Training Guide 1 – Basic Construction Overview

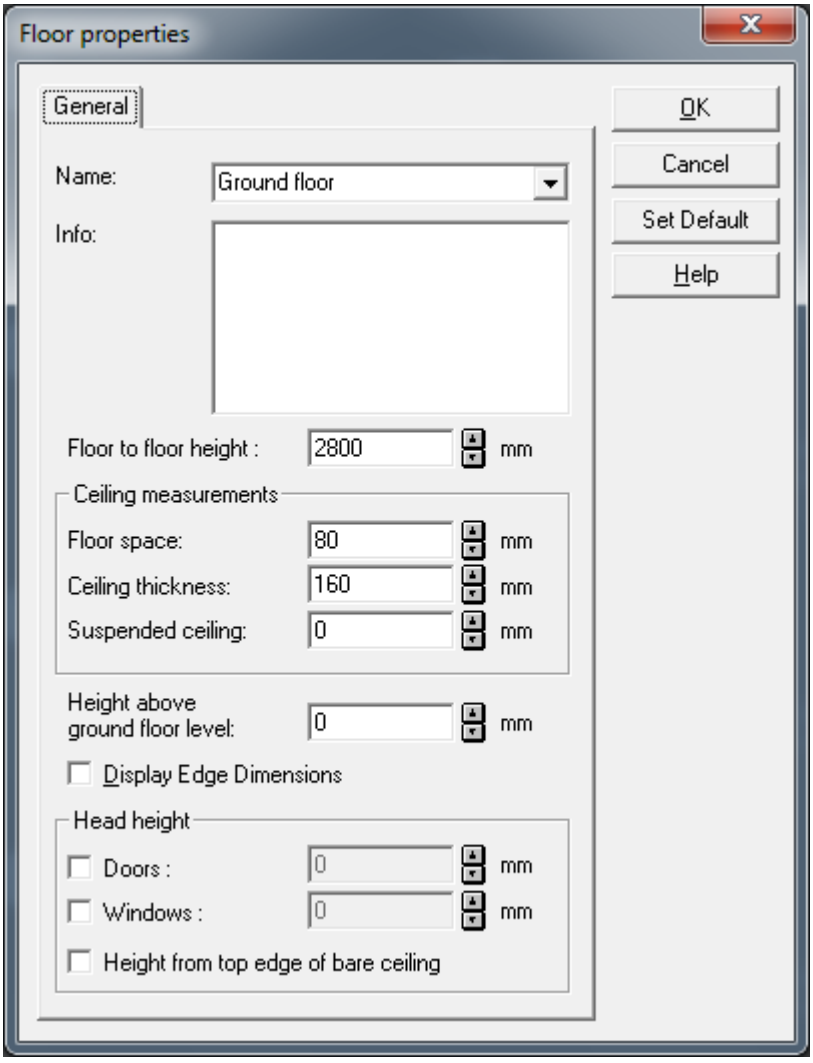
(v1.1)

Contents

Creating a new project

In order to start with our drawing, we have to initially create a new project and establish the project settings which will define the parameters of our drawing.

1. Navigate to the **File** menu
2. Select **New**
3. You will be presented with a dialogue box to confirm the floor properties of the initial floor of your new building:



4. In the **Floor Properties** dialogue box we need to select the following fields:
    a. **Name** – either select the correct floor name from the drop down list, or type a new one in this box. Using meaningful and correct floor names will aid navigation through projects as they become larger and more complex
    b. **Floor to floor height** – this will help determine the height of your walls in 3D. Floor to floor height represents the measurement from the floor surface of the floor we are creating, to the floor surface of the level above. To calculate floor to ceiling

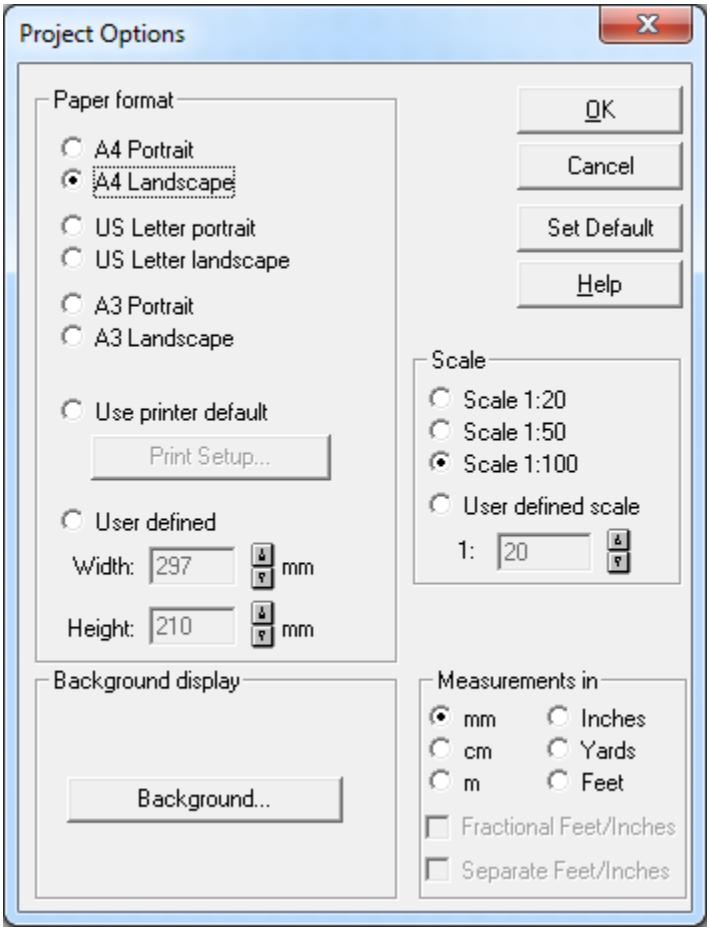
height you would need to subtract the values in the **Ceiling measurements** box from the **Floor to floor height**

c. **Height above ground floor level** – if required this can be set to an appropriate measurement either positive for raised properties or negative for underground builds

5. When these settings are correct, click **OK** to open your blank workspace. Don't worry about the accuracy of these settings if they are unknown as they can be edited at any time.

You will now be presented with an empty workspace on which your drawing will exist. However before we start with the drawing we need to check the scale and paper size settings are correct and appropriate for our requirements.

1. Navigate to **File**
2. Select **Project Options**, the following dialogue box will open:



3. Using the radio buttons next to the options, we can select our paper size, the scale the project will be drawn at and the measurement units for the project. These settings can again all be changed at anytime so it is always possible to change scale/size or metric/imperial measurements and different unit types.

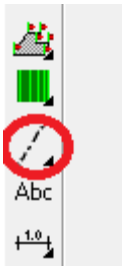
4. Under **Paper Format** select **Use Printer Default** and then press the **Print Setup** button. In the dialogue box that opens, choose the paper type and orientation that you would like to print your projects to. The page on screen will then adjust to match your chosen printer settings
5. Select the required **Scale** (for most plans this will be **1:100**) and the measurement units you wish to use (this would normally be **mm**)
6. If you want to use these settings as your default for future projects, select **Set as default** then press **OK** to return to your newly formatted project page.

Entering Measurements

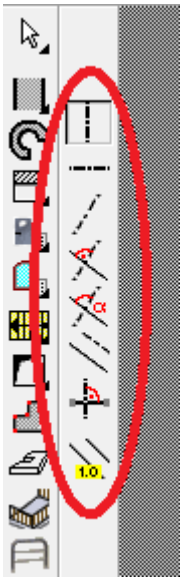
With the Arcon software there are often multiple methods that can be used to achieve the same outcome. Providing multiple options for producing the same end goal enables the user to select a working method that suits their own style. For the purposes of entering our dimensions of the floor plans, we can achieve this in a number of ways. The method detailed below is just one option, although it is seen by most users as the fastest and most accurate way of creating an accurate floor plan.

In the method we will use below, we initially ignore the placement of walls. Instead, we will mark out our known measurements using the **Guideline** tool.

1. From the left-hand toolbar locate and click on the **Guideline** tool



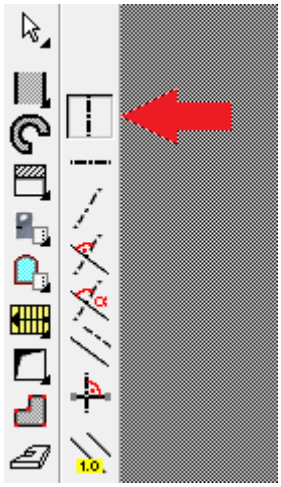
2. Clicking on the **Guideline** tool will display a new set of options on the inside left toolbar



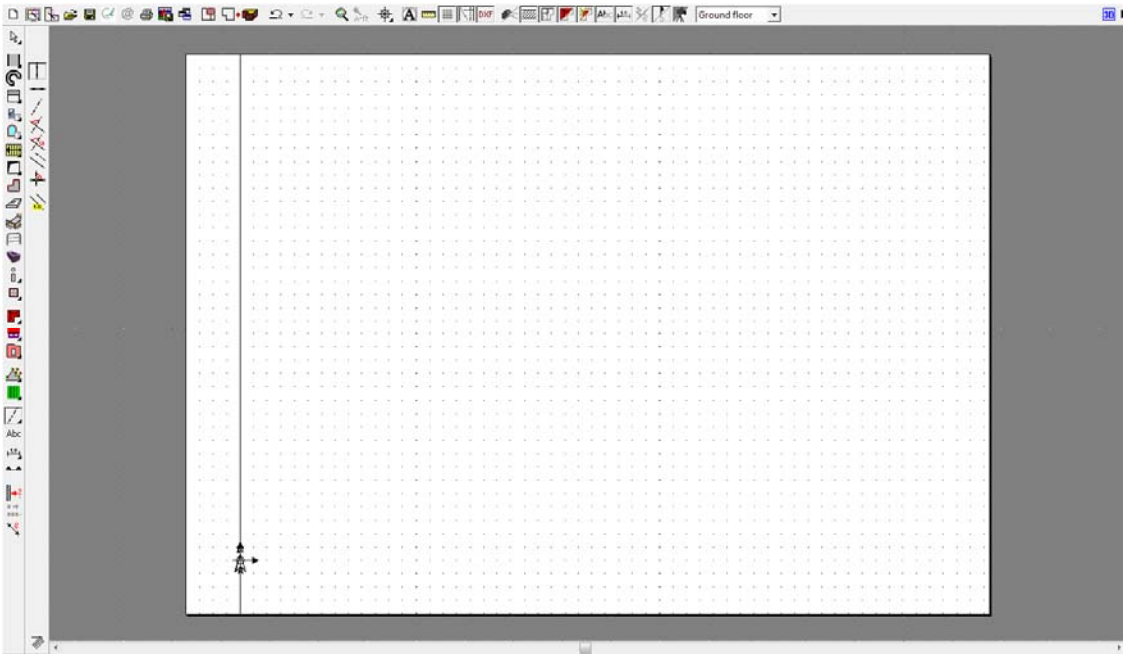
3. Each of the icons displayed in this toolset represent a different placement method or type of **Guideline**. We will now use a combination of these **Guidelines** in order to place our known measurements
4. As we will be dealing with real world measurements, we need to ensure that the guidelines we place are accurate. The first thing we need to do is place a reference point on our

drawing to measure from (this method is the same for working with either internal or external measurements).

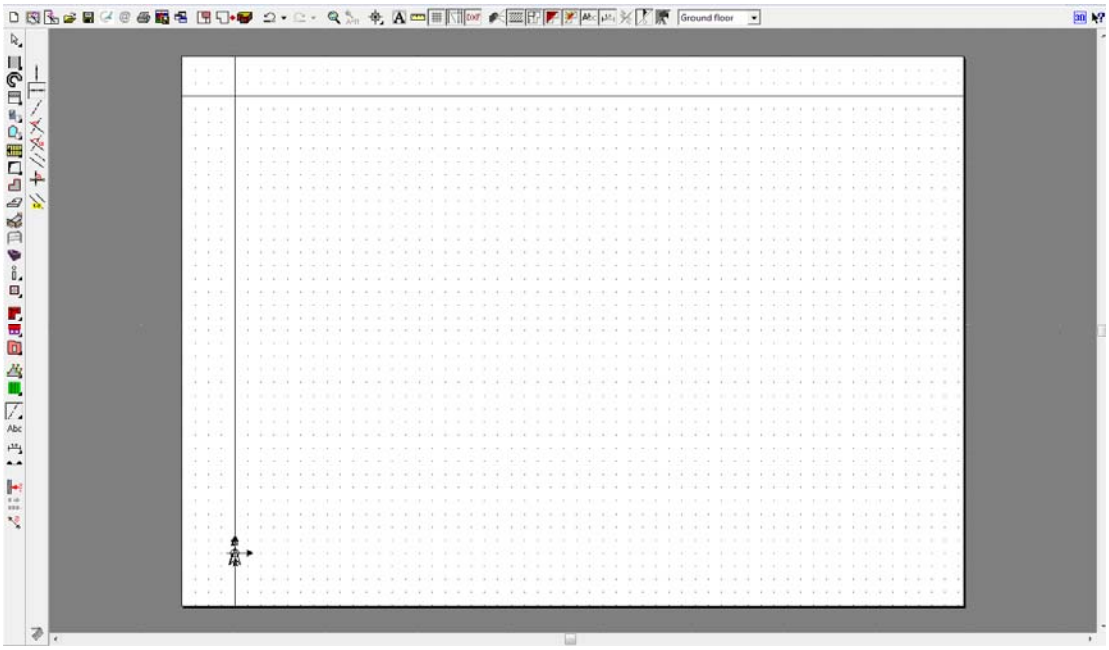
5. Firstly we will place a **Vertical Guideline** on the left-hand side of our page. To do this left click on the **Vertical Guideline** icon on the inside left toolbar



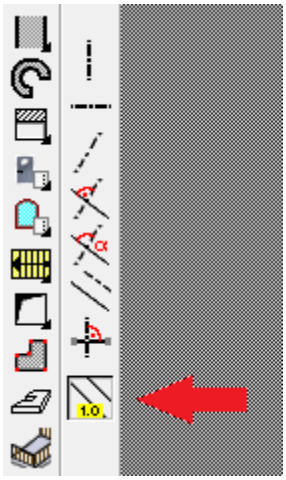
6. With the **Vertical Guideline** selected, move your cursor onto the drawing area of you page. As you move your cursor onto the page you will see that the cursor is now accompanied by a vertical line. This line represents our **Vertical Guideline**. To place the **Guideline** left-click the mouse. Your page should now have a single **Guideline** which runs the full height of the page.



7. Ok, we now have a reference point on the page for any vertical measurements, we now need to add in a **Horizontal Guideline**. Follow steps 5 and 6 above to place a **Horizontal Guideline**, making sure to select the **Horizontal Guideline** in place of the **Vertical Guideline**. Place your **Horizontal Guideline** near the top edge of the page, which should now look like this:

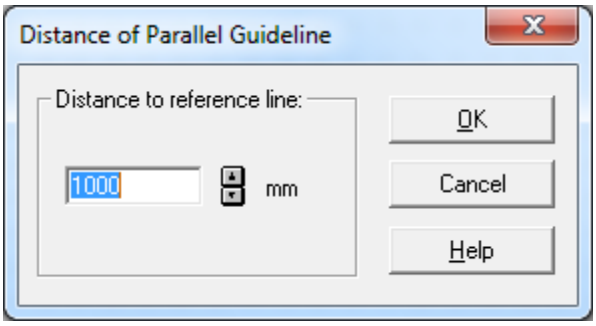


8. Having placed both a **Vertical Guideline** and a **Horizontal Guideline** we have created a reference point from which we can measure all of the dimensions needed to create the footprint of the building.
9. We will now place **Guidelines** at all of the ends of the measurements that we know to create an accurate scaled plan of the building.
10. To place our first known measurement we will use the **Set Distance Parallel Guideline**. Select this from the left-hand toolbar by clicking on the icon:



11. The **Set Distance Parallel Guideline** differs from the standard **Vertical** and **Horizontal Guidelines** that we have already placed in that it requires a reference point to measure from.
12. To place our **Set Distance Parallel Guideline** we need to move the cursor back onto our page. Move your cursor towards the **Vertical Guideline** we placed earlier. As you move your cursor close to this guide, the cursor will snap to the guide which will then highlight (N.B. the highlight colour will depend upon the guideline colour. The highlight colour for black is white, so the guide will effectively 'disappear'.)

13. To select the **Vertical Guideline** as our reference, with the mouse cursor highlighting this guide, left click. This locks this position as the 'measure from' point. (N.B. the **Snap** function must be turned on for this tool to function correctly.)
14. Once the 'measure from' point is set, move your mouse in the general direction of the next measurement. As we are using a parallel guide and referencing a **Vertical Guideline** we will only be able to move left or right across the page.
15. Now we can left click on the page again. Doing this will open a dialogue box asking for entry of the dimension. This is the measurement we wish to use from our baseline:



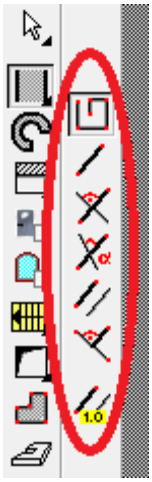
16. In the highlighted box, type the measurement you wish to enter and click **OK**. A new guideline will now be placed on your page which is the exact distance specified from the reference point.
17. By repeating steps 12-16 for each known measurement of our floor plan, we can very quickly build a series of intersecting guidelines which reflect the accurate measurements to the scale of our project.

