Tip Sheet

ArchiCAD 11
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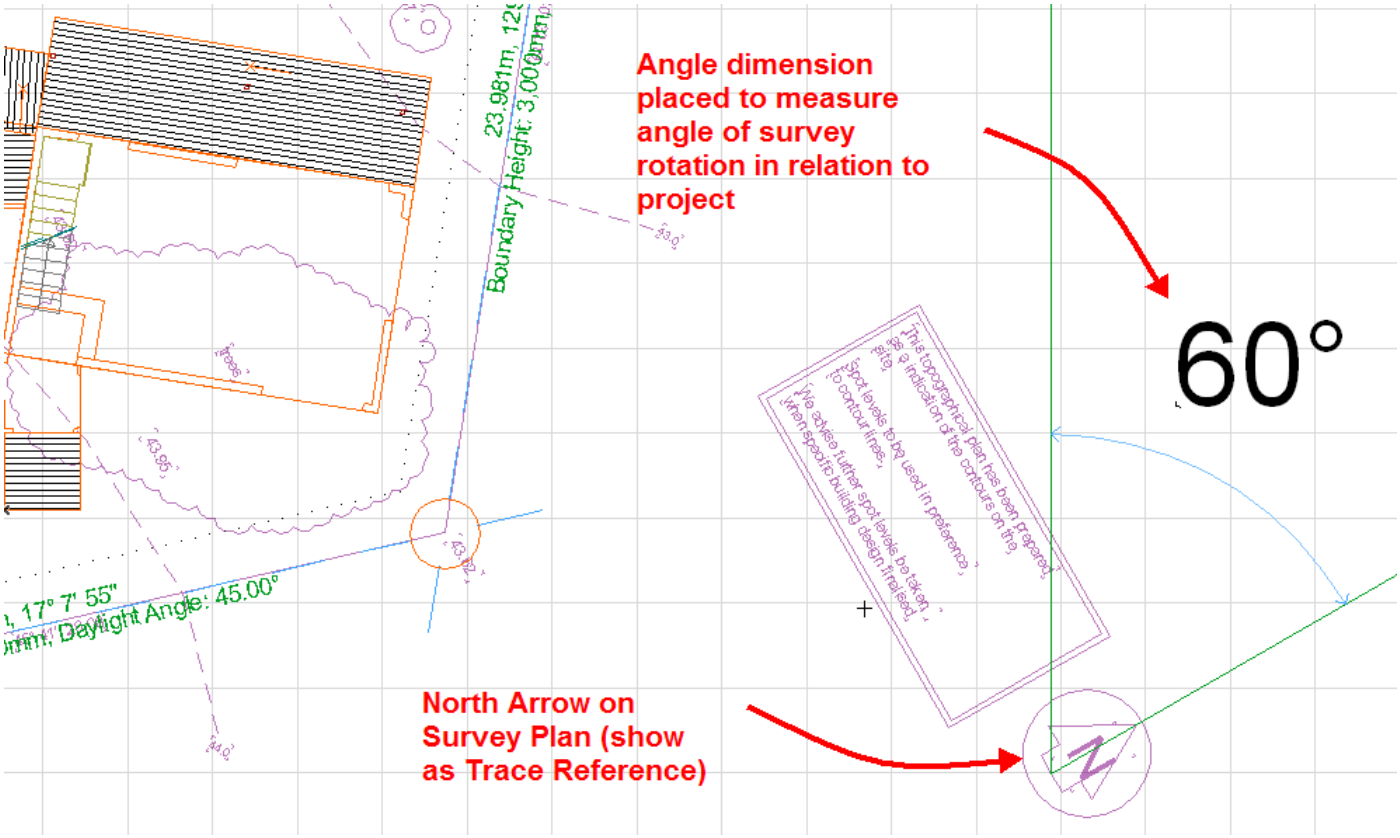
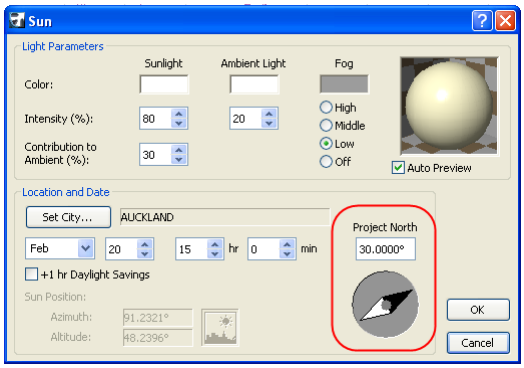
Sun Studies and Shadow Diagrams

There are typically two reasons to document the effects of the Sun in ArchiCAD, to display the effects of the Sun on your Building > Sun Studies or the effects of your Building on the surroundings > Sun Shadow Diagrams.

