

Terrain Modeling

Geländemodellierung

Modellazione del Terreno

Modélisation de Terrains

Modelos del terreno

ArchiTerraTM

vers. 3.0



PLUGIN FOR ARCHICAD®



ArchiTerra User Guide
Version 3.0 for Microsoft Windows and Apple Macintosh
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The ArchiTerra Plug-in

Terrain Modeling

Update of previous version

Although the general programme use philosophy is more or less unchanged, we advise users of previous versions to read this manual carefully, as there are many new functions and the organization of data to describe the terrain and the way in which modelling is handled are completely different.

These modifications have greatly improved improving the performance, reliability and functions of ArchiTerra.

Work methods

Depending on the needs, work to define the terrain is essentially based on two different methods (although they are often used together).

Interactive manual insertion method

In this mode, the operator uses the ArchiTerra basics (points, constraints and contour lines) to plot the land morphology.

In a common typical example, the user has a bitmap format digital map of the work area.

After correctly importing and scaling the image using the ArchiCAD Figure tool, the map can be used as a reference base to “trace” the necessary data to describe the terrain (plotting altitude points, defining constraints and creating contour lines).

Manual mode can obviously also be used to define new terrain with the morphology required by the user.

Data import method

The designer often already has a description of the terrain in electronic format (lists of points or DXF drawings) deriving from collaboration with surveyors or land survey studios.

In such a case, the model is created by importing these documents and automatically transforming the data they contain into ArchiTerra primitives.

During importation, it is however important to verify the compatibility of the formats received and if necessary simplify the data by using the filters available in the ArchiTerra import functions.

The Toolbox



When you use the Display ArchiTerra Toolbox command, the programme's toolbox will be displayed in your ArchiCAD worksheet window.

The tools (and toolbox itself) are not active in all ArchiCAD worksheet windows (there would be no sense, for example, in using the ArchiTerra Toolbox in an ArchiCAD Detail Drawing Window). The following list shows the meaning of the various icons in the ArchiTerra toolbox and their functions are explained in detail in subsequent paragraphs.

 About ArchiTerra.

  Text File Import/Export

 DXF File Import

 Point tool

 Constraint tool

 Outline tool

 Contour Lines tool

 Terrain tool

 Show Depth tool

 Plateau tool

 Pavement tool

 Road tool

 Road Longitudinal Section tool



Random terrain, tree and rock generation functions



Basin tool



Building tool



Coloured Area tool



Wall tool



Retaining Wall tool



Calculate tool



Unlink from Terrain



Show/Hide ArchiTerra Layers



Modify X-Y coordinates/modify Z coordinate toggle



Data Update



Spot Heights tool



Gravity on Terrain



Camera tool



ArchiTerra tool default settings



Help

Text File Import/Export



This tool imports lists of points in text format for use in defining land morphology or exports the points defining a terrain created with ArchiTerra.



Importing data from a text file

Lists of points are usually used by studios carrying out land surveys and are easily supplied as they are produced by the same electronic tools as used to survey the land.

From these files, ArchiTerra obtains the four pieces of basic information required by the operator:

- X coordinate;
- Y coordinate;
- Z coordinate;
- point identification code (optional field).

Apart from the alphanumeric code, the other three pieces of information are essential to identify the position of the point in three-dimensional space.

To import a list of points, click on the **Import TXT** icon.



ArchiTerra immediately displays a standard **Open** dialog box where you can locate and select the text document to import.

Select the desired file by clicking on its name and confirm the import by clicking on **Open**.

ArchiTerra immediately displays the following dialog box to configure importation of the data in the text file:

The preview area at the top shows the contents of the first four lines of the text file.

You can use the **Options** box to configure a number of characteristics for the import to be performed:

Format

The first three radio buttons tell ArchiTerra in what order the data in the text file are listed (ArchiTerra will, in any case, automatically propose the most logical solution).

The following orders are available:

X, Y, Z, Code

Code, X, Y, Z

X, Y, Z

When the last check-box (**reverse x-y**) is activated, the import order of the two X and Y coordinates is inverted, with the following results:

Y, X, Z, Code

Code Y, X, Z

Y, X, Z

This function was added on the request of a number of users who receive lists of coordinates in which X and Y are reversed with respect to the ArchiTerra standard reading logic.

Decimal separator

Once again, ArchiTerra will automatically propose the most appropriate solution. You can, however, use the two radio buttons to tell the programme which decimal separator is used in the text, a full stop or a comma.

Delimiter

The various fields present in the text file are separated by delimiter characters making it clear where information to be recognised starts and finishes.

In the majority of cases, the delimiter used is a TAB, but you can, however, use the radio buttons in this section to define an alternative appropriate delimiter.

Tab: there is one TAB (and one only!) between each field

Semicolon: there is one “;” (and one only!) between each field

3 or more spaces: there are at least three spaces between each field (or any greater number)

Other: when this option is activated, the text field on the right is enabled for you to enter the required delimiter character (when this is not shown above).

IMPORTANT:

To display the data correctly, the structure of the text file must be congruent and constant.

For example, if the separator defined is a semicolon, ONE semicolon AND ONE ONLY must be included between the various fields and all the lines must respect this syntax (subsequent lines cannot use other separator characters).

The only exception to this rule is the "3 or more spaces" rule which enables you to import data from a text file with a variable number of spaces between each field (this field has also been added on the request of experienced users).

If ArchiTerra refuses to import the selected text file, try opening the file using a simple electronic spreadsheet to verify the arrangement of the contents of the fields within the individual cells, make the necessary modifications then save in tabbed text format and reimport the corrected file with ArchiTerra.

Skip the first row

Often the first row of a text file is explanatory, giving the names of the subsequent fields. Activating this check-box avoids importing these data (not relevant to the description of the land morphology).

Filter Distance

When importing data (whether from a text file or a DXF file), it is extremely important to simplify the number of data required to describe the terrain as far as possible.

This field is used to define a filter distance in order to avoid importing excessively close points.

TIP:

Perform an initial import with the filter set to zero, then calculate the terrain.

Then use ever larger filters to process the data and check whether the simplification has a noticeable effect on land modelling.

The simpler the mesh, the better ArchiCAD's performance will be.

Mesh with more than 7000 points (obviously this value depends on your hardware configuration) slows down ArchiCAD and all operations associated with 3D view considerably.

The **Imported Points** box can be used to define particular options for the points (hotspots containing additional information) to be inserted in the ArchiCAD worksheet.

Overwrite original code

When you activate this check-box, you can use the two fields below to define the data, creating a personal code to be assigned to each imported point (overwriting any data already present).

The first field takes an optional alphanumeric string (max 20 characters) and the second, a progressive number. The code will be a combination of these data.

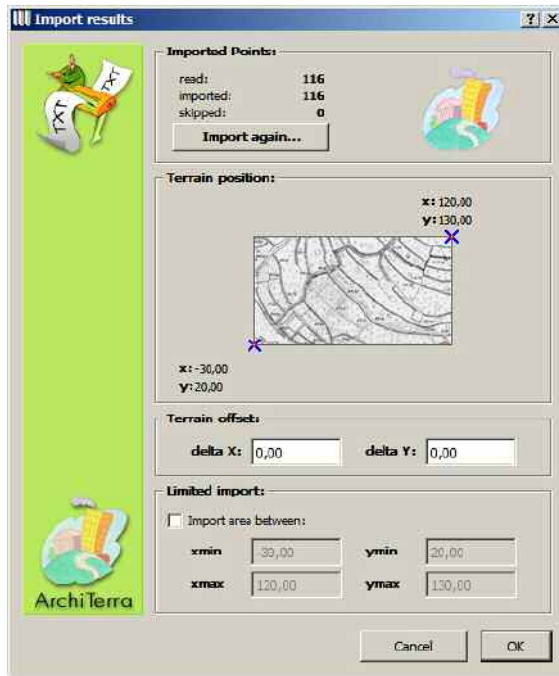
Immediately on the right, you can choose the **pen** to represent the imported hotspots and the pop-up menu at the bottom allows you to choose the **layer** where the new elements created by the import operation will be stored.

Import results

After reading the contents of the text file, ArchiTerra displays the following dialog box (**Import Results**) showing the results of the import operation performed:

The **Imported Points** section lists the number of points contained in the original text file, the number of points imported into the worksheet and the number of points skipped.

The difference between the points imported and the points read obviously depends on the configuration of the **Filter** option.



If the number of points imported is excessively large (a warning image appears on the right), you can click on the **Reimport...** button to return to the previous dialog window and change the filter value to simplify the number of data to be imported.

In the **Terrain Location** area you will see the X-Y coordinates of the two corners (bottom left and top right) of the rectangle containing the terrain to be imported.

If the relief is georeferenced, the position of the terrain could be very distant from the ArchiCAD origin and this could cause view and processing problems.

This can be resolved by using the two fields below in the **Terrain Offset** section to shift the data and reposition them near the origin:



Delta X and Delta Y are the two values used to offset the terrain.

Negative values will obviously produce a shift towards the left and downwards, while positive values produce a shift towards the right and upwards.

IMPORTANT:

Do not undervalue this characteristic. Terrain distant from the origin could cause various problems during use of ArchiCAD.

The last section at the bottom, **Limit Import** enables you to import part of the data only, defining the limits using the four coordinates below:

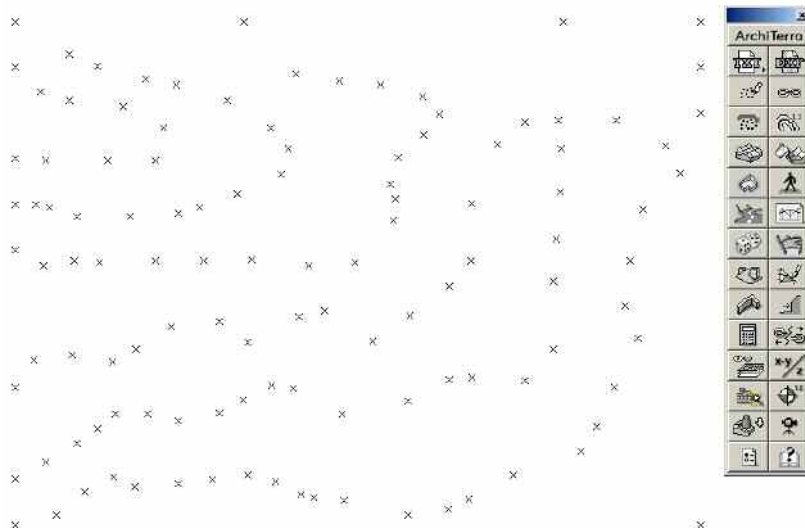


When this option is activated by means of the **Import area between** check-box, four fields (**xmin, ymin, xmax, ymax**) are enabled where you can define the area to be imported.

This option is useful when the survey you have obtained covers a much larger area than you are interested in.

A partial import avoids having to manually cancel the unnecessary data subsequently.

Finally, clicking on OK confirms the import and after a brief process, the hotspots representing the points read from the text file will be positioned on the map worksheet:



Exporting the data of a terrain/mesh to a text file

At any time, you can export the morphology of the selected terrain/mesh in text format (in other words, a list of point coordinates).

Firstly, select the terrain/mesh you wish to export and then click on the Export Text File tool icon in the ArchiTerra toolbox.

Notes:

Note that this is the only icon in the ArchiTerra toolbox with a double function (highlighted by the presence of a small arrow at the bottom right). To select the required function, click with the mouse on the icon until you see a pop-up menu where you can choose the required command.

Once the procedure has been started by clicking on the icon, you will see a standard save dialog box where you can define the name of the file to export and the position where you want it to be saved.

Define these data and confirm with the OK button. The export text file dialog box appears.



The top section simply gives the name chosen for the file to be exported.

The **Coordinates Order** section allows you to define the order in which the X and Y coordinates will be exported.

The **Exported Information** section allows you to choose what to export:

- **Export Terrain/Mesh Only** (only the morphology of the original terrain is saved)
- **Export Terrain with Modifications** (points deriving from modifications to the terrain with elements are also saved).

Data from DXF file



Use this tool to import information describing the terrain obtained from DXF drawings.

Before describing the procedure, we will take a brief look at DXF documents, how the information they contain is read, which primitives ArchiTerra reads and imports and which information you are advised to import.

DXF (Drawing eXchange Format) was developed by AutoDesk for data exchange between different CAD programs.

ArchiTerra reads DXF in text format (the most common) but is not compatible with DXF binaries.

A DXF drawing is structured in layers (as with ArchiCAD) and all graphic information is contained in the different original layers.

ArchiTerra reads and imports the following primitives from DXF drawings:

- POINT:** point-type primitive, generally used to describe a typographic point.
- LINE:** line-type primitive.
- POLYLINE:** polyline-type primitive, a split line made up of a series of consecutive segments.
- LWPOLYLINE:** polyline-type primitive, a split line made up of a series of consecutive segments with a thickness configuration.
- SPLINE:** primitive describing a curve (similar to ArchiCAD splines).

IMPORTANT:

ArchiTerra cannot import DXF blocks (the equivalent of ArchiCAD library parts). If the survey points have been created using such blocks, they cannot be imported.

An important rule to always remember is that the aim is to import **ONLY** the information useful to describe the terrain. The drawing probably includes a lot of other information which is not necessary to create the terrain model in this phase.

For example, the drawing could contain graphic primitives marking the borders, the key, tables etc.

This information bears no relation to the terrain and so is discarded.

Use the layer hierarchy in the DXF document with care and only import from the useful layers: the rest can be imported using ArchiCAD if necessary.

The terrain is mainly defined through points (nodes) and graphic primitives describing contour lines, which could also be identified as constraints, determining the way in which the triangulation is mapped.

TIP:

before using ArchiTerra to import DXF, ask the supplier for a table describing the use of the layers and the type of information they contain. If this is not available, first import the DXF file using ArchiCAD and check which layer contains the primitives you wish to import. Take note of these layers and import the DXF file again using ArchiTerra, activating only the layers in question.

NOTE:

*even if it seems obvious, you should remember that the DXF document **MUST** contain three-dimensional information, in other words, the terrain description must include a "Z" coordinate.*

If you import a 2D drawing, all the information will be useless and will all lie on the same flat plane at altitude zero. If you receive a 2D DXF, import it with ArchiCAD and use the ArchiTerra commands to transform the 2D primitives into three-dimensional ArchiTerra parts.

Use ArchiCAD to check whether your DXF document is 2D or 3D:

1. Open the DXF document as an ArchiCAD library element, following the procedure described in the ArchiCAD user manual;
2. display the 3D view of the element and check how ArchiCAD visualizes it. If the primitives are all on the same plane it means that the DXF drawing is 2D.

Now we will look at the import procedure for a DXF drawing using ArchiTerra.



Click on the **Import DXF File** icon to import a DXF drawing.

ArchiTerra immediately displays a standard **Open** dialog box where you can locate and select the DXF document to import.

Select the desired file by clicking on its name and confirm the import by clicking on **Open**.

ArchiTerra immediately displays the following dialog box:



The central area displays a list of all layers in the DXF drawing selected (or rather, all the layers containing information compatible with ArchiTerra).

There are two check-boxes next to each name regulating the treatment of the layer in question.

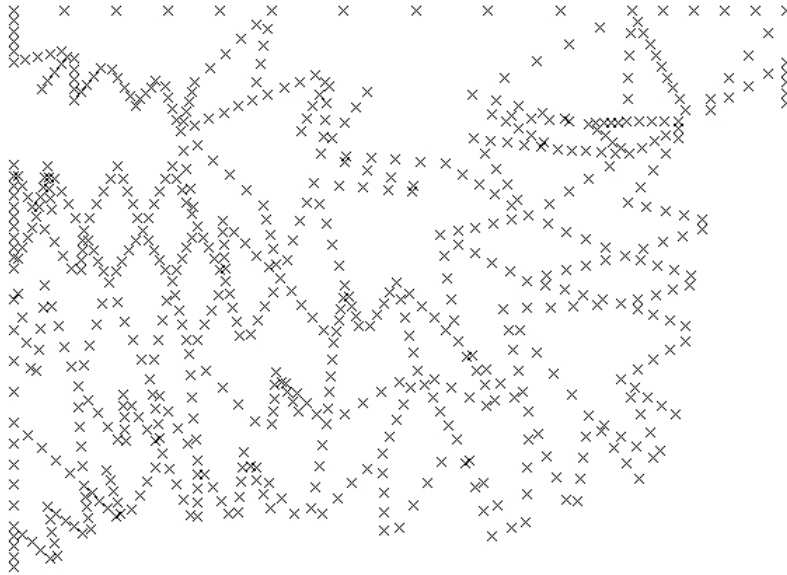
Use the first Import from Selected Layers **check-box to activate/deactivate the layer import**. Information contained in the layer will only be imported if this box is ticked, otherwise the information in the layer will be ignored.

Use the second (**Create Constraints**) check-box to determine how to import the graphic parts of the layer.



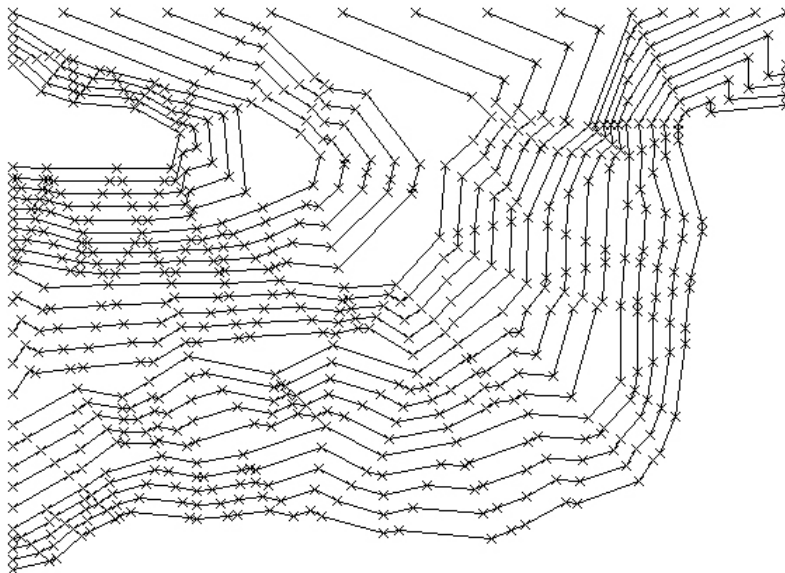
If the check-box is not ticked, ArchiTerra imports the primitives by simply reading the extreme coordinates and inserting ArchiTerra points/hotspots in their place.

Therefore, if the layer contains lines (such as contour lines), ArchiTerra only imports their altitude, placing points/hotspots at each end.



When the box is ticked, ArchiTerra also imports the graphic primitives, transforming them into ArchiTerra constraints (see the description of the constraint tool further on).

The result of the import will be a series of points/hotspots connected by constraints.



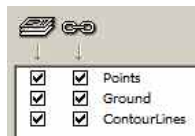
In this case (**Create Constraints**) it is useful to group together elements imported from the same primitive: for example, all points and constraints deriving from the same polyline.



Tick the check-box **Group** in the upper right part of the window to group these elements together.

TIP:

click on the two icons in the upper part of the layer list window (icon with layers and icon with chain) to tick all check-boxes for all the layers listed with a single click.



The two icons correspond respectively to the commands:



import from all layers;



create constraints from all layers.

Correspondence with the DXF unit system

Under the list of layers, you can define the unit system for the DXF drawing as you do for ArchiCAD (for further information on the concept of unit systems, refer to the ArchiCAD DXF-DWG Conversion Guide).

Filter Distance

The instructions given above for importing text files is even more indispensable for DXF models.



These two fields are similar to those used to import lists of points (**Import TXT**), allowing you to simplify data in the import phase.

DXF drawings often contain superfluous information.

We found that many of the DXF drawings sent to us by users came from bitmap images.

Bitmap information can be automatically transformed into vectorial primitives using a digital map and special software.

This is a widespread practice but produces particularly complicated results. For example, a contour line represented by a bitmap image and then transformed into a vectorial polyline produces a polyline consisting of hundreds (often thousands!) of tiny dashes.

This means that when reading the DXF file in question, ArchiTerra imports thousands of points and thousands of constraints into the worksheet, making the document extremely heavy and reducing ArchiCAD's performance.

The filter (and hence the related filter distance field) is extremely important to simplify the data you import.

The distance set is used to filter the points you import. Points falling within this distance are deleted and not imported.

NOTES:

as seen above, you can also set the filter after the first reading of the file, as you will probably not know at the beginning how many points are in the file to be read.

The first value, on the left, defines the filter distance for importing points and works exactly as described for text file imports.

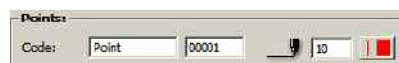
The second value is used to simplify polylines. By setting an adequate distance, you can considerably simplify a polyline of thousands of points without losing any important information in the description of the morphology.

TIP:

always use these two filters to import as little superfluous information as possible and find a good balance between the amount of information imported and the accuracy of the terrain model.

Points

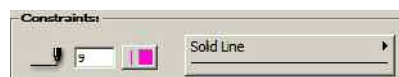
In this section, you can use the two fields below to define data to create your personal **code** to be assigned to each imported points.



The first field takes an optional alphanumeric string (max 20 characters) and the second, a progressive number. The code will be a combination of these data.

Immediately on the right, you can choose the **pen** to represent the imported hot-spots.

Constraints



In this section, you can define the **pen** and line **type** used to represent the constraints/lines imported.

NOTES:

When importing data from DXF drawings, you do not have to select any layer for the imported primitives as they will be stored in the same layers (automatically generated if not present in your project) as in the DXF drawing.

Import Results

After reading the contents of a DXF drawing, ArchiTerra displays the following **Import Results** dialog box showing the results of the import operation performed and enabling you to make additional settings to optimise the results of the DXF drawing reading.

This dialog box is identical to the one described previously in the section on importing text files. You should therefore see page 13 of this manual for a description of the contents.

Points Tool



The point is the simplest but most essential unit on which the terrain morphology description is based.

ArchiTerra uses simple hotspots to represent the 'points', enabling complex terrains to be handled without overburdening the model or slowing down ArchiCAD.

Be careful though not to confuse simple hotspots inserted using the relevant tool from the ArchiCAD palette with those inserted manually using the ArchiTerra Points tool or inserted automatically from a TXT or DXF document using the ArchiTerra import procedures.

The hotspots inserted using ArchiTerra contain added information - the altitude and identification code of the point - while hotspots inserted using ArchiCAD are simple 2D graphic primitives containing no extra information.

There are two dialog boxes associated with this tool, one to edit the points/hotspots already included in the map and one to create/insert new hotspots.

If you click on the Point tool without selecting a point, you start inserting points on the worksheet and ArchiTerra displays the following box:



This starts the point insertion cycle and each time you click on the worksheet, a new point with the characteristics defined in this box is inserted.

To stop the insertion cycle, click on Cancel in the box or Esc on the keyboard (as well as all the other standard ways in the ArchiCAD interface).

The following characteristics can be defined in the box and then associated with the ArchiTerra points:

- Code:** as described above, an alphanumerical string and a number (increasing automatically) can be defined to identify the next point created.
- Layer:** from the relative pop-up menu, you can select the layer where the next point will be stored.
- Project Zero:** in this field you can define the Z coordinate of the point (the X and Y position are obviously defined by your click on the worksheet)
- Pen:** the pen to be used for the next point created on the ArchiCAD worksheet.

If one of the points already inserted manually or imported using the procedures described above is selected and you then click on the **Point** tool, ArchiTerra will display the following dialog box with the settings for the point selected:



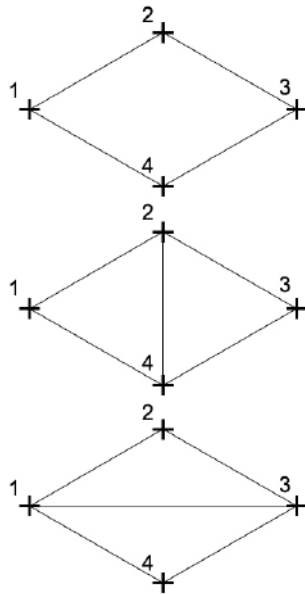
Despite the different layout, the information displayed is the same as that described above.

Just as with any ArchiCAD settings dialog box, closing it by clicking **OK** saves any modifications made.

Constraint tool



Constraints are used to form the triangulation, linking two points following the specifications defined by the user.



In the terrain processing phase, ArchiTerra takes account of the constraints inserted, providing the triangulation requested.

As with points, in order to lighten the processing phase and not overload the document, plain lines are used to identify the constraints.

Remember not to confuse the plain lines inserted using ArchiCAD and those transformed using ArchiTerra. The latter contain important information for terrain processing!

When you click on the Constraint tool, ArchiTerra displays the following dialog box:



The constraint dialog box offers the following options:

Line type: the type of line used to represent the constraint.

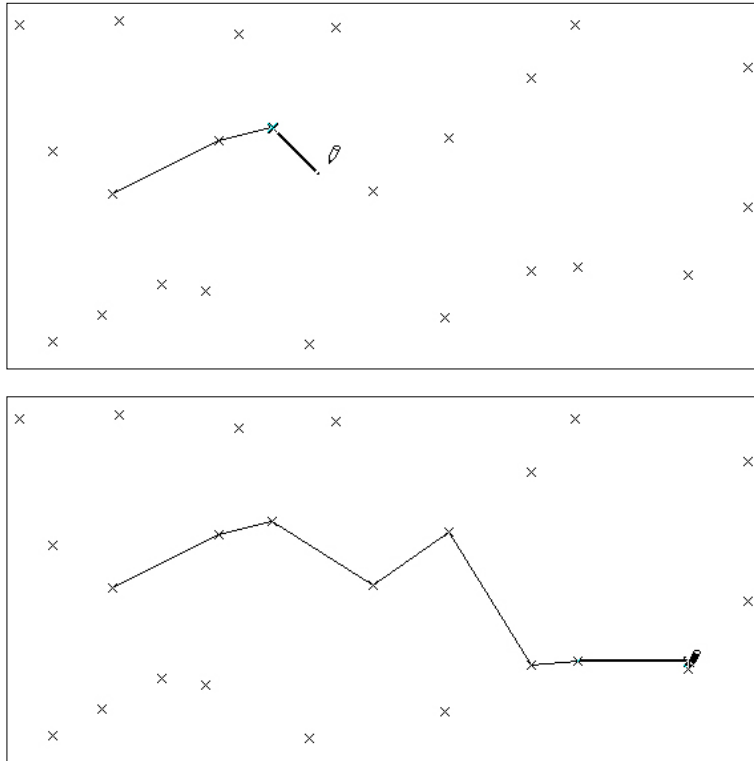
Pen: the pen used to draw the constraint.

Layer: the layer where the constraint is inserted.

How to define a constraint

It is extremely easy to define constraints between points on the worksheet:

1. click on the Constraints tool icon
2. configure the tool settings
3. confirm with the OK button
4. draw a polyline on the map joining the constraint points



To finish drawing the constraint:

- double-click on the last point;
- press the Cancel key on the ArchiCAD control bar.
- press the Esc key on the keyboard

Modifying constraints

- Select the constraints to be modified
- click on the Constraints tool icon
- make the desired modifications in the constraints configuration box
- click on the OK button to confirm the modifications

IMPORTANT:

you can only modify the constraint attributes: line type, pen and layer. The shape of the constraint (the position of its nodes) is linked to the nodes on which the constraint is "placed". When the nodes are moved, the constraint is automatically updated.

How to delete constraints

Constraints can be deleted using the standard ArchiCAD procedure (select and cancel).

If you delete one of the two end points of the constraint, you also delete the constraint itself.

Outline tool



Before generating the 3D terrain model, you must first define its outline or external perimeter.

There are two ways to define the outline:

1. using a previously created ArchiCAD Fill
2. using the ArchiTerra Draw Outline function directly.

How to draw an Outline using the ArchiCAD fill tool

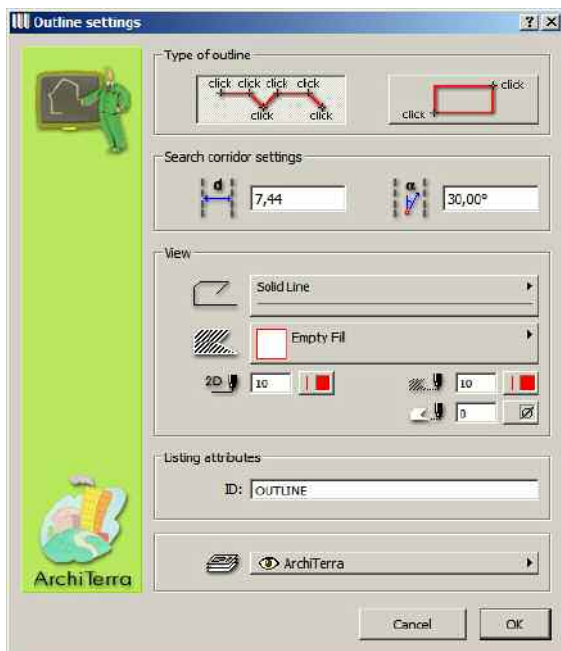
1. Using the ArchiCAD Fill tool, trace out the rough perimeter of your terrain
2. select the fill and click on the Outline tool icon, ArchiTerra will display the Outline settings dialog box.



3. configure the preferences as you wish
4. confirm the settings with the OK button
5. ArchiTerra redraws the fill, adapting it to fit your configuration and the points inserted on the map.

How to draw an Outline using ArchiTerra procedures

1. click on the Outline tool icon without selecting anything
2. ArchiTerra immediately displays the following Outline settings dialog box:



3. configure the options as required and choose the drawing option using the two buttons on the left side of the dialog box defining the type of outline: polygon or rectangle.



4. confirm the settings with the OK button.
5. draw the rough perimeter of your terrain.

After this drawing stage, ArchiTerra redraws the fill, adapting it to fit your configuration and the points inserted on the map.

The two procedures for manual Outline drawing are:



Polygonal: like the ArchiCAD procedure for drawing a polygon, to finish the drawing:

- a. double click on the last point
- b. click on the starting point



Rectangular: like the ArchiCAD procedure for drawing rectangles, define the internal diagonal of the rectangle with two clicks.

The second click ends the drawing stage. ArchiTerra uses this rectangle to automatically trace the outline of the terrain (which is not necessarily rectangular in shape).

The search corridor

To avoid certain problems with the Outline search and creation algorithm used in early versions of ArchiTerra, a new algorithm has been defined based on the search corridor concept.

The guidelines used by the new algorithm enable the shape and precision of the outline to be better defined.

You can define the specific parameters for this procedure in the Outline settings dialog box (whether you are manually drawing the outline or transforming a previously selected ArchiCAD fill):



d (distance between guidelines): determines the width of the search corridor. Only the ArchiTerra points/hotspots included in this corridor will be considered when generating the outline.

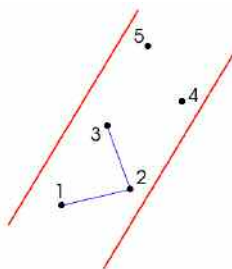
Alfa (search angle): ArchiTerra uses this information to select the next point to join to generate the outline.

