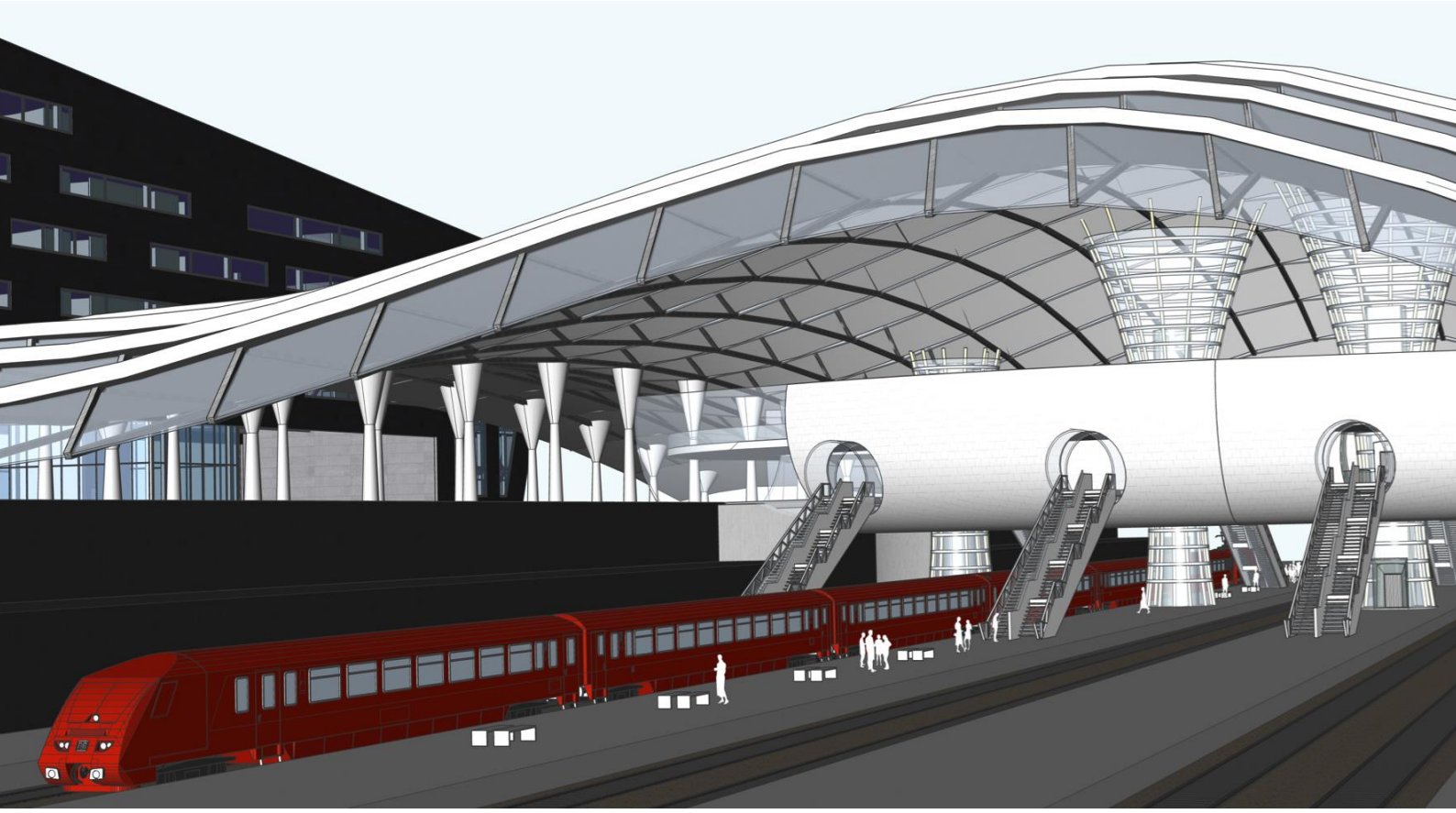


Updated for V21

BricsCAD BIM

Training

Contents*

* This document can be used by Bricsys Partners to create their own localized BIM training. Bricsys only requests to receive the localized content when finalized.

Introduction to BIM

What is Building Information Modeling (BIM)?

BIM is an acronym for Building Information Modeling or Building Information Model. It is a virtual, digital representation of your building. As you make design choices and add information to a BIM, the level of development (LOD) of the BIM increases. And as LOD increases, the BIM becomes a progressively richer source of design data. A BIM represents the concept of a single source of truth about a building project.

BIM as a central library

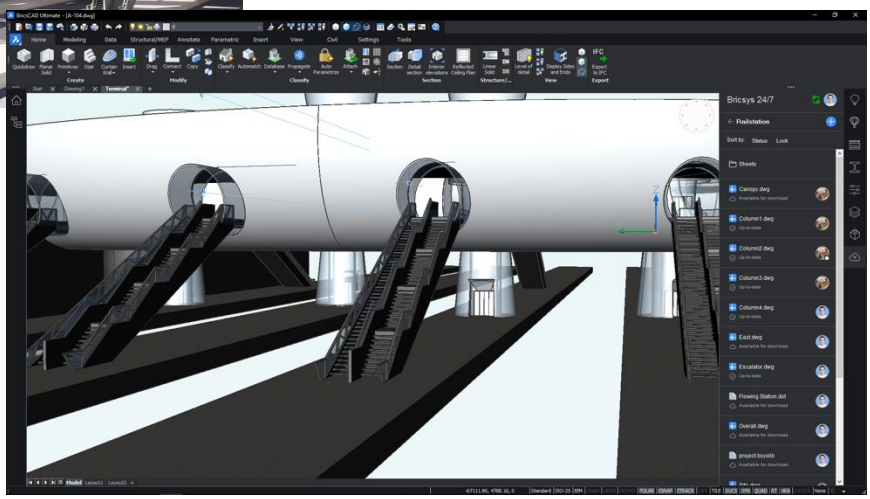
In BIM, a line isn't just a line. The entire model is built from construction elements that refer to reality. In that sense, a wall 'knows' it is composed of different layers with different physical properties and a window 'knows' it can only be placed inside a wall. This results in the fact that BIM can also perform energy analysis for example and that the construction joints can be modelled with the correct details. You do not necessarily need to input more in a BIM model than in a CAD model, but the output is so much smarter and more complete.

During a BIM process, a central model is built. All info is extracted from this model such as 2D drawings (plans, sections, elevations – for all design stages, details, type plans, ...), 3D information (renderings, IFC-files, 3D-detailsections, ...) and schedules (preliminary quantity take-offs, ...).

Why Building Information Modeling (BIM)?

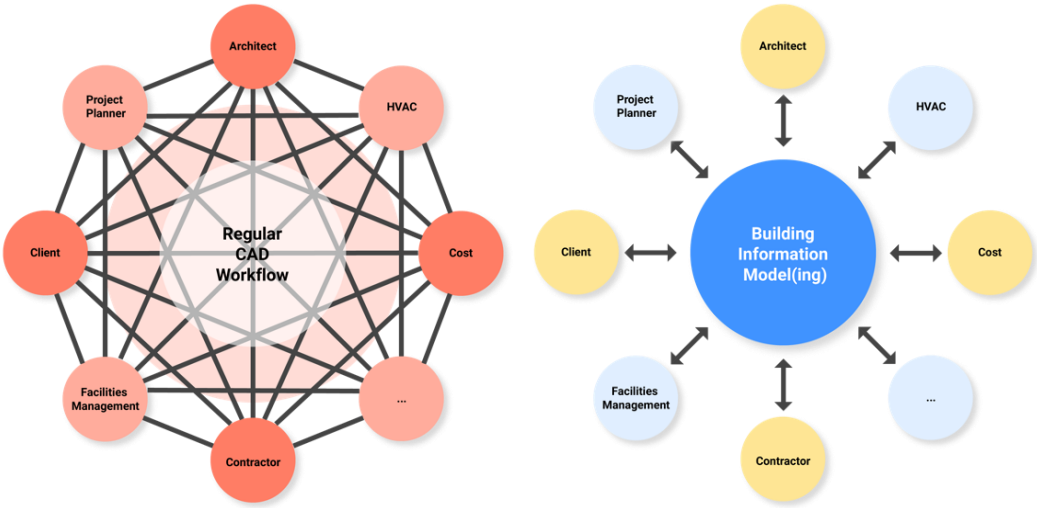
The business case for making the move to Building Information Modeling continues to grow. The potential for a better end-to-end design workflow is driven by the concept of a BIM as a 'single source of truth' in building design. Principals love the marketing power of BIM, citing the strong competitive advantage they get from it. This is especially true when firms solicit business from new clients.
- Business Value of BIM report, McGraw-Hill Publishing 2017

The business benefits of BIM are clear and well-founded. Better document coordination with reduced potential for design errors can lead to savings of money and time in all phases of a building's lifecycle. The authors of the McGraw-Hill report state that building owners also see the long-term value of BIM. They appreciate the fact that more accurate as-built documentation facilitates, and simplifies, maintenance and remodeling projects.



Regular CAD vs BIM

But what is the advantage of BIM? Well, as opposed to the regular CAD process, all involved parties can start together from the very beginning. The BIM process makes sure that files no longer need to be sent separately to all parties once they are almost finished, to then being sent back with a ton of corrections that again need to be sent for feedback to another party, etc. No, with BIM this is history because BIM makes sure that all involved people can work together on one big model, being adapted in real-time. A model that stores all the latest information regarding costs, execution, fire safety and so much more.



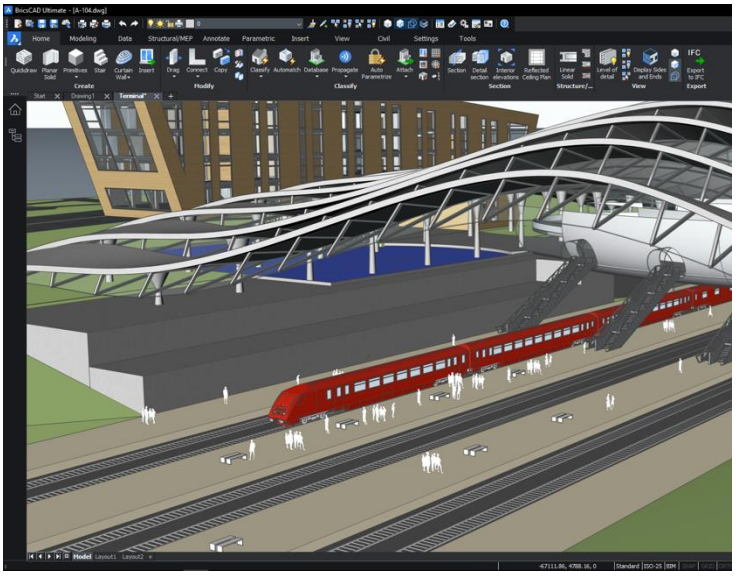
Why choose BricsCAD® BIM?

Because traditional BIM is not enough. At Bricsys, we've compared 2D drafting-based design workflows to 3D BIM based design concepts. And it's clear that Building Information Modeling workflows offer a better choice than 2D drafting-based design workflows. But traditional BIM systems don't always offer an ideal workflow. Part of this is because of legacy, and part because of the way that these traditional systems were designed. Regardless, we are here to offer you a unique BIM workflow; one that delivers on the promise of BIM, and more.

The Bricsys BIM story starts with DWG

Unlike making a move from 2D to traditional 3D BIM, Bricsys can offer you an incremental change in your existing workflow. How? First, we offer a familiar environment: one that current users of DWG-based CAD products already know and appreciate. We declare that users of DWG-based CAD software have 80% of the knowledge that they need to use BricsCAD BIM in an effective way.

The commands and procedures that you already know from 2D CAD work seamlessly in BricsCAD, and therefore inside of BricsCAD BIM. Finally, using tools that are familiar lets you work smart - with a safety net. It's about approaching the move to BIM at your speed, and on your schedule. Another benefit? Your huge collection of existing models and drawings can be re-used directly. Working in DWG also offers a unique ability to divide your BIM model into smaller pieces. XREFs are familiar, and they are BIM-ready. The workflows are very well known and supported by the majority of file storage and management applications. XREFs are supported across the entire BIM workflow in BricsCAD BIM. This is important because your BIM models can be split into smaller, light-weight models / components. The spatial relationships between the XREFs are managed automatically in the database that underlies the BricsCAD BIM workflow. Bricsys is a founding member of the Open Design Alliance – the industry recognized second source for DWG compatibility. We are one of the largest contributors to the consortium. This helps ensure the highest compatibility with the DWG file format, now and into the future.



One product, one platform

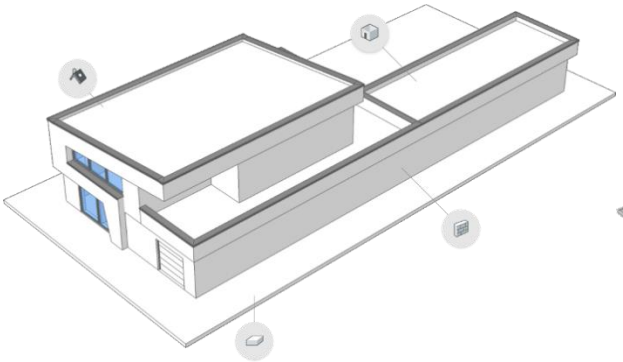
BricsCAD BIM enables full, CAD-accurate 3D modeling from the very start. We offer simple and accurate modeling tools that separate the process of geometric modeling from BIM data. It means that you can begin with a CAD-accurate massing model, where any geometry can be classified as any BIM type. You are not restricted by libraries of parts, where you need to know in advance what you want to model. Your model can remain light and responsive because it's not over constrained. There is a direct link to Rhino / Grasshopper from McNeel & Associates to deliver algorithmic design capabilities to ensure that your greatest ideas can be realized in the BricsCAD BIM workflow.

More than this, BricsCAD BIM offers a single product / platform for BIM and mechanical design. This opens the possibility to use mechanical assemblies in a BIM model, or to design detailed manufactured building components directly in BricsCAD BIM. Think about the sheer number of products in a building that are manufactured. The ability to go from conceptual design of a building element to fully detailed manufacturing drawings is a dream in other BIM systems, but it's a feature of BricsCAD BIM. And the mechanical design tools in BricsCAD Mechanical run side-by-side with BricsCAD BIM, in one product, on one platform.

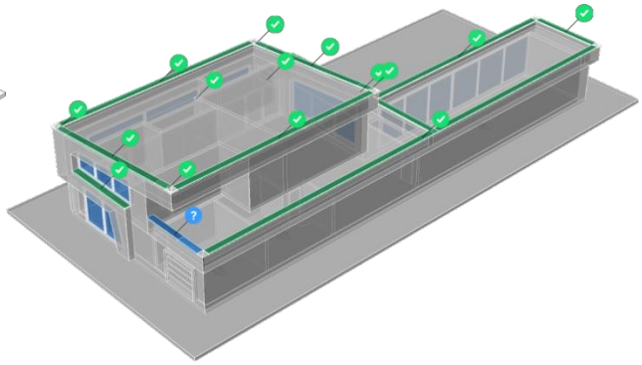
The power of machine learning/ A.I.

The freedom to model without limitations, creating geometry without regard for entity type is a hallmark of the BricsCAD BIM workflow. But a real BIM requires strict entity classification. Here's where the power of machine learning shines in the BricsCAD BIM approach. When your concept design is complete, you can automatically classify BIM geometry with our BIMIFY machine learning / A.I. workflow. BIMIFY examines each component in the model and automatically assigns it an IFC entity classification. This functionality can save hours of work in building a BIM. The massing model becomes the BIM, it's just that simple. And since BricsCAD BIM stores geometric data in industry-standard DWG files, BIMIFY works across multiple external references (XREFs). This workflow is well known in the industry, by engineers, architects, and designers alike.

BIMify is not the only of the use of A.I. in our 3D BIM workflow. Our PROPAGATE workflow allows you to speed the increase in a consistent level of development across your entire BIM, automatically. For example, you can adjust a composition ply at a ceiling / wall juncture and automatically propagate the change across the entire model. With the PROPAGATE tool, the user always has full control over changes made versus changes deferred – and the option to accept or reject changes is noted graphically, directly on the BIM model.



BIMIFY:
turn your design concept
into a full BIM with one click



PROPOGATE:
Model once, use many times

Detailing

Why is model accuracy important? As we've stated earlier, one of the most powerful benefits of a BIM workflow is automated generation of drawing views for the creation of construction documentation. BricsCAD BIM ensures CAD-accurate drawings, driven by the BIM model, and detailed in the industry's best drafting workflow – again, all in one product. And when the BIM model changes, all associated drawing views are automatically regenerated to ensure that documentation stays in sync with the model. In BricsCAD BIM, drawing view generation is threaded across multiple cores of your PC's CPU, to let you keep working as the drawings are updating.

To find out more, visit: www.bricsys.com/bim/

Introduction

1. The step-by-step instructions also have figures included to provide additional context for select steps
2. Modules have “starter .dwg files” that should be used
3. The text in **“bold blue”** indicates BricsCAD BIM commands
4. The text in **“bold black”** is inserted and/or selected values
5. The exercises are in metric units (mm)

Before beginning, make sure the following settings are enabled:

- In the Status Bar (bottom right of your screen): ESNAP, STRACK, DUCS, DYN, QUAD, RT
- In the Command Line: DMEXTRUDEMODE = 3, BIMOSMODE = 1, QUADDISPLAY = 5, (optional - for better on-screen rendering) ANTIALIASSCREEN = 2

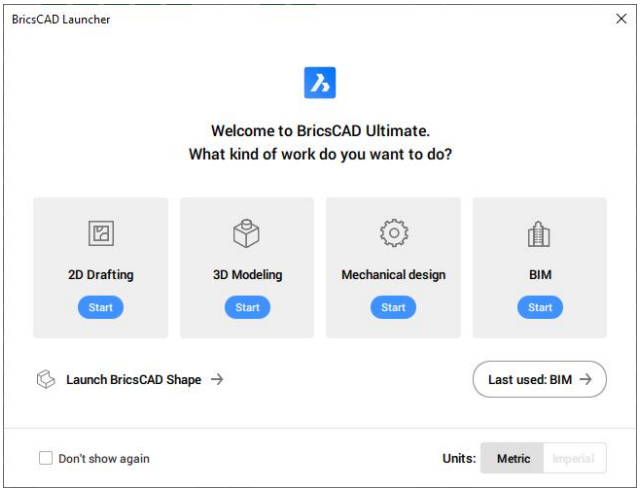
Interface, viewing, and navigation

This module explains BricsCAD BIM interface, shows how to show and hide (selected) entities, makes sections and how to navigate in 3D.

1 Interface

1.1 BricsCAD Launcher

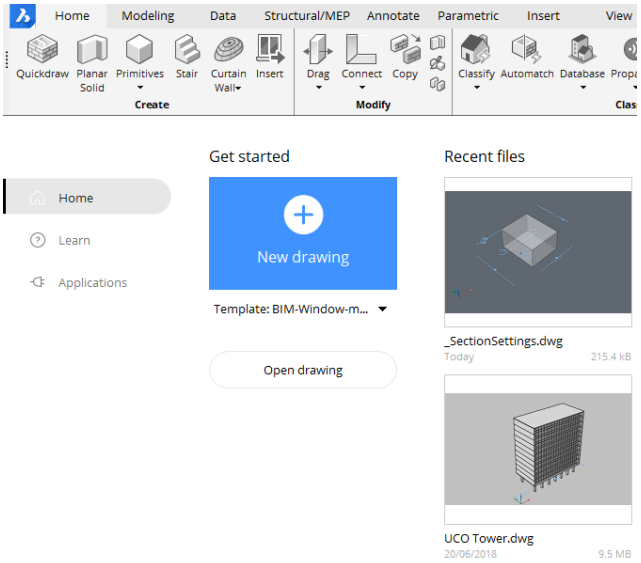
When starting BricsCAD, the Launcher dialog appears. Here you can select your workspace. Since our training is for BIM we will select the BIM workspace.



1.2 Getting Started

In the welcome window, you have 3 main sections (1) HOME, (2) LEARN and (3) APPLICATIONS.

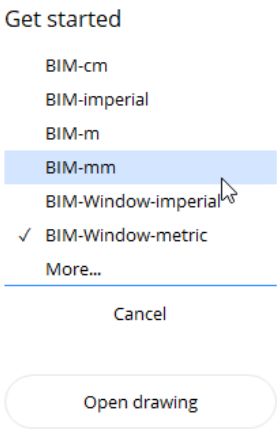
1. From the HOME tab, you can create a new drawing, choose your units, open a drawing or access your most recent files.
2. From the LEARN section, you can access tutorials.
3. From the APPLICATIONS section, you can explore third-party applications.



1.3 New Drawing

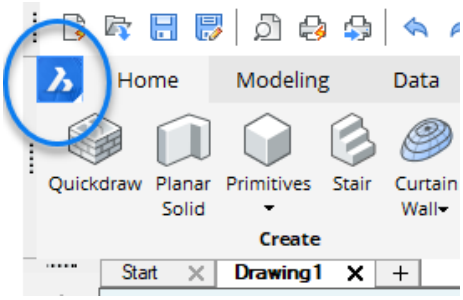
Before starting a New File, check that you use the BIM-mm template. You can change it by scrolling down through the Templates and selecting BIM-mm.

NOTE: Once the model space appears, check that the settings are according to the one mentioned in the introduction.



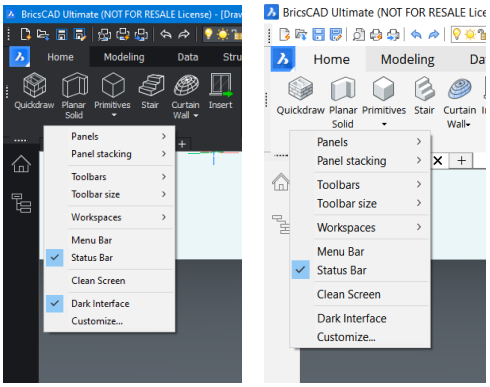
1.4 File Menu

The FILE menu can be accessed through the BricsCAD icon, in the top left corner of the ribbon.



1.5 Dark Interface

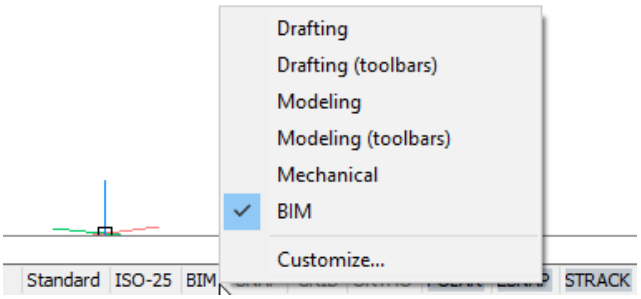
BricsCAD is set by default to have a Dark Interface, but this can be easily changed by right-clicking anywhere in the ribbon or toolbar, and de-selecting **Dark Interface**.



1.6 Workspaces

Switching between workspaces can be done from the status bar. If you right-click on the tab displaying **BIM**, the list of different workspaces will be displayed.

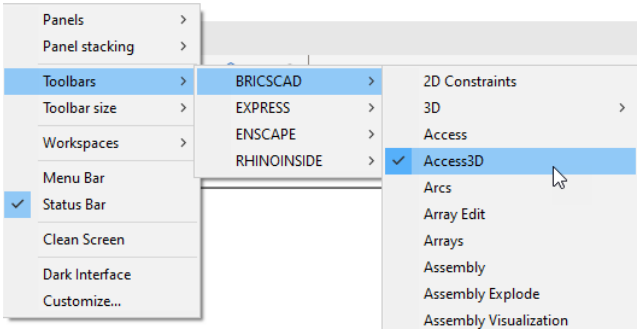
TIP: You can also access the **Workspaces** by right-clicking anywhere in the ribbon or toolbar.



1.7 Access Toolbar

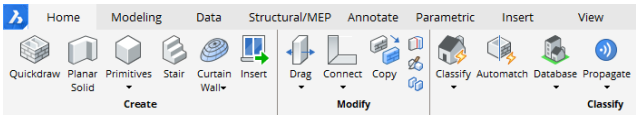
BricsCAD Access toolbar at the top of your screen acts as an Express Toolbar. Here you will find the most used tools when 3D modeling.

You can access this toolbar by right-clicking in the ribbon, selecting toolbars, then BRICSCAD and Access3D.



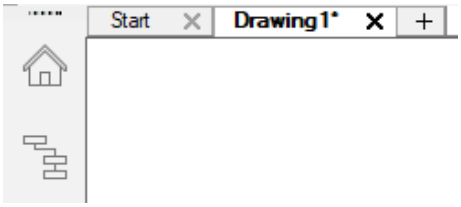
1.8 Ribbon Tabs

Common tools are organized in groups within tabs, each tab corresponds to a group of functionality.



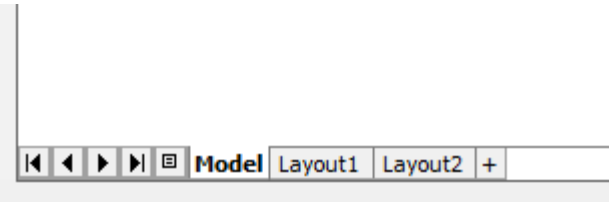
1.9 Drawing Tabs

This allows you to easily switch between different open drawings.



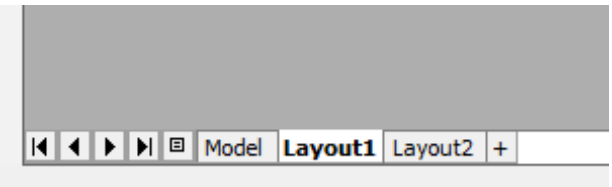
1.10 Model Tab

Model Space is an area in which you create two-dimensional and three-dimensional entities based on either the World Coordinate System (WCS) or User Coordinate System (UCS).



1.11 Layout Tab

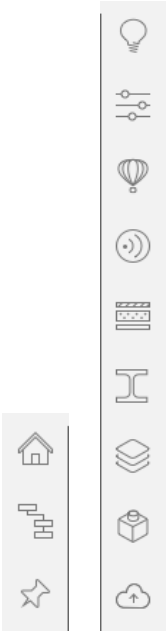
The layout tab can also be referred to as paper space. Here is a work environment that provides the model space view at a given scale, depending on the size of the paper.



1.12 Dockable panels

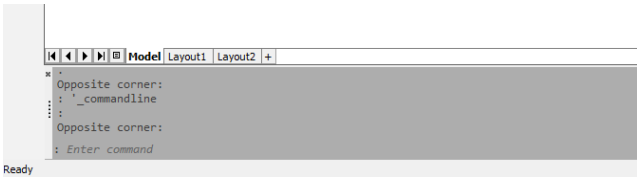
A set of dockable panels is shown on either side of the screen. In the BIM workspace, by default, the Structure browser, Project browser and BCF Panel are pinned to the **left-hand** side.

On the **right-hand** side, you will find the Tips, Properties, Components, Details, Compositions, Profiles, Layers, Mechanical browser, and 24/7 Panel. Most of these will be covered later in this document.



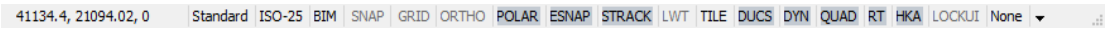
1.14 Commandline

In the lower field, you can type the commands and BricsCAD shows prompt, options and other information regarding the execution of commands here. Press **F2** to show the full command prompt in a separate window, or **Shift + F2** to show/hide the commandline.



1.15 Status Bar

The Status Bar sits along the bottom edge of the BricsCAD application window. It contains a lot of information about the settings in the current drawing.



2 Viewing

If you work with many entities in a drawing, everything that you have in the drawing is visible in the view. When you want to temporarily make only a few entities or a particular entity visible and manage them in a view, you can use the Hide or Isolate tools.

2.1

File: Select **Template: BIM mm**. Then click on Open drawing. Select file **Building_M1.dwg**.

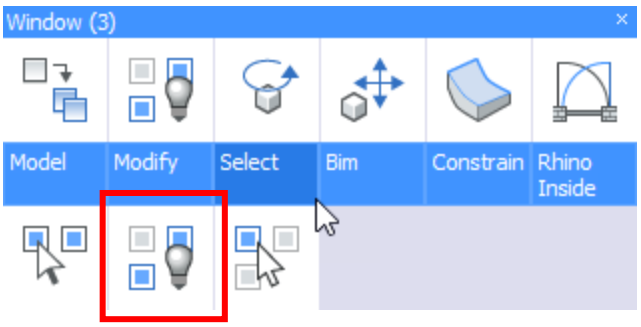
2.2 Hiding Entities

The Hide tool temporarily hides the selected entities in the view.

In this drawing, we will hide the windows from the right building

1. Select windows
2. Quad appears, move the cursor to Select tab and click on **HIDE ENTITIES** icon .

All entities that have been selected are hidden in the view.

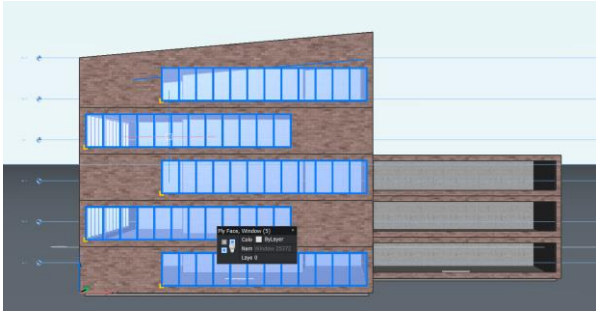


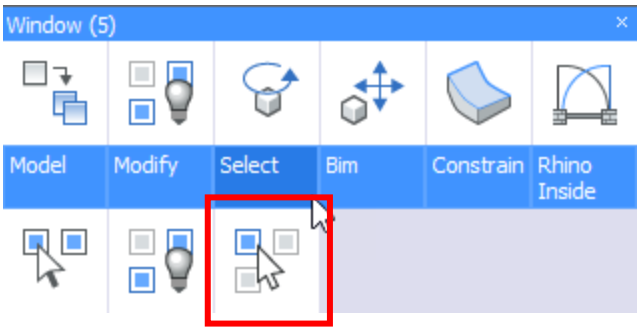
2.3 Isolating Entities

The Isolate tool temporarily hides all entities except those that have been selected.

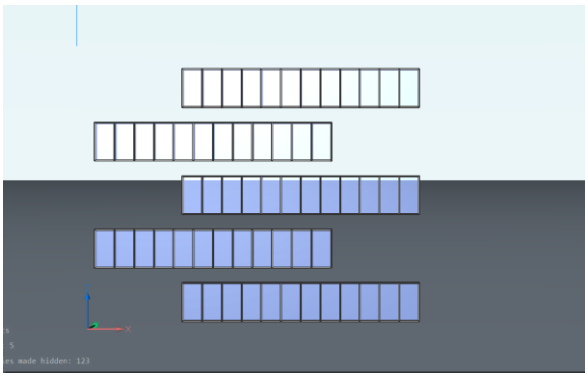
In this model,

1. Select the front windows from the left building.
2. Once the quad appears, go to Select tab and click on **ISOLATE ENTITIES** .





All entities that have been selected are temporarily isolated.



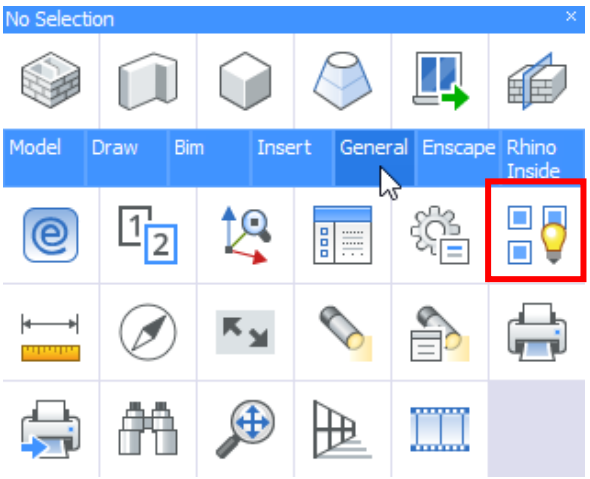
2.4 Showing entities

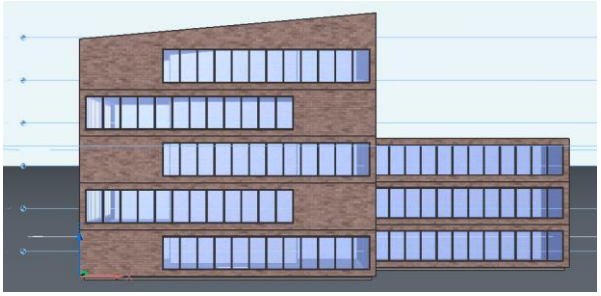
The Show Entities tool brings back all hidden entities in the view.

Let's bring all entities back to view

1. Right-click in the model space. The quad appears in no selection state
2. Move cursor over the General tab and click on **SHOW ENTITIES**

All entities that were temporarily hidden and isolated will be shown.





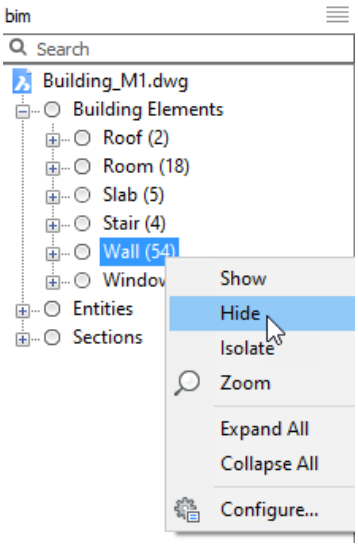
2.5 Structure Browser

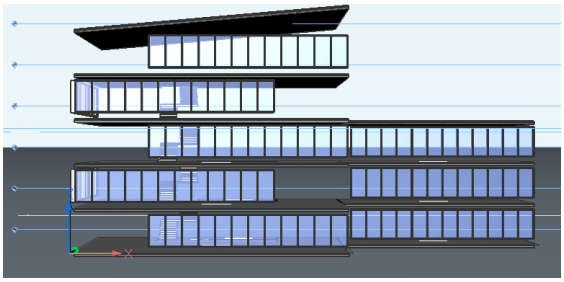
The Structure Browser can also be used to hide and isolate selected entities as well as revealing all hidden entities in the model space.

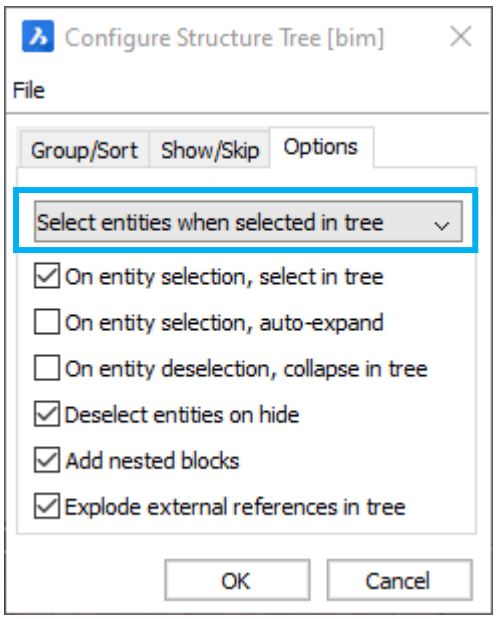
1. Open the **Structure Browser**.
2. Make sure the current configuration is set to bim. If not, click the hamburger menu on the top right corner of the structure browser.
3. Select **Wall** elements. All entities under this element will be selected.
4. Right-click and select Hide.

All the walls have been temporarily hidden.

NOTE: Make sure the settings for the structure browser are correct by clicking on the name **Bim** on top of the structure browser. You will enter a dialog where you need to go to the **Options** tab. There you need to choose the preset **Select entities when selected in tree** from the dropdown.






Configure Structure Tree [bim]
File
Group/Sort
Show/Skip
Options
Select entities when selected in tree
On entity selection, select in tree
On entity selection, auto-expand
On entity deselection, collapse in tree
Deselect entities on hide
Add nested blocks
Explode external references in tree
OK
Cancel

3 Navigate in 3D

As you navigate around and through your 3D model, the location of the model in space remains constant. It's your current view (viewpoint) of the model that is changing.

3.1 Mouse and Keyboard Navigation

Most used navigation tools are the zoom in/out, pan and orbit which can be easily accessed through the mouse and keyboard.

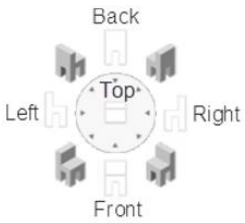
1. **Zoom in/out** – roll the mouse wheel.
2. **Pan** – hold the mouse wheel or middle mouse button.
3. **Orbit** – hold Shift key and mouse wheel.

3.2 View Ribbon Tab

Extra zoom, panning and orbit tools can be found in the View Tab from the ribbon tool.

3.3 LookFrom Navigation Tool

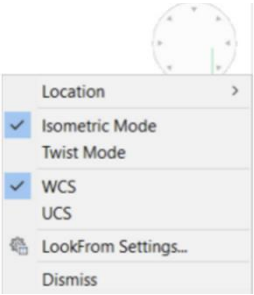
The **LookFrom** tool is displayed in the upper right corner of the drawing area.