Adding the Walls

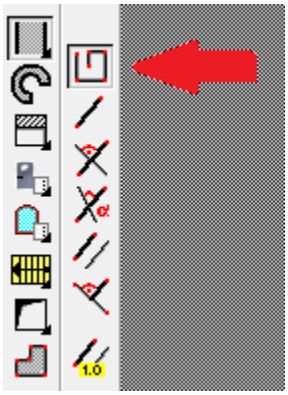
As with any construction, we need to create the walls that create our building and on which the roof will sit. By using the guideline placement method detailed above, we can use a very simple method to place the walls, effectively tracing around the edge of our guidelines to create a measured, accurate floor plan.

1. Firstly we need to select the wall tool and the placement method. So to begin, left-click on the **Wall** tool on the left-hand toolbar

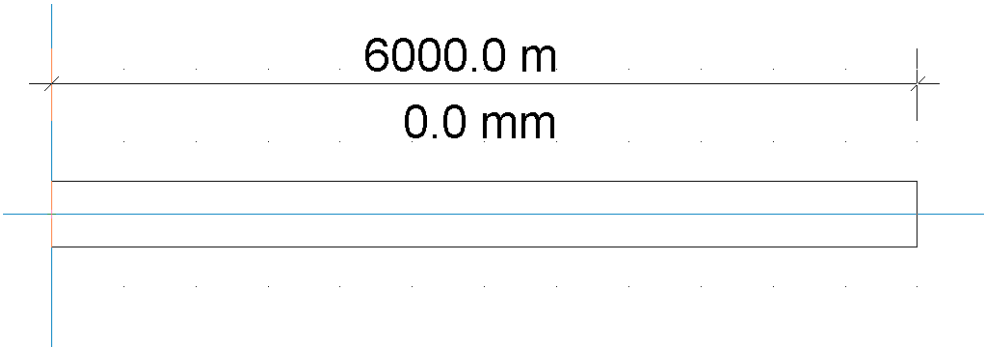
2. Clicking on the **Wall** tool will display the placement options on the inside left toolbar



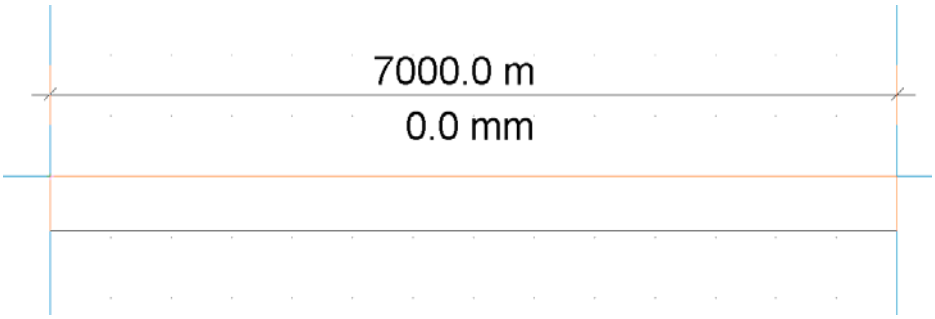
3. Each of the icons displayed in the toolset represent a different placement method to draw a **Wall**. As we have already laid out our floor plan, we will only need to use one of these tools.
4. The tool we are going to use in the **Multiple Walls** tool. To select this tool, left click on the icon



5. With the **Multiple Walls** tool selected, we can now begin to draw the floor plan by tracing the **Guidelines** already placed on the page
6. Firstly, move your mouse to the first intersection of your **Guidelines**, this will be our starting point.
7. Left-click once to place the start of you wall and drag the mouse towards the next intersection where the end of the wall will be (NB. At this point DO NOT left-click to place the end of the wall).
8. As you will see from the screen, when you draw your mouse across the page, a ghost image of the wall you are going to create (together with its dimensions) follows the cursor. When looking closely you should also be able to see that by default, walls are drawn along the centre line of their depth (thickness)

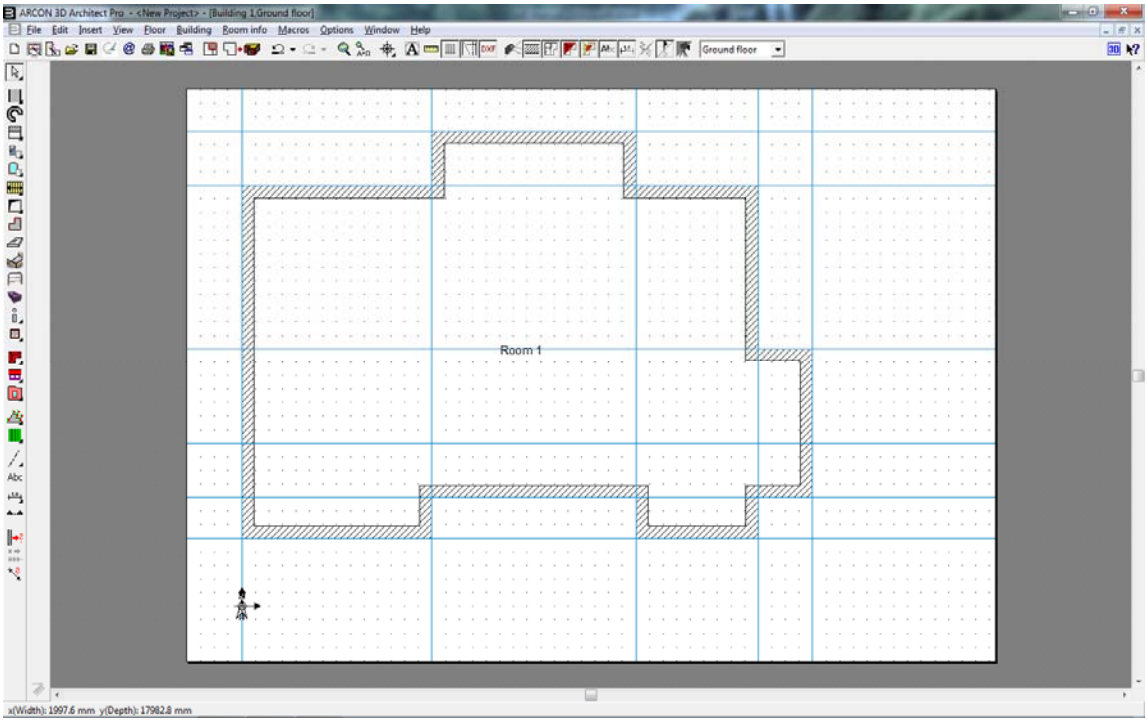


9. Obviously, this can create problems when using internal or external measurements as you will end up with half the wall depth inside/outside your guidelines, stopping the drawings from being accurate to the measurements we placed earlier.
10. Therefore, before we place the end of this wall (and carry on with the remainder of the floor plan) we need to define which edge of the wall we want to draw along.
11. To do this we simply press **CTRL**+**W**. This key combination enables you to toggle between the centre line of the wall, the inside edge and the outside edge. Try pressing this key combination a few times to see the effect on screen. Use **CTRL**+**W** to select the outside edge as the drawing edge



12. With the correct edge selected, complete the first wall by left clicking to place the end point.
13. As we are using the **Multiple Walls** tool, you will notice that finishing our first wall automatically gives us the start point for the next wall. Also as we have already set the wall to draw on the correct edge, this setting remains in place until we cancel the tool.

14. Now it's simply a case of following your guidelines to place wall finish/start points at all of the correct intersection points until you get back to where you began and the floor plan is completed.



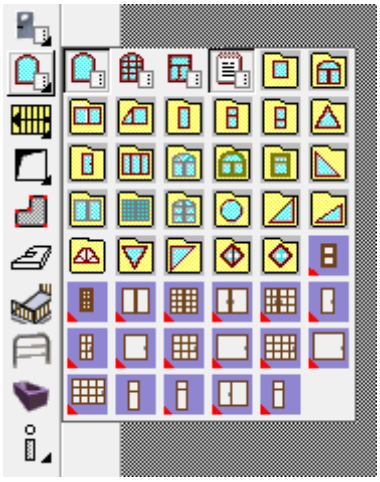
15. You will notice that when your final wall connects back to your start point, the room is automatically labelled '**Room 1**'. This is an important part of the checking process when drawing in **Arcon**. The room label confirms that all of your walls connect, with no gaps or spaces, to form a fully contained room. Once walls connect like this they are a room, which means that the floor and ceiling are created. If the walls do not connect, then no floor or ceiling will be added. Room labels can always be changed to more meaningful names.
16. At this stage, you could now go on to split the floor plan into smaller spaces using internal walls, add doors and windows, stairs and other architectural features. However, as we are primarily concerned with creating the roof structure we will just use the outside floor plan we have created.

Inserting Doors & Windows

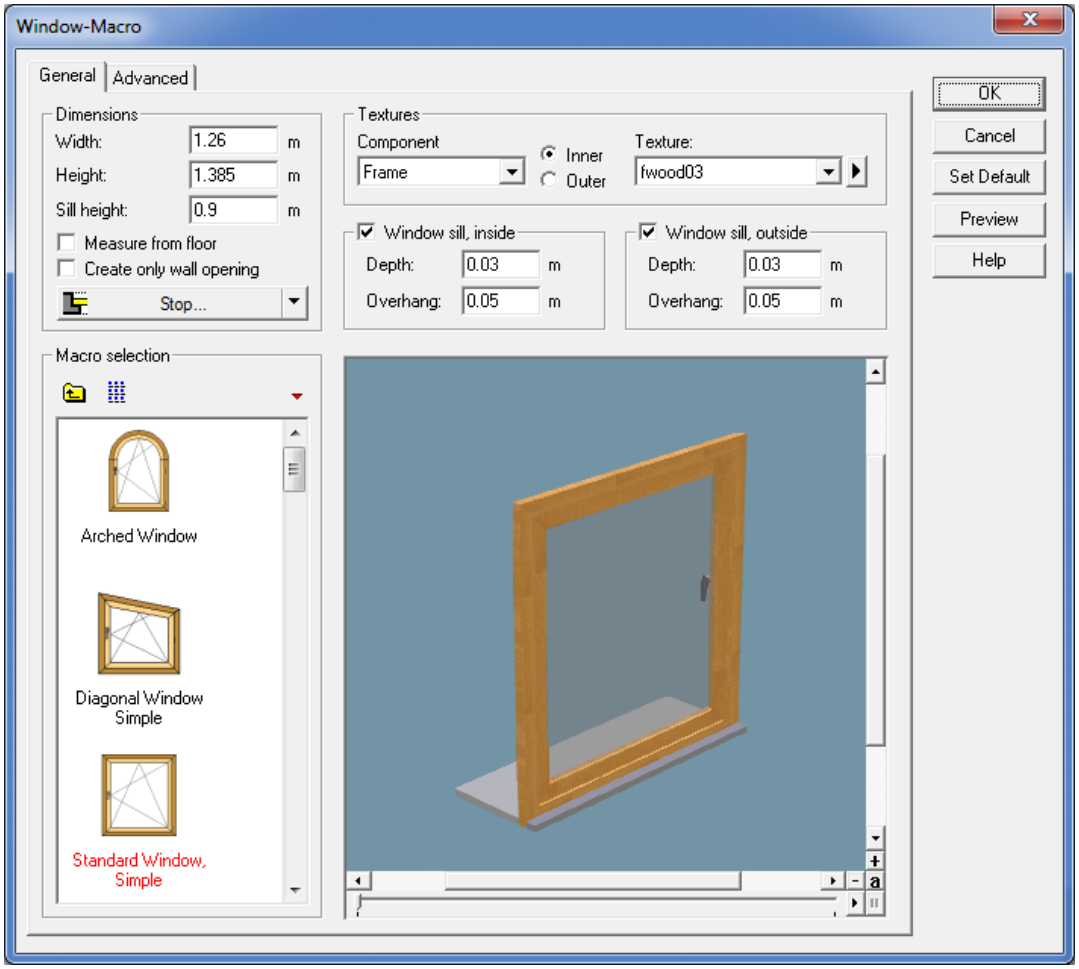
With your external and internal walls in place it is generally now that we would place the remaining construction items in the first floor we have completed. Although you can add these details at any time, adding them in at this stage means you can then copy the details to other floors if required, saving time.

We will start with adding doors and windows into the project. The basic principles for adding doors and windows are the same. The following steps will cover placing a window into the project using one of the selected window types. The process for placing different windows or doors will be the same although some of the customisation options vary depending upon the model of door or window chosen.

1. The first thing to understand with both **Doors** and **Windows** is that they need to be placed into an existing **Wall**.
2. With the **Wall** in place, we need to select the **Window** type we want to use. Do not worry about leaving or creating an opening for the **Window** in the **Wall**, this will be created automatically when placing the **Window**.
3. Initially we need to select the **Window** type from the **Window** menu.
4. Hover your mouse over the **Window** icon on the left hand toolbar, the fly-out menu will be displayed:



5. Each icon on the fly-out menu represents a different style or type of **Window**.
6. Like **Doors**, **Windows** vary in their complexity meaning that some types have more variables that can be changed than others. Particular attention should be paid to the first four options (**Simple Windows, Advanced Window, Window with Fanlight, Window Macro**) as these contain the most complex set of variables enabling the more complex designs to be created.
7. For this example we are going to use the **Window Macro** type. So left click the **Window Macro** to select it.
8. The fly-out menu will be closed and you should notice that the **Window** icon on the left toolbar has now changed to show the active type as **Window Macro**.
9. As with all tools in Arcon, we can now right click on the **Window** icon to open the properties dialogue box:

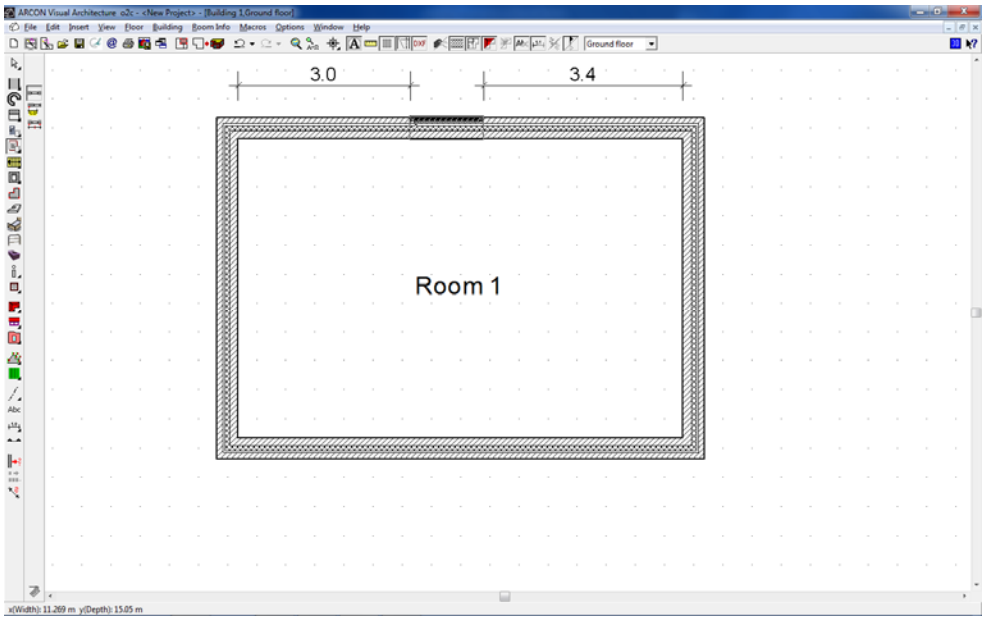


10. As we have selected the **Window Macro** type, the dialogue box that opens is specific to this type of **Window**. With this particular type, you can select a new style from the sub-menu on the left (any **Windows** created in the **Door/Window Macro Designer** will also appear in this sub-menu).
11. Make any adjustments you need to the style and size of the **Window** and when finished click **OK**.
12. With the **Window** set to the correct size we now need to left-click on the **Window Icon** to activate this tool.
13. You should now see three placement options for inserting this **Window** appear on the inside left toolbar:

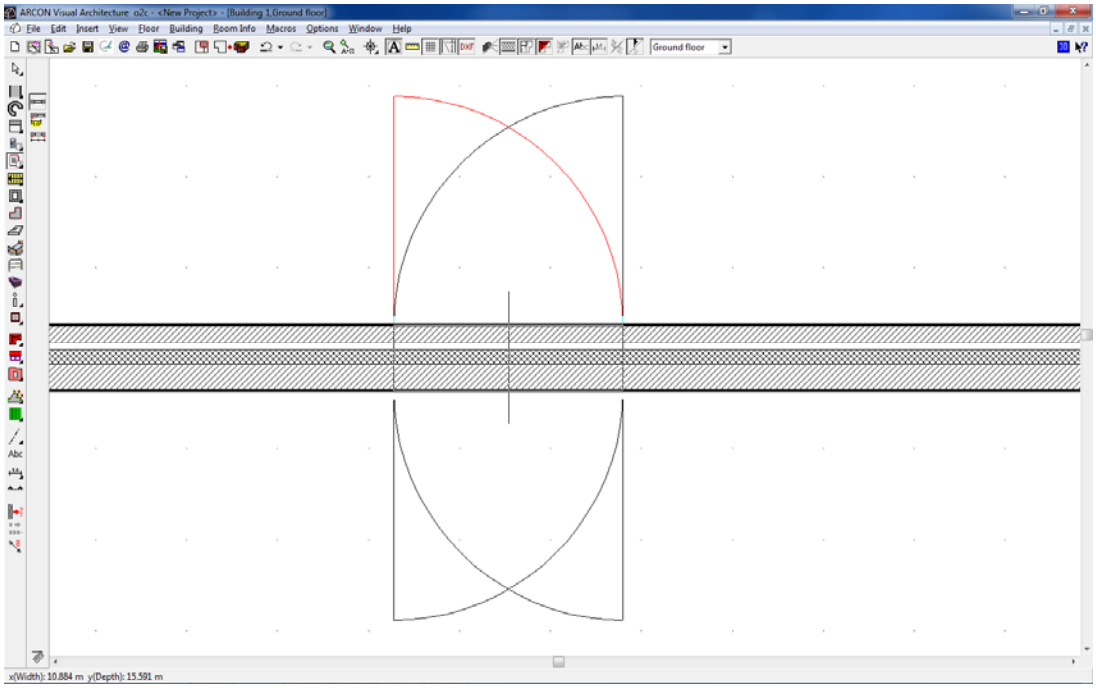
14. Each of these options represents a slightly different method for placing the **Window** into the wall. **Window, Free Position** enables you to use a drag and drop action to simply click on the spot the want to place the **Window**. **Window Position at Set Distance** enables a reference point to be selected and then a distance entered to determine how far from the reference point the **Window** should be placed. Finally, **Window Midway** functions like all 'midway'

options within the software and allows you to define two points with the **Window** being placed exactly centred between these two points. You should use whichever of these methods is appropriate for your particular situation.

