the option Allow dimensioning when entering each element, you can enter the height numerically).



The extrusion will result in the creation of a set of surfaces that delimit the volume of the extrusion. Any of the resulting surfaces will serve as the generatrix of a possible architectural element, if necessary.

3.6 Creating architectural types

Previously defining typologies will simplify entering elements later on. Moreover, in case of any later changes, assigning elements to a given type will allow the features associated with all elements belonging to that type to be changed simultaneously.

Steps to follow for **creating types**:

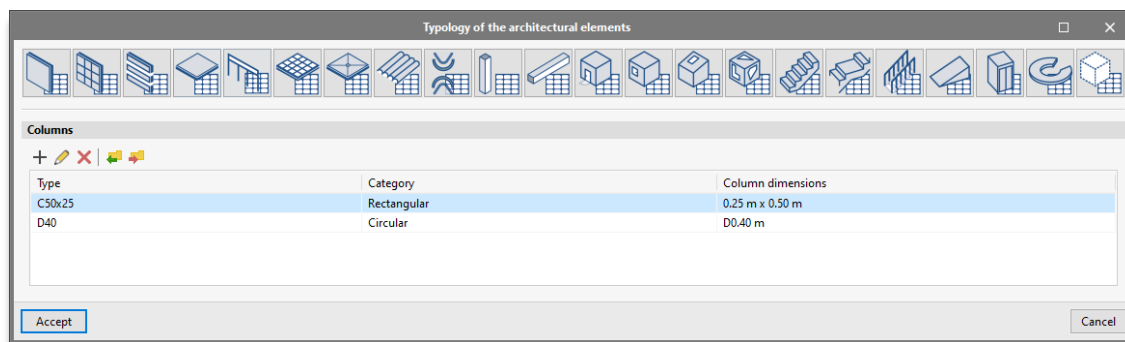
1. Click on the **Architecture** button > **Typology of the architectural elements**

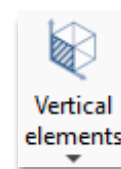


2. Click on the category to which you wish to assign new types (e.g., columns)
3. Click on the + sign to add a new type. Depending on the category, a menu will appear with the options for defining elements belonging to that category. In any case, the **Reference** field must be filled in to identify the new type created. If desired, other identifying fields can be added, such as **Description** or **Tags**. For columns, other specific parameters must be defined: **Category** (**Rectangular** or **Circular**), **Dimensions** and **Colour**.
4. Once the features of the newly created type have been defined, a new line will appear in the **Typology of the architectural elements** window. From this window, types can be edited, deleted, exported, or imported.

The extrusion will result in the creation of a set of surfaces that delimit the volume of the extrusion. Any of the resulting surfaces will serve as the generatrix of a possible architectural element, if necessary.

Once some shared features per type have been defined, the creation of new elements will be much simpler.





3.7 Vertical elements I: Columns

Although entering columns can be done in a completely free and individual way, the prior definition of types will, as we have already seen, make it easier to create new elements.

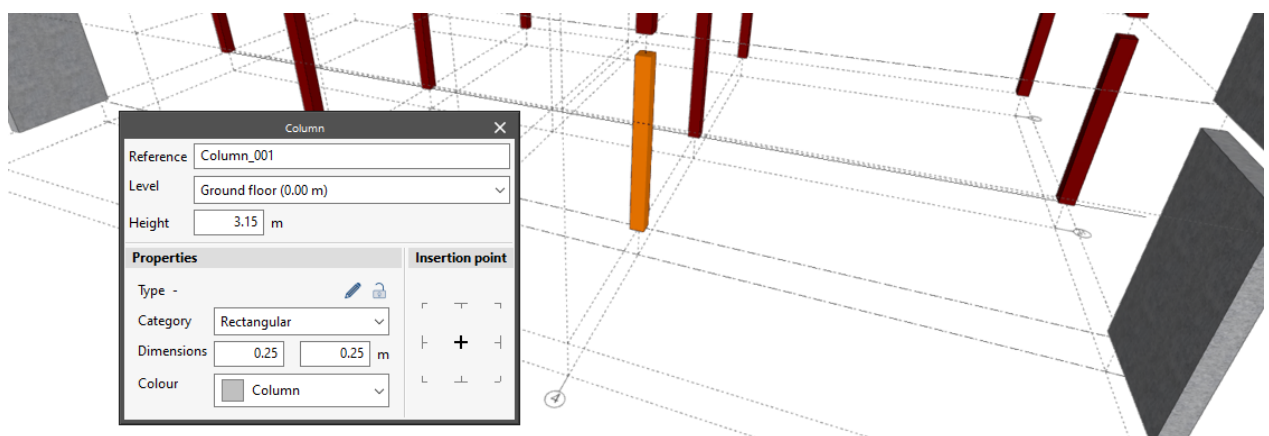
Steps to follow for **creating columns**

1. Select the appropriate view and activate, if necessary or convenient, the reference grid.
2. Click on the **Column** tool which can be found under the **Architecture** tab in the **Construction elements** group in the Vertical elements drop-down menu. When clicking on **Vertical elements**, a small floating toolbar will appear that can be attached to one of the sides of the graphic window; the toolbar includes the **Column** tool along with others.
3. Once the tool has been activated, a small floating menu will appear, allowing users the features of the new column being created to be defined, if a column type has been previously defined, these features can be loaded directly via the pencil:
 - **Reference.** The one proposed by the application can be modified.
 - **Level.** Reference level for the new element, important for filtering later on.
 - **Height.**
 - **Type.** If types have been previously defined, one of the existing ones can be selected from the folder icon; this will cause the defined parameters for the type to be filled in and linked to the features defined for it.
 - **Category, Dimensions, Colour.** These can be freely defined if the element is not associated with a predefined type.
 - **Insertion point.** Any of the references shown graphically may be defined.

4. Once the features of the column have been defined, it is time to place it in the graphic window. To do this, several issues must be considered:

- **3D/2D mode.** A floating window will allow both the 2D Mode and the reference to a work plane to be activated (if we are working on a view associated to a level, the choice of work plane will be determined by the view itself and the selector will appear inactive), and the 3D Mode (in this case, the element can be freely located in the space, in the dimension associated to the selected point). The 2D Mode will allow the introduction of a vertical Offset, measured from the reference plane.
- **Orientation.** A second floating window allows the orientation of the element to be defined; however, once placed, a magenta-coloured selector will allow the created element to be rotated. This procedure is common to other CYPE modelling tools.
- **References.** If grids are displayed, both the lines and the intersections between them will be snapped for the exact location of the column. Additionally, if **Object snap (Endpoint, Midpoint, Nearest, etc.)** is activated, pre-existing elements in the scene will serve as a reference for entering new elements.

5. Finally, left-clicking the graphic window will insert and create the new column. The tool will remain active so that new elements can be inserted sequentially. Right clicking the mouse will deactivate the tool.



All the construction elements entered will be visible from the drop-down window when activating the BIM Model tool, available in the Architecture tab, in the BIM Model group. This panel will allow filtering by categories and an "analytical" view of the model. Elements can be edited from this panel.

3.8 Horizontal elements: Floor slabs

The previous explanations, referring to both creating columns and the aforementioned considerations, can be completely extended to the creation of other construction elements. The Floor slabs tool includes some additional features that will be discussed below.