Small search angles will produce outlines as straight as possible.

Large search angles will produce outlines with more broken zigzag sides.

The following examples explain the importance of the search angle more clearly.

In the following situation:

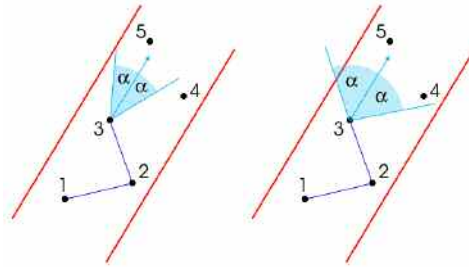


Point 3 could be connected either with point 4 or with point 5.

The size of the search angle determines the choice.

With a small search angle, point 3 will be connected to point 5 as point 4 does not fall within the angle.

With a large search angle, point 3 will be connected to point 4.



TIP:

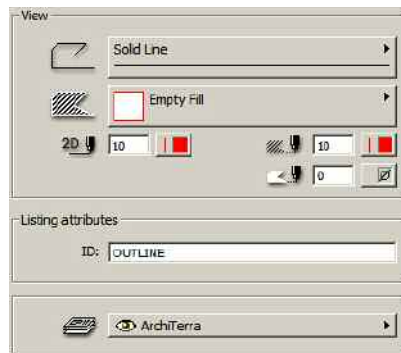
Remember that large angles produce uneven outlines, while small angles result in more linear outlines.

IMPORTANT:

Even if you are transforming an ArchiCAD fill into an outline, ArchiTerra will still follow the same logic (and therefore the two values described above), so appropriate values must be set with care in the outline settings dialog box.

Outline attributes

In the Outline settings dialog box, you can set a number of attributes for the fill generated to represent the perimeter of the terrain:



In the **View** section you can define the graphic appearance of the elements:

the line type used to represent the outline.

the fill used to represent the outline.

The pens used for the edge, hatching and fill background.

In the **Listing Attributes** section you can define an alphanumeric string to identify the outline.

In the bottom part of the dialog box, a pop-up menu allows you to select the **layer** where the fill will be stored.

Contour lines tool



The Contour Lines tool allows you to define the morphology of your terrain model by indicating the course of the contour lines or calculating and displaying the contour lines on pre-existing terrain models.

Contour lines are imaginary broken lines which connect points at the same altitude, making it easier to understand the terrain model in the map or 3D views.

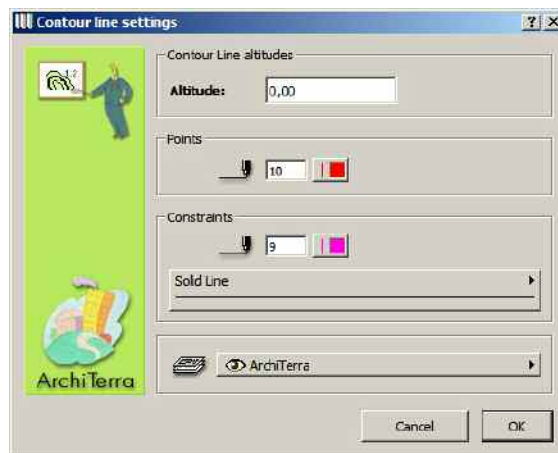
Drawing contour lines

You normally need to draw contour lines when you start to collect and define data to build a terrain model from scratch.

A scanner is most commonly used to digitalize the terrain map. Then, when the image is correctly imported and scaled in ArchiCAD, the contours on the map are recopied and transformed into ArchiTerra information.

Drawing a contour line is extremely simple:

1. draw a connected series of lines, arcs, polylines and splines, then group them together.
2. select the group of elements at the same altitude to transfer into contour lines.
3. click on the Contour Lines icon in the ArchiTerra toolbox and the programme will display the Contour Lines settings dialog box:



4. configure the contour line parameters.
5. confirm with the OK button
6. ArchiTerra transforms the selected elements, assigning them the necessary information to build the terrain.

The options in the dialog box to transform the two dimensional primitives into contour lines are:

Altitude:	the altitude of the contour line from the project zero.
Pen for points:	the pen used to draw the points/hotspots deriving from transformation of the primitive into a contour line
Pen for constraints:	the pen used to draw the constraints/lines deriving from transformation of the primitive into a contour line
Line type:	the line type used to draw the constraints/lines deriving from transformation of the primitive into a contour line
Layer:	the layer where the points/hotspots and constraints/lines making up the contour line are stored

IMPORTANT:

The primitive 2D curves will be transformed into contour lines using the current resolution settings of the ArchiCAD Magic Wand. This value should be appropriately configured to avoid generating excessively complex contour lines consisting of hundreds of thousands of nodes.

Modifying contour line attributes

It is extremely simple to modify the graphic or altitude attributes of a contour line following the standard ArchiCAD procedure:

1. select the contour lines you wish to modify
2. click on the Contour Lines icon.
3. configure the parameters you want to modify.
4. confirm with the OK button.

TIP:

At the moment of creation, the contour lines are generated by automatically grouping all their constituent elements (points/hotspots and constraints/lines). They are therefore extremely easy to select.

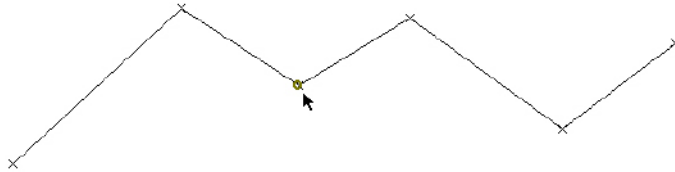
Selecting one of the components selects the entire line (check beforehand that the Suspend Groups option is not activated).

Modifying the shape of contour lines

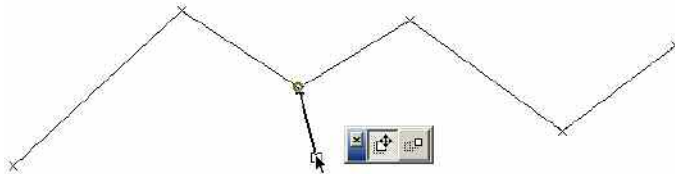
ArchiTerra transforms contour lines into groups of points/hotspots and lines/constraints (or special versions of them containing additional information and therefore very different from normal hotspots and lines drawn by ArchiCAD).

As described for constraints, contour lines can be modified by moving single points/hotspots. Constraints are then automatically updated.

1. select a contour line hotspot.



2. drag it to the new position



3. ArchiTerra immediately updates the contour line



Calculating contour lines

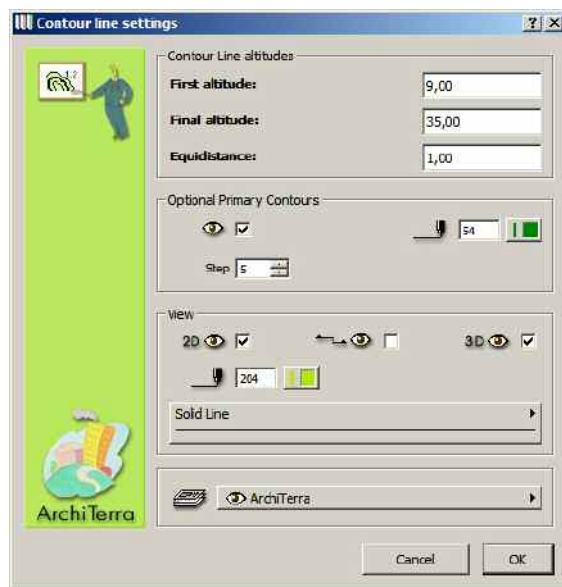
The same tool in the ArchiTerra toolbox is also used to calculate contour lines on previously drawn terrain/mesh (which must be selected before clicking on the Contour Lines tool).

The Contour Lines calculated are displayed using a highly parametric GDL object known as AT3_CONTOURLINES.

TIP:

See the paragraph on AT3_CONTOURLINES in the Appendix for more detailed information on use of this object.

In this case you see a different dialog box offering the following options:



Contour Line Altitudes

Start altitude: the altitude from which to start calculating the contour lines (the default value that appears is the lowest altitude on the selected terrain).

Final altitude: the altitude where calculation of the contour lines should end (the default value that appears is the highest altitude on the selected terrain).

Equidistance: the spacing between contour lines.

Primary Contours

When this option is activated (check-box with an eye icon), primary contours are displayed every given number of secondary contours as defined in the Step field. The pen selection field allows you to graphically differentiate these contours from the secondary contours (configured in the section below).

View

The first three check-boxes enable or disable contour line display:



in the Map view



in the Section/Elevation view



in the 3D view.

The pen below defines the colour used to represent the contour lines

Layers

The last pop-up menu can be used to define the layer where the GDL object representing the contours of the selected terrain will be stored.

Modifying the calculated contour lines

As described above, the contour lines calculated are nothing but a special GDL object (AT3_CONTOURLINES). This object is automatically linked to the terrain for which it was generated and therefore its parameters must be modified NOT by selecting the object but by selecting the terrain/mesh from which it derives and then clicking on the Contour Lines tool (as if they were being generated from scratch).

Any operation performed with ArchiTerra which modifies the mesh morphology will automatically result in immediate updating of the Contour Lines object (if it has been calculated).

TIP:

If the mesh has been manually modified (not using ArchiTerra procedures), the contour lines display object will not be automatically updated.

In this case, select the terrain/mesh and click on the Data Update tool icon, the object will immediately adapt to the modifications made to the mesh.

Show Depth tool



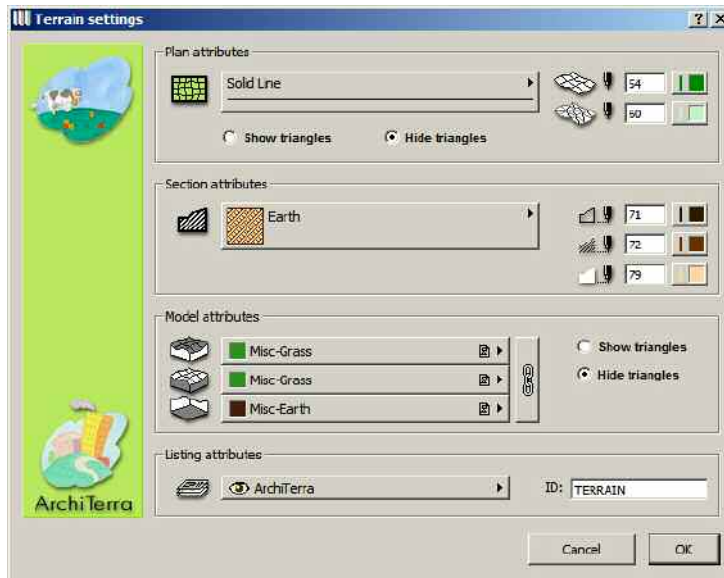
This tool enables you to start work on the terrain, modify the attributes of a terrain/mesh calculated previously, or convert a "standard" ArchiCAD Mesh into ArchiTerra terrain/mesh.

Calculating terrain

After the data describing the land morphology has been defined, you will have a series of 2D primitives (points/hotspots, constraints/lines, outline/fill) on the ArchiCAD worksheet.

To calculate the terrain produced from this information, select the outline/fill identifying the perimeter and click on the Terrain tool.

ArchiTerra immediately displays the following Terrain settings dialog box:



In the **Map Attributes** section, you can configure:

- the type of line used to represent the terrain/mesh.
- the pen used for the terrain/mesh outlines
- the pen used for the terrain/mesh edges
- the two bottom radio buttons enable the terrain/mesh triangulation on the map to be shown/hidden.

In the **Section Attributes** section, you can configure:

- the fill used for the selected parts of the terrain/mesh in Section/Elevation views
- the pen used for the section fill outline
- the pen used for the section fill hatching
- the pen used for the section fill background.

In the **Model Attributes** section, you can configure:

- the material for the top surface of the terrain/mesh
- the material for the side skirt of the terrain/mesh
- the material for the bottom surface of the terrain/mesh
- the two radio buttons on the right enable the terrain/mesh triangulation on the map to be shown/hidden in the 3D view.

In the **Listing Attributes** section, you can configure:

- the layer where the generated terrain/mesh is stored.
- an identifying code for the generated terrain/mesh.

When the configuration is confirmed with the OK button, calculation of the terrain begins.

After processing, ArchiTerra will insert the terrain/mesh produced from the project data into the ArchiCAD map.

Converting ArchiCAD Mesh into ArchiTerra Terrain

This procedure can be used to convert a simple ArchiCAD mesh into an ArchiTerra terrain/mesh. You will therefore be able to use all the tools provided by the programme to modify your original mesh.

This is an extremely simple procedure:

1. on the worksheet, select the ArchiCAD mesh to be converted
2. click on the Terrain tool in the ArchiTerra toolbox and the programme will display the following dialog box:



3. click on **Convert** to transform the Mesh into ArchiTerra Terrain. The ArchiCAD mesh is immediately converted into an ArchiTerra terrain/mesh and is ready for use.

Show Depth tool



This function is one of the innovations introduced in ArchiTerra 3.0.

Use this tool to highlight differences in terrain altitude in the 3D view using a colour gradient defined by the user.

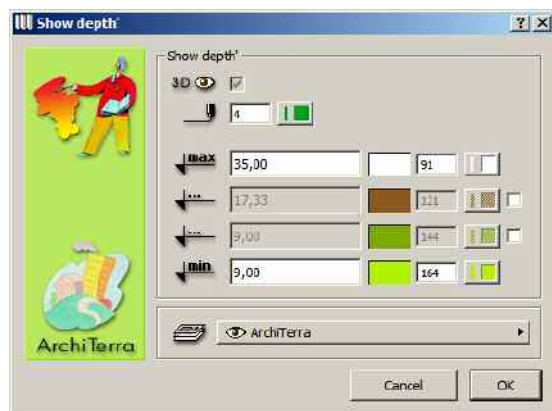
This gradient is displayed in your photorendering using a highly parametric GDL object known as AT3_CONTOURLINES.

TIP:

See the paragraph on AT3_CONTOURLINES in the Appendix for more detailed information on use of this object.

Select the terrain/mesh you wish to work on and then click on the Show Depth tool icon.

ArchiTerra immediately displays the following settings dialog box:



The first check-box can be used to activate/deactivate depth display (in the case of a first generation, this check-box is deactivated. You are creating the element and therefore it is obviously visible!).

The control below defines the pen used in the 3D view to display the various contour lines dividing the terrain/mesh into different colour bands according to the gradient of colour defined.

The four series of controls below define up to four colours to be used (a minimum of two) for each altitude defined in the numerical field on the left. In the interval between each pair of altitudes, a colour gradient is used which changes from the colour of the lower altitude to reach the colour of the top altitude.

Obviously the minimum altitude and maximum altitude cannot be outside the range represented by the vertical extension of the terrain/mesh. Similarly, the intermediate altitudes must be included within this interval.

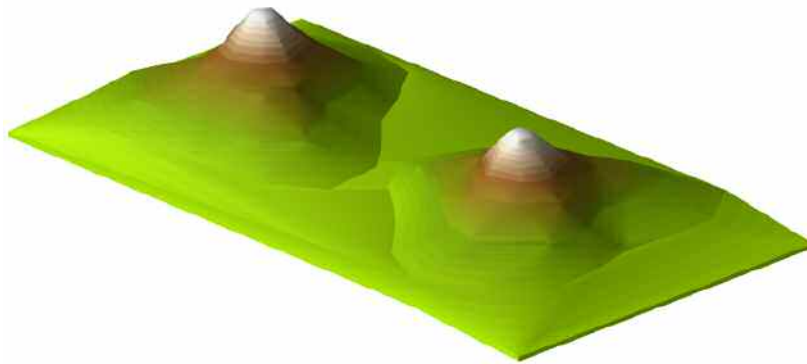
The first editable field can therefore be used to define the altitude corresponding to the colour specified on the right.

The following field can be used to customise the colour chosen. Click on the box to access the standard colour definition dialog box.

The editable numerical field and the following pop-up menus allow you to choose one of the pens from the ArchiCAD toolbox to be used with the colour. When you select the colour from the ArchiCAD toolbox, you will lose any colour defined in the previous box (this will automatically be set to correspond to the selected ArchiCAD pen).

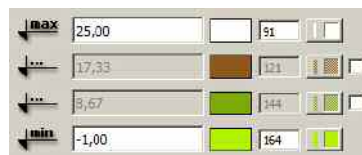
The pop-up menu in the bottom part of the dialog allows you to define the layer where the GDL object (AT3_CONTOURLINES) used to display the colour gradient will be stored.

The result in the photorendering view will be as follows:

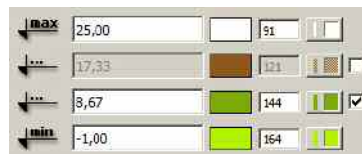


As explained above, you can use up to four different colours (a minimum of two) according to the status of the two check-boxes on the far right of the two lines included between the maximum and minimum altitudes:

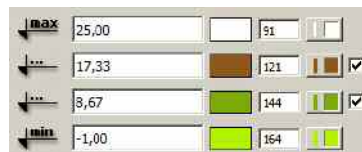
gradient between two colours:



gradient between three colours:



gradient between four colours:



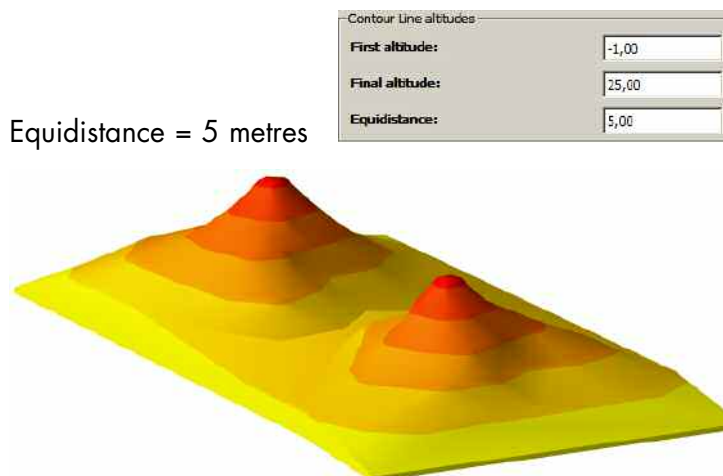
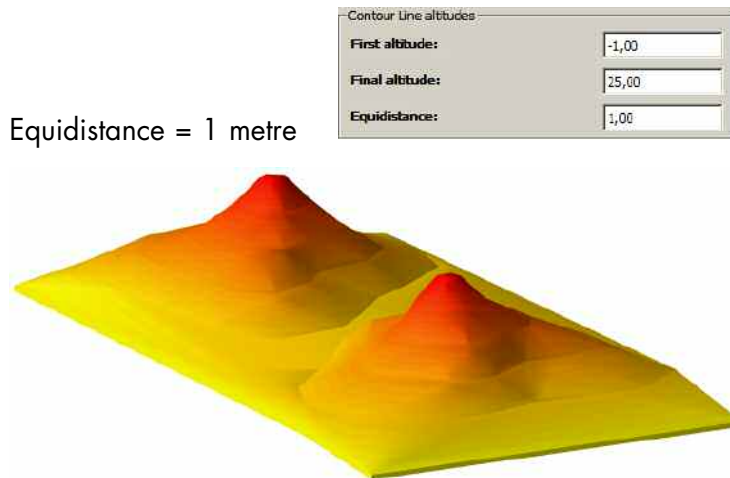
TIP:

As explained above, the gradient is displayed using a highly parametric GDL object known as AT3_CONTOURLINES, the same object as used to calculate and display the Contour Lines.

The division into layers of different colours in fact uses the same equidistance value as used for the Contour Lines.

If you want your gradient to be more gradual, use a smaller equidistance value (in practice, recalculating the contour lines by reducing the equidistance), if you want the different layers of colour to be more obvious, use a larger equidistance value.

Here is an example with two different equidistance settings:



How ArchiTerra tools modify the terrain

Before describing the next tools in the ArchiTerra toolbox, here are a few simple examples of how ArchiTerra tools modify terrain.

Firstly, from this version of ArchiTerra, modifications to the terrain (plateaux, roads, coloured areas and retaining walls) are performed using the Solid Elements Operations technique (Boolean operations).

The main advantage of this technique lies in the fact that all actions are parametric, in other words, the characteristics can be modified without losing the work carried out so far.

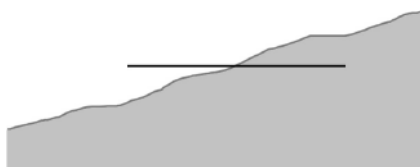
This is an incalculable advantage over previous versions.

For example, when using previous versions of ArchiTerra, once a plateau had been created at a certain level, neither the level nor the shape could be modified. You could say that it was "frozen".

As all actions are now parametric, in the example given above, the level of the plateau, its shape or any associated parameter (such as the angle of the scarps or materials used) can be modified without problem.

Here is a simple example of a plateau to illustrate how these actions are handled by ArchiTerra.

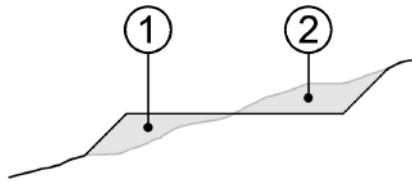
The following image shows the profile of a terrain with a segment indicating the plateau we want to obtain:



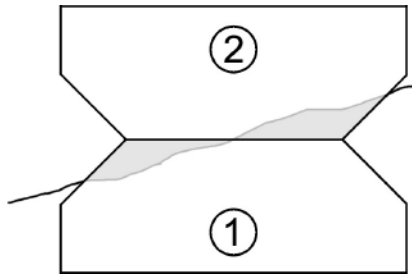
In practice, by modelling the terrain with ArchiTerra we want to obtain the following results:



If we analyse the operation with the help of the following diagram, it can be seen that part of the terrain (the part on the right labelled 2) has been removed, while the other part (on the left with number 1) has been filled:



Considering the terrain as a solid and thinking in terms of Boolean operations, the solution to model the terrain in such a way as to obtain the required plateau would be as follows:



Solid number 2 is the solid which “excavates” and which will therefore be used in the Boolean subtraction.

Solid number 1 is the solid which “fills” and which will therefore be used in the Boolean addition.

The two Boolean operations of subtraction and addition (excavation and fill) give the required results:



ArchiTerra uses precisely this technique.

As all ArchiCAD users will know, the solids used as operators cannot be cancelled (otherwise the solid operation is lost), but must be positioned on an invisible layer.

ArchiTerra adopts the same logic, using a special layer named “**AT_Operators**” in which these two objects (the excavating object and the filling object) are stored, managed and suitably hidden (the Show/Hide ArchiTerra layers tool which will be explained below acts precisely on these layers).

A third object we can consider as the actual operation itself has a display and editing function only.

In the case described above of a plateau, it simply displays the edge of the plateau and provides editable hotspots allowing you to drag the corners to modify the shape if required.

The three objects (excavation, fill and display) are intimately linked and you need not be concerned about which you are editing (although you in fact see and edit the display object only). When you modify one, ArchiTerra automatically modifies the other two as well.

When you select the operation (you are in fact selecting the display object) and modify the configurations using the settings dialog box, ArchiTerra will automatically modify and update all three objects.

IMPORTANT:

Do not change the layer of the ArchiTerra objects used for terrain modelling or, if this is unavoidable, always use the ArchiTerra dialog boxes, selecting the action and then clicking on the icon of the relative tool in the ArchiTerra toolbox.

ArchiTerra will be able to manage display automatically only if the original layer is used.

Plateau tool

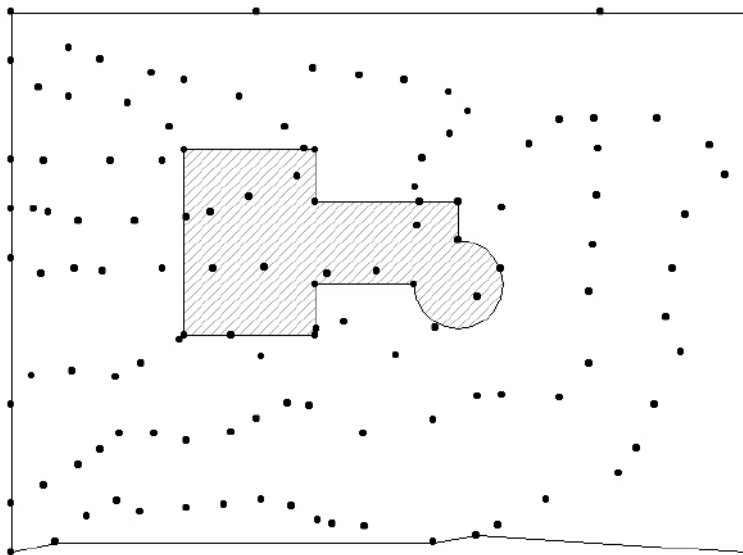


You can level your terrain with this simple tool to create horizontal or sloped planes, defining the angle of the scarps in the case of excavation or fill.

Unlike in previous versions, remember that from this version of ArchiTerra, the perimeter of the area to be levelled can be defined only by using the ArchiCAD Fill tool.

The fill used to identify the area to be levelled can include curved sides but not holes. If holes are present in the fill used, ArchiTerra will not consider them.

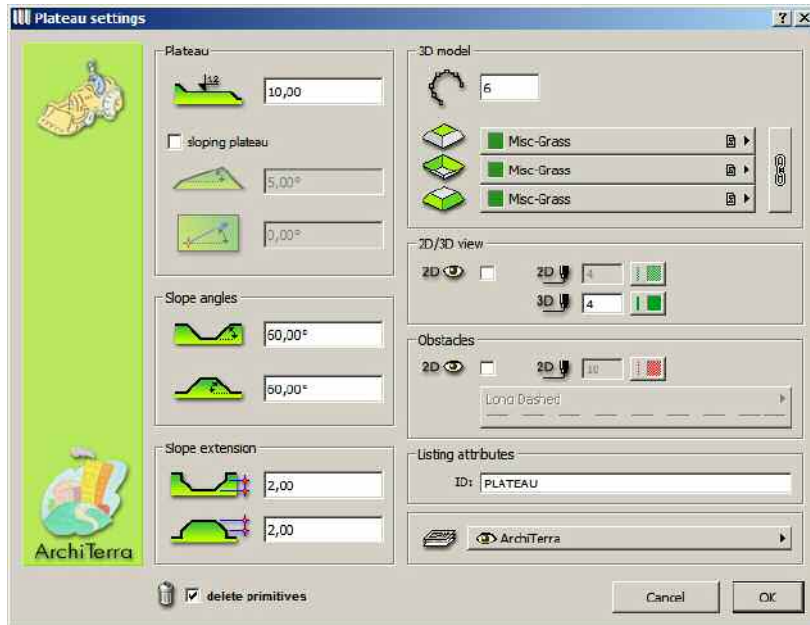
Horizontal plateaux



To create a plateau, first draw the perimeter of the area to be levelled using the fill tool and then select the terrain/mesh to be levelled and the fill to be processed:

Then click on the Plateau tool to start the procedure.

ArchiTerra immediately displays the following tool settings dialog box:



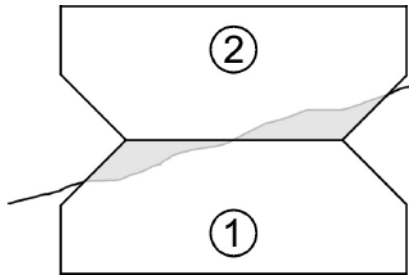
In the section at the top left **labelled** Plateau, you can define the height and type of the plateau, given that from this version of ArchiTerra you can create either **horizontal** or **sloped** plateaux.

In this example the **sloped plane** option is disabled and a plateau with a horizontal plane will therefore be created. How to create a plateau with sloped plane will be described in detail in the following paragraph.

You can define the angle of the scarps created by the excavation or fill in the following section, **Scarp Angles**.

A value for the length of the scarp can be defined in the **Scarp Offset** section immediately below.

As seen in the previous paragraphs, two objects are used to model the terrain (one to excavate - Boolean subtraction - and one to fill - Boolean addition). These have a particular shape.

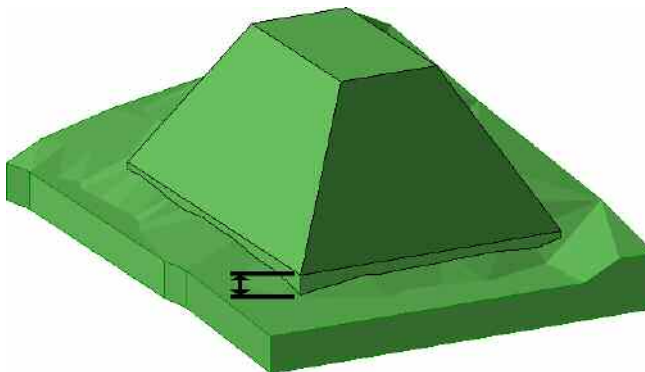
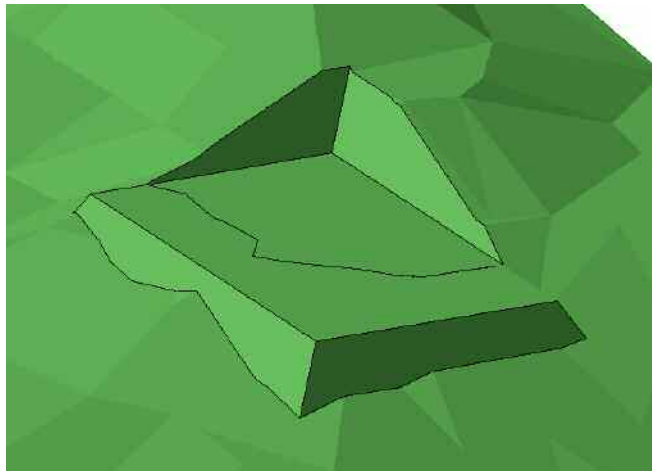


The sloping part determines the scarp and its length is calculated automatically by ArchiTerra on the basis of the land morphology.

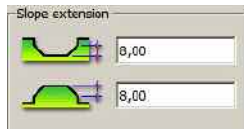
However, as you can graphically modify the land morphology as described previously, this value automatically calculated by the first calculation of the operation may not be congruent after subsequent modifications.

Here is a simple example.