15. For this example I will use **Window, Free Position**. With this option selected, move your cursor over to your project page. You will see that as you hover over a wall the outline of the window appears where your cursor is located:



16. If you move your cursor off a wall, the option to place the **Window** will no longer be valid.
17. When you are happy that the **Window** is in the correct position, left click to lock it into place.
18. Before the **Window** is finalised we need to define which way the **Window** will open (i.e. windows swing/window note). The four symbols that appear show the different available opening directions:



19. Move you cursor between the swing options to highlight the required option in red. Once you have chosen the appropriate opening side, left click to finish and place the **Window**.
20. You can now repeat these steps for your remaining **Windows** or copy this process to place **Doors**, simply substituting the **Window Type** with a chosen **Door Type**.

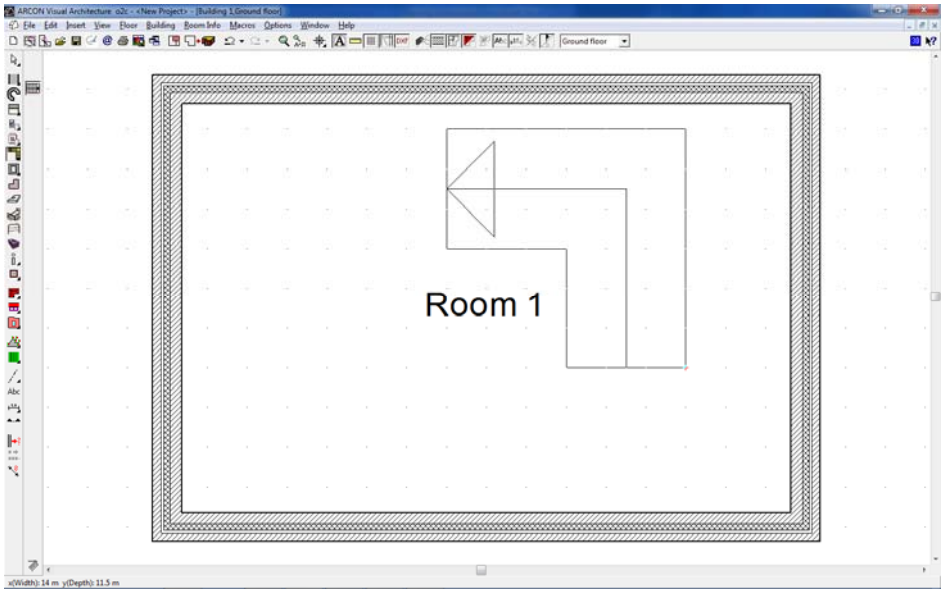
Placing a Staircase

Once your ground floor is complete, it is likely that your building will be multi-storey. We will need to add additional floors to the building shortly, but first we will add a staircase to link the floors together.

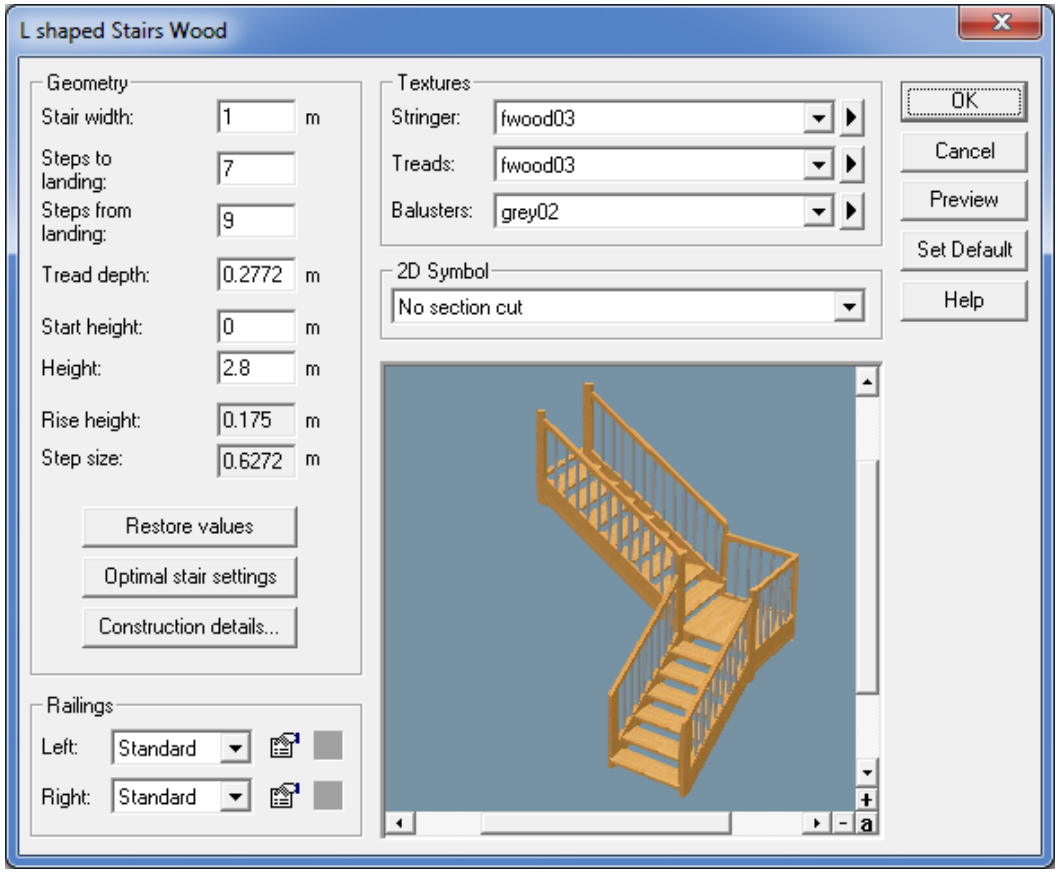
Within Arcon we can define numerous styles of staircase from the available options and we retain full control of depth, width, number of steps and even the start and end heights. These are all fully adjustable meaning complex stair configurations can be created. For the majority of cases however, a simple floor-to-floor staircase is all that is required. This basic guide covers placing a single staircase to link two floors.

1. To begin, we first need to select the **Staircase** type that we want to use.
2. We can select the **Staircase** by hovering the cursor over the **Stairs** icon on the left-hand toolbar. This opens the fly-out menu which shows the **Staircase** options available:

3. The **Staircases** are formed into two columns. These represent the construction type, either timber or concrete. The **Staircase** types within each column are identical in their shapes (with the exception of the spiral staircase and ramp construction options).
4. As with all tools, we can right-click on the **Staircase** icon for the design we want to use to set the properties. However, with **Stairs** it is generally more logical to place the **Staircase** first and then make any changes to the properties.
5. So to begin with select the **Staircase** style you wish to use by left-clicking the appropriate icon.
6. With the **Staircase** selected, move your cursor into your project page space, you should now see that your cursor now has a 'ghost' outline of the **Staircase** shape attached to it:



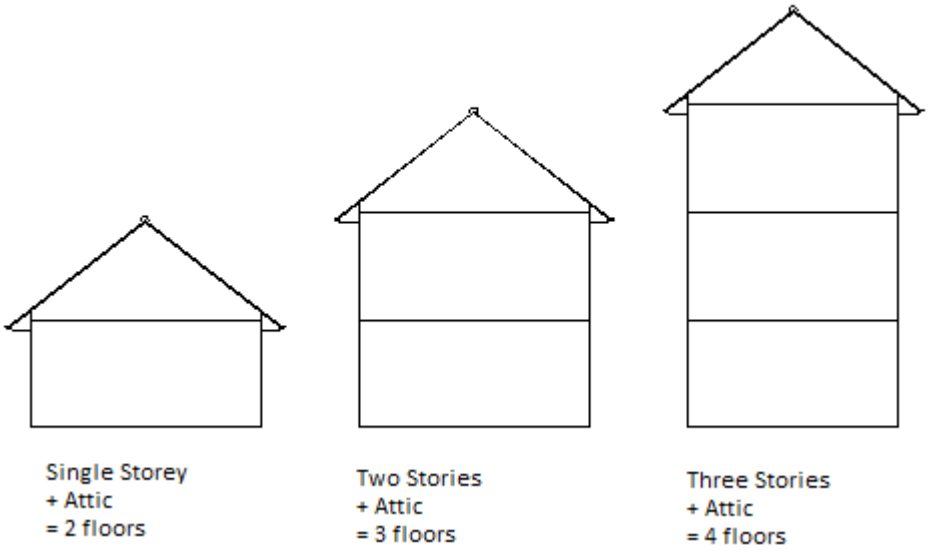
7. We now need to place the **Staircase** into the room.
8. **Stairs** are placed with a 'three-click' system. The three clicks are used to effectively form an L-shape with the cursor which will define the length from the base of the **Staircase** to the furthest point and then the width. This process can easily be simplified by making use of **Guidelines** to mark out known measurements before placing the **Stairs**.
9. As you can see from the position of the cursor in relation to the 'ghost' **Staircase**, the first point we lock into position is the bottom corner (at this stage it doesn't matter if this is the left or right corner as we will define that with the third click). Click once to place the bottom corner.
10. Your cursor movement is now restricted and we need to place the second click. The second click represents the furthest point (length) of the **Staircase** from the bottom corner (first click). This would be the full length of the **Stairs** if using a straight **Staircase** but my just be the furthest point if using L or U shaped **Stairs**.
11. With the second point in place, we can now only move left or right to place the third click. Again with a straight **Staircase** this would give us the width. With an L or U shaped **Staircase** this will be the distance to the top.
12. Once the **Staircase** has been entered onto the plan with the three click method the **Stairs** dialogue box will open to show the default settings for the **Staircase**.



13. By default the **Stairs** will run from the floor level to the floor surface of the floor above. You can of course amend any of the settings to change the start and end heights as well as changing the depth, width and number of steps.
14. Click **OK** to accept these settings. Your **Staircase** will be added to your floorplan, complete with automatic cut-out for the ceiling above.

Adding Additional Floors

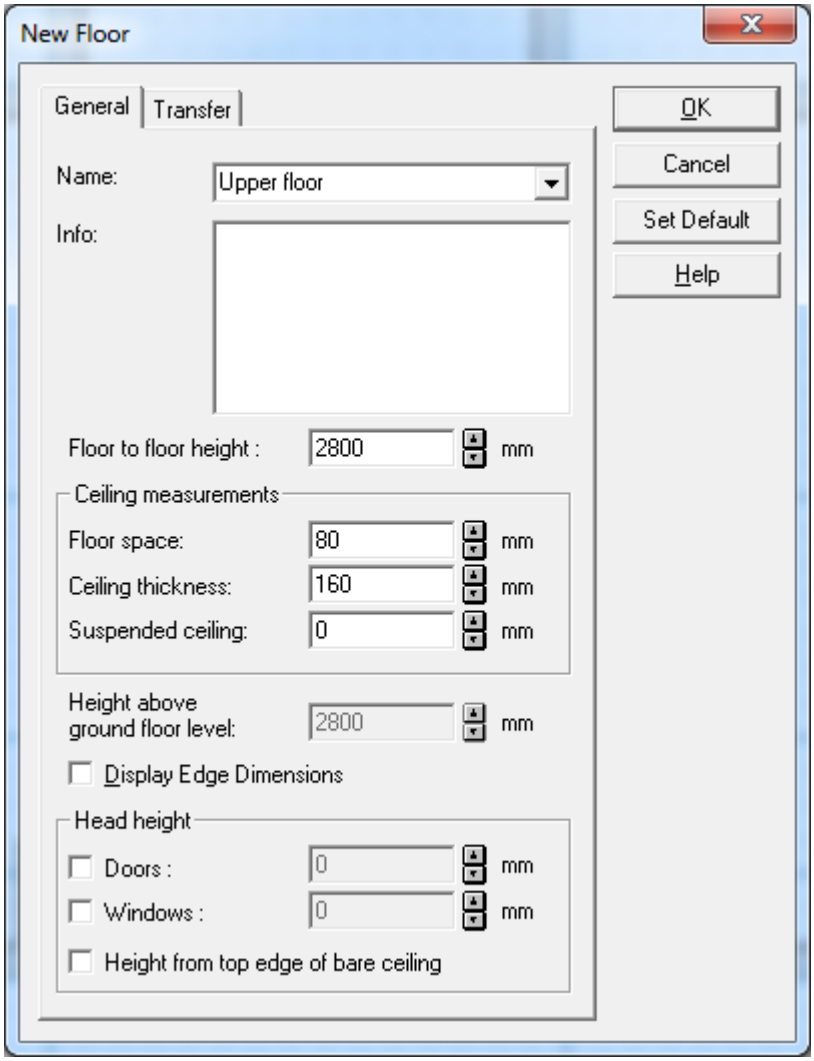
Once the ground floor has been created, we will need to add any additional floors that are relevant to the building we are modelling. In the majority of cases we will probably be adding between 1 and 3 new floors. The reason for this is that we almost always treat the roof as the top floor of the house, so we have to create an attic floor for the roof to sit on. See below:



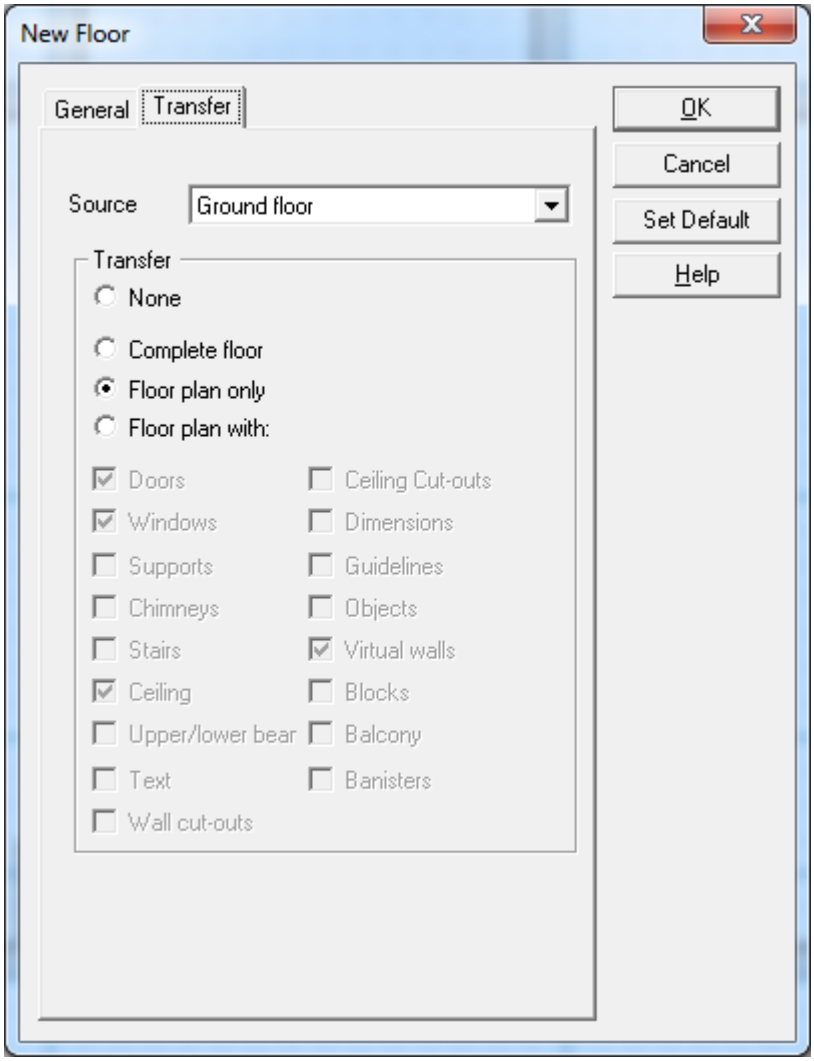
As demonstrated above, the attic floor is created as with any new floor, the roof settings we apply to that floor will then determine how much or how little of the walls of the attic floor we actually see. This will be explained further when we look at placing the roof.