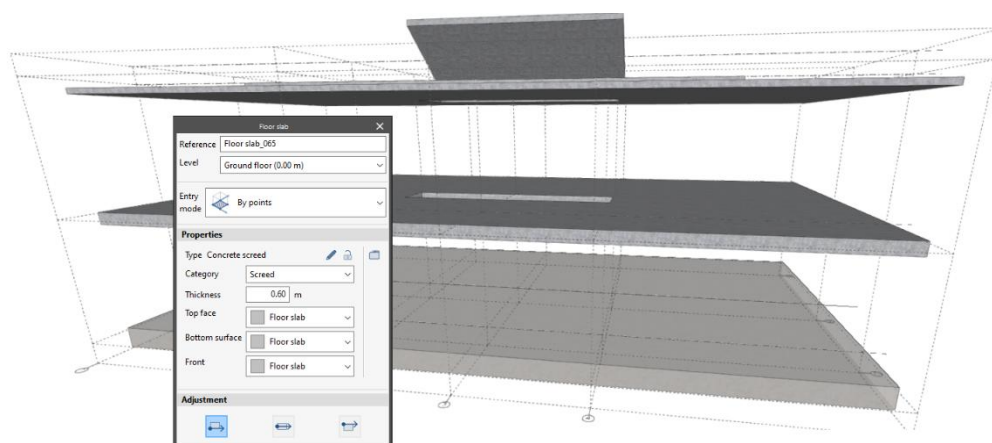
Steps to follow for **creating floors slabs**: 

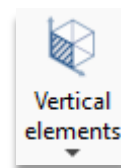
1. Define, if necessary, floor slab types (with the **Typology of architectural elements** tool).
2. Select an appropriate view, activate the desired layer and view of the required reference elements.
3. Click on the **Floor slab** tool, which can be found under the **Architecture** tab in the **Construction elements** group in the **Horizontal elements** drop down menu. When clicking on **Horizontal elements**, a small floating window will appear that can be attached to one of the sides of the graphic window; in the toolbar, the **Floor slab** tool is included, among others.
4. Once the tool has been activated, a small floating menu will appear, allowing the features of the new floor slab being created to be defined; if desired, a type can be loaded:
 - **Reference.** The one proposed by the application can be modified.
 - **Level.** Reference level for the new element, important for filtering later on.
 - **Entry mode.** Floor slabs can be entered in two ways: **By points** and **By surface area**. For the first option, users simply enter a series of points to define the reference polygon for creating the floor slab. For the second, users must select a sketch element (plane defined by a closed contour).

- **Type.** If types have been previously defined, one of the existing ones can be selected from the folder icon; this will cause the defined parameters for the type to be filled in automatically and linked to the features defined for it.
- **Category.** Allows the use or relative position of the element being created to be defined.
- **Thickness.**
- **Colour.** For floor slabs, a different definition is allowed for the **Top face**, **Bottom surface**, and **Front**.
- **Adjustment.** Defines the direction of the extrusion from the generating plane.

5. Once the properties of the floor slab have been defined, it is time to place it in the graphic window. To do this, several issues must be considered:

- If a **By points Entry mode** has been chosen, all the considerations made for placing columns related to the 3D/2D entry mode and the use of references must be considered. For floor slabs, the introduction of points, one per vertex, must be completed; right clicking the mouse will end the introduction and create the construction element.
- If a **By surface area Entry mode** has been chosen, users simply have to select a plane enclosed by a contour; immediately after, the floor slab will be created. In order to have a generating plane, a closed outline must be defined with the drawing tools available in the **Sketch** tab.





3.9 Vertical elements II: Walls

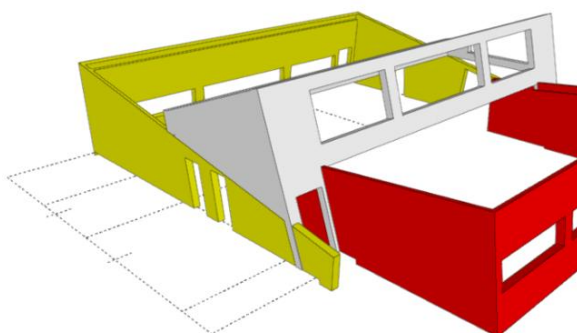
The **Wall** tool allows vertical or inclined surface elements to be created; the tool will allow different categories to be distinguished: **External façade**, **Party wall**, **Internal partition** or **Basement wall**.

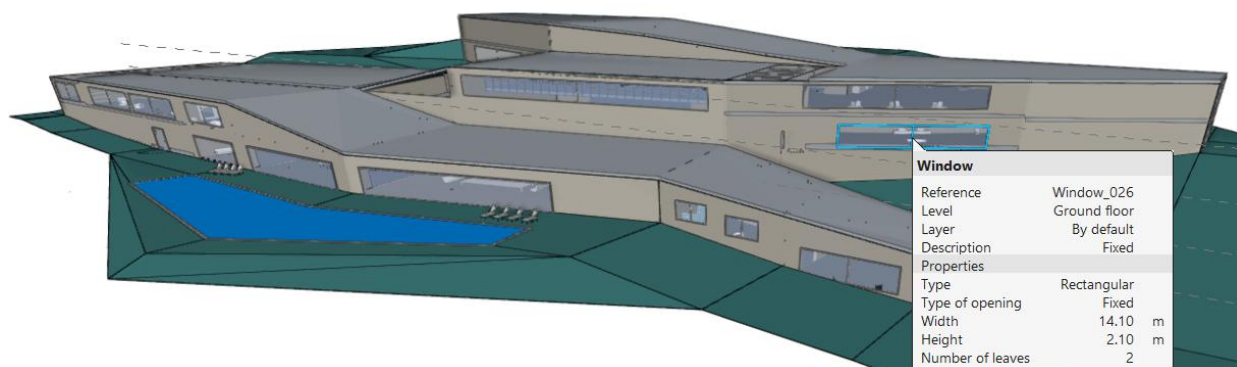
Steps to follow for creating walls :

1. Define, if necessary, wall types (with the **Typology of architectural elements** tool).
2. Select an appropriate view, activate the desired layer and view of the required reference elements.
3. Click on the **Wall** tool, which can be found under the **Architecture** tab in the **Construction elements** group in the **Vertical elements** drop down menu.
4. Once the tool has been activated, a small floating menu will appear, allowing the properties of the new wall being created to be defined; if desired, a type can be loaded:
 - **Reference.** The one proposed by the application can be modified.
 - **Level.** Reference level for the new element, important for filtering later on.
 - **Entry mode.** Walls can be entered in three ways: **By polyline**, **By points** and **By surface area**. The first case will be the usual one in BIM modelling applications, i.e., guidelines will be drawn to create vertical walls with the desired height, thickness, and direction of lateral growth. In the second case, a series of points need only be entered to define the reference polygon for the creation of the wall (this will allow the creation of free-form walls). In the third case, a sketch element (plane defined by a closed outline) must be selected.
 - **Type.** If types have been previously defined, one of the existing ones can be selected from the folder icon; this will cause the defined parameters for the type to be filled in automatically and linked to the features defined for it.