Click on different places on the **LookFrom** tool to display the view from standard viewpoints.

TIP: To view Bottom viewpoints hold **CTRL** key.

NOTE: A right-click menu offers access to additional controls and settings. To learn more, refer to BricsCAD Online Help.



3.4.1 BIM Sections

The **DEFINE SECTION**  tool allows you to create a cross-section in your BIM model and thus view the interior details.

1. Select **DEFINE SECTION**  from the No Selection Quad.

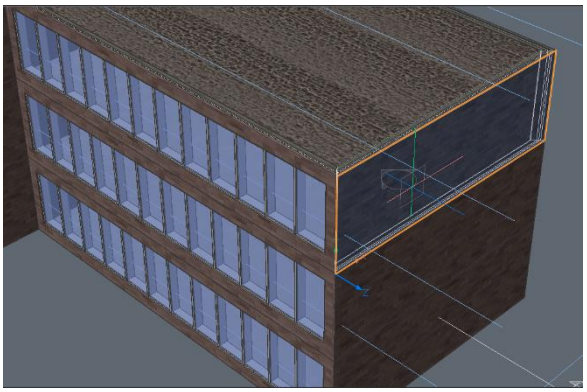
2. You are prompted **Select a point to place section or [Detail/Interior/Scale/Reflected ceiling]:**

   Do one of the following:

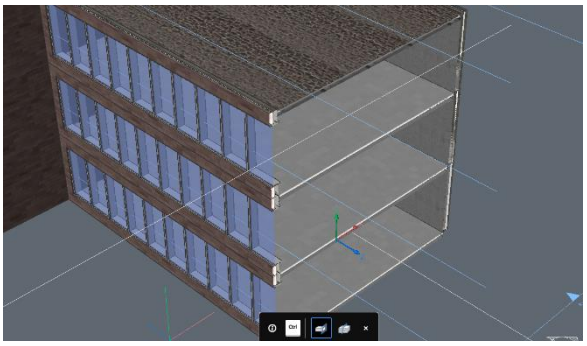
   a. To create a plan section, click a point anywhere outside the model.

   b. Hover the cursor over the face of a 3D solid which is parallel to the section plane you want to create (DUCS in the status bar needs to be active) and left-click.

   c. Optionally, hit the **Shift** key to lock the highlighted plane, allowing you to start from a point outside the selected 3D solid face and left-click.



   The initial section plane displays dynamically and the 3D model is clipped accordingly.



3. You are prompted **Specify distance:**

   Do one of the following:

   a. Type a value in the dynamic dimension field to offset the section from the initial position.

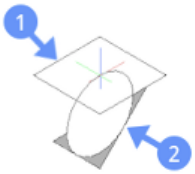
   b. Move the cursor until the section plane is at the location you want it to be and left-click.

   The BIM Section entity is defined

3.4.2 BIM Section types

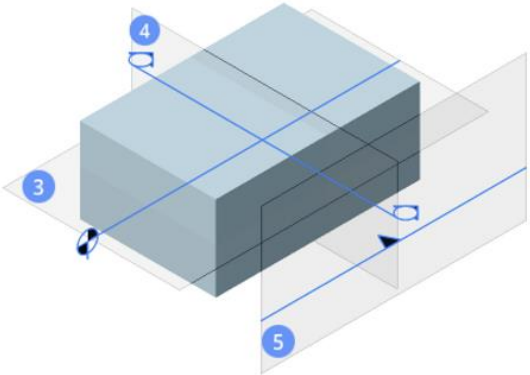
TIP: The **BIM Section** tracker indicates:

1. SECTION PLANE
2. VIEW DIRECTION



NOTE: The Section Type will depend on the section plane directions and its place in the model.

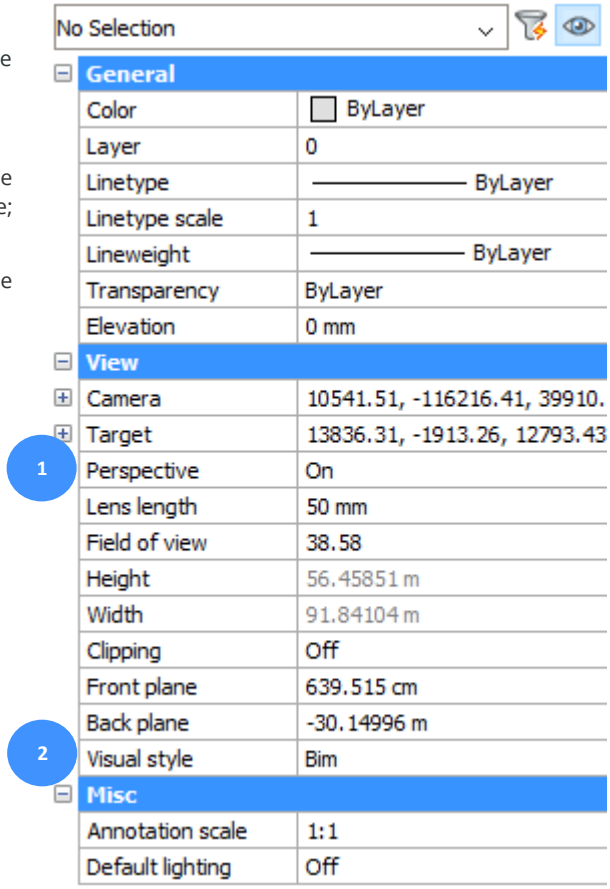
3. PLAN shows a horizontal section plane.
4. SECTION shows a vertical section that cuts through the model.
5. ELEVATION shows the exterior elevation view.



3.5 Properties Panel

Extra view settings can also be found in the **Properties Panel** while nothing is selected.

1. PERSPECTIVE: Reports the current value of the PERSPECTIVE system variable; switches perspective view mode on and off.
2. VISUAL STYLE: Reports the current visual style and allows you to select a different one.



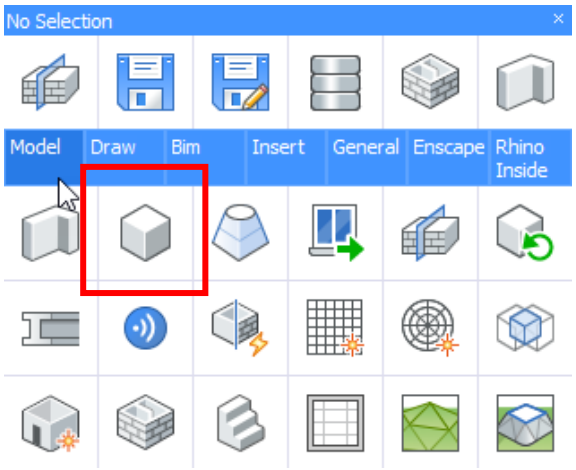
4 Selecting entities and Quad cursor

The following steps will demonstrate how to work with the Quad Cursor and highlight & select 3D model entities.

4.1 **File:** New, select **BIM mm template**. Note that the drawing units of this file will be in millimeters.

4.2 Using the Quad

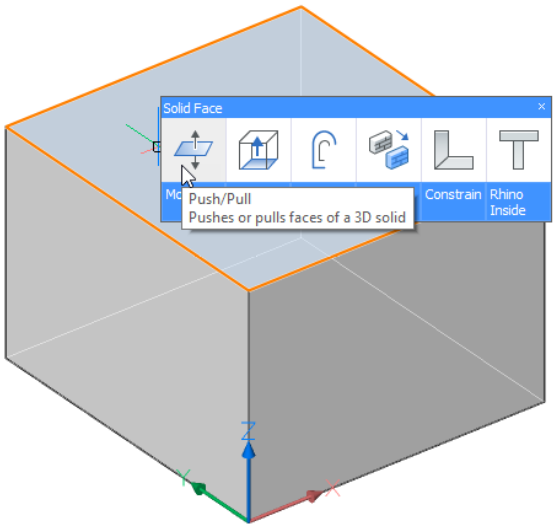
The quad is a floating toolbar that adjusts its content, depending on what you are or are not highlighting, and what you may have selected in the current workspace.



We'll start with an empty drawing.

1. Right-click in the model space. The quad appears in *no selection* state.
2. Move the cursor over the **Model** tab.

   The tool group is expanded with more tool options.
3. Click the **BOX** icon from the quad.
4. Draw a simple 3D box.
5. Hover the cursor over one of the faces of the box. The Quad displays a single icon, which is the most recently used tool with this entity type.
6. Right-click to launch the most recently used tool or move the cursor over the icon to further expand the Quad.



4.3 Selection modes

Selection modes allow you to control which sub-entities (faces, edges, and boundaries) should highlight in selection preview, and can be selected.

1. Selection modes can be found in the **Access toolbar** or by typing **SELECTIONMODES** in the command line.
2. Click the face and boundaries options.

Select edges is inactive whereas select faces and select boundaries are active

Enable detection of 3D solid edges	Controls whether 3D solid edges are highlighted by selection preview, and can be selected.
Enable detection of 3D solid faces	Controls whether 3D solid faces are highlighted by selection preview, and can be selected.
Enable boundary detection	Controls whether closed boundaries in XY-plane of the current coordinate system or on the face of 3D solids are detected.

4.4 Highlighting vs Selecting entities

When select Edges is off, select Faces and Boundary Detection are on (default), do one of the following:

1. Hover over the face with your mouse cursor

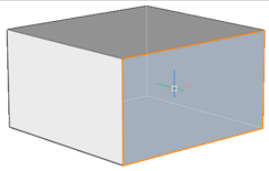
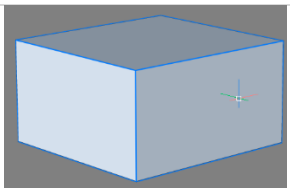
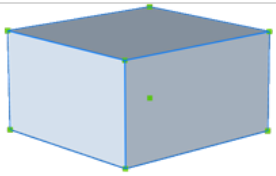
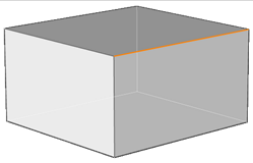
   The **solid face** is highlighted in orange. When the face is highlighted, click this face to select it.

2. Hover over one of the faces of the solid while holding down the **CTRL** key.

   The solid displays in blue. When the solid is highlighted, click the solid to select it.

3. Hover over the edge of the solid while holding down the **CTRL** key.

   The edge displays in blue. When the edge is highlighted, click the edge to select it.

Highlighted/Selected Face	
Highlighted Solid	
Selected Solid	
Highlighted/Selected Edge	

4.5 Selecting multiple entities with selection windows

The selection windows allow you to select one or more than one entity at a time.

There are two types of selection windows in BricsCAD;

Blue selection window: It appears when creating a window from left to right.

Green selection box: It appears when creating a box from right to left.

1. Click and move the mouse to the right to create a blue window around the box geometry you've created before**.** When the box is completely inside the window, it will be added to the selection set

NOTE: by default, selection window only selects entire entities (e.g. solids, lines, polylines, blocks...) but not sub-entities (e.g. solid faces, solid)

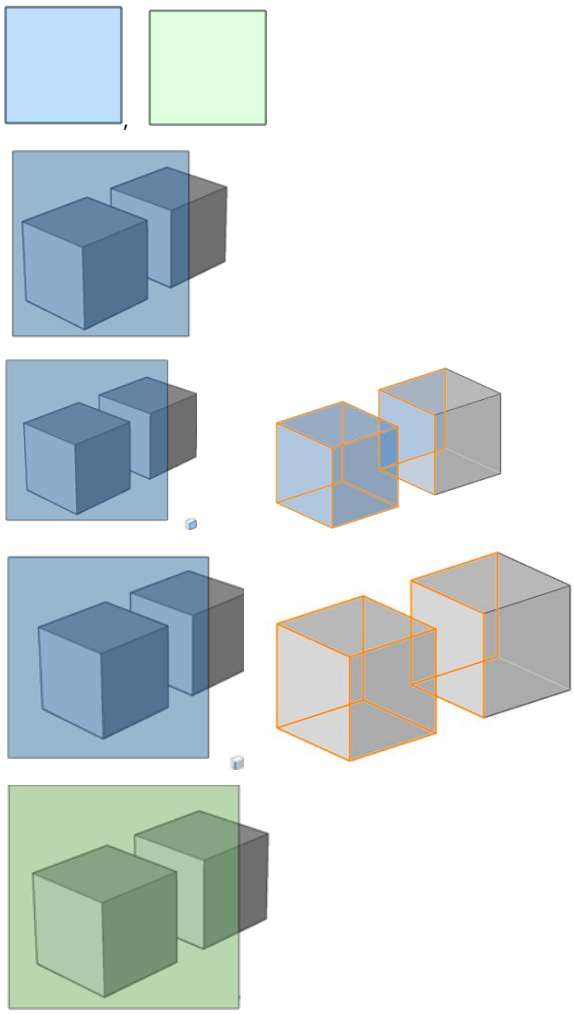
2. Press CTRL key once during window selection to select the **faces** of the 3D box.

3. Press CTRL key twice during window selection to select **edges** of the 3D box.

4. Click and move the mouse to the left to create a green window around the box geometry.

When the box overlaps the window or is completely inside the window, it will be added to the selection set.

To select faces or edges of the 3D box with the green selection box, follow the same process as the blue selection box.



Modeling

Creating the geometry of a model can be done in several ways. The main point to take away from this section is that no matter how you obtained the geometry, you can still use it later to add intelligence and data, and take it further in the BIM process. That is, as long as you're working with solids. Some possible ways to create the geometry are:

- Starting from an existing 2D layout, either by extruding objects upwards or by using Quickdraw
- Starting from some 3D mass model and 'sculpting' your way to a more detailed model
- Importing geometry from another file format such as .3dm or .stp
- Using the RhinoInside plugin in BricsCAD BIM to be able to run Grasshopper scripts directly inside BricsCAD
- ...

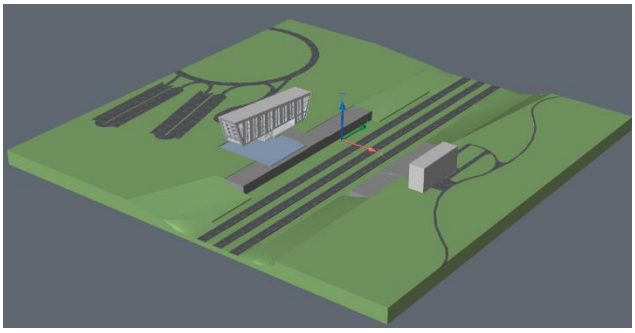
1 Importing geometry

The following steps will give an example of how to import geometry and how it can be used to enrich your BIM Model.

1.1 Open Overall.dwg.

You should see something like the image on the right. Hovering over the objects, you should notice that the drawing consists of three Xref's: one for each building volume and one for the site.

Also, note that one of the building volumes is currently just a box. We will turn this into an actual building later in the process.



1.2 Importing geometry

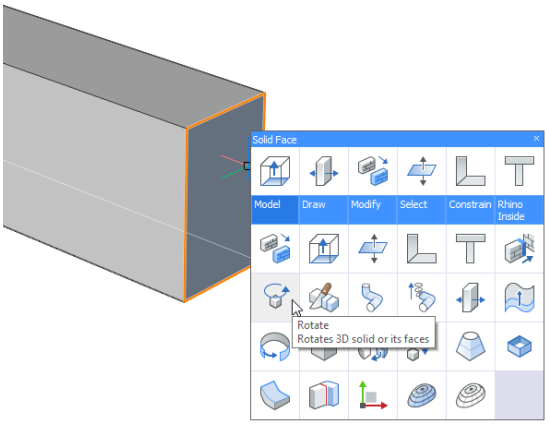
1. Click the Bricsys button next to the **Home** tab on the Ribbon and click **Import**, or type in the **IMPORT** command.
2. Select *Canopy.3dm* and click Open.
3. A large canopy structure should appear in between the two buildings. This canopy consists of solids, which means that the geometry can be used for further manipulation and information can be added to the geometry.

2 Sculpting a model

The following steps will give an example of how to turn a simple volume study into actual building geometry. You will learn some basic modeling tools along the way.

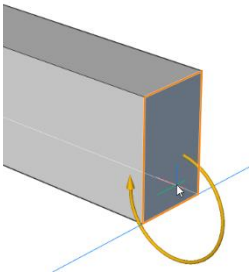
2.1 Manipulating the basic shape of an object

1. Hover your cursor over the building that looks like a box and in the Quad under **Modify**, click **OPEN XREF**. Alternatively, open the **Attachments Panel**, right-click **East** and click **Open**. If the Attachments Panel is not showing in your panel stack, right-click any empty space of the Ribbon and under Panels, enable *Attachments*.



2. Now you should be able to see the box in a separate drawing. We want to rotate some faces of the box to create a more interesting shape. To do this, make sure **Face Detection** is enabled.

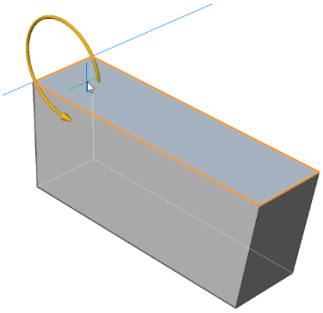
3. Hover over the end face of the box so that it is highlighted in orange, and in the Quad under the **Model** tab click **ROTATE**.



4. A yellow widget appears that indicates the rotation direction and axis. Move your cursor close to the bottom edge of the face, until the widget 'rotates' around that edge.

5. Move your cursor to the right so that the face rotates 'outwards',

   type in **10** and hit **Enter**.

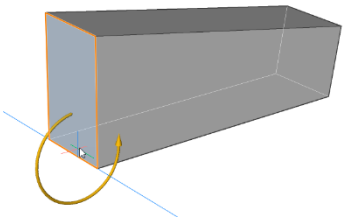


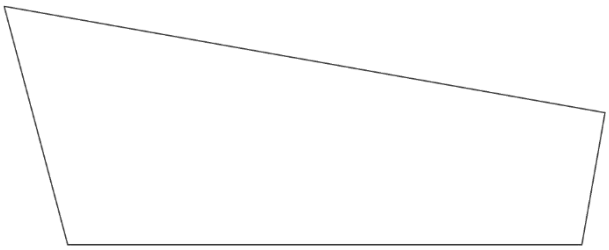
6. Do the same for the top face:

   rotate it **10** degrees downward around its **left** edge (see image).

7. Do the same for the opposite end face of the box: rotate it **15** degrees outward around its **bottom** edge (see image).

8. In the end, you should end up with a shape similar to the one shown in the final image (side view).

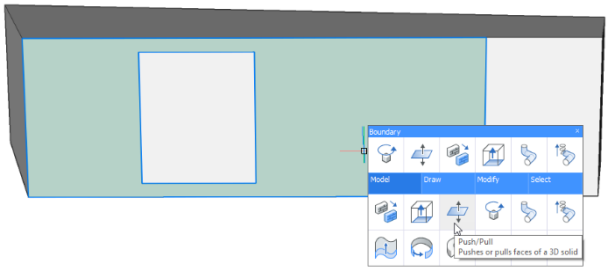


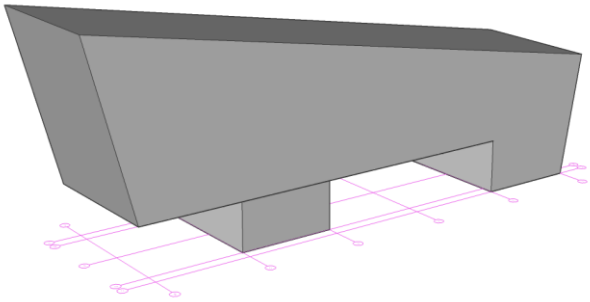


2.2 Using Push/Pull

We want to use some Push/Pull to create a more interesting shape. We want the shape to be similar to the one of the West Building (see Overall.dwg).

1. Rotate the camera so you can see the bottom side of the solid. We will be using the existing rectangles as a basis for what to push/pull.
2. Make sure **Boundary Detection** is enabled.
3. Move your cursor on the bottom face of the solid so that the boundary is highlighted as shown in the image on the right.
4. Once you have this boundary selected or highlighted, use **PUSH/PULL** and push these faces inward over a distance of **5500**. Thus, you should end up with something similar as shown in the final image.

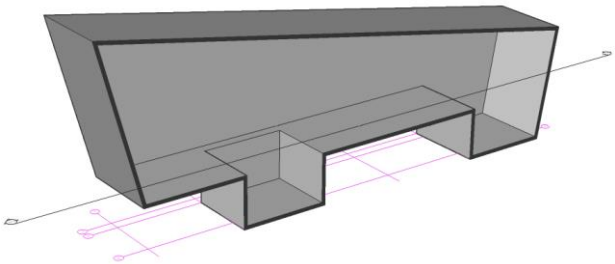




2.3 Using Shell

Currently, our building is still just a box: if we section through our building, we see that it is not hollow so no spaces can be made inside.

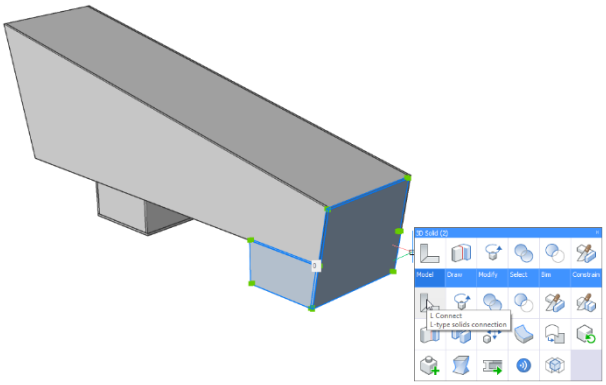
1. In the **Home** tab of the Ribbon, click **SECTION**. Hover the cursor over one of the side faces until it is highlighted in orange, and left-click. You should now be able to clip vertically through your model. Move the cursor inward so that you're clipping about halfway through the model, and left-click.
2. In the **Modeling** tab of the Ribbon, under **Solid Editing**, click **SOLIDEDIT > BODY > SHELL**.
3. Select the solid and press **Enter**.
4. When prompted the enter the shell offset distance, type in **300** and press **Enter.**
5. Hit **Enter** twice more to exit the solid editing command.



2.4 Splitting the model into separate pieces

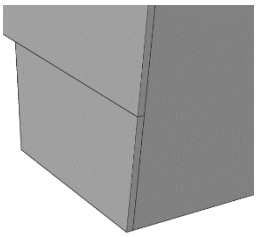
The solid is now hollow, but it still consists of 1 single object. In general, we want to split up the model so every object is a separate entity. Otherwise, you might run into problems when performing commands like Bimify or when assigning compositions. We can split up the model manually

using tools like **Slice**, but in this case, we'll use an automatic way to do this.

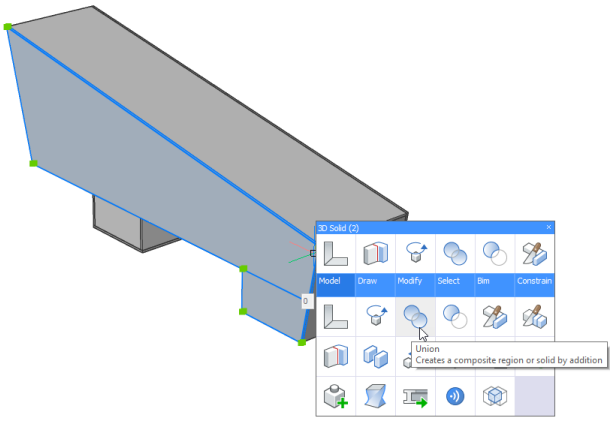


1. Remove the section plane if you haven't done so already.
2. Highlight the **solid** (not one of the faces), and in the Quad under **Model** click **SPLIT** . This command will try to assume how to split the model into separate solids.

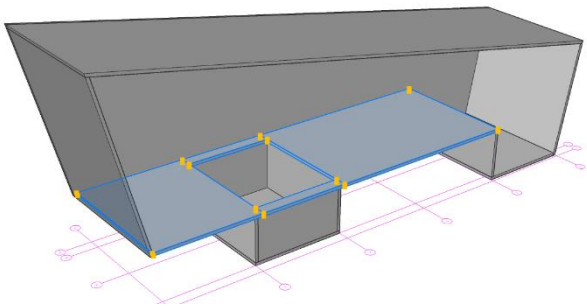
   Note: this works best on simple geometry.



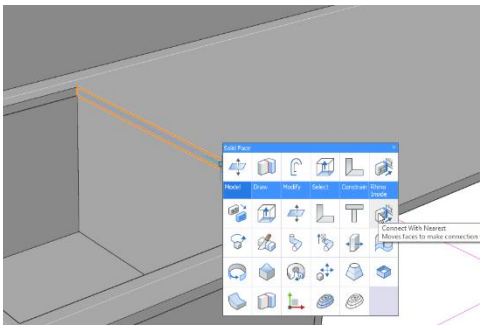
3. We now have 18 solids. We need to clean up a bit after using **Split**, because it did not do exactly what we wanted. As we can see on the image on the right, the large sidewall (on either side) was also split into two pieces.
4. Select the two walls as indicated on the image in the top right, and in the Quad under **Model** click **LCONNECT** . This allows you to change how the two walls are connected.
5. Hit **ctrl** a few times to cycle through the different options. Finally, press **Enter** when encountering the solution as indicated on the image on the right.



6. Finally, start the **UNION** tool and union the two coplanar walls together, as shown on the image.
7. Repeat this process on the other side of the building.
8. Highlight the side wall **solid** and in the Quad under **Select** tab, click **HIDE ENTITIES**
9. Now that we can look inside, we see that the floor slab has a hole in it where the support structure is located, and the slab itself is split into 4 separate pieces.

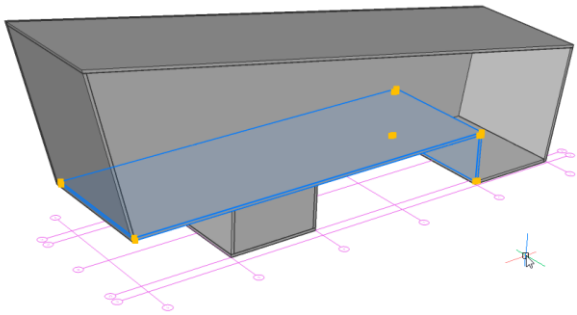


10. In the **Modeling** tab of the Ribbon, under **Solid Editing**, click **UNION** and select the four parts of the floor slab, see image.
11. To remove the hole in the slab, highlight any of the inner faces of the hole (make sure **Face Detection** is enabled), and in the Quad under **Model**, click **CONNECT WITH NEAREST**



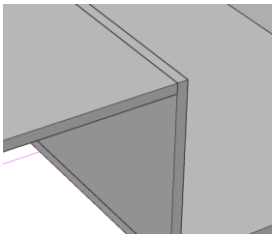
2.5 Creating some more interior walls and slabs

Let's change the connection between the upper floor slab and the wall highlighted in the image.



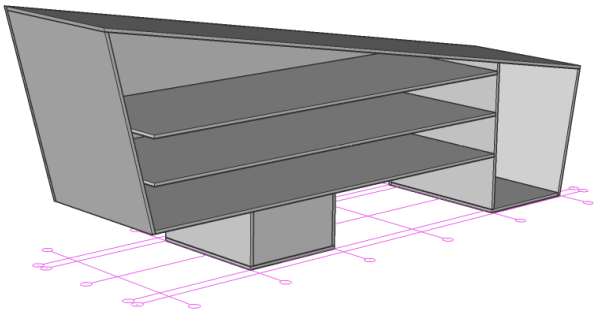
12. Select both solids as highlighted in the image, and in the Quad under **Model** tab, click **L-TYPE SOLIDS CONNECTION**

13. Hit the **Ctrl**-key a few times until the connection is shown as in the image, i.e. with the slab butted against the wall instead of resting on top of it. Press **Enter** to accept.



14. Highlight the top face of the wall (make sure **Face Detection** is enabled), and in the Quad under **Model**, click **CONNECT WITH NEAREST**. This should connect this wall with the roof slab, so we now have to separate rooms inside our building.

15. We can create some more interior floor slabs. We can do this by simply copying the existing upper floor slab in the Z-direction, or we could use the **BIM Copy** tool

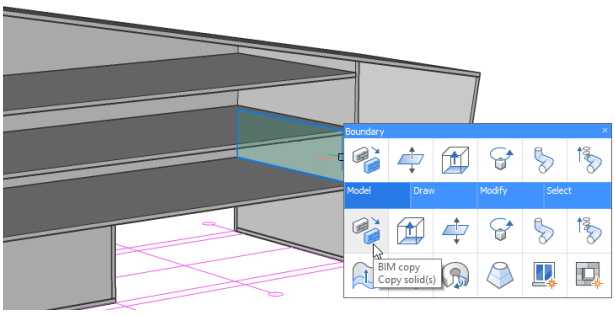


16. Highlight the top face of the upper floor slab and in the Quad under **Model** tab, click **BIM COPY**

17. Move the cursor upward, type in **4000** and hit **Enter**

18. Hit the **Ctrl**-key once so you go into 'repeated copy' mode; move your cursor until there are in total 3 slabs above each other. Press **Enter** to exit the command.

19. Notice that the two upper floor slabs are not connected to the slanted end wall. We can again use **CONNECT WITH NEAREST** on the end faces to solve this problem.



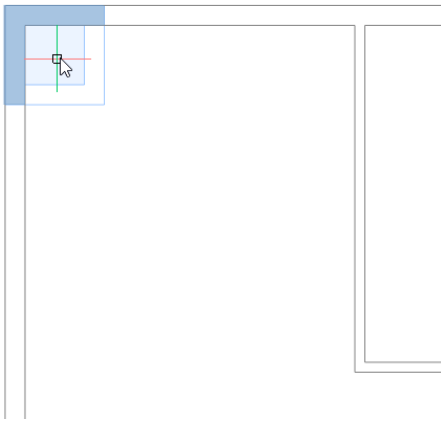
20. The **BIM Copy** tool can also be used on boundaries; Make sure **Boundary Detection** is enabled and hover the cursor over the boundary highlighted in the image. This way you can easily copy (parts of) walls and floor slabs around your mode.

3 Starting from a 2D Layout

In this section, we'll create a building starting from a simple 2D layout, on the one hand using Quickdraw and on the other hand using more standard tools like Extrude.

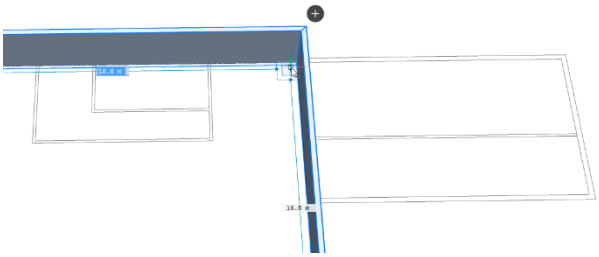
3.1 Using Quickdraw to trace over an existing layout

1. Open **Office Building.dwg**.
2. Let's start with the layout that is drawn along the current UCS and that has simple rectangular spaces.
3. In the **Home** tab of the Ribbon, click **QUICKDRAW** .
4. A special cursor appears, indicating the locations of the walls you will be creating.
5. Move the cursor close to one of the corners of the layout: you will see that it snaps to the lines. Position your cursor as shown in the image.

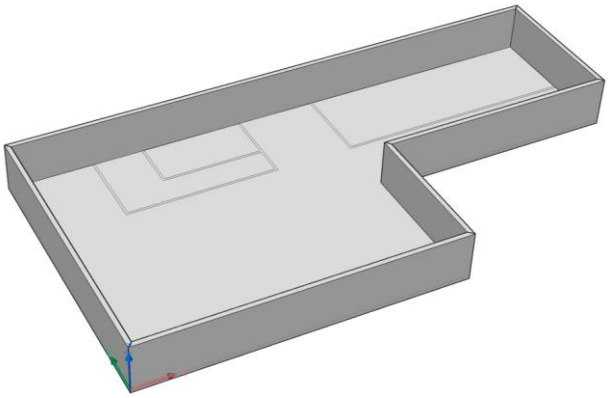


6. Left-click: you are now drawing the first room. Move your cursor to the opposite (bottom right-hand) corner of the layout and left-click again. If you now rotate the camera, you'll see that you created 4 walls and a slab.
7. We can expand this room into an L-shaped room by moving our cursor into the corner of the two walls highlighted in the image and left-clicking.

   Note that the walls you are snapping to are highlighted in blue.

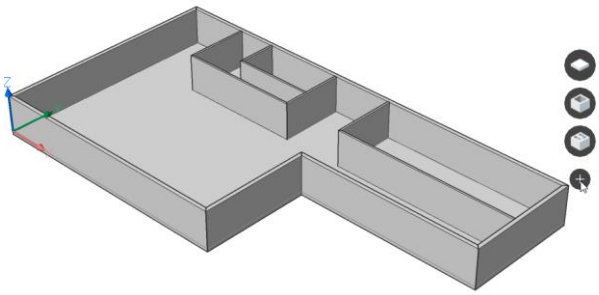


8. By moving the cursor to the right, you will see that a part of the right-hand wall becomes red. This means that we will be removing this part of the wall so that the room can be expanded into an L-shaped room.
9. Again, snap to the (other) bottom right-hand corner and left-click. You should now have an L-shaped room.

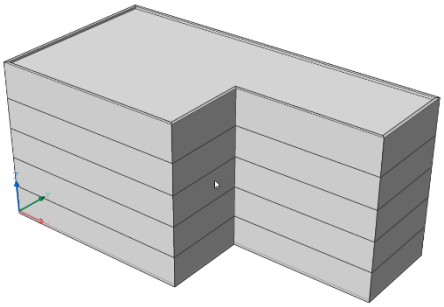


10. We can use these steps to trace the interior walls as well. Note that the cursor becomes 'thinner' as it snaps to these lines.
11. Continue using Quickdraw until all of the lines of this layout have been traced over, and you have every inner wall in place.
12. **Note** that Quickdraw uses default values for slab thickness, room height etc. These default values can be found and changed in the settings dialog.
13. Also **note** that this Quickdraw tool can be used in combination with direct modeling tools. For the sake of simplicity this section and the previous section were split up but it is perfectly possible to use hybrid methods.

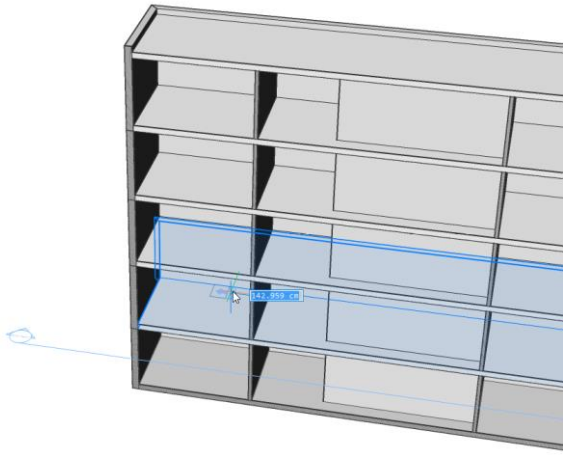
3.2 Copying floors using Quickdraw



1. Note that when Quickdraw is active, a little **'+'** icon is displayed next to the building. Clicking it gives you three options:
   - Copy an entire floor
   - Copy only the outer walls of the floor
   - Create a flat roof
2. Click the *copy entire floor* button four times so you have a total of 5 floors.
3. Finally, click the *create roof* button to finish the building envelope.

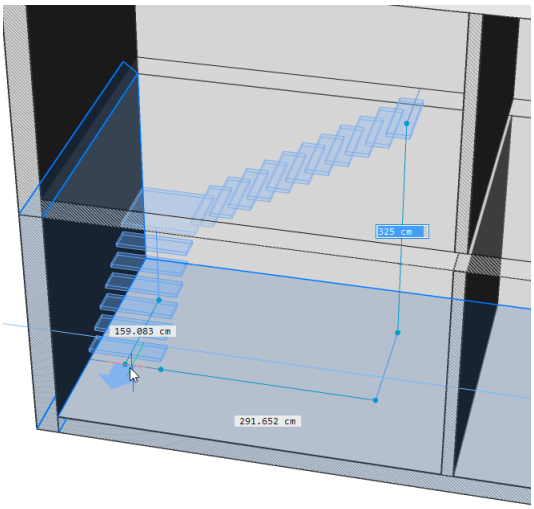


3.3 Creating stairs



Creating stairs can be done in several ways; again, direct modeling is an option. However, it's easier to use the dedicated stair tool.