From the footprint of the building we have created so far, we will create a standard two storey house. This means that we need to add an additional two floors (one for the first floor and one for the attic) to our existing ground floor. The process for adding each floor is the same.

1. From the top menu bar, navigate to **Floor** and left click to expand the options contained in this menu.
2. As we are currently working on the ground floor, select **New Floor Above Current**. This option always enables us to place a new floor directly above the currently active floor and is the option you will use on most occasions when adding a new floor. You will then be presented with the following dialogue box:



3. As you can see this looks very similar to the dialogue box we saw when we defined our ground floor options at the start of the project. As we are now starting a new floor, we get to define these options again as the new floor may have different settings to the floor below.
4. In addition to changing the floor properties, you will see that we also have a tab labelled **Transfer**, which was not present when we setup our ground floor at the start of the project.
5. Left click on the **Transfer** tab to view the options available:



6. The selection boxes available in this tab enable you to specify the **Source** to copy from together with what we will copy to the new floor. The options to transfer are:
    a. **None** – Creates a new blank floor on which we can start drawing again. This is useful if the upper floor of the building is completely different in layout to the ground floor
    b. **Complete Floor** – Creates an identical copy of the **Source** floor including fixtures and fittings, ideal for creating duplicates of apartments
    c. **Floor Plan Only** – Creates a copy of all the walls from the **Source** floor and as we have only created walls in our plan, this will be the option we need to choose
    d. **Floor Plan With** – Selecting this option opens up all of the tick boxes below and enables us to choose which elements are copied from the **Source** floor
7. Ensure that the option **Floor Plan Only** is selected and click **OK**
8. A new floor has now been added to our plan and is now the active floor we are working on.
9. At this stage we have two floors to our building. We now need to add the final floor for our attic. To do this, simply repeat steps 1 to 8, making sure to select **Floor Plan Only** again and change the name of the new floor to 'Attic'. Having added this third floor to our building, we can now place our roof.

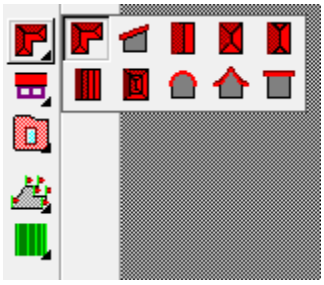
Adding a Roof to the Building

Roofs can be added to the building in a variety of ways, and the best method to use will depend on the type, complexity and style of the roof. As creating an accurate representation of the roof structure and style is of paramount importance to visualisation of solar panels, we will look at all of the different methods for roof placement.

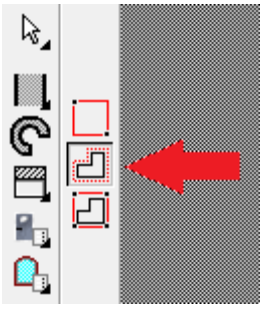
Method 1: Automatic Roof

The simplest of all the methods of adding a roof to the building is by using an automatic roof placement option. This option allows us to very quickly place a standard hipped roof onto our building. The settings of this roof can then be changed to alter all aspects of the style and design (See section **Editing Roofs**).

1. Firstly we need to select the **Roof Type** from the **Roof Type** icon menu on the left-hand toolbar. Hovering over the icon will display the fly-out menu showing the **Roof Type** options available:

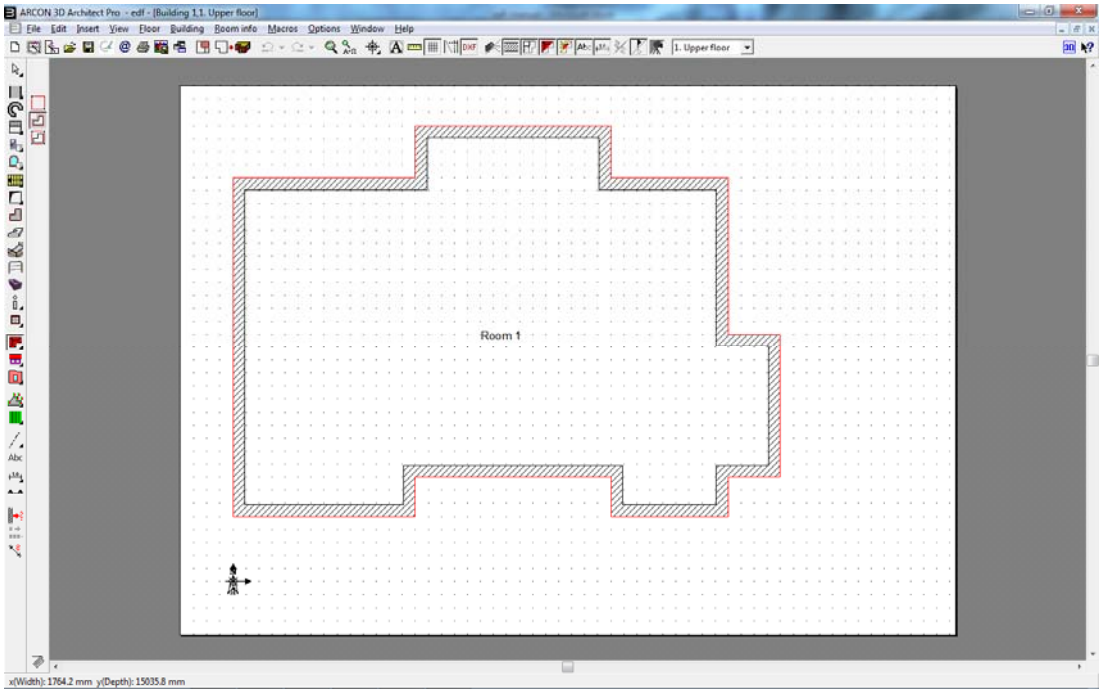


2. For this method we will select the first option on the top left of the fly-out menu, **Freeform Roof**.
3. Choosing the **Freeform Roof** then displays three options on the inside left toolbar, which represent the different methods available for placing the roof onto the building:

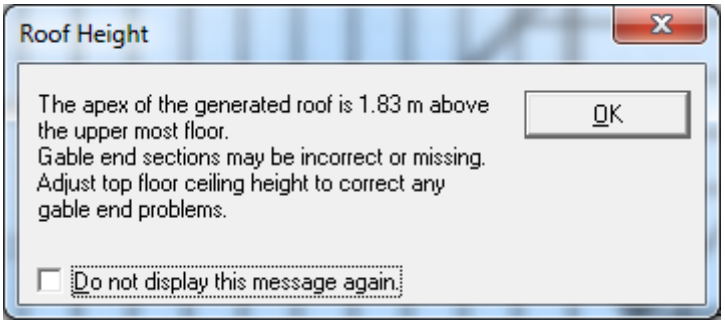


4. We need to left-click on the middle icon, which allows us to use the **Automatic Roof**.

5. With the **Automatic Roof** option selected, simply move your cursor back onto your floor plan (NB. Make sure you have the Attic floor selected as the active floor before starting to place your roof).
6. As you move your cursor over any of the walls of your building, the whole floor plan will be highlighted with a red outline:

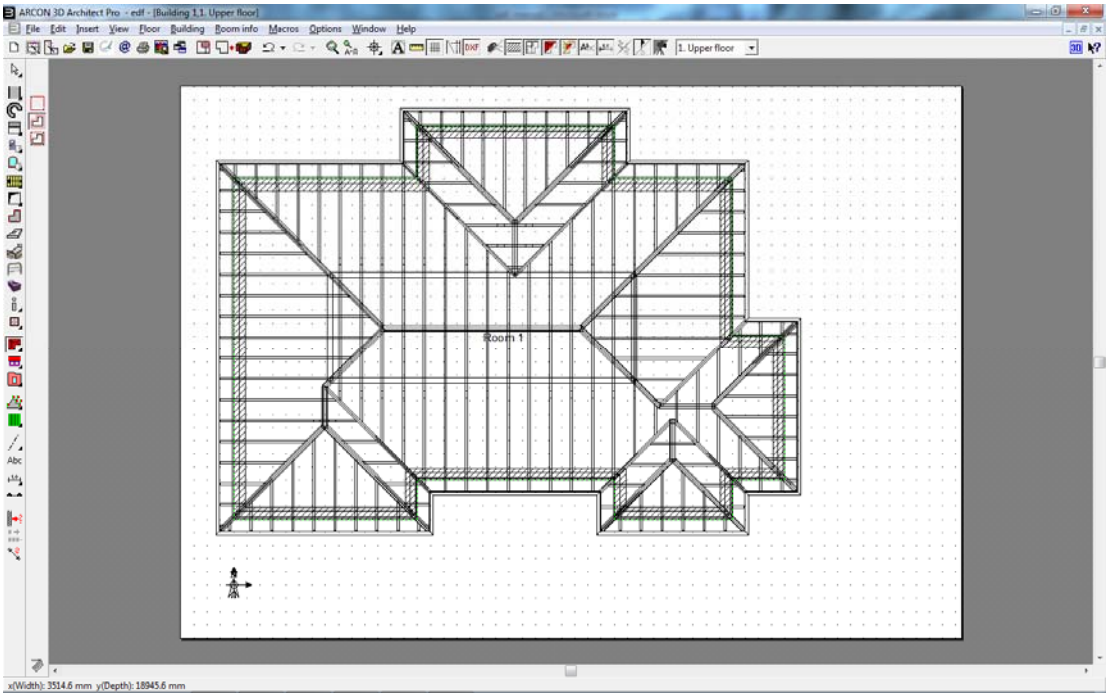


7. This red outline, highlights the section of the floor plan (generally the whole plan) over which the roof will be drawn.
8. Now simply left click once and your roof will be drawn with default settings.
9. You will now be presented with the **Roof Editor**, which enables you to now make changes to the type of roof and the roof settings. The use of the **Roof Editor** will be covered in a later section, so at this stage click the **OK** button.
10. Depending upon the size of the property and the roof settings, the following message may appear on screen:



11. This is an information message, rather than an error and is designed to inform you that the apex of the roof is higher than the walls the roof sits on. If this message does appear at this stage, click **OK**. We will look at the effects and the resolution to solve the problem later on.

12. We now have a roof on our building, and in the standard 2D floor plan view, you should now be able to see the structure of the placed roof:

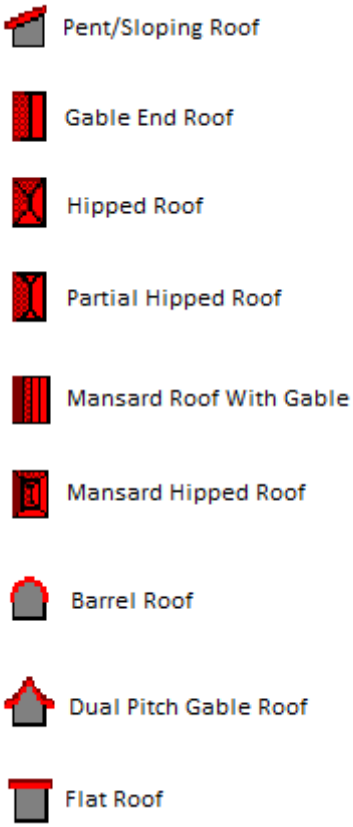


Method 2: Placing a Simple Roof

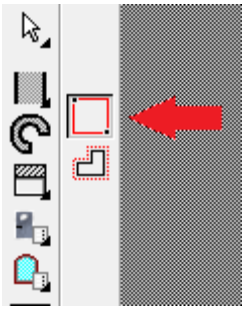
If the roof that you are modelling is very simple, it may be quicker to use one of the preset roof types available from the **Roof Type** menu. Using the preset roofs allows us to find the correct roof style right away. These roofs have fewer editable options but you retain full control over pitch, height etc.

1. By hovering you mouse cursor over the **Roof Type** icon, the fly out menu will show the simple roof styles available:

2. As we have already seen in **Method 1** above, the first icon represents the **Freeform Roof**. For the simple roof type we ignore this icon and choose from one of the other standard roof styles:



3. Although all of the roof styles available vary greatly in structure and editable settings, the basic principle of placing these **Roof Types** is the same regardless of which type is chosen.
4. From the fly out menu, left click on the **Gable Roof** icon to select it.
5. We now have two options to place the **Gable Roof**. You will see that one of these is the **Automatic Roof** option that we used to add our **Freeform Roof** earlier. This works in the same way except the roof editor options will be specific to the roof type we are placing. However, on this occasion we are going to use the **Rectangular Roof** placement option. To select it, left click on the icon:



6. By choosing the **Rectangular Roof** option, we now need to define the space that we wish the roof to cover. Unlike the **Automatic Roof** option, placing with this method does not require you to produce any walls. Accordingly if you prefer you can simply use your guidelines for measurements and then draw only a roof.
7. For simplicity, navigate to a part of your page that currently has empty space (i.e. no walls, or roof).

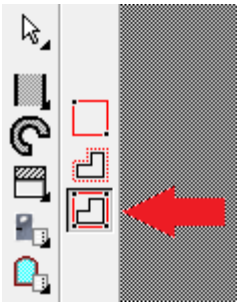
8. Left click once to place the first corner of the **Rectangular Roof**. This first point now represents the top left corner of the roof as we look down onto the page.
9. Move your mouse cursor right and down across the page. You will see that the outline of the roof shape is being created as a rectangle.
10. Continue until you reach the point that will be your bottom right corner of the roof (NB. Normally we would be using walls or guidelines to ensure sizing is correct). Left click again to set this opposite corner.
11. Your **Gable Roof** will now be created and the appropriate **Roof Editor** dialogue box will be displayed. Again, as we will look at the **Roof Editor** shortly, simply click **OK** at this stage to place your roof on the page.

Method 3: Creating the Roof Shape Manually

There will of course, always be occasions where a standard roof shape is inappropriate, or the shape of the roof differs from the shape of the floor plan. On these occasions it may be necessary to manually define the roof shape by placing a series of points to define the corners.

1. Firstly we need to select the **Roof Type** from the **Roof Type** icon menu on the left-hand toolbar. Hovering over the icon will display the fly-out menu showing the **Roof Type** options available:

2. For this method we need to select the first option on the top left of the fly-out menu, **Freeform Roof**.
3. Choosing the **Freeform Roof** then displays three options on the inside left toolbar, which represent the different methods available for placing the roof onto the building:



4. The final option of the three is to place a **Roof from Polygon Marks**. This option is only available with the **Freeform Roof** type.
5. To add the roof, we need to now place a single polygon mark at each point where we need a roof corner to be.
6. Moving our mouse cursor to the first (top left for example) corner of the building, left click once to place the first polygon mark.
7. Now move your cursor to the next corner and left click again to place the next polygon mark. Repeat this process until you have completed the shape of the roof.
8. When you have completed the shape of the roof, right click the mouse to complete the polygon.
9. You will now be presented with the **Roof Editor**, which enables you to now make changes to the type of roof and the roof settings. The use of the **Roof Editor** will be covered in a later section, so at this stage click the **OK** button.
10. The main benefit of using this type of roof placement derives from the fact that we can place polygon marks where we choose. This means that the roof does not have to automatically follow the shape of the building, instead we can make forced corners and roof breaks by placing polygon points to create roof shapes and styles which are not easily created using the automatic or simple roof methods. Refer to the **Revealed** guide for an example of using this technique.

Editing the Roof

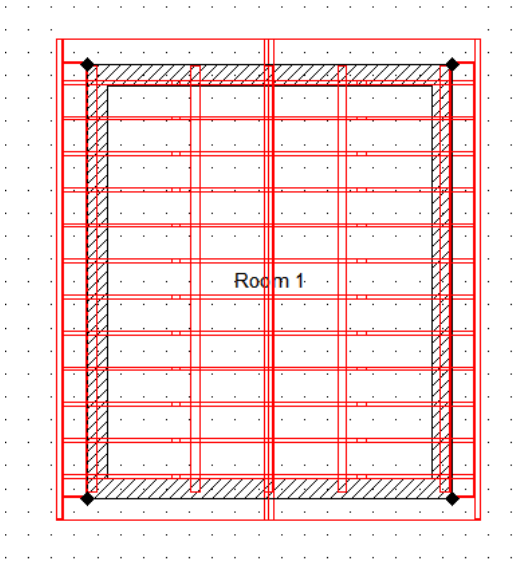
Once a basic roof has been placed, you will want to make sure that all of the settings and variables correctly reflect those of the existing roof we are modelling. As you complete the roof placement, the appropriate **Roof Editor** will open automatically to enable you to enter the correct settings. Alternatively you can always open the roof after it has been placed to change, edit and amend the roof settings.

The **Roof Editor** dialogue box varies depending upon the type of **Roof Placement** used. All of the individual roof types which are covered by the **Simple Roof Type** have a specific editor, unique to the **Roof Type** selected. Using the **Freeform Roof Type** and any of its associated placement methods (Automatic, Polygon and Polygon Marks) will open a more advanced **Roof Editor** which provides many more options and variables. We will look at both options here, starting with an example of the **Roof Editor** for the **Simple Roof Type**.