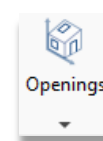
- **Thickness.**
 - **Colour.** For walls, a different definition is allowed for each of the main faces.
 - **Adjustment.** Defines the direction of the extrusion from the generating plane.
5. Once the properties of the wall have been defined, it is time to place it in the graphic window. To do this, several issues must be considered:
- If a **By polyline** or **By points Entry mode** has been chosen, all the considerations made in previous points related to the 3D/2D entry mode and the use of references must be considered. For creating walls **By polyline**, the programme will wait for the points contained in a horizontal line to be entered; the first two points will define the first span of wall, for each new point, a new span will be added to the chain, right clicking the mouse will end the chain of points, keeping the wall tool active. For creating walls **By points**, the introduction of points, one per vertex, must be completed; right clicking the mouse will end the introduction and create the construction element.
 - If a **By surface area Entry mode** has been chosen, users simply have to select a plane enclosed by an outline; immediately after, the wall will be created. In order to have a generating plane, a closed outline must be defined with the drawing tools available in the **Sketch** tab.

It can be deduced from the various wall entry modes that there is a great deal of modelling freedom. The By polyline entry mode allows conventional vertical walls to be created quickly using a guideline; on the other hand, the By points or By surface area entry modes allow walls to be created without geometrical restrictions.





3.10 Openings: Doors and windows



In the **Architecture** tab, next to the drop-down menus for Vertical elements and Horizontal elements, is the drop-down menu for Openings. This drop-down menu includes the following creation tools:

- **Opening**
- **Door**
- **Window**
- **Skylight**
- **Glazed surface**

The **Opening** tool allows construction elements to be drilled without adding carpentry elements; for the rest of tools, creating an opening will be joined by the placement of a carpentry element.

The **Glazed surface** tool allows a free geometry to be defined on a construction element (wall or floor slab); in all other cases, the geometry of the opening will be determined by the carpentry element.

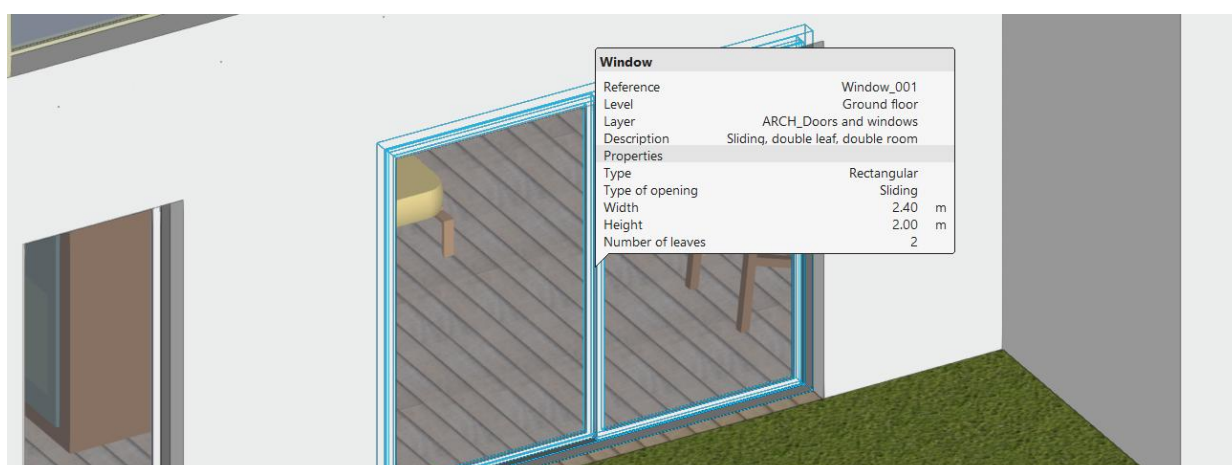
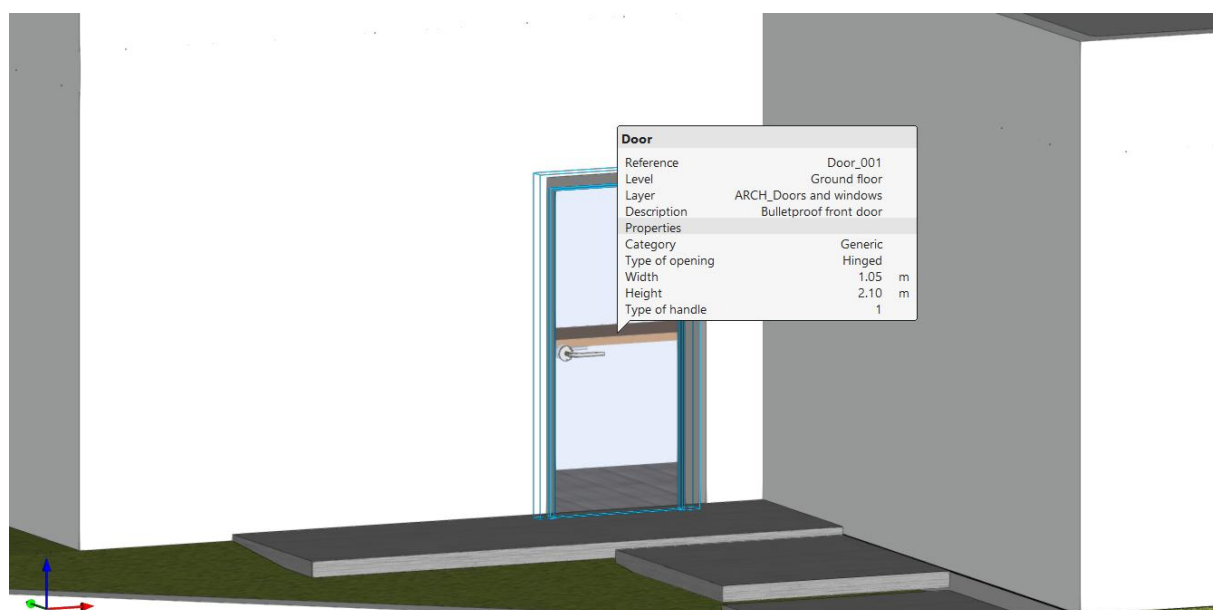
Although independent carpentry elements can be created, a host element (wall, floor slab or roof) is normally used.



Steps to follow for **introducing doors**

1. Define, if necessary, door types (with the **Typology of architectural elements** tool).
2. Select an appropriate view, activate the desired layer and view of the required reference elements and hosts.
3. Click on the **Door** tool. Once the tool has been activated, a small floating menu will appear, allowing the properties of the new door being created to be defined; the editor includes a graphic window showing the result of the configuration:
 - **Type.** If types have been previously defined, one of the existing ones can be selected from the folder icon; this will cause the defined parameters for the type to be filled in automatically and linked to the features defined for it.
 - **Type of opening.** This will allow users to choose one of the types available: **Hinged door, Hinged door, double leaf, Sliding door, Sliding door, double leaf.**
 - **Door dimensions.** This section defines the dimensions of the door that, in turn, will define the dimensions of the opening to be created in the host element.
 - **Glazed opening.** Activating this parameter will allow a transparent element to be inserted in the leaf, the dimensions of which can also be defined.
 - **Type of handle.** Activating this parameter will allow a handle element to be inserted, which can be chosen from the types available in the drop-down menu.
 - **Colours.** Colours can be assigned to the different sub-components: **Frame, Door, Handles** and **Glass.**
4. The previous editing window will give way to a small floating menu with the following individual options:
 - **Reference.** The name proposed by the application can be modified.
 - **Level.** Reference level for the new element, important for filtering later on.
 - **Insertion point.** Any of the references shown graphically may be defined.
 - **Adjustment.** It will define the direction of creation from the generator plane.