Being able to communicate how the sun casts shadows on and how far the Sun penetrates into your Building is often critical especially now that environmental considerations have become higher in the list of design priorities. Natural Daylight is cheap heating and lighting but can produce glare and overheating if not controlled. The ArchiCAD inbuilt sun allows us to accurately model and display the effects of the sun on our building. In order to display the sun accurately we need to model our Building accurately. This means the site and where our building sits on the site needs to be accurate; the old adage rubbish in, rubbish out, bears true. I refer you to Tips ***Setting Up Stories*** *28/11/2007* and ***Site Modelling*** *31/05/2007*.

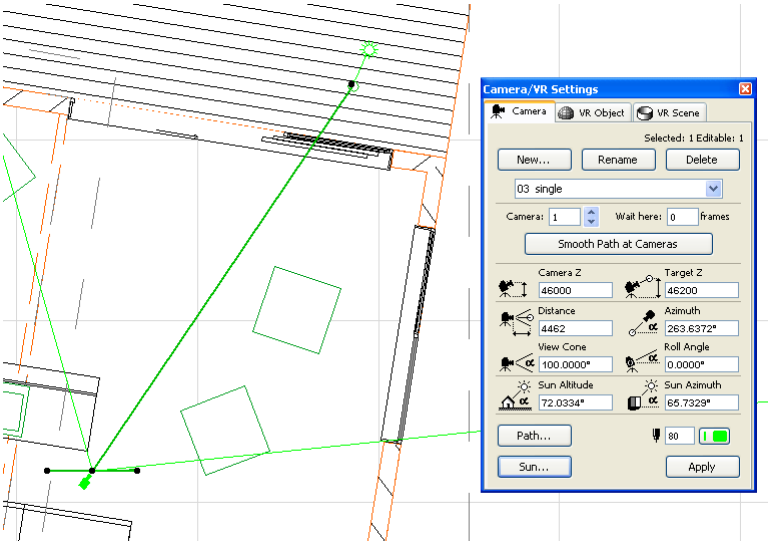


Firstly, the North direction needs to be set. Typically we draw buildings with their major dimension running horizontal and rotate the site, and consequentially north, around this. Checking with your survey data, calculate the angle North has been rotated from vertical and enter this into ArchiCAD ***View > 3d Projection Settings > More Sun***. Remember that in ArchiCAD, 0° is horizontal and 90° is vertical so in the example shown 90°-60°=30°. If you have placed any North Arrow objects in your ArchiCAD project these will automatically rotate to this North Angle. Also, in the Sun dialog you can set your location. There are 174 locations set in the New Zealand version of ArchiCAD; everything from Parnell to Ross. If your locality is not included, or for extra accuracy, you can set the Longitude or Latitude for your particular site using a GPS or one of the many web based mapping systems. You can also set the date and time of day; remember to include daylight savings if applicable.



Now that your building is accurately located we can start looking at the sun's effects on your building. There are a number of different ways to illustrate how the sun is going to fall on your building.