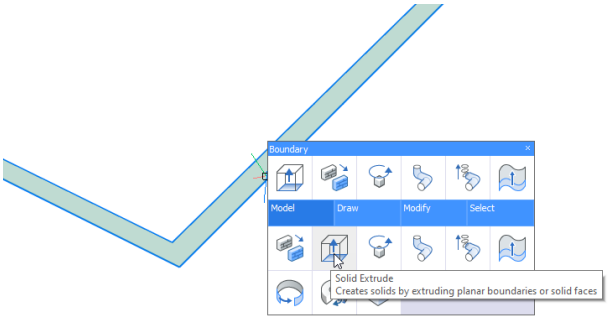
1. Activate a vertical section so you can see inside the building.
2. In the **Home** tab of the Ribbon, click **STAIR** 
3. A special cursor appears, similar to the Quickdraw cursor. This time it shows the first tread and the direction of the stair. Hit the **Ctrl**-key to change the direction.
4. **Note** that the cursor snaps to existing slabs and walls. This allows for easy alignment with existing objects.
5. Move the cursor so that it snaps to the back wall and is going 'towards' the left wall, as shown in the image.
6. A live preview of the stair is shown as you move your cursor over the slab beneath it. You can make single-flight stairs, L-shaped stairs, and U-shaped stairs.
7. Move your cursor along the left wall so that an L-shaped stair is previewed;
8. **Note** that when the stair is created, automatically a hole is made in the upper slab. This is based on the **HEADROOM** setting. More default settings can be found in the settings dialog under BIM → General → Stair.
9. Select the stair and open the Properties Panel. Under Parameters, you can find and alter its geometric properties, such as stair width or step thickness.



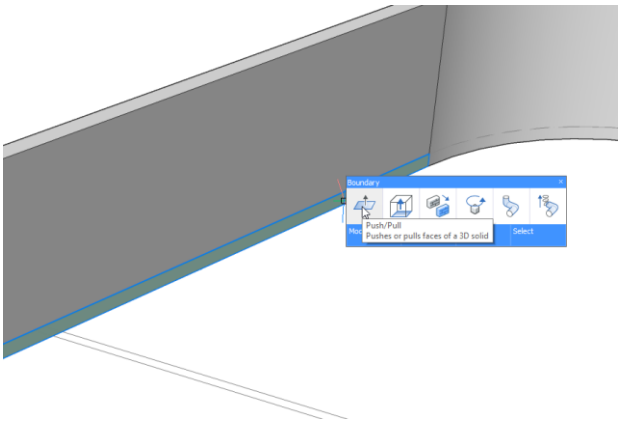
3.4 Starting from non-rectilinear layouts

The previous example consisted of a rectilinear layout, aligned with the current UCS. The second example is not so simple: the outer walls are not aligned to the current UCS, the inner walls are not perpendicular and there is a cylindrical wall.

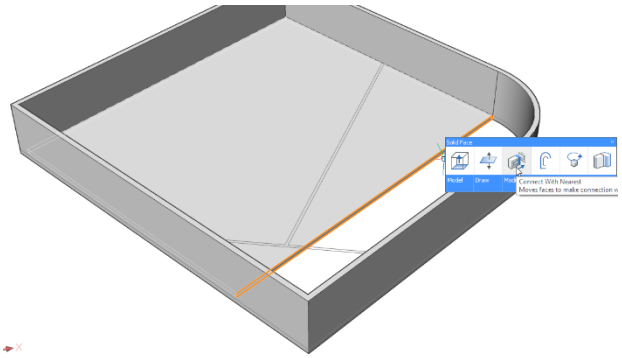
Since Quickdraw only works in the current UCS, it's not straightforward to use this tool for this particular situation.



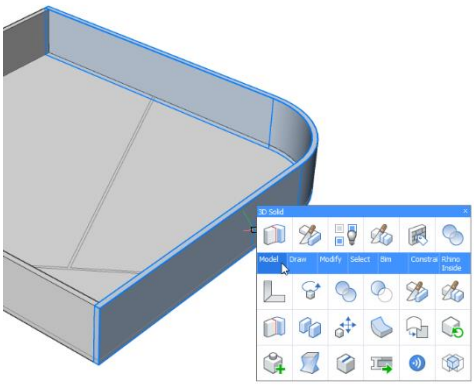
1. Make sure **Boundary Detection** is enabled and move your cursor inside the two lines of the outer walls. The boundary should be highlighted in green.
2. In the Quad under **Model** tab, click **SOLID EXTRUDE**.
3. Move your cursor upward, enter a value of **3000** and press **Enter.**



4. Let's also **PUSH/PULL** the bottom face of the walls **down** over a distance of **250** mm so we can easily create a floor slab.
5. Now we can use the boundary between the lower edge of one of the walls and the layout lines to **SOLID EXTRUDE** the floor slab. You may need to construct **part** of the floor slab first and then use **CONNECT WITH NEAREST** so it connects properly with the cylindrical wall (see third image).



6. Currently the outer walls are all constructed as 1 solid; use **SPLIT** to split it up into separate pieces.
7. Notice that the walls were split up into three parts instead of five; the cylindrical wall was not taken into account when splitting. We can still split this up manually.
8. Highlight the **solid** of the wall (see fourth image) and in the Quad under **Model** tab, click **MULTISLICE** (careful: this icon look very similar to Slice by Object, which is less straightforward to use in this case).
9. Multislice asks for a **slicing plane**: choose the face of the wall perpendicular to this part of the wall (in the image: the wall in the bottom left-hand corner). A blue slicing plane should appear that indicated where you will slice the selected object.



10. Snap to the point where the **straight** wall and the **curved** wall come together, and left-click. Hit **Enter** to exit Multislice.

11. Do the same in the perpendicular direction for the other segment of the wall.

12. In total we should now have 5 walls: four straight walls and one cylindrical.

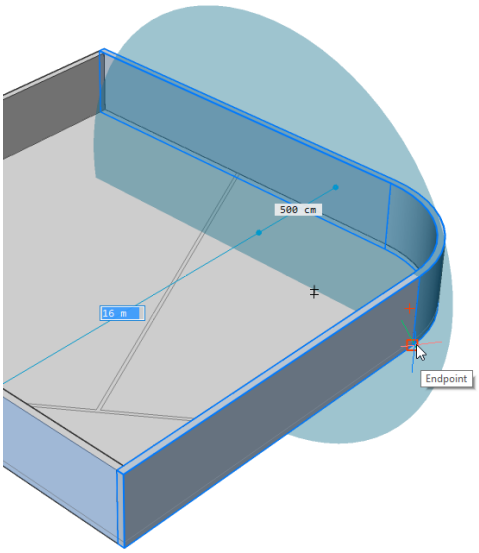
13. Make sure **Boundary Detection** is enabled and move your cursor inside the two lines of the interior walls. The boundary should be highlighted in green.

14. In the Quad under **Model** tab, click **SOLID EXTRUDE** .

15. Move your cursor upward, enter a value of **3000** and press **Enter**.

16. Now use **SPLIT** on these interior walls to split them into separate solids.

17. Now we can simply copy this floor up using **COPY** or using the Manipulator.



4 Starting from a mass model

In this section, we'll use an existing mass model and turn this into a building with walls & slabs in a semi-automatic way.

4.1 Quickbuilding on imported geometry

18. Open a new drawing starting from the BIM-mm.dwt template. This can be done by going to the Bricsys button next to the **Home** tab on the Ribbon and clicking **New Wizard**, or by typing in **NEWWIZ** in the command line.

19. Click the Bricsys button next to the **Home** tab on the Ribbon and click **Import**, or type in the **IMPORT** command.

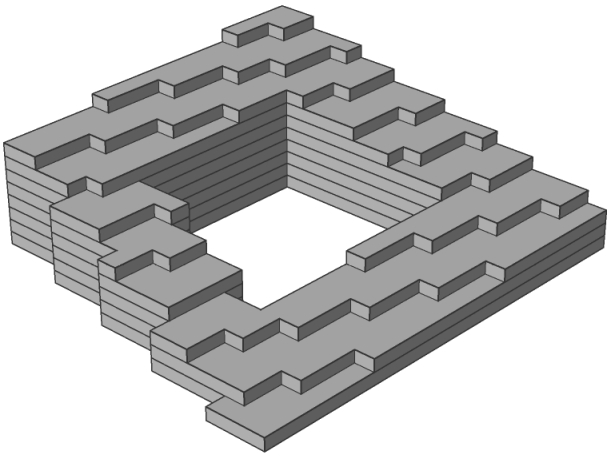
20. Select *mass_blocks.3dm*. If you don't see the model, use the **LookFrom** widget at the top right of the modeling area to zoom out.

21. This geometry was imported as a single solid, representing the mass model of a building. We can turn this into an actual building using Quickbuilding.

22. Highlight the solid and in the Quad under **BIM**, click **QUICKBUILDING**

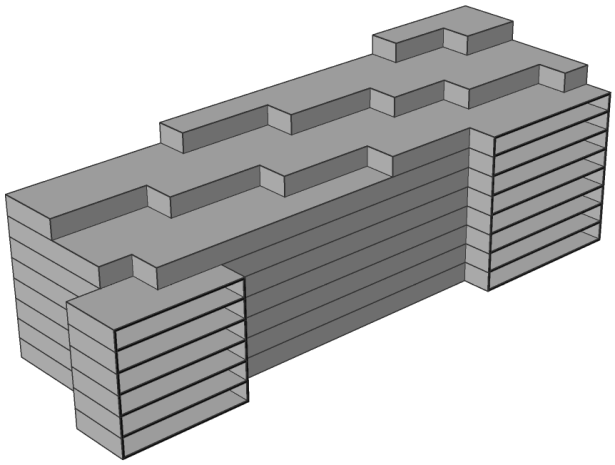
23. Enter a desired story height of **3000 mm** and press **Enter.**

24. Note that a new drawing is created in a temporary location – Quickbuilding did **not** alter your original mass model. To make sure you



don't lose your work, save this drawing to another location.

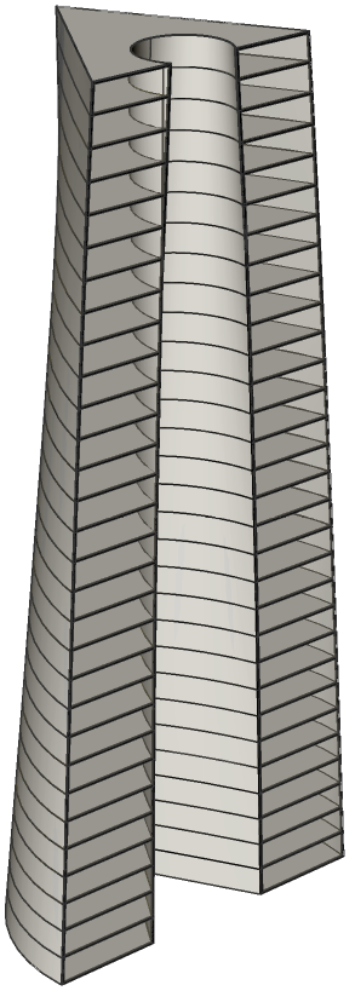
25. Quickbuilding has created walls, slabs and roofs, as well as spatial elements in for form of an enveloping *building, stories* and spaces.



4.2 Quickbuilding on lofted geometry

Quickbuilding also works on more complex geometry, such as lofted or twisted objects. It generally takes a bit more time to generate the required geometry – the more complex the mass is, the more difficulties Quickbuilding will have.

26. Open *mass_lofted.dwg*
27. Highlight the solid and use Quickbuilding on it.
28. Enter a story height of e.g. **4000 mm** and press **Enter**. This might take a minute.

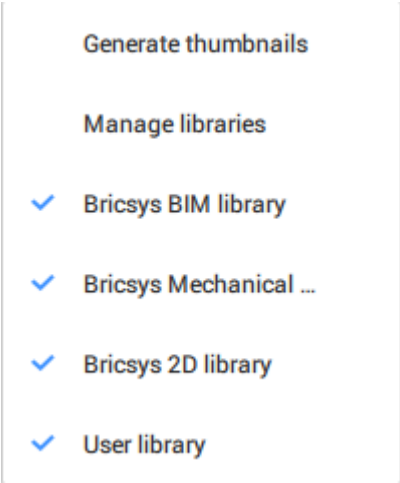


Components

You will learn to use the Library Panel, insert objects into your model, create a simple non-parametric window and create windows and curtain walls on the fly.

1 Inserting components

1.1 Using the Library Panel



1. Open **East.dwg** in the Components folder.
2. On the right-hand side of your screen, open the Library Panel . It should contain several categories such as Windows and Doors. If it does not, click the little menu icon in the top right corner and enable *Bricsys BIM Library*.
3. **Note:** aside from the BIM components also the so-called *Bricsys Mechanical Library* is delivered with the product. This library contains components used in mechanical design, such as standard parts and sheet metal features.
4. The BIM Library and Mechanical Library are saved under *C:\Program Files\Bricsys\BricsCAD Vxx en_US\UserDataCache\Support\en_US*.
5. On Windows, when creating custom components these will be saved under *C:\ProgramData\Bricsys\Support\Bim\Components*, or whichever path is specified in the COMPONENTSPATH variable which can be found in the settings dialog.

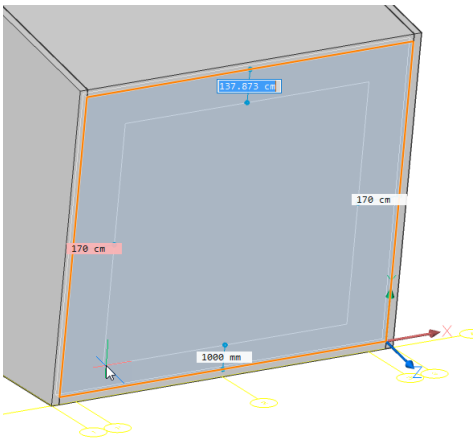
   For Mac open the Finder, go to the Go tab and click on 'Go to folder...' and type in *var/Bricsys/Components*.
6. Left-clicking a category will open it. Left-clicking a component will allow you to insert it.
7. **Note:** when inserting a component the command **BMINSERT** is launched. Thus, if you want to insert a component that is not in your library, you can always manually call **BMINSERT** or click the Insert Component icon on the ribbon or Quad.

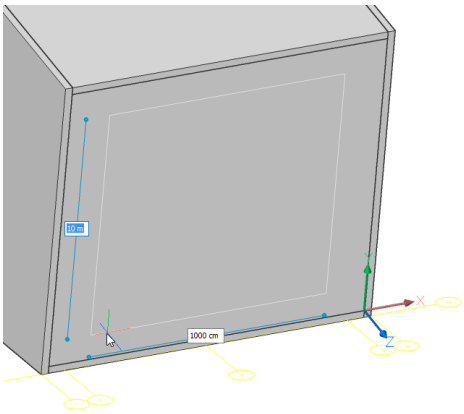
1.2 Inserting a window

Let's insert a library window into one of the walls.

1. Make sure the Dynamic UCS (DUCS) and Dynamic Input (DYN) are enabled. This can be toggled on in the status bar, at the bottom right of your screen.

2. In the library panel, browse to the Windows category
3. Left-click the **Window 1x1** component
4. Automatically the properties panel is opened and the properties of the window are shown. Here you can change its geometric parameters such as Width, Height or GlazingDepth. Change the Width and Height both to **10000 mm**.
5. Move your cursor over the back wall of the building. The outline of the window is displayed, and dynamic inputs are displayed indicating the distances to the edges of the wall.
6. Enter a value in the dynamic dimension field that is highlighted (e.g. **1700**), and press **Tab** to jump to the next dimension. The one you entered is now locked and displayed in red. Using this technique you can accurately position the window in the wall.
7. While still placing the window, press **Ctrl** once. Now the dynamic input fields change from 'positioning' to 'dimensions': you can now still edit the width and height of the window while placing it. Again you can press **Tab** to toggle between width and height.
8. To go back to 'positioning' dynamic inputs, press **Ctrl** again.
9. To finally place the window, press **Enter** or **left-click**.
10. **Note:** If you highlight this window and in the Quad under **Model** tab click **BIMINSERT** you will be able to copy this exact window (including its new parameter values) over to other locations in your drawing.





1.3 Editing an existing window

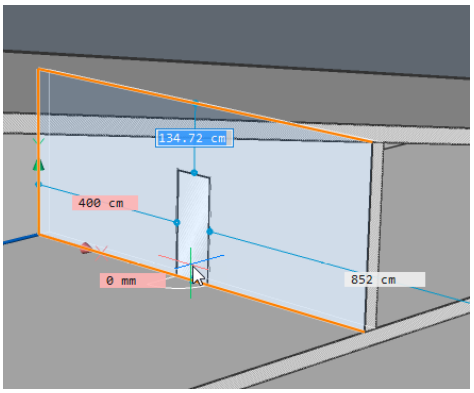
1. Select the window that you just inserted.
2. Open the Properties Panel
3. Here you can find several properties of the window, such as for example IFC Common properties. Also the geometric parameters that you saw before are visible here.
4. Change some of the parameter values and see what happens to the model.

Parameters	
W	1000 cm
H	1000 cm
Rebate	0 mm
PlacementDepth	0 mm
LiningThickness	60 mm
LiningDepth	250 mm
GlazingDepth	20 mm
GlazingOffset	100 mm

1.4 Inserting other types of components

These same steps apply for inserting other types of components as well, for example furnishing elements.

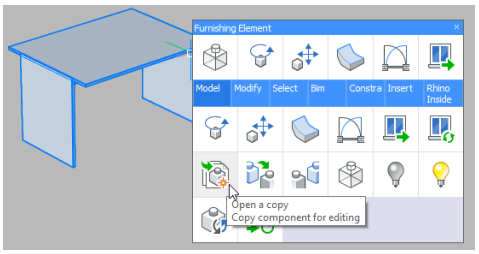
1. Activate the vertical section plane so you clip through the building
2. Try inserting some furniture into the drawing using these same steps.
3. Insert a door in one of the interior walls of the building.
4. Note that the door displays a swing line. If you want the door to have a different orientation, highlight it and in the Quad under **Model** tab, click either of the **BIMFLIP** icons: 



1.5 Customizing a library object

If you want to alter an object beyond its geometric parameters (e.g. add extra geometry, change the materials...) you can use the following steps.

1. Insert the object you wish to alter in your drawing
2. Hover your cursor over the component and in the Quad under **Model** tab click **OPEN COPY** 
3. Make the modifications you want
4. In the Library Panel, click the **blue Plus icon** at the bottom. See also next section for a more detailed explanation on making custom components.

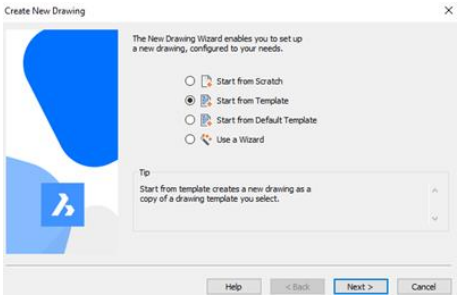


2 Creating a custom component

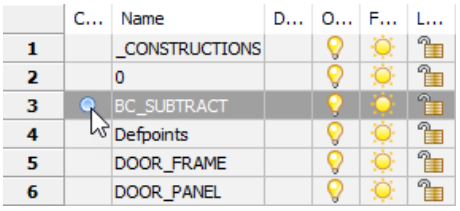
In this section we will create a custom window component. Note that this window will **not** be parametric; this is a more advanced topic that will be covered later.

2.1 **File: New Wizard,** choose **Start from Template** and click **Next**, choose **BIM-Window-metric.dwt**. Uncheck the box that says '*Use the selected template as default*' and click **Finish.**

This template already contains some predefined layers such as BC_SUBTRACT or WINDOW_FRAME.



2.2 **Change current layer to 'BC_SUBTRACT'.** Layers can be found in the Layers panel on the right-hand side  .

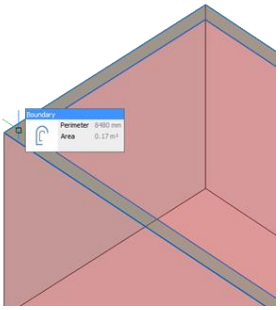


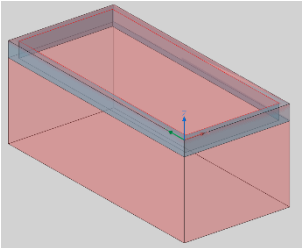
2.3 **Let's create the Subtractor Solid. This is the volume that will be cut away from the wall in which the window is inserted:**

1. Select **BOX** icon  or type **BOX** in the command line.
2. To start, type **0,0,0** and enter.
3. Move cursor towards upper right (i.e. first quadrant of the XY-plane). Type **1500** in highlighted cell, and press **Tab.**
4. Type **700** in highlighted cell, and press **Enter.**
5. Move cursor downward (negative Z-direction).
6. Type **600** in highlighted cell, and press **Enter.** The depth of this solid doesn't matter much, as long as it's thicker than the walls you will be inserting it in.

2.4 Create a window frame

1. Change current layer to **'WINDOW_FRAME'**.
2. Highlight **top surface** boundary of box.
3. Quad select **OFFSET** in the **Draw** tab.
4. Move cursor towards center.
5. Enter **40** + **enter** (polyline created).
6. Zoom in so cursor is fully within 40 mm boundary, so boundary is highlighted (see figure).
7. Quad select **SOLID EXTRUDE** .
8. Move cursor downward, and press **Ctrl** once so you enter *'Create mode'* instead of *'Auto mode'*, which in this case will subtract. Input **100** and press **Enter**.





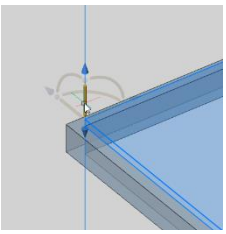
2.5 Turn off 'BC_SUBTRACT' layer by clicking the lightbulb next to the layer nameand make 'GLASS' layer current.

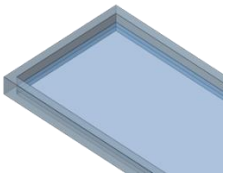
2.6 Create window glazing

1. Highlight boundary inside window.
2. Quad select **SOLID EXTRUDE** .
3. Move cursor upward.
4. Input **25** + enter.

2.7 Move window glazing

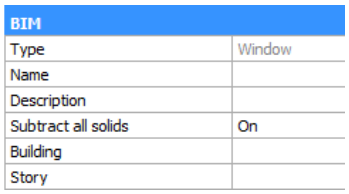
1. Select the window glazing **solid.** While doing so, hold down the left mouse button slightly longer. This should make the **Manipulator** appear, a yellow cursor that allows you to easily move, rotate, copy and mirror entities.
2. Click the vertical bar of the Manipulator as shown in the image. This should make sure you move the object vertically upwards or downwards.
3. Move your cursor down, enter **75** and press **Enter.**





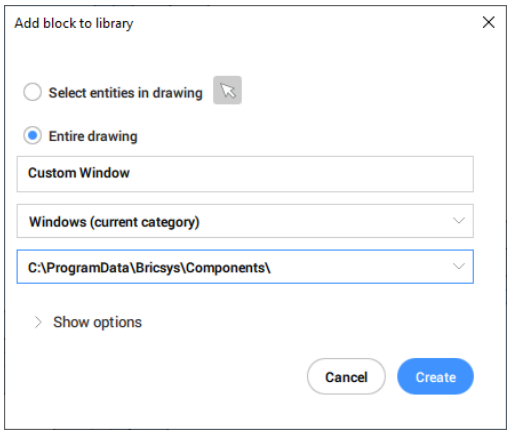
2.8 Classify as Window

1. Currently, this drawing is just a bunch of solids. We can classify the drawing as a Window so that upon insertion in another drawing, a Window object is inserted instead of just a 'dumb' block reference.
2. Make sure you have *nothing* selected by pressing **Esc**.
3. Launch the **BIMCLASSIFY** command.
4. Enter **'I'** for **wIndow** and press **Enter**.
5. Press **Enter** again to classify the entire drawing.
6. If you now open the Properties Panel on the right-hand side of your screen, you will see a new tab with BIM properties. The properties you fill in here will also be displayed after inserting this window into another drawing.



2.9 Creating the component

1. Open the Library Panel .
2. Browse to the folder where you want to save this component (Windows in this case).
3. Click the **blue Plus icon** at the bottom of this panel.
4. A dialog box displays.
5. Tick the **Entire Drawing** option
6. Enter a name in the Name field, e.g. *Custom Window*
7. The category and folder where it will be created should already be filled in correctly.
8. Click the **Create** button
9. **Note:** If the window is not displayed in the Library Panel click the right-hand side menu button and select the *Generate thumbnail* option in the fly-out menu.
10. Now this window can be inserted into walls like you would insert any other component. If you don't wish to save this object into the library, you can just save the .dwg anywhere on your system and insert it using the **BMINSERT** command.



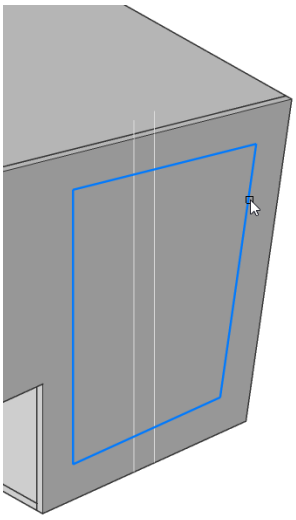
3 Alternative methods of creating windows

In this section we will create a custom window component. **Note** that this window will **not** be parametric; this is a more advanced topic that will be covered later.

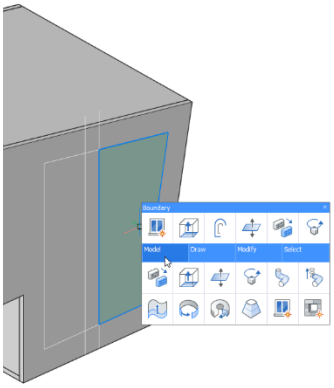
3.1 Using BimWindowCreate on a polyline and a boundary

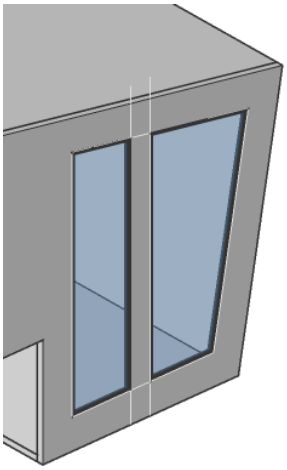
BIMWINDOWCREATE lets you create window components with custom geometry on the fly without the need to predefine a window or fiddle with existing ones. This command allows three types of input geometry:

- Closed boundary on any solid face
- Closed polyline
- Grid



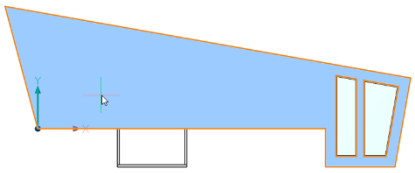
1. Go back to **East.dwg.** On one of the sides of the building a trapezoid and two lines were already drawn. We can use this as input geometry to create windows.
2. From the ribbon under the **Modeling** tab, click **CREATE WINDOW**  .
3. As input geometry, click the polyline highlighted in the image on the right and press **Enter**.
4. A dialog box appears allowing you to choose the style of the window. Let's select the top left one.
5. A window is created in the shape of this polyline. Select the window and open the properties panel. You should be able to alter its properties such as *Frame Thickness* and *Frame Depth*.
6. **Undo** until before the window was created.
7. Now let's use a boundary to create a window. Make sure boundary detection is enabled: 
8. Move your cursor inside the polyline; a boundary should be highlighted as shown in the image on the right.
9. In the Quad under **Model** tab, click **CREATE WINDOW**  .
10. Again a dialog box is displayed. Choose a window style.
11. Do the same for the other portion inside the polyline so that you have two windows as shown in the final image.
12. **Note:** It's also possible to select multiple polylines or boundaries before using BimWindowCreate, this way you can create multiple windows at once.



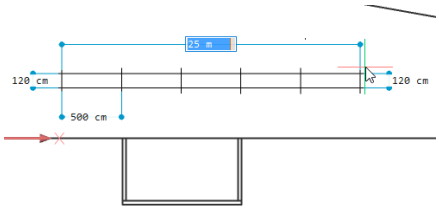


3.2 Using BimWindowCreate on a grid

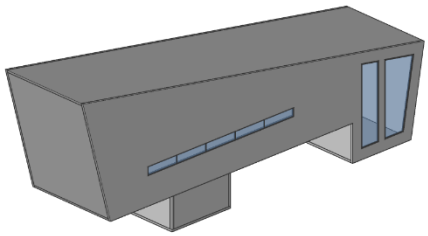
It's possible to use grids as input geometry for window creation.



1. Let's create a temporary grid on one of the façades. Using the LookFrom widget on the top-right corner of your screen, click the **Back** position so that you have a side view of the building.
2. Let's create a temporary grid on one of the façades. From the ribbon under the **Modeling > Create** tab, click the **RECTANGULAR GRID** icon .
3. Move your cursor on the side façade of the building. Make sure your UCS is pointing the right way up (X-axis horizontal, Y-axis vertical) and hit the **Shift** key once to lock this plane, see image on the right.

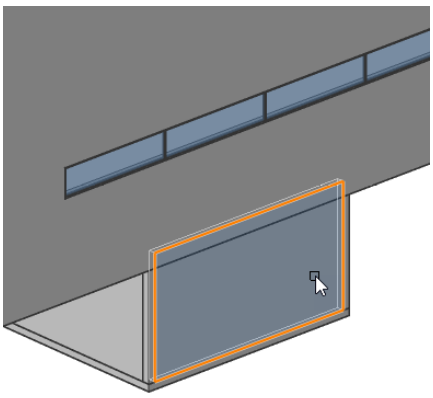


4. Left-click anywhere on this face to start creating the grid. Move your cursor outwards until you see multiple grid cells appear
5. Four dynamic input fields are displayed: two for the individual grid cell sizes (X and Y direction) and two for the overall grid size (X and Y direction). Hit **Tab** until the dynamic input field is highlighted that governs the **vertical dimension of one grid cell**. Type in **1200** and hit **Tab.**



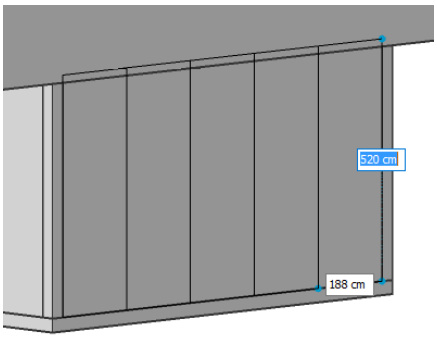
6. Move your cursor until you have grid of 5 by 1 cells, in total a grid of **25 meters by 120 cm**, and left-click. The grid is now created (**Note:** automatically grid labels are created)
7. (Optional) you can now still make modifications on the grid by using the **BEDIT** tool.
8. Highlight the grid and in the Quad under **Model** tab, click **CREATE WINDOW**

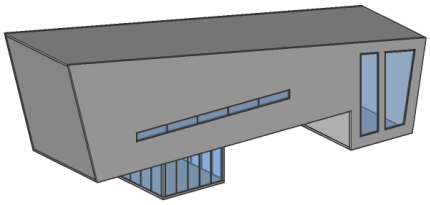
3.3 Using the Curtainwall tool



1. In the ribbon under the **Modeling** tab, click the **CURTAIN WALL** icon
2. Select one of the side faces of the small box underneath the building
3. Automatically a first grid is laid out on this face. You can use the dynamic input fields to give an approximation of how wide and high you want the grid cells to be. Alternatively, you can use the command prompts to enter the number of panels in both directions.
4. Type in **NU** and press **Enter**. Type in **1** and press **Enter**.
5. Type in **NV** and press **Enter**. Type in **5** and press **Enter**.

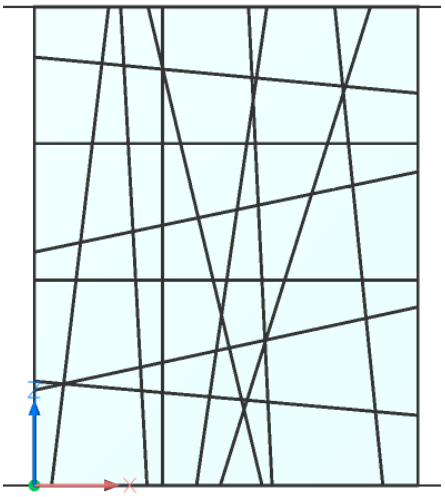
6. Once you are happy with the sizes of your panels, press **Enter** again.
7. At this stage it is possible to change the Frame Width, *Frame Depth, Glass Thickness* and *Connections Type.* To see what the different connection types are, please refer to the article on Curtain Walls on help.bricsys.com.
8. Press **Enter** to create the curtain wall.
9. Repeat the process for the other sides.



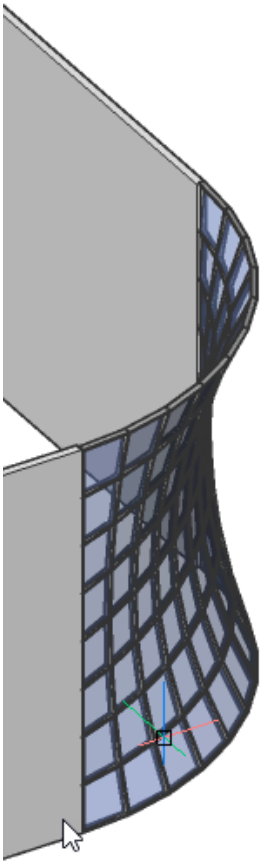


3.4 Some more advanced glazing

1. Open **Curtainwall.dwg** in the Components folder.
2. Select the grid that is drawn on the face of the large straight wall. **Note:** this grid was created by using the rectangular grid tool as shown before, and using **BEDIT.** The different grid axes were randomly rotated and shifted to generate a random pattern.
3. In the Quad under **Model** tab, click **CREATE WINDOW**
4. In the ribbon under the **Modeling** tab, click the **CURTAIN WALL** icon
5. Click the face of the lofted surface in between the two perpendicular walls. **Note:** this surface was created by using the **LOFT** command on three arcs.
6. Choose a proper panel size so that the glazing still looks smooth enough. Try **1500 x 1500** cells, and press **Enter**.
7. You are now asked whether to Planarize the cells. In the previous example you were not asked because it was already a planar face. Whether to planarize or not depends on the type of surface you are using. Generally planarizing can be useful as it tends to simplify the geometry. However, in the case of twisted surfaces this may not lead to satisfactory results.
8. In this case, we will choose **not** to planarize. Type in **N** and press **Enter**.
9. Change the Frame Depth to **150** and the Connection type to **Smooth**. Press **Enter** to accept.



10. A smooth glazing façade should now be created in the shape of the lofted surface.



Adding BIM data

This module explains the different methods to add more BIM data into your BIM model.

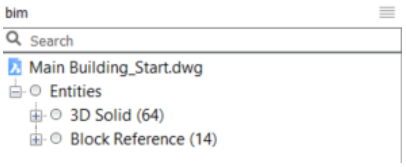
1 **Structure Browser and Classifications**

1. Open **'Main Building_Start.dwg'** from the Adding BIM data folder.
2. First, let's get started with the **Structure Browser.**
3. Open the **STRUCTURE BROWSER**  from the Tool panel at the left-hand side.

   The structure browser is an interactive tree that displays all the entities in the current model.

   The **tree structure** of the Structure browser represents the hierarchical set of rules in a graphical form. Each rule has a filter property, a grouping property, and a sorting property. Organizing the properties in the Structure Browser enhances the performance of your project while querying the entities among others.
4. Make sure the default **bim.cst** configuration file is active. Using the configurable structure tree on the Structure Browser the BIM model can be organized in a way that you want to view the elements. Once you configured the tree, you can easily save this structured tree as a .cst file. By default, the .cst files are stored in the **Support Folder**.
5. If it is not, at the top of the structure tree click the little hamburger menu.
6. Choose **bim** from the drop-down list.
7. There are 64 Solids and 14 Block References in this drawing.

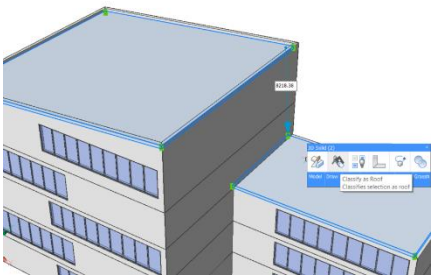
   Note: When you use smart modeling tools like Quickdraw, WindowCreate, BimStair, Propagate, etc to create your model, it will already automatically classify your model into different BIM classifications and spatial locations.



2 **Bimify**

1. Select the two top slabs and use **BIM: CLASSIFY AS ROOF**  from the Quad. Now you have two Roof elements in your drawing.