5. Once the properties of the door have been defined, it will be time to place it in the graphic window, normally onto a host element. To do this, users must keep in mind all the considerations made in previous points related to the 3D/2D entry mode and the use of references; placement on a host element will require activating **Object snap (Nearest, Midpoint, etc.)**.
6. Once the insertion point has been selected, a second click will be required to define the direction and rotation of the door; a plan symbol will allow the position relative to the cursor position to be previewed.
7. A third point will be required to define the relative position of the door in the host element. The application shall allow a choice between the outer plane, the inner plane, and the middle plane.





Steps to follow for **introducing windows**:

1. Define, if necessary, window types (with the **Typology of architectural elements** tool). Select an appropriate view, activate the desired layer and view of the required reference elements and hosts.
2. Click on the **Window** tool. Once the tool has been activated, a small floating editor similar to the one for doors will appear:
 - **Window shape.** A **Rectangular Window** or a **Circular Window** can be chosen.
 - **Type of opening.** This will allow users to choose one of the types available: **Fixed window**, **Hinged window**, **Sliding window**.
 - **Dimensions of the opening.** This section defines the dimensions of the opening in which the carpentry will be placed.
 - **Number of leaves.**
3. The previous editing window will give way to a small floating menu with the following individual options shown for windows and also:
 - **Height above the ground.** Activating this parameter will allow the window to be raised a certain distance above the reference plane.
4. Once the properties of the window have been defined, it is time to place it in the graphic window, normally onto a host element. To do this, all the considerations made in previous points regarding the 3D/2D entry mode, and the use of references must be considered; the placement on a host element will require activating **Object snap** (**Nearest**, **Midpoint**, etc.)
5. A third point will be required to define the relative position of the window on the host element. The application will allow users to choose between the outer plane, the inner plane, and the middle plane.

3.11 Editing tools

The **Architecture** tab includes a set of general editing tools:

	Edit	Allows users to select a model element and edit its parametric properties.
	Delete	Works in the same way as pressing the DELETE key.
	Move	Allows multiple elements to be selected (right clicking the mouse will end the selection).
	Rotate	Allows multiple elements to be selected.
	Copy	Works similarly to Move .
	Edit geometry	Allows users to edit the vertices of an existing architectural element.
	Copy properties	Allows the following properties to be transferred between elements: Level , Description , Category , Height , Thickness and Colour .
	Search by reference	As its name implies, it allows users to search for elements by reference.

When copying or moving objects, entering a start point and an end point will define the displacement vector (activating coordinate introduction and/or orthogonal mode will be especially useful).

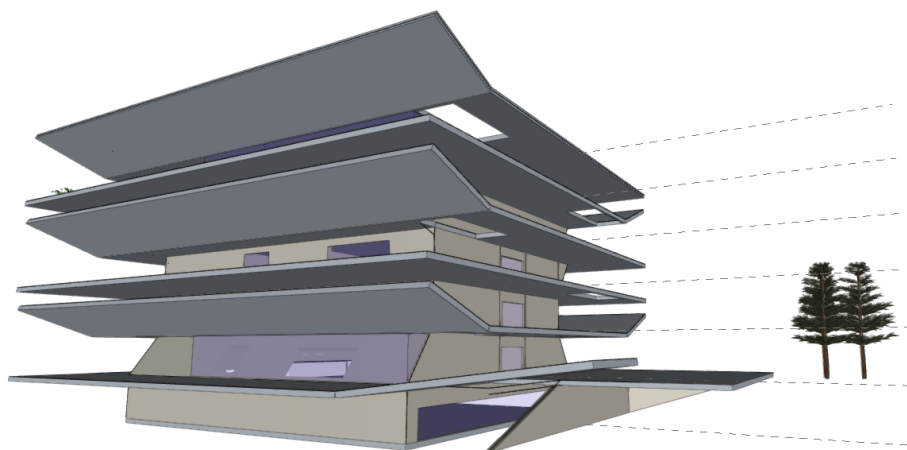
Also included are useful tools for intersection solutions between construction elements:

	Intersection solutions	This tool will automatically resolve the intersections between the construction elements entered (overlaps, extensions, etc.). This function can be applied to all the joints present in the model or only to those pending solutions.
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The tools described below will allow intersections to be solved in a more manual way.

	Subtract	Allows the intersection between two elements to be removed; the intersection will be removed from the first selected element.
	Extend face	Allows the face of an object to be selected and stretched to any reference plane.
	Slice with surface	Allows users to remove the part of an object on one side of the plane defined by one of its faces.
	Cut by plane	Allows users to remove the part of an object lying on one side of the selected plane (unlike the previous one, the cutting plane can be defined by faces of other objects).
	Regenerate	Allows users to restore the original geometry of the object (i.e., undo all changes made by the other tools in the group).

At this stage, some elements may need to be copied from one level of the model to another; this is explained step by step in section 3 of this chapter (Levels).



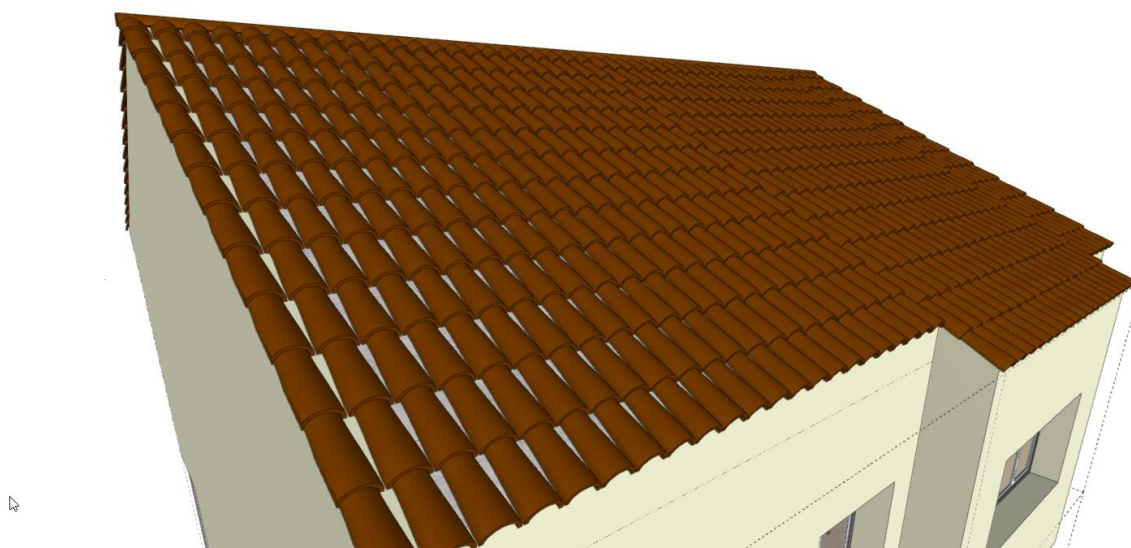
3.12 Roofs (sketch modelling)

The **Roofs** drop-down menu, included in the **Construction elements** group (**Architecture** tab) offers three tools:

- **Slope formation.** This tool allows a new volumetric element to be created from the perimeter, elevation difference and height of the drain. The new element will be

created with a height defined by the Slope parameter and, depending on the geometry of the perimeter, it will generate drainage planes towards the point of the drain that will be located at a relative height defined by the **Height of the drain** parameter.

- **Roof tiles.** The roof tile tool will create a set of roof tiles modelled on a plane to be defined by a free form closed perimeter. Once the perimeter has been defined, the definition of a polyline will be required to define the direction of the slope and the placement of the tile lines.
- **Special roof element.** Allows the detailed modelling of traditional roof tiles by adding ridges or ridges defined by polylines.