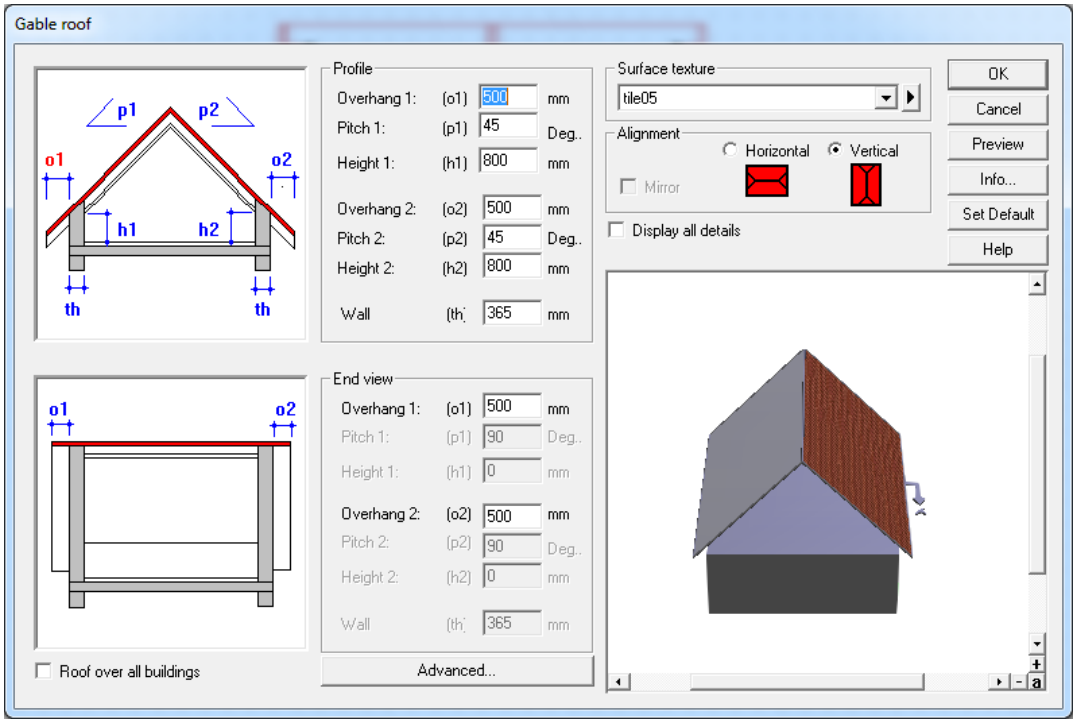
Roof Editor – Simple Roof Type

The options for the **Simple Roof Type** will vary slightly depending on the individual roof style selected. The process for amending the roof remains the same.

1. The **Roof Editor** will be opened either automatically following the placement of the roof or by selecting an already placed roof.
2. To select a roof we have already placed, first left click on the roof structure to highlight it:



3. With the roof highlighted, double click the roof to open the **Roof Editor**:

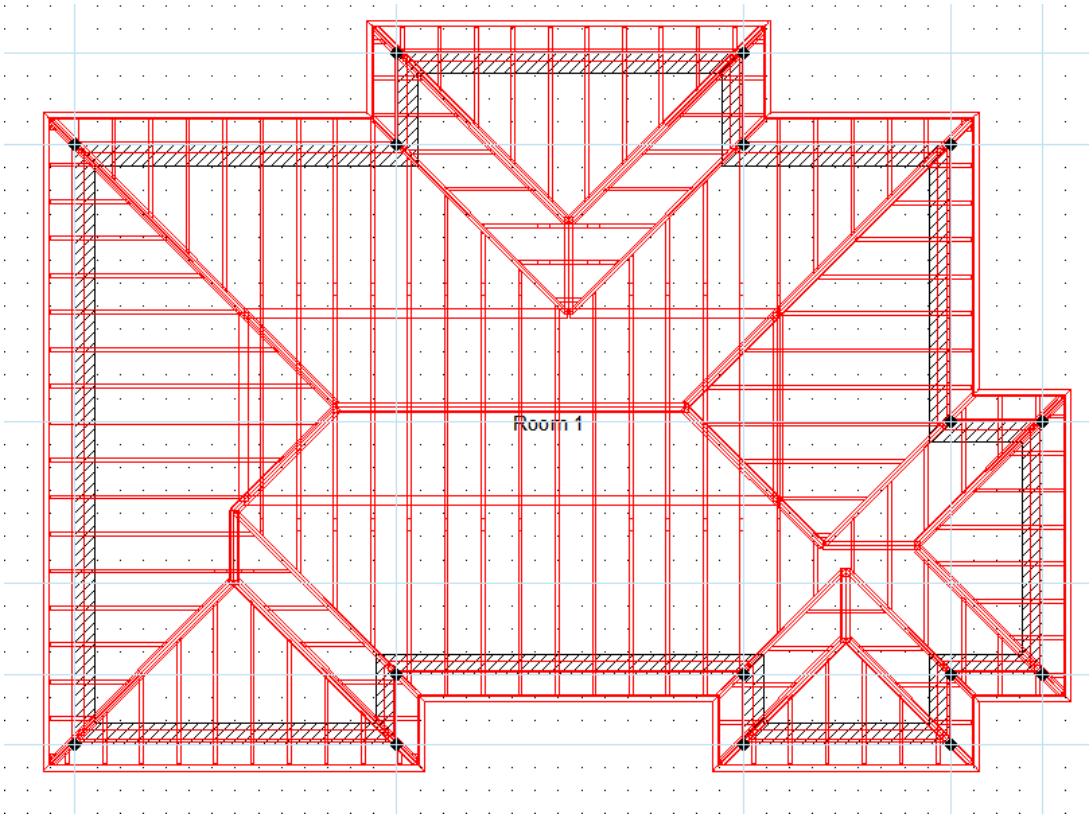


4. The actual screen you will see may vary slightly, again depending upon the **Roof Type**. Here we have the **Roof Editor** for the Gable Roof type and the settings available for us to edit are now specific to this roof style.
5. On the left of the **Roof Editor** we can see a 2D cross section of the roof from both the side and end views. We can see that the cross section is labelled with a series of tags which directly correspond to the editable fields in the centre section.
6. Highlighting a field will show the corresponding tag and vice versa.
7. To change a variable, left click into the field and either over-type or delete and enter new settings.
8. Clicking the mouse into a different field will then apply the new value and you should see this reflected in the 3D preview window on the bottom right.
9. Each field only corresponds to a single side of the roof, allowing for asymmetrical designs to be created.
10. Just above the 3D preview are two selection buttons labelled **Horizontal** and **Vertical**. Swapping from one to the other changes the direction of the ridge line of the roof.
11. Clicking **OK** will accept your changes and close the dialogue box. This can then be opened again at any point to make further changes.

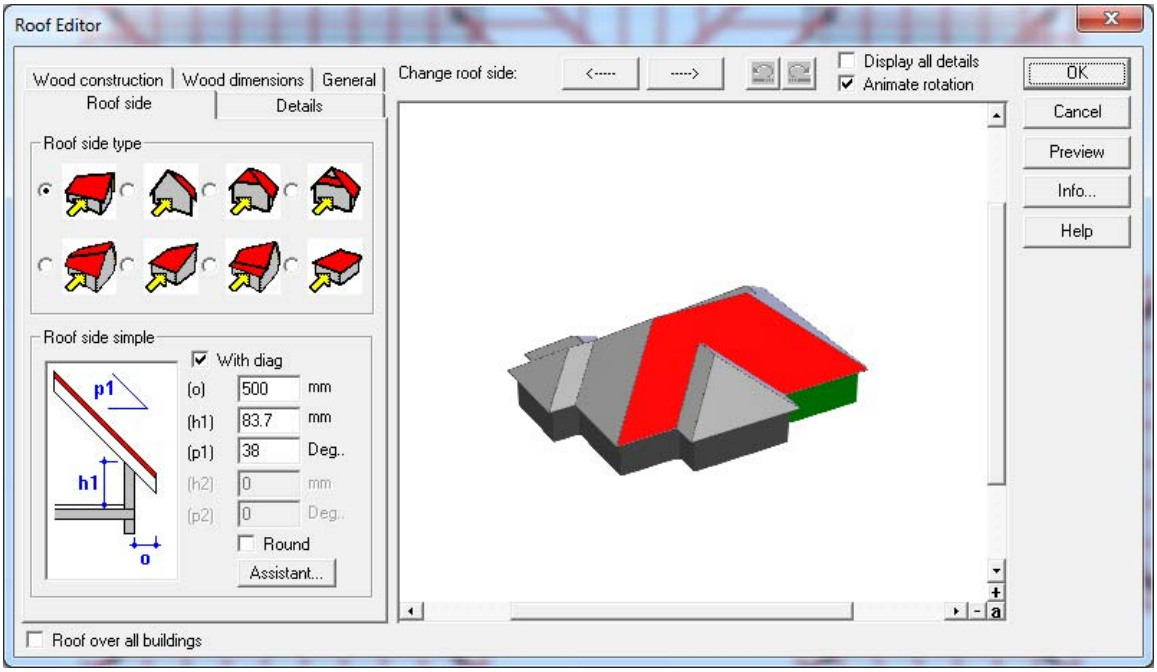
Roof Editor – Advanced Roof Editor

Roofs placed using the **Freeform Roof** type, irrespective of the placement method used, have a more detailed **Roof Editor** which enables greater changes to be made to the roof structure. The **Advanced Roof Editor** not only enables changes to height/pitch etc but also allows each roof side to be changed in style and type.

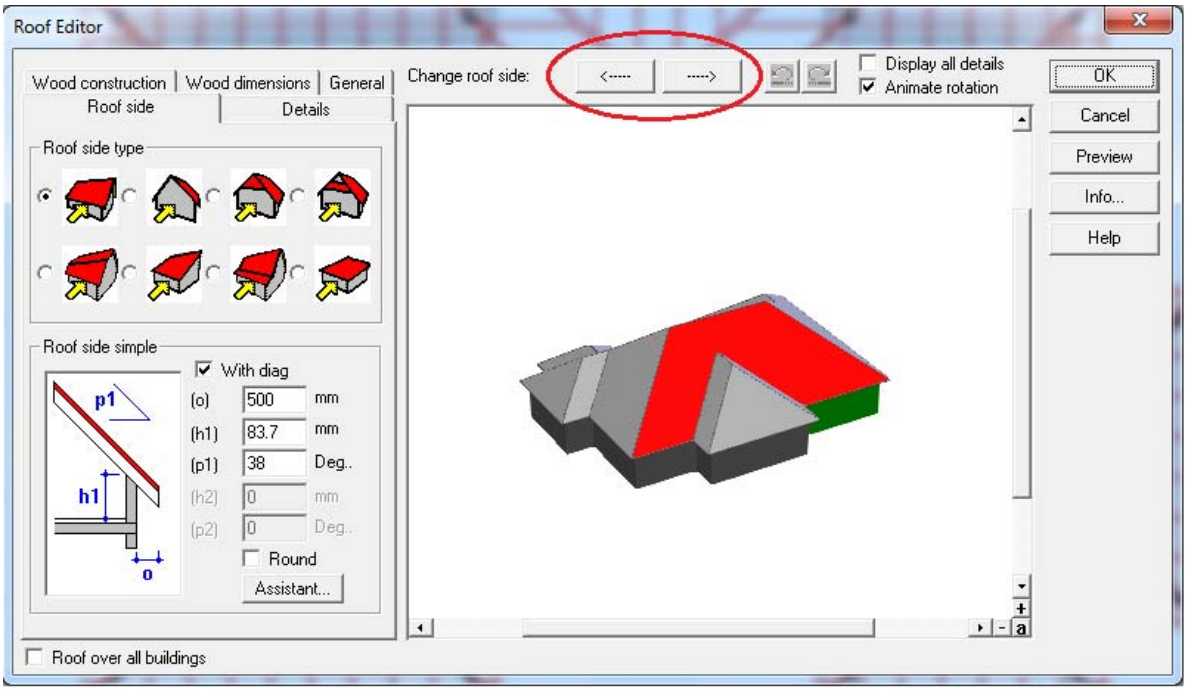
1. The **Roof Editor** will be opened either automatically following the placement of the roof or by selecting an already placed roof.
2. To select a roof we have already placed, first left click on the roof structure to highlight it:



3. With the roof now highlighted, double click to open the **Advanced Roof Editor**:



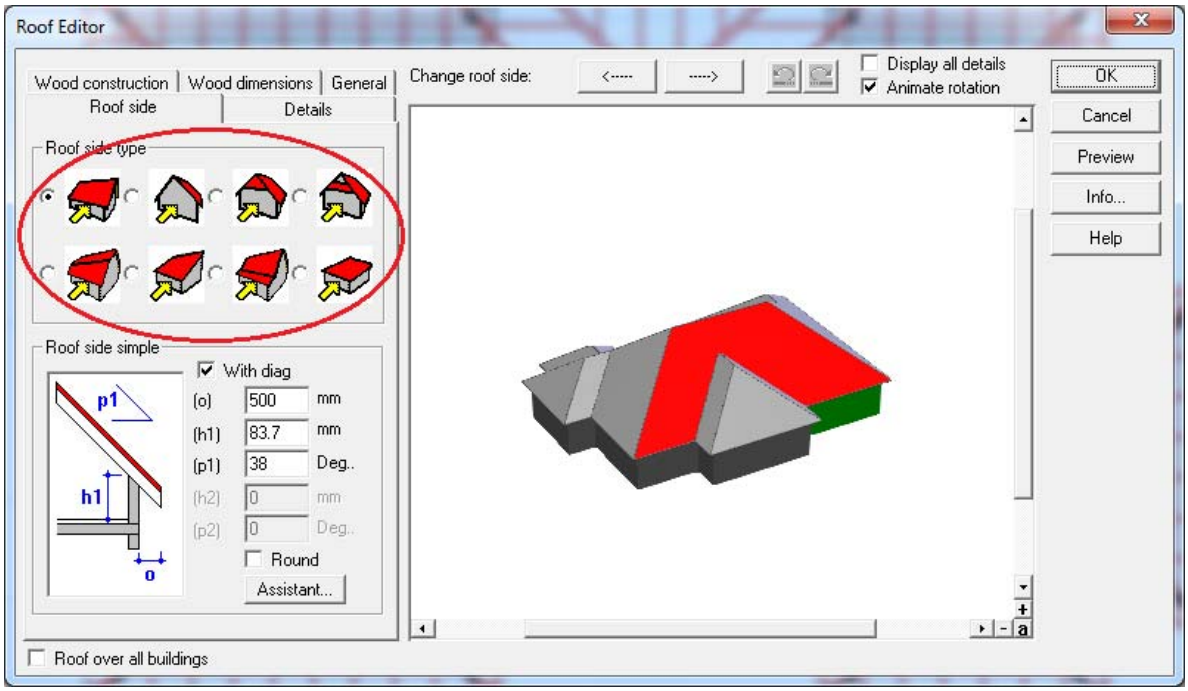
4. As you can see, the layout of the **Advanced Roof Editor** varies greatly from the **Simple Roof Editor**. Here, the 3D preview becomes more important as it enables us to select which part of the roof we are using and therefore changing. The active roof surface is highlighted in red.
5. At the top of the dialogue box, directly above the 3D preview, we can see two arrow buttons pointing left and right:



6. Clicking on either of these buttons will rotate the model in the 3D preview and change which of the roof sides becomes the active side. Using these two buttons enables us to

rotate the roof, working on each side at a time and changing the settings just for that specific roof side.

7. On the left hand side, we can see that we have a 2D cross section of the roof side that we are currently working on, showing variables that we can change such as pitch, height and overhang. As with the **Simple Roof Editor**, the fields available to change will depend upon the roof style for the selected roof side.
8. Unlike the **Simple Roof Editor** however, with the **Advanced Roof Editor** in addition to changing pitch/height etc. We can also change the style of a roof, one side at a time. This can be done by using the **Roof Side Type** selector at the top left:

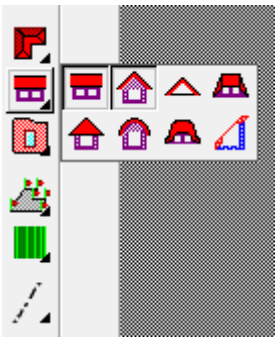


9. Each of these icons represents a different roof style. Simply tick the required roof style for the roof side we currently have selected and it will be changed to the new style, together with showing the variable fields appropriate to this roof type.
10. Using this method we can move around the roof, changing styles and variables to create more complex roof shapes and structures.