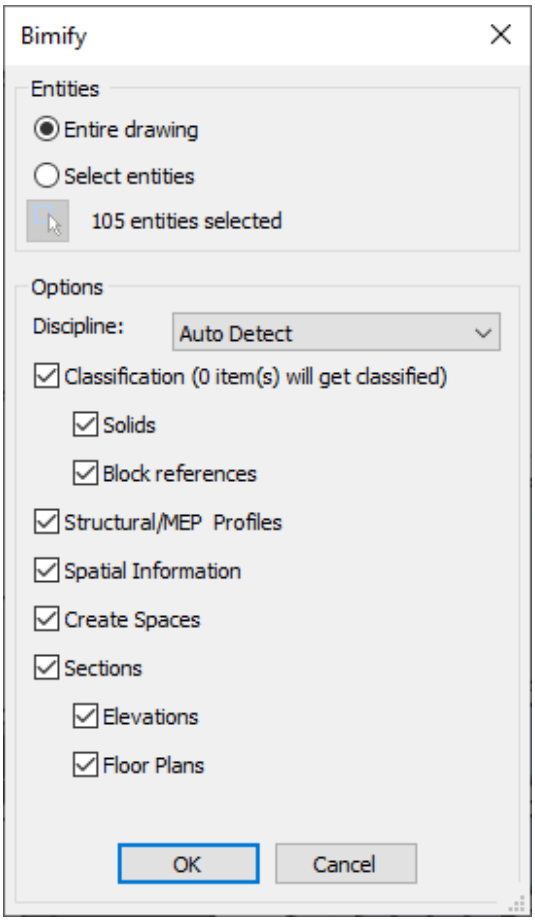
   Note: In **Structure browser,** it has shifted to **Building Elements: Roof**



2. Classifying elements can be done manually, or automatically using **BIMIFY**  . If any solids

remained unclassified, BIMIFY will take care of them. Bimify will also add elevations and floor sections.

3. In the Ribbon under the Bimify button, open **BIMIFY ADVANCED**: here you can choose options to use in your BIM model by ticking the boxes.



In the Bimify dialog, you have the option to scan the entire drawing, or just scan selected entities in the drawing.

Bimify can automatically detect whether a model is an Architectural, Structural or MEP model. BricCAD uses this information during the autoclassification process. Define this information before you launch Bimify, to improve the accuracy of the automatic classification.

Classification enables us to classify 3D Solids and Block References automatically.

Checking the **Structural/MEP Profiles** box allows us to automatically assign column, beam, member or flow segment profiles. If their profiles match a definition in the profile library, the profile name will be automatically added to the entity's properties as meta-data. If no matching profile definition is found, a new one is created in the library.

Spatial information will assign locations to objects, i.e. whether they are part of a certain building or floor.

Create Spaces will create new solid objects that are classified as spaces, based on the adjoining walls and slabs.

Sections allows to create automatic elevations and floor plan section planes.

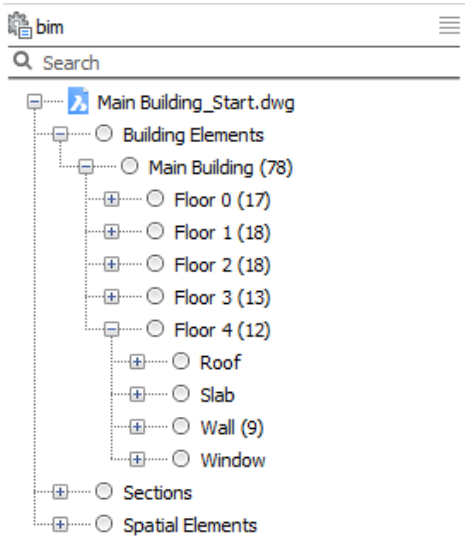
4. Press **OK** to use all the options.
5. Expand Building Elements in the **Structure Browser**: All the 3D solids in the model are divided in different sorts of building elements. Select one in the structure browser, and one in your model, to show the link between model and structure browser and the ability to quickly select solids.
6. Spaces, Elevations and floor sections have also been added to the model.

3 Structure Browser and Spatial Locations

The spatial locations allow you to specify a building and its stories in a project. In BricsCAD, a BIM model file can contain one site and multiple buildings and a building can contain multiple stories. When the entities are classified as a building element in the project, these classified entities will have a **Building** and a **Story** property. Every building element in the

BIM model resides in a particular story within a particular building.

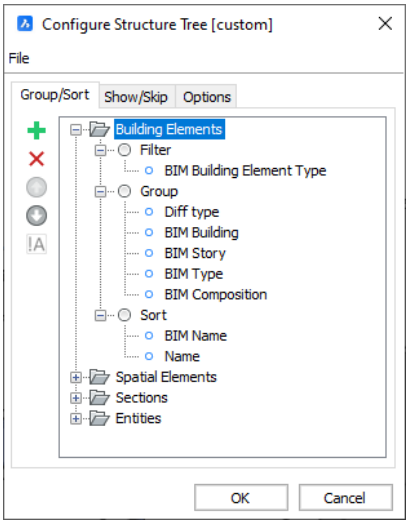
1. Quad select **SPATIAL LOCATIONS** (Quad: **BIM** tab).
2. You should see one building. Rename it to **Main Building**.
3. Inside this building should be 5 levels.

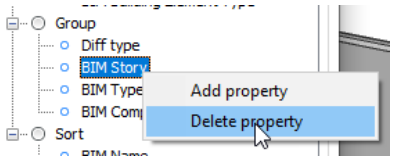


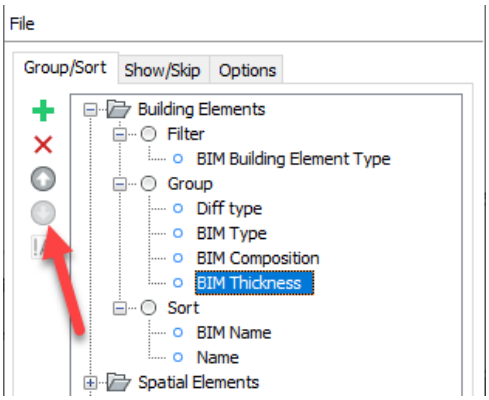
4 Customizing the structure browser

As mentioned before, the structure browser is fully customizable. Let's take a look at how this can be accomplished.

4. Click **bim** at the top of the structure browser. The Configure Structure Tree dialog appears.
5. First, let's make sure we create a new configuration file instead of editing the existing bim.cst. Click **File** at the top left, click **Save as** and create a new file, e.g. *custom.cst*
6. For now we are only interested in the **Building Elements** rule, so we can collapse all other ones (i.e. Spatial elements, Sections & Entities).
7. We can see that the **Building Elements** rule only displays entities that have a certain *Building Element Type*, as defined by the filter.
8. Then, we see that these objects are grouped according to different rules: first they are grouped according to their Diff type (we can ignore this for now), then they are grouped by Building, within each building they are grouped further by story, by type etc.
9. Finally, the objects within each group are sorted by BIM Name and Name.
10. Let's say we are not interested in the Building & Story information, so we can simply remove them from the grouping properties. Right-click **BIM Building** and delete the property. Do the same for **BIM Building**.
11. What if we want to group existing objects by a certain property? We can easily add a rule by

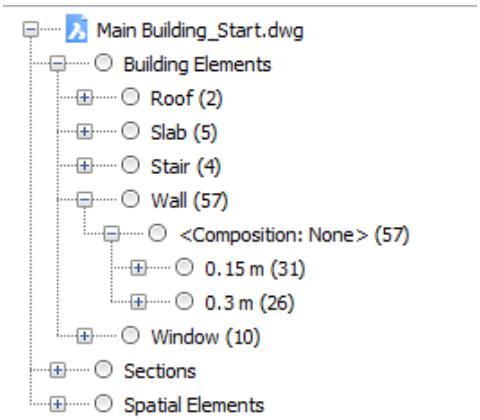






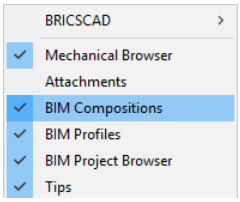
clicking the green Plus icon. This opens up a new dialog where we can select a property.

12. Scroll down this list and under **Extensions > Quantity**, select **Thickness**.
13. Finally, select the *Thickness* property in the list of Grouping properties, and move it down using the down arrow on the left-hand side of the dialog box. Move it so that it you have the same configuration as shown in the image on the right.
14. Finally, click **OK**.
15. The structure browser should now look different. When expanding **Building Elements**, you should no longer see a *Main Building* with different floors in it, but rather see the types directly grouped together i.e. walls, slabs etc.
16. When expanding *walls* you will see 57 walls with no composition, and when expanding this node further you should see two groups: a group of 31 walls with a thickness of 0.15 m, and a group of 26 walls with a thickness of 0.3 m.

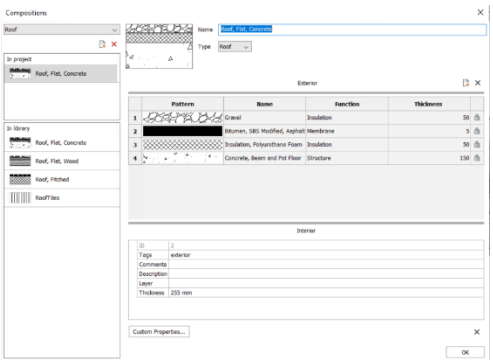


5 BIM Compositions

To further add BIM data to our drawing, you can add **Compositions** to the entities of the model. They can be either multiple plies or single-ply. In BricsCAD, predefined compositions of each building element type are stored in the library database.



1. Open the **BIM Compositions Panel** on the right-hand side of your screen. If the panel is not shown, right-click a blank menu area and select **BIM Compositions**.
2. It should appear with an icon in the Tool Panel. If it appears as a standalone, drag it over Tool Panel and position cursor until the large rectangle turns blue and release.
3. Use the search button to find **Roof, Flat, Concrete.**
4. (Optional) Double click to open the Composition dialog to edit the composition plies.
5. Drag and drop this roof type onto the Roof.
6. You are prompted to select a reference face. The top face should be highlighted by default. If it is not, you can change it by clicking this icon: .
7. The selected face (reference face) will stay in the same position while the other face will shift if the object needs to get thicker or thinner.



8. In this case, you need the reference face to be the top face. If not, you should flip it and press Enter. The composition is now applied to the roof.

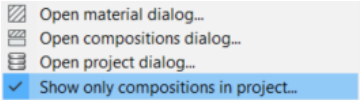
9. Make sure **RENDER COMPOSITION MATERIAL** is toggled **ON**. This option allows to enable displaying render materials of compositions applied to objects in the model.

10. Create a **BIMSECTION** in the ribbon or Quad select in Model tab.
11. Select the front face of the building to define the direction of the section.
12. Type in **2000mm** to define the distance of the section.

13. Click on the dropdown menu of the Compositions panel and choose **Show only compositions in project...**

14. Using the structure browser, select the two **Roofs** and drag-and-drop the *Roof, Flat, Concrete* on one of them. Accept the default reference faces.

15. Repeat this process with the following types & compositions:
    5 slabs: **Floor, Concrete, Insulated**
    31 interior walls: **Interior wall, Plaster**
    26 exterior walls: **Cavity Wall, Front**



7 Composition Plies

To further add more detail and information in your drawing, let's increase the LevelOfDetail (LOD) by editing the plies of the compositions.

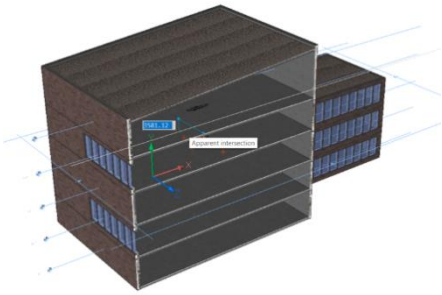
16. Zoom in to the connection between the bottom floor slab and exterior wall.

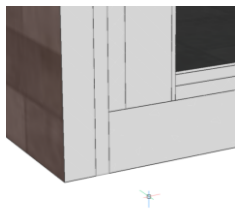
17. Make sure **LEVEL OF DETAIL** is toggled **ON**. Level of Detail allows to manipulate individual composition plies/materials.

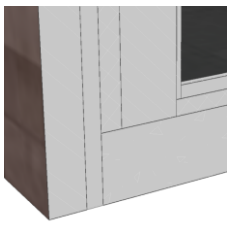
18. Since you will be editing the plies of the compositions, **Selection of faces should be ON** in the ribbon or **SELECTIONMODES** should be **value 2**.
19. Hover cursor near the concrete surface of the floor slab, and press **Tab** until the Ply Face of the Concrete ply is highlighted.

20. Quad select **PUSH/PULL** and move it to the insulation layer of the wall (like the image on the right).
21. Do the same for the floor screed layer, until it looks like the right images.
22. You can check the change in the geometry of the floor slab.
23. Selection of faces can be turned **OFF** in the ribbon or **SELECTIONMODES** should be **value 0**.

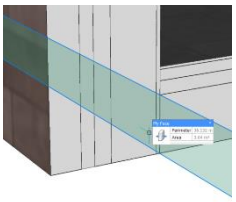
24. Highlight floor solid.

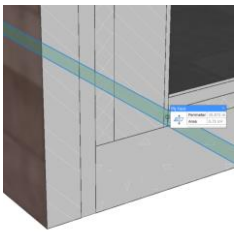


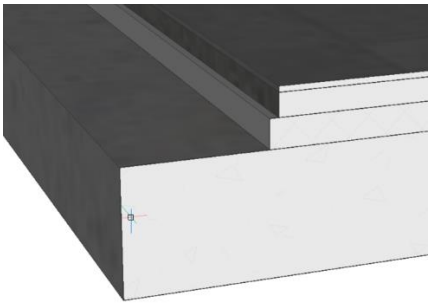




25. Quad select **ISOLATE ENTITIES**
26. The floor geometry is isolated, and you should see the form changes that you just made.
27. Quad Select **SHOW ENTITIES**

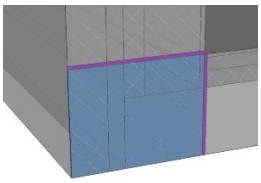




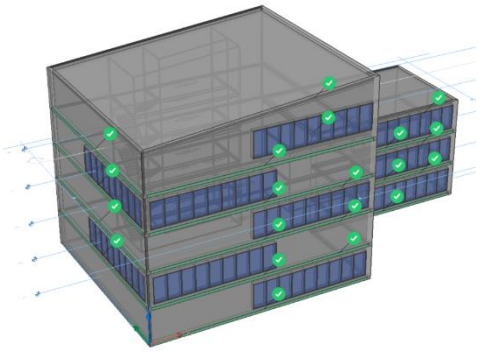


8 Automatically copying details with BIMPROPAGATE

BimPropagatePlanar is one of the five Propagate options in BricsCAD BIM. It can be used to copy detailed connections between two or more planar entities. Propagate will search for similar situations in the drawing where the connection can be applied to. Common examples are wall-slab connections or wall-wall connections.



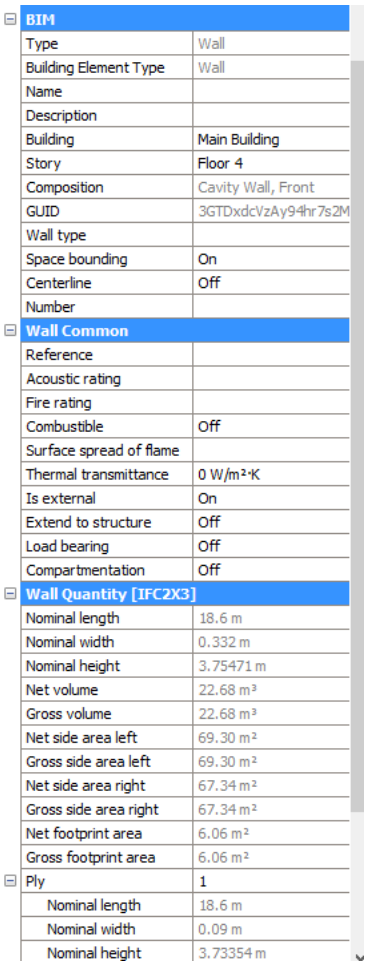
1. Toolbar select **BIMPROPAGATE PLANAR** (Quad: **Model** tab).
2. Select the floor and wall that have been edited previously.
3. Press **Enter** twice, once to confirm the reference solids, once to confirm an extra solid (optional).
4. The detail should be shown as in the top right image. Press **Enter** to confirm the detail.
5. The locations where the desired detail can be applied will be marked with **a green checkmark.**
6. Press **Enter** to **apply all 29** visible suggestions.
7. The section will be activated again.
8. Zoom in to the other side of the building where you didn't edit the composition plies to see the applied connection.

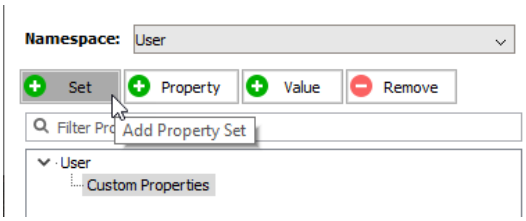


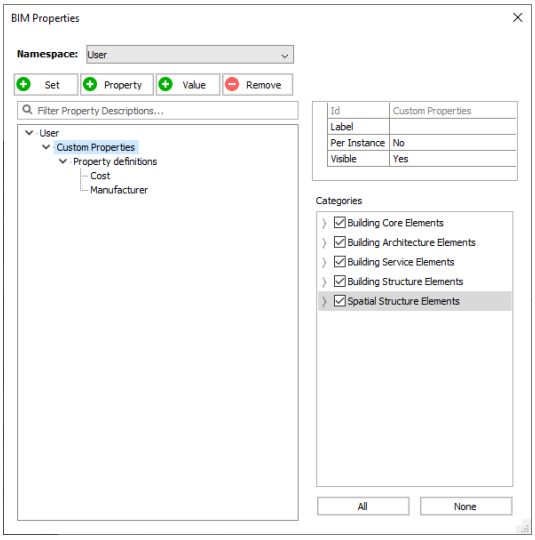
9 Properties

Every entity has properties. A Line entity has CAD properties such as Color, Layer and Linetype. BIM entities have these properties as well, but besides other properties are available depending on the type of entity.

1. Select one of the exterior walls and open the **Properties Panel**
2. **Mass** properties are calculated based on the geometry of the solid and are not editable.
3. **BIM** properties include spatial locations, compositions, and other BIM specific properties
4. **Quantity** properties are also calculated based on the geometry of the solid. This section also allows you to see quantities of separate composition plies (e.g. volume of concrete in a composite wall).
5. **Wall Common** is part of the IFC Common properties, governed by BuildingSmart. These are hardcoded and used by other BIM applications.
   Note: if you select a window this will show **Window Common** instead of Wall Common. You can enter values for Fire Rating or Acoustic rating here.
6. It's possible to create custom properties as well. In the **No selection Quad** under the **BIM** tab, click **Properties**. The dialog box displays for specifying and editing properties of BIM projects.
7. By default, three namespaces exist. **IFC2X3** contains the IFC common properties that we talked about earlier. **User** contains custom properties. **Quantity** contains some quantities of BIM objects, such as the length of a wall.
8. Go to the **User** namespace, add a new Property Set and give it a name, e.g. **Custom Properties**
9. You can choose which types of objects this property set applies to. This way, you can make custom property sets for e.g. windows, or columns and beams, or whichever combination you want. In this case, we'll just apply it to **all** categories.
10. Add a new property to the selected Property Set and give it a name, **Cost.**
11. You can also define the type of the data:
    Boolean: an ON or OFF value.
    Integer: a whole number between -2147483648 and 2147483647.
    Real: an approximation of a real number.
    String: a sequence of characters, can be both numbers and letters.
12. Change the Cost property to a **Real** type.







13. Let's add another property to this set: **Manufacturer**. The data type should be **String**.
14. If we now select any BIM entity, we should be able to see these new properties in the Properties Panel and fill in the values.

Drawing documentation basic

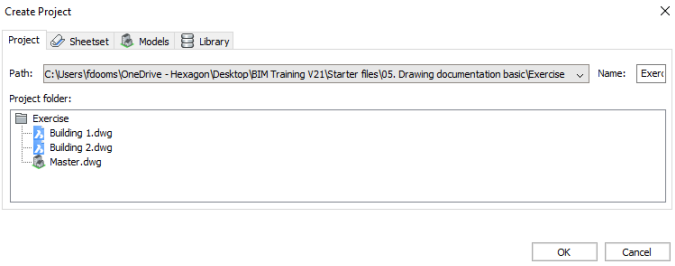
This module explains the basics of drawing documentation. We will use the Project Browser to set up a project and place sections and schedules, generated from our BIM model, onto sheets.

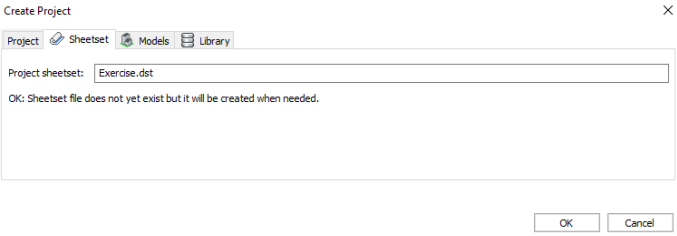
1 **Opening the file**

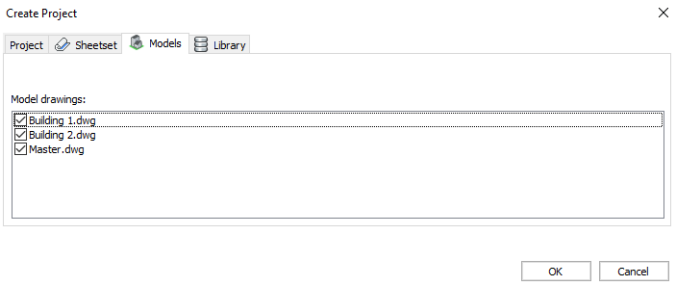
Open **Master.dwg** from the Exercise folder in the Drawing documentation basic folder.

2 **Project set-up**

1. On the left-hand side of the screen, open the **PROJECT BROWSER** Panel 
2. Click **Create Project...** button in the panel.
3. **Create Project** window appears. It is divided into 4 tabs:







   a. **Project:**

      Here you see the path of the folder in which your current dwg is located. You also see all the files that are in the specified folder, because those might be all the files that we want to keep together.

      Dwg's that are noted with a building icon are models that are part of the project.

      On top of the project folder structure tree, you find the path in which the folder is located and you can specify a name for the project.

   b. **Sheetset:**

      Here you can set the name of the .dst file that will contain all the sheets in the project.

   c. **Models:**

      Here you can choose which models will be included in your project. Check all of the checkmarks to **include them all**.

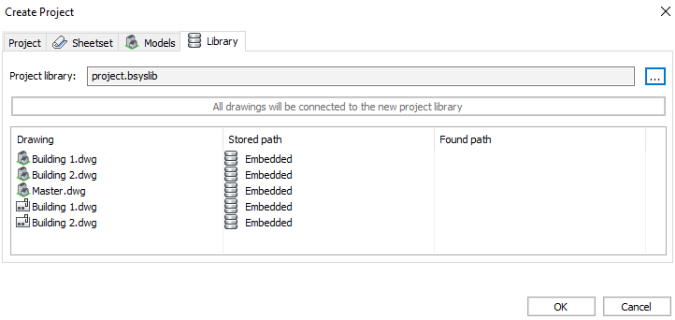
   d. **Library:**

      In the library tab you can find which library is used by which file.

      A new external library will be set for all models so that they all share the same library. This file is a database which stores information such as materials and

compositions, steel profiles, custom properties, and the connection with the generated sheets. Using this external database avoids duplicating materials, and allows you to modify a material or composition over the entire project instead of just one model.

Afterwards, all the drawings will share the same library. If you for example make a custom property set in one of your drawings, these properties will also show up in the other drawings and vice versa.



4. After going through the different tabs, hit **OK** to confirm the settings.

3 Sheetset set-up

1. In the second step of the creation of a project, we get the Sheetset set-up dialog. Here we can see a list of all our sections and previews of our sections onto sheets.

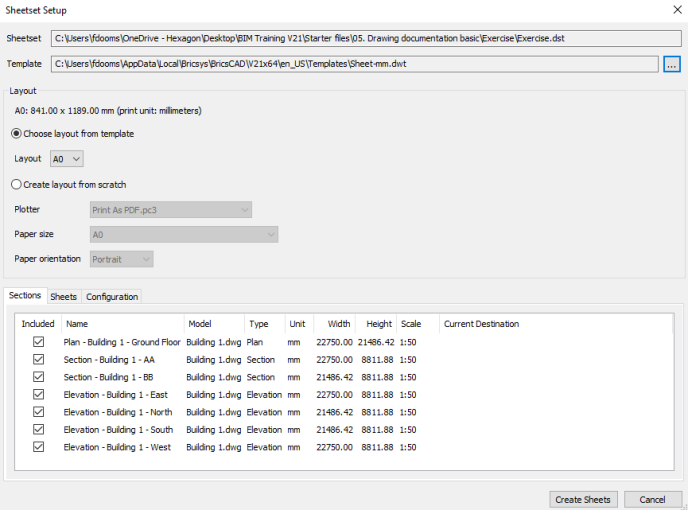
2. The dialog consists of 4 parts:

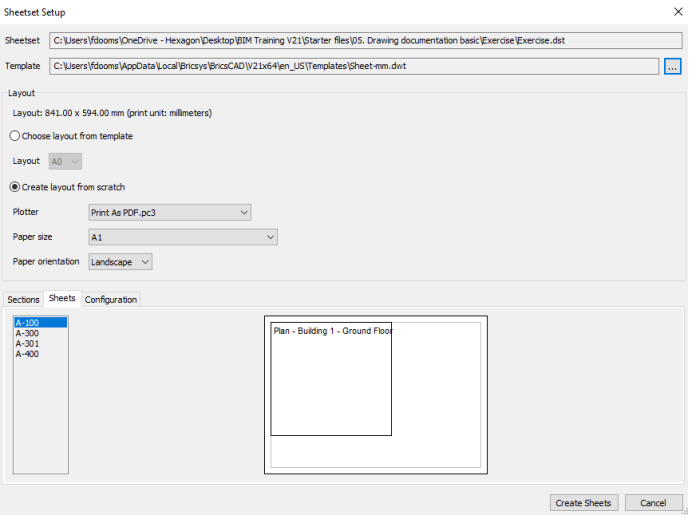
   a. **Info at the top:**

   You see the path of the sheetset that you specified in the previous step. You see the sheetset template that is being used. You can specify your own here if you wish. If you choose a layout from template, it will look to the template which you set under the template path to find all available lay-outs and list them in the drop-down.

   You can also choose to create an empty layout from scratch, by choosing a plotter, a paper size and orientation from the respective drop-downs.

   For this exercise, **choose 'Create layout from scratch'** and select **paper size A1** and **paper orientation landscape**.





   b. **Sections:**

   You see all the sections available in the models of your project. You can select or deselect them to be included . If a section is already placed on a sheet then this is stated in the 'Current Destination' column. These sections will not be placed onto any new sheets, so that the current destination will never be overwritten. You can also change the scale of the drawing. To begin, the sheetset set-up takes the scale specified in the Properties of your section planes. By double-clicking the scale however, you can still change it afterwards.

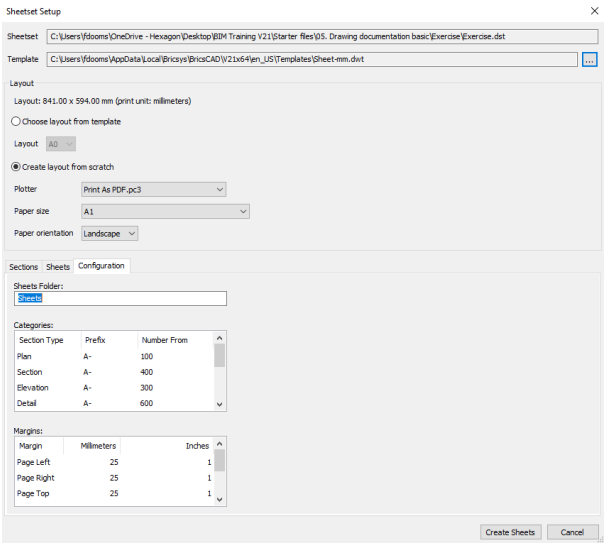
   In this project we will accept the default: include all the sections with their predefined scale.

   c. **Sheets:**
   Here you see a preview of your sections' outline onto your sheets. We are creating 4 sheets now: one with the floor plan,

called A-100, and two with the elevations, called A-300 and A-301, and one with the sections called A-400.

d. **Configuration:**
Here you can specify some naming options, as well as make sure that different types of sections are placed onto separate sheets or onto the same sheet. You can also specify margins. We will not touch the default settings however.

3. Click on **Create Sheets** to finish the project and sheetset set-up.



4 Explore the project

1. You now can see that the project is created and it has 4 tabs:

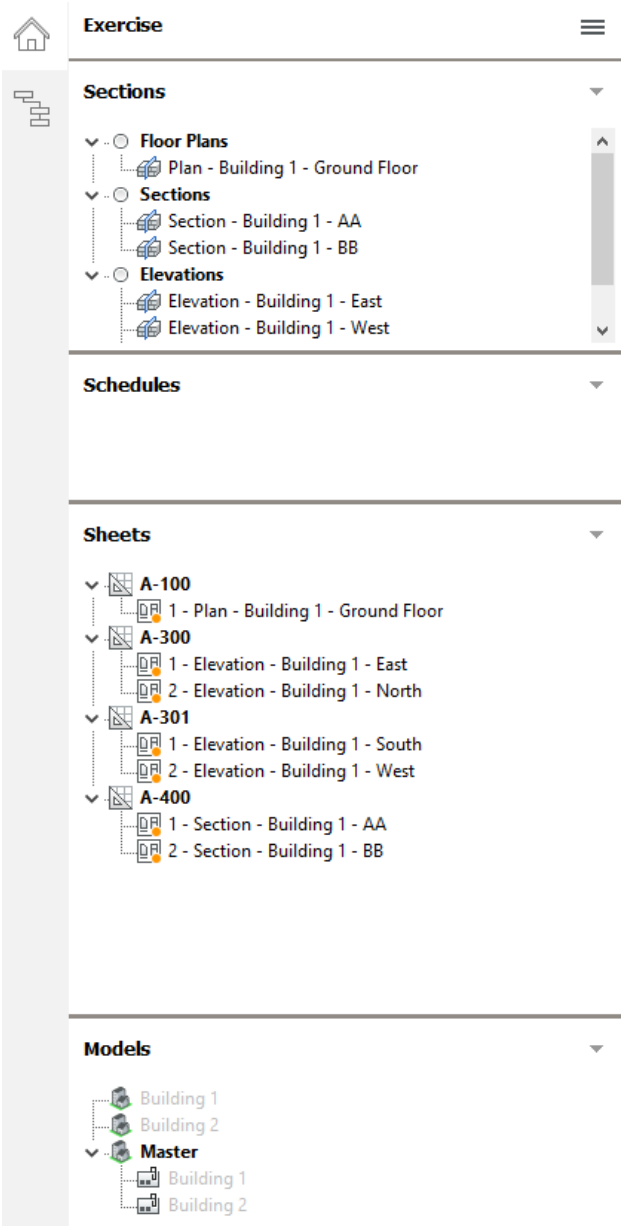
   a. The first is the *sections* tab with a list of all sections in the project. If you right-click one section name, you can:

      - View the section properties with 'Section properties...'.
      - Select the section object, with 'Select Section Entity'.
      - Rename the section object with 'Rename'.
      - Update the generated result attached to this section object with 'Update'.
      - Go to its generated result, with 'Display Section Result', if there is already a sheet with this view on.

      You can also drag-and-drop a section onto a different sheet than the sheet which it is currently located on, by dragging the section name from the 'Sections' tab towards the sheet name in the 'Sheets'-tab.

   b. In *schedules,* you will be able to find all schedules that were generated. Schedules list quantities of your model, specified in the order that you want. We don't have any schedules for now, but we will make them further on in this training.

   c. In *sheets,* you find all the sheets in the sheetset. You can enable BricsCAD to update them in a background process: the ones without icon are already updated, the ones with the loading sign are in progress and the ones with an orange dot next to them are queued and will be done after the previous one is finished.



To enable background updating, click the hamburger menu in the top right corner of the panel and check the setting **Enable Background Update**. If you right-click on the sheet name, you can:

- View the sheet's properties with 'Sheet properties...'.
- Open the sheet with 'Open sheet'.
- Remove the sheet with 'Remove...'.
- Add a sheet subset in the project's sheetset with 'Add Subset'.
- Add a new sheet in the project's sheetset with 'Add Sheet...'.

If you right-click on the view name, you can:

- See the view's properties with 'View properties...'.
- Display the view, placed on the sheet which it is part of, with 'Display View'.
- Manually update the view by right-clicking it and selecting 'Update'.
- Remove the view y clicking 'Remove View/Result'. Be careful with this option, since it will not prompt you for any confirmation after choosing this option.

d. In *models,* you can find the models in the project and you can navigate to them by double-clicking them. If you right-click a model, you get following options:

- 'Model properties...' to view the properties of the model.
- 'Close drawing' to close the drawing if it would be open in the current BricsCAD session.
- 'Remove from Model List' to remove the drawing from the models included in the project.

5 Edit the project

1. To edit the project after creation, you can go to the hamburger menu in the top right corner of the panel and click on '**Project set-up...'**. Then we get the same dialog as upon creation, and you can alter the project.

Altering the 'Name' of the project (in the Project tab) will just alter the name you see at the top of the Project Browser Panel.

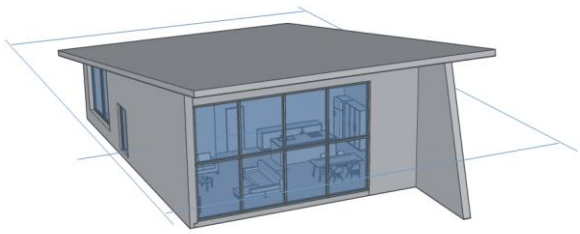
Changing the 'Project sheetset' (in the Sheetset tab) will create an entirely new sheetset for the project. In which case, you will have to go through Sheetset Setup again to generate the sheets in this new sheetset.

Changing the 'Project library' will connect all the drawings in the project to this new library. Make sure to only do this when you really need to define a new library for all models.

6 Adding section planes

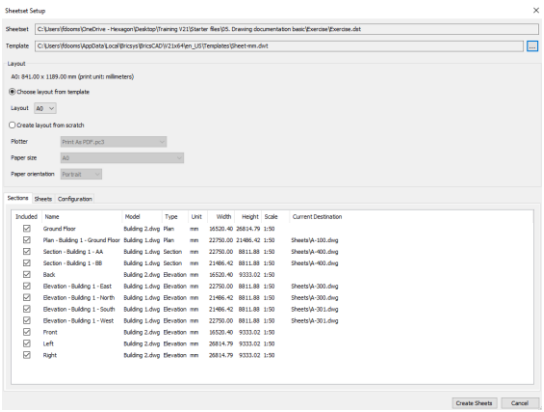
To add new sections in the Xref without sections, you can run Bimify on the model.

1. Let's open up the Xref of Building 2 by selecting **XOPEN** from the Quad (select Xref: **Modify** tab).
2. We can run **BIMIFY** (Quad: **Bim** tab) on it to generate the section planes, or manually create section planes using the **BIMSECTION** command. Note that a section plane has a property called 'Project Section'; if this property is ON, the section plane will appear in the Project Browser and you can use it to generate drawings. Let's run **BIMIFY** on this drawing. Automatically, one floor plan and four elevations are created.
3. If we now save the file, go back to our Master model and reload the attachment in the **ATTACHMENT PANEL**, we can see the sections appear in the drawing.
4. If we refresh the Project Browser (Hamburger menu > 'Refresh'), we will see the sections appear in the 'Sections' tab as well.



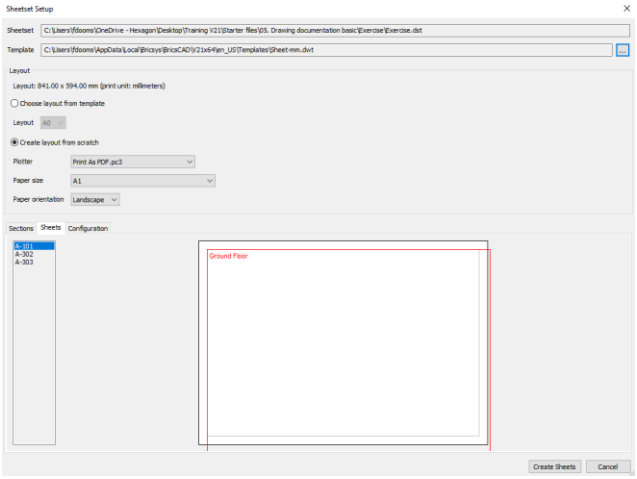
7 Add new sections to new sheets

1. If we go to **Sheetset Setup** (under the hamburger menu) we can now include the new sections on new sheets.
2. We get the same dialog as during the creation of the project. Again, pick **A1 landscape** from the **'Create layout from scratch'** option.
3. Now you see that in the Sections tab we have sections that already have a current destination filled in.
4. In the Sheets tab, we get three sheets: one for the plan and two for the elevations. The sections that already had



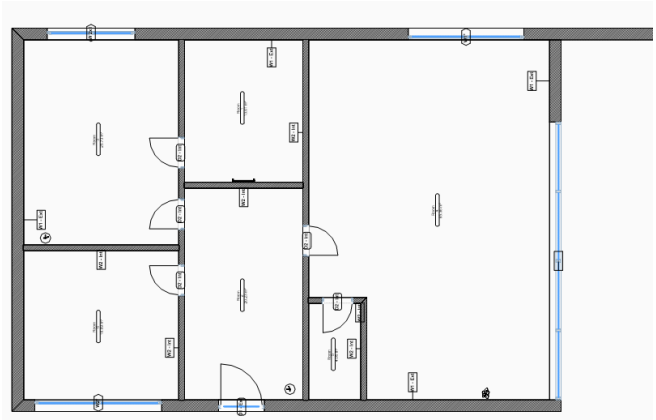
a destination file are not placed onto these sheets again.