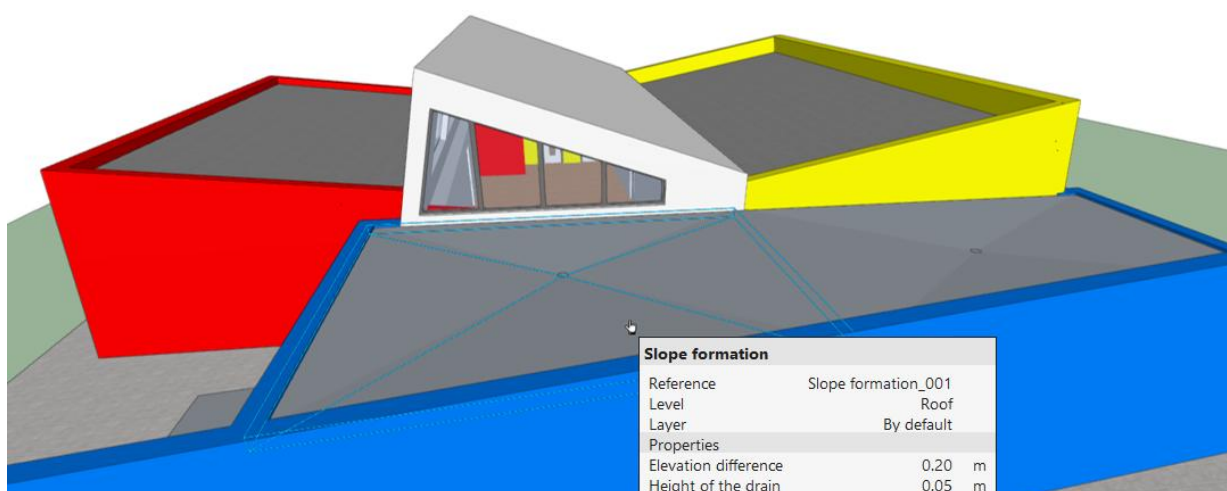


An icon is available on the display panel to activate or deactivate the visibility of tiles and special roof elements.

Alongside the specific tools for creating roof elements, the application allows the modelling of sloped slabs that can be used to support the previous elements. The creation of sloped slabs does not require any other instructions than those included in the previous section (Steps to follow for creating floor slabs); however, it is necessary to have a sloped reference for creating the slab, which will require that the user remembers how to use the sketch tools.

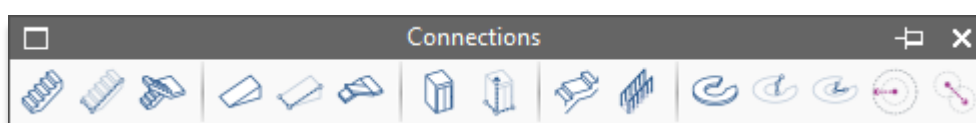
Steps to follow for **creating sloped floor slabs**:

1. Activate the **Sketch** tab. Activate the visibility of the **Sketch** elements, if necessary.
2. Click on the **Line** tool and activate the **3D mode** for introducing points.
3. Introduce two points to define the border that will later limit the floor slab at the bottom. Right click to finish the line.
4. There are many ways of defining the geometry; to do this in a very graphic way, we will copy the previous line at a certain distance, keeping the same dimension. This line will represent the projection of the upper edge of the slab.
5. Activate **Orthogonality** (CTRL+O) and move the last line created along the Z axis to the desired dimension.
6. Activate the **Line** tool again and connect the ends of the two previous lines (deactivate **Orthogonality** to be able to insert inclined lines).
7. Connecting the previous lines will result in a sloped plane, which will be used as a reference for creating the floor slab.
8. Return to the **Architecture** tab and follow the steps in the previous section (*Steps to follow for creating a floor slab*) and select the **By surface area Entry mode**.



Once the architectural elements have been created, the previously created sketch elements can be deleted or hidden. Remember that the editing tools are specific to sketch, architectural and furniture elements; to delete sketch elements you must activate the tool found in the Sketch tab.

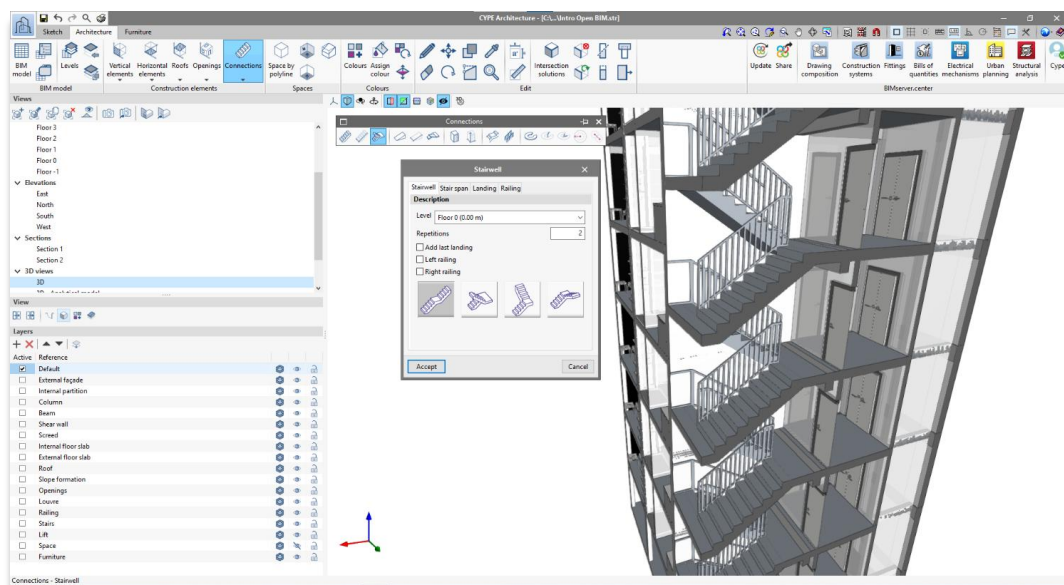
3.13 Connections: stairs



The **Construction elements** group in the **Architecture** tab includes a final drop-down menu for **Connections**. This button will open a toolbar that includes the following features:

- **Stair span.** This is the basic stair generation tool; it allows to generate stair spans by defining **Stair width**, **Number of steps**, the **Tread** and **Riser** as well as some additional features.
- **Stair span defined by three points.** Similar to the previous tool, it allows stair spans to be generated from the definition of a riser height, width, and a height to be saved (the width and height will be entered graphically).
- **Stairwell.** Allows a stairwell to be automatically generated from the joint definition of spans, landings, and railings. The tool can be used to generate repetitions of conventional staircases: straight stairwells and stairwells rotated at 90 and 180°.
- **Ramp span.** Similar to **Stair span**; in this case the ramp width, length and height will be defined.
- **Ramp span defined by three points.** Similar to Stair span defined by three points, in this case users simply have to define the width and height.
- **Ramp core.** Similar to Stairwell. The tool can generate repetitions of straight ramps or ramps rotated at 90 and 180°.
- **Elevator/Lift.** This tool allows the simple modelling of the lift cabin with freely definable geometric properties. Once the properties for the lift cabin have been defined, the tool allows the different **Entrance** stops to be defined; this will lead to a reserve space being created in the model. Any other adjustments can be made with the **Edit** tool.