The following image shows a rectangular plateau, the scarps are correct and reach the level of the terrain:

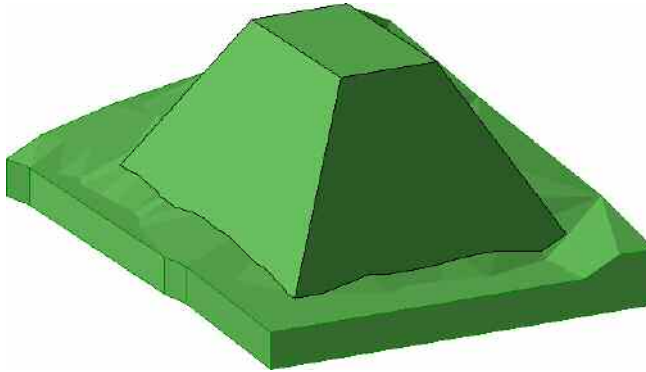


In a subsequent phase, the height of the plateau has been modified and raised appreciably. As can be seen from the following image, this graphic modification has left a block at the base where the original length of the scarp is no longer sufficient:



To avoid this problem, open the settings box by clicking on the icon of the relative tool in the ArchiTerra toolbox and increase the scarp length value appropriately:

Confirm the modification and the excavation will be updated and will again be correct:



In the **3D Model** section of the Plateau settings dialog box, you can configure the resolution of the curved parts and the three materials used for the surface of the plateau, the surface of the excavated scarps and the surface of the filled scarps (the chain on the

right enables the same material to be assigned to the three surfaces).

In the **2D/3D View** section, you can configure



whether the perimeter of the excavation will be displayed in the map view (by activating the relative check-box on the left) and the pens used to represent the edge of the excavation in the map and 3D views.



Immediately below, in the **Obstacles** section, you can show/hide the obstacles (see relevant paragraph for an explanation of the concept of obstacles and the **Retaining Wall** tool) and

design the pen and line type used to represent these objects:

The **ID** field in the **Listing Attributes** section can be used to assign an identification string to the element in order to recognise it in the project lists to calculate the volumes of earth moved.

Lastly, the pop-up menu at the bottom right allows you to define the **layer** where the element object (as described previously, the object used for editing and display, as the other two objects used to modify the terrain with solid operations are automatically stored in the AT_Operators layer) is stored.

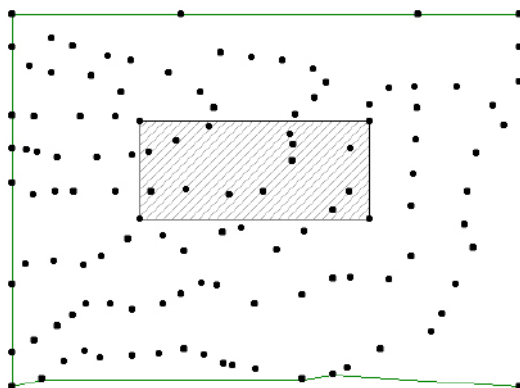
IMPORTANT:

At the bottom left of the dialog box there is a check-box labelled *cancel primitives*. If this check-box is activated, when the dialog box is closed using the OK button, ArchiTerra will automatically cancel the 2D primitives used to define the shape of the element from the worksheet. If the check-box is left disabled, the primitives will not be automatically cancelled.

Sloped plateaux

From this version of ArchiTerra, you can also generate sloped plateaux. The operation is in every way similar to that described for horizontal plateaux.

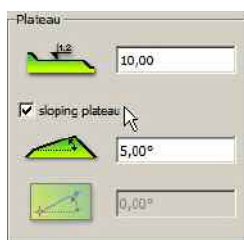
To create a sloped plateau, first draw the perimeter of the area to be levelled using the fill tool and then select the terrain/mesh to be levelled and the fill to be processed:



Then click on the **Plateau** tool to start the procedure.

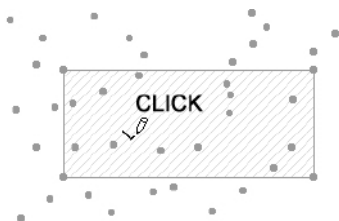
ArchiTerra immediately displays the tool settings dialog box described above.

To create a sloped plateau, click on the **sloped plane** check-box in the **Plateau** section.

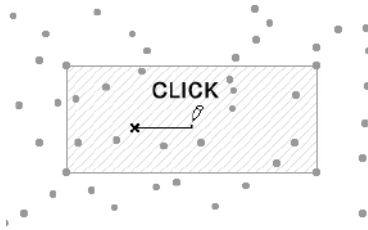


When the check-box is activated, the field below is enabled and you can define the slope of the plane.

All other fields have the same function as described previously, configure as required and click on the OK button.

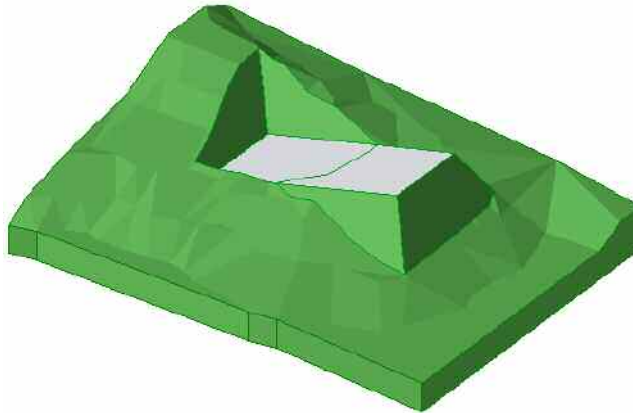


ArchiTerra closes the box and changes the shape of the cursor into a pencil, waiting for you click to define a node of the plateau at the height set in the first field in the Plateau section (the height of the rest of the surface of the plateau will obviously vary according to the slope).



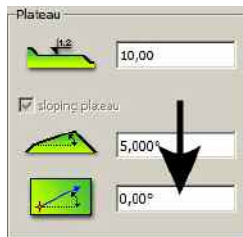
After clicking, you must click again to define the vector (which starts from the previous node and ends at the next point indicated by the click) determining the slope direction:

After this second click, the sloped plateau is generated immediately:

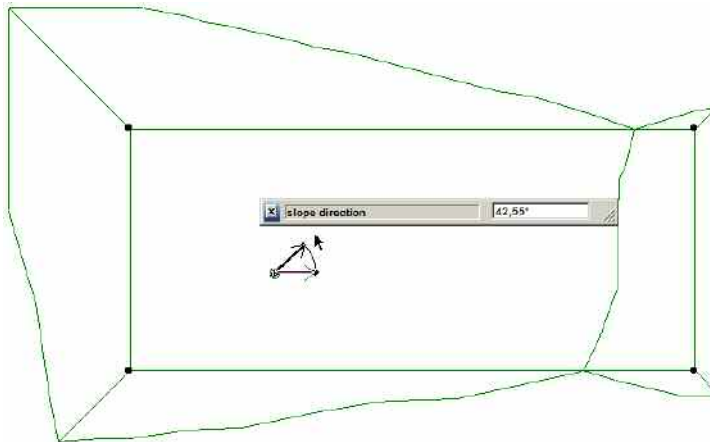


Now that the slope of the plateau has been defined graphically, when you select the element and click on the Plateau tool to display the settings box, you will see that a second field identifying the angle of the sloped plane can now be edited should you need to modify it in the future:

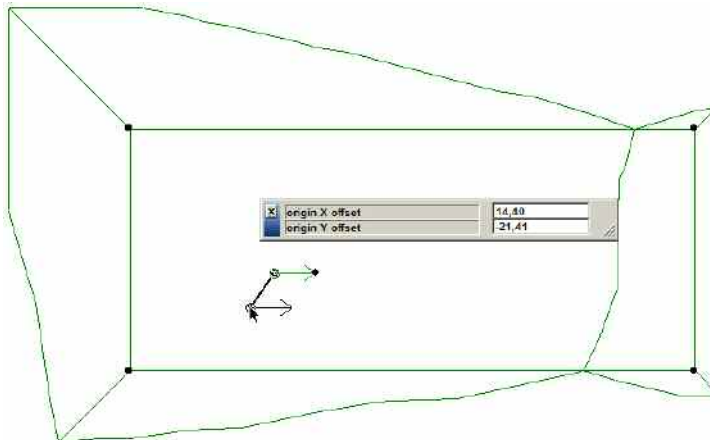
If you select the sloped plateau (in map view only!) and click on the **Modify X-Y** coordinates/Modify Z coordinate toggle you can activate/deactivate display of two editable hotspots to graphically modify these two values:



Graphic modification of the slope direction



Graphic modification of the origin (the point with the height indicated for the plateau)

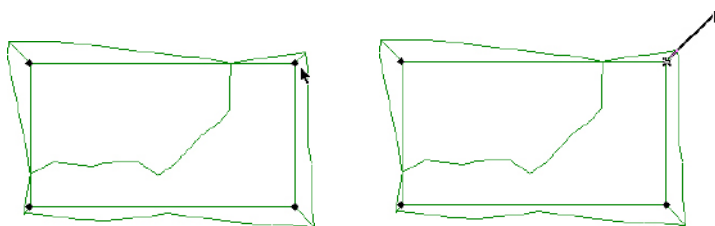


Modifying plateaux

As already mentioned, these elements are parametric and can therefore be modified at any moment.

The shape can be modified extremely easily:

1. in the map view (or 3D view), select the element by clicking on one of the perimeter nodes
2. click on the nodes, drag them and release them in the required position as you would to modify any ArchiCAD polygonal element (slabs, fills, etc).
3. after modification, click on the **Data Update** tool to update the preview of the element in the map view.

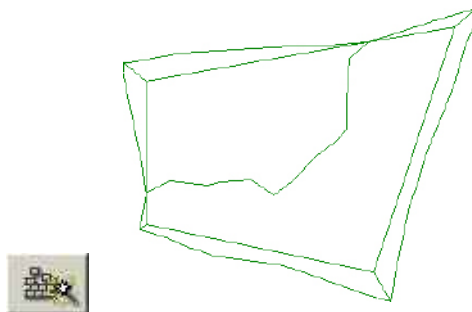


selecting the element

moving the nodes

The element parameters can be modified in exactly the same way as any ArchiCAD library element:

1. in the map view (or 3D view), select the element by clicking on one of the perimeter nodes
2. click on the icon of the relative tool in the ArchiTerra toolbox to display the settings dialog box
3. carry out the necessary modifications
4. confirm the modifications by closing the dialog box with the OK



updating the preview in the map view

Pavement tool

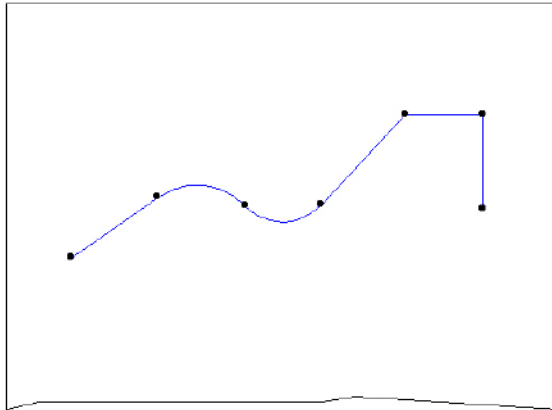


Creating a pavement or path is extremely easy with ArchiTerra.

As described in the following paragraph on the Road tool, there are two ways to create a pavement - use an ArchiCAD polyline or use an ArchiCAD fill.

Creating a pavement using an ArchiCAD polyline

Using the ArchiCAD Polyline tool, draw a polyline to represent the course of one side of the pavement:



Note:

the nodes of the polyline are extremely important as they define the variations in altitude of the element. ArchiTerra uses these nodes to calculate the altitude of the element which will be placed on the ground with these coordinates.

*Select the polyline and the terrain/mesh and click on the Pavement tool in the ArchiTerra toolbox to display the **Pavement settings dialog** box.*



In the top section you can define the width (in the polyline creation mode, the pavement is a strip with a constant width) and the thickness of the pavement.

Immediately below, you can define the resolution of curved parts and the material used for the pavement and the excavated and filled scarps.

In the **2D/3D View** section, you can configure



whether the perimeter of the pavement will be displayed in the map view (by activating the relative check-box on the left) and the pens

used to represent the edge of the pavement in the map and 3D views.

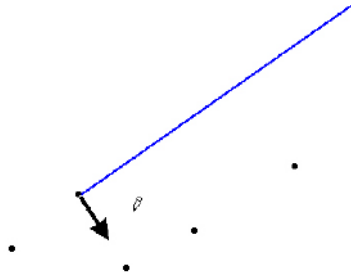
The **ID** field in the **Listing Attributes** section can be used to assign an identification string to the element in order to recognise it in the project lists to calculate the volumes of earth moved.

Lastly, the pop-up menu at the bottom right allows you to define the layer where the element object (as described previously, the object used for editing and display, as the other two objects used to modify the terrain with solid operations are automatically stored in the AT_Operators layer) is stored.

IMPORTANT:

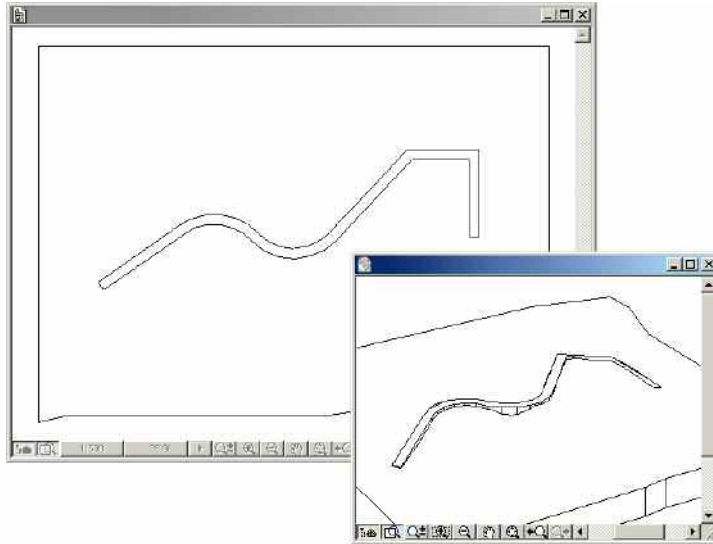
At the bottom left of the dialog box there is a check-box labelled **cancel primitives**. If this check-box is activated, when the dialog box is closed using the OK button, ArchiTerra will automatically cancel the 2D primitives used to define the shape of the element from the worksheet. If the check-box is left disabled, the primitives will not be automatically cancelled.

When the settings made are confirmed with the OK button, ArchiTerra closes the dialog box and the cursor changes to an arrow at the start of the polyline used to generate the element:



If you move the cursor to the two sides of the polyline, the arrow changes direction, indicating the side on which the pavement will be constructed.

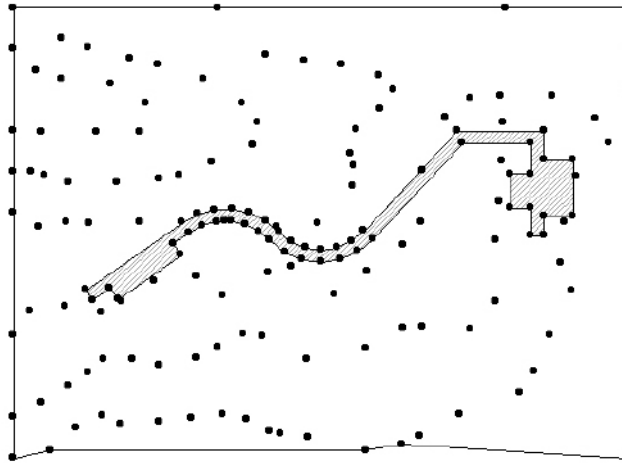
Click on the required side and ArchiTerra immediately generates the element requested:



Creating a Pavement using an ArchiCAD fill

As described above, if you use a polyline you will obtain a “regular” shaped pavement only (although by dragging the editable nodes subsequently, you can modify the morphology).

You will often need to create more complex shapes, not necessarily “symmetric” on the two sides.



In this case you can use an ArchiCAD fill to define the shape of the element more freely.

Using the ArchiCAD Fill tool, draw a polyline to represent the edge of the pavement:

Note:

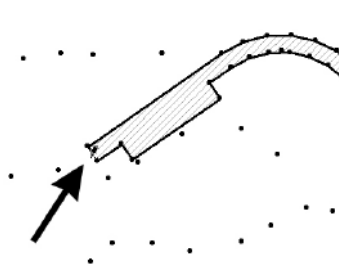
the nodes of the polyline are extremely important as they define the variations in altitude of the element. ArchiTerra uses these nodes to calculate the altitude of the element which will be placed on the ground with those coordinates (from the side selected as the reference side).

Select the fill and the terrain/mesh and click on the Pavement tool in the ArchiTerra toolbox to display the **Pavement settings dialog** box.

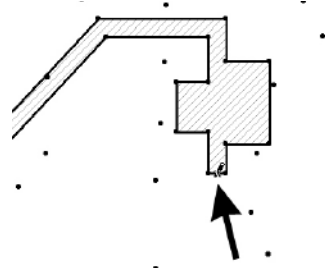
From this point, the procedure is the same as described in the above paragraph. Configure the settings as required and confirm by closing the dialog box by clicking OK.

ArchiTerra closes the dialog box and the cursor changes shape, waiting for you to make three clicks to define information fundamental to creating the element.

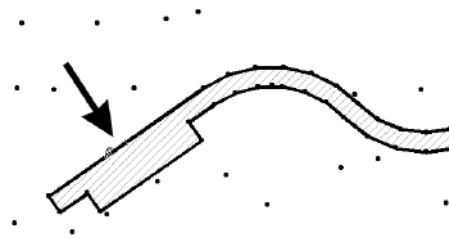
The first two clicks must be performed on the two sides which identify the two ends of the pavement, while the third and last click defines the reference side.



Click to define the starting side



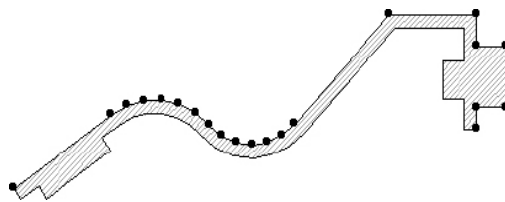
Click to define the end side



Third click to define the reference side

The third click is particularly important as it defines the reference side. The altitudes of the element being created will be calculated on the basis of the nodes along this side.

In the following image, you can see from which nodes the altitudes will be extrapolated following the click performed in the example described above:



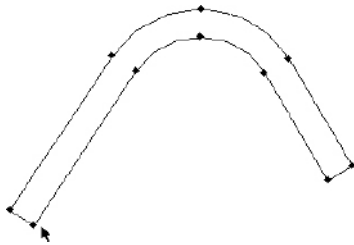
After the third click, the element is calculated and displayed on the terrain.

Modifying pavements

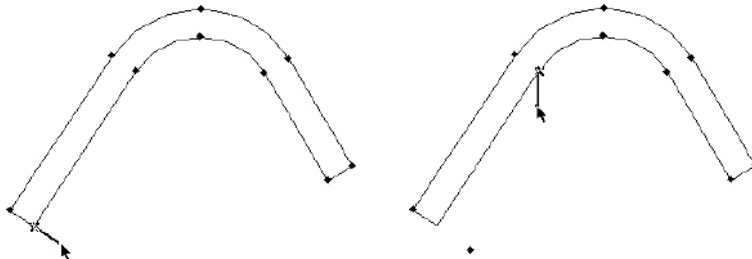
The two procedures described above can also be used to modify pavements.

The shape can be modified extremely easily:

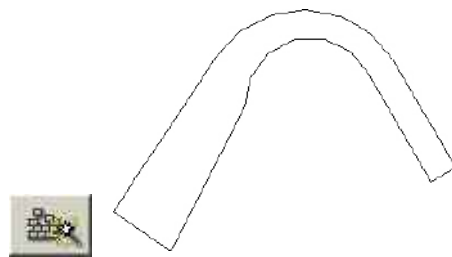
1. in the map view (or the 3D view) by clicking on one of the perimeter nodes
2. click on the nodes, drag them and release them in the required position as you would to modify any ArchiCAD polygonal element (slabs, fills, etc).
3. after modification, click on the Data Update tool to update the preview of the element in the map view.



selecting the element



moving the nodes



updating the preview in the map view

The element parameters can be modified in exactly the same way as any ArchiCAD library element:

1. in the map view (or the 3D view) by clicking on one of the perimeter nodes
2. click on the icon of the relative tool in the ArchiTerra toolbox to display the settings dialog box
3. carry out the necessary modifications
4. confirm the modifications by closing the dialog box with the OK button.

Road tool



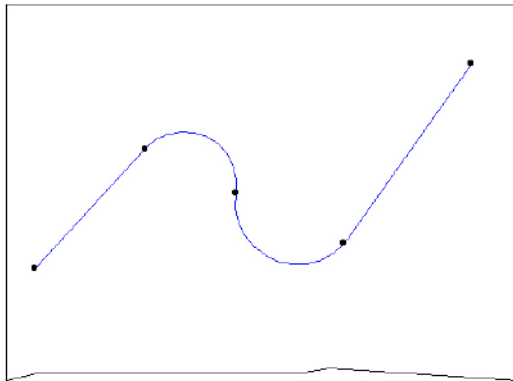
Creating a road using ArchiTerra is extremely simple.

As described for the Pavements tool, there are two ways to create a road - use an ArchiCAD polyline or use an ArchiCAD fill.

Note for users of previous versions: the road creation and management procedure is totally different from previous versions. Read the following paragraphs carefully.

Creating a road using an ArchiCAD polyline

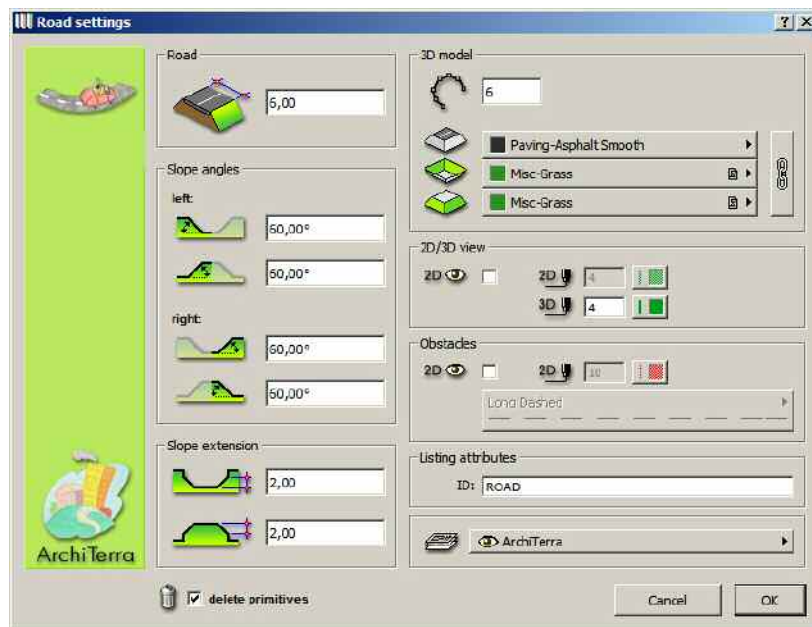
Using the ArchiCAD Fill tool, draw a polyline to represent the centre line of the road to be created:



Note:

the nodes of the polyline are extremely important as they define the variations in altitude of the element. ArchiTerra uses these nodes to calculate the altitude of the element which will be rested on the ground with these coordinates.

Select the polyline and the terrain/mesh and click on the Road tool in the ArchiTerra toolbox to display the **Road settings dialog** box.



The first value in the **Road** section indicates the width of the carriageway. Use a polyline to create “regular” roads with a constant width (although by dragging the edge nodes, you can easily modify the shape afterwards).

Immediately below in the **Scarp Angles** section, four fields allow you to define the angle of the excavated and filled scarps on the right and left of the road.

Below this, in the **Scarp Offset** section, you can define a value for the length of the scarps. These two values follow the same logic and have the function as described for the Plateau tool. See the chapter on this tool for a detailed explanation of their meaning.

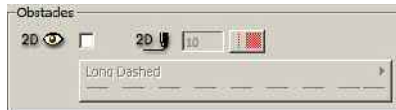
At the top right in the **3D Model** section, you can configure the resolution of the curved parts and the three materials used for the surface of the road and the surface of the excavated and filled scarps (the chain on the right enables the same material to be assigned to the three surfaces).

In the **2D/3D View** section, you can configure:



whether the perimeter of the road will be displayed in the map view (by activating the relative check-box on the left) and the pens used to represent the edge of the road in the map and 3D views.

Immediately below, in the **Obstacles** section, you can show/hide the obstacles (see relevant paragraph for an explanation of the concept of Obstacles and the **Retaining Wall** tool) and design the pen and line type used to represent these objects:



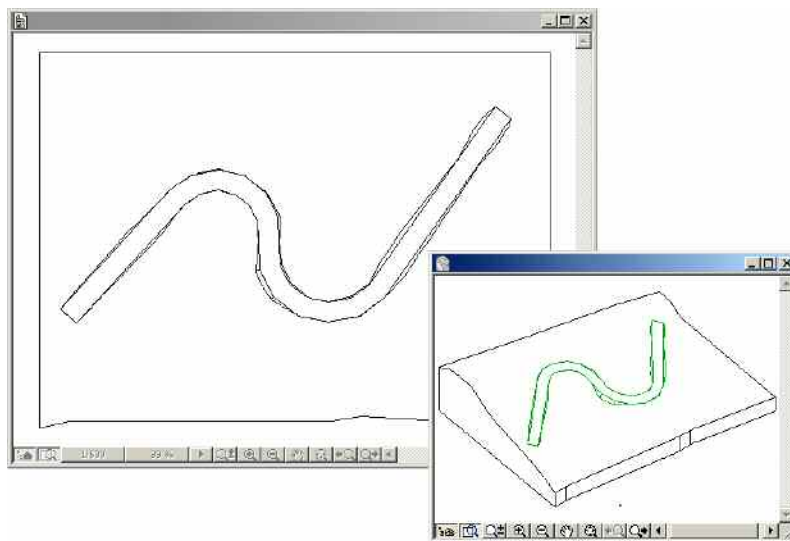
The **ID** field in the **Listing Attributes** section can be used to assign an identification string to the element in order to recognise it in the project lists to calculate the volumes of earth moved.

Lastly, the pop-up menu at the bottom right allows you to define the **layer** where the element object (as described previously, the object used for editing and display, as the other two objects used to modify the terrain with solid operations are automatically stored in the AT_Operators layer) is stored.

IMPORTANT:

*At the bottom left of the dialog box there is a check-box labelled **cancel primitives**. If this check-box is activated, when the dialog box is closed using the OK button, ArchiTerra will automatically cancel the 2D primitives used to define the shape of the element from the worksheet. If the check-box is left disabled, the primitives will not be automatically cancelled.*

Confirm the modifications made to the settings using the OK button and ArchiTerra will immediately process the road as requested:



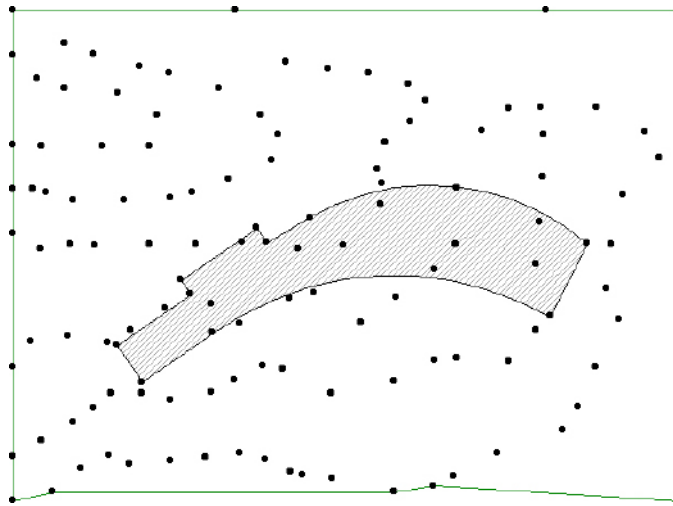
Creating a road using an ArchiCAD fill

As described above, by using a polyline you will obtain a “regular” shaped road only (although by dragging the editable nodes subsequently, you can modify the morphology).

You will often need to create more complex shapes, not necessarily “symmetric” on the two sides.

In this case you can use an ArchiCAD fill to define the shape of the element more freely.

Using the ArchiCAD Fill tool, draw a polyline to represent the edge of the road:



Note:

the nodes of the polyline are extremely important as they define the variations in altitude of the element. ArchiTerra uses these nodes to calculate the altitude of the element which will be placed on the ground with those coordinates (from the side selected as the reference side).

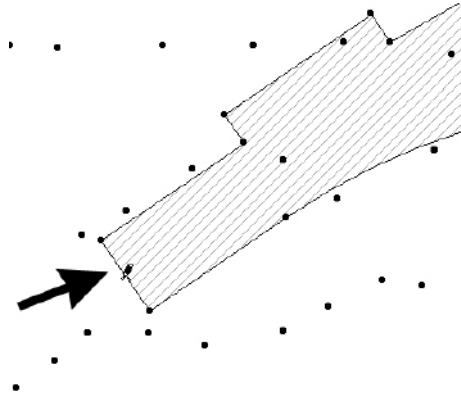
Select the fill and the terrain/mesh and click on the Road tool in the ArchiTerra toolbox to display the **Road settings dialog** box (where obviously the road width field will be disabled).

From this point, the procedure is the same as described in the above paragraph.

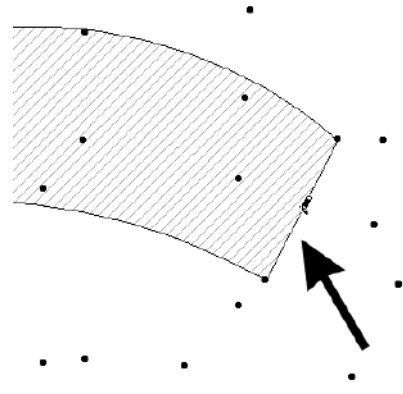
Configure the settings as required and confirm by closing the dialog box by clicking OK.

ArchiTerra closes the dialog box and the cursor changes shape, waiting for you to make three clicks to define information fundamental to creating the element.

The first two clicks must be performed on the two sides which identify the two ends of the road.

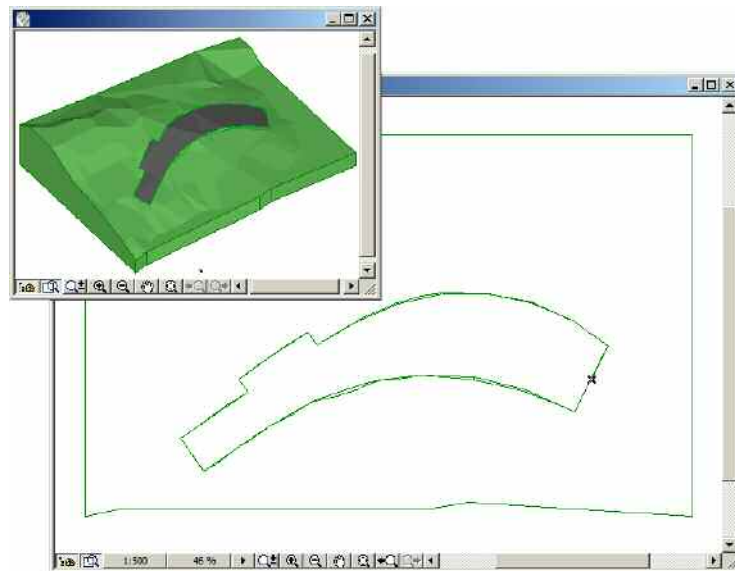


Click to define the starting side



Click to define the end side

After the second click, the operation is calculated and displayed on the terrain:

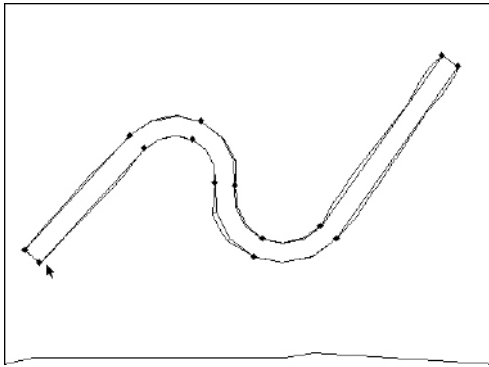


Modifying roads

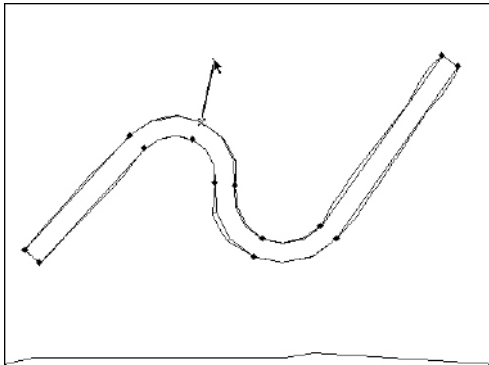
As already mentioned, these operations are parametric and can therefore be modified at any moment.