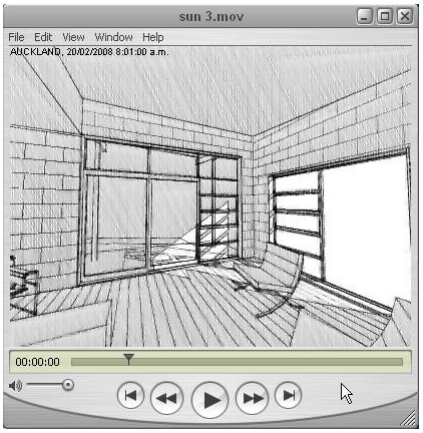
Sun Study

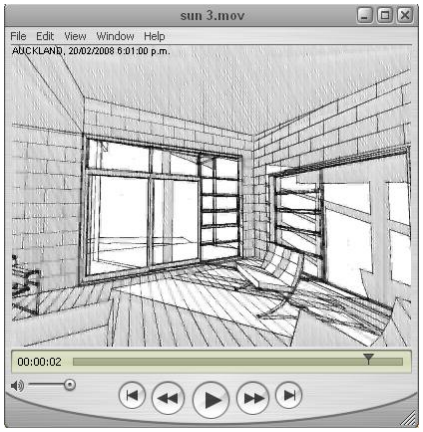


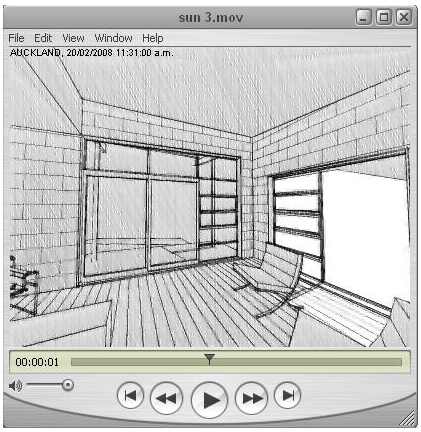
Often as a design tool it is good to create a study of a particular space to illustrate the sun's path over a day. Place a camera in the position that you wish to view e.g. in the living room of a dwelling. In the Camera / VR Settings dialog you can also edit the Sun settings and check your Date Time and Location settings.

Once you have Set the Camera and Sun settings and are happy with your 3d view, Choose ***Document > Creative Imaging > Create Sun Study***. Within the Create Sun Study dialog you can choose to render in the 3D window (open GL) or the PhotoRendering Window using your current PhotoRendering Settings. *Tip: Often it is good to do a quick render in the 3D window to check your settings before setting off potentially a time consuming PhotoRendering.*

Within the Create Sun Study settings window you are able to set the Date and the duration of the Sun Study and the interval. The interval is the time between frames, e.g. 30 min; more interval equals a longer render. As per all renders you can choose a Result: (format) Typically this will be quick time movie; other image formats are available. The Sun Study will time stamp each Frame / Interval in the top left corner for reference.

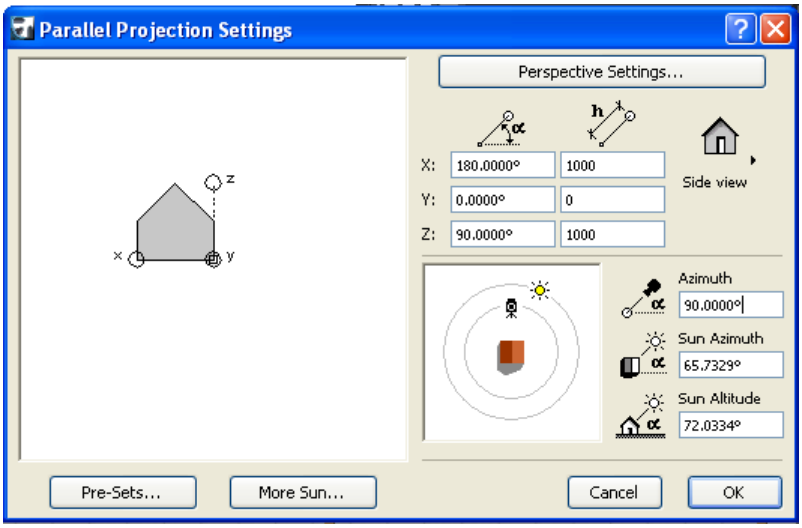




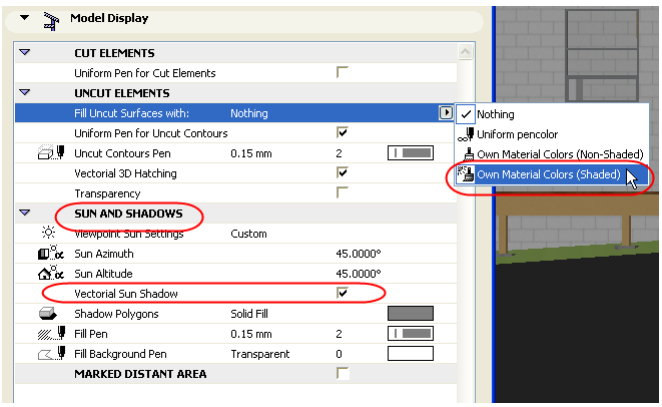


Illustrating Shadows in Elevation

Sun Studies can also be used to illustrate Façade Sun Studies. These can be generated by viewing the model in Parallel Projection. ***View > 3D View Mode > 3D Projection Settings > Parallel Projection Settings.*** This means you can render a movie of the model in a flat elevation view. It is also good for viewing your model quickly in 3D rather than generating an elevation.



Another way to illustrate Façade Sun Studies is to turn on Shading in the ***Elevation Settings > Model Display*** dialog.