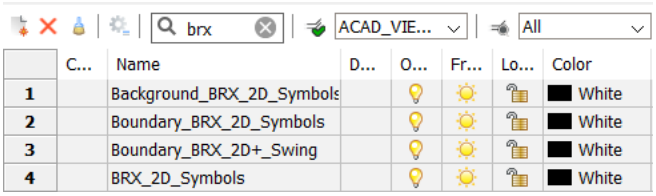
5. Let's try and change the scale for the plan to **1:20** instead. You can do that in the Sections tab.
6. If we now go back to the Sheets tab, we see that all the view 'Floor 0' turned red, because it doesn't fit the sheet size anymore.
7. Revert the plan scale to **1:50**.
8. Hit **Create Sheets** to create the sheets.
9. We see that the sheets are added to the tab Sheets and they are again automatically updated in the background, if the 'Background update' is on.

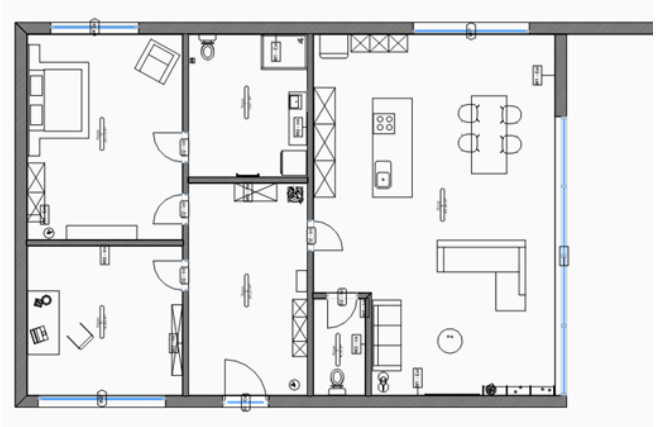


8 Check generated drawings

1. To see the resulting drawing of section Ground Floor, right-click **Ground Floor** in the 'Sections' tab and select **Display Section Result** in the flyout menu.
2. The floor plan is placed on a sheet and we see the cut-through representation of the walls, as well as some automatically placed tags. However, we don't see the furniture.
3. To fix that, filter on **BRX_2D** in the LAYERS PANEL . Make sure all layers with this in their name are turned on.
4. If the BRX_2D layers are turned on we see our furniture. This happens because our real section was replaced by a 2D symbolic representation. The component we cut through had a 2D representation on the BRX_2D layer and this makes that our actual section will be overwritten. If you want a 2D representation together with the actual section, you need to use the **BRX_2D+** layer. This is, for example, handy for doors, where you want to display a door swing together with the cut-through representation of the door.
5. We will discuss in more detail the created layers in the Drawing Documentation Advanced module.

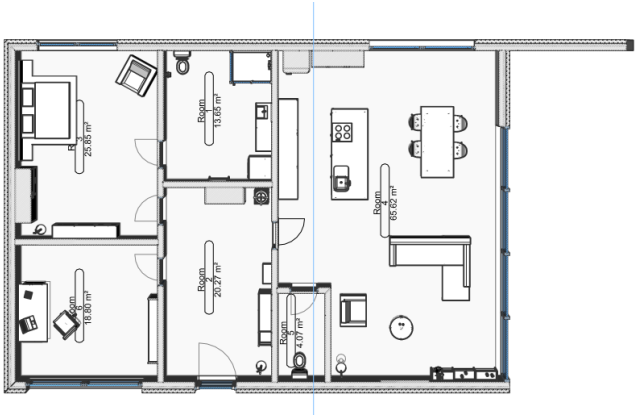


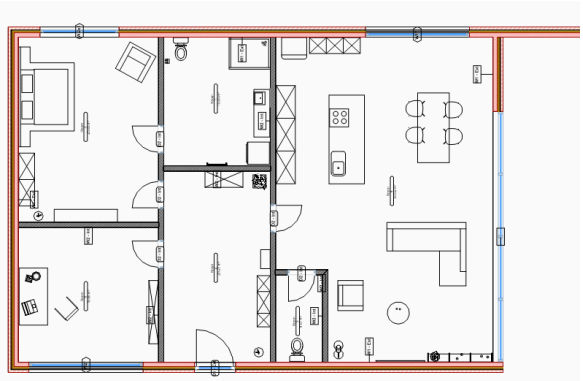




9 Changing the 3D model

1. Let's make some changes to the BIM model and update the floor plan. Open up the section in the 3D model easily by selecting the viewport we were looking at before and clicking **Open Model** (Quad: **Model** tab).
2. Select an interior door and Quad select **BIM Flip** (Select door: **Model** tab). The door swing is flipped.
3. **Delete the couch** in the living room.
4. Open the **LIBRARY PANEL** .
5. Browse to the **Furnishing Elements**.
6. Drag a chair into the living room.
7. Give the outer walls the composition **Cavity Wall, Brick** by first selecting the walls and then drag and drop this composition from the **COMPOSITIONS PANEL** onto the selected elements.
8. Save drawing Building 2.dwg.
9. Switch to the **Ground Floor** plan.
10. Update the floor plan either using the **PROJECT BROWSER** or select the BIM Viewport and Quad select **UPDATE SECTION** (Quad: **Model** tab).
11. The floor plan view will update to display the changes.



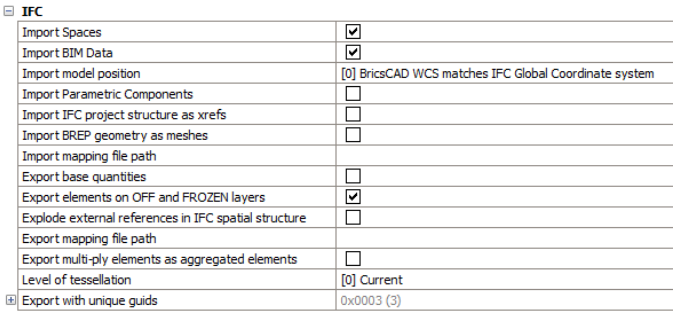


Collaboration

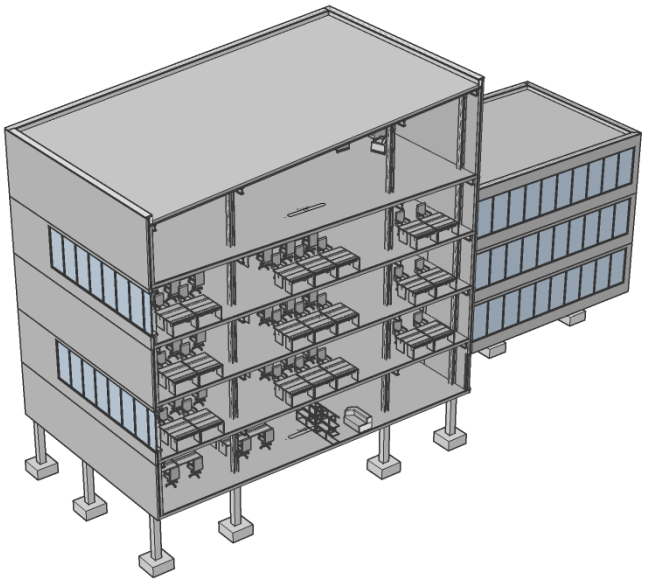
This module explains how to collaborate during the design of a project. You will learn how to import and export IFC files, as well as work with BCF files. We will cover Revit import, and explain how the 24/7 panel works.

1 Importing IFC files

1. Open a new drawing in the BIM-mm template.
2. Under **Settings**, scroll down and go to the section **BIM > Import and Export > IFC**. Here you can find some settings on import and export of IFC files
3. Make sure the default settings are applied, as shown in the image (non-default settings will be highlighted in blue).
4. Click the **Bricsys** button in the Menu Bar and select **Import**. The import file dialog box displays.
5. Browse to the correct location and import **MainBuilding_Arch.ifc**.
6. A building should be imported. Navigate through the model using the structure browser, the spatial locations manager and the compositions panel, and check if everything is in order.
7. Now, **Import** the other IFC file: **MainBuilding_Str.ifc**.
8. A steel structure should be imported. In this case, the steel structure is located on a different spatial location (*Steel structure* as opposed to *Main Building*).
9. Notice that the geometry is imported as **native geometry** such as solids and block refs. This means that we can edit any imported geometry as if it were created in BricsCAD!



IFC	
Import Spaces	☑
Import BIM Data	☑
Import model position	[0] BricsCAD WCS matches IFC Global Coordinate system
Import Parametric Components	☐
Import IFC project structure as xrefs	☐
Import BREP geometry as meshes	☐
Import mapping file path	
Export base quantities	☐
Export elements on OFF and FROZEN layers	☑
Explode external references in IFC spatial structure	☐
Export mapping file path	
Export multi-ply elements as aggregated elements	☐
Level of tessellation	[0] Current
Export with unique guids	0x0003 (3)



2 Exporting IFC files

We will export this same file to IFC. However, we will define some rules on what and how to export.

1. Browse to the folder where the two IFC files were stored, and open **exportmapping1.txt** using a text editor.
   This is an export mapping file. It contains some simple rules, such as mapping a certain BricsCAD BIM type to a certain IFC type.
   In this case, BimDbFootings are mapped to IfcColumns. If no explicit mapping is mentioned in this file, then the types will be implicitly mapped to their corresponding IFC types (e.g. BimDbFooting to IfcFooting, BimDbWall to IfcWall etc.)
   It also contains two lines saying that furnishing elements and flow terminals should be skipped, i.e. will not be exported.

```
BimDbFooting      IfcColumn
BimDbFurnishingElement   skip
BimDbFlowTerminal    skip
```

2. Open the **Settings** dialog. Under **BIM > Import and Export > IFC**, find the *Export Mapping File Path* setting, and choose **exportmapping1.txt**.
3. In the Ribbon under the **Home** tab, click **Export to IFC**, or alternatively type in the **IFCEXPORT** command.
4. Press **Enter** to select the entire model
5. Choose a file name.
6. In the **Save As** type, you can choose to export as IFC2X3 or as IFC4.
7. Click **Save**.
8. (optional) open the IFC file in an IFC viewer such as Solibri. You will notice that no furnishing elements or flow terminals are present in the drawing. Also, the Footings were exported as columns.
9. Browse to the folder where the two IFC files were stored, and open **exportmapping2.txt** using a text editor.
   Here you will notice that 4 types have been mentioned explicitly, even though they are using the default mapping (BimDbColumn > IfcColumn, BimDbBeam > IfcBeam, BimDbMember > IfcMember and BimDbFooting > IfcFooting).
   This is because of the * operator, which means 'all non listed entity types'.
10. In BricsCAD, choose this exportmapping2.txt as your new export mapping file in the **settings** dialog, and repeat steps 3 to 7.
11. When opening this IFC file in a viewer, you should see that only columns, beams, members and footings were exported.

```
BimDbColumn IfcColumn
BimDbBeam   IfcBeam
BimDbMember default
BimDbFooting    default
*   skip
```

Mapping to the default type can be done in two ways: either by writing the corresponding export type explicitly, **or** by writing 'default' as the export type.

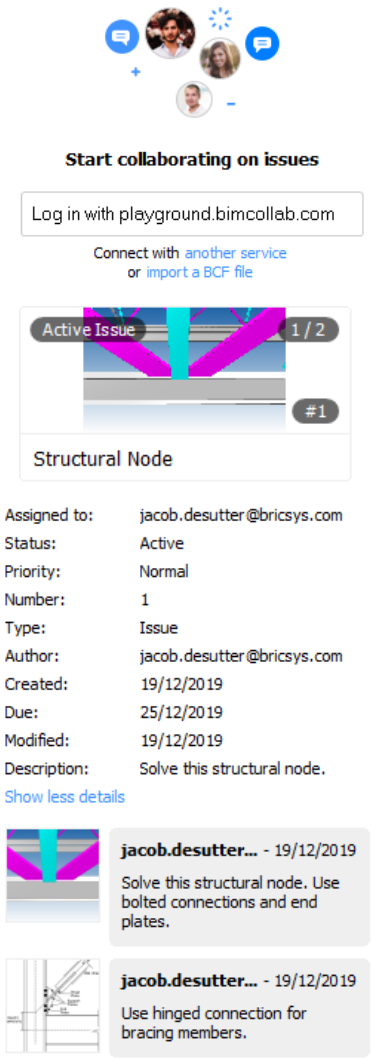
3 Importing IFC files using custom mapping

The same method of export mapping can be used for **import mapping**. The exact same rules apply, the same type of file can be used, and the same syntax is used. The only difference is the order of types: now obviously an IFC type should be mapped to a BimDb type. So instead of writing *'BimDbWall IfcWall'* you should write *'IfcWall BimDbWall'*.

1. Try to create your own Import Mapping File, e.g. converting IfcWindows to BimDbDoors, and skipping some entity types (hint: the delimiter used between two words in this file is **tab**).
2. In the Settings dialog, select this new file as your *import mapping file*
3. Import one of the IFC files, and check if it worked correctly.

4 Working with the BCF panel

1. Open a new drawing in the BIM-mm template.
2. Under **Settings**, make sure the Import Mapping File Path is empty, i.e. no mapping file is used
3. **Import** the *West_Str.ifc* file
4. Zoom out so you can see the geometry
5. Open the **BCF Panel** . If you cannot see this icon, right-click anywhere in the ribbon and under panels, enable **BIM BCF**
6. In this panel, you get the option to either log in to a BCF service such as BIMcollab, BimSync or BIMtrack, or to import a .bcf file. Due to practical reasons, in this training we will only cover the .bcf file import. For more information on synching with BCF servers, please visit our help page.
7. Click **Import a BCF file**, and choose *Structural_node.bcf*. You should see an active issue appear in the BCF Panel.
8. Click this issue. You should find some information on the issue e.g. creation date, due date & assignee.
9. Click one of the images at the bottom. This should take your camera to the location of the issue. This allows you to easily navigate through issues and solve them where necessary.



Increasing LOD

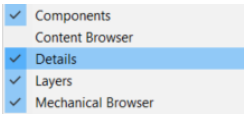
This module explains how to further increase the level of detail in your model.

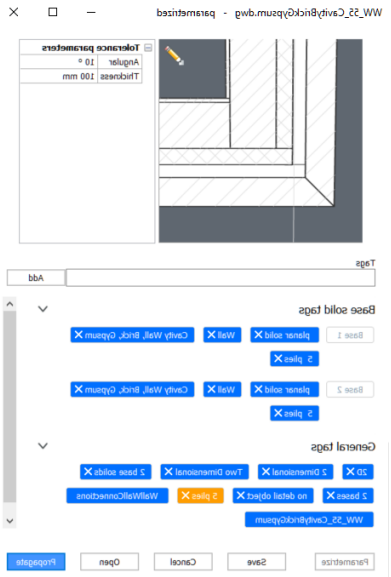
1 Details Panel

On Windows, paste the details from the Details folder in the following path: *C:\ProgramData\Bricsys\Support\Bim\Details.*

For Mac open the Finder, go to the Go tab and click on 'Go to folder...' and type in *var/Bricsys/Details*. Paste the content of the Details folder there. The Details folder can be found in the folder 'Increasing LOD'.

The **Details Panel** is a panel where you can store construction details, like planar details (e.g wall-wall connections, wall-roof connections, etc), structural steel details and MEP details.
This way you can use a certain detail not only inside one drawing but also in other drawings outside a certain project.

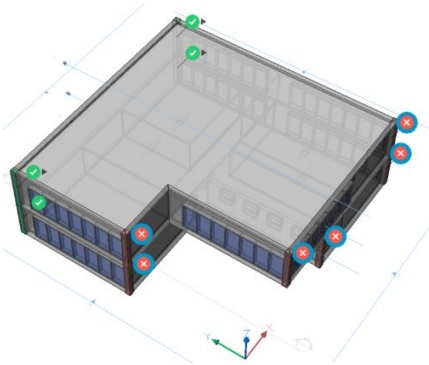


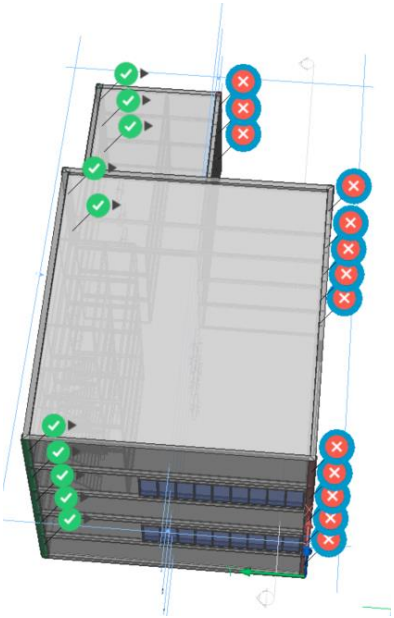


1. Open **'SecondBuilding LOD.dwg'**
2. Turn **ON** of the **Floor Plan section (Floor 1)** by using **CLIPDISPLAY** or by double-clicking.
3. Zoom in to the **Wall, Front - Wall, Back-**connection
4. Open the **Details Panel** on the right-hand side of your screen. If the panel is not shown, right-click a blank menu area and select **Details.**
5. It should appear with an icon in the Tool Panel. If it appears as a standalone, drag it over Tool Panel and position cursor until the large rectangle turns blue and release.
6. Like most of the dockable panels in BricsCAD, it is equipped with a search tool so you can quickly find the specific detail you are searching for. In the Details Panel, this search function works with tags: **solid tags, general tags, and customized tags**.
   Use the search button to find all wall connection using the **Wall**-tag. Click on the **+ sign** once.
7. Choose the detail **'WW_55_CavityBrickGypsum.dwg'** and open it by double-clicking.

2 Propagate saved Details

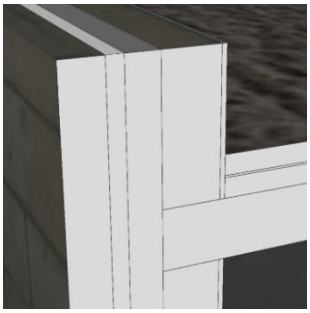
1. Click **Propagate** in the detail dialog.
2. The locations where the desired detail can be applied will be marked with **a green checkmark**
3. Only apply the suggestions on the connections of the blind facade (like the image).
4. Press **Enter** to apply all 4 suggestions.
5. The floor section will be activated again.
6. Zoom in to the **Wall, Front - Wall, Back-** connection again to see the difference.
7. Close the section plane.
8. Open **'Main Building LOD_Start.dwg'**
9. Drag and drop the detail **'WW_55_CavityBrickGypsum.dwg'** into the drawing to propagate.
10. The locations where the desired detail can be applied will be marked with **a green checkmark**
11. Only apply the suggestions on the connections of the blind facade (like the image).
12. Press **Enter** to apply all 10 suggestions.
13. Turn **ON** of any **Floor Plan section** by using **CLIPDISPLAY** or by double-clicking.
14. Check the new construction detail.
15. Close the section plane.





3 Create an advanced Detail

1. Open **'SecondBuilding LOD.dwg'**
2. Open the **vertical section plane**.
3. Zoom in to the connection of the roof slab and exterior wall.
4. Since you will be editing the plies of the compositions, **Selection of faces should be ON** in the ribbon or **SELECTIONMODES** should be **value 2**.
5. Hover cursor near the concrete surface of the roof slab, and press Tab until the Ply Face (green) of the concrete is highlighted.
6. Quad select **PUSH/PULL** and move it to the insulation layer of the wall (like the image on the right).



7. Let's add a wall cap on the rooftop edge. Hover cursor on the top face of the exterior wall, press **Tab** until the Solid Face (orange) is highlighted.

8. Quad select **SOLID EXTRUDE** , drag the face up to create a new solid.

9. Type in **50mm** for the height and press **Enter**. Now a new wall cap solid is created in the construction detail.

10. Hover of the horizontal face (orange on the image) and **SOLID EXTRUDE** to delete the part until the wall cap.

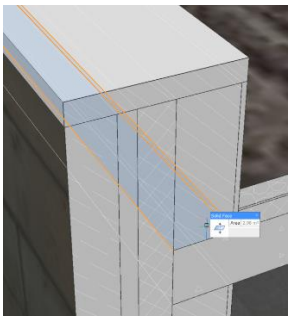
11. Highlight the same horizontal face and **SOLID EXTRUDE** to create a new solid for insulation.

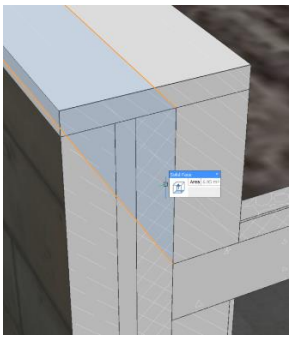
12. To finish, highlight the side face of the new insulation solid and **PUSH/PULL** to the next ply of the wall (see last image on the right).

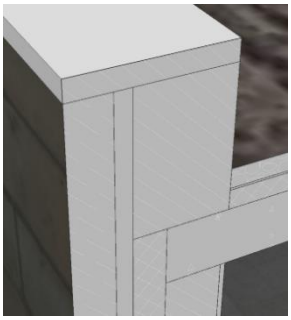
13. **Selection of faces can be turned OFF** in the ribbon or **SELECTIONMODES** should be **value 0**.

14. Open the **BIM Compositions Panel** and search for **'Concrete'** (Show only compositions in project should be off).

15. Add following compositions to the 2 newly created solids by dragging and dropping the compositions:
- Wall cap: **'Concrete, Plain'**
- Insulation block: **'Supporting Wall, Cellular Concrete'**







4 Save Details in the Details Panel

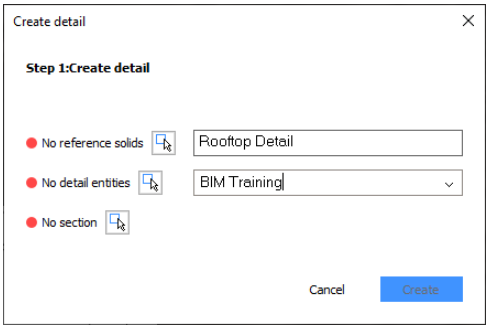
1. Type in **BIMCREATEDETAIL** in the command line.

2. A dialog will pop up to specify info about the detail. Type in de detail name, for example, **Rooftop detail**

3. Assign the detail to an existing category in the dropdown menu. Or create a new category by typing the new category name, for example, **BIM Training**

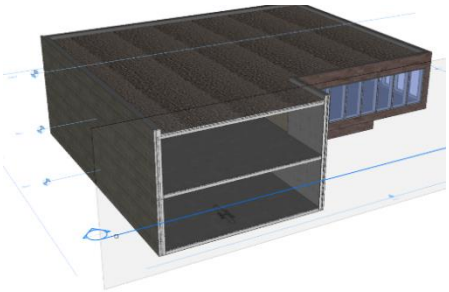
4. **Select the reference solids of the detail**: these are the original solids used to create this construction detail. Here in this example, you should select the roof slab and the exterior wall.

5. **Select the detail entities**: these are the new solids created when editing the detail. In this

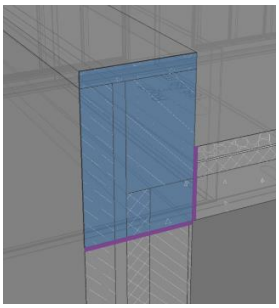


detail, we have the wall cap and the insulation block that you should select.

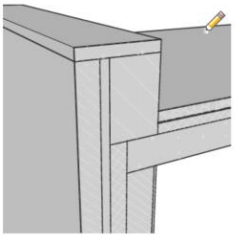
6. **Select section**: the vertical section plane that is currently open on the construction detail (see image on the right).



7. When all the information of the detail is added, click **Create**.
8. You are prompted to confirm and accept the detail: Press **Enter** once to accept the detail.
9. A new **'Save detail'** dialog box will pop up. Here the detail name and category are displayed again, you can change it if you need to.
10. It is possible to change the thumbnail of the detail by clicking the pencil icon on the top right corner.



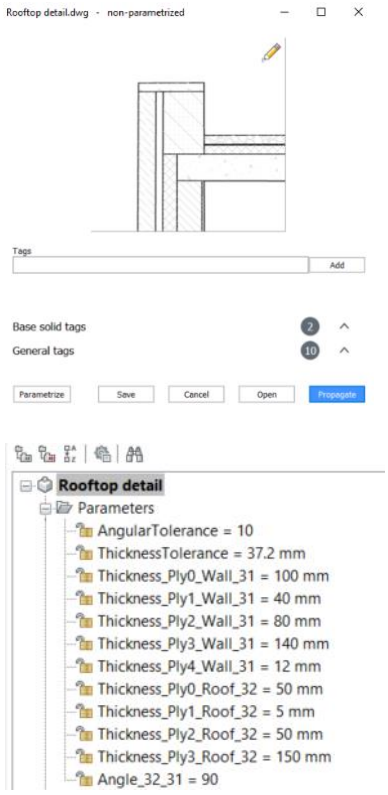
11. Change the view of the detail you want and press **Enter**.
12. **Reference solid tags (2)** and **General tags (7)** are automatically created. You can delete them if you want to, but you can also create your own tags for this detail.
13. Let's create an own tag by typing **'Wall cap'** and click **'add'**. The new tag is added to the **General tags (8)** and is displayed in orange.



14. Click **SAVE** to finish.

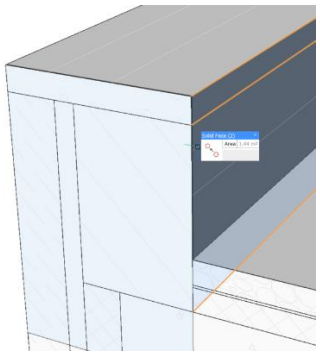
5 Parametrize details

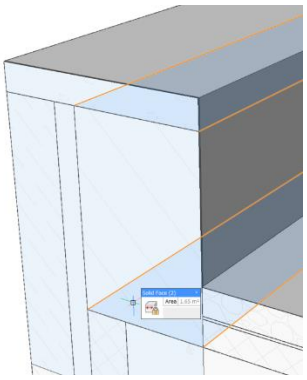
1. Open the **Details Panel** on the right-hand side of your screen and search for tag **'Wall cap'**.
2. Click on the detail you have just created. On the top of the dialog box, you can see that the detail is non-parametrized. That means that the detail doesn't have any parameters and the thicknesses and angles of the plies are fixed.
3. Let's change that by adding parameters to this detail. Click on **'Parametrize'**.
4. The parameters are automatically added to the detail and the detail will be opened in a new .dwg- drawing **'Rooftop detail'**.
5. Open the **Mechanical Browser** to check the parameters and constraints added to this detail.
6. You can check the change in ply thicknesses by selecting a parameter, for example, **'Thickness_Ply3_Roof_32'** and right-click choose **'Animate'**.



6 Editing Parametrize details

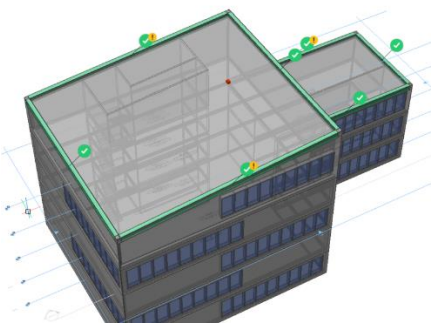
1. **Animate 'Angle_32_31'**.
2. Let's add some constraints to the detail to create the ideal Angle-parameter for your construction detail.
3. **Selection of faces should be ON** in the ribbon or **SELECTIONMODES** should be **value 2**. Boundary Detection should be OFF.
4. Select the faces to the wall cap and the insulation solid (like the image of the right) and Quad select **COINCIDENT CONSTRAINT**. This means that the face of the wall cap and the face of the insulation will be the same.
5. **ADD DISTANCE CONSTRAINT** on the top and bottom surface of the wall cap, distance should be **50mm** (Press **Tab** until you highlight the right surface). The distance of these two faces will always be 50mm when the angle of the details will be changed.
6. **ADD DISTANCE CONSTRAINT** on the top and bottom surface of the insulations solid, distance should be **355mm** (Press Tab until you highlight the right surface). The distance of these two faces will always be 355mm when the angle of the details will be changed.
7. **Animate 'Angle_32_31'** again to check the result.
8. **Selection of faces can be turned OFF** in the ribbon or **SELECTIONMODES** should be **value 0**.
9. Select **'ThicknessTolerance'** and change the parameter to **100mm**.
10. **SAVE** the drawing and close.





7 Propagate Parametrized details

1. Open drawing **'Main Building LOD.dwg'**.
2. Choose the parametrized **'Rooftop detail'** in the Details panel.
3. Drag and drop the detail into the drawing.
4. The locations where the desired detail can be applied will be marked with **a green checkmark**
5. **Enter** to apply all 7 suggestions.
6. Zoom in to the rooftop edge to see the change.
7. Close the section plane.
8. **SAVE** the file.



Structural modeling

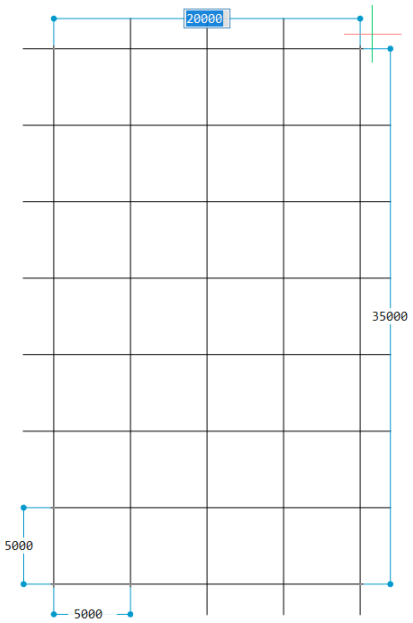
How to model a steel structure and how to detail it using propagate and the details panel.

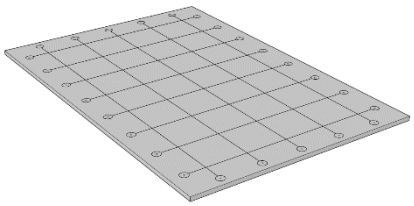
1 **Open a new mm drawing and save it**

2 **Creating a base grid**

We'll start by creating a grid, and drawing a base slab underneath it

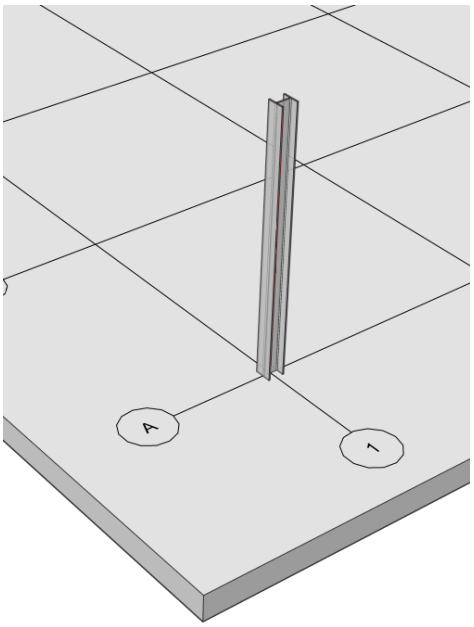
1. In the Quad under the **Model** tab, click **BIMGRID**  . Choose a start point by left-clicking
2. Type in values for the grid sizes, using **Tab** to switch between dimensions until you get the values as shown in the image on the right (i.e. grid cells of **5000 x 5000** and a total grid size of **35000 x 20000**)
3. Start the **BOX**  command, and start drawing somewhere outside of the grid
4. Choose the opposite corner so that the grid is entirely on top of the slab (see image)
5. Type in **500** to give the slab a thickness, and press **Enter**





3 Creating a column

1. Open the **PROFILES PANEL** on the right of your screen.
2. Choose Domain: *Structural Steel.*
3. Choose Standard: *EURO.*
4. Click the I-shape icon, and search for **HEA**.
5. Drag the **EURO HEA 300** profile into the modeling area.
6. Start drawing the linear solid at the intersection point of two of the grid axes. Draw vertically upwards (make sure ORTHO or POLAR is enabled). Make sure the orientation is as indicated in the image on the right (i.e. flanges parallel with the Y-axis). If the orientation is not as shown in the image, you can enter **Q** and press **Enter** while still drawing to give the profile a Quarter Turn.
7. Enter a height of **5000** and press **Enter**.



4 Understanding Propagate

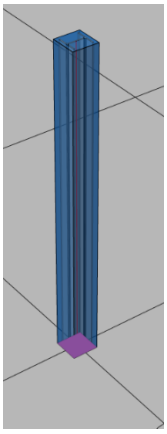
Propagate is a very versatile tool that can be used in many different situations. It is used to automatically copy objects or details to similar locations.

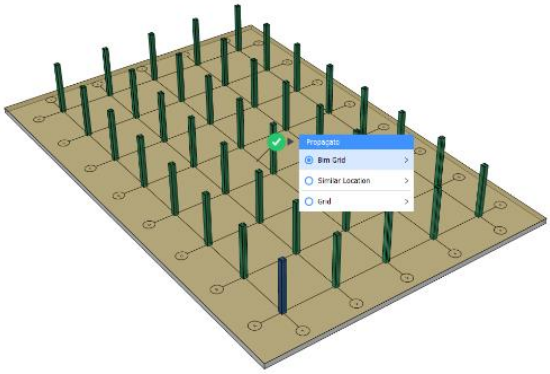
The key concept: there are 2 selection sets:

- Reference solids: solids that define the relation of that detail. Specify as many reference solids as relevant!
- Detail solids: solids that need to be copied around.

We already saw some use cases of Propagate in the basic training. In this section, we'll use propagate to copy the column to every grid intersection.

1. Highlight the floor slab, and in the Quad under the **Model** tab, click **PROPAGATE** .
2. Select the column **solid** as your detail, and press **Enter**.
3. You will be automatically zoomed into the 3D detail. We don't want the detail to be copied as a Block, but as a **Copy**, so press **C** and then press **Enter.**
4. Propagate automatically detected that a grid was attached to the slab. It will make the first suggestion (see image).

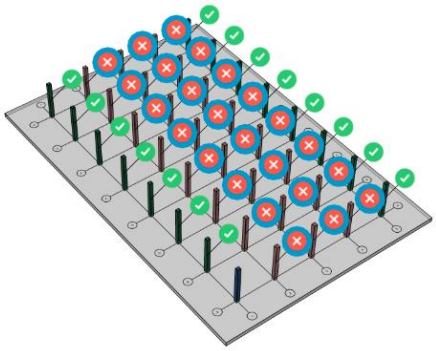




5. Hover over the green checkmark and click *Bim Grid* in the little dialog window.

6. Then, click *Explode,* and the entire grid will be exploded in a set of suggestions. We can now manually toggle off individual suggestions. Create a pattern as shown in the image. Make a selection set over the checkmarks you don't need and toggle them all off at once by clicking one of the checkboxes you just selected.

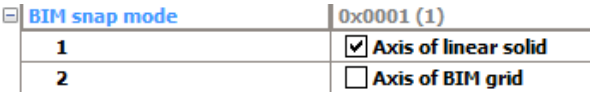
7. Press **Enter** twice to accept.



5 Creating the truss

1. In the Ribbon, go to the Structural/MEP tab. At the far right, make sure *Display Sides and Ends* is toggled **off**, and *Display Axes* is toggled **on**. You can also do this via the Command Line: DISPLAYSIDESANDENDS = 0, DISPLAYAXES = 1.

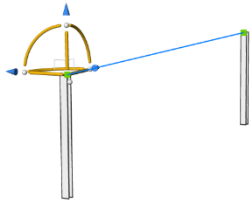
2. In the Settings dialog, search for *bimosmode* and find the setting **BIM snap mode**. Expand this setting and make sure the first suboption (*Axis of linear solid*) is checked **on**. This setting will override snapping for linear solids such as steel column and beams, so you can more easily snap to the axis of the solid instead of snapping to e.g. profile corners. Close the settings dialog.



3. Isolate the two columns of the first row.

4. Draw a line (select **LINE** from the **Annotate > Draw** tab) between the top end points of the column axes.

5. Move down the line **400** mm by long left-clicking it and thus activating the **MANIPULATOR**. Choose the vertical bar, move it downwards and type in **400**.



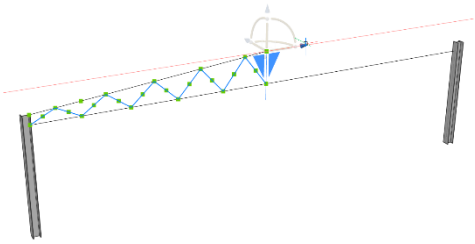
6. Press **Esc** to exit the Manipulator.