The shape can be modified extremely easily:

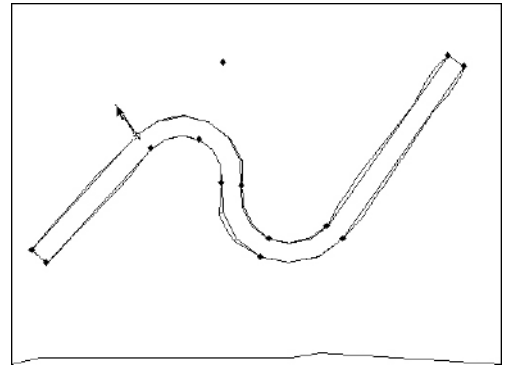
1. in the map view (or the 3D view) by clicking on one of the perimeter nodes
2. click on the nodes, drag them and release them in the required position as you would to modify any ArchiCAD polygonal element (slabs, fills, etc).
3. after modification, click on the **Data Update** tool to update the preview of the element in the map view.

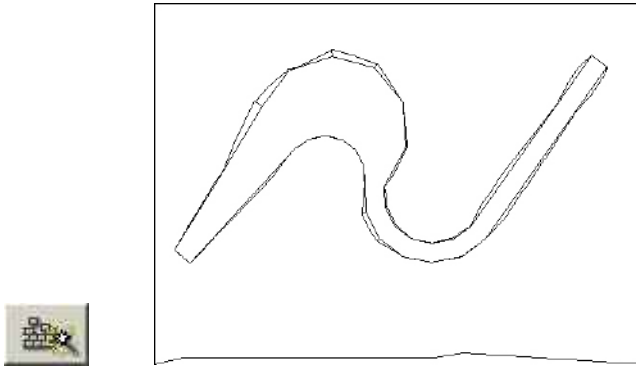


selecting the operation



moving the nodes





updating the preview in the map view

The element parameters can be modified in exactly the same way as any ArchiCAD library element:

1. in the map view (or the 3D view) by clicking on one of the perimeter nodes
2. click on the icon of the relative tool in the ArchiTerra toolbox to display the settings dialog box
3. carry out the necessary modifications
4. confirm the modifications by closing the dialog box with the OK button.

Compared to previous versions, this tool is slightly less important, or rather, it is more important for the purposes of documentation than as a modification tool.

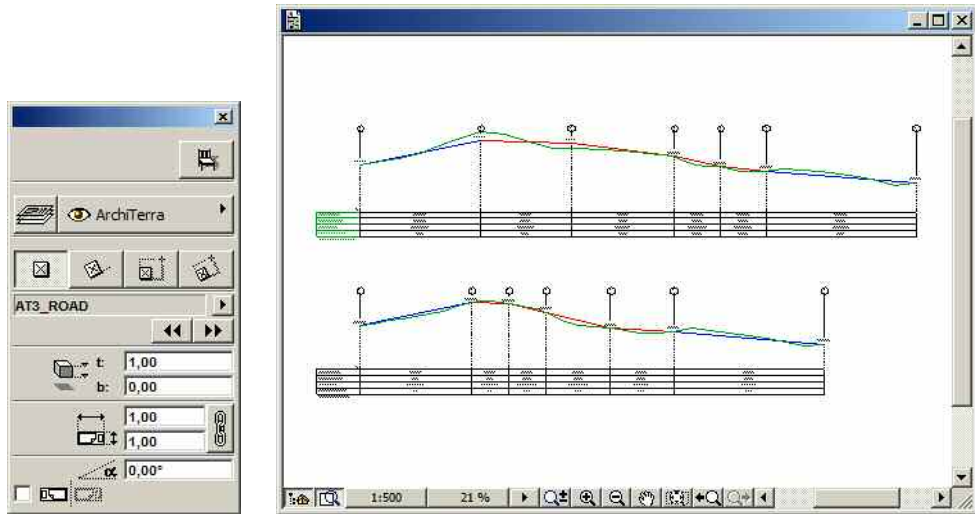
This procedure may, however, still be useful as it is an excellent tool for documenting the longitudinal section of the road.

A further difference compared with the previous version lies in the fact that previous versions proposed a longitudinal section along the axis of the road (as roads could only be “regular”, with parallel sides). This version of ArchiTerra, however, offers two longitudinal sections describing the profile from the left and from the right of the road.

1. in the map view, select the road whose longitudinal section you want to view and click on the Longitudinal Section tool in the ArchiTerra toolbox. ArchiTerra immediately displays the tool settings dialog box:

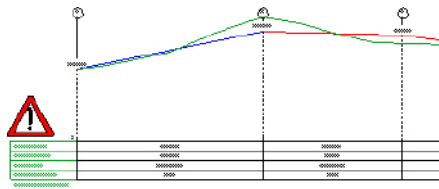


2. Configure the settings as required (they will be explained in more detail below) and confirm by clicking OK.
3. ArchiTerra has already selected and appropriately configured the AT3_ROAD object. You can click in the map view or, preferably, open and click in the Section/Elevation view to define the insertion point for the longitudinal section object and your section will be inserted in the worksheet as requested:

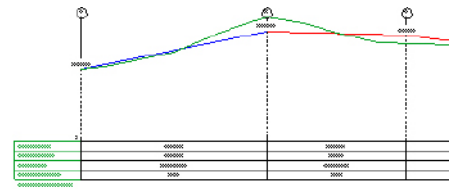


This object is intimately linked to the Road object on your map. All modifications (mainly to the altitudes) can be automatically transferred to the original Road object by selecting the modified section object and clicking on the **Data Update** tool icon.

Whenever the section object is modified, remember to update at the end of the procedure using the Data Update tool (which transfers the modifications to the road on your terrain). You will see a warning icon which will disappear as soon as the update has been performed:



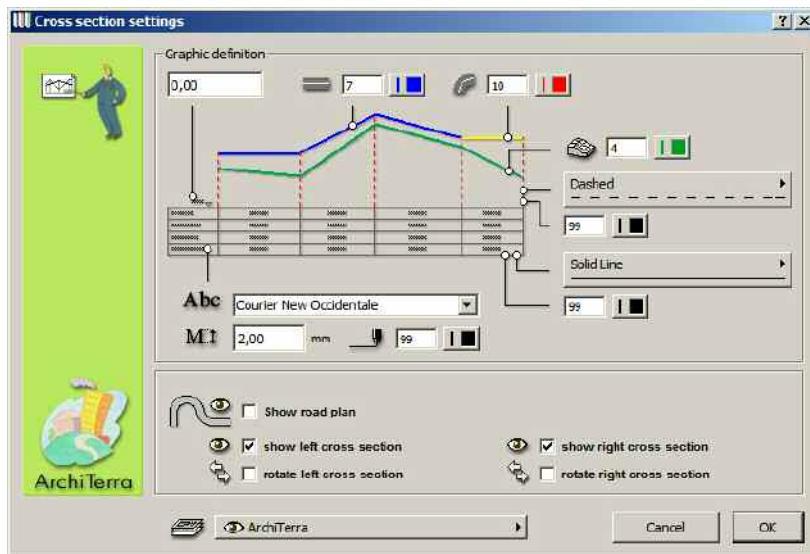
Data requires updating



Data already updated

Configuring Longitudinal Section Settings

The Road Longitudinal Section tool settings box can be used to customise the appearance and number of data items displayed:



The numerical field at the top left enables you to set the reference altitudes (within the limits of the interval available). You can use this field, for example, to align the various longitudinal sections and make them congruent.



pen for straight sections of the road



pen for curved sections of the road



pen for the terrain profile



line type and pen for vertical reference lines



line type and pen for table grid lines



font, character size and pen for text



check-box to show/hide the plan of the road. It may be useful to display the plan when the longitudinal section has been inserted in an ArchiCAD Section/Elevation view. The plan may be a useful reference when making modifications (the progressive numbering of the nodes in the two sections is also used in the plan).



these two check-boxes allow you to show/hide the left profile and the right profile of the road.

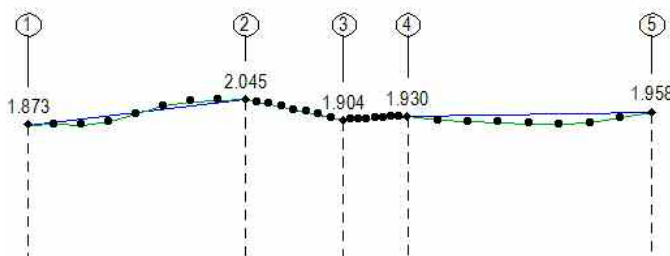


these two check-boxes allow you to reverse the direction of the profile. The original direction of the two profiles derives from the direction of the road itself (calculated from the 2D elements - polylines or fills - used to generate it). These controls allow you to manage the orientation of the road as you wish.

Finally, the last pop-up menu allows you to choose the layer for the longitudinal section.

Modifying road levels using the longitudinal section

When you select the longitudinal section, you will see that each node of the road profile corresponds to an editable hotspot:

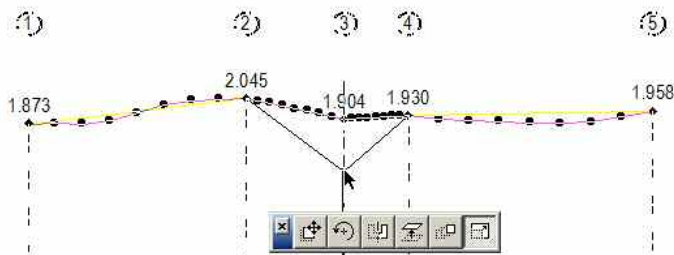


IMPORTANT:

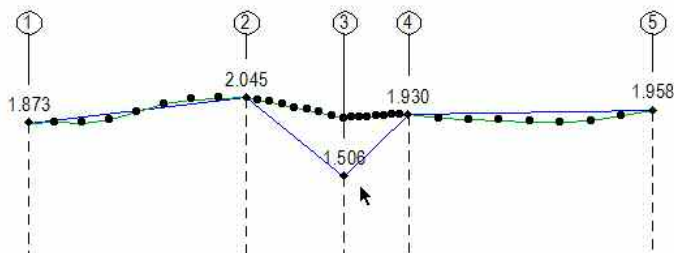
The editable hotspots (displayed by ArchiCAD as small diamonds and in a different colour according to the settings and version of ArchiCAD you are using) correspond to numbered dots at each node along the side of your road.

The other hotspots (simple dots) are merely reference points indicating the original profile of the terrain (and therefore its altitude) along the side of the road.

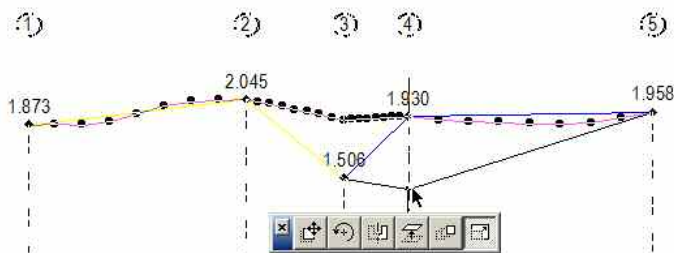
It is extremely simple to modify the levels of the side of the road, (obviously dragging is automatically constrained to a vertical direction):



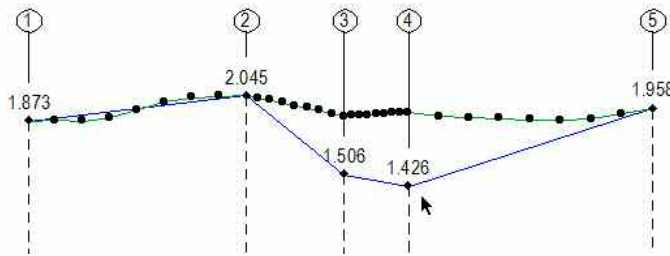
Dragging the node



Node dragged into a new position



Dragging the node



Node dragged into a new position

After modifications, the original road can be updated by clicking on the **Data Update** icon.

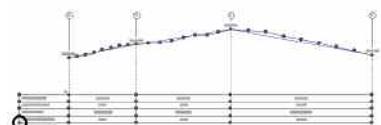
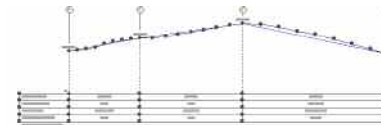
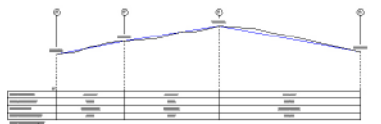
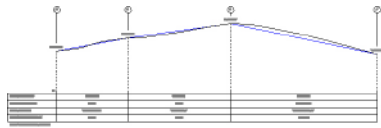
Note:



if you are working in Section/Elevation view, the ArchiTerra toolbox will automatically be configured to show you only the functions available in this view (namely, the Longitudinal Section tool which enables you to modify the parameters of the elements and the Data Update tool to update the original road):

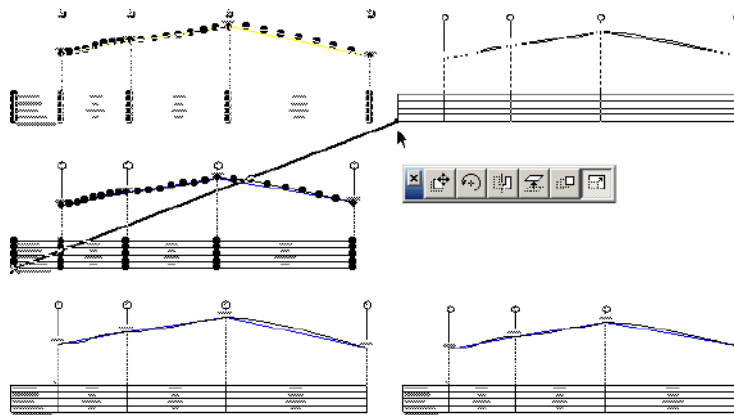
Viewing the two road profiles side by side

By default, the two profiles of the road are represented one below the other:



Sometimes it may be more convenient to view the two sections side by side (for example to facilitate editing of node altitudes) or to position them as you wish.

This possibility is provided by an editable hot-spot in the bottom left corner of the lower section which enables you to drag the section into the required position:



Dragging the hotspot into the new position

The two sections side by side

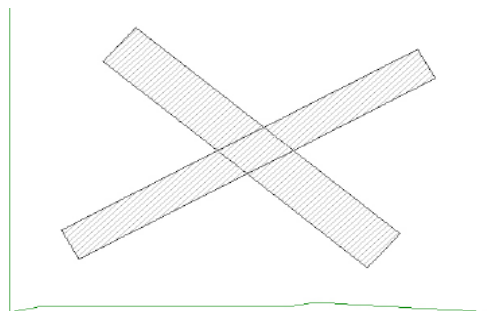
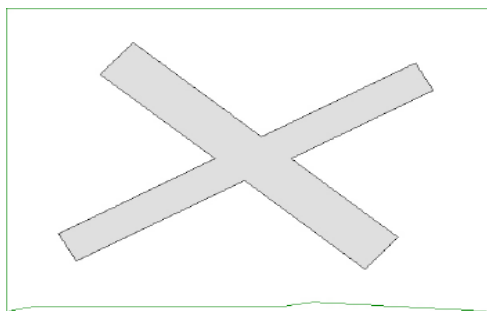
Creating road junctions

Once again, thanks to the innovations introduced into the programme, the logic used to create road junctions is completely different from previous versions.

As seen in the previous paragraphs, each node on the side of the road can be dragged into the required position. In addition, the road itself can assume any shape and therefore by dragging and positioning the nodes you can obtain any type of road junction.

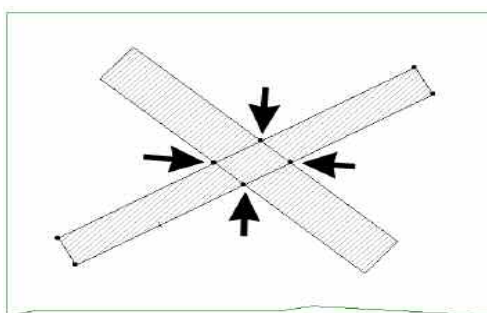
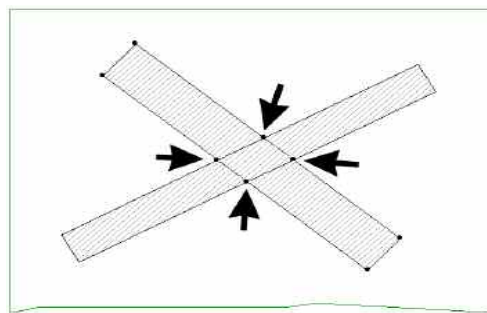
Creating a junction with additional nodes

Imagine a situation in which you want to create the following junction on a terrain:



Draw two fills to represent the roads:

In each of the two fills, add four nodes at the junction with the other fill/road:



At the junction, each of the two roads will now have editable nodes that can be used to adjust their shape.

Now, following the usual procedure, the two roads can be generated.

1. select the fill representing the first road and the terrain/mesh and click on the Road tool
2. configure the parameters in the Road settings dialog box and confirm the modifications with the OK button

3. now, in the map view, make the two clicks required to define the start side and end side of the road

ArchiTerra will now generate the first road.

Before going on to create the second road (extremely important!), configure the altitudes of the perimeter nodes of the road just created in order to achieve the required result.

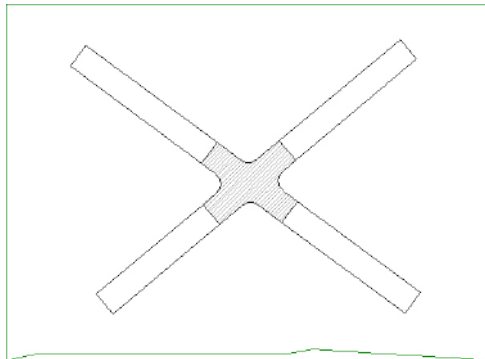
This operation **MUST** be performed before generating the second road. In this way, the nodes on the junction will already be at the correct altitudes and the second road corresponding to the junction will already be configured correctly.

Repeat the above procedure with the second road.

Creating a junction with a road/junction

We believe that the junction creation procedure suggested in the following example is simpler, more flexible and more immediate than many other methods, although the method described above enables you to manage the angles of the side scarps of the roads at the junction precisely and is therefore preferable.

The following image shows a terrain/mesh and two roads which cross at the centre:



The junction, represented by a fill with 45° hatching, also contains curved parts. As explained in previous paragraphs, there are in fact no limitations to the shape.

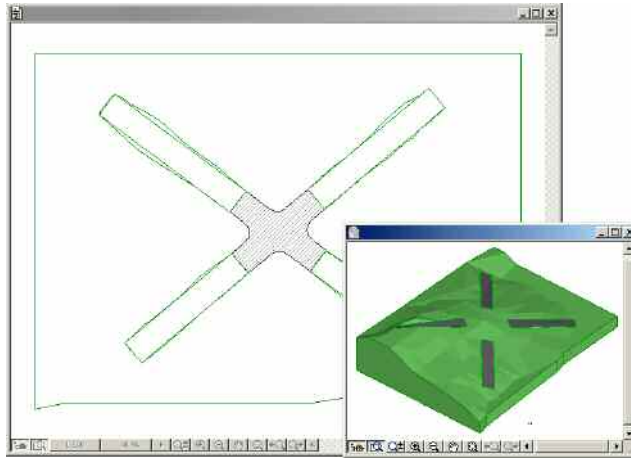
The four roads have also been represented using fills.

We will now process these roads.

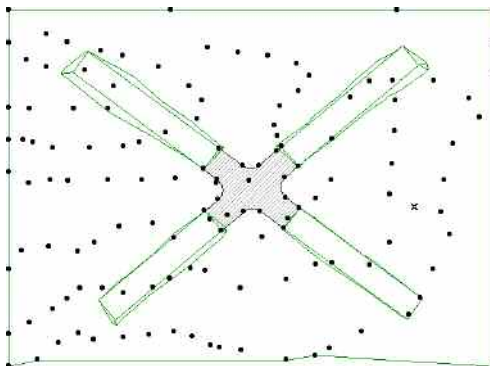
1. Select the road at the bottom left together with the terrain/mesh and click on the Road tool.
2. Configure the settings dialog box and confirm the modifications by clicking on the OK button, then make the three clicks required as described in the previous paragraph

Repeat the same procedure with the other three roads.

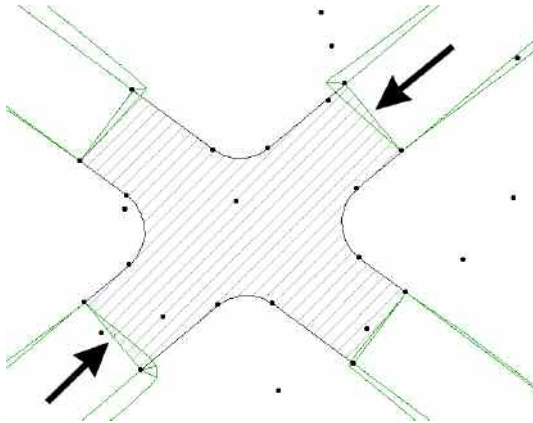
The end result will be similar to the following:



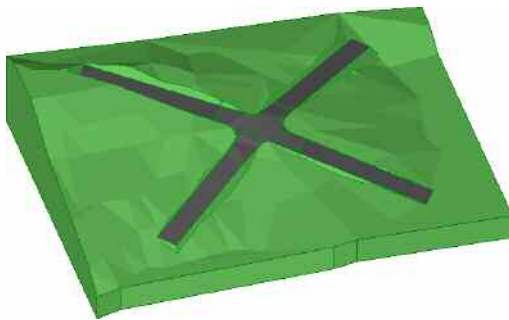
Before created a junction, make all the necessary modifications to the altitudes of the road levels until you obtain the desired situation (thus avoiding the need to manually reconfigure the altitudes of the junction nodes during subsequent phases):



Now select the fill which represents the junction together with the terrain/mesh and repeat the same procedure, in other words, the junction is considered as if it were a road:



Click on two sides to define the ends of the road/junction:



And ArchiTerra immediately calculates the road/junction:

Random terrain, tree and rock generation functions



This new ArchiTerra instrument can be used to randomly generate terrain, trees and rocks which are always different.

The procedure does not create new library elements, but always uses the same highly parametric object. In particular, the various commands use:

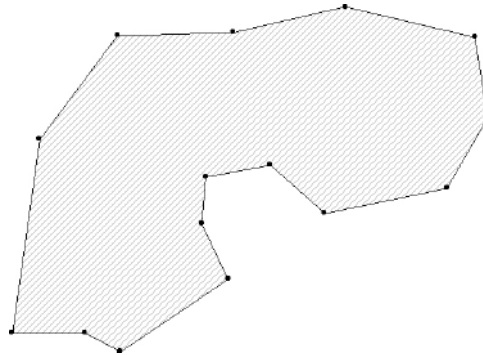
Random terrain: simple ArchiCAD mesh

Random trees: SS_TREE

Random rocks: AT3_RANDOM_ROCK

These projects can be passed on to other users without ArchiTerra who will be able to see these library elements, but not modify their characteristics.

Random generation of terrain

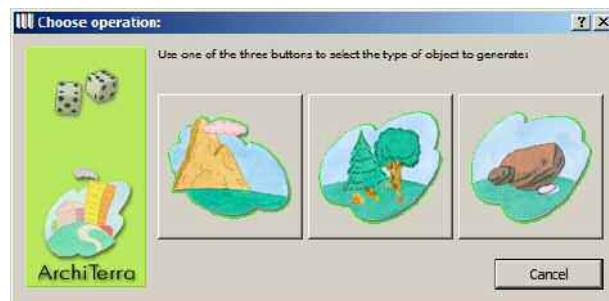


To generate random terrain, first draw a fill representing the edge of the terrain to be generated on an ArchiCAD map view worksheet.

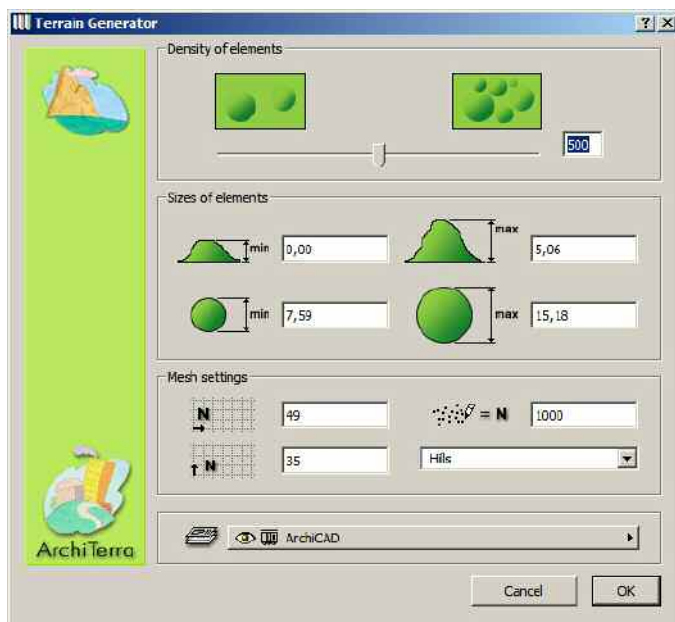
The fill must not include holes (if present, they will be ignored), but can include curved sides.

Then draw an ArchiCAD fill, select it and click on the Random Generation tool.

ArchiTerra immediately displays a key panel to choose the procedure to be performed:



Click on the first button to randomly generate terrain and the terrain configuration dialog box will be displayed immediately.



The first cursor at the top controls the density of the elements characterising the terrain.

Moving the cursor to the far left reduces the number of elements, while moving it to the right increases the number of elements on the surface.

In the intermediate **Element Dimensions** section you can configure the minimum and maximum dimensions of these elements. They will be generated with random sizes varying within this range.

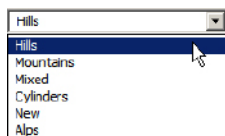
Immediately below in the Mesh Settings section, check the resolution (and therefore the complexity!) of the resulting mesh.

The two fields on the right give the number of rows and columns defining the mesh grid, while field N gives an approximation of the resulting number of nodes (depending on the density of rows and columns and the morphology of the selected fill).

These two fields are obviously linked.

When the number of rows and columns is modified, the approximate number of points present in the mesh is varied automatically. Vice versa, varying the number of nodes gives new values for rows and columns.

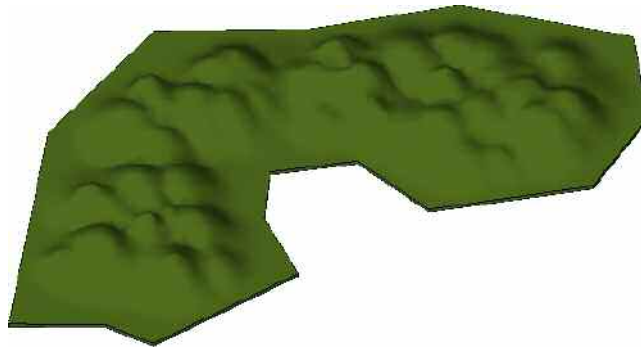
On the right, a pop-up menu enables the style of the terrain to be defined:



The six styles give different results and use different terrain generation algorithms.

Try it to see which is most suitable for your purposes.

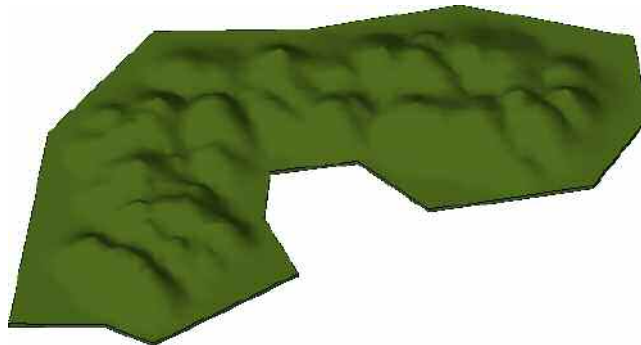
Hills



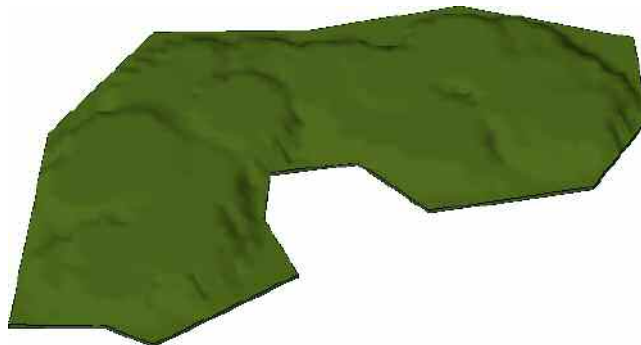
Mountains



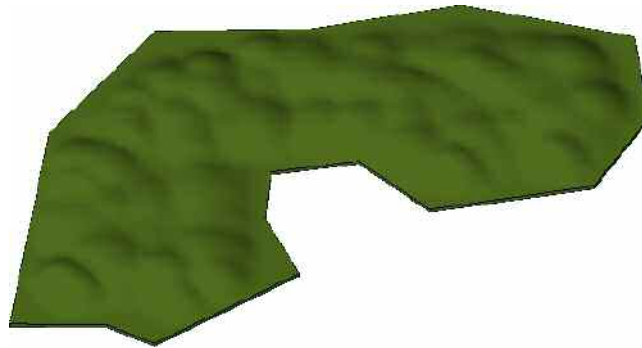
Mixed



Cylinders



New



Alps



Finally, the last pop-up menu allows you to choose the layer where the generated terrain will be stored.

When you confirm the settings with the OK button, the terrain calculation procedure begins according to the configuration.