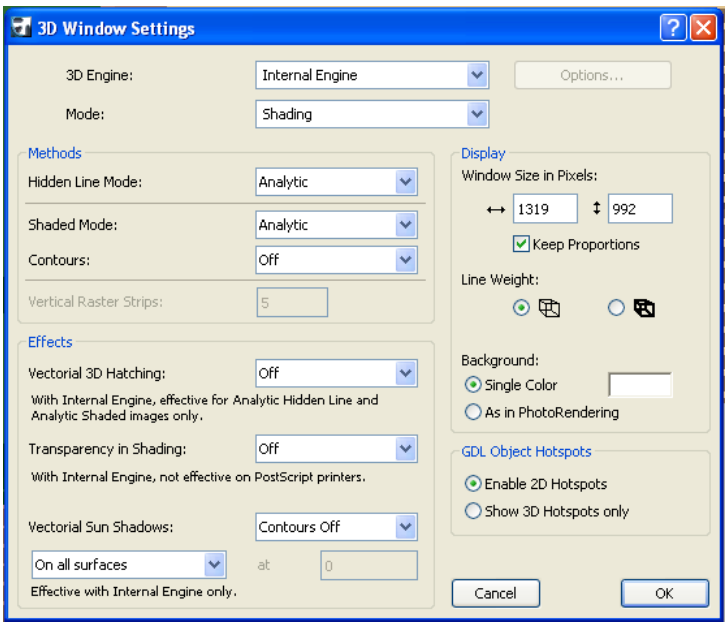
There are two options in the Elevation Settings;

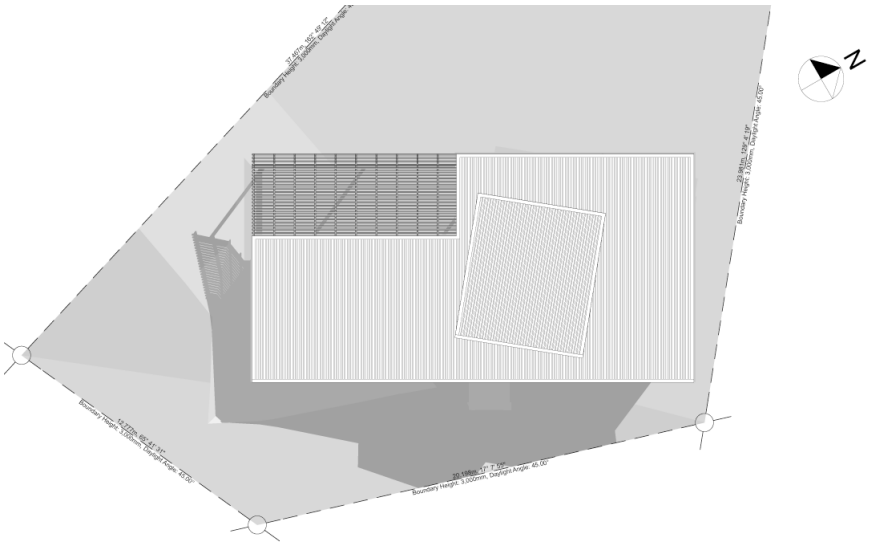
- **Uncut Elements** > Fill Uncut Surfaces with; allows for a simple Own Material Colours Shaded view using ArchiCAD's inbuilt "ambient" lighting.

- For more accurate sun shadows in Elevation, **SUN AND SHADOWS** allows for Vectorial Sun Shadows to be projected on the model. These can either use your 3D window settings (i.e. a specific time of day), or custom settings. Typically for custom settings, 45° will give nice generic shadows. I always recommend custom settings for the South elevation unless you are working in the northern hemisphere.

Shadows in Plan

Illustrating the shadow footprint of a building is often critical to show proposed developments and their effects on neighbouring properties. Firstly, view your model in 3D using Parallel Projection Settings Top View. Then in the 3D Window Settings set it like the screen shot. This will show your model casting accurate shadows (in accordance with your date, time, location, and model). This 3D view can then either be saved as various views with different time of day, or rendered as still images.



Another technique is to save out the shadows as 2D fills. From the 3D window choose file save and choose ArchiCAD 2D Lines (*.2dl). This 2dl file can then be merged into a plan view e.g. a bulk and location plan, to overlay different times of day / year.

Note: Over the years we have had a few people requiring further information on the accuracy of the Sun in ArchiCAD. There is actually an ArchiCAD Wiki topic on this http://archicadwiki.com/TechNotes/Sun_Study_Accuracy. Whilst this shows ArchiCAD to be very accurate, you may wish to ratify the data ArchiCAD generates with your local observatory and manual calculations especially if your documents are being used in legal proceedings.