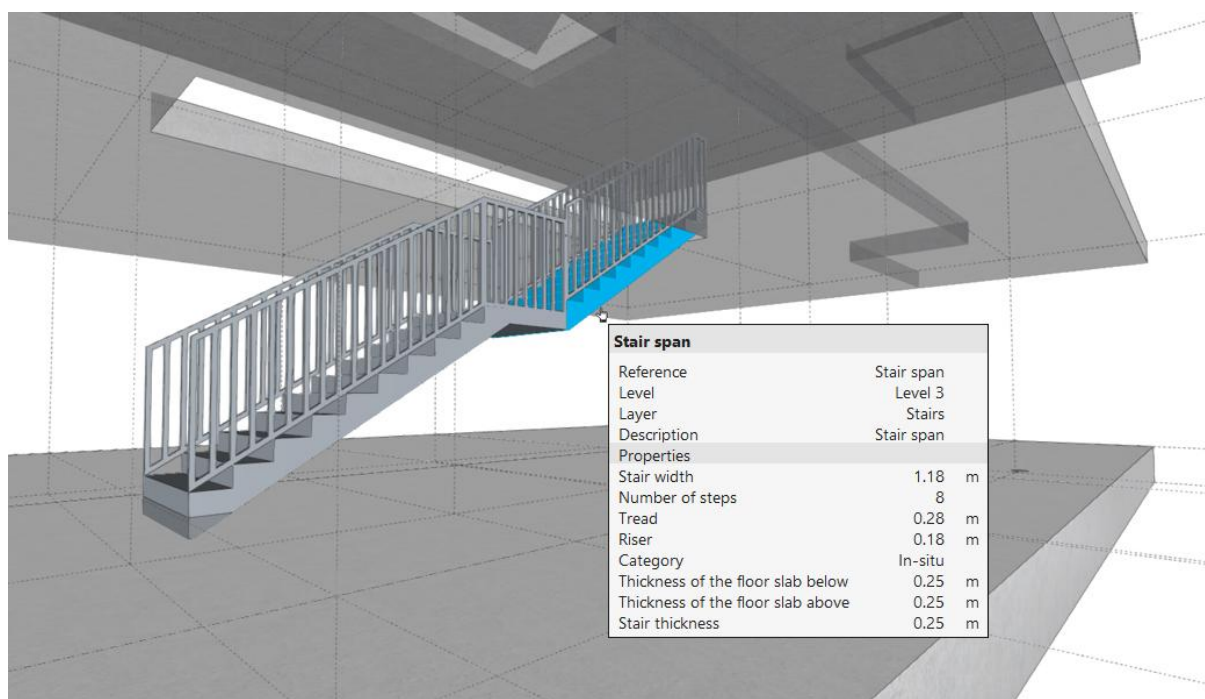
- **Lift defined by three points.** With the same result as the previous tool, it will allow the geometry on the graphic window itself to be defined.
- **Landing.** Allows users to add landings to the detailed design of staircases; usually they will be added to the spans created independently with the **Stair span** tool; working in **3D mode** is particularly convenient. The configuration of the element parameters and its creation mode is completely identical to that of **Floor slabs**.
- **Railing.** Allows railings to be added to the connection elements included in the toolbar. Its configuration requires entering data for its height, type of handrail, etc., and the graphic definition of its direction on the graphic window. Working in 3D mode is particularly convenient.
- **Curved ramp span.** Allows a curved ramp span to be created from the geometric data of the **External radius**, **Internal radius**, **Elevation difference of the ramp**, **Thickness**, **Initial angle**, and **Final angle**. Once the parameters have been defined, users simply need to locate its centre.
- **Curved ramp span given the height and width.** Similar to the previous tool, it allows the thickness and height of the ramp to be defined graphically.
- **Curved ramp span given the centre and two points.** Similar to the previous tool, it allows the ramp to be defined from the starting edge, an insertion point and a final point to define the end of the ramp.
- **Extend radius.** Allows the radius of an existing ramp to be modified (a floating checkbox will show the resulting slope).
- **Move centre.** Allows the centre of an existing ramp to be moved.



Steps to follow for **creating a straight stair span with a landing**:

1. Define, if necessary, types of **Stair span** and **Landings** select one of the appropriate **Views**, activate the desired **Layer** and the **View** of the necessary reference elements.
2. Click on the **Stair span** tool. Once the tool has been activated, a small floating menu will appear, allowing the properties of the new stair span being created to be defined:
 - **Reference.** As usual, the application will propose a name that can be modified as desired.
 - **Level.** The level associated with the span must be defined.
 - **Stair width.** Enter the desired width for the span being created.
 - **Number of steps.** Enter the number of complete steps (**Tread + Riser**) to be created.
 - Enter the desired dimensions for the **Tread** and **Riser**. Activate or deactivate the **With nosing** checkbox.
 - Expand the **Category** group to define other parameters such as the stair span type (**In-situ**, **Monolithic stair**, **Floating** and **Precast**).
 - Depending on the type chosen in the previous step, additional parameters will be offered; for example, for the **In-situ** stair span type, the thicknesses of the floor slab in the stair span itself, the floor slab above and the floor slab below must be defined. These thicknesses must match the thicknesses of the floor slabs or landings with which the current span is going to be connected.
 - Define, if desired, the **Colours** for the different sub-components created.
3. In the graphic window, the stair span with the properties that have been defined will appear, users must simply click on the point of placement; working in 3D mode is particularly convenient. A right click will close the command.
4. Click on the **Landing** tool. Once the tool has been activated, a floating editor will appear, allowing users to define the properties of the new stair span being created:

- **Reference.** As usual, the application will propose a name that can be modified as desired.
 - **Level.** The level associated with the span must be defined.
 - **Entry mode.** Choose between the **By geometry**, **By points** or **By surface area** entry modes. In the first case, users must simply define the plan dimensions (X and Y); for the other two, the same procedure for defining floor slabs can be followed (**By points** or **By surface area**).
 - **Thickness.** Define the thickness of the **Landing** (it must match the thickness defined in the parameters for the stair span).
 - Define, if desired, the **Colours** for the different sub-components created.
5. On the graphic window, the landing with the properties that have been defined will appear, users must simply click the placement point; working in **3D Mode** is particularly convenient. A right click will close the command.
 6. Insert the remaining spans or landings until the desired staircase is complete.



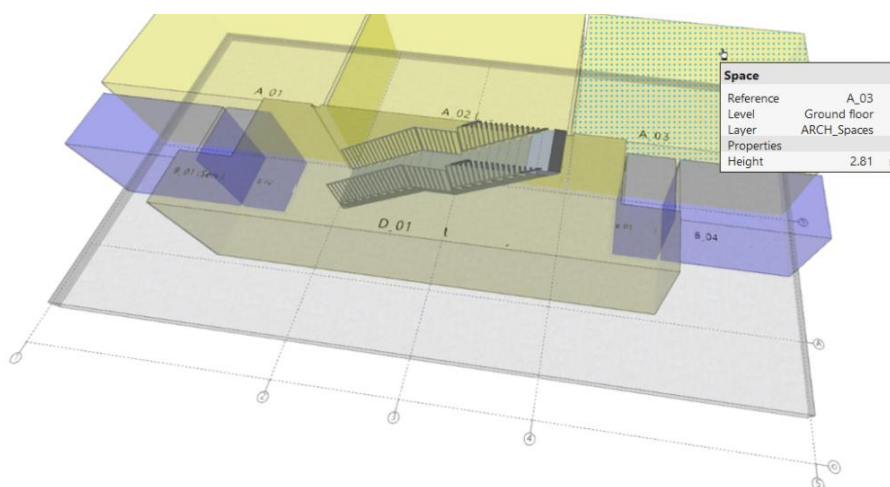
3.14 Spaces

Spaces are elements that are used for identifying both interior and exterior volumes in the project.