At the end of the process, the following dialog box appears:



The mesh created by this random generation can be either a simple ArchiCAD mesh or an ArchiTerra terrain/mesh.

In the latter case, you can use it like any other tool in the ArchiTerra toolbox.

Click on the **Convert** button to generate the terrain and make it compatible with ArchiTerra.

Click on the **Cancel** button to generate the terrain as simple ArchiCAD mesh.

Note:

any modifications you make subsequently to the general parameters of the terrain will depend on this choice.

If you generate a simple ArchiCAD mesh, to modify the settings, select and double click on the ArchiCAD Mesh tool.

If you generate an ArchiTerra terrain/mesh, to modify the settings, select and click on the ArchiTerra Terrain tool.

Random tree generation

As will be explained below for random rock generation, this function has two possible uses.

No selection

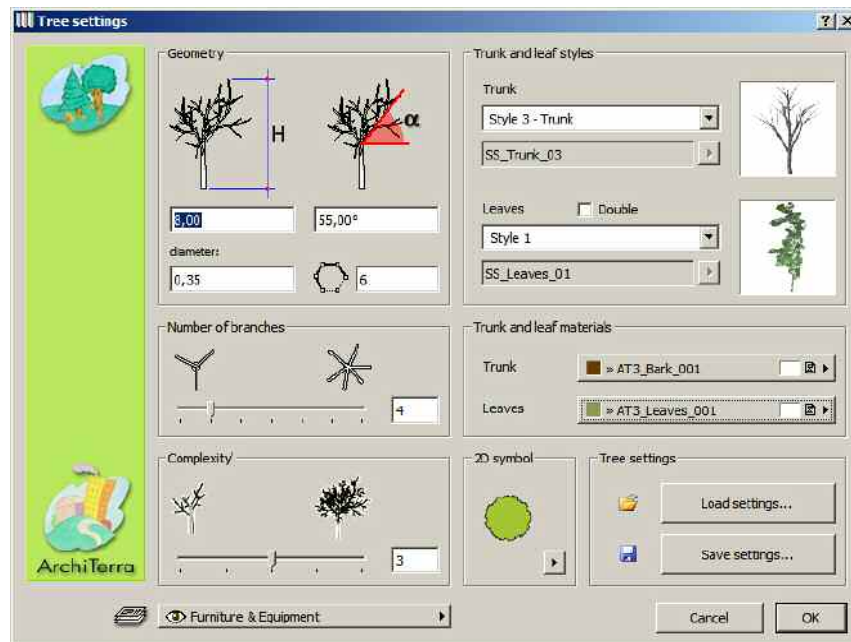
If you click directly on the Random Generation tool and then on the tree generation button without selecting any ArchiTerra terrain/mesh on the worksheet, you will generate trees which will be inserted at the altitude currently configured with the ArchiCAD Object tool.

A terrain/mesh is selected

If you click directly on the Random Generation tool and then on the tree generation button after selecting an ArchiTerra terrain/mesh on the worksheet, you will generate trees which will be inserted at the altitude of the terrain at the point indicated by the click on the map.

Irrespective of the selection, the general operation of this tool is the same.

Click on the Random Generation tool and then, when the key panel appears, on the Random Tree Generation button. ArchiTerra immediately displays the Tree settings dialog box: the Shape section you can define the total altitude of the tree, the angle of the branches with respect to an imaginary horizontal line (the value can be negative to generate conifers), the diameter of the trunk and the resolution used.



In the **Number of Branches** section, you can define the number of branches which start out from the trunk (and then from each subsequent branch).

In the **Complexity** section, you can define the number of repetitions.

For example, if you set a Complexity value of 1, you will have a tree with just one series of branches starting out from the trunk.

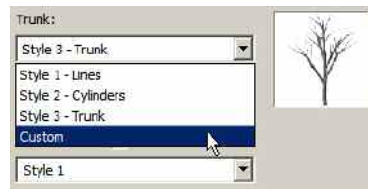
If you set a Complexity value of 2, you will have a tree with one series of branches starting out from the trunk, then another series of branches starting out from each of the previous branches..

IMPORTANT:

Obviously the higher the values used, the more realistic and effective the result, but at the same time the more complex the calculation. Aim for a good compromise to have trees which are quick to calculate, but sufficiently realistic.

In the **Trunk and Leaf Style** section, you can customise the resulting tree.

The first pop-up menu allows you to choose between four possible trunk styles:



Style 1 - Lines: trunk and branches are simple lines

Style 2 - Cylinders: trunk and branches are simple cylinders (with the resolution set in the Shape section)

Style 3 - Trunk: trunk and branches have a realistic appearance which simulates the natural shape of these elements

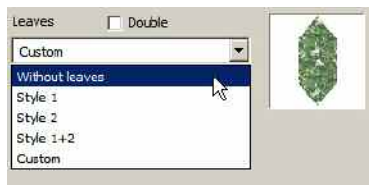
Custom: this enables you to use a previously defined library element to represent the trunk and the branches (see the appendix for a description of how to customise these elements)

When you choose Custom style, the small button with an arrow shown below will be activated:



Click on this button to display a dialog enabling you to select the library element to use to represent the trunk and branches. After you have selected the element, the field on the left displays the name of the selected element.

The second pop-up menu allows you to choose between five possible styles of foliage:



Without leaves: no foliage, only the branches are represented

Style 1: groups of leaves with an elongated shape are used

Style 2: groups of leaves with a constant shape are used

Style 1+2: a mixture of groups of leaves with an elongated shape and with a constant shape are used

Custom: this enables you to use a previously defined library element to represent the groups of leaves to be used (see the appendix for a description of how to customise these elements)

When you choose Custom style, the small button with an arrow shown below will be activated:



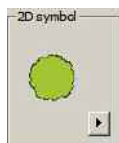
Click on this button to display a dialog enabling you to select the library element to use to represent the groups of leaves. After you have selected the element, the field on the left displays the name of the selected element.

Note:

the **Double** check-box above the leaf style selection pop-up menu allows you to double the foliage elements. The tree will be considerably more realistic, but slower to process.

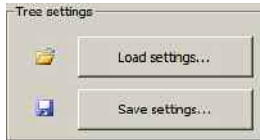
In the **Trunk and Leaves Material** section, you can select the material used for these two components of the tree.

The **2D Symbol** section allows you to manage the method used to display the tree on the map:



A small preview displays the style currently selected, while the small button at the bottom right opens a dialog to configure the 2D symbol (see detailed description below).

The last section at the bottom right, **Tree Settings**, is extremely important:



The ArchiTerra random tree generation function is extremely powerful but requires configuration of numerous parameters which can at times become tedious.

What is more, once you have achieved the required result, you may want to repeat it in the same project or in other projects without having to configure it again, or without wasting time taking notes enabling you to reconfigure it.

In this case, use the **Save Settings...** button to save the current configuration which can then be used at any time by using the **Load Settings...** button

You will, however, never obtain two completely identical trees. At each insertion, ArchiTerra introduces small variations which make each tree different from all the others.

Finally, the pop-up menu at the bottom right allows you to choose the layer where the element will be stored.

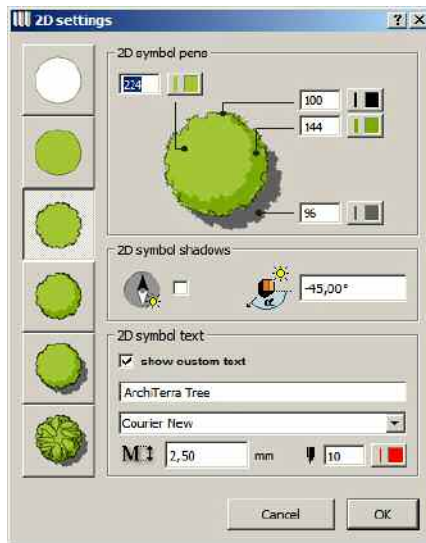
When the settings are confirmed with the OK button, the procedure to insert the trees in the worksheet begins.

This procedure follows a cycle. After inserting one tree, ArchiTerra waits for you to click on the worksheet again to insert another, without having to configure the parameters.

To exit from the cycle, use the standard ArchiCAD procedure (Esc on the keyboard, or Cancel on the Control Bar).

Configuring the 2D tree symbol

As already mentioned in the 2D Symbol section, clicking on the small button on the bottom right displays the dialog for configuring the 2D symbol:



The key panel on the left allows you to choose between six styles for the 2D symbol.

The **2D Symbol Pen** section can be used to select:

- the pen used for the fill of the foliage
- the pen used for the outline of the tree
- the pen used for the shading of the foliage (if the symbol includes shading)
- the pen used for the shadow of the tree (if the symbol includes the shadow)

Below, the **2D Symbol Shadows** section allows you to manage the shadows in the symbol (if the symbol includes a shadow).

If the first check-box is activated, the shadow follows the current sun settings configured in the 3D Projection settings dialog box.



The second field, considered only if the check-box on the left is disabled, throws the shadow at the specified angle.



In the **2D Symbol Text** section you can display text on the symbol (by activating the relevant check-box).

The string displayed is given in the field below (default string: "ArchiTerra Tree").

The character, size of character and pen used for the text can be configured immediately below.

Changing the parameters of a tree already inserted

As described, ArchiTerra trees are in every way ArchiCAD library elements.

To change the parameters of a tree already inserted:

1. select the tree or trees in the map view
2. click on the Random Generation tool
3. ArchiTerra automatically displays the Tree settings dialog box and you can make the required modifications
4. confirm with the OK button.

Random rock generation

There are two ways to use this function.

No selection

If you click directly on the Random Generation tool and then on the rock generation button without selecting any ArchiTerra terrain/mesh on the worksheet, you will generate rocks which will be inserted at the altitude currently configured with the ArchiCAD Object tool.

A terrain/mesh is selected

If you click directly on the Random Generation tool and then on the rock generation button after selecting an ArchiTerra terrain/mesh on the worksheet, you will generate rocks which will be inserted at the altitude of the terrain at the point indicated by the click on the map.

Irrespective of the selection, the general operation of this tool is the same.

Click on the Random Generation tool and then, when the key panel appears, on the Random Rock Generation button. ArchiTerra immediately displays the Rock settings dialog box:



first three fields define the size of the rock to be created (width, depth, altitude).

On the right, in the field with the die icon, you can enter a value to define the resizing interval of the rock. All rocks created in sequence will be different from all others and their size will vary according to the value set here.

The two pens below define the colour of the element in the map view and 3D view.



The first cursor determines the definition and therefore the complexity of the rock to be generated:



The second cursor affects the morphology of the rock to be generated. Moving the cursor to the left creates elements with more edges and angles (to the point of displaying solids resembling crystals), moving it to the right creates more rounded forms:

Finally, there are two pop-up menus to define the material to be used for the rock surface and the layer where it will be inserted.

When the settings are confirmed with the **OK** button, the procedure to insert the rocks in the worksheet begins.

This procedure follows a cycle. After inserting one rock, ArchiTerra waits for you to click on the worksheet again to insert another, without having to configure the parameters.

Once the first rock has been inserted, ArchiTerra displays a new Rock management toolbox:



During the insertion cycle, you can use this toolbox to modify the main parameters of the rocks to be inserted (size, materials, pens).

To exit from the cycle, use the standard ArchiCAD procedure (Esc on the keyboard, or Cancel on the Rock management toolbox).

Changing the parameters of a rock already inserted

As described, ArchiTerra rocks are in every way ArchiCAD library elements.

To change the parameters of a rock already inserted:

1. select the rock or rocks in the map view
2. click on the Random Generation tool
3. ArchiTerra automatically displays the Rock settings dialog box and you can make the required modifications
4. confirm with the OK button.

Basin tool



This simple tool can be used to generate basins (lakes, rivers, canals, etc.) on your terrain.

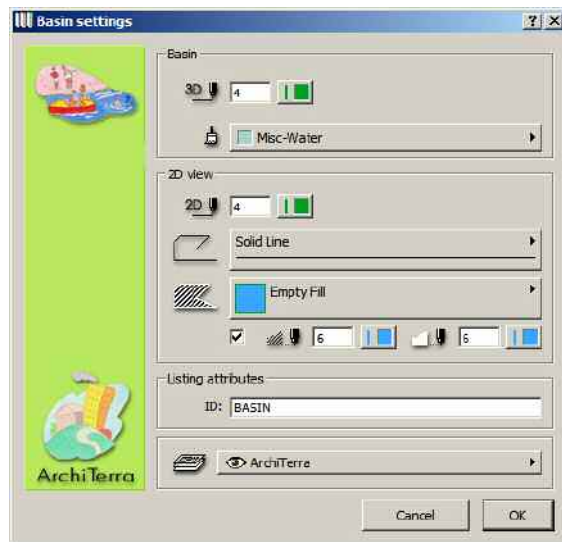
ArchiTerra allows you to “fill” the terrain by generating a plane at the user-defined altitude, modelled according to the land morphology.

The principle is simple. You indicate the altitude of this plane by clicking on the terrain and ArchiTerra automatically calculates its perimeter.

Select the terrain/mesh on which you want to create the basin and click on the Basin tool icon in the ArchiTerra toolbox.

ArchiTerra immediately displays the Basin settings dialog window:

In the **Basin** section, you can configure the pen for the 3D display of the basin and its surface material.



In the **2D View** section, you can select:

- the pen used for the outline of the basin in the map view
- the line type for its outline
- the fill used for the hatching the check-box to activate hatching of the area covered by the basin
- the pen used for the fill hatch
- the pen used for the fill background.

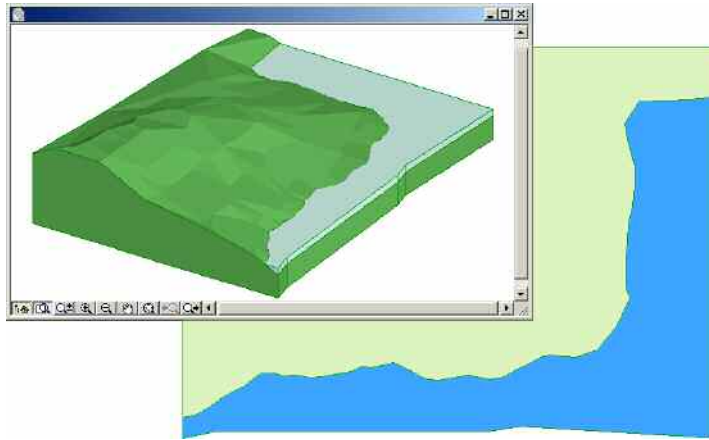
In the **Listing Attributes** section, you can define an identification string for the Basin.

In the last pop-up menu, you can select the layer where the element to be created will be stored.



Confirm the modifications with the OK button and then, when the box closes, click with the cursor on a point on the terrain/mesh to define the altitude of the basin:

After a short process, the basin will immediately be displayed in the map and 3D views:



Changing the parameters of a basin already inserted

To change the parameters of a basin already inserted:

1. select the basin in the map view
2. click on the Basin tool
3. make the required modifications in the Basin settings dialog box displayed by ArchiTerra
4. confirm with the OK button.

Building tool



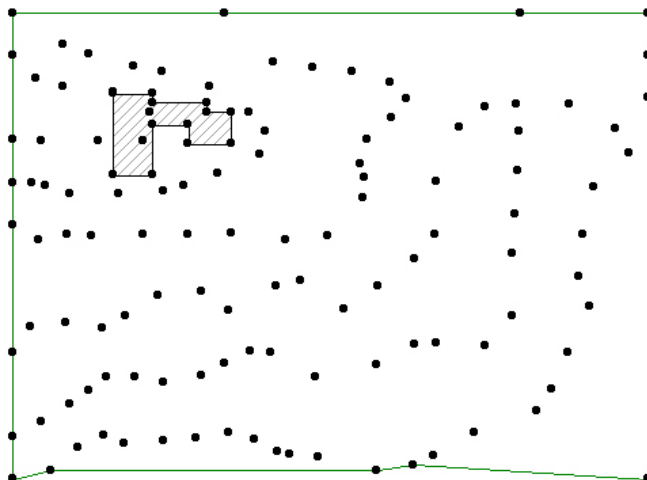
Use this simple tool to generate the volume of buildings on your terrain.

The principle is simple: you define the solid perimeter to process using ArchiCAD graphic primitives (fills or polylines) and then transform the 2D perimeter into a three-dimensional element by defining the altitude.

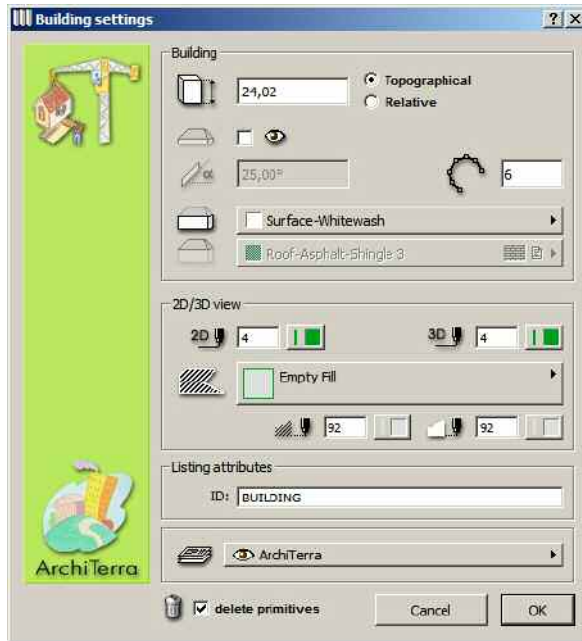
This type of element is generated using an extremely simple GDL description, allowing you to create as many elements as you wish without weighing down the 3D model in your project excessively.

So this is how the volumes of a building are generated.

After drawing (in the example below, using the ArchiCAD Fill tool) the perimeter of the building to be created, select it together with the terrain/mesh on which it stands:



Then click on the Building tool icon in the ArchiTerra toolbox to display the Building settings dialog box:



The first field defines the altitude of the eaves of the building to be created.

The two check-boxes on the left of the field define if this is the absolute topographic altitude (the altitude of the eaves with respect to ground zero) or the relative altitude (the height of the building, in other words, the distance from its lowest point to the line of the eaves).

The check-box below activates/deactivates display of the roof. This is an automatic roof which will approximately represent the roof of the building to be created.

The following field defines the pitch of the roofs (if displayed).

On the right, a whole value manages the approximation of any curved parts of the building to be created.

The subsequent pop-up menus allow the surface material used for the solid part and roof (if displayed) of the building to be defined.

In the **2D/3D View section**, you can configure:

- the pen used for the outline of the building in the map view
- the pen used for the outline of the building in the 3D view
- the fill used for the building in the map view
- the pen used for the fill hatch
- the pen used for the fill background.

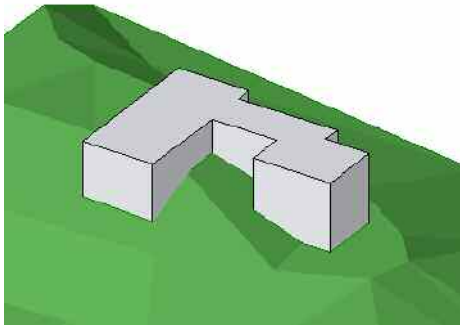
Immediately below in the **Listing Attributes** section, you can define an identification string for the building object.

The last pop-up menu defines the layer where the element will be stored.

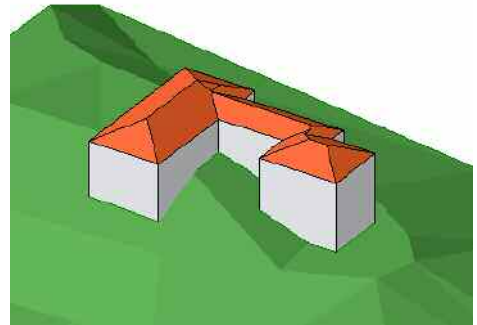
IMPORTANT:

At the bottom left of the dialog box, there is a check-box named **cancel primitives**. If this check-box is activated, when the dialog box is closed using the OK button, ArchiTerra will automatically cancel the 2D primitives used to define the shape of the element from the worksheet. If the check-box is left disabled, the primitives will not be automatically cancelled.

Confirm the modifications with the OK button and ArchiTerra will immediately insert the building calculated:



Building without roof



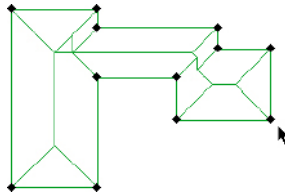
Building with automatic roof

Modify the buildings

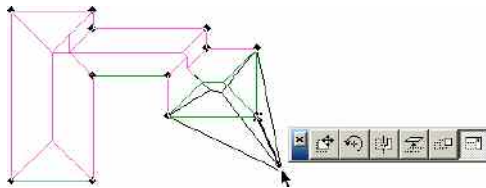
Buildings are parametric objects (AT3_BUILDING) and can therefore be modified at any moment.

The shape can be modified extremely easily:

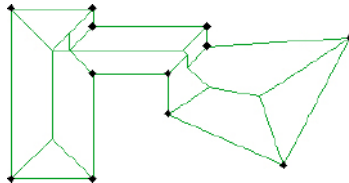
1. in the map view (or the 3D view) select the building by clicking on one of the perimeter nodes
2. click on the nodes, drag them and release them in the required position as you would to modify any ArchiCAD polygonal element (Slabs, Fills, etc).



selecting the building



dragging the nodes



the modified building

Modifying the parameters of the building is in every way similar to the procedure used to modify any ArchiCAD library element:

1. in the map view (or the 3D view) select the building by clicking on one of the perimeter nodes
2. click on the icon of the relative tool in the ArchiTerra toolbox to display the settings dialog box
3. carry out the necessary modifications
4. confirm the modifications by closing the dialog box with the OK button.

Coloured Area tool



You can use this simple tool to colour the terrain surface.

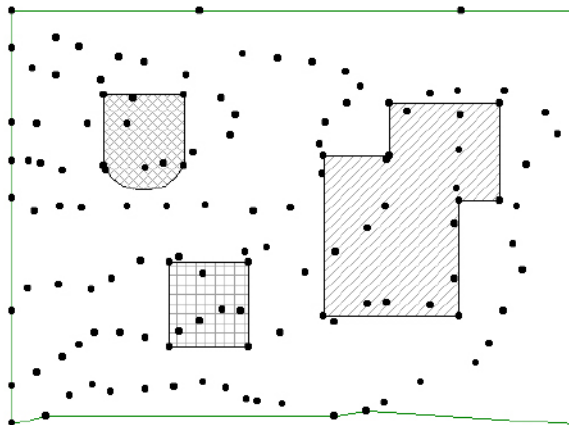
You define the perimeter of the coloured area using an ArchiCAD fill and ArchiTerra colours the terrain following your settings.

Note:

this tool is also very different from previous versions.

In previous versions, ArchiTerra used an object for each Coloured Area defined. This version uses a single highly parametric object (AT3_PAINTER) for each piece of terrain to manage all the coloured areas defined by the user.

Define the surface (or surfaces) to be coloured in the map view using ArchiCAD fills.

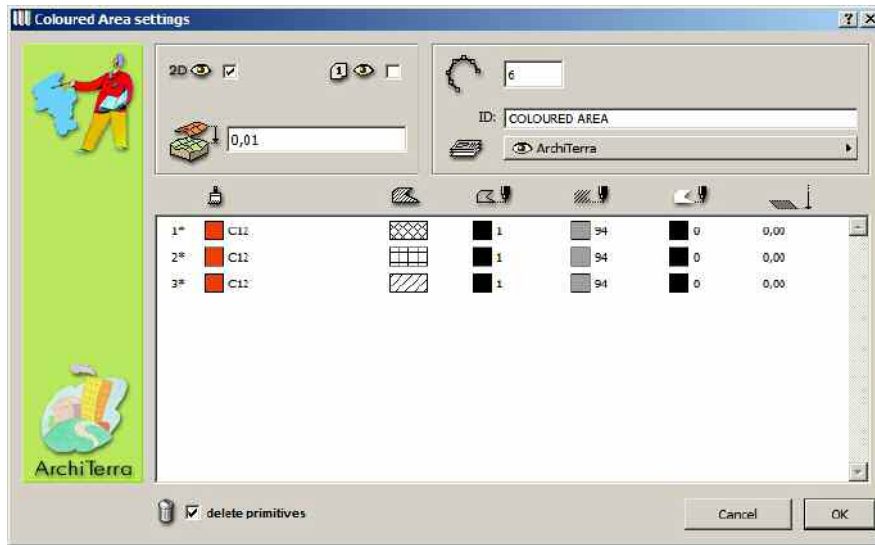


TIP:

use different fills (or different pens) if you colour a number of separate areas at the same time. This enables you to distinguish the various surfaces (and thus assign the correct attributes) in the fill list in the Coloured Area settings dialog box.

Select the fill (or fills) and click on the Coloured Area tool icon in the ArchiTerra toolbox.

You will immediately have access to the Coloured Area settings dialog box:



As you can see in this example, from this version you can process a number of fills with a single command.

In addition, as explained above, a single highly parametric object (AT3_PAINTER) retains all the information on areas already coloured or to be coloured.

In the Coloured Area settings dialog box, there is a list of all the fills and their assigned attributes.

The information listed in the columns are, from left to right:

- progressive number of the surface
- material used for the surface
- fill used in the map view to represent the surface
- pen used for the fill outline in the map view
- pen used for the fill hatch in the map view
- pen used for the fill background in the map view
- elevation of each individual coloured surface with respect to the terrain

To edit the values of a line, click on the line to select it and use the fields to define the values.

The two top sections of the dialog box are used for general configuration of the object representing the coloured areas.

At the top left, you have access to:

 a check-box to **show/hide the coloured areas** in the map view



a check-box to **show/hide the progressive numbers** of the individual coloured areas. Activate it to highlight the correspondence between the coloured areas in the map view and those listed in the list in the Coloured Area settings dialog box.



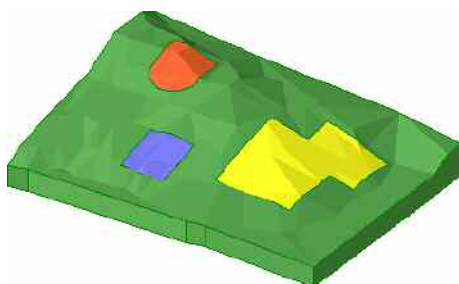
global **elevation of the coloured surface with respect to the terrain**. Use this value to modify the global position of the coloured areas with respect to the terrain with a single setting.

At the top right you can:

- configure the resolution of curved parts of the coloured areas
- define an identification string for the Coloured Area object (AT3_PAINTER)
- choose the layer where the element will be stored.

IMPORTANT:

At the bottom left of the dialog box, there is a check-box named **cancel primitives**. If this check-box is activated, when the dialog box is closed using the OK button, ArchiTerra will automatically cancel the 2D primitives used to define the shape of the element from the worksheet. If the check-box is left disabled, the primitives will not be automatically cancelled.



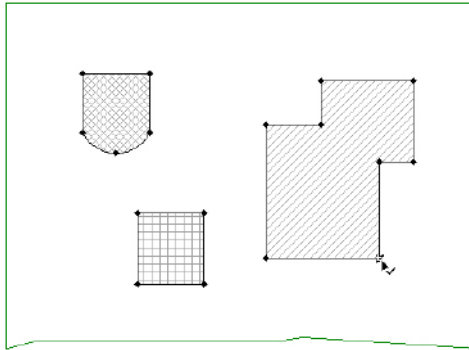
Confirm the modifications with the OK button and ArchiTerra will immediately display the coloured areas according to your settings:

Modifying Coloured Areas

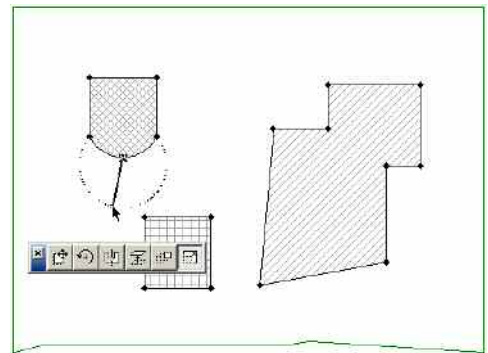
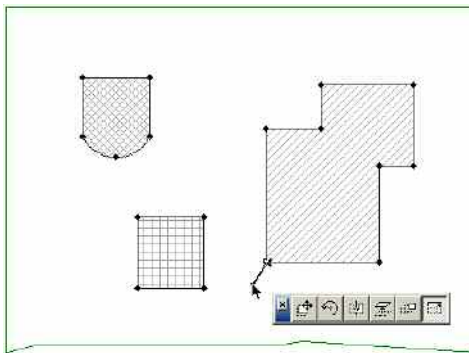
Coloured areas are managed by a parametric object (AT3_PAINTER) and can therefore be modified at any moment.

The shape can be modified extremely easily:

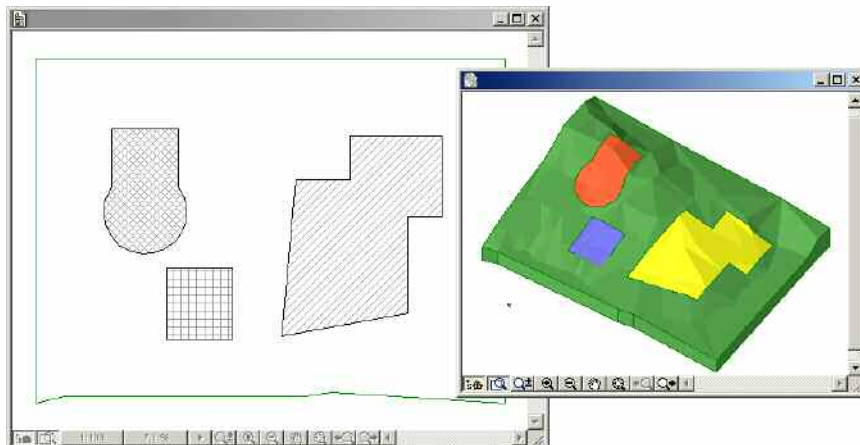
1. select the coloured areas in the map view by clicking on one of the edge nodes
2. click on the nodes, drag them and release them in the required position as you would to modify any ArchiCAD polygonal elements (Slabs, Fills, etc).



selecting the coloured areas



dragging the nodes



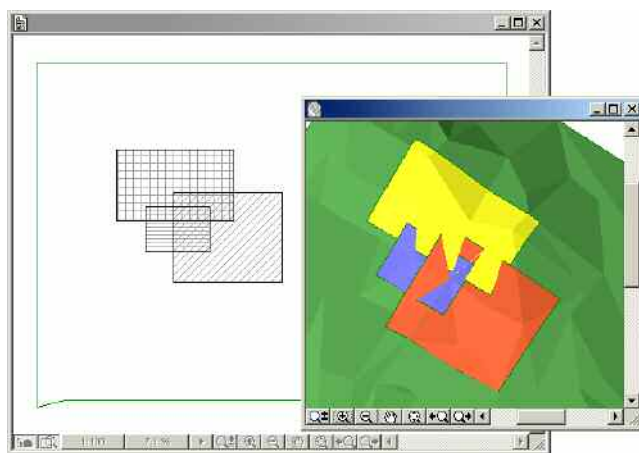
The modified coloured areas

Modification of the coloured area parameters is in every way similar to that used to modify any ArchiCAD library element:

1. select the coloured areas in the map view by clicking on one of the edge nodes
2. click on the icon of the relative tool in the ArchiTerra toolbox to display the settings dialog box
3. carry out the necessary modifications
4. confirm the modifications by closing the dialog box with the OK button.