7. Draw another line, this time from the midpoint of the previous polyline upwards for **1400** mm.

8. Draw another line, this time from the endpoint of the previous polyline to the top end point of the left column axis.

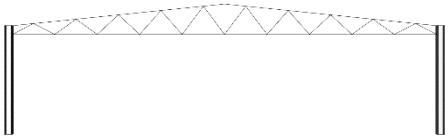
9. Divide the bottom horizontal line into 20 segments and the upper one into 10, by using the **DIVIDE** command (Quad: **Draw** tab) and entering **20** for the bottom line and **10** for the upper one.

10. Draw lines again. This time creating a truss pattern as specified on the image to the right.



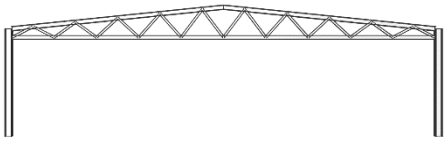
11. Delete the points that were created by going to the **STRUCTURE BROWSER** and selecting them and hitting the **Delete** button.

12. Select the truss pattern and upper line and bring up the **MANIPULATOR** (Quad: **Modify** tab). Drag the Manipulator to the right spot by using the little white grips. Stand on the little blue **Flip along X-axis** icon and flip the truss.



13. Enter **C** for Copy and enter the distance **0**.

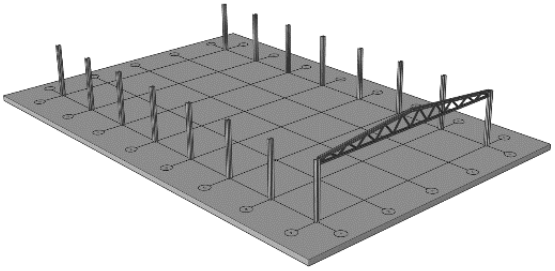
14. Press **Enter** to accept and **Esc** to go out of the command.



15. Delete the midlines.

16. Search the **EURO IPE 240** beam by typing in **IPE** in the search box.

17. Drag it to the bottom line. The line changes into the profile. Click **Enter** to accept if it is rotated correctly.



18. Select the top lines.

19. Search the **EURO IPE 200** beam.

20. Drag it to the top lines. The lines change into the profile. Click **Enter** to accept if it is rotated correctly.

21. Select the truss lines.

22. Search the **EURO IPN 100** beam by typing in **IPN** in the search box.

23. Drag it to the truss lines. The lines change into the profile. Click **Enter** to accept if it is rotated correctly.

24. The truss is created.

25. The top beams were probably classified as members. **BIM CLASSIFY** them **AS BEAMS**.

26. Delete the line entities via the Structure Browser.

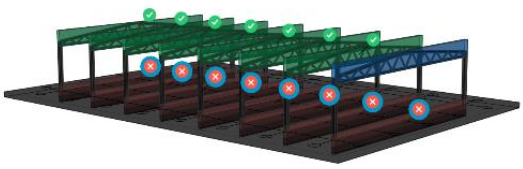
27. Show all entities.

6 Propagating the truss

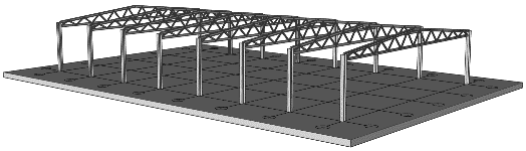
1. Launch **PROPAGATE**.

2. Select the two front columns as reference solids.

3. Select the truss as detail solids.

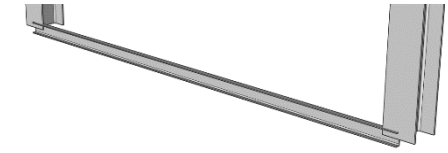


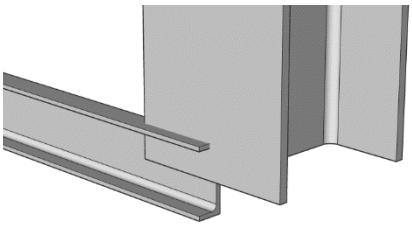
4. Press **C** to copy as solids. Press **Enter**.
5. Toggle off the bottom suggestions.
6. Press **Enter** twice to accept.

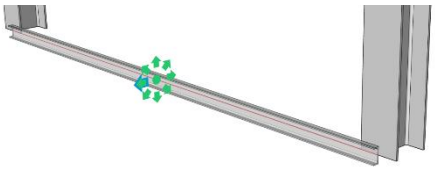


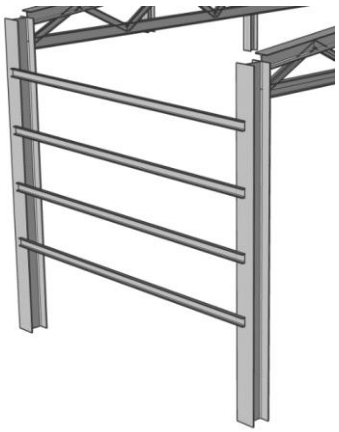
7 Adding sidebars

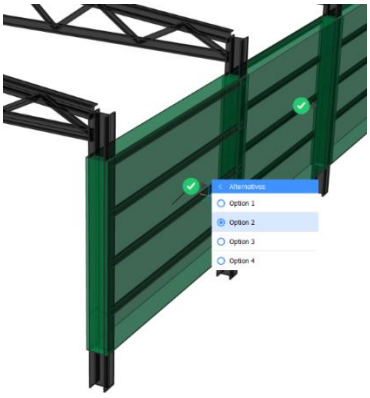
1. Hide the slab and the grid.
2. Search for **EURO UPN 120** in the **PROFILES PANEL** by typing in **UPN** in the search field.
3. Drag and drop the profile in empty space.
4. Set **BIMOSMODE** = 0
5. Make the profile from the outer bottom midpoint of the first column to the outer bottom midpoint of the second column (in the Y direction). Quarter turn by pressing **Q** during the command, to get the profile turned like in the picture to the right.
6. Highlight the U-shaped profile, and in the Quad under the **Model** tab, click **ADD ECCENTRICITY** .
7. A widget appears. Click the *Outer* arrow to make sure the beam moves outwards with respect to its axis. Press **Enter**.
8. Long-click the U-shaped profile to get the **MANIPULATOR** and press the vertical bar to move the beam upwards by **1500** mm.
9. Press the up bar of the Manipulator again. Press **R** for Repeat. Enter the height of **900** mm. Move the cursor upwards until you have 4 bars. **Click** in the space above the 4 bars. Press **Esc** to exit the command.
10. Launch **PROPAGATE** .
11. Select the two first columns as reference solids.
12. Select the bars as detail solids.
13. Press **C** to copy as solids. Press **Enter**.
14. Select **Option 2** for all the suggestions at the other side of the construction.
15. Press **Enter** to accept.

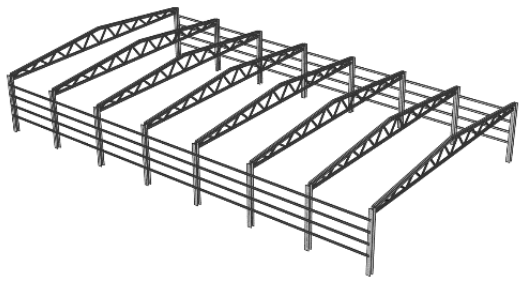




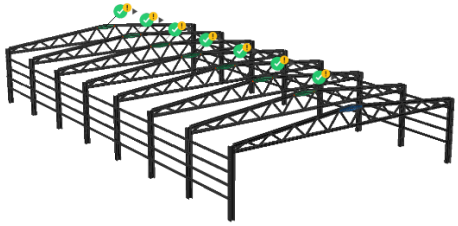




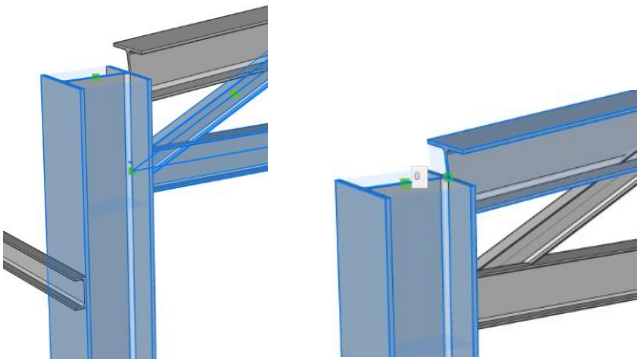




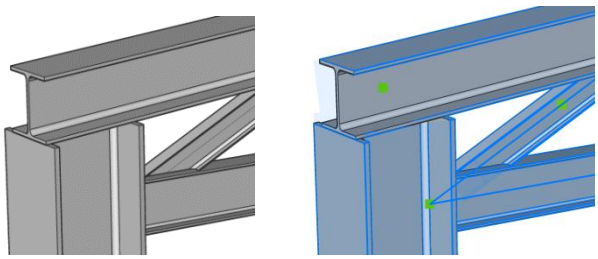
8 Cleaning up some details

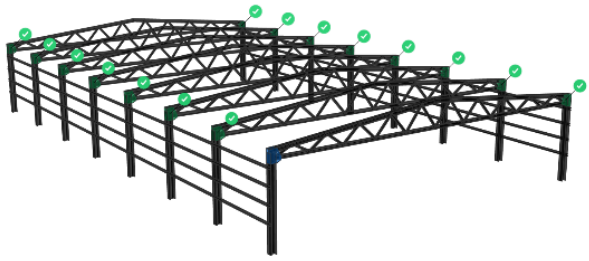


1. Show all entities again.
2. Select the two top beams of the first portal.
3. **L-CONNECT** (Quad: **Model** tab).
4. Press **Enter** to accept.
5. Launch **PROPAGATE** .
6. Select the two top beams of the first portal as reference solids.
7. Press **Enter** three times to accept.
8. Select the three elements of the first portal that are indicated in the right picture.



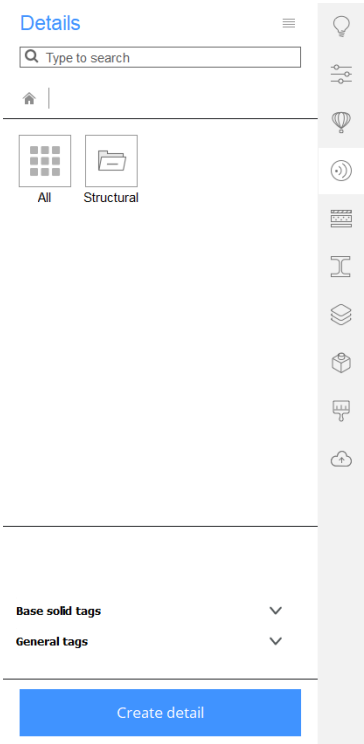
9. **STRUCTURALCONNECT** (Quad: **Model** tab).
10. Select the column and top beam of the first portal.
11. **L-CONNECT** (Quad: **Model** tab) them like on the picture to the right by pressing **Ctrl** two times during the command.
12. Launch **PROPAGATE** .
13. Select the elements as in the right-hand picture.
14. Press **Enter** three times to accept.





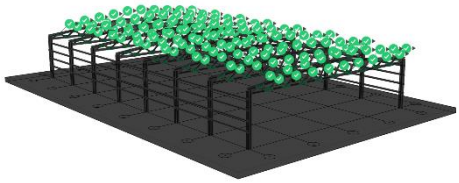
9 Add details to the details library

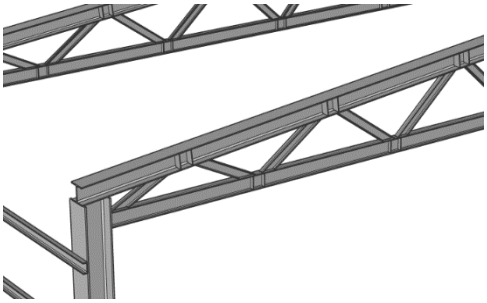
15. Go to **Manage libraries** under the hamburger menu in the **DETAILS PANEL** .
16. Under *Details Directory Path,* click the three dots, click **Add Path** and choose the *DetailsStructural* folder under *C:\Users\<user>\Documents\Bricsys247\<training folder>\Documents\Starter files\08. Structural modeling\DetailsStructural*
17. Close the settings.
18. Now you should see a thumbnail of the Structural folder in the Details panel.



10 Detail the truss connections

1. Drag and drop the detail **TrussConnection** from the **DETAILS PANEL** (in the **Structural** folder) to your workspace.
2. Click **Enter** to accept.
3. The trusses are now nicely detailed.

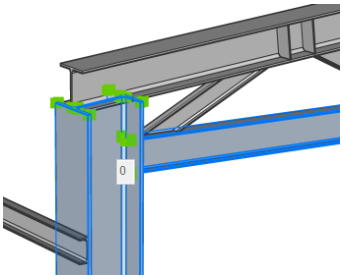




11 Creating a more detailed connection

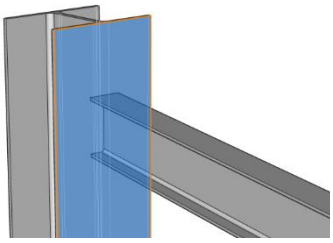
BricsCAD BIM is not a structural detailing and calculation software, however, it is still possible to create steel connections using a combination of direct modeling and our library of mechanical parts. To be able to work properly on a connection detail, there are a few things we need to do first:

1. We need to add the standard mechanical parts to the **LIBRARY PANEL** . You do

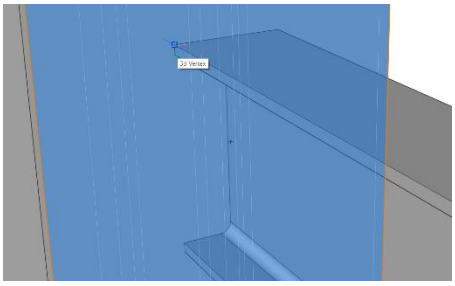


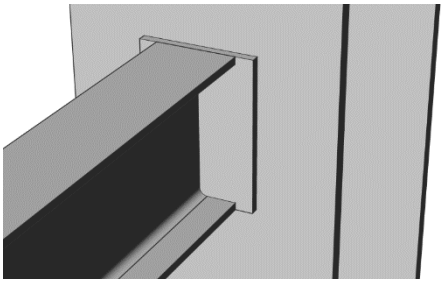
this by going to the **DROPDOWN MENU** on the top right side of the panel and making sure the option *Bricsys Mechanical Library* is turned **on**.

2. Let's design the connection between a beam and the flange of a column using an end plate bolted to the column. We'll **ISOLATE** the beam and the column so it's easier to see what we're doing (see image).



3. First, we'll create an endplate, welded onto the beam. Start the **BOX** command and hover the cursor over the side face of the column. Then press **Shift** once, so that this side face is highlighted in blue (see image). Start in the outer corner of the beam as shown in the image, and then click the opposite outer corner. Give the plate a thickness of **10** mm**,** so we end up with something like is shown in the fourth image.



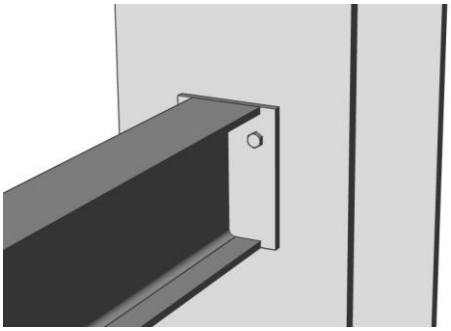


4. **PUSH/PULL** the vertical sides of the plate outwards by **20** mm.

5. Open the **LIBRARY PANEL** and go to *Standard Parts > fasteners > BOLT > HEX HEAD > ISO.*

6. Click and move the **ISO 4015** onto the plate and position it precisely using the Dynamic Dimensions. Remember, you can press **Tab** to switch between dimension field.

7. Give it a distance of **30 mm** from the side, and **55 mm** from the top of the plate.



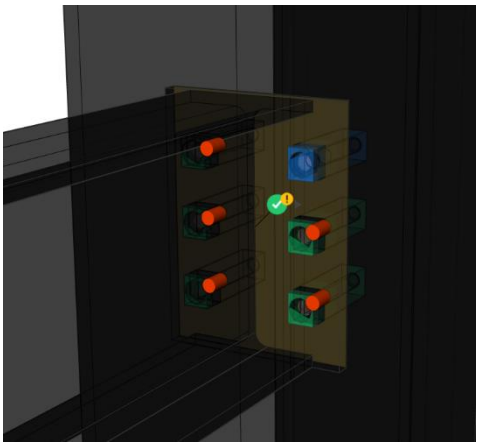
8. We'll use the propagate tool to distribute more bolts over this plate evenly. Highlight the plate, and in the Quad under the **Model** tab, click **PROPAGATE**

9. Select the bolt as the detail objects and press **Enter**.

10. Press **Enter** again to accept the suggestion. Now a blue question mark should appear. Click it and it turns into a green checkmark.

11. You can edit this suggestion by hovering over the checkmark and clicking *Grid.*

12. Add one row, so you end up with a suggestion as shown in the image. Press **Enter** to accept the suggestion.



13. To finish this detail, we will create a little plate, welded onto the column beforehand, on which our beam can rest

during the construction phase of the steel structure.

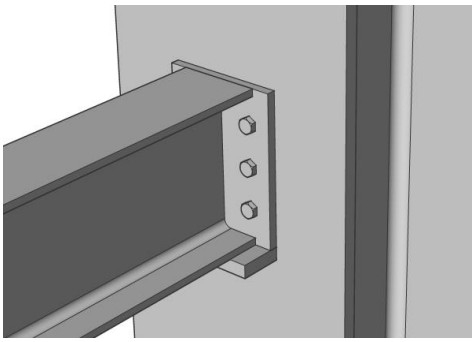
14. **EXTRUDE** the bottom face of the endplate with a distance of **15** mm.

15. **PUSH/PULL** the front face of the new plate by **40** mm.

16. We can now give the elements a correct classification. Highlight the plates and in the Quad under the **BIM** tab, click **CLASSIFY MANUALLY**. In the pop-up menu select **Plate** from the *Building Structure Elements* drop-down. Select all the bolts and classify them as well, this time select **Mechanical Fastener**.

17. The last thing we want to do is classify the entire bolted plate as a building element. So select the plates and the bolts and in the Quad under the **BIM** tab, click **CLASSIFY MANUALLY**. Choose **Building Element** and check **Convert to block and classify the block reference**. Give in a name for the block and click OK.

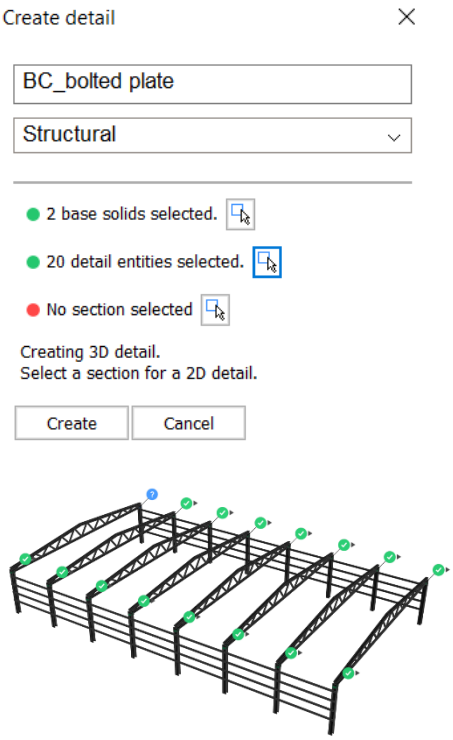
The result looks like in the picture to the right.



12 Saving and propagating a detailed connection

We can again use the **DETAILS PANEL** to save this detail and then copy it over to the rest of the drawing.

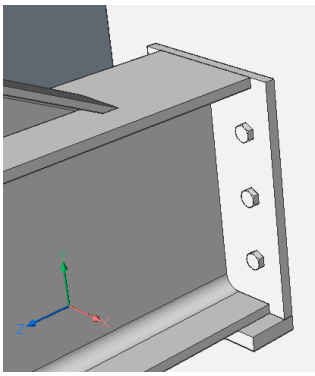
1. Click on the **Create Detail** button.
2. Give it the name *BC_bolted plate* (BC for BeamColumn) and the category *Structural*.
3. Select the column and the beam as reference solids.
4. Select the block as detail solids.
5. Don't select a section element, as this will allow us to create a 3D detail.
6. Click onto the **Create** button.
7. Press **Enter** to accept the detail.
8. Edit the thumbnail by pressing the pencil icon, if you don't like the current preview.
9. Click the **Save** button.
10. In the Quad under the **General** tab, click **SHOW ENTITIES**.
11. Drag and drop the detail you just created into your drawing.

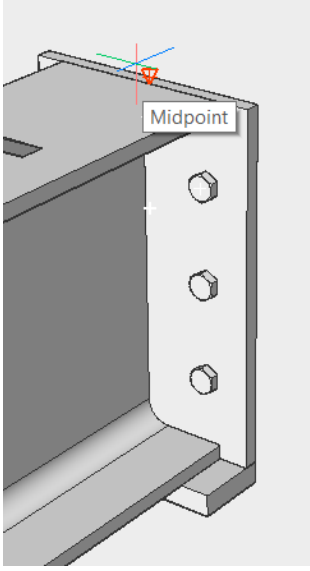


12. You should see suggestions as shown in the image.
13. Turn the question mark in a checkmark and press **Enter**, to propagate this detail.
14. Now this detailed connection has been propagated to every possible location in your drawing.

13 (Optional) Changing the blocks so that no interferences occur

1. Revert to the file we had at the end of step 11 or go to intermediate file **Structural_13.1_optional.dwg**.
2. Now **EXPLODE** the block that we created at the end of step 11 and create a component from the elements instead.
3. First, we need to change the UCS however to the inside face of the flange of the column, so that our component will be defined as laying flat on this face.
4. To do that type in **UCS** and type **F** to select a face. Select the inside face of the flange. Make sure to enter the face from the left-hand side while selecting it, so that the UCS is turned as in the image to the right. Press **Enter** to accept.
5. Now select the block with the plate and bolts and convert it into a component by typing in **BMFORM**.
6. Choose the **midpoint** of the upper edge (near the column) of the bolted plate, as specified on the image to the right, as an insertion point.
7. Give in a name for your component and press **Enter**.
8. **CLASSIFY MANUALLY** this newly created component as **Building Element**.
9. Set your UCS back to World by typing **UCS** and hitting **Enter** to accept the **World** Coordinate System.
10. Now repeat step 12 with the component instead of the block.
11. (Optional) Run the **INTERFERE** command to check the amount of interferences in the drawing. Select all solids for the first set and check against this same first set for the second set.. **192 solids interfere**. These are of course the bolts and the plates/columns that interfere. We will solve this issue now by



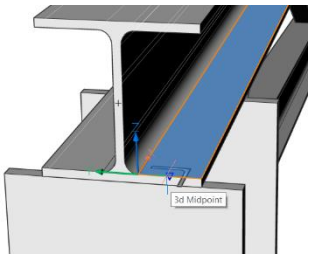


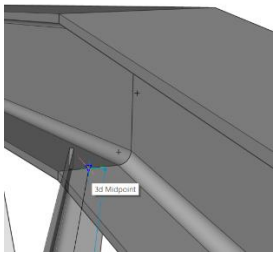
replacing the components we just created by one that you can find in the starter files.

12. (Optional) **UNDO** step 13.11.
13. Select all the **Building Element** entities in the Structure Browser. There should be 16, namely the components we just created.
14. Choose **REPLACE** from the **Model** tab in the Quad.
15. Press **Enter** to choose **from a file**.
16. Choose **BoltedPlate.dwg** as source file.
17. Select all the **Building Element** entities again and now choose Update from the **Model** tab in the Quad.
18. As a result there should now be temporary holes in your columns if you hide the updated components. These holes will be gone again if you delete the components.
19. Now go to your layers. You will see a new layer called the **BC_Subtract layer**. It is this layer that contains the solids that create temporary holes once inserted into another entity. To not see these solids (and just see the holes), **hide** and **freeze** the layer.
20. Now run the **INTERFERE** command again and see that the solids don't interfere anymore, due to the newly created temporary holes!

14 (Optional) Creating diagonal braces

1. To let our structure resist wind forces, we can create some diagonal braces in the roof.
2. Do this by drag and dropping the **Euro L 35X35x5** profile into empty model space. Draw diagonally from the second portal beam to the first. Lock the face of the flanges and snap to the points as indicated on the images. **Q**uarter turn, after the first click, to get the right orientation of your profile.





3. **ADD ECCENTRICITY** to the brace, moving it up, so that it doesn't cross the flanges of the beams anymore.

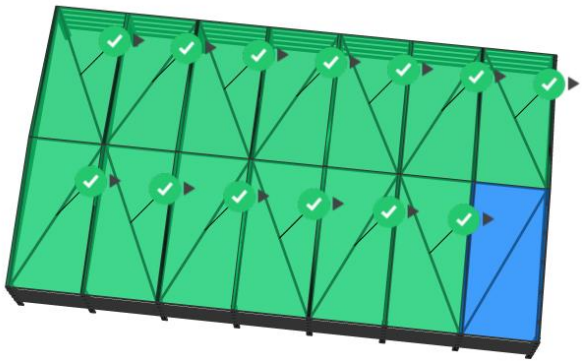
4. Move the ends of the brace by grabbing the grip points and make sure the ends don't stick out anymore.

5. Launch **PROPAGATE** . Select the two top beams as reference solids and the brace as detail solid.

6. Type **C** for creating copies. Press **Enter**.

7. Check all the suggestions as specified on the image.

8. Press **Enter** to accept.



15 (Optional) Setting extra columns in front and back portal

1. To be able to mount an exterior facade onto our steel structure, we will complete our model with some extra columns in the front and back portal.

2. Open the **PROFILES PANEL** . Search for **300** in the *IShape* category. Drag and drop the **EURO HEA 300** onto empty model space.

3. Snap to the intersection of the grid lines underneath the front portal. Turn the profile just like in the picture to the right and draw upwards with **4480** mm.

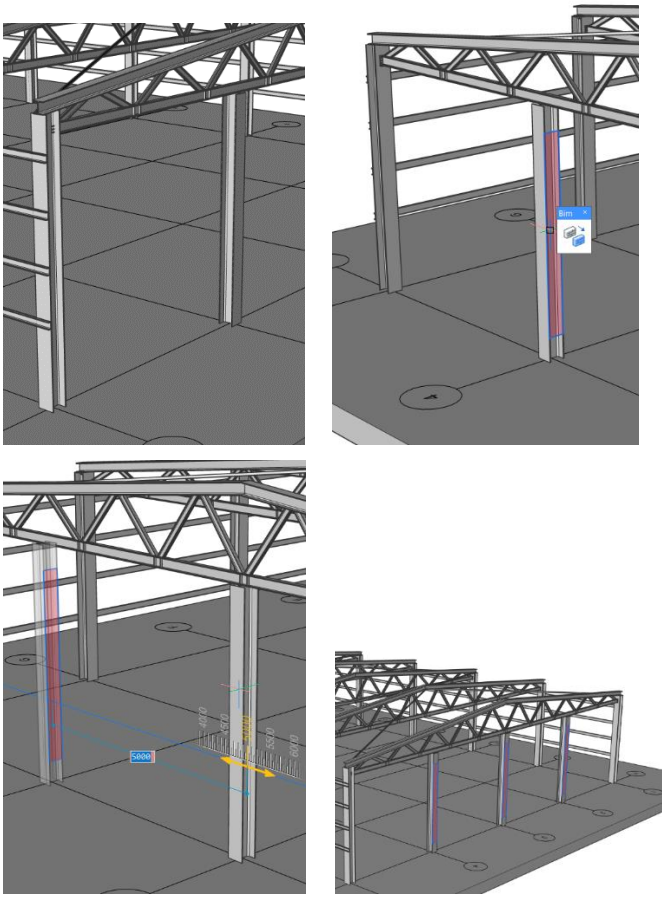
4. To copy the columns more easily, turn **on** the display of sides and ends of linear solids in the ribbon (can also be changed by typing in **DISPLAYSIDESANDENDS**).

5. Highlight the side of the column and select **BIM COPY** from the **Model** tab in the Quad. Type in **5000** mm for the copy distance. Press **Enter**. Type in **5000** mm again, for the next column. Press **Enter** twice to exit the command.

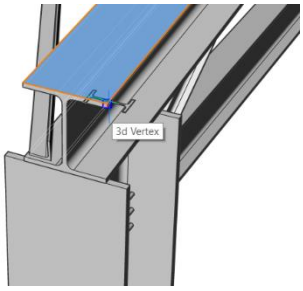
6. You now have three columns in the front portal.

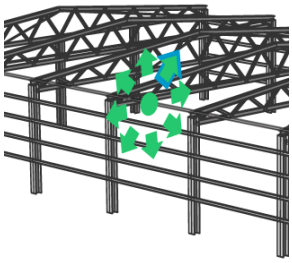
7. Select the fronts of the three columns and choose **BIM COPY** from the **Model** tab in the Quad. Type in **35000** mm for the copy distance. Press **Enter** twice to exit the command.

8. You now also have three columns in the back portal.

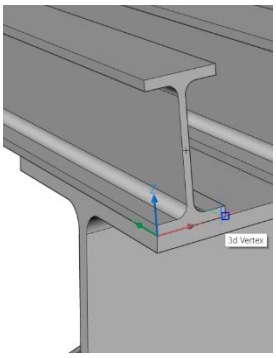


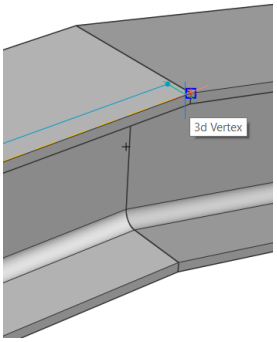
15 (Optional) Creating cross-beams



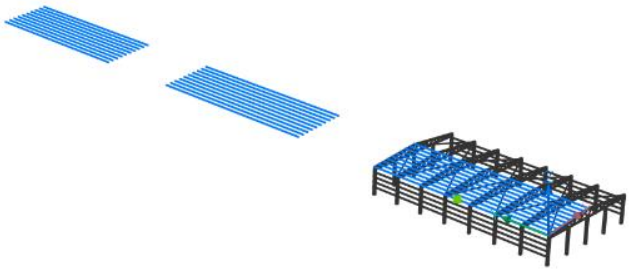


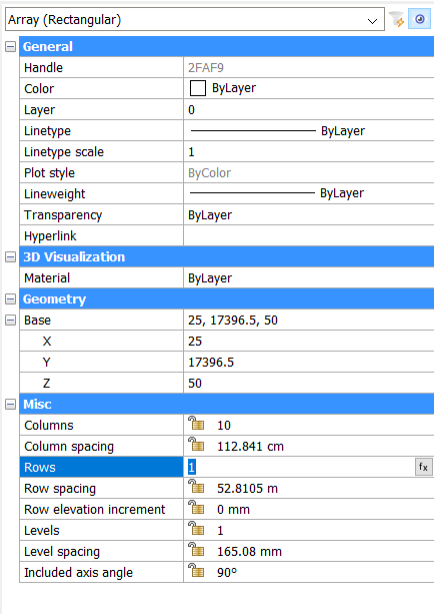
1. To be able to mount a roof on top of our steel structure we will create some cross-beams on top of the roof.
2. To work more easily, turn **off** the display of sides and ends of linear solids in the ribbon (can also be changed by typing in **DISPLAYSIDESANDENDS**).
3. Open the **PROFILES PANEL**. Search for **80** in the *IShape* category. Drag and drop the **EURO IPN 80** onto empty model space.
4. Lock the top face of the first sloped beam (by hovering over it and hitting **Shift**) and snap to the vertex displayed on the image.
5. Enter a distance of **35100** mm or snap to the endpoint at the back portal. Click **Enter** to exit the command.





6. **ADD ECCENTRICITY** (**Model** tab of the Quad) to your beam. Click on the up to right side arrow of the green widget.
7. We will now use an array to array this cross-beam over the roof.
8. First, adjust your UCS to the top face of the sloped beam by typing in **UCS** in the command line. Type **F** to select a Face. Select the top face of the sloped beam. Hit **Enter** twice to accept.
9. Select **RECTANGULAR ARRAY** from the **Draw** tab of the no-selection Quad. Select the cross-beam to be arrayed.
10. Type in **COL** for Columns. Give in **10** for the amount of columns. Type in **T** to give in the total distance between start and end columns. Click on the point specified in the image to the right to start measuring the distance. Click on the second point specified in the image on the right to stop measuring.
11. Press **Enter** to exit the command.
12. We now have too many rows.
13. If we select the array and go to its properties in the **PROPERTIES PANEL** we can see that the array has parameters. One of them is *Rows*. Put this value onto **1** and we have the array that we need.





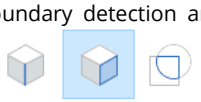
Array (Rectangular)	
General	
Handle	2FAF9
Color	ByLayer
Layer	0
Linetype	ByLayer
Linetype scale	1
Plot style	ByColor
Lineweight	ByLayer
Transparency	ByLayer
Hyperlink	
3D Visualization	
Material	ByLayer
Geometry	
Base	25, 17396.5, 50
X	25
Y	17396.5
Z	50
Misc	
Columns	10
Column spacing	112.841 cm
Rows	1
Row spacing	52.8105 m
Row elevation increment	0 mm
Levels	1
Level spacing	165.08 mm
Included axis angle	90°

14. Put your UCS back to World by typing in **UCS** and hitting **Enter** to accept the default value of *World*.

15. Mirror the array along the centerline of the grid by typing in **MIRROR** in the command line and clicking two points on the centerline of the grid. Type **N** and hit **Enter** for keeping the original entities.

3D constraints and parameters

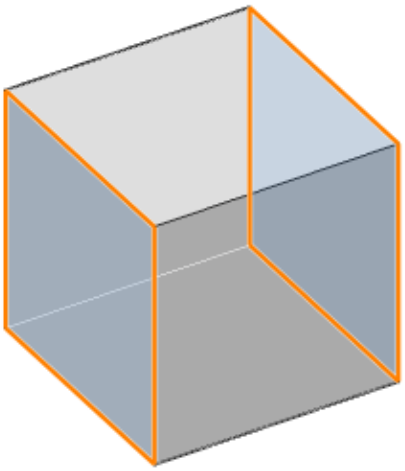
You will learn to understand and use 3D constraints and parametric expressions.

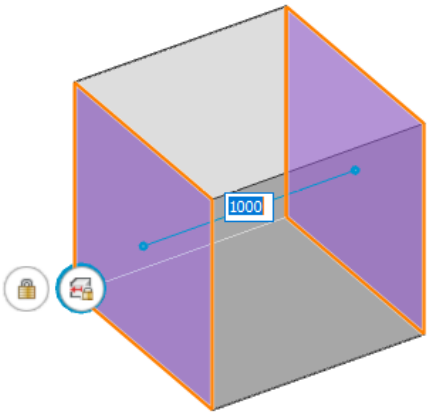
1 **Open a new drawing.**
Before drawing anything, open the Parameters and Constraints panel $f(x)$ **on the right side of your screen.**
If you cannot find this panel, right-click anywhere in the ribbon and under Panels, enable *Parameters and Constraints.*
This panel will display all your constraints and parameters. As the drawing is empty, of course the panel doesn't show anything. For this section, we will shorten the name to *Parameters Panel*.
(Optional) Turn off boundary detection and turn on face detection: 

2 Making parametric geometry

1. Draw a box of **1000 x 1000 x 1000**.
2. In the ribbon, click the *Parametric* tab. Here you will find commands to add constraints to your drawing, both in 2D and 3D. Alternatively, some of these commands can be found in the Quad.
3. Select the two faces highlighted in the image on the right
4. Quad select **CONSTRAINTS: ADD DISTANCE**
5. Press **Enter** to accept the value of 1000
6. Now the Parameters Panel should show one Distance Constraint with a value of 1000. Right-clicking it and clicking **'Animate'** will give you an idea of what this constraint does exactly.
7. So this distance constraint controls the distance between these two faces. But which of the two faces will move when changing this constraint value? Right now there is no way of knowing, so we'll add a fixed constraint
8. Select one of the two faces, and Quad select **CONSTRAINTS: ADD FIXATION**

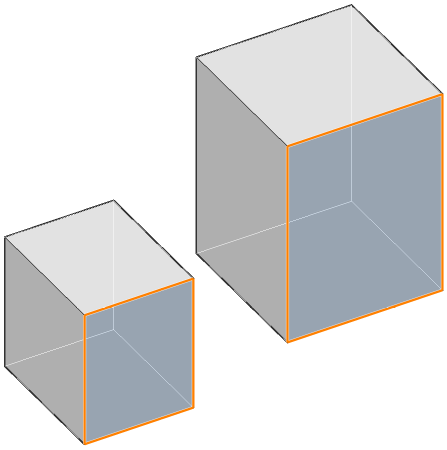
   This new constraint should appear in the Parameters Panel as Fix_2. This fixed constraint will mean that **this** face will not shift; changing the Distance_1 value will make the **other** face move further or closer.
9. Select this face again. You should see two little icons appear. These show the constraints that are currently active on this face. Clicking on one of the icons will also highlight the associated constraints in the Parameters Panel.
10. Select Distance_1 in the Parameters Panel, and change its **'Expression'** field to another value (e.g. 800); you will see the opposite face shift so that the distance is now 800. Alternatively, you can click the editable dimension that is shown, and change its value there, see image on the right.