Roof Features: Dormer Windows

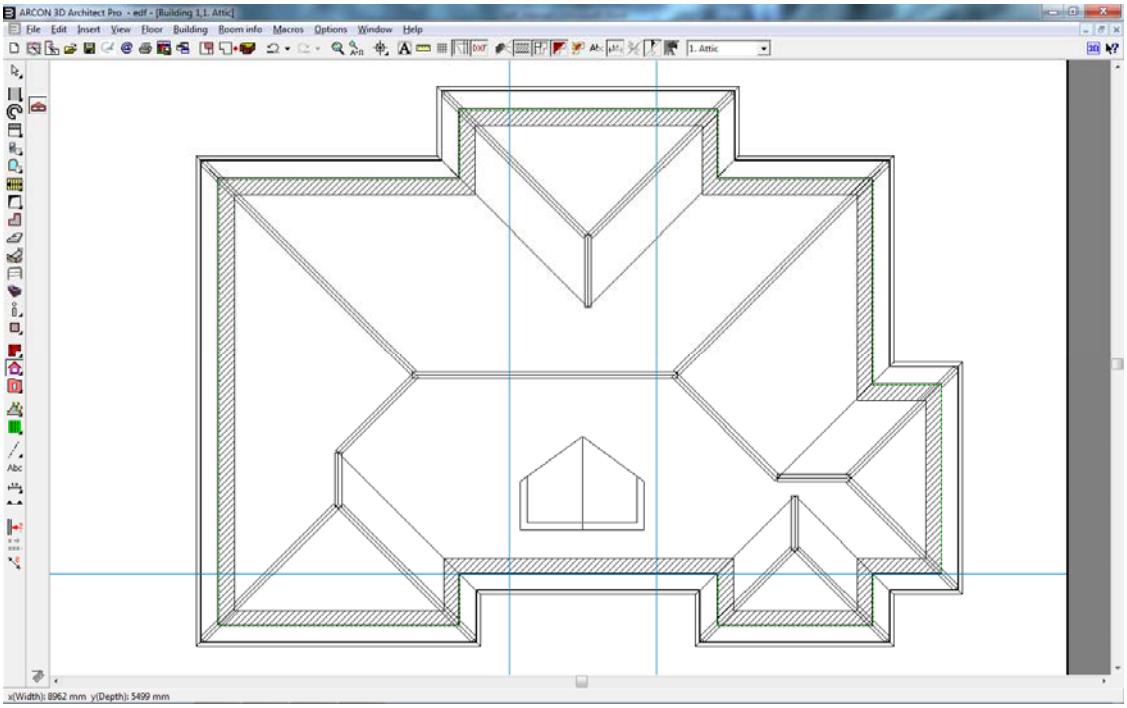
If the roof structure contains **Dormer Windows** they can be added with a specific **Dormer Window** toolset. In order to place a **Dormer Window** we need to first ensure that the basic roof structure has been added to the building. Roof settings can still be amended after the dormer has been added, but generally it is recommended to get the roof structure set correctly before adding a **Dormer Window**.

1. To place the **Dormer Window** we first have to select the type we want to use from the fly-out menu.
2. From the left hand toolbar, hover your cursor over the **Dormer Window** icon to show the options available:

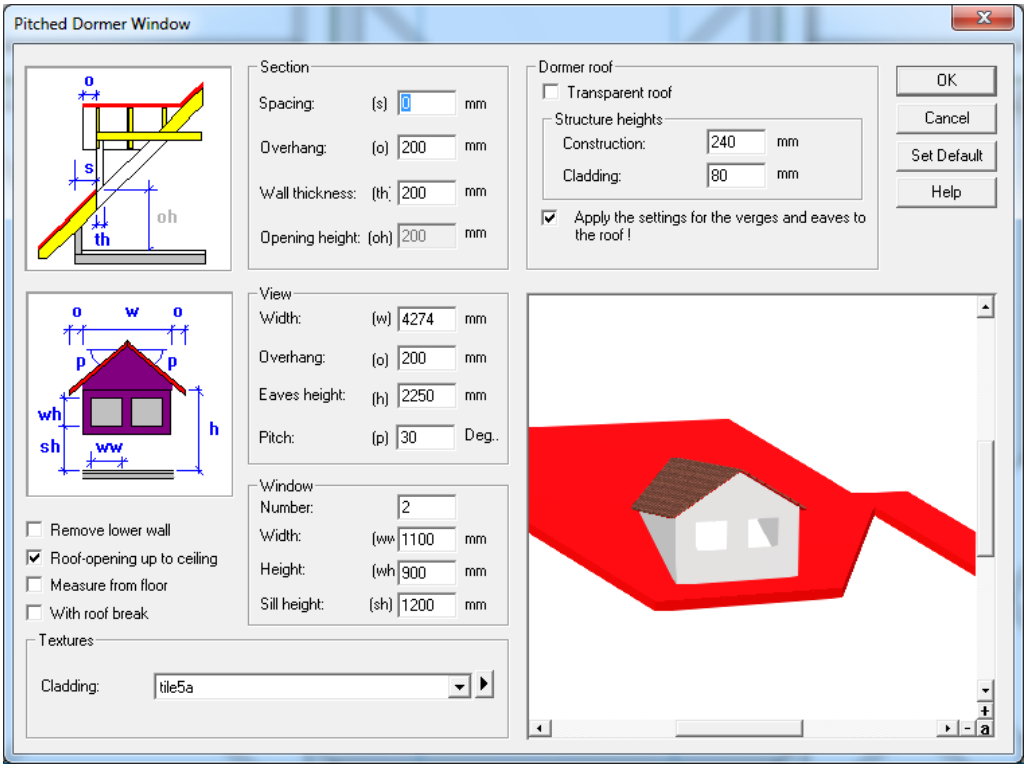


3. In a similar way that we selected the **Simple Roof Type**, each of the icons on the **Dormer Window** menu represents a different style or type of dormer or roof feature:

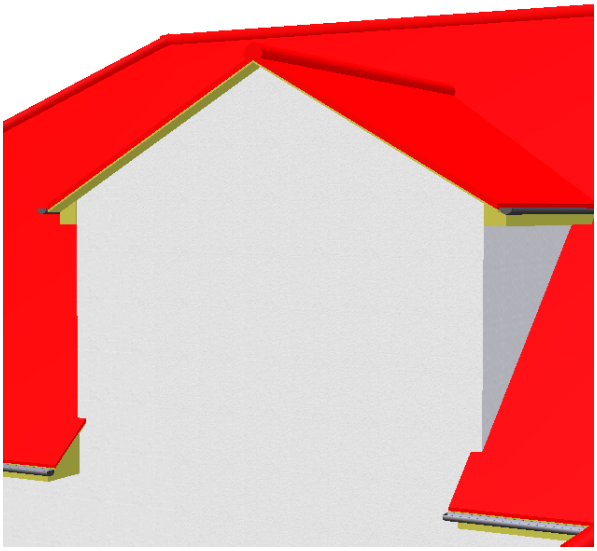
4. The description of each dormer relates to the style of roof that will be applied to the dormer itself, rather than the style of roof it must be placed on. This gives a great amount of flexibility to create and replicate complex designs.
5. To place a dormer it is recommended to first place **Guidelines** to show the position of the front wall and the two sides of the dormer. Refer to **Entering Measurements** to be reminded how to use **Guidelines** to place known measurements. (NB. Use external measurements for the guidelines, as the dormer requires you to place the external walls).
6. Select one of the **Dormer Window** types by choosing the appropriate icon and left click to select it.
7. Now, making sure you are working on the floor which holds the roof (i.e. Attic), move your cursor over the roof surface. Your cursor now shows an outline of the dormer shape you have chosen:



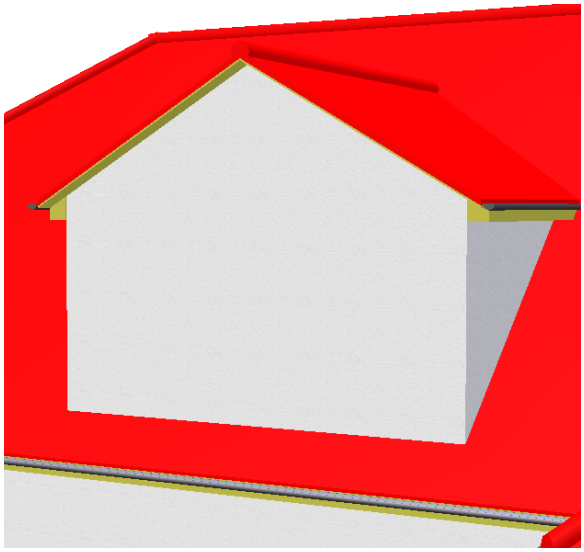
8. You will notice that the face of the dormer automatically faces in the same direction of the downward slope of the roof side that you are hovering on. Move to another roof face in a different direction to see how this changes for each roof side.
9. With our **Guidelines** in place, move the cursor so that the bottom left corner of the dormer snaps to the intersection of our guidelines. Left click to place the wall.
10. With one wall locked into place you can now only move left or right of this point to place the opposite dormer wall. As we have a guideline on the right side, move your cursor across and left click to place the other wall and complete the dormer.
11. Upon completing the placement of the dormer, the **Dormer Window** options dialogue box opens:



12. The **Dormer Window** dialogue box is very similar to the **Simple Roof Editor** in that it contains a series of variables to change the pitch and overhang of the dormer roof. In addition there are fields to alter the wall elements of the dormer and the automatically placed windows.
13. The 2D preview panes on the left show tags for each of the fields so that we can easily see what we are changing. In addition any changes are reflected in the 3D preview pane on the right.
14. We can amend the roof and wall settings as desired to ensure that the model correctly reflects the existing structure of the roof and dormer.
15. To remove windows from the dormer, simply set the **Number** field in the **Window** section to 0.
16. Finally, there is a tick box on the left named **With Roof Break**. Checking this box creates a break in the roof line directly in front of the dormer:



Dormer with **Roof Break**



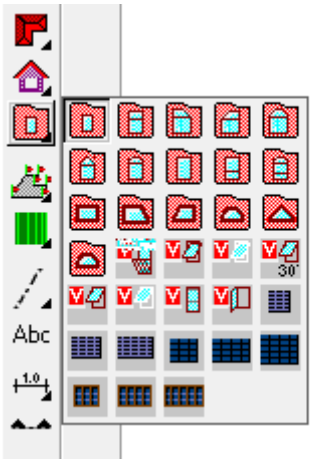
Dormer without **Roof Break**

17. With all of the **Dormer Window** settings in place, click **OK** to close the dialogue box and place the dormer. One item of note is that when you place a dormer it becomes part of the roof and it will automatically amend the roof structure and construction (woodwork etc.) to fit the dormer. Due to the complexity of this process it can be very difficult to move and resize a dormer retrospectively. If this need to be done it is easier to delete the existing dormer and replace it with another to the correct settings.

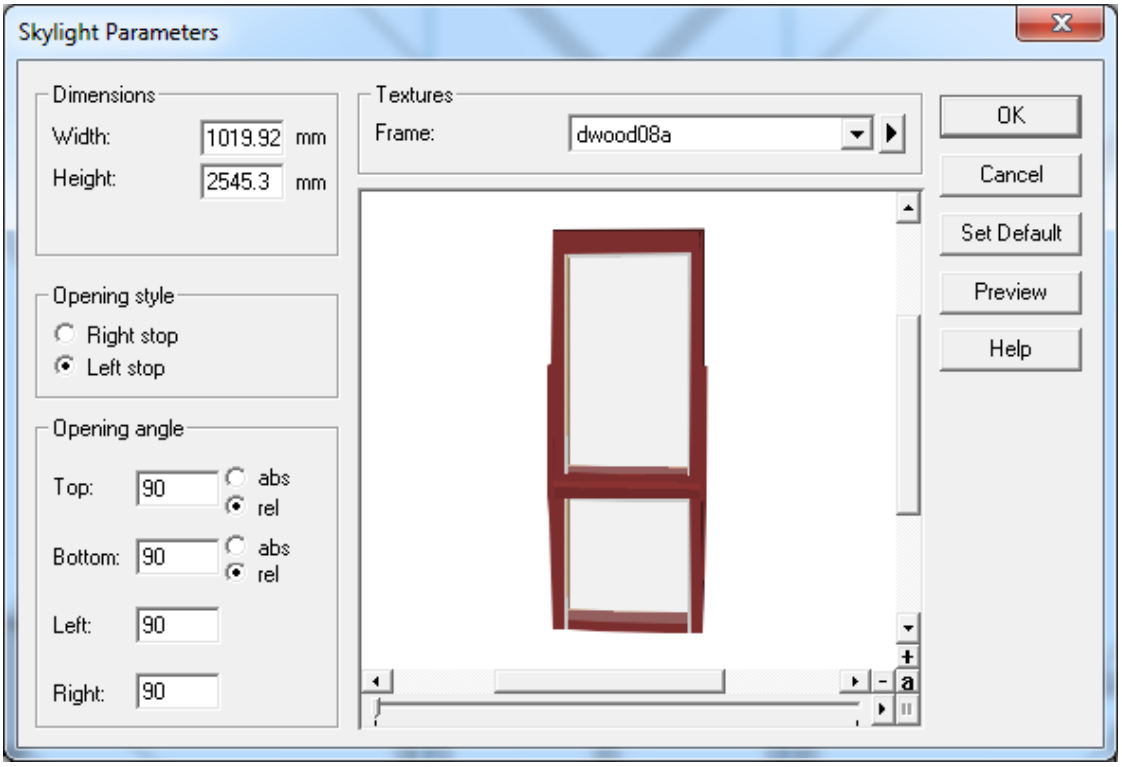
Roof Features: Skylights and Velux Windows

Of all the other potential roof furniture/features, Skylights and **Velux** windows are the only other items which directly affect the roof structure. In the similar way that **Dormer Windows** adjust the construction of the roof around them, **Skylights** and **Velux** windows also have an impact of the structure of the roof.

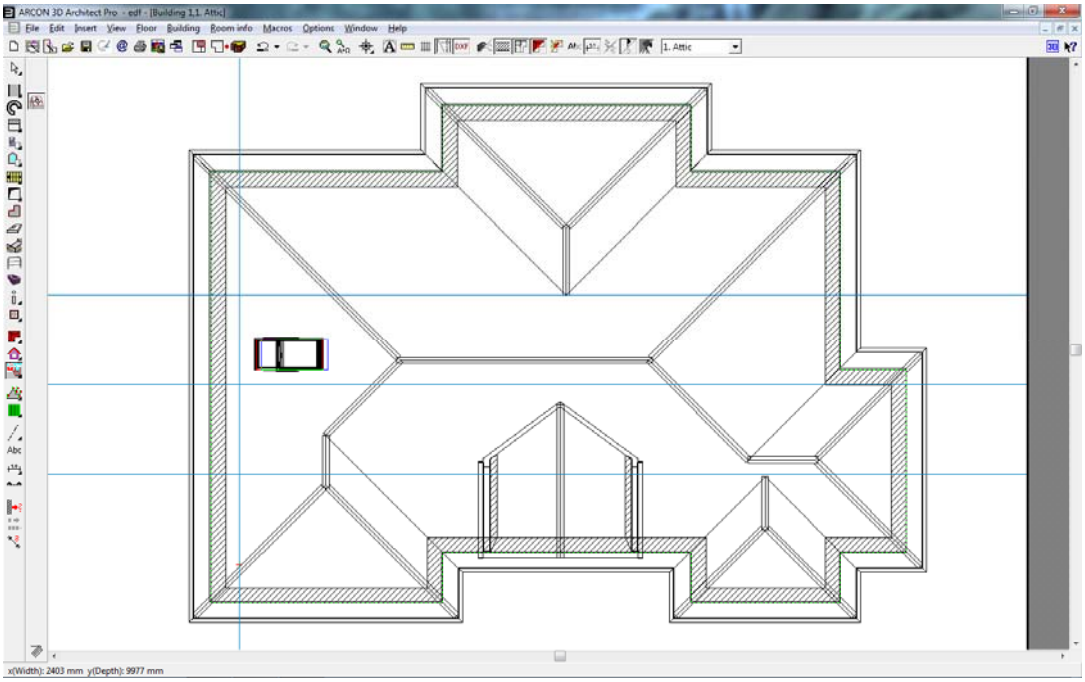
1. In order to be able to use **Skylights** and **Velux** windows, we must first have a roof in place on the building. **Skylights** and **Velux** windows can only be applied to a roof surface.
2. Both **Skylights** and **Velux** windows are accessed from the same fly-out menu. This appears on the left hand menu and hovering over the icon will display the variety of **Skylights** and **Velux** windows available:



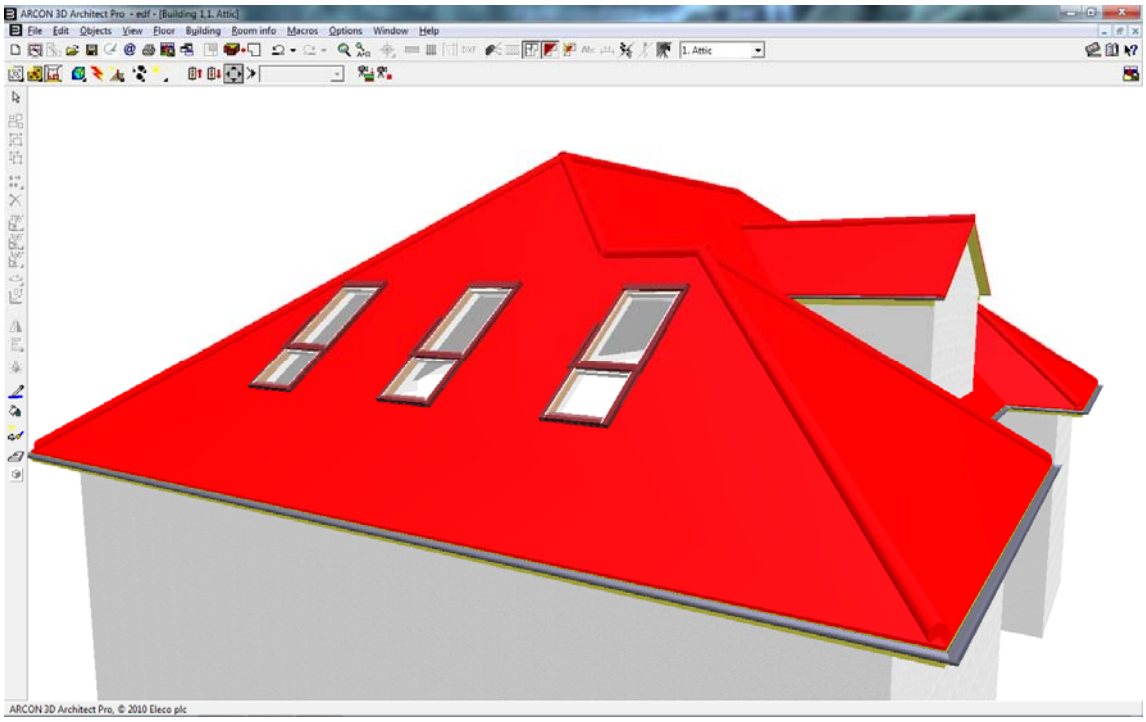
3. Each of the icons represents a different style of **Skylight** or **Velux** (denoted with the red and white 'V' symbol). For the purposes of amending, placing and editing them, there is no difference between the two types of object other than style.
4. Select one of the **Skylights** or **Velux** windows by left clicking the icon.
5. With one selected we can now right click on the icon to open a preview of the window:



6. The right hand pane of the dialogue box shows the 3D preview of the chosen window.
7. In addition, on the left we can change the dimensions of the **Skylight** prior to placing it into our roof. Alternatively, we can place the **Skylight** on the roof and then open this dialogue by double clicking the object to change the properties.
8. Click **OK** to accept any changes made and close the dialogue box.
9. In the same way that we previously used **Guidelines** to ensure we placed elements such as walls and dormers in the correct place, we can of course use them to ensure the placement of **Skylights** is correctly measured.
10. With a **Skylight** selected, moving your mouse over the roof of the project shows the outline of the **Skylight**. The outline will only display when your cursor is over a valid section of the roof and that the chosen **Skylight** settings enable the window to fit in that part of the roof surface:



11. As with **Dormer Windows** the **Skylight** automatically aligns itself with the direction of the downward pitch of the roof surface.
12. Position your **Skylight** in line with your **Guidelines** and left click to place the **Skylight** into the roof. Repeat this for the number of windows you need to place:

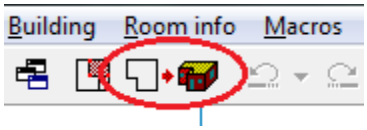


Adding Solar Panels and Other Objects

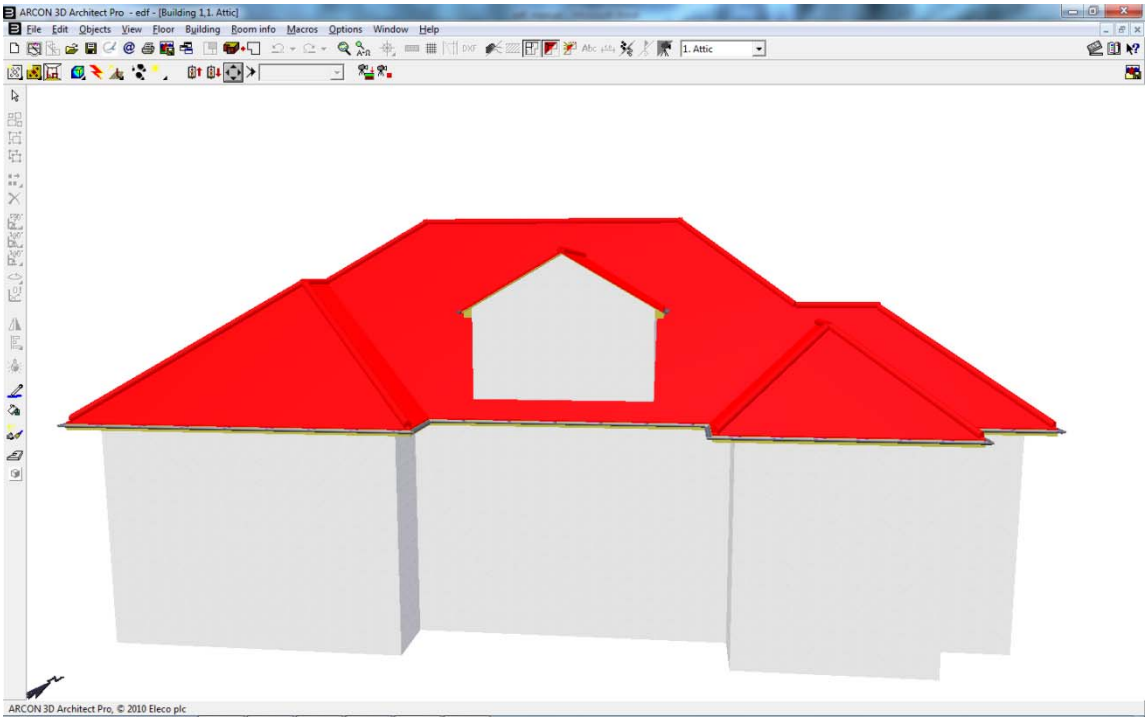
Within the Arcon system, all furniture, fixtures and fittings are represented by individual 3D models which are stored in the **Object Catalogue**. Each of these models will have preset dimensions, but these can be amended as required on an individual object basis. The objects themselves can be positioned by simple drag-and-drop functionality from the catalogue into the model.

In order to access the **Object Catalogue** and then place, edit and amend objects, we need to change from **Construction Mode** to **Design Mode**. These two modes of the software are for different purposes and therefore each has its own unique toolset. Everything we have done so far has been in **Construction Mode**, where we create the building. In **Design Mode** we can see the building in full 3D and place objects as well as decorating and changing finishes with textures.

1. To switch from **Construction Mode** to **Design Mode** either press **F12** on your keyboard or left click the following icon on the top toolbar (clicking the icon again or pressing **F12** again will toggle us back to **Construction Mode**):

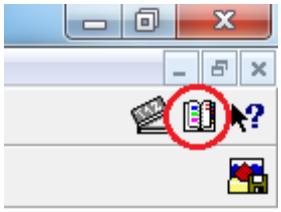


2. Upon entering **Design Mode** your default view will be the 3D **Perspective View** and you will see that the icons on the toolbars have changed to provide us with a new toolset:

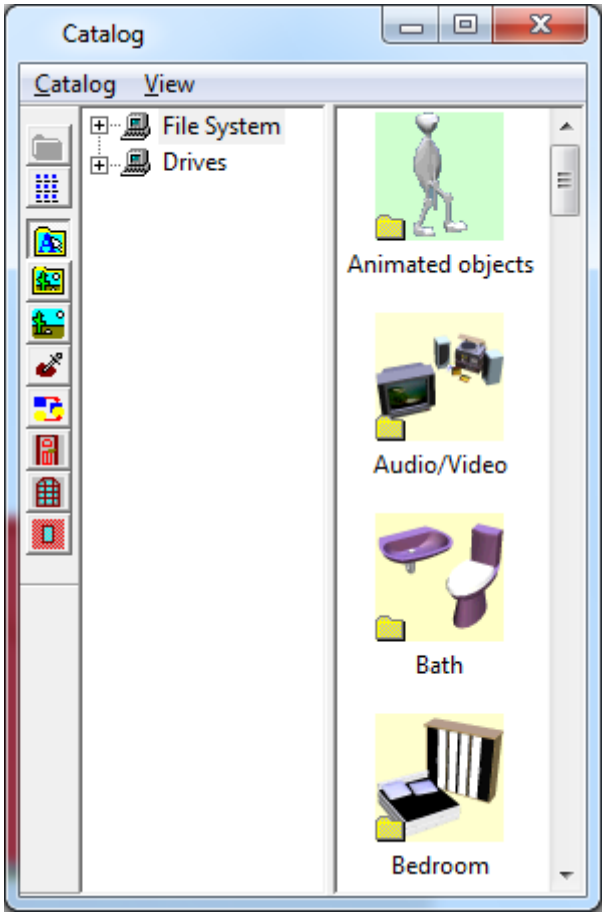


3. At this stage, the majority of the tools on the left hand toolbar are inactive. Most of these tools are used to manipulate or amend our objects and accordingly, they only become active once an object has been selected and placed into our project.

4. We now need to open the **Object Catalogue** to select the objects we want to add to the project.
5. The **Object Catalogue** icon is located in the top right corner of the screen, directly underneath the standard Windows minimise/maximise buttons:



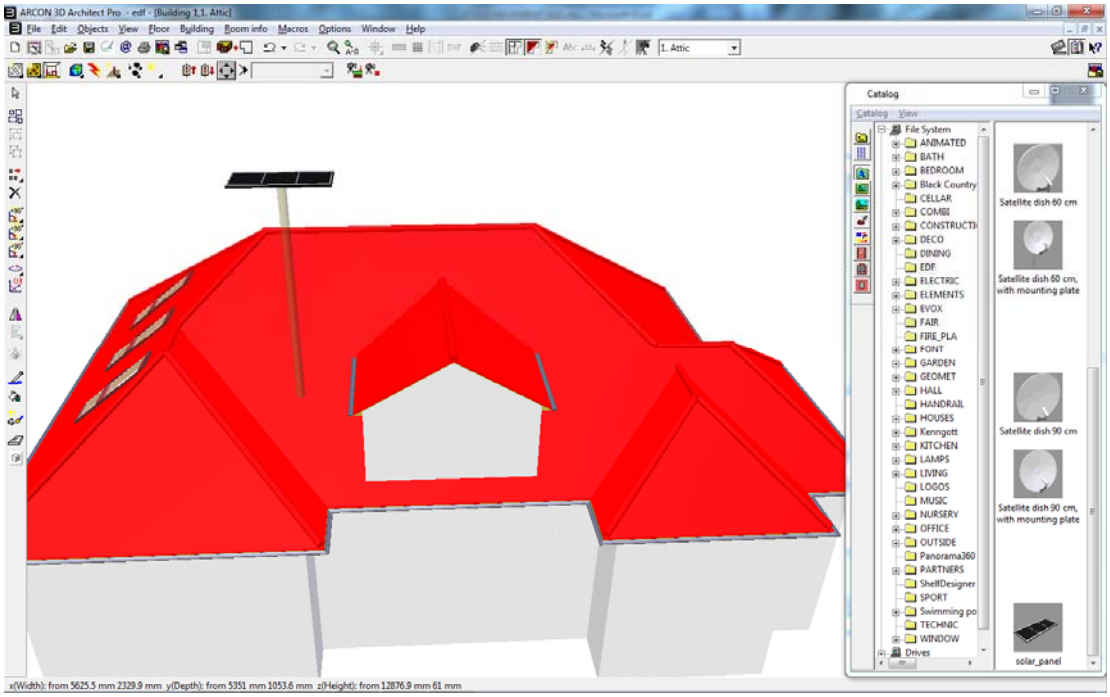
6. Left click on the **Object Catalogue** icon to open the catalogue:



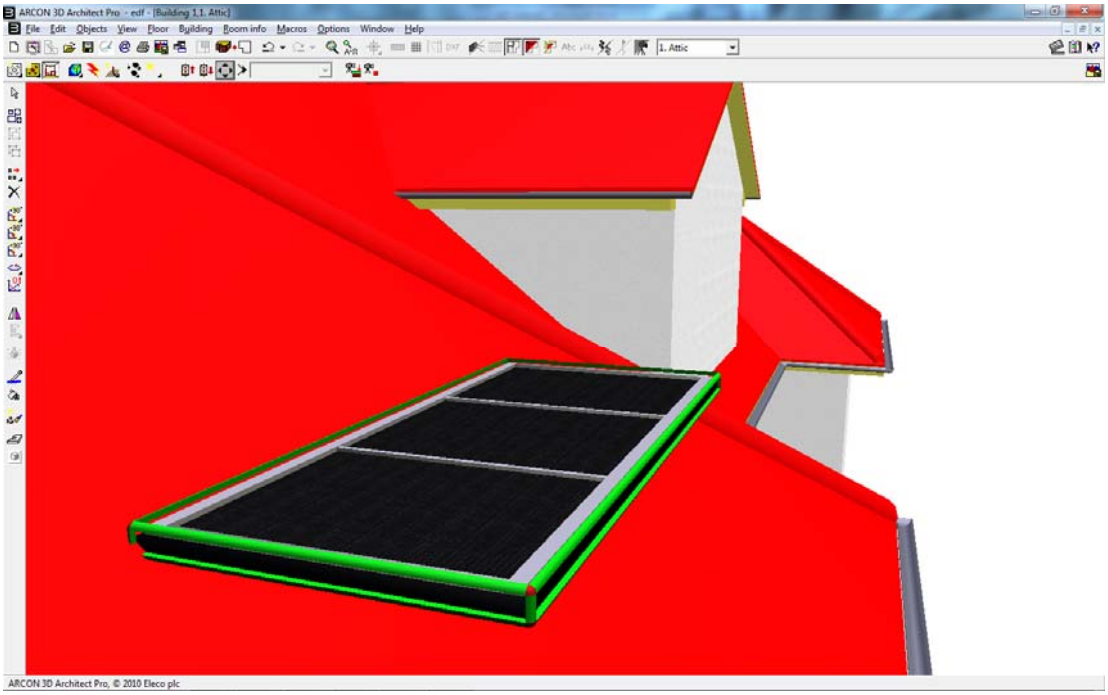
7. This window can be positioned and resized as required; the layout of the window is dynamic so the orientation of the icons and viewing panes may appear different than above depending where the window is located on your screen.
8. The **Object Catalogue** consists of three panels. On the left we have a number of icons, each of which enables us to access a different set of catalogue items (objects, textures, materials etc.). In the centre we have the file tree panel. This is a standard Windows folder menu enabling the sub folders of the tree to be viewed by pressing the '**+**' icon next to the folder name (i.e. File System). Finally on the right side is the thumbnail pane. This shows a thumbnail preview of each object to aid selection. Thumbnails with a small folder icon on

the bottom right corner indicates that this is a folder thumbnail and clicking on it will drill down to the next level of that folder.

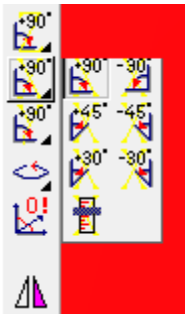
9. On the right hand pane, use the scroll bar to locate the **SOLAR** folder and double click to select it. (*NB. Objects available may vary between versions, if you do not have this folder select any object for the purposes of this tutorial. For example use* ***Elements>Plate Horizontal***).
10. We can now see the thumbnails of the objects inside this folder. These objects can now be dragged onto our model.
11. Objects can be placed onto the model in 3D **Perspective View** however this can be difficult to align or position the object correctly. Try placing an object onto the roof. Select the **Solar Panel** object by left clicking and this time, hold the left mouse button down.
12. Now move your mouse over to the roof of the building:



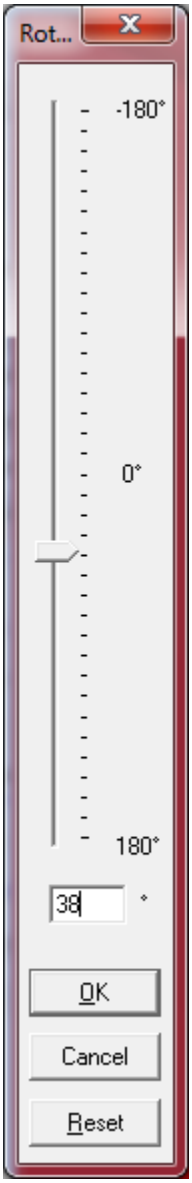
13. An indicator line underneath the object shows the position of the object and where it will 'land' on the roof surface. Still holding the left mouse button, you can move the object around the screen to position it (hold the right mouse button down to move the object closer or further away).
14. When you have chosen the position of the **Solar Panel** release the left mouse button. The object will now naturally fall to rest on the roof surface:



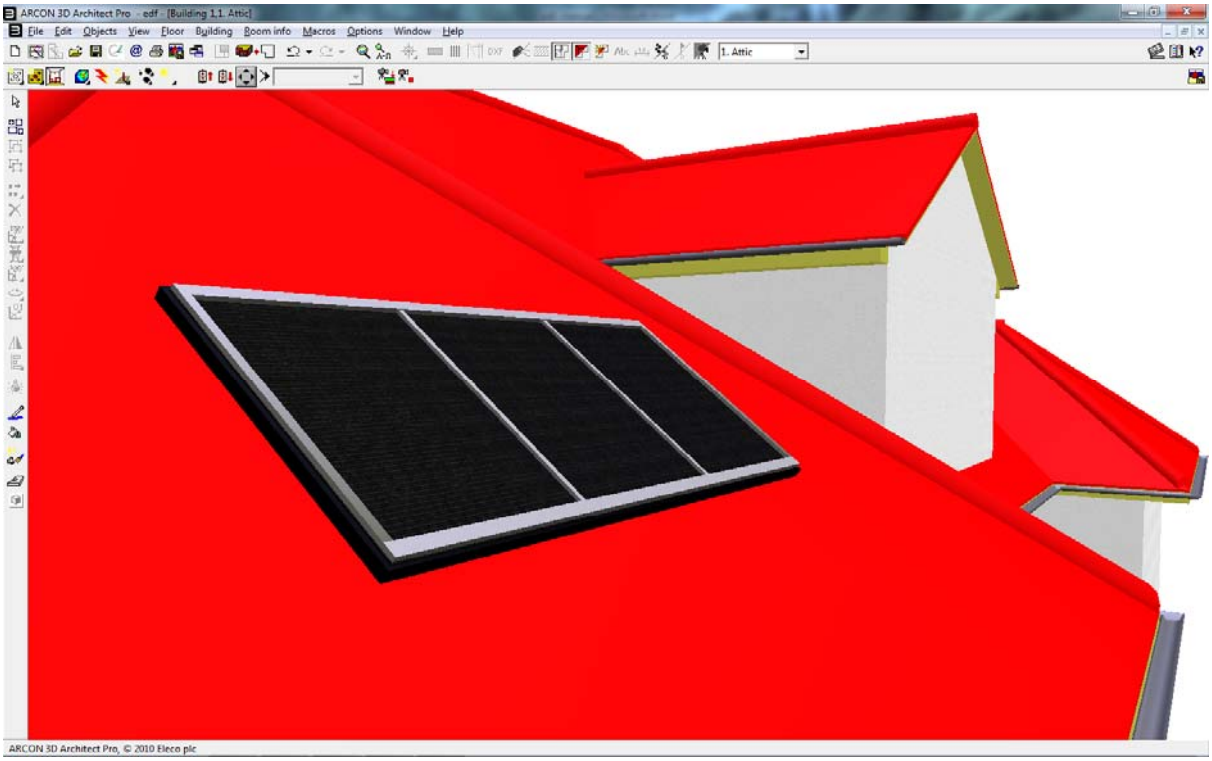
15. As we can now see, the object is resting on the roof, however its angle does not match the pitch of the roof. We need to adjust the angle of the **Solar Panel** to match the roof.
16. At the moment, our object is surrounded by a green bounding box. This box highlights the object that is currently active. You can see that now we have an active object in the model, the majority of the icons on the left hand toolbar are now available.
17. We need to select one of the object rotation tools to change the angle of the **Solar Panel** to match the roof. There are options to rotate objects on each of the three axes (X, Y, Z) together with freehand rotation options. Each of the axis has a number of different rotation preset options on the fly-out menu:



18. For each axis there are preset clockwise and counter-clockwise rotation settings for 90, 45 and 30 degrees. For the purposes of matching the roof pitch however we need to use the **Free Rotation** option on the **X-Axis** menu. Click on the **Free Rotation** option to select it.
19. With the **Free Rotation** option selected, left click the icon to open the slider and rotation value bar:



20. The slider can be adjusted to change the angle of the **X Axis** of our **Solar Panel** simply by moving the angle indicator up or down the slider. Alternatively, enter the angle value in the field at the bottom on the slider. Here we have set the angle to 38 degrees to match the pitch of the roof surface. Click **OK** to set the angle.
21. With the correct angle now set for our object the **Solar Panel** should now sit flush with the roof surface:

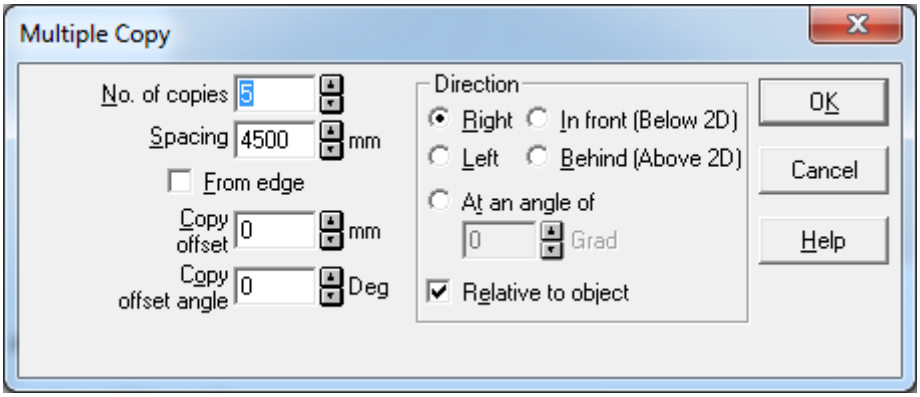


22. This process of adding an object can now be repeated to add additional items or more copies of the **Solar Panel** object.
23. In addition to adding single items, objects can be **Grouped** so that they move as one combined item. These **Groups** can then be transferred back to the **Object Catalogue** and saved for use in future projects.
24. To **Group** objects you first need to select more than one object. To select multiple objects we simply hold down **Shift** and left click all of the objects we want to include in the group.
25. With multiple objects all highlighted together, we then select the **Group** icon from the left hand toolbar.
26. We are then prompted for a **Group Name**, this will be used as the identifier for the **Group** once it is transferred to the **Object Catalogue**, therefore it is useful to make this name meaningful.
27. With the **Group** created, left clicking on any item within the **Group** will highlight the whole **Group** as a single object. This can then be moved, edited, rotated etc.
28. To save this **Group** for use in future projects, we simply left click to select the **Group** and hold the left mouse button down. Now drag the mouse cursor back to the right hand pane of the **Object Catalogue**. The **Group** is now added to the catalogue under the same name we called the **Group**.

Copying Objects

Once one object, a **Solar Panel** for example, is placed it is possible to copy that object to add more of the same without having to amend each object. Standard Windows commands for Cut, Copy & Paste are valid either through the **Edit** menu or the standard keyboard shortcuts (CTRL+X for cut, CTRL+C for cut, CTRL+V for paste).

In addition to the standard options, Arcon includes and option to **Multi Copy**. This option enables us to select a single item and automatically produce a number of copies in a specified direction and specific spacing:

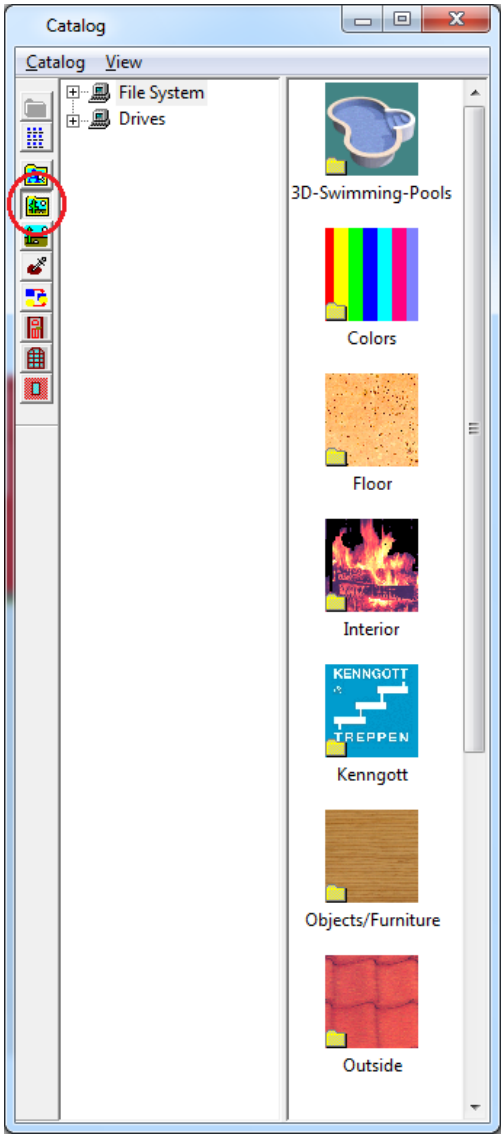


By using this option we can quickly build up a bank of objects (**Solar Panels** for example) from a single item. This can then be used in conjunction with the **Group** option to make building large arrays from a single panel very quick.

Adding Textures

In Arcon, we use **Textures** to add colour or pattern to an object to try to replicate more accurately the look and feel of the building we are modelling. All of the **Textures** in the catalogue are simple 256 colour bitmap (.bmp) images. This means they can easily be added to with your own **Textures** if you have specific requirements for roof tiles, masonry etc.

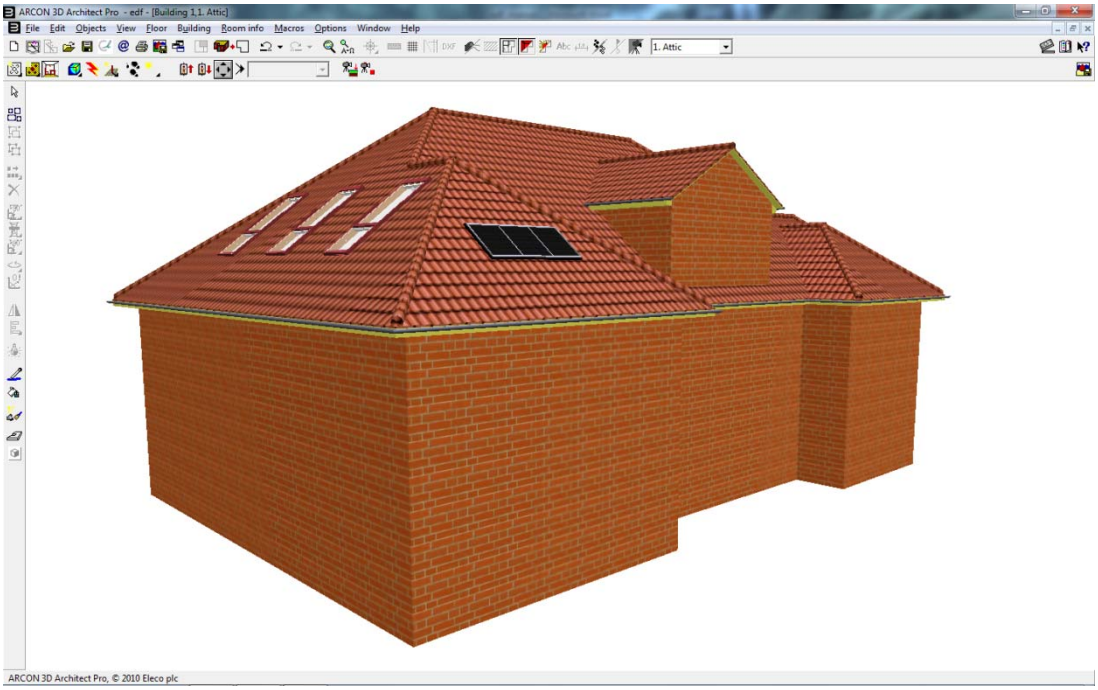
Textures are accessed through the **Object Catalogue** just as we did with our **Solar Panel**. To use the **Object Catalogue** we again need to make sure we are in **Design Mode** and we open the **Object Catalogue** using the same icon as before:



1. As we can see the **Object Catalogue** layout is no different from placing an object. However on the left hand tool bar of the **Object Catalogue** we need to ensure we now choose the **Texture** icon.
2. This provides us with the same set of panes as with our 3D objects and they function in exactly the same way. We can drill down through the folder thumbnails to find the texture

we want to apply to the model we have created. In this case we will change the **Texture** of the **Roof Surface** and the **Walls**.

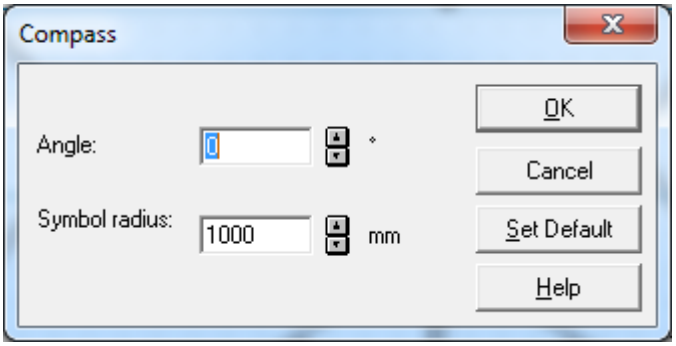
3. On the thumbnail panel double click on the **Outside** thumbnail followed by **Roof Tiles**. Use the scroll bar on the side of the window to locate a new **Texture** for our **Roof Surface**.
4. When you have chosen a new **Texture**, left click on the thumbnail and hold the left mouse button down.
5. Now move your cursor over to the 3D model in the main window and make sure it is hovering above the **Roof Surface**.
6. Simply release the left mouse button and the **Texture** will be applied to the **Roof**.
7. Now repeat this for the **Walls**, choosing a suitable **Texture** from the catalogue:



Viewing Shadow Detail and Sun Positioning

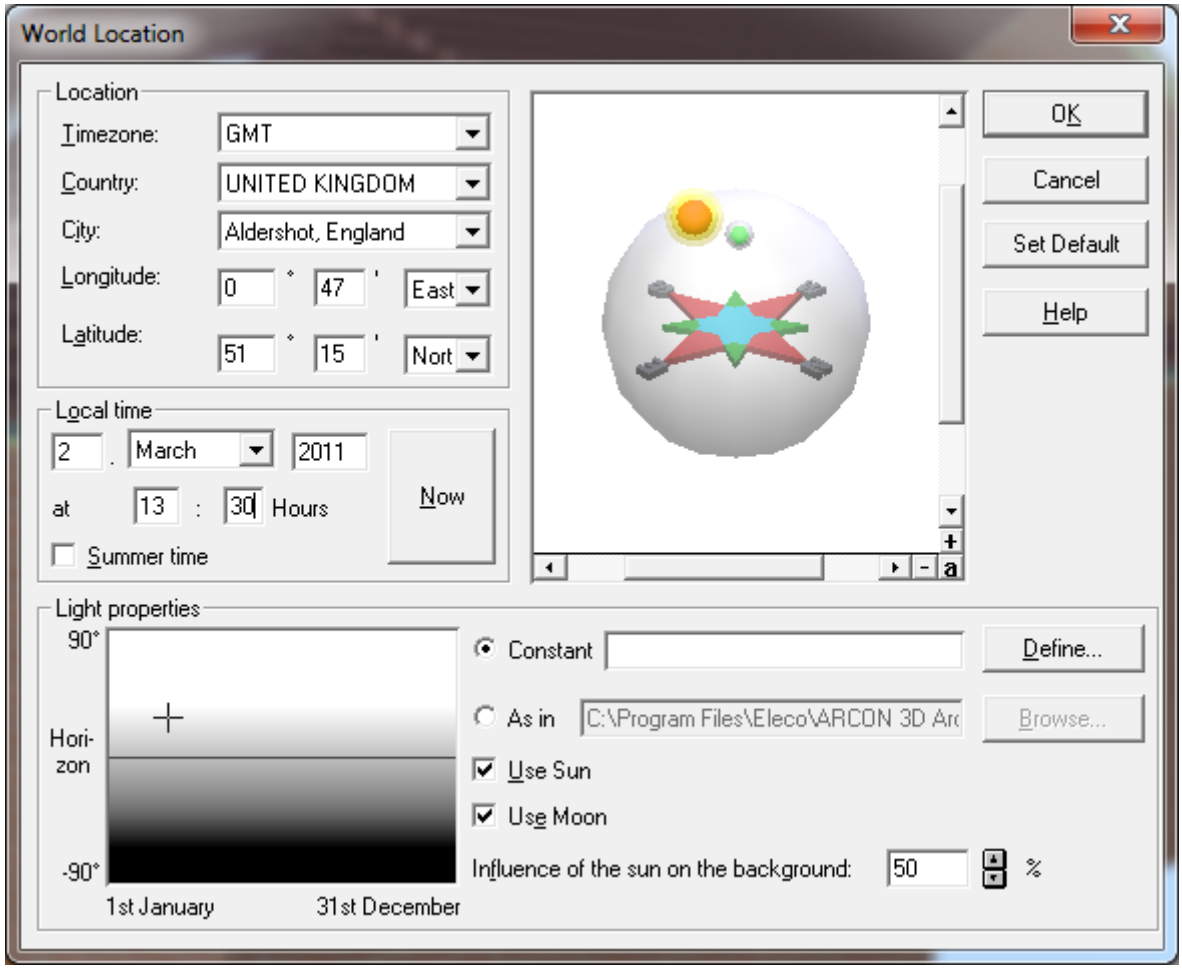
Once our model is complete and all of the required detailing and texturing has been finalised, we can use the sun positioning feature to check for shadow casts from both structures and roof furniture.

1. To enable us to show shadows we need to first identify the position of the sun in relation to the building.
2. Firstly, back in **Construction Mode** check that the **Compass** is correct in relation to the direction the building should face. If not, double click the **Compass** to set it to the correct angle:



3. With the **Compass** set correctly, toggle back into **Design Mode**.
4. We now need to set the time and location to show the sun position.
5. Move the mouse to the top toolbar and locate the **Day** icon:

6. Hovering over this icon reveals options for **Day**, **Night** and **Variable Time of Day**. Left click on **Variable Time of Day** to select it.
7. With **Variable Time of Day** selected, right click on the icon to navigate to the options screen. On the dialogue box that opens click the **Advanced** button.
8. We can now see that the a dialogue box opens containing variables which can be adjusted to select the location of the property and the date and time we wish to use to calculate the sun position:



9. The drop down boxes allow for selection of location by **Country** and nearest **City**. More accurate calculations will be presented if you use the **Longitude** and **Latitude** of the actual plot/property (this can be located on mapping services such as Googlemaps).
10. Once the location has been chosen, set the date and time to use for the calculation. The **Now** button sets the date/time to the current system date/time.
11. Click **OK** to accept these settings.
12. With the location and time set, we can simply click the **Raytrace** button to calculate the shadows cast from the property and its fixtures.
13. There are many settings for speed and quality of the shadow calculation and raytracing and these can be amended to suit your requirements. Lower settings for faster calculations or higher settings for better quality.