Managing overlapping coloured areas

When there are overlapping coloured areas, if you do not configure them specifically, the result in the 3D view will not be satisfactory.



From a software point of view, this is easy to understand as the three areas are at the same level and therefore interpenetrating.

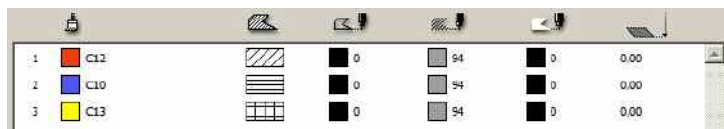
ArchiCAD does not, therefore, know how to resolve the display.

The problem is simple to resolve. Just act on the level of the three areas in such a way as to distribute them

along the Z axis. The highest surfaces will have priority over lower ones.

Then select the object representing the Coloured Areas in the map view and click on the icon corresponding to the relevant tool in the ArchiTerra toolbox.

As no configuration was performed at the moment of creation, the elevation fields of the individual areas are configured to zero:

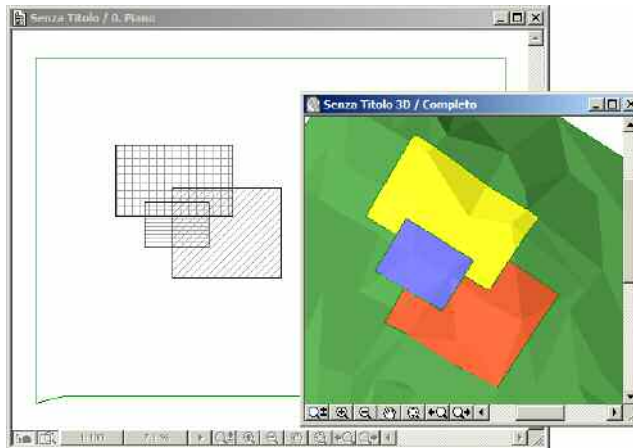


Let's imagine you want to give the blue surface maximum priority, followed by the yellow surface, then the red surface.

The elevations of the three overlapping surfaces must be suitably configured so that the blue is the highest, followed by the yellow, leaving the red in the current position:



Here is the new result in the 3D view:



Wall tool



You can generate walls following the surface of the terrain with this simple tool. You define the guideline of the wall to be generated and ArchiTerra builds the wall following your settings and the land morphology.

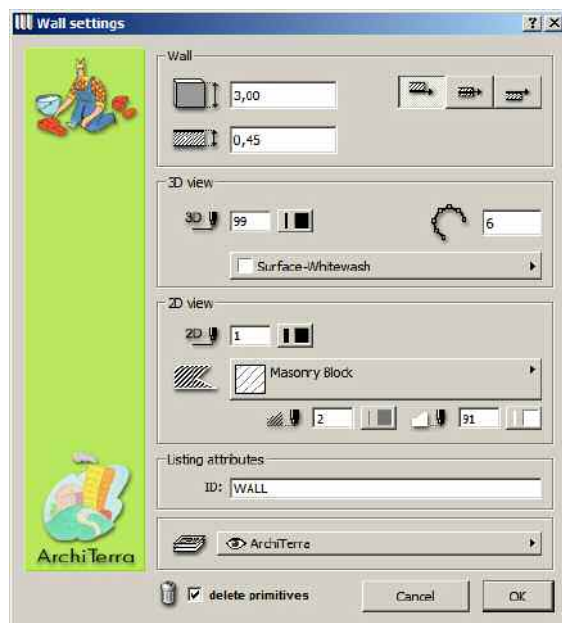
IMPORTANT:

be careful not to confuse ArchiTerra walls with ArchiCAD walls, they are two completely different things! ArchiCAD walls are project building parts, ArchiTerra walls are parametric library parts used for a different purpose.

To generate an ArchiTerra Wall, use the ArchiCAD Polyline tool in the map view to define its reference line (which could include curved sides).

Then select this polyline and the terrain/mesh on which the wall is built and click on the Wall tool icon in the ArchiTerra toolbox.

The Wall Settings box will immediately be displayed:



In the **Wall** section, you can define the height of the wall (constant along the full length) and its thickness, while the three buttons on the right define the position of the wall with respect to its reference line (the selected ArchiCAD polyline), with the same logic as used for standard ArchiCAD walls.

In the **3D View** section, you can configure:

- the pen used for the wall in the 3D view
- the approximation for curved parts of the wall
- the surface material used for the wall.

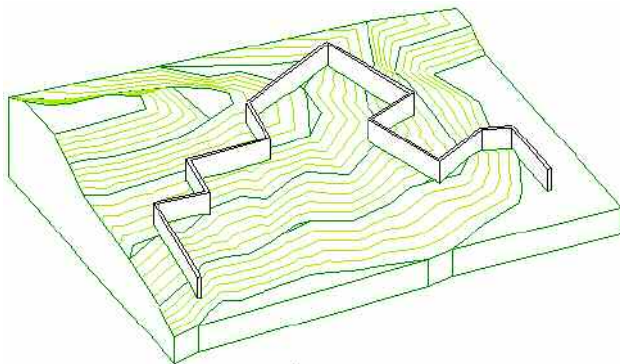
In the **2D View** section, you can configure:

- the pen used for the wall in the map view
- the hatched fill of the wall in the map view
- the pen used for the fill hatch
- the pen used for the fill background

In the **Listing Attributes** section, you can define an identification string for the wall object.

The last pop-up menu allows you to define the layer where the element will be stored.

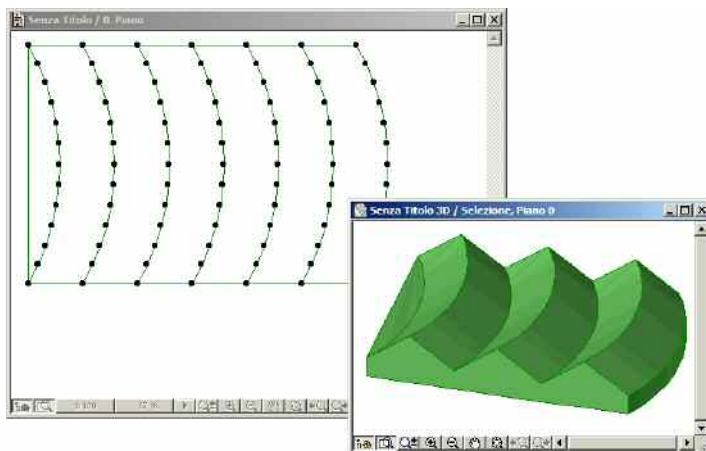
Confirm the settings with the OK button to start processing the element which ArchiTerra will insert immediately in the map view.



The altitudes of ArchiTerra Wall nodes

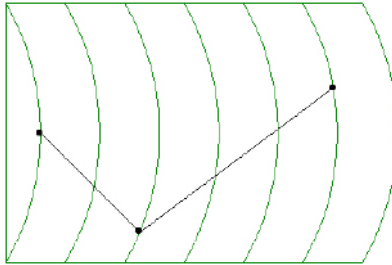
When the reference line of an ArchiTerra Wall is defined using the ArchiCAD polyline tool, the number and position of the nodes in the polyline are fundamental as ArchiTerra uses these nodes to extrapolate the altitude of the base of the wall to generate.

Here is a simple example to clarify this concept.



The previous image shows terrain with a zigzag altitude.

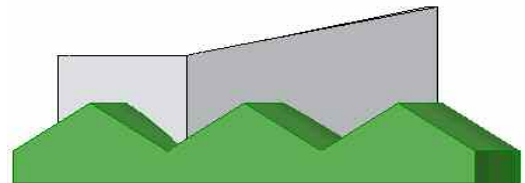
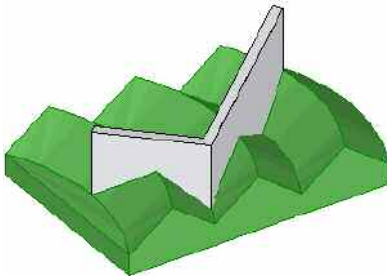
Now draw an ArchiCAD polyline consisting of three nodes only as shown in the following image:



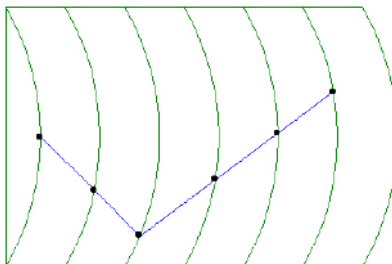
As explained above, when you transform this polyline into an ArchiTerra wall, ArchiTerra will use the three nodes to acquire information on the altitudes of the terrain and then construct the resulting wall.

Then select the polyline and the terrain/mesh and click on the Wall tool in the ArchiTerra toolbox to display the Wall settings dialog box, confirming the default configuration.

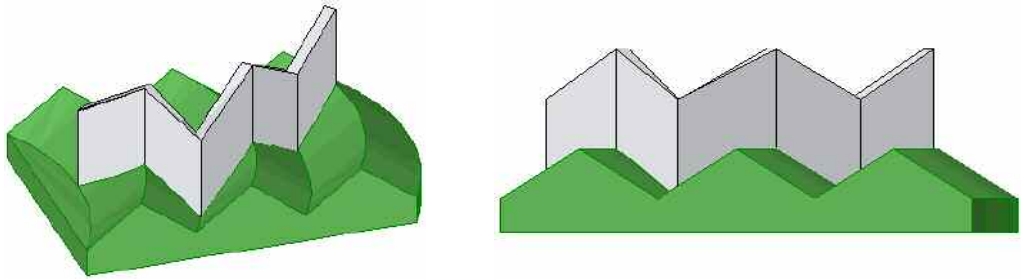
The resulting wall will be similar to the following:



As can be easily understood from the two previous images, the wall is constructed on the basis of the nodes of the original polyline (reference line). These nodes rest on the ground and the altitude of the wall is correct at these points.



If you draw another polyline using more nodes and based on the terrain contour lines, the result is significantly different:



You must therefore be careful when you define the polyline for the wall reference line. You define the final result of the operation as ArchiTerra will build the wall on the basis of the nodes in the polyline you drew.

Tip:

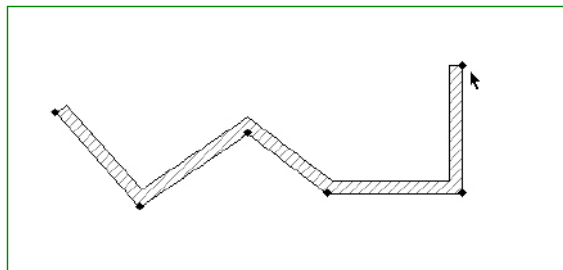
The Retaining Wall tool uses a completely different algorithm (explained in the following chapter) which automatically follows the course of the terrain altitude. It is up to you to decide in each case the most appropriate tool for the walls you wish to create on the terrain surface.

Modifying ArchiTerra Walls

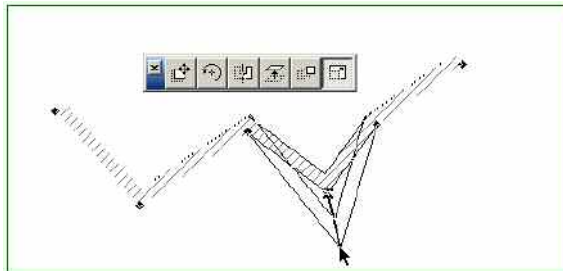
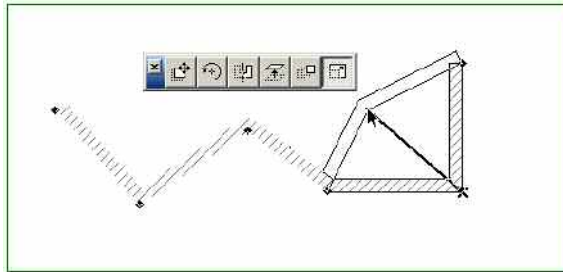
ArchiTerra walls are parametric objects (AT3_WALL) and can therefore be modified at any moment.

The shape can be modified extremely easily:

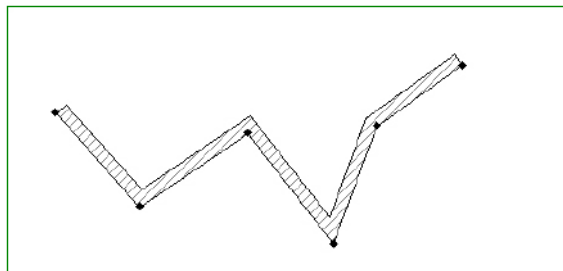
1. in the map view (or the 3D view), select the wall by clicking on one of the nodes in the reference line
2. click on the nodes, drag them and release them in the required position as you would to modify any ArchiCAD polygonal elements (Slabs, Fills, etc).



select the ArchiTerra wall



moving the wall nodes



The modified ArchiTerra wall

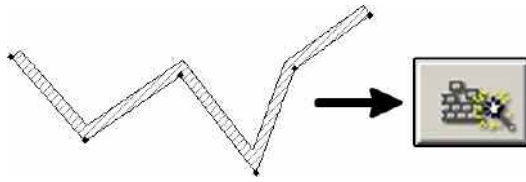
IMPORTANT:

Modifying the position of the nodes on the reference line introduces obvious incongruence in the information on the altitude of these nodes.

The altitudes were calculated by ArchiTerra on the basis of the original position of the node which is no longer the same.

To update the altitudes of the moved nodes and then restore congruence with the terrain model, select the ArchiTerra wall modified graphically and click on the Data Update icon in the ArchiTerra toolbox.

After a short process, ArchiTerra will correctly configure the altitudes of all the nodes on the selected wall.



The procedure used to modify the parameters of an ArchiTerra wall is in every way similar to that used to modify any ArchiCAD library element:

1. select the walls in the map view by clicking on one of the nodes of the reference line
2. click on the icon of the relative tool in the ArchiTerra toolbox to display the settings dialog box
3. carry out the necessary modifications
4. confirm the modifications by closing the dialog box with the OK button.

IMPORTANT:

The wall object can also be used to draw fences or rails. These functions can be accessed by selecting the object and accessing its configuration by the ArchiCAD Object settings dialog box. Consult the Appendix for more detailed information on these characteristics.

Retaining Wall tool



This is one of the new tools introduced in the latest version of ArchiTerra and its operation varies according to the conditions at the moment you click on the Retaining Wall tool in the ArchiTerra toolbox.

The Retaining Wall can be used to draw walls which follow the course of the terrain or retain scarps in ArchiTerra elements (just like actual retaining walls).

Creating a retaining wall

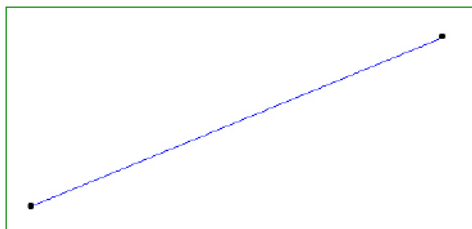
To generate a retaining wall, you first need to use an ArchiCAD Polyline in the map view to define its reference line (which could include curved sides).

The algorithm used to generate this type of wall is completely different from the one used for ArchiTerra walls (as already noted in the previous paragraph).

In this case, the polyline nodes are used to define the development of the wall in the map view only.

The altitudes of the base of the wall are calculated precisely on the basis of variations in the altitude of the terrain.

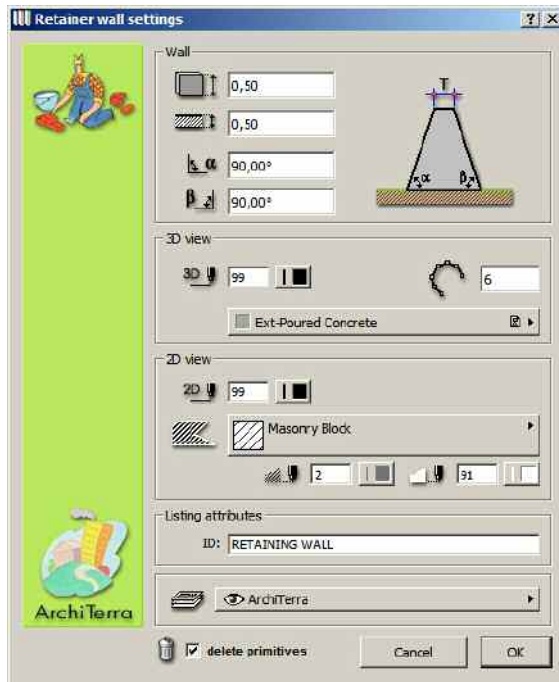
To underline this characteristic, in the following example we have traced an ArchiCAD polyline consisting of just two nodes (at the ends) on terrain with a highly irregular altitude.



Select this polyline and the terrain/mesh on which it is located and click on the Retaining Wall tool icon in the ArchiTerra toolbox.

ArchiTerra immediately displays the following Retaining Wall settings dialog box:

In the **Wall** section at the top you can define:



- the height of the wall (the distance between the altitude of the extrados and the altitude of the terrain on the reference line side)
- the thickness of the wall
- the angle of the left surface (with respect to the reference line)
- the angle of the right surface (with respect to the reference line)

In the 3D View section, you can configure:

- the pen to represent the element in the 3D view.
- the resolution of any curved sides
- the surface material.

In the **2D View** section, you can configure:

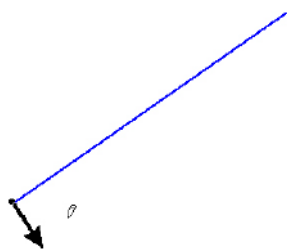
- the pen to represent the element in the map view.
- the fill used in the map view
- the pen used for the fill hatch
- the pen used for the fill background

In the **Listing Attributes** section, you can define an identification string for the element.

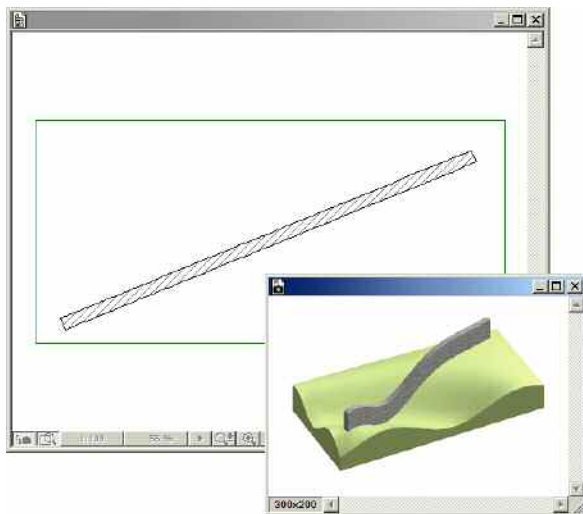
In the bottom pop-up menu, you can choose the layer where the element will be stored.

IMPORTANT:

At the bottom left of the dialog box, there is a check-box named *cancel primitives*. If this check-box is activated, when the dialog box is closed using the OK button, ArchiTerra will automatically cancel the 2D primitives used to define the shape of the element from the worksheet. If the check-box is left disabled, the primitives will not be automatically cancelled.



When the settings made are confirmed with the OK button, ArchiTerra closes the dialog box and the cursor changes to an arrow at the start of the polyline used to generate the element:



If you move the cursor to the two sides of the polyline, the arrow changes direction, indicating the side on which the Retaining Wall will be constructed.

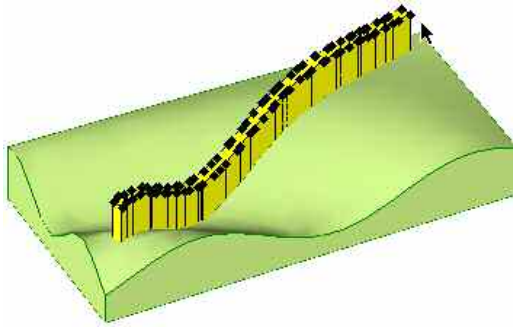
Click on the required side and ArchiTerra immediately generates the element requested:

Modifying Retaining Walls

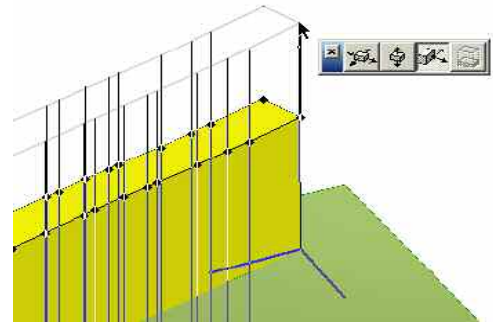
ArchiTerra retaining walls are parametric objects (AT3_RETAINING_WALL) and can therefore be modified at any moment.

Given the complexity of the element and its characteristics (following the land morphology), the shape of this type of element in the map view cannot be changed, but you can graphically modify the height in the 3D window:

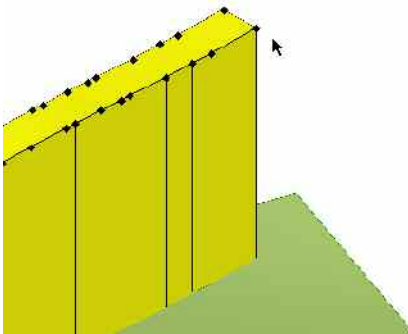
1. select the retaining wall in the 3D window by clicking on one of its surfaces
2. click on the top nodes of the wall, drag them and release them in the required position as you would to modify the height of any ArchiCAD GDL object.



select the ArchiTerra retaining wall



moving the top nodes of the wall



The modified ArchiTerra retaining wall

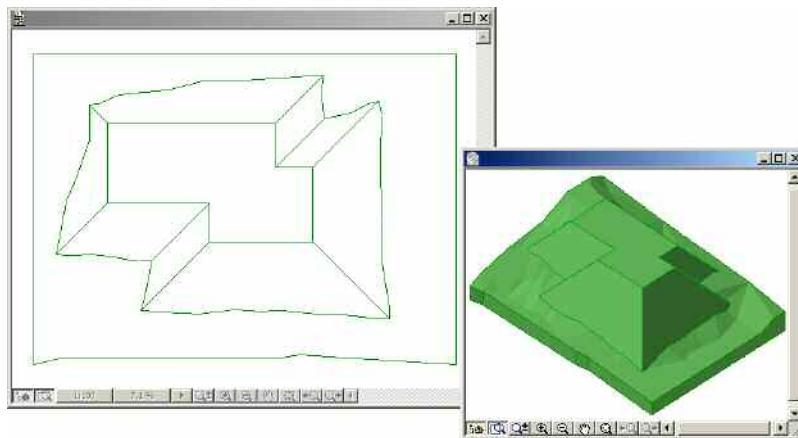
The procedure used to modify the parameters of an ArchiTerra retaining wall is in every way similar to that used to modify any ArchiCAD library element:

1. select the retaining walls in the map view (or 3D view) by clicking on one of the nodes of the reference line
2. click on the icon of the relative tool in the ArchiTerra toolbox to display the settings dialog box
3. carry out the necessary modifications
4. confirm the modifications by closing the dialog box with the OK button.

Creating a retaining wall as an obstacle

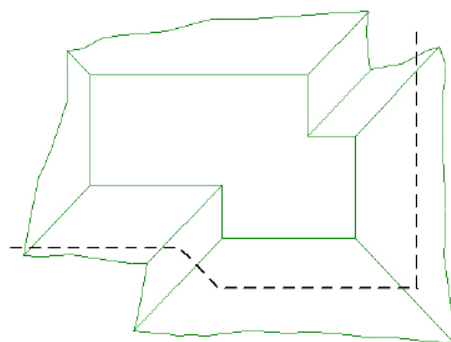
As already mentioned, as well as creating single walls which follow the course of the surface of the terrain, a Retaining Wall can also be used as an obstacle to limit elements calculated on the terrain itself, just like a genuine retaining wall.

Let's take a look at the following example:



Here you can see a terrain/mesh with a plateau whose scarps rest on the majority of the terrain.

Suppose that the scarps on the bottom and right sides of the map must be limited as shown by the dotted line in the following image:

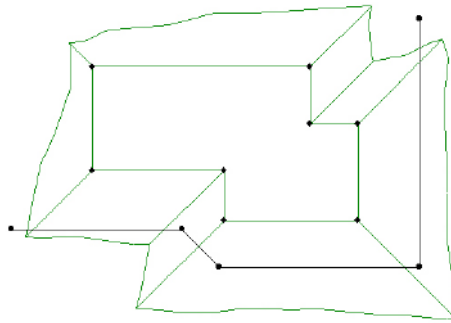


Limiting elements using a Retaining Wall is quite easy.

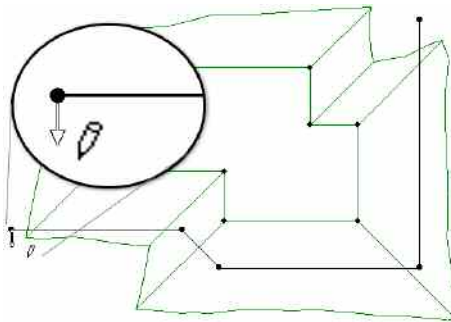
Firstly, you can only limit elements which have already been "constructed" on the terrain. The logic is that you must first "construct" the element, then subsequently "limit it".

Use an ArchiCAD polyline to define the obstacle (take care to use open polylines only!).

Then proceed as follows:

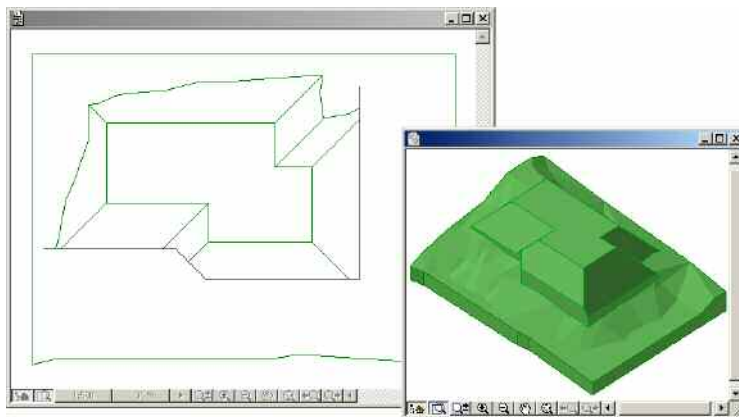


Select the element to be limited (in our example, a plateau) and the polyline representing the obstacle and then click on the Retaining Wall icon in the ArchiTerra toolbox.

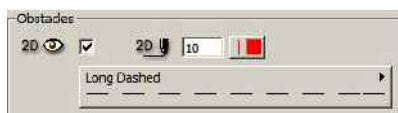
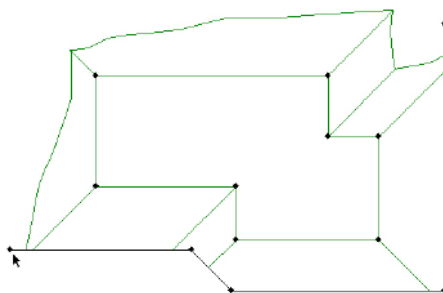


When you have clicked the Retaining Wall icon, the procedure begins and the cursor changes to an arrow at the start of the polyline used to generate the obstacle: If you move the cursor to the two sides of the polyline, the arrow changes direction, indicating the side on which the Retaining Wall will be constructed and therefore the part of the element to be limited/eliminated.

Click on the part you want to limit/eliminate and ArchiTerra immediately limits the intervention along the selected polyline:



If you now select the element (the plateau), you will see that editable hotspots have been added to the symbol coinciding with the polyline limiting the element:



By dragging these hotspots into new positions you can graphically modify the element, changing its limits (to see the result, you must use the Data Update tool).

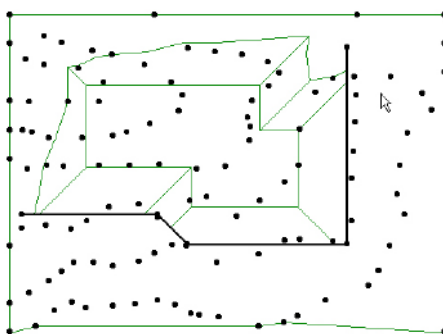
The way these elements (obstacles) are drawn can be configured in the settings box of the tool which generated the element (plateaux and roads) in the **Obstacles** section:

The first check-box below activates/deactivates the obstacle polyline.

The pen and line type are the attributes used to represent the obstacle in the map view.

Creation a Retaining Wall along the obstacle

We have described how to limit an element, now we will explain how to place a Retaining Wall along the limit line.

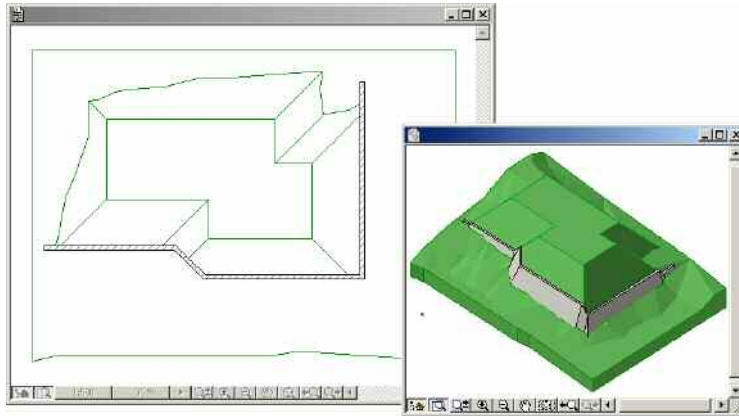


The polyline used to limit the scarps of the plateau in our example is NOT cancelled by ArchiTerra. It can, in fact, be used to create a retaining wall along the obstacle generated.

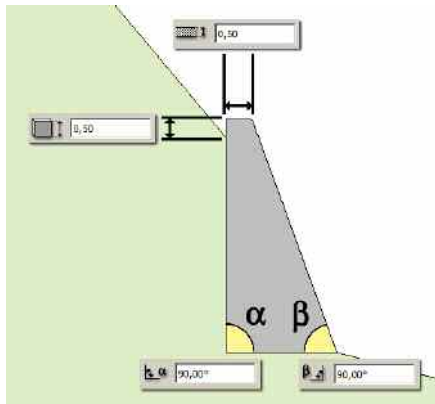
Select this polyline and the terrain/mesh on which it is found and click on the Retaining Wall tool icon in the ArchiTerra toolbox.