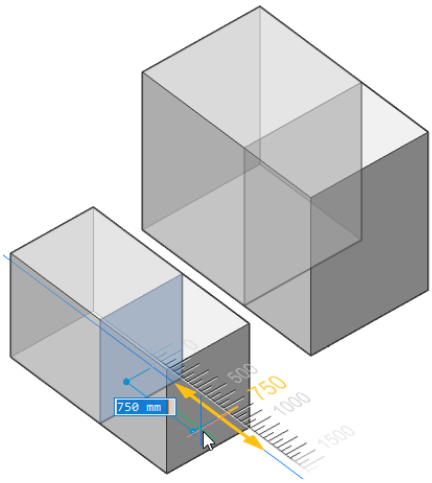




3 **Some more constraints**

1. Draw another box next to the original one
2. Select two parallel faces: one of each box (see image)
3. Quad select **CONSTRAINTS: RIGID SET**
4. A rigid set means the (sub)entities in this set will remain rigid with respect to each other. In this case this means the faces will always remain the same distance to each other.
5. This can be illustrated by using **PUSH/PULL** on one of these faces. You will see that the other face in this rigid set will also move along (see second image).

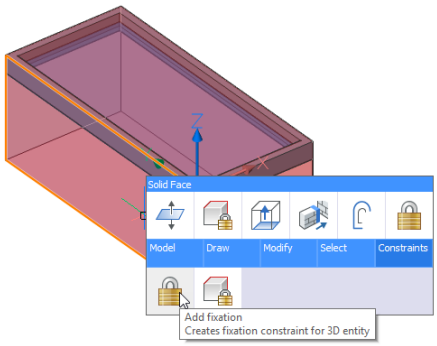




4 **We'll parametrize an existing component.**
Open **My Window.dwg.**
The parameters we want to control are the total Height, total Width, and the thickness of the frame. Make sure the Parameters Panel is open.

5 **First, let's create some fixed constraints. These make sure the selected faces will stay in the same plane at all times.**

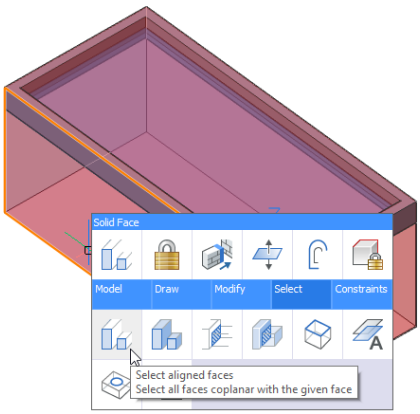
1. Select left surface of subtractor box (make sure you select the surface and **NOT** the boundary)
2. Quad select **CONSTRAINTS: FIXATION** (appears in Panel as "Fix_1")
3. Select short, front surface of subtractor box
4. Quad select **CONSTRAINTS: FIXATION** (appears in Panel as "Fix_2")



6 **Now we'll create some Rigid Set constraints. These make sure that all entities inside this set remain in the same position with respect to each other.**

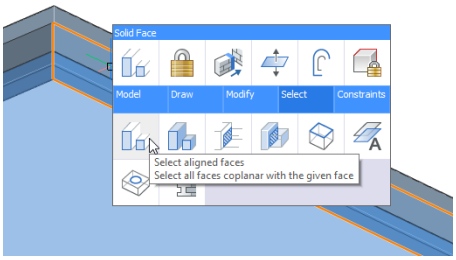
1. Highlight one of the side faces of the subtractor solid
2. Quad select **SELECT ALIGNED FACES**  in the **select** tab
3. Now you should have two faces selected: the side face of the subtractor solid, and the side face of the frame
4. Quad select **CONSTRAINTS: RIGID SET** 

   This rigid set will make sure these two faces remain coplanar.
5. Repeat process for the other three sides. You should see each of these constraints appear in the Parameters Panel.



7 **We'll want to do the same for the *inside* of the frame.**

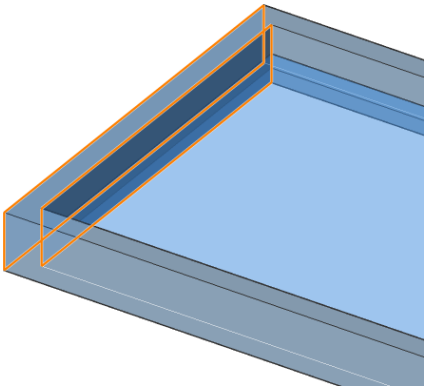
1. Turn off **"BIM_Subtract"** layer
2. Highlight one of the inside faces of the frame
3. Quad select **SELECT ALIGNED FACES**  in the **select** tab
4. You should again have two faces selected: the inside face of the frame, and the side face of the glass pane.
5. Quad select **CONSTRAINTS: RIGID SET** 
6. Repeat process for other three sides.
7. If all steps were followed correctly, you should now have 2 fixed constraints and 8 rigid sets in the Parameters Panel, each containing two faces.



8 **Time to add some distance constraints. Two faces that are linked by a distance constraint will always be that distance apart.**

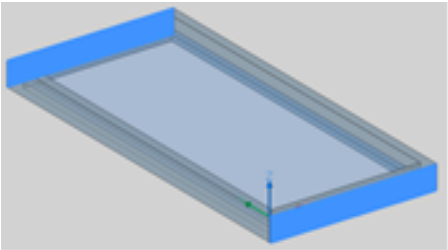
The first thing that we'll be handling is the frame thickness.

1. Select the **inside** and the **outside** faces of one end of a frame (see image):
2. Quad select **CONSTRAINTS: ADD DISTANCE** 
3. Dimension will appear, just press enter *(Distance_11 = 40 should appear in Panel)*
4. To check which faces a distance constraint controls, right-click it in the Parameters Panel and click **'Animate'**. You should now see the thickness of this side of the frame change.
5. Repeat this process for the other three sides.



9 **Now we'll add overall distance constraints.**

1. Select the two opposite **outer** faces of the width of the window frame.
2. Quad select **CONSTRAINTS: ADD DISTANCE** 
3. Dimension will appear, just press enter *(Distance_15 = 700 should appear in Panel)*
4. Select window frame bottom outer end surface and top outer end surface.
5. Quad select **CONSTRAINTS: ADD DISTANCE** 
6. Dimension will appear, just press enter *(Distance_16 = 1500 appears in Panel)*
7. To check whether all the constraints were applied correctly, try to **animate** these last two distance constraints. If all went well, the height and width of the window should change, while the frame thickness stays the same. Also the glass pane and the subtractor solid should move along with the animation.



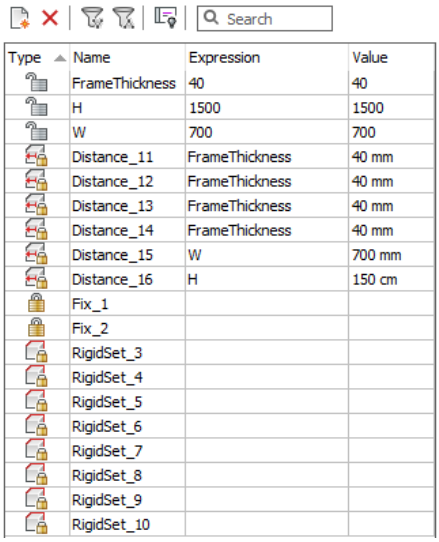
10 **Creating Parameters**

1. At top of the Parameters Panel, click the **New** icon. A new parameter will be created.

2. Select new parameter, and change name to **"W"**
3. Change Expression to **700**
4. Create a new parameter
5. Select new parameter, and change name to **"H"**
6. Change Expression to **1500**
7. Create a new parameter
8. Select new parameter, and change name to **"FrameThickness"**
9. Change Expression to **40**

11 **Applying parameters**

1. In the Parameters Panel select the distance constraint with value **700**
2. In expression field, type **"W"** *(use same syntax as parameter name),* press **Enter.**
3. Select the **distance constraint** with value **1500**
4. In expression field, type **"H"** *(use same syntax as parameter name),* press **Enter.**
5. Select the **distance constraints** with value **40**
6. In expression field, type **"FrameThickness"** *(use same syntax as parameter name),* press **Enter.** You will have to do this individually for all four distance constraints
7. In the end, the Parameters Panel should look similar to the image on the right.



Type	Name	Expression	Value
	FrameThickness	40	40
	H	1500	1500
	W	700	700
	Distance_11	FrameThickness	40 mm
	Distance_12	FrameThickness	40 mm
	Distance_13	FrameThickness	40 mm
	Distance_14	FrameThickness	40 mm
	Distance_15	W	700 mm
	Distance_16	H	150 cm
	Fix_1		
	Fix_2		
	RigidSet_3		
	RigidSet_4		
	RigidSet_5		
	RigidSet_6		
	RigidSet_7		
	RigidSet_8		
	RigidSet_9		
	RigidSet_10		

12 **Checking parameters**

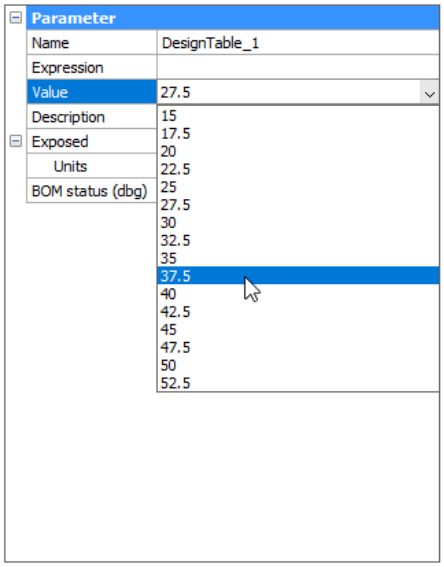
1. In Parameters Panel, right-click **W** and click **'Animate'**. Does it do what you expect?
2. You can now change the values of **W, H** and **FrameThickness** before saving the file.
3. You can now save this component in your library by opening the Components Panel and clicking **CREATE COMPONENT**. After dragging and dropping this new window into another drawing, you will see these parameters **W, H** and **FrameThickness** show up in its properties, allowing you to change the appearance of this window after inserting it.

13 **Using design tables**

Currently this window can be created in all possible sizes, from miniscule to supersized to having odd sizes. In practice usually the allowed sizes of an object will be limited to certain parameter combinations due to manufacturing constraints.
We can create design tables that impose these restrictions up front. Let's start with creating a design table for the frame thickness.

1. Open the *Mechanical Browser* on the right side of your screen. Note that this browser also displays the constraints and parameters that we created earlier
2. Right-click the **FrameThickness** parameter and click **Create design table.**
3. Currently the design table is empty. The easiest way to configure this design table is in a spreadsheet editor. Right-click the design table and click **Export.**
4. Save it as a .csv file somewhere easily accessible, and open this .csv file with a spreadsheet editor like Excel.
5. The .csv file has two empty columns. The left-most column (*DesignTable_1*) will contain the names of the possible configurations, whereas the right-most column (*FrameThickness*) will contain the possible values of the **FrameThickness** parameter. In this simple case having both columns the same would make the most sense (i.e. the name of the configuration equals the value that the parameter will be). Fill in some values that make sense, for example as shown in the image on the right. This will mean that the frame thickness can only be chosen between **15 mm** and **52.5 mm** in increments of **2.5 mm**.
6. Save the .csv file and go back to BricsCAD and in the Mechanical Browser, right-click **DesignTable_1** and click **Replace**. Now select the file you just edited.
7. Select the design table and under Parameter you can now change its **Value** to any of the values you included in the .csv files.
8. (Optional) turn its **Exposed** property to **Off.**

DesignTable_1	FrameThickness
15	15
17.5	17.5
20	20
22.5	22.5
25	25
27.5	27.5
30	30
32.5	32.5
35	35
37.5	37.5
40	40
42.5	42.5
45	45
47.5	47.5
50	50
52.5	52.5



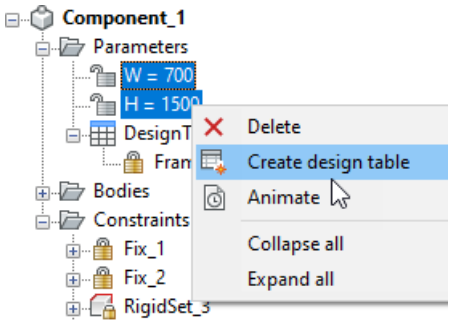
14 **Combining multiple parameters in a design table**

It is possible to combine more than one parameter in a design table. For example, maybe there are only certain combinations of

Width and Height of the window possible. You can define these combinations in a design table.

1. Select both **W** and **H** parameters (by holding down **ctrl** and left-clicking them both), right-click and choose **Create design table**.
2. Using the same steps as before, we can export this design table and open it in a spreadsheet editor. Now the file contains three columns: one for the names of the configurations, and two for the parameter values for **W** and **H**.
3. Fill in some values that make sense, as shown in the image on the right. Thus, only the combinations of **W** and **H** that are listed in the .csv file will be possible.
4. Back in BricsCAD, replace **DesignTable_2** by the .csv file you edited. Now under Parameter you can change the **Value** to any of the preset combinations.
5. Rename **DesignTable_2** to **Window Size**.

You can now save this component in your library by opening the Components Panel and clicking **CREATE COMPONENT**. After dragging and dropping this new window into another drawing, you will see the parameters **FrameThickness** and **WindowSize** in the component's properties. Now you can easily select the sizes of these two parameters from the drop-down list that appears.



DesignTable_1	W	H
600 x 1200	600	1200
600 x 1400	600	1400
600 x 1800	600	1800
600 x 2000	600	2000
800 x 1200	800	1200
800 x 1400	800	1400
800 x 1800	800	1800
800 x 2000	800	2000
1200 x 1200	1200	1200
1200 x 1400	1200	1400
1200 x 1800	1200	1800
1200 x 2000	1200	2000

15 **Parametrizing an object automatically**

After parametrizing this window object, you might agree that constraining and parametrizing an object is not straightforward. Luckily there is a command that will do most of the work for us.

1. Open **Chair.dwg**
2. In the Parameters Panel you can see that there are no parameters or constraints in this drawing.
3. Select the chair **solid**
4. Launch the **PARAMETRIZE**  tool (Quad: in the **Constraints** tab)
5. The Parameters Panel now shows a set of parameters and constraints that were automatically defined.
6. Animating each of these parameters lets us understand what they do exactly:

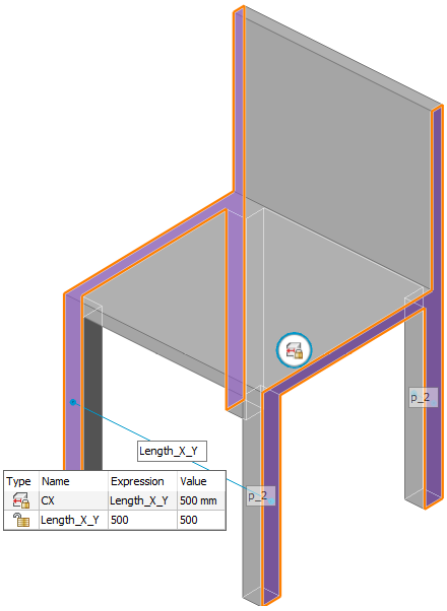
   Length_X_Y changes the width and depth
   Length_Z changes the overall height

p_1 controls the seat thickness
p_2 controls the leg thickness
ratio_1 controls the ratio between seat height and overall height.

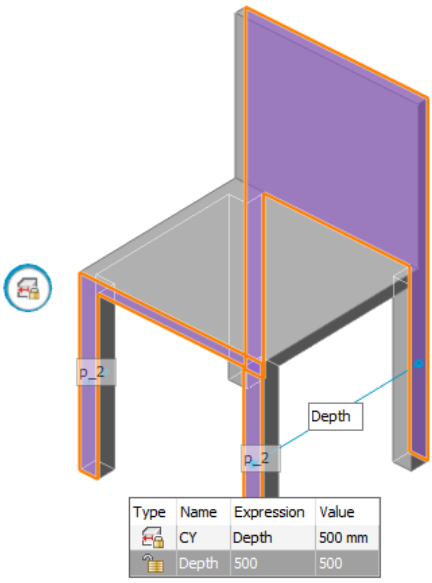
16 **Changing the parameters and constraints**

This first suggestion of parameters and constraints is very useful, but maybe we want to define our parameters differently. For example, we want our width and depth of the chair to be controlled by two separate parameters, instead of one combined parameter **Length_X_Y**:

1. Close the Parameters Panel
2. Select one of the side faces of the chair
3. A distance constraint icon should show. Click it.
4. Now two editable dimensions should be visible: click the one that says **Length_X_Y**
5. A parameters manager pops up, showing the expression of this distance constraint, and the value of this expression. This is actually a subset of the Parameters panel, showing only the constraints and expressions that are relevant in this situation. If the parameters panel were open at that time, this floating manager would not appear.
6. We want this distance constraint to be controlled by a new parameter: right-click the parameters manager and click **'New'**
7. Give the new parameter a name (e.g. **'Width'**) and an expression (e.g. **500**)
8. Now change the Expression of the distance constraint (the top row in this parameters manager) to be this new Parameter 'Width'.
9. We can again animate this parameter to see whether our changes were correct.
10. Select the front face of the chair, and click the distance constraint icon.
11. Open the parameters manager by clicking the editable dimension that says **Length_X_Y**
12. Change the name of **Length_X_Y** to **Depth**
13. **Note:** all of the steps in this section could also have been done using the Mechanical Browser. However the method explained here is a more visual method, easier to understand.

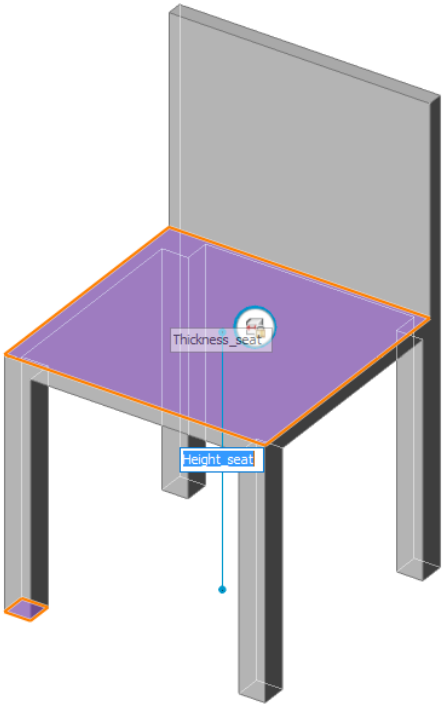


Type	Name	Expression	Value
	CX	Width	500 mm
	Length_X_Y	500	500
	Width	500	500



17 **In this section we'll let the height of the chair be controlled by two absolute value parameters instead of an overall height and a ratio.**

1. Select the top face of the chair seat
2. Click the distance constraint icon, and then the dimension that gives the distance between the top face of the seat and the bottom face of one of the legs
3. We see that the height of the chair seat is controlled by an expression: the overall height of the chair (Length_Z) multiplied by a certain ratio (ratio_1). This is a rather confusing way to represent this height, so we'll create a new parameter: **'Height_seat'** with a value of **480**
4. Now change the expression of the distance constraint to be this new parameter Height_seat
5. Select the top face of the chair backrest
6. In the parameters manager, change the name of **Length_Z** to **Height_backrest**
7. Animate these two parameters to check the results.
8. **Note:** The parameter **ratio_1** has now become obsolete; it is no longer used in any expressions, so we can delete it.



18 In a final step, we can rename the parameters **p_1** and **p_2** to have more appropriate and recognizable names. In this case, **p_1** could be renamed to **Thickness_seat**, and **p_2** could be renamed to **Thickness_leg**. This way, the parameters are more easily recognizable when editing the chair's dimensions.

Drawing documentation advanced

This module explains how to advance your sheets and schedules and how to use templates to customize your future generated drawings.

1 Open starter files

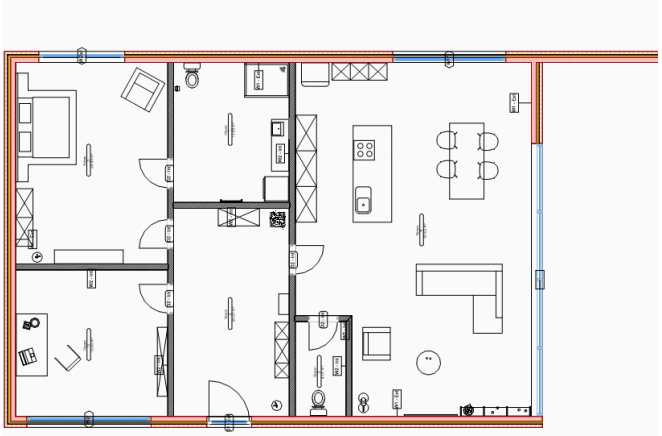
1. To begin, open the following file: **Master.dwg** from the Exercise folder in the 'Drawing documentation advanced' folder. This project is the project we made during the 'Drawing documentation basic' module.

2 Open the Project Browser

1. The **PROJECT BROWSER** should be populated with a set of 12 sections, 6 sheets, and 3 models.
2. Inside the project folder, you will find an extra file: a **project.bsyslib file**. This file links together all of these drawings and sheets. In the following sections, we will keep using the Project Browser to navigate and manage our project and the associated documentation.

3 Check generated drawings

1. To see the generated drawing of the section Ground Floor, right-click **1- Plan – Building 2 - Ground Floor** and select **Display View** in the flyout menu.
2. The floor plan displays the cut through representation of the windows and walls, with different hatches for each ply of the wall, as well as the furniture symbols and some automatically placed tags. We will discuss in detail how these different elements are created in the next steps of this module.

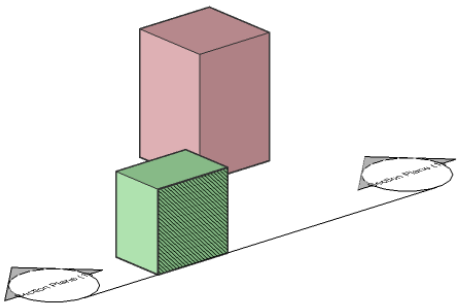


4 Understanding the layers that were created

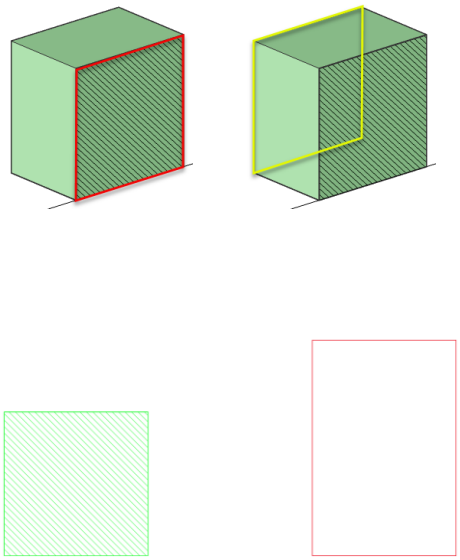
If you take a look at the **LAYERS PANEL** in the **Ground Floor** drawing, you will find that an entire set of layers was created to structure this drawing. They are mainly grouped into three groups: *Background, Boundary* and *Fill.*

The way this is set up is as follows:

1. Imagine having two objects in your 3D model, each on their own layers: **Layer1** and **Layer2.**
2. A section plane is cutting *through* the object on **Layer1** (the green object in the image on the



right). The section plane is *not* cutting through the object on **Layer2** (red object in the image).



3. In the resulting section drawing, some layers will be created for the green object: **Boundary_Layer1** for the boundary of where the section plane slices through the object (indicated with a red line in the image on the right). A **Fill_Layer1** layer will be created containing a hatch of where the section plane cuts through the object. Finally, a **Background_Layer1** layer will be created that contains subentities (e.g. vertices of solids) that are **not** sliced by the section plane: in this case, the vertices indicated with a yellow line in the image on the right.

4. For the red object, only **one** layer will be created. Since the section plane does not cut through this object, only a **Background_Layer2** layer will be created. Thus, the section result will look like the image shown here.

5. This logic is extended when a physical material is assigned to an object. Take a look at the **COMPOSITIONS PANEL** in **Building 2.dwg**. Double-click *Cavity Wall, Brick*, this composition consists of 4 plies, each with their own material. Each physical material is associated with a hatch pattern, which will be shown when creating a floor plan or vertical section.

6. When a physical material or composition is applied to an object, this material name will **overwrite** the name of the layer which the object is on, when creating the *Fill_, Boundary_ and Background_* layers in the resulting section drawing. So let's say you have an object on Layer **Wall**, and it has a composition that consists of two plies: **Brick** and **Insulation**. Instead of creating *Fill_Wall, Background_Wall* and *Boundary_Wall,* it will create the layers *Fill_Brick, Background_Brick, Boundary_Brick, Fill_Insulation, Background_Insulation* and *Boundary_Insulation.*

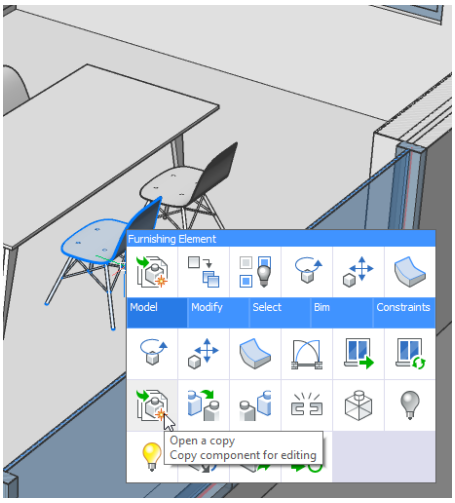
7. For objects **without** a composition, the colors of the *Fill_, Background_* and *Boundary_* layers will be copied from the layer in the 3D model. For objects **with** a composition, the default colours and line weights are set by a template found by typing in **SUPPORTFOLDER** and browsing to *Bim/Sections/_SectionSettings.dwg.* Thus, it's possible to create your own templates for material colors.

8. The way these *Fill_, Background_* and *Boundary_* layers are set up can be controlled in the drawing that contains the section planes; i.e. **Building 2.dwg** in this case. Open this drawing and type in **SECTIONPLANESETTINGS** in the command line. This will open the drawing explorer in the Section Planes tab. Here you can control per section plane how certain types of lines are plotted, and on which layer they are created. This should give you full control over

which layers are created and what your generated 2D drawings will look like. We will not go into full detail here, but it is worth exploring the different options and settings if you want to create templates for your own workplace.

5 Understanding the created BRX_2D layers

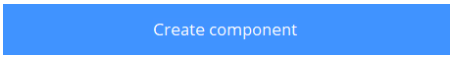
In the drawing with the generated 2D sections, open the **LAYERS PANEL** . In the search bar, type in 'BRX'. You can see that there are a couple of so-called *BRX_2D* layers. We already met them in the 'Drawing documentation basic' module, but we will explore them further here.



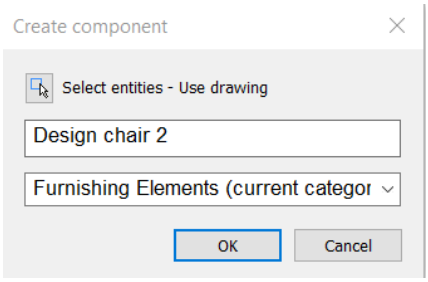
Note that objects on BRX_2D layers will only be displayed in a section result if the section plane is **parallel** to these objects.

You can create your own BRX_2D layers in custom objects, so long as they have the correct syntax: *BRX_2D_* or *BRX_2D+_* as a prefix.

1. Open **Building 2.dwg**.
2. Activate the horizontal floor plan section by double-clicking it.
3. In the dining room, highlight one of the chairs and in the Quad, click **OPEN A COPY** .



4. In this drawing, you can see that there are a layer *BRX_2D_Symbols,* containing some polylines and splines. Thus, when creating a horizontal section, this chair will not be represented by what it looks like as a 3D model, but by the polylines and splines that are on this *BRX_2D_Symbols* layer.
5. Change the representation of the chair to your standard. Make sure to put your symbolic representation on the *BRX_2D_Symbols* layer and to **not** use regular **Lines**, as these will not be displayed upon section generation.
6. Save this copy of the component by hitting the button **Create Component**, in the **COMPONENTS PANEL** , while nothing is selected. Give it a name, for example, **Design chair 2**, and a category, here **Furnishing Elements**.



7. Go back to **Building 2.dwg**.
8. Replace the old chair with the new one by selecting the chair and clicking **REPLACE** from the **Model** tab of the Quad. Click **Enter** to fetch the new component from a file. Browse to the *C:\ProgramData\Bricsys\Components* folder. This is the folder where new components are stored that are made via the Components Panel. If you browse to the Furnishing Elements folder,

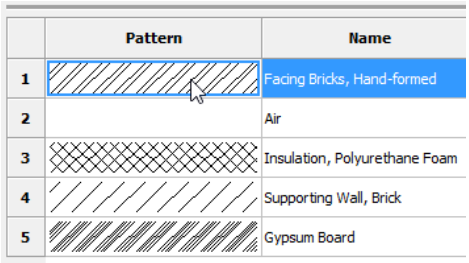
you will find the *Design chair 2* component. Select this dwg to replace the chair with.

9. Now save **Building 2.dwg**.

10. Click **Update** on the **Ground Floor** section in the Sheets tab of the Project Browser and then click **Display View**. You will now see that the BRX_2D_Symbol has changed to the new representation.

6 Updating section hatch patterns

When changes are made in the 3D drawing, these changes can be easily updated in the 2D section result.

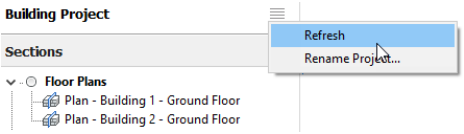


1. Open **A-100.dwg**.

2. Check out the created plan view **Ground Floor**. Notice the different hatch patterns in the section.

3. Go to **Building 2.dwg**.

4. Open the **COMPOSITIONS PANEL** and double-click *Cavity Wall, Brick*



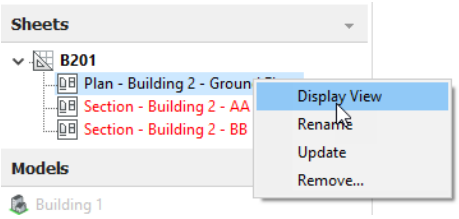
5. Double-click the hatch pattern of the *Facing Bricks, Hand-formed*

6. In the appearance tab, double-click the hatch pattern and change it to **ANSI33**

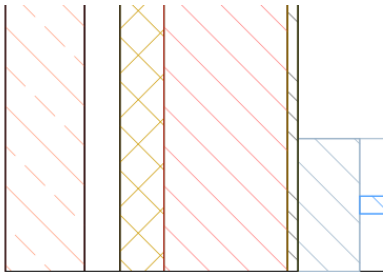
7. Click OK to close the compositions dialog

8. Save this drawing

9. In the Project Browser, right-click **Ground Floor** and click *Display View.*



10. Right-click it again, and this time click *Update*. You should see the changes you made in the 3D model being reflected in this 2D section as well; the hatch pattern of the facing brick is updated to ANSI33 instead of the default hatch pattern.



7 Tagging building elements

The command **BIMTAG** allows you to manually or automatically add tags on section results. However if the property '**Generate Tags**' of the respective section plane is on, the tagging will happen automatically upon generation of your section. Which has happened in our sections.

1. If the setting would be off though you can go to the Quad, under the **Model** tab, click **TAG** and press **Enter**.
2. You see a bunch of Multileaders on your sections. To understand which information those Multileaders show, type **MLEADERSTYLE** in the command line. This opens up the Drawing Explorer in the Multileader Styles tab.
3. Select the _WallTypeStyle; it gives you a preview of what the tag will look like. We will change the tag style so it contains different information and has a different appearance
4. Change the Type from *'Straight'* to *'None'*. Now it won't have a line connecting the building element and the tag itself
5. In the *Content* tab, you see that the Source Block is called _WallTag. Close the drawing explorer.
6. In the command line, type **BEDIT** and choose to edit the _WallTag block definition
7. Select the *WallType* Attribute Definition, and in its **PROPERTIES PANEL** change the 'Tag' value from *WallType* to *Composition*
8. Copy this Attribute Definition and paste it a bit lower. Change this new Attribute Definition's Tag value to *Quantity/Thickness* (see image on the right)
9. Delete the rectangle
10. In the floating Block Edit toolbar, click the **BCLOSE AND SAVE** icon, or type **BCLOSE** in the command line and choose the Save option
11. Highlight the viewport containing the floor plan again
12. In the Quad, under the **Model** tab, click **UPDATE SECTION**
13. The wall tags should now have a different appearance: they should show the composition name as well as the thickness. The box and the leader connecting it to the building element should no longer appear.

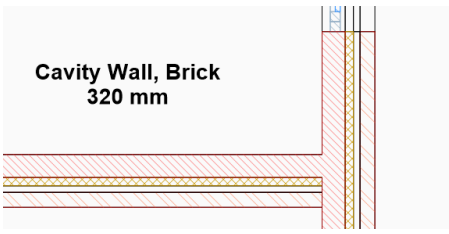
Note: these block definitions and multileaderstyles are saved in a template drawing in the support folder. Type in **SUPPORTFOLDER** and browse to Bim/Sections/_SectionTag. Thus, it is possible to create your own templates for tag styles, using the same method as described above in the template file.

Composition
Quantity/Thickness

Note: the syntax to be used is as follows:

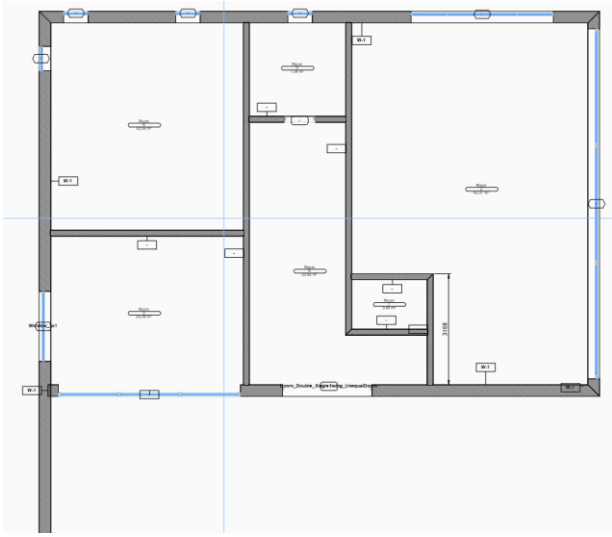
@PropCatName/@PropName. If "/" delimiter is not present in the tag, "BIM" category is assumed.

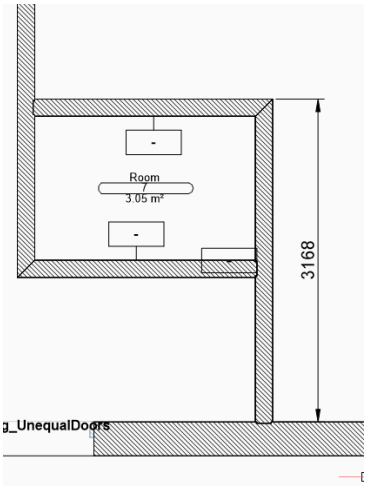
Base property name should be separated from the child name with ":" character, e.g. mass/ucs elevation:minimum.

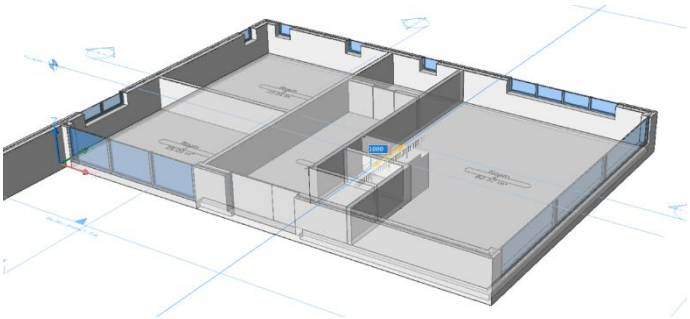


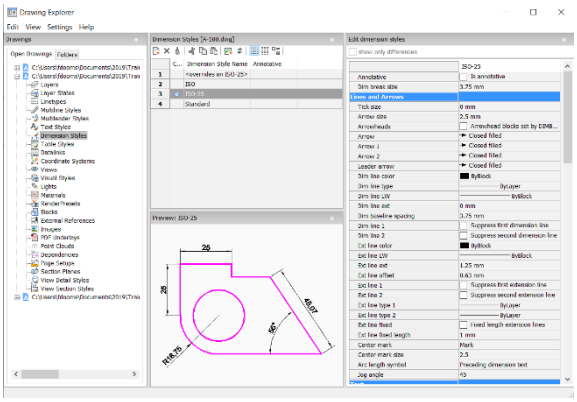
8 Adding dimensions

1. Open the **Plan – Building 1 – Ground Floor** section drawing.
2. Go to the **Annotate** tab and select **DIMENSION** from the Dimensions category.
3. Click a line (without snapping to a point) of the wall that is dimensioned in the image to the right.
4. Click again to place the dimension's text somewhere in the neighborhood of the wall.
5. Save the file **A-101.dwg**.
6. Open **Building 1.dwg** and clip the horizontal section.
7. Drag the wall, indicated in the picture to the right, by **1000 mm**. To do this, hover over a face of the wall and click **DRAG** from the **Model** tab of the Quad. Then move the cursor out of the little room into the big room, type in **1000** and hit **Enter**.
8. Save **Building 1.dwg**.
9. Go back to **Plan – Building 1 – Ground Floor**.
10. Click on the viewport and click **UPDATE SECTION** (Quad: **Model** tab).
11. The dimension line adjusted itself according to the new length of the wall.
12. If you want to add some more annotations, you can do so, but in this training, this was the last type of annotation that we discussed.
13. You can customize and save dimension styles in the **Dimensions** section of the **Drawing Explorer**. You can go there by typing in **DIMSTYLE** in the command line.
14. Note that if you want to store dimension styles for future drawings you can do so by adding them in a .dwt template file. The process of adding things to a template file will be discussed in one of the next steps.