In any case, it is convenient to define spaces in the model to help in the subsequent definition of the analytical model, which will allow users, as its name indicates, to analyse the building thermally and acoustically. Defining spaces is important for developing other specialties.

In the **Architecture** tab, a specific group is dedicated to creating and modifying **Spaces**. This group includes the following tools:

- **Space by polyline.** This is the basic tool for generating spaces. Once activated, a **Reference**, **Level**, **Category** and **Colour** can be associated to them (spaces can also be associated to predefined types). Furthermore, a **Height** must be defined for the space as well as a **Text height** for the representation of the reference in the graphic window.
- **Space by wall and floor slab.** Similar to the previous tool, it allows spaces with desired properties to be generated from a selection of perimeter walls and a base floor slab.
- **Detect spaces on plan.** Allows spaces to be created automatically in a plan view. Once the properties have been defined, users can simply place the cursor in a space delimited by walls (for the tool to work correctly, the guidelines that generate the walls must effectively close an interior space).
- **Adjust space.** The spaces, by default, will be generated in the shape of a straight prism; if this geometry must be adjusted due to the presence of walls or inclined floor slabs, this tool can be used to make this adjustment automatically.



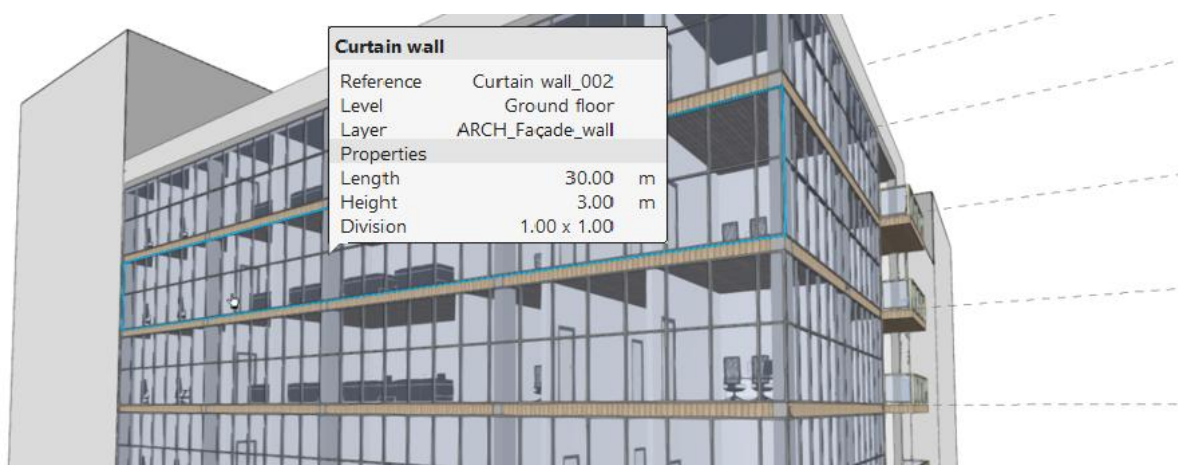
It is especially convenient to place the spaces in a specific layer to control their visualisation during the modelling process.

3.15 Detailed modelling

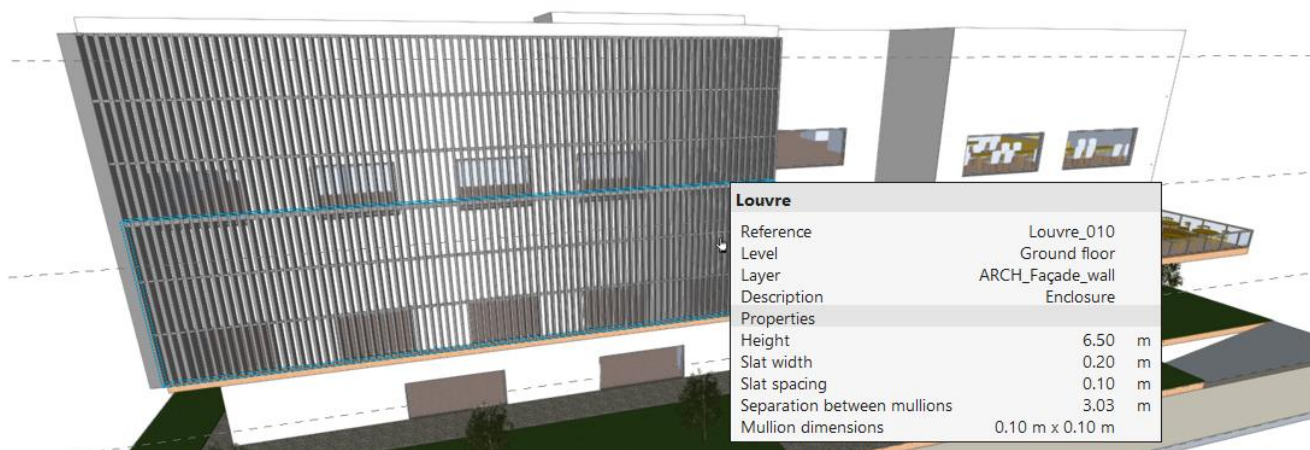
In the previous points all the main modelling tools have been shown. In the application, however, other minor tools are included that allow detailed modelling. These tools are briefly presented in the following list:

Vertical elements

- **Railings.** As well as the option included in the **Connections** group, the **Vertical elements** toolbar includes this tool. The tool (as opposed to the one integrated in the Connections group) is intended for placing protective elements on horizontal elements. It allows the geometry and colour of the various sub-components: **Posts**, **Handrails**, **Balusters** and **Panel** to be defined.
- **Louvres.** Allows louvres with horizontal or vertical slats to be created. The tool allows users to control the geometry and colour of the different subcomponents: **Mullion** and **Slats**.

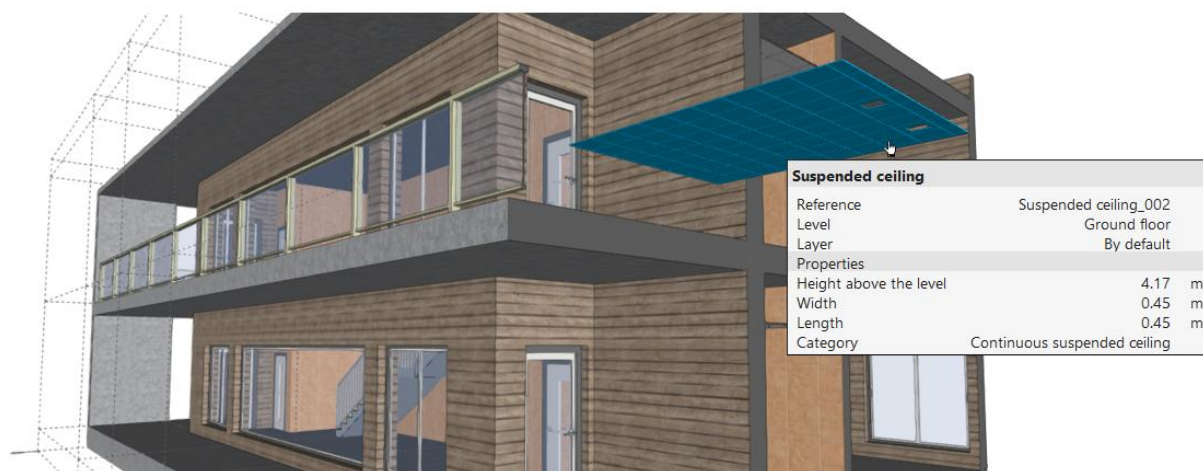


- **Curtain wall.** Similar to the previous tools, it allows users to create curtain walls and to define their geometry, separation, and colour of their different subcomponents: **Transom** and **Mullion**.