At this point, the procedure is the same as described in the paragraph "Creating retaining walls" in this chapter:

1. configure the values in the dialog box appropriately
2. confirm the settings with the OK button.
3. click on the worksheet to define on which side the Retaining Wall is constructed



The following diagram shows the meaning of the values in the Wall section of the Retaining Wall settings dialog box:



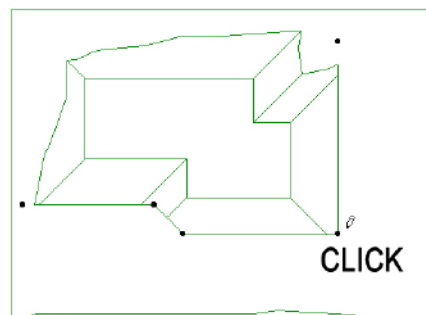
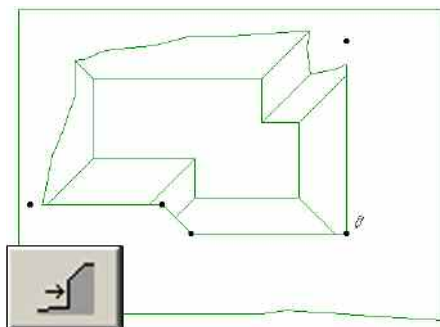
Cancelling an obstacle

After it has been defined, it may be necessary to cancel an obstacle for some reason.

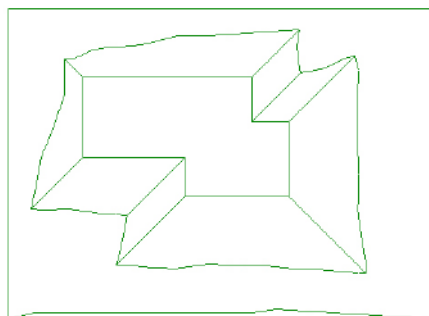
Elimination of the obstacle obviously restores the original element which will no longer be limited along the limit polyline.

It is extremely easy to cancel an obstacle and we will use the previous example to describe it.

1. Select the element (plateau or road, in our example, a plateau) in the map view:
2. click on the Retaining Wall tool icon. By limiting the selection to a single element (plateau or road), ArchiTerra understands that the intention is to cancel an obstacle and changes the shape of the cursor (pencil), waiting for your click:



3. Click on one of the nodes of the polyline representing the obstacle:
4. ArchiTerra immediately cancels the limit and restores the original element:



Calculate tool



One of the most interesting characteristics of ArchiTerra is the possibility of calculating the quantity of earth moved following interventions on the terrain.

Here too, certain things have changed compared with previous versions, precisely because the land modelling method has changed and is now based on solid elements operations.

Firstly, it is important to remember that the calculation of quantities must be updated each time so as to take account of possible graphic modifications performed by the user as part of the project.

The Calculate tool is used for this purpose. It updates all data to faithfully reflect the current situation.

Select one piece of terrain at a time (the procedure is too complex to allow more than one piece of terrain to be selected) and click on the Calculate tool icon in the ArchiTerra toolbox.

This starts the procedure (which requires a few seconds of processing) to update the quantities relating to the terrain selected.

At this point, you can use the “ArchiTerra 30” components list to view the quantities associated with the interventions on the terrain:

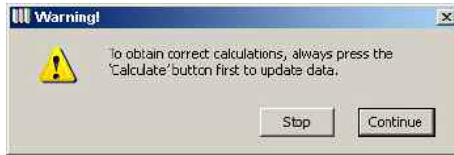
TERRAIN 01					
TERRAIN 01			DESCRIPTIONS	CUT	FILL
TERRAIN 01		001	PLATEAU 01	1.262,34 m3	83,90 m3
TERRAIN 01		002	PLATEAU 02	0,00 m3	6.374,63 m3
TERRAIN 01		003	PLATEAU 03	7.076,06 m3	534,48 m3
TERRAIN 01		004	ROAD 01	350,44 m3	651,05 m3
TERRAIN 01			TOTALI	8.688,84 m3	7.644,06 m3
TERRAIN 02					
TERRAIN 02			DESCRIPTIONS	CUT	FILL
TERRAIN 02		001	PLATEAU 05	27.692,77 m3	0,23 m3
TERRAIN 02		002	PLATEAU 06	6,62 m3	2.363,05 m3
TERRAIN 02			TOTALI	27.699,40 m3	2.363,28 m3

The above table clearly shows the importance of the identifying strings associated with the terrain/mesh and other elements or operations (excavations and roads).

The first column gives the ID string identifying the terrain for which the quantities are displayed, while the second column gives the name of the element or operation calculated.

Note:

each time you access the “ArchiTerra 30” component list, the following warning message will be displayed for each terrain/mesh in the map view:



This is a simple warning that you should update the quantity data by using the Calculate tool in order to have a congruent component list.

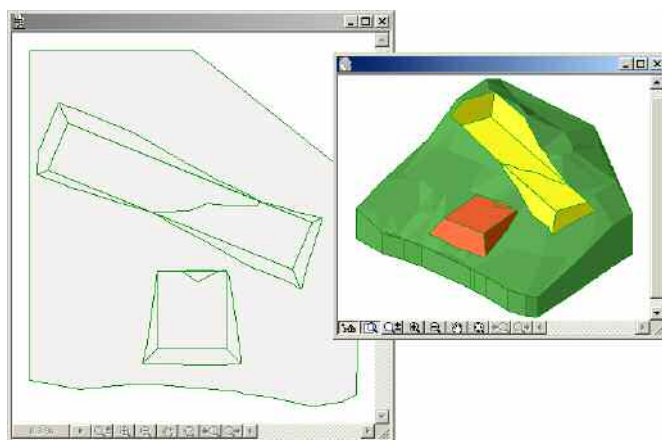
Unlink from Terrain



As repeatedly seen in the previous chapters of this manual, all modifications on the terrain are managed by means of special GDL objects and solid elements operations.

Each of these elements is intimately linked to the terrain/mesh on which it acts and it is precisely this connection which enables ArchiTerra to automatically manage all operations performed on the GDL object or terrain/mesh on which it is located.

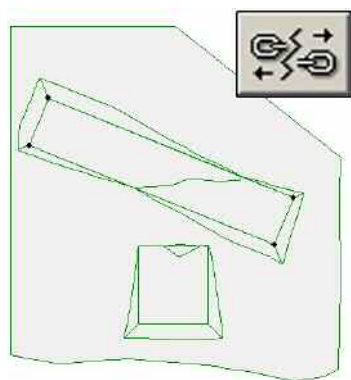
For example, if you move the terrain/mesh in space, you do not need to move the other objects modifying it, ArchiTerra will do it automatically for you.



For various reasons you may have to interrupt this link and restore the original shape of the mesh, without however losing all the data relating to the element or operation (the configuration settings).

This is where you should use the Unlink from Terrain tool.

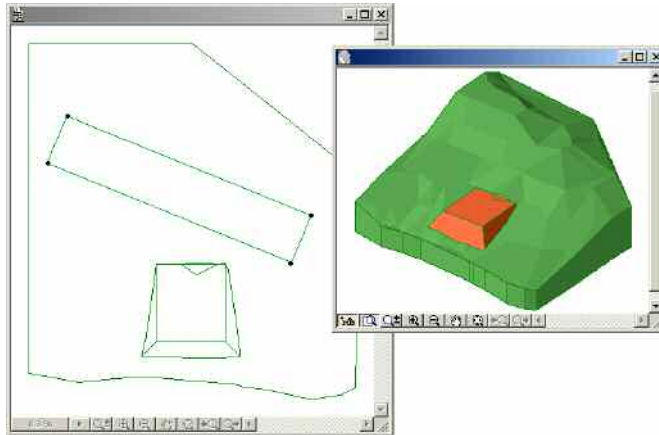
Let's take a look at the following example: The image shows a terrain/mesh with two plateaux.



Assume that you need to unlink the plateau at the top.

Select the plateau and click on the Unlink from Terrain tool icon in the ArchiTerra toolbox.

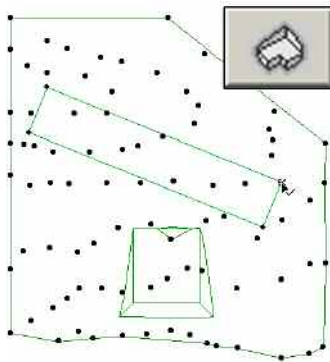
ArchiTerra immediately unlinks the plateau object and restores the original shape of the mesh. Now on the ArchiCAD worksheet you have a GDL object (in this case an AT3_PLATEAU object) which does not modify the terrain, but which can be reused without having to reconfigure it from the beginning, retaining all the original settings.



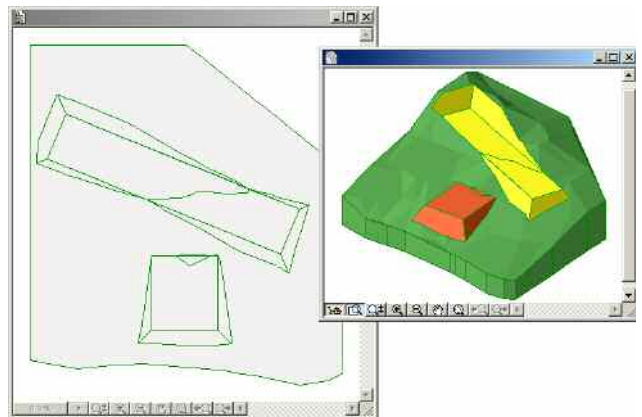
To make sure the element object has retained all the settings information, select it together with the terrain/mesh and click on the icon of the relevant tool (in this case, the Plateau tool).

No further configuration is required.

ArchiTerra reads the necessary information from the object and integrates/links it directly to the terrain, modifying the morphology as necessary.



Select the element and click on the Unlink from Terrain tool



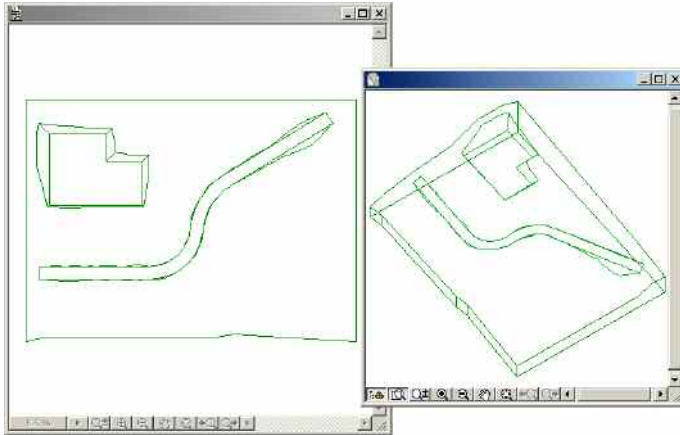
The original shape of the mesh is restored and the element becomes an independent object

Show/hide ArchiTerra layers tool

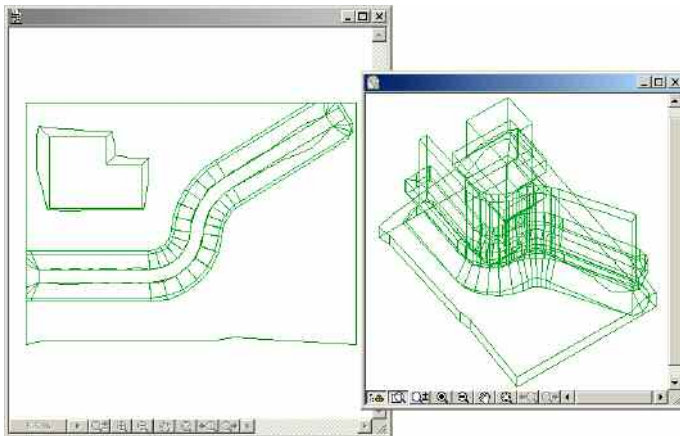


This tool is a simple toggle which shows/hides the AT_Operators layer containing the parametric GDL objects used to model (excavation and fill) the terrain.

Click on the icon to toggle the layer display status:



AT_Operators layer invisible: "normal" view



AT_Operators layer visible: the objects used for the solid operations are visible

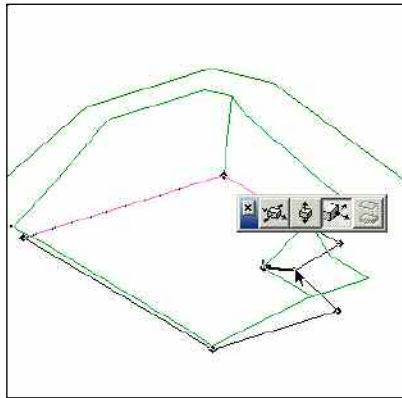
Modify X-Y coordinates/modify Z coordinate toggle



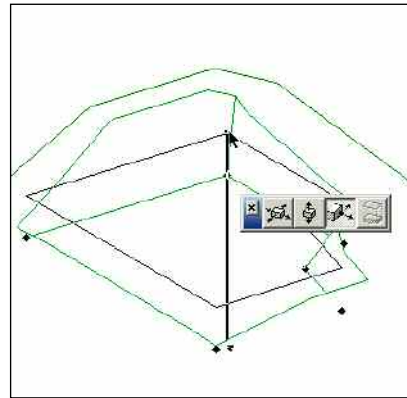
This is also a simple toggle used in the 3D view to switch from graphic editing of the X-Y coordinates to graphic editing of the Z coordinate.

A click on the tool icon after selecting the object you want to modify will simply and easily switch you from editing the position of the nodes on the horizontal plane to editing those on the vertical plane.

Here is a simple example using a plateau:



Graphic editing of a node on the horizontal plane



Graphic editing of a node on the vertical plane

Data Update tool



As has been described numerous times in the previous chapters of this manual, this tool is used to update data on the worksheet, integrating it with the latest modifications introduced by the user.

Depending on the situation and contents of the selection, it may produce various results.

The following list sums up its possible uses.

Updating altitudes

If you select a terrain and the relevant ArchiTerra altitudes, those altitudes will be updated.

Updating ArchiTerra walls

If you select one or more ArchiTerra walls, the altitudes of the intrados of the wall (the level on which it rests) will be updated to correspond to the modified terrain.

Updating the element preview

If you select one or more walls and terrains/meshes, the preview of the elements will be updated (if it has not already been updated automatically).

Updating a basin

If you select a basin, this will be updated to conform to any modifications made to the terrain/mesh on which it is inserted.

Updating a road longitudinal section

If you select a road in the map view, the corresponding longitudinal section data will be updated to conform to the road modified on the map.

Updating a road on the map

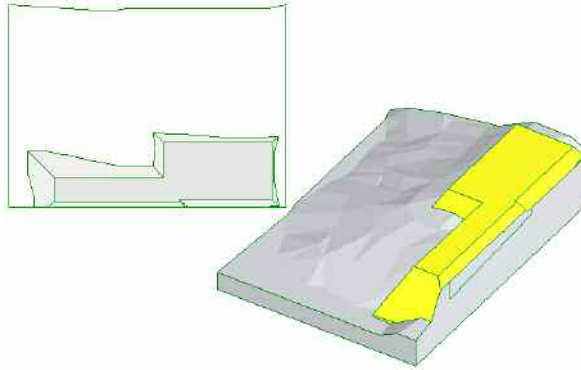
If you select the longitudinal section of the road, the original data of the road on the map will be updated to conform to the road modified in the section view.

Updating all elements

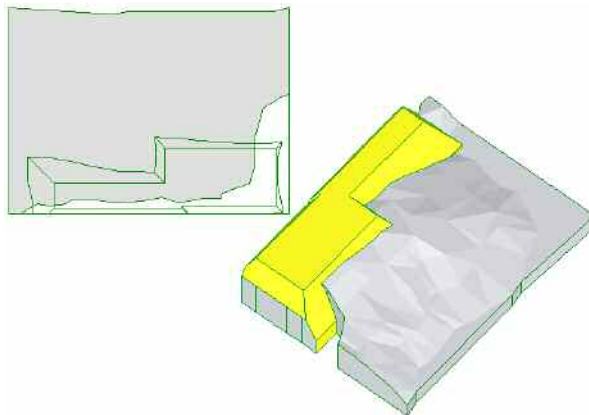
If you select any element, its perimeter on the terrain will be updated.

The following explanation uses a plateau.

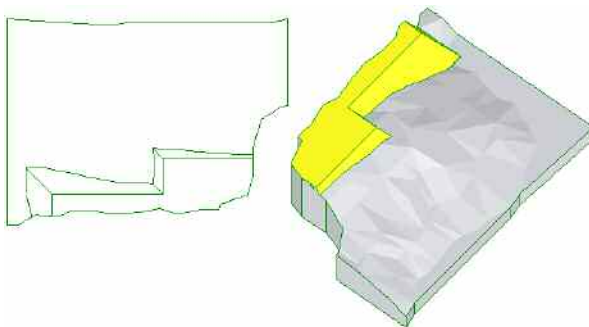
The following image shows a "correct" plateau calculated on a terrain/mesh:



If the perimeter of the terrain is modified subsequently (in the following image, the hatched part of the map indicates the new perimeter of the terrain), for example by creating indentations, the result will be a "projecting" terrain as the shape of the original perimeter has been modified:



If you select the plateau and click on the Data Update tool, the list of terrain perimeter nodes will be updated and the element will be displayed correctly:



Spot Heights tool



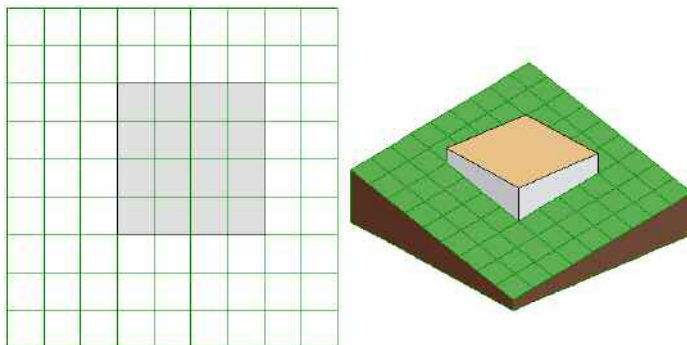
The Spot Heights tool allows you to display the data associated with the points/hotspots of the terrain/mesh and to attribute spot heights to your terrain/mesh.

In the former case, displaying the information memorised in the points, its usefulness is clear as ArchiTerra uses simple ArchiCAD hotspots to represent the points and without this tool there would be no other way to view this information.

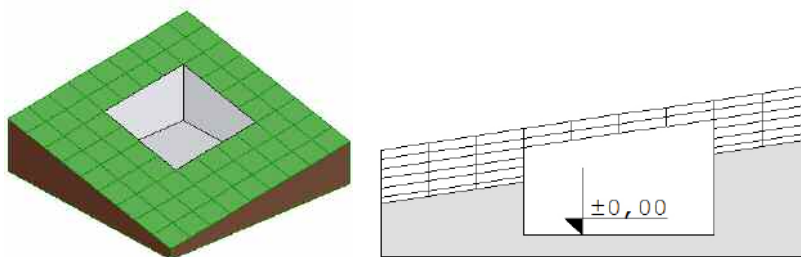
When used to attribute spot heights to the terrain/mesh, it could seem to be a duplicate of the tool already present in the standard ArchiCAD toolbox.

In fact this is not the case.

Here is a simple example, without using ArchiTerra, of correct use of the tool in ArchiCAD.



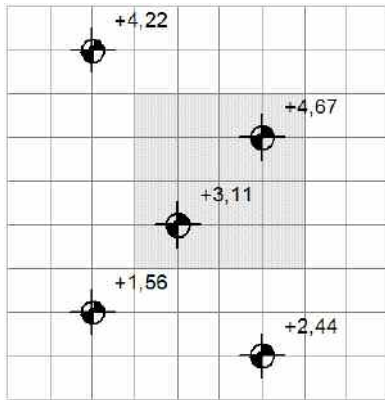
The above image shows a simple Mesh constructed with ArchiCAD into which a Slab has been inserted.



Using Solid Elements Operations, the volume of the slab is subtracted from the mesh:

As can be seen in the cross section, the altitude of the mesh corresponding to the plateau obtained by subtracting the volume of the mesh is 0.00 metres.

We will now attribute spot heights to that zone of the mesh using the ArchiCAD Spot Heights tool and activating gravity to the mesh in order to view the level of the surface of the mesh at the points clicked:



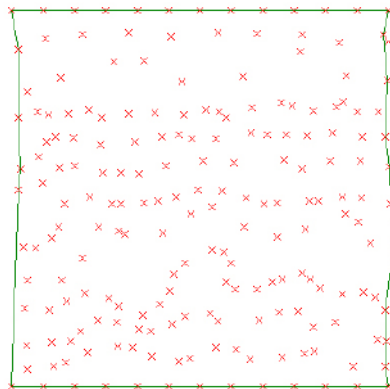
As can be seen in the image, ArchiCAD still attributes spot heights at the original surface altitude (prior to the Boolean subtraction operations) without considering the modifications made using Solid Elements Operations.

As described previously, all modifications which can be made by ArchiTerra on terrains/meshes are based on Solid Elements Operations and we therefore had to provide the user with a suitable tool to correctly attribute spot heights to the terrain, taking modifications made to the surface of the mesh into consideration.

Attributing spot heights to survey points

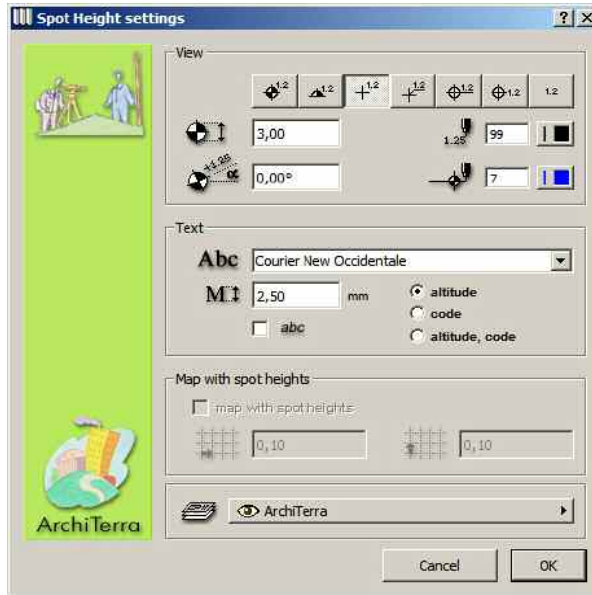
Spot heights are attributed to survey points, in other words the points/hotspots used to construct the terrain/mesh, automatically.

Let's suppose we want to view the information on the points used to construct the terrain/mesh in the following image:



Without selecting any object (so ArchiTerra understands it must initiate the procedure to display the information on the points/hotspots present on the worksheet), click on the Spot Heights tool in the ArchiTerra toolbox.

ArchiTerra immediately displays the Spot Heights settings dialog box:



In the **View** section, you can configure the appearance of the marker by choosing the style and defining the dimensions, angle and pen used to draw it.

In the **Text** section, you can choose the font, size of character and possible use of italics for the string of information to be displayed.

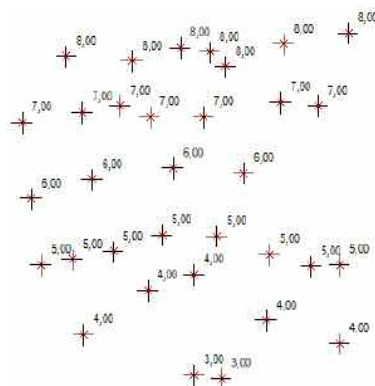
The three radio buttons on the right define the information to be displayed:

- altitude:** the altitude of the point will be displayed alongside the marker
- code:** the code of the point will be displayed alongside the marker
- altitude, code:** the altitude and the code of the point will be displayed alongside the marker

The Map with spot heights section will be described below. In this case the options are disabled.

The last pop-up menu allows you to choose the layer where the GDL object (AT3_POINT_MARKER) used to represent the altitudes on the map will be stored.

Here is the result:



IMPORTANT:

the information displayed relates to the points/hotspots in the map view worksheet. If the terrain/mesh has been modified subsequently, the spot heights will not correspond to its surface. It must be emphasised that this procedure has in any case been conceived to view information associated with the points/hotspots and NOT the terrain/mesh they generate.

Attributing spot heights to the terrain

The procedure for attributing spot heights to points on the terrain/mesh (required to have correct altitudes even when using Solid Elements Operations), is as simple as the standard ArchiCAD procedure.

Firstly, select the terrain/mesh for which you want to view the spot heights.

This must be done as there could be a number of terrains/meshes on the worksheet and ArchiTerra must therefore be told which require processing.

Click on the Spot Heights tool in the ArchiTerra toolbox.

In the Spot Heights settings box which appears, configure the parameters as required.

Note:

in this case, the three radio buttons to select the type of information to display are not available. We are in fact viewing the spot heights of “random” points which do not correspond to the points/hotspots used to generate the terrain and which may include a code as additional information. The only information which can be displayed is the altitude of the point.

During this procedure, the **Map with spot heights** option is active, but we will skip it as it will be described in the next paragraph.

Close the settings dialog box and confirm configuration of the spot heights by clicking on the OK button.

The shape of the cursor changes (pencil cursor) and ArchiTerra waits while you define the point for which you want to view the spot height by clicking on the terrain/mesh previously selected.

The procedure is cyclic. After you have clicked, ArchiTerra displays the spot height and waits for you to click again before inserting another.

To exit from the procedure, click on Cancel in the ArchiCAD control bar or Esc on the keyboard (as well as all the other standard ways in the ArchiCAD interface).

Each spot height inserted is a parametric GDL object (AT3_POINT_MARKER) which can be individually selected and edited (to modify the parameters again, select them and click on the Spot Heights tool icon, modify the values and confirm with the OK button.

Creating maps with spot heights

A map with spot heights is a regular grid of spot heights describing the contours of the terrain.

To create a map with spot heights on a terrain/mesh, firstly select the terrain you want to visualise as a map with spot heights (there could be a number of terrains/meshes on the worksheet and ArchiTerra must therefore be told which requires processing) and then click on the Spot Heights tool icon in the ArchiTerra tool-box.

The usual Spot Heights settings dialog box appears. All the other parameters operate in the way described above and here we will describe the characteristics of the **Map with spot heights** section only:



The first check-box enables this option.

If the check-box is disabled, the procedure is used to enter individual spot heights, if it is

enabled, the procedure defines the map with spot heights.

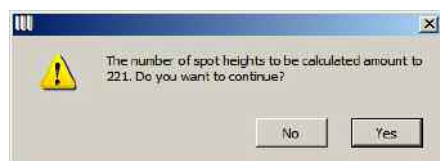
The two bottom fields define the horizontal and vertical grid size, in other words, the distance along the X and Y axes between each successive altitude.

Note:

The spot heights must be extrapolated by ArchiTerra by processing the model of the terrain. The denser the grid of the map with spot heights, the longer it will take to process the AT3_POINT_MARKER object.

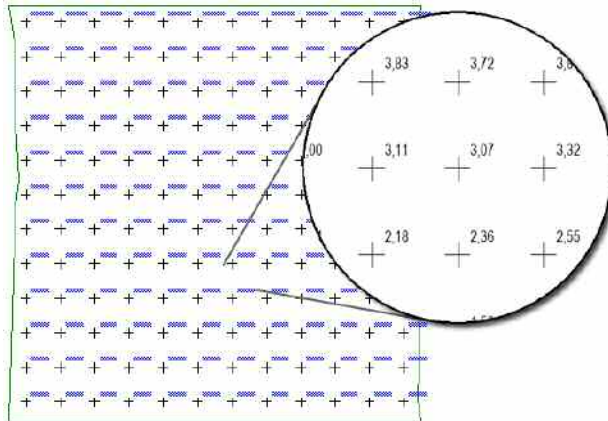
Confirm the configuration by clicking the OK button. ArchiTerra closes the dialog box and changes the shape of the cursor (pencil) waiting for you to click on the terrain/mesh to define where you want the map with spot heights to be inserted (in practice, the point indicated by the click will be one of the points on the grid of spot heights).

ArchiTerra immediately displays the following message:



indicating the number of spot heights which will be generated (and therefore calculated) for the map with spot heights being inserted.

Click on **Yes** to accept the processing and after a suitable processing time (depending on the quantity of spot heights to be calculated and your hardware configuration), the map with spot heights will be inserted in the map view.



In this case, the entire map with spot heights is represented by a single AT3_POINT_MARKER object.

To modify the characteristics, select the AT3_POINT_MARKER object and click on the Spot Heights tool icon, modify the parameters and confirm with the OK button.

IMPORTANT:

the spot heights in this version of ArchiTerra cannot be updated (in other words, the spot height displayed is not updated when the terrain is modified).

If you modify the land morphology, simply cancel the spot heights (whether individual or part of a map with spot heights) and reposition them in order to reflect the current situation.

Gravity on Terrain



The Gravity on Terrain tool enables you to position ArchiCAD library elements precisely on the surface of the terrain.

This could also seem to be a duplicate of a function already present in ArchiCAD.

This is not in fact the case, for the same reasons as explained for the Spot Heights tool. The ArchiCAD gravity function always refers to the original points on the surface of the mesh and not to the surface resulting from modifications made with Solid Elements Operations (see the description in the Spot Heights tool for more detail).

The Gravity on Terrain function is extremely easy to use:

1. Select the terrain/mesh on which you wish to position the objects (there could be a number of terrains/meshes on the worksheet and ArchiTerra must therefore be told which requires processing.
2. Click on the Gravity on Terrain tool
3. ArchiTerra immediately displays the following Object settings dialog box where you can select and configure the library element you wish to insert
4. Confirm the configuration with the OK button and select the library element
5. In the map view, click on the surface of the terrain/mesh to insert the object at those coordinates and at the altitude of the land at that point.

This starts the object insertion cycle and each time you click on the worksheet, a further object with the characteristics previously defined is inserted on the surface of the terrain.

To exit from the insertion cycle, click on Cancel in the ArchiCAD control bar or Esc on the keyboard (as well as all the other standard ways in the ArchiCAD interface).

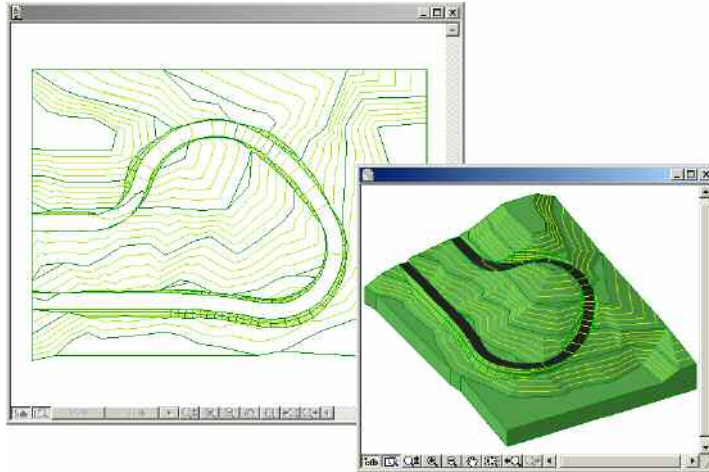
Camera tool



You can use this tool to define Fly-Through routes so that each camera is automatically positioned on the surface of the terrain/mesh selected.

Let's look at a simple example of operation.