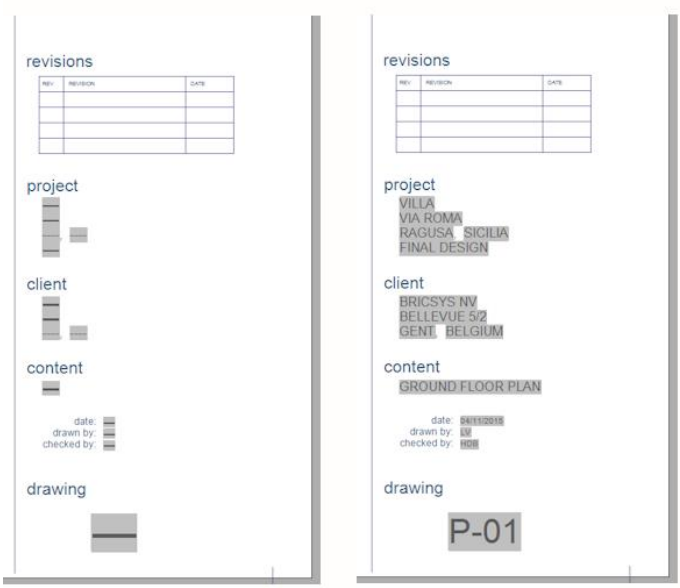






9 Inserting title blocks and sheet list tables

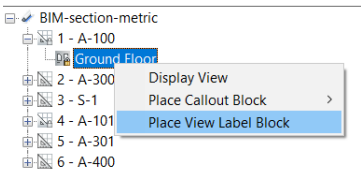
1. Go to the file **A-101.dwg**.
2. Open the **Drawing Explorer - Blocks** dialog by typing in **XB** in the command line.
3. Double click the **Title** block.
   The Drawing Explorer dialog closes and the block is attached to the cursor.
4. Click at the lower right corner of the paper sheet in the layout.
5. Define some **Project properties** in the **SHEET SETS PANEL** .
6. Save the drawing. Normally the fields are now updated automatically.
7. If the fields would not update automatically, you can go to the **Annotate** tab, select the Title block, then click the **UPDATE FIELDS** tool button ( ) in the **Text** tab under the **Fields** drop-down.
8. Now let's insert a sheet list table.
9. A **Sheet List** table can be inserted on any sheet of the sheet set.
10. Right-click the sheet set name in the **SHEET SETS PANEL** and choose **Insert Sheet List Table** in the context menu.
11. Specify a point in the drawing to place your table.
12. Fill in the numbers of the sheets by going to each individual sheet in the **SHEET SETS PANEL** . Run the **UPDATE FIELDS** command onto the table to regenerate the table.
13. Note that if you want to store the title block for future drawings you can do so by adding it in a .dwt template file. The process of adding things to a template file will be discussed in one of the next steps.



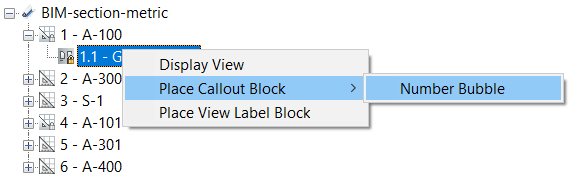
Sheet List	
Number	Title
1	A-100
2	A-300
3	A-301
4	A-400

10 Adding view labels and callout blocks

1. We will start by adding a view label.
2. Go to the file **A-100.dwg**.
3. Select the sheet view **A-100** in the **SHEET SETS PANEL** and click on the plus in front of it.
4. Right-click the sheet view you want the view label block to be inserted for.
5. Choose **Place View Label Block** in the context menu.
6. Click on your sheet to specify an insertion point.
7. **Enter** to accept 1 for the Scale factor of the block.



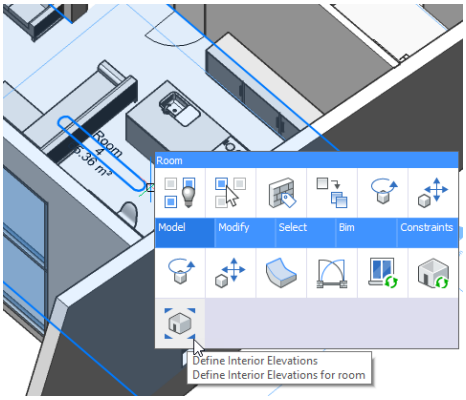
8. **Enter** to accept 0 for the Rotation angle of the block.
9. The View Label block is inserted.
10. The Sheet Number, Sheet View Number, Sheet View Title and Viewport Scale of the selected sheet view are filled in automatically.
11. Select the sheet view **A-100** in the **SHEET SETS PANEL** and click on the plus in front of it.
12. Right-click the sheet view you want the callout block to be inserted for.
13. Choose **Place Callout Block** > **Number Bubble** in the context menu.
14. Click on your sheet to specify an insertion point.
15. **Enter** to accept 1 for the Scale factor of the block.
16. **Enter** to accept 0 for the Rotation angle of the block.
17. The Number Bubble block is inserted.
18. The Sheet Number and Sheet View Number of the selected sheet view are filled in automatically.
19. You can store the source files of various callout blocks in a template.
20. The template is located in the *..\Support\Bim\Sections* subfolder of the Roamable Root folder. By default this is: *C:\Users\<user_name>\AppData\Roaming\Bricsys\BricsCAD\Vxx\en_US\Support\Bim\Sections*. You can easily access this file by typing in **SUPPORTFOLDER** and browsing to Bim/Sections.
21. You can edit these files to customize the layout of the callouts and the section tracker blocks.
22. When a drawing is generated, the needed callout blocks are created from the callout blocks source file(s). When a BIM section is updated, the existing callout blocks in the target drawing are used (type **BEDIT** to choose one to edit).



11 Creating interior elevations

If you're interested in interior elevations of a room, these can be created automatically. This can be particularly interesting for interior designers, or to make the layout of wall plugs/light switches

1. Open **Building 2.dwg**
2. Activate the horizontal plan section by double-clicking it
3. Highlight the living **Room** or select it in the Structure Browser
4. In the Quad, under the **Model** tab, click **DEFINE INTERIOR ELEVATIONS**



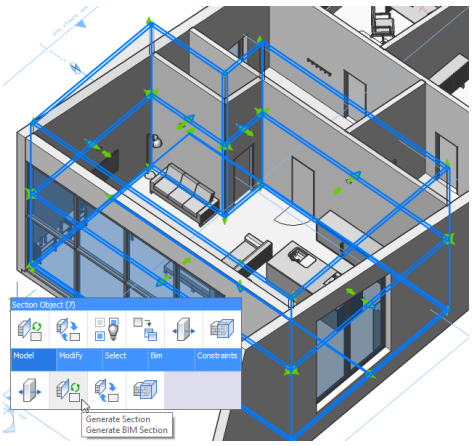
This should create an elevation for each wall, and a floor plan of this room.

5. Open the **STRUCTURE BROWSER** and under **Sections**, you should now find 6 Interior Elevations and 1 Interior Floor Plan.

6. Select all 7 of these section planes and in the Quad under the **Model** tab, click **GENERATE SECTION**.

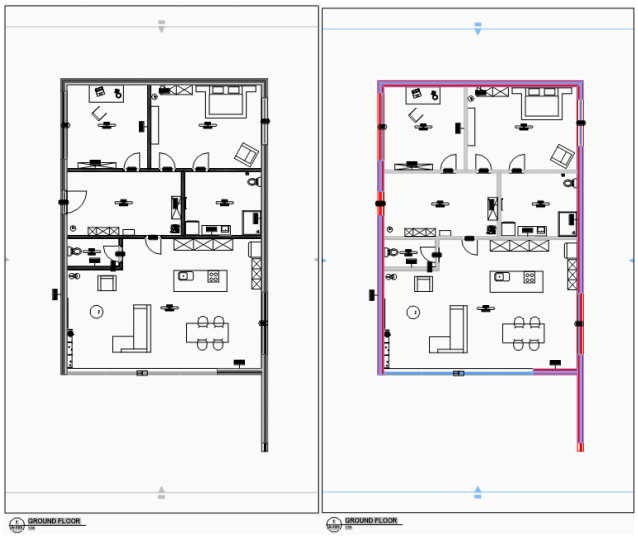
7. You can open the section results by clicking **OPEN MODEL** while having the section planes selected, or by opening the Project Browser. This should now contain a new sheet displaying these interior elevations.

8. Rearrange the section results so that they fit on the sheet. These interior elevations work the exact same way as the sections and plans we created earlier, so everything about the layer setup and updating changes etc. also applies here.



12 Creating Drawing Customization templates

You can set up Drawing Customization templates which you can apply to selected viewports on sheets. These templates are helpful to ensure certain graphic standards are applied uniformly across different set of drawings, and across other projects, based on your desired entities' BIM properties and their values. It can also be useful to check if the 3D model elements and its metadata have been correctly created. For this training exercise, we will create a template to filter and apply bespoke graphics to highlight External Walls and Doors on a floor plan.



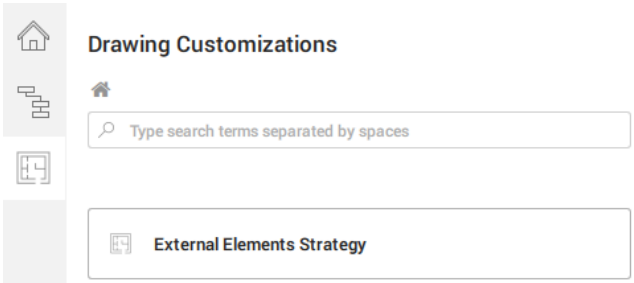
1. Open **Building 2.dwg** and **A-102.dwg**

2. On the side panel, turn on the **DRAWING CUSTOMIZATION PANEL** to access the interface.

3. Click to create a new template. By default, the template is named "**New Customization**" with the text highlighted.

4. Rename the template to "**External Elements Strategy**" while the text is being highlighted. Once done, hit **Enter** to save and apply the name.

5. Click the newly created template tab to begin defining its customization settings. The first step into the template brings you to the Entity Customizations, where you will define how your desired element should appear in the customized drawing.



6. Click + to create a new entity customization template. Similar as before, the template is named "New Customization" with the text highlighted.

7. As this template will contain the customization settings for external walls, rename the template to "**Wall - External**" while the text is being highlighted. Once done, hit **Enter** to save and apply the name.

8. Repeat Steps 6 and 7. For the second template, rename it to "**Door – External**". Hit **Enter** to save and apply the name when done.

9. Create a third template and rename it to "**Others**". This is a general entity customization setting that could "blanket" apply to other entities or parameters outside what have just been specified. This is helpful especially to "tone down" the presence of any unrelated or unimportant entities you do not wish to the reader to pay attention to.

10. With 3 entity customizations to consider, that gives you an idea how many different styles will have to be created. Go to ✎ to access the **STYLES** tab.

11. To create a new style, click + at the bottom right of the panel and a new **STYLES** template tab will appear.

12. By default, the tab is named "**Style**". Rename it to "**Red**" while the text is being highlighted as shown. After you are done, hit **Enter** to save and apply.

13. Repeat Steps 11 and 12 for the 2 other styles. Rename the 2nd and the 3rd Style templates as "**Blue**" and "**Grey**". Now you should have 3 styles in total.

14. Click **Blue** to set its style settings.

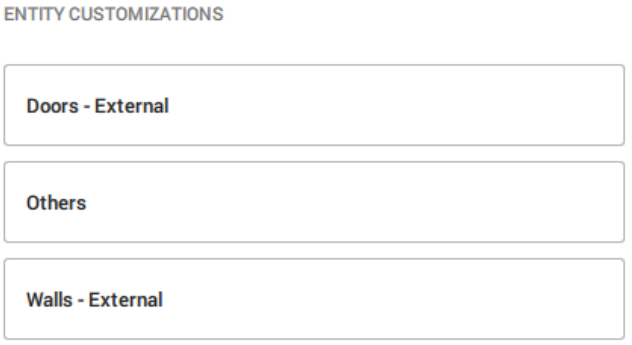
15. Click its current **Color** value **RGB: 255,255,255** to edit.

16. In the **Select Color** dialog, click the **Index Color** tab to access a range of pre-set colors. Click the v button to change the index value from **255** to **5**. Alternatively, you could type **5** into the value box or select a blue square with a value of **RGB: 0,0,255**. Press **OK** to apply the changes and exit the dialog.

17. The color value should now be changed to **Blue**. Hit **OK** in the Drawing Customization panel to apply the changes to the style template.

18. To adjust the right colors for the Red and Grey style templates, repeat Steps 14 – 17. However, for **Grey** choose **Index 1; RGB 255,0,0** and for **Red** choose **Index 9; RGB: 192,192,192**.

19. With all 3 style settings set, click **Back** to return to the previous page on the panel. It should bring you to the Entity Customization page.



20. Click **Wall – External** tab to define its entity customization settings.

21. Click **Section Result Customization**. As this drawing customization template will be implemented on a floor plan, walls taller than the view plane, ie. 1000mm, will be appear as cut, like in a section. Therefore, it is appropriate to change the default value of the **Intersection Fill** setting to an available Style. In the drop-down selection, select **Red.**

22. As this style should also apply to External Walls shorter than the View Plan height, select **Red** for the **Background** value in its drop-down to enable this function.

23. The main color of the affected entities has now been set to **Red**, but any corresponding hatches will remain as its default settings. In the drop-down selection box for Appearance Override, select **Aluminium** from the list, which as a material hatch appears as a solid hatch. Now my External Wall entities when cut will appear solid.

24. Ensure the **Inherit For Plies** box is **ticked** so the settings also apply across those compositions with multiple layers.

25. Click **Back** twice to return to the Entity Customization page to resume setting up the rest.

26. Click **Door – External** tab to define its entity customization settings.

27. Click **Symbol Customization**. In this drawing customization template, the external doors will be replaced with a desired symbol.

28. Click on the **Select File** tab to select a 2D symbol drawing in dwg format you would like to replace the door entity in the customized drawing.

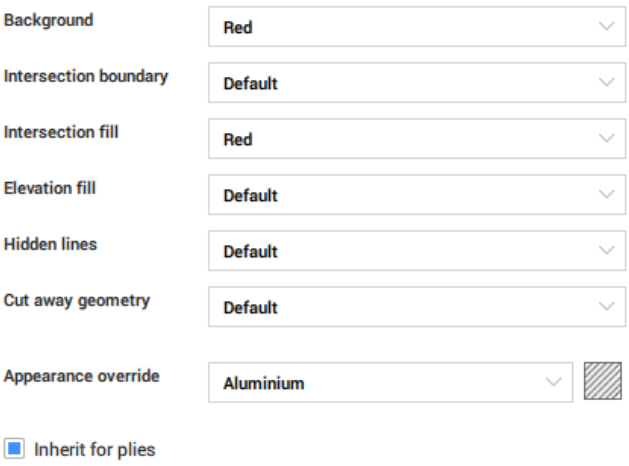
29. In the dialog, choose **Symbol – Circle** in the **Starter files – Drawing Documentation Advanced – Exercise folder**. For best practice, always transfer the symbol file to the relevant Drawing Customization template folder within Support Folder – Customizations. For more information, please refer to the V21 Help Guide on how to access customization templates.

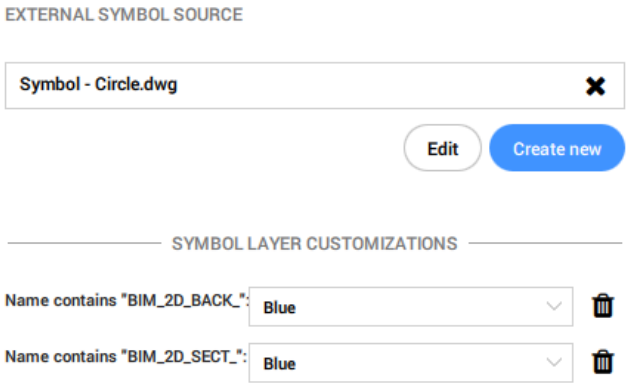
30. As the default layer settings in the symbol file are not defined or associated with any desired colors, it is best to customize the symbol file based on its layer names and with the styles created earlier.

    Symbol – Circle.dwg contains 2D objects in 2 separate layers, therefore they would need to be adjusted accordingly.

31. Click + and when prompted with **Symbol Name Contains:**, enter "**BIM_2D_BACK_**". Hit **OK** when done.

32. Repeat Step 31 and for the prompt, enter "**BIM_2D_SECT_**". Hit **OK** when done.





33. For both values of the new symbol layer customizations, select **Blue** from their drop-down values.

34. On the tree structure (on top of the panel), click **External Elements Strategy** to quickly return to the Entity Customization page or click **Back** two times.

35. Finally, define the settings for the **Others**. Click **Section Result Customization**.

36. Select **Grey** as values for the **Background, Intersection Boundary** and **Intersection Fill** fields.

37. When done, click at the top right-hand corner of the panel to access the **RULES**.

38. Click to create a new Rule. Rename the rule to "**Walls**" while the text is being highlighted. Hit Enter when done.

39. Repeat Steps 38 and 39. Rename the second Rule as "**Doors**"

40. Now let's first apply rules to the walls, click within **Walls**. You will be prompted with a selection of new functions to choose from.

41. Select **Filter.**

42. In the **Edit Filter Parameters** dialog, the default values refer to a formula "Type (BIM) = Wall", which coincidentally corresponds with the desired filter rule for the walls.

43. Repeat Step 41 to create a **Sub Rule**. Note: This **sub rule** is to specify the selection of External Wall only.

44. Select **Sub rule**.

45. Rename the rule to "**External**" while the text is being highlighted. Hit **Enter** when done.

46. Click within the **SUB RULE**.

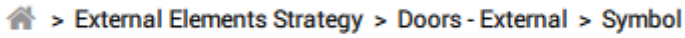
47. Select **Filter.**

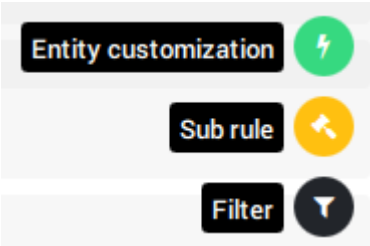
48. In the Edit Filter Parameters dialog, change the **Filter Property** from **Type (BIM)** to **Is External (Wall Common).**

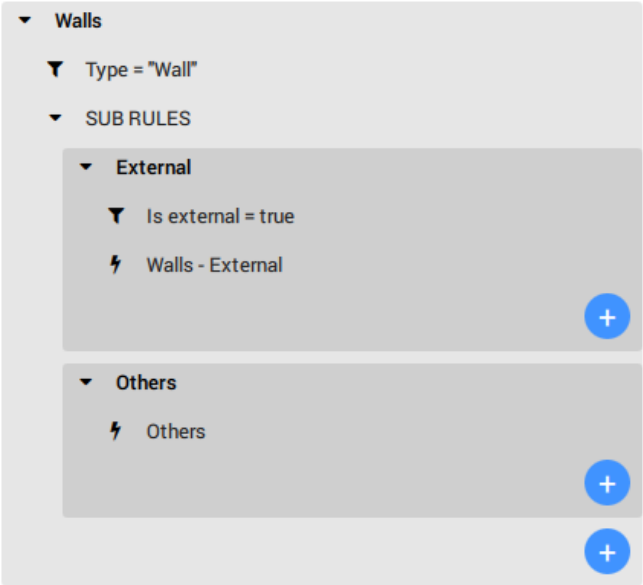
    Note: Instead of scrolling you can also type "Is External (Wall Common)"

49. For the **Check Value (Boolean)** field, choose **True** from the drop-down selection to ensure a formula "Is External (Wall Common) = True" is applied to the filter **SUB RULE** for all **Wall** entities within the model.

50. To end this sub-rule, click within the sub rule and select **Entity Customization**.







51. Here you will be prompted to select a Name. From the drop-down selection, choose **Wall – External.** Hit **OK** when done.

    Note: By selecting from the drop-down selection "Wall-External", we are applying the rule to the **Entity Customization** called **Wall-External**, which was created on Step 7.

52. Repeat Steps 44 – 46 but rename the new **SUB RULE** to "Others".

53. Simply repeat Step 51 and choose **Others** in the drop-down selection prompt. Without any additional sub-filters, this **SUB RULE** will now apply to walls whose **Is External (Wall Common)** value is **False**, i.e. Internal. Hit **OK** when done.

54. Repeat the actions from Steps 41 and 42, but this time on the **Door** Rule.

55. In the Edit Filter Parameters dialog, change the **Check Value (String)** value from **Wall** to **Door**, such that the formula refers to "Type (BIM) = Door", to select all Door entities in the model.

56. Repeat the sequence of creating new sub rules as you have done from Steps 44 – 54, while making sure any relevant filter rules refer to Door entities, i.e. Is **External (Door Common)** and that the sub-rule for the External Door is paired with **Door – External.**

57. Now your entity customizations, filter rules and styles are set. You may click  to exit the settings and return to the Drawing Customization homepage to prevent any accidental changes.

58. Click the **A-102.dwg** tab to view the sheet.

59. Ensure the **PROPERTIES** panel is turned on and is displayed.

60. Select **PLAN – BUILDING 2 – GROUND FLOOR** viewport and in the **PROPERTIES** panel, go to the **Drawing Customization** property and select **External Elements Strategy** from its drop-down selection.

61. Hover over the selected viewport and select **UPDATE SECTION**  in the Quad under **Model** tab.

62. You should see a refreshed viewport with the graphical changes as per your Drawing Customization settings.

BIM	
Name	
Description	
Generate elevation fill	Off
Drawing customization	External Elements Strategy

13 Creating schedules

Let's add some more schedules to the project, besides the Door schedule we created in the 'Drawing documentation basic' module. Step 1 to 9 are meant to refresh your memory of how this is done. This time we make a schedule of windows.

1. Go to **Building 2.dwg**.

2. In the **Schedules** tab of the **PROJECT BROWSER**  , click *Add Schedule*. A dialog pops up.

3. First, we'll create a window schedule: Enter a name (e.g. **Building 2 – Windows**). Select **Building 2.dwg** in the model field if it is not already selected. In the Data Extraction Definition field, choose for **Windows (BIM).dxd** (this file can be found in your *Supportfolder/Bim/Schedules)*. Choose an appropriate name for the resulting drawing. This will be another sheet, so you could choose a name that is consistent with the sheet you created for the plans and sections.

4. Click **Next**.

5. Tick **off** 'Extract entities from blocks'. Click **Next**.

6. You can now select the properties you want. Click **Finish** to accept the defaults of the .dxd file.

7. The schedule is now shown in the project browser, but it is not generated yet.

8. Right-click the schedule name and click *Update.*

9. Right-click the schedule name and click *Display Schedule.*

10. We see that both schedules have a column '*Story*' showing. This is not very relevant, as the building only has one story. So we'll delete this field from the Schedule. You could have done that by deselecting this property in the creation process. The way to do this afterward, however, is by changing the Data Extraction Definition (.dxd file). The files you've used are a set of default .dxd's to help new users on their way. However, every time you go through the schedule wizard a new .dxd file is created in your project folder, with your selected settings. This is then used to create the schedule.

11. Right-click the Windows schedule in the Project Browser, and click *Properties…*

12. In the .dxd field, copy the file path and past it in your Windows Explorer. The file will be opened in a text editor. It is the new .dxd in your project folder that is opened.

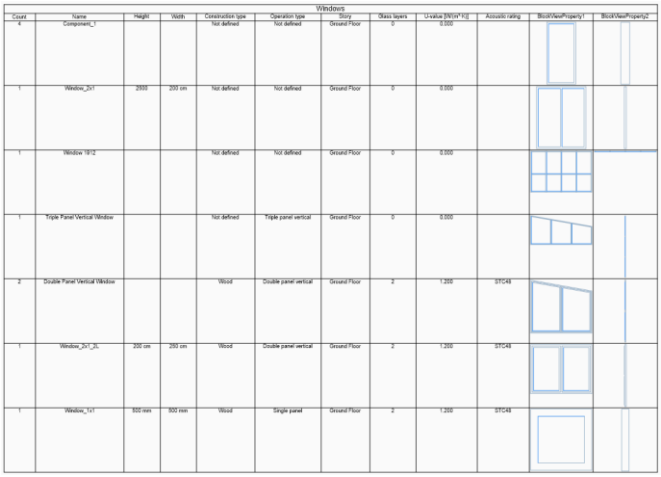
13. A .dxd file is a readable file, so it's possible to create your own .dxd's in a simple text editor.

14. Remove the line that says **Story|Story|**

15. Save the file.

16. Do the same for the **Doors (BIM).dxd.**

17. Update both sections; they should now not have any *Story* information showing.



Windows

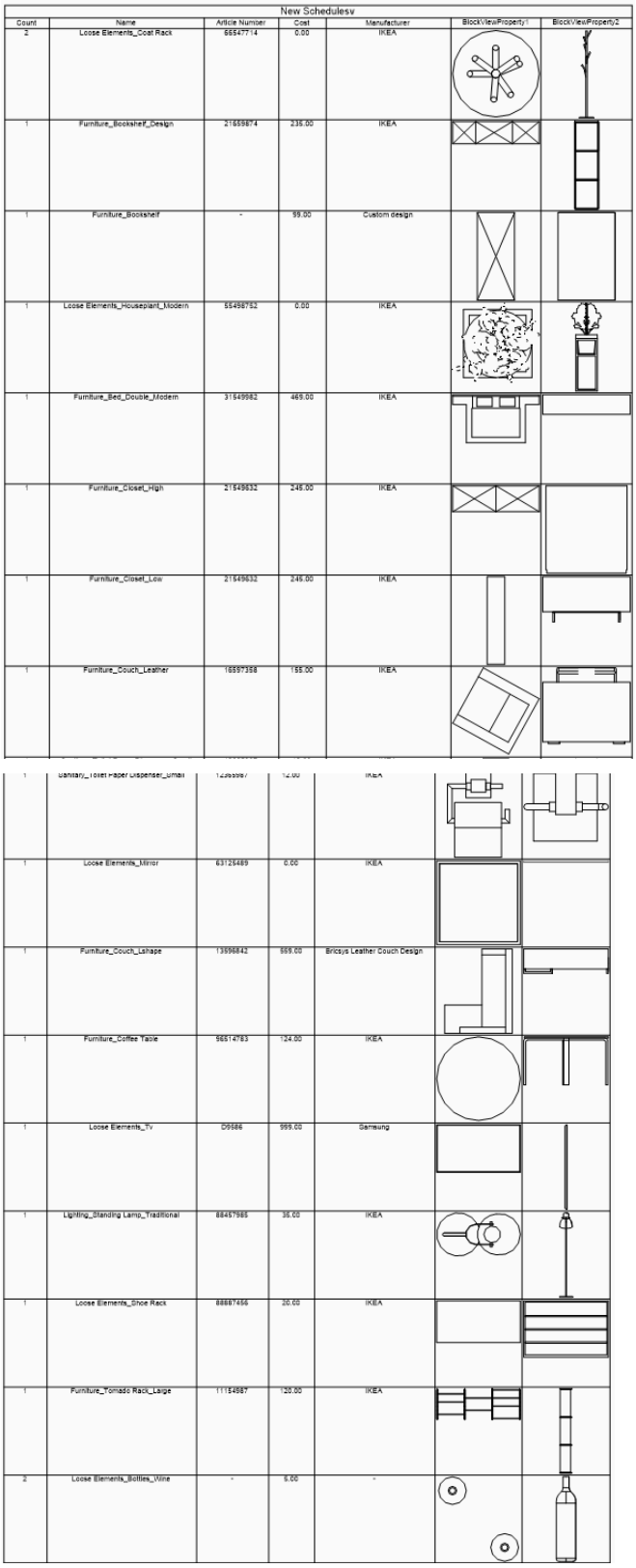
Count	Name	Height	Width	Construction type	Operation type	Story	Glass layers	U-value [W/(m² K)]	Acoustic rating	BlockViewProperty1	BlockViewProperty2
4	Component_1			Not defined	Not defined	Ground Floor	0	0.000			
1	Window_2x1	2000	200 cm	Not defined	Not defined	Ground Floor	0	0.000			
1	Window 19:2			Not defined	Not defined	Ground Floor	0	0.000			
1	Triple Panel Vertical Window			Not defined	Triple panel vertical	Ground Floor	0	0.000			
2	Double Panel Vertical Window			Wood	Double panel vertical	Ground Floor	2	1.200	STC48		
1	Window_2x1_2L	200 cm	250 cm	Wood	Double panel vertical	Ground Floor	2	1.200	STC48		
1	Window_1x1	500 mm	500 mm	Wood	Single panel	Ground Floor	2	1.200	STC48		

14 Creating a Data Extraction Definition from scratch

The **DATAEXTRACTION** command will, just like the Schedules wizard, make a new .dxd file with your

settings, but it will also make a .csv file with your data in it.

1. Open **Building 2.dwg.**
2. In the Structure Browser, select all Furnishing Elements.
3. Type in **DATAEXTRACTION** in the command line.
4. **Uncheck** the *Extract entities from blocks* box.
5. Check the *Create Data Extraction Definition* box, and choose a file: name it *"FurnishingElements.dxd"* and save it in your project folder.
6. Click **Next.**
7. Select All and click **Next.**
8. Check the three properties in the *Furniture Information* category: **Article Number, Cost, and Manufacturer.**
9. Click **Next**.
10. Click on the three dots next to the *Output to CSV* field. Give in a new name for you .csv file and click **Save**.
11. Click **Finish**.
12. This should have created 2 files: a .csv file containing the results of the dataextraction (basically the same as a schedule, but in an external file), and a .dxd file. This .dxd file can now be re-used for creating a schedule.
13. Open the .dxd file in a text editor. We can see 5 sections: **Settings**, **Entity Types, Properties, TableFormatOptions** and **SELECTION SET.**
14. The **Settings** we will leave as they are
15. The **Entity Types** are chosen because of the selection set we had active when using data extraction. However, instead of explicitly choosing which types (and handles, see later) we want to extract data from, we will just replace the explicit entity types by an asterisk (*), to define that we want to extract information from **all** entity types.
16. The **Properties** we will leave as they are.
17. The **TableFormatOptions** we will leave as they are.
18. We can delete the entire **SELECTION SET** section, because again we don't want to explicitly define which entities we'll be extracting data from. We'll do this by adding a filter.
19. We can add a filter by adding a new section:
    The section title is called `[Filter]`
    The section content is
    `(Type == Furnishing Element)`
    (cfr. the .dxd files that are given as example in the support folder, there a Filter on Door and Window type is used).



New Schedulesv

Count	Name	Article Number	Cost	Manufacturer	BlockViewProperty1	BlockViewProperty2
2	Loose Elements_Coat Rack	66547714	0.00	IKEA		
1	Furniture_Bookshelf_Design	21659874	235.00	IKEA		
1	Furniture_Bookshelf	-	99.00	Custom design		
1	Loose Elements_Houseplant_Modern	55498752	0.00	IKEA		
1	Furniture_Bed_Double_Modern	31549982	469.00	IKEA		
1	Furniture_Closet_High	21549632	245.00	IKEA		
1	Furniture_Closet_Low	21549632	245.00	IKEA		
1	Furniture_Couch_Leather	16597358	195.00	IKEA		
1	Sanitary_Toilet Paper Dispenser_Small	12295087	12.00	IKEA		
1	Loose Elements_Mirror	63125489	0.00	IKEA		
1	Furniture_Couch_Lshape	13596842	559.00	Bricsys Leather Couch Design		
1	Furniture_Coffee Table	56514783	124.00	IKEA		
1	Loose Elements_Tv	D9586	999.00	Samsung		
1	Lighting_Standing Lamp_Traditional	88457985	35.00	IKEA		
1	Loose Elements_Shoe Rack	88897456	20.00	IKEA		
1	Furniture_Tornado Rack_Large	11154987	120.00	IKEA		
2	Loose Elements_Bottles_Wine	-	6.00	-		

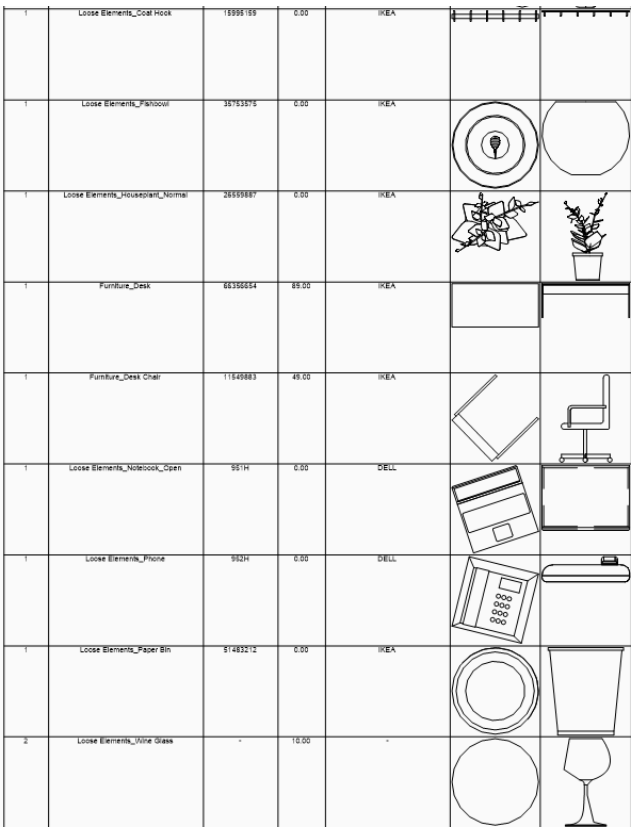
20. Thus, the contents of the .dxd file should be as follows:

```
[Settings]
ExtractFromBlocks=0
ExtractFromXrefs=1
CountXrefs=0
CombineEqualRows=1
IncludeNameColumn=1
FooterStyle|0
FlowDirectionRtoL|0

[Entity Types]
*

[Properties]
Article Number~User|Article Number|
Cost~User|Cost|%lu2%pr2
Manufacturer~User|Manufacturer|

[TableFormatOptions]
TableStyle=Standard
TitleCellStyle=Title
HeaderCellStyle=Header
DataCellStyle=Data

[Filter]
(Type == Furnishing Element)
```

21. Save this .dxd file in your project folder.

22. In the Project Browser, click *Add Schedule* and give it an appropriate name (e.g. Building 2 – Furnishing Elements). Select **Building 2.dwg** in the model field if it is not already selected. In the Data Extraction Definition field, choose for the .dxd file you just saved. For the result drawing, choose a new drawing.

Update the schedule and display it. You should now have a new schedule, containing information about furniture elements: Cost, Manufacturer, Article Number, Count and BlockViewProperties.



15 Creating sheet set templates

1. The sheet set templates are stored in the *C:\Users\<user_name>\AppData\Local\Bricsys\BricsCAD\Vxx\en_US\Templates* folder.

2. If you want to edit an existing template, you have two options. Either you edit it directly, or you make a copy.

3. To edit it directly, you can go to **Open** under the BricsCAD icon, choose .dwt in the 'Files of type' drop-down and choose the file you want to edit. You can then make the modifications and save the file.

4. To make a copy, double-click on the .dwt file you want to copy. A new .dwg with this template will open. Make your modifications and save your file as .dwt. Save it in the templates folder to easily use the copied template in a new drawing.

5. If you have saved the template .dwt to the sheet set templates folder, you will see it

appear when you use the New Wizard to open a new drawing. You will also be able to select it as the template for the creation of generated drawings in the sheet set set-up of the Project Browser.

6. What can you store into a template?
   You can store the following things by using them in your .dwt file:

   a. Title block
   b. Layers
   c. Colors
   d. Line types
   e. Hatch patterns
   f. Blocks
   g. Text styles
   h. Dimension styles
   i. Page set-ups