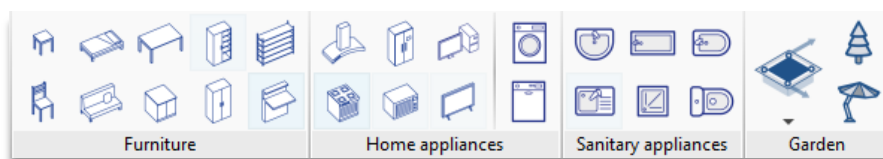
Horizontal elements

- **Suspended ceiling.** With the same entry modes used for **Floor slab**, the tool allows a **Continuous suspended ceiling** or **Removable suspended ceiling** to be modelled. When working on a plan view, it is possible to enter elements by means of outline detection (in a similar way to the one mentioned for **Spaces**).
- **Beam.** Allows directrix and rectangular section elements to be generated.



3.16 Furniture

The **Furniture** tab includes, in addition to a group of **Edit** tools (**Edit**, **Copy**, **Delete**, **Move element group**, **Rotate a group of elements** and **Measure lengths**), specific groups for **Furniture**, **Home appliances**, **Sanitary appliances** and **Garden**.



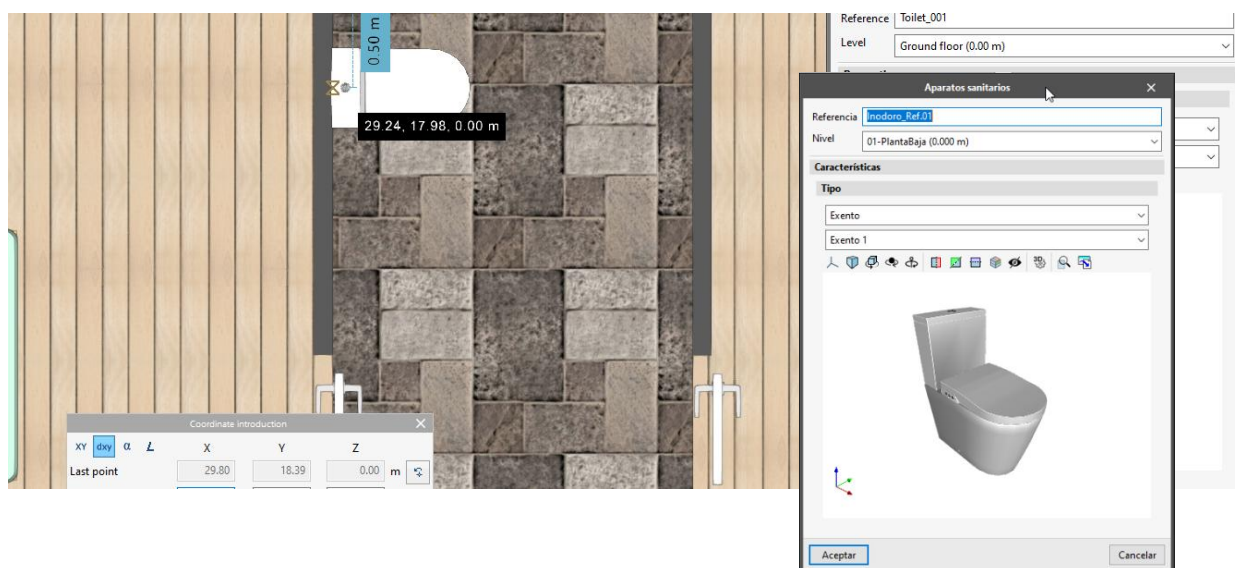
Placing these elements will help to understand the model and provide possible uses for the spaces. Furthermore, the **Sanitary appliances** can be imported from other applications for analysing and designing installations; in this case, they will be converted into consumption and possible connections to the different supply and/or sanitation networks; for example, home appliances can be imported from **Open BIM Electrical Mechanism**.

Moreover, placing them on the model will be instantaneous, users simply have to click on the required element, define its **Reference, Level, Properties** (model and/or type, if applicable), **Colours** and then position it in the desired location.

*For placing **Furniture** elements, the use of relative coordinates is particularly convenient; this way, it is possible to control the exact position of these elements compared to other architectural elements.*

Steps to follow for placing a toilet 50cm to the right of a partition wall:

1. Although it is not necessary, creating a sketch element will help visualise the references. Draw a line (CTRL+L) from any point on the partition wall to the end which will be used as a reference.
2. Activate **Coordinate introduction** in the top toolbar.
3. Click on the **Toilet** tool; enter the required **Reference, Level** and **Type** data. Click **Accept**; do not enter any point on the model yet.
4. In the **Coordinate introduction** window, click on the button located on the right (**Last point**) this will display the last point entered (the end point of the line) on the model; it will appear as a small yellow cross.
5. Click on the **Relative coordinates** option (dxy) and enter the relative coordinates for X:0.5m, Y:0.0m, Z:0.0m which will be measured from the point indicated in the previous step. Press ENTER when all three fields have been completed.
6. The toilet placement point (which will coincide with the point indicated in the previous step) must now be entered, so enter the value zero in the X:0.0m, Y:0.0m, Z:0.0m fields and press ENTER.
7. Right click to close the tool.



3.17 Sharing the project



3.17.1 Exporting to BIMserver.center

Once the model is finished, simply click on the Share tool to upload a copy of the model to **BIMserver.center** and make it available to project collaborators.

The **BIMserver.center** platform is a software repository for projects where users can share and access them from any device at any time.

In a transparent process for the user, the application will create a copy of the model in IFC format, save it in the work team's local path and, using the synchroniser, upload the model to the **BIMserver.center** cloud.

The application will be able to generate other visualisation and information exchange files such as glTF files, a file format for scenes and 3D models based on the JSON standard. Should the model include, in addition to **Construction elements**, **Spaces** or **Furniture** or **Sanitary Appliances**, separate models will be generated, allowing users to activate or deactivate the visibility of each of them independently, on the viewer incorporated in **BIMserver.center**.



3.17.2 *Updating BIMserver.center files*

Once other files are added to the **BIMserver.center** project, if, while working, any of the collaborators modify their part or include a new part in the project, the **Update** button in the **BIMserver.center** section will blink indicating that there are new files or changes.

New files can be loaded by clicking the **Update** button and choosing the files to be uploaded. In the **Changes** column, users can see which files are in use, if any changes have been made or if there are any new files.

3.17.3 *Viewing results on BIMserver.center*

BIMserver.center allows the models to be viewed from any mobile device, tablet or computer. This way they can be easily accessed at any time.

From **BIMserver.center** you will be able to access all the information generated by the different tools in the Open BIM workflow.