The following image shows a terrain/mesh in which a road has been drawn:



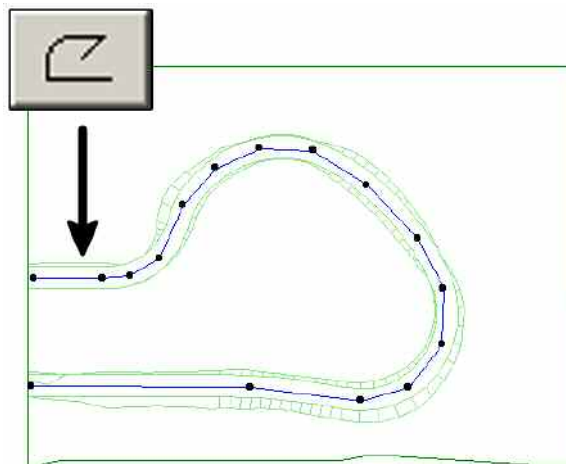
The aim is to create a route along the road which simulates what a driver on that road would see.

Firstly, use the ArchiCAD polyline tool to draw the route you want to create in the map view.

Remember that the camera distribution procedure does NOT consider curved sections, in other words, if curved sides are present, it considers the chord joining the two ends of the arc.

You should therefore avoid use curves (or remember that they will be approximated as described).

Here is the route to be transformed drawn with an ArchiCAD polyline:

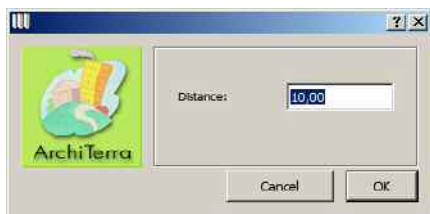


Now, select the terrain/mesh for which you want to distribute the cameras.

This must be done as there could be a number of terrains/meshes on the worksheet and ArchiTerra must therefore be told which require processing.

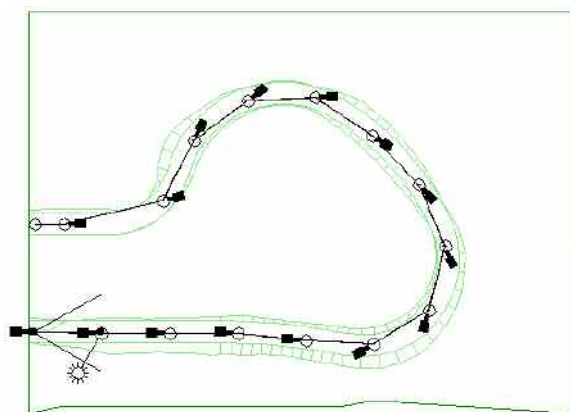
Next, select the ArchiCAD polyline defining the route where you want the cameras to be distributed and finally click on the Camera tool icon in the ArchiTerra toolbox.

ArchiTerra immediately displays the Camera settings dialog box:



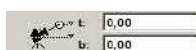
This dialog contains a single parameter - the approximate distance between each camera along the route.

Enter a value and confirm with the OK button.



After a short period of processing (the length of time depends on the complexity of the model, the number of cameras calculated and the configuration of your hardware), a new route is generated and displayed in the map view:

Notes:



The two elevation values for the camera - point of view and focus - are configured by ArchiTerra on the basis of the current camera tool settings and the altitude of the terrain/mesh at the insertion point. In practice, the altitude of the terrain has been added to the current default values of the camera tool.

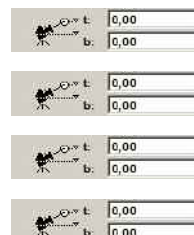
A simple example: the camera must be positioned at a point on the terrain at an altitude of 23.50 metres:

The current settings of the camera tool are:

The two values for the camera inserted by ArchiTerra will be:

The current settings of the camera tool are:

The two values for the camera inserted by ArchiTerra will be:



IMPORTANT:

As described above, the Camera tool is used to generate routes only.

To modify the settings for the route or individual cameras, use the standard ArchiCAD procedure.

ArchiTerra tool default settings



As with any other programme, ArchiTerra has default settings for pens, fills, layers, values, etc.

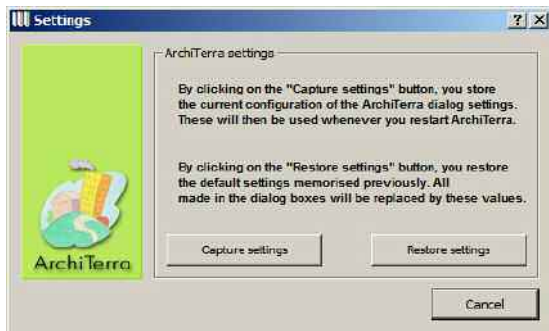
Each time you start up ArchiCAD, ArchiTerra reads these default settings and proposes them in the various settings dialog boxes.

It could therefore be useful to configure “your” ArchiTerra so as to automatically propose the most commonly used pens, fills, etc.

And this is exactly what the ArchiTerra Default Tool Settings tool is for.

To customise your ArchiTerra, configure all the dialog boxes as you prefer, setting your standard values and attributes.

When you have completed this phase of configuration, click on the ArchiTerra Default Tool Settings tool to view the following dialog box:



Click on the **Capture Settings** button to memorise the current configurations which will then become the default settings for your ArchiTerra.

All this information will, in fact, be memorised in the AT3_PREFS GDL object used by ArchiTerra during initialisation to set the default values.

To reset the original default values for all values and attributes used by ArchiTerra, click **Restore Settings**.

Click on the **Cancel** button to close the dialog box without modifying the programme settings.

Help tool



Click on this button to view the user manual in pdf format.

To function correctly, you must have Acrobat Reader installed on your computer and the relative help document in pdf must be in the same folder as the ArchiTerra add-on.

Appendix

This section of the manual takes a more detailed look at a number of subjects already covered in the manual:

ArchiTerra library elements

Multiple use of the AT3_CONTOURLINES object

Further characteristics of the ArchiTerra wall

Customising trunks and leaves

Problems with Solid Elements Operations

ArchiTerra library elements

The ArchiTerra library contains a series of objects used by ArchiTerra to modify terrain or represent operations and elements.

The main folder contains the following elements:

AT3_CONTOURLINES.gsm	used for contour lines, the function shows depth and a preview of elements and operations
AT3_PREFS.gsm	used to memorise ArchiTerra default settings
AT3_ROAD.gsm	used to create and represent roads
AT3_SIDEWALK.gsm	used to create and represent pavements
AT3_RETAINING_WALL.gsm	used to create and represent retaining walls
AT3_PAINTER.gsm	used to represent coloured areas
AT3_SLOPED_PLATEAU.gsm	used to create and represent sloped plateaux
AT3_RANDOM_ROCK.gsm	used to represent random rocks
AT3_BASIN.gsm	used to create and represent basins
AT3_LEVEL_MARKER.gsm	used to represent spot heights on the terrain and maps with spot heights
AT3_WALL.gsm	used to create and represent walls, fences and guardrails
AT3_POINT_MARKER.gsm	used to display information on the points/hot-spots used to generate the terrain
AT3_PLATEAU.gsm	used to create and represent horizontal plateaux
AT3_BUILDING.gsm	used to represent buildings
AT3_OBSTACLE.gsm	used to manage element obstacles
SS_TREE folder	folder containing the library elements required to create and represent random trees
IMGs folder	folder containing images of the library elements user interface dialogs
MACROs folder	folder containing the macros required for the functioning of other objects

Skipping the contents of the IMGs and MACROs folders, the SS_TREE folder (used to generate random objects) contains the following:

SS_TREE.gsm	the random tree object
MASTER_GDL_AT30_MAT.gdl	the GDL macro which, in ArchiCAD, automatically generates the standard default materials used in a random tree
Leaves styles folder	folder containing the various leaf objects/styles
Tree macros folder	folder containing the macros used in the tree object
Tree textures folder	folder containing the textures used in the standard default materials for a random tree
Trunk styles folder	folder containing the various trunk objects/styles

Multiple use of the AT3_CONTOURLINES object

The AT3_CONTOURLINES object is a highly parametric library element used to represent:

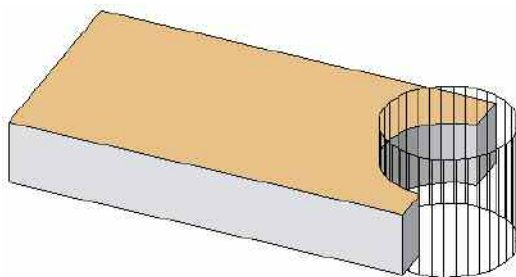
elements in the map view

the contour lines calculated on the terrain

the colour gradient associated with terrain depth in the 3D view

Viewing elements in the map view

As users will be aware, the current version of ArchiCAD does not display the result of solid elements operations correctly as the ArchiCAD plan is not a 3D view of the model from above, but simply a representation.



A slab from which a cylinder has been removed by means of Solid Elements Operations



The plan view of the same slab

As explained above, all modifications performed on the terrain/mesh are the result of Solid Elements Operations and therefore ArchiCAD would not display their result in the map view.

To avoid this problem, ArchiTerra uses the AT3_CONTOURLINES object to correct the display. It, in fact, contains a plan view of the terrain/mesh from above enabling the result of your modelling to be displayed in the ArchiCAD plan view.

The contour lines calculated on the terrain

The AT3_CONTOURLINES object is also used to display the primary and secondary contour lines in both the map, 3D and section/elevation views (obviously depending on the configuration chosen in the Contour Lines tool settings dialog box).

Many users continue to ask for the contour lines to be directly incorporated in the terrain/mesh. We are still considering this possible solution, but for the moment prefer to avoid it as it would considerably weigh down the mesh shape, making the ArchiCAD performance (both in display and modification) extremely slow.

Remember that the contour lines are a simple representation. There is no plan to make them manually editable and for these modifications to be transferred to the original terrain.

The colour gradient

The mesh element of ArchiCAD used by ArchiTerra to represent terrains has a fundamental limitation as far as surface materials are concerned. There is just one material for the top surface of the mesh.

This limitation means it is practically impossible for the mesh to have different colours in different areas of its top surface and therefore it is not possible to obtain a colour gradient varying according to the altitude of the terrain.

To avoid this problem and provide this additional function, ArchiTerra uses the AT3_CONTOURLINES object to represent this gradient in the 3D view.

Managing the AT3_CONTOURLINES object

As explained, this library element is intimately linked to the terrain.

It is automatically managed by ArchiTerra and does not require any form of user interaction.

Any modification must be performed by selecting the terrain/mesh (and NOT the object) and then using the relevant tools:

1. the **Contour Lines** tool (for everything concerning modifications to contour lines)
2. the **Show Depth** tool (for everything concerning modifications to the colour gradient in the 3D view)
3. the **Data Update** tool (to update previews of elements if they have not been automatically updated after modification)

Further characteristics of the ArchiTerra wall



As mentioned in the chapter describing the ArchiTerra Wall tool, once this library element has been processed and positioned in the map view by ArchiTerra, you can modify its characteristics by exploiting its parametric qualities.



When you select the **AT3_WALL** object plan view (or 3D view), you can display the standard ArchiCAD Object settings dialog box to access these characteristics:

The three buttons determine functioning of the object, from left to right:

Wall function: standard use of the element. This is used to represent walls on the terrain

Fence function: the object used to represent fences on the terrain

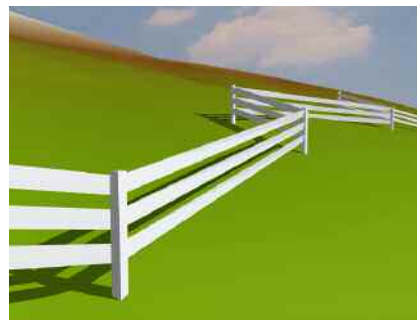
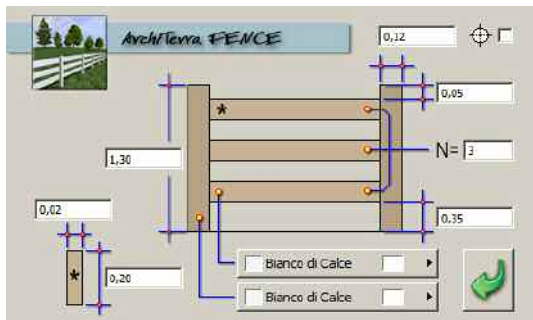
Guardrail function: the object used to represent guardrails on the terrain.

When you choose either the Fence or Guardrail option, a further button is displayed to customise the element settings:



Fence function

When you choose this function in the main key panel and then click on the settings definition button, a dialog box to customise the fence will appear.



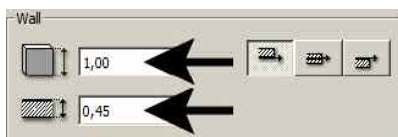
You can configure the altitude and size (side or diameter) of the vertical elements and choose whether they are square or round.

You can define the number of horizontal elements (N field) and their offset from the base and top and the size of their cross section.

Two pop-up menus allow you to define the surface material for the horizontal and vertical elements.

Note:

In this case, the thickness and height defined by the ArchiTerra Wall settings dialog box

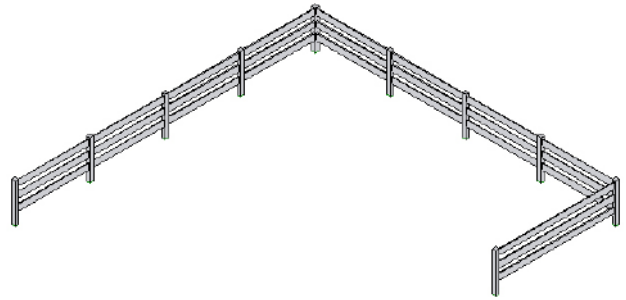
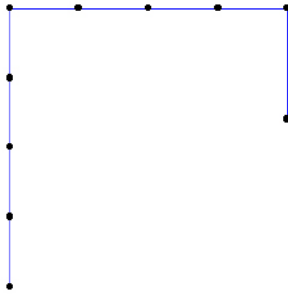


are irrelevant as the thickness and height of the fence depends on the configuration in the Object settings dialog (side/diameter of vertical elements).

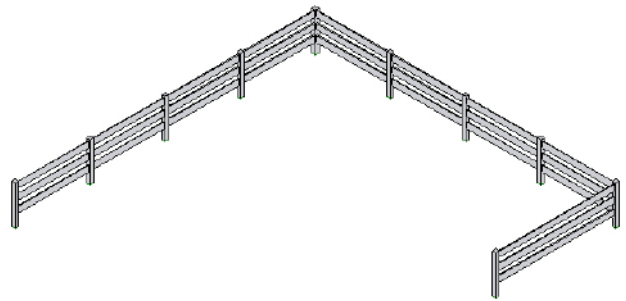
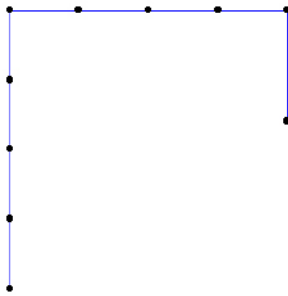
Tip:

The vertical elements correspond to the nodes of the polyline used to generate the wall element, so when you want to create a fence, you are consequently defining the nodes of the polyline.

In the two following examples, you can see how the number of uprights changes according to the nodes on the polyline used:



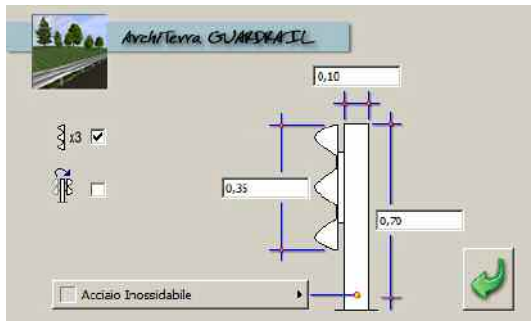
A polyline with four nodes generates a fence with four uprights



A polyline with ten nodes generates a fence with ten uprights

Guardrail function

When you choose this function in the main key panel and then click on the settings definition button, a dialog box to customise the guardrail will appear.



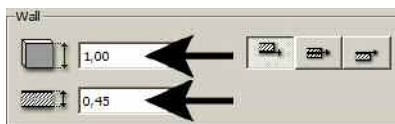
You can configure the height and size of the vertical elements.

You can configure the height of the barrier, if it is made up of two or three elements and the side on which it is inserted.

A pop-up menu allows the surface material to be defined.

Note:

In this case, the thickness and height defined by the ArchiTerra Wall settings dialog box

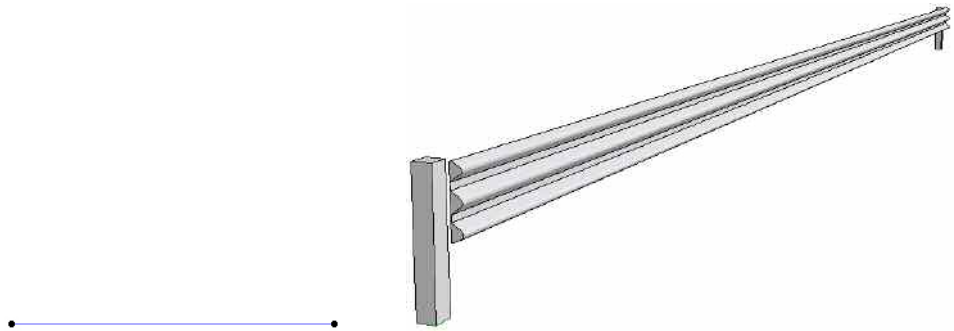


are irrelevant as the thickness and height of the guardrail depends on the configuration in the Object settings dialog (side/diameter of vertical elements).

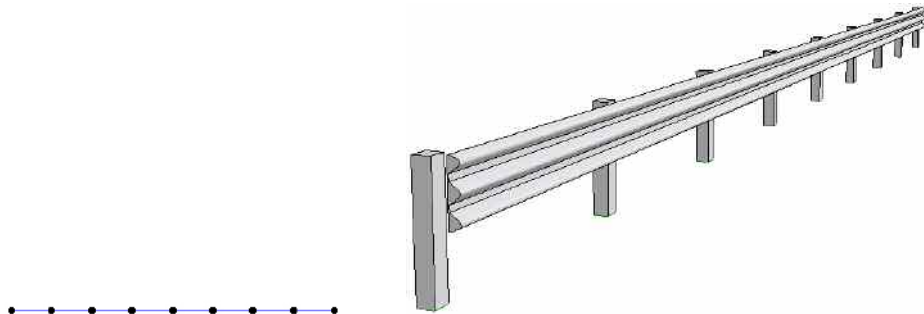
Tip:

The vertical elements correspond to the nodes of the polyline used to generate the wall element, so when you want to create a guardrail, you are consequently defining the nodes of the polyline.

In the two following examples, you can see how the number of uprights changes according to the nodes on the polyline used:



A polyline with two nodes generates a guardrail with two uprights



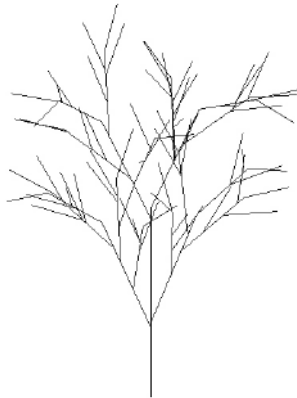
A polyline with nine nodes generates a guardrail with nine uprights

Customising trunks and leaves

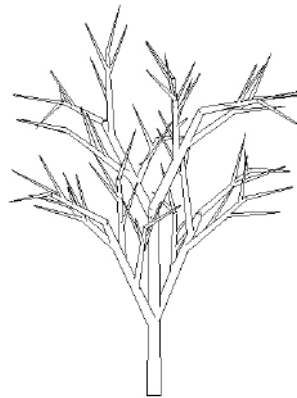
By using the following tips and a little imagination and application, you can further customise your random trees by generating trunks/branches and fronds according to your taste.

Trunks

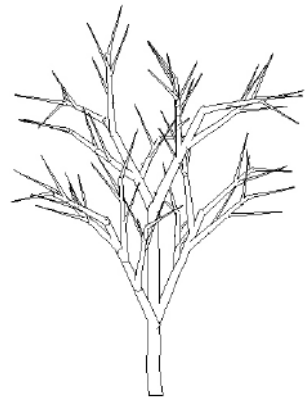
As already seen, ArchiTerra already includes a number of trunk/branch styles:



Style 1 - Lines



Style 2 - Cylinders

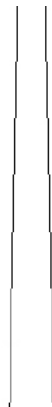


Style 3 - Trunk

These three styles correspond to three GDL objects used by the SS_TREE object to generate the trunk and branches:



SS_Trunk_01.gsm



SS_Trunk_02.gsm



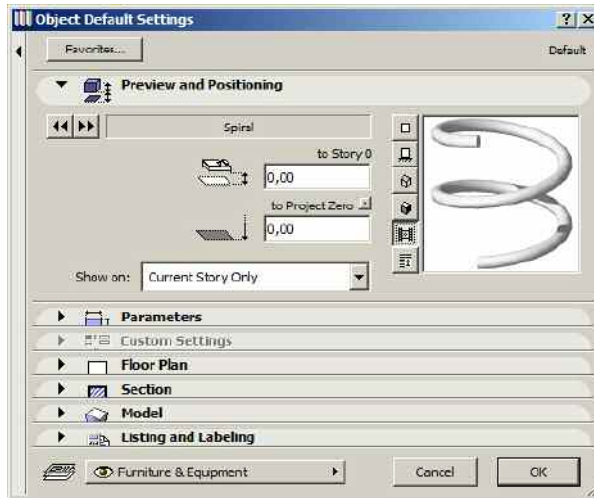
SS_Trunk_03.gsm

Now we will try and create a custom trunk without using GDL programming.

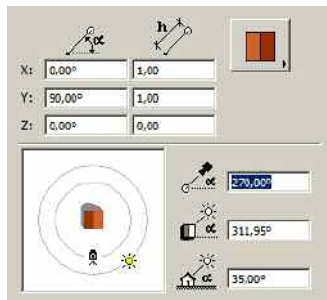
Spiral trunk

Let's try and create a strange tree with trunk and branches consisting of spirals. Without using GDL, we will take an element present in the standard ArchiCAD library, the spiral.

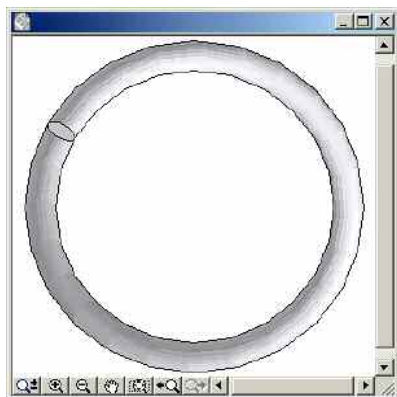
Configure the parameters of the object so as to obtain a result similar to the following:



Now let's display an object with the following settings as a plan from above in the 3D view:



The 3D view will appear as follows:



With the 3D view at the front, from the File menu choose the GDL Objects.../Save 3D Model as... command.

In the save box which appears, enter a name for your object and choose to save it (we suggest you use the Trunk styles folder in the ArchiTerra library), confirming with the OK button.

In the subsequent dialog, select the object format icon and activate the Non-editable 3D Binary Format option, then click on the Save button.

The first part is over and the object must now be modified to make it a custom trunk/branch in the ArchiTerra library.

From the File menu, choose the GDL Objects.../Open Object... command and select the spiral branch just saved in order to modify it.

ArchiCAD will open the library element editing window.

At the top right, click on the Select Subtype button... and in the list which appears select the **SS_Trunk_Subtype** subtype (in the Model Element item), then confirm the choice with the Select button.

Now you must add a number of GDL texts (always the same, don't worry!).

In the Master text window (which will be empty), add the following two lines:

```
A=raggio_1
```

```
B=raggio_1
```

At the beginning of the 3D GDL Text box, add the following lines:

```
ADD -A/2, -B/2, 0
```

```
MATERIAL mat
```

At the bottom of the GDL text, find the command BINARY 0,1 and replace the first 1 with a zero:

```
BINARY 0,1
```

Finished!

Record the modifications to your spiral branch and you are ready to use it.

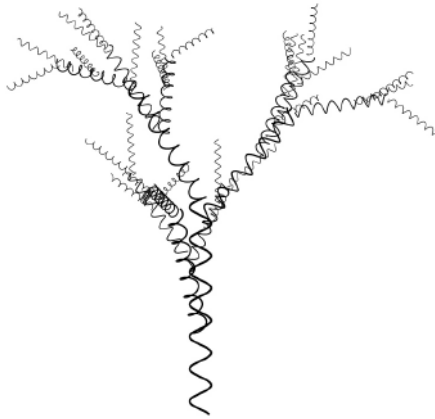
Now generate a random tree (as described in the relevant chapter) and in the **Trunk and Leaf Style** section:



Select the custom style option in the trunk style pop-up menu, then by clicking on the arrow button on the right, select your spiral branch.

Confirm the modifications with the OK button and

here is your tree, consisting of a series of spirals in place of the trunk and branches:

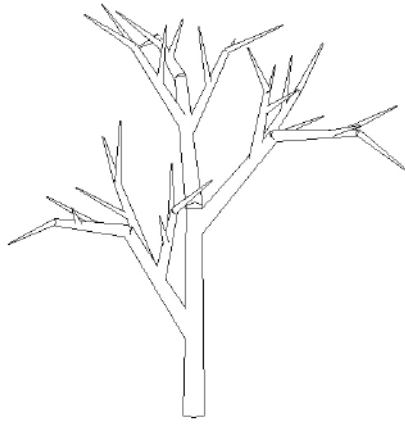


Note:

Experts in GDL programming will obviously be able to obtain much more satisfactory results. Take a look at the script for the three pre-defined trunk styles to understand how they work.

Leaves

As already seen, ArchiTerra already includes a number of leaf frond styles:



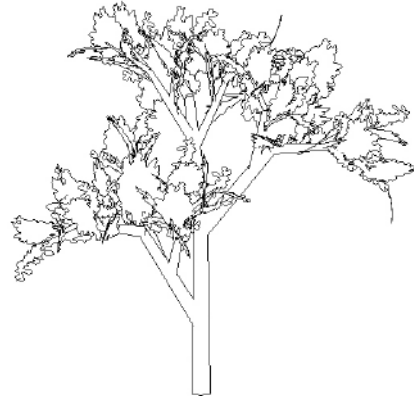
Without leaves



Style 1



Style 2



Style 1+2

These three styles correspond to three GDL objects used by the SS_TREE object to generate the fronds:



SS_Leaves_00.gsm



SS_Leaves_01.gsm



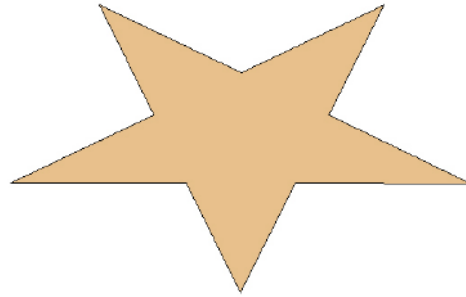
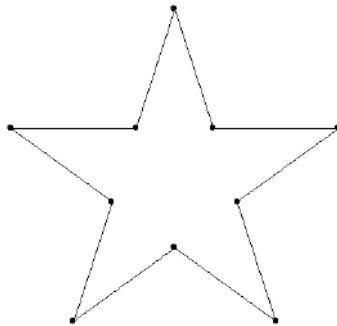
SS_Leaves_02.gsm

Now we will try and create a custom frond without using GDL programming.

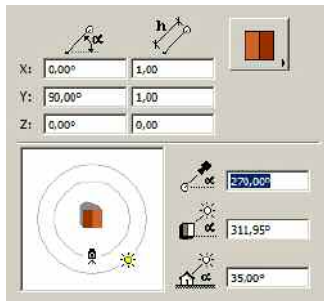
Star frond

Let's try and create a strange tree with star-shaped fronds.

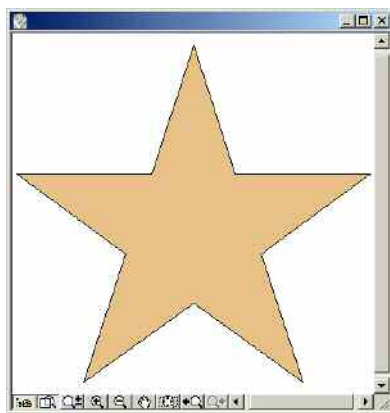
Use a zero-thickness ArchiCAD slab to draw the star:



Select it and view a plan from above of the slab in the 3D view with the following settings:



The 3D view will appear as follows:



With the 3D view at the front, from the File menu choose the GDL Objects.../Save 3D Model as... command.

In the save box which appears, enter a name for your object and choose to save it (we suggest you use the **Leaves styles** folder in the ArchiTerra library), confirming with the OK button.

In the subsequent dialog, select the object format icon and activate the Non-editable 3D Binary Format option, then click on the Save button.

The first part is over and the object must now be modified to make it a custom frond in the ArchiTerra library.

From the File menu, choose the GDL Objects.../Open Object... command and select the star frond just saved in order to modify it.

ArchiCAD will open the library element editing window.

At the top right, click on the Select Subtype button... and in the list which appears select the **SS_Leaves_Subtype** subtype (in the Model Element item), then confirm the choice with the Select button.

Now you must add a number of GDL texts (always the same, don't worry!).

At the beginning of the 3D GDL Text box, add the following line:

```
ADDx -A/2
```

At the bottom of the GDL text, find the command BINARY 1,1 and you should replace the first 1 with a zero:

```
BINARY 0,1
```

Finished!

Save the modifications to the star frond and you are ready to use it.

Now generate a random tree (as described in the relevant chapter) and in the **Trunk and Leaf Style** section:



Select the custom style option in the leaves style pop-up menu, then by clicking on the arrow button on the right, select your star frond.



Confirm the modifications with the OK button and here is your tree, consisting of a series of star fronds:

Problems with Solid Elements Operations

As already described a number of times in this manual, all the modelling operations performed on the terrain use Solid Elements Operations.

The shapes used to model the terrain can be extremely complex for ArchiCAD and sometimes (depending on the version used as Graphisoft continues to improve the Solid Elements Operations calculation engine), errors may occur which prevent modelling of the terrain as requested.

We always recommend that you enable interruption for error messages so as to have immediate feedback on the error.

In any case, if the Solid Elements Operation is not successful, you will realise immediately as the terrain will not be modelled, will be partially modelled or there will be errors.

To avoid this problem, proceed as follows:

1. try slightly varying the altitude of your operation (the altitude of the plateau or the altitudes of individual nodes of the road)
2. modify the angle of the scarps until the operation is successful (if the error is caused by the shape of a scarp, it can usually be resolved by using an angle creating a steeper scarp)
3. reduce or increase the resolution of curves (it is usually best to unlink this value) modify the scarp continuation value
4. It is, however, difficult to give a general solution as it depends on the specific shape of the terrain and the element involved.

For more efficient suggestions and specific instructions to resolve your problem, save the project, compress it and send by e-mail to:

fabrizio.diodati@cigraph.com

We will check your project and contact you with specific instructions.