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# A guide to calculating roof orientation using Cadcorp<sup>©</sup> SIS

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The orientation of a property's roof plays an important role in the efficiency of a solar thermal or photovoltaic installation. Ideally, in the Northern Hemisphere, the roof should face due south. Deviations from south will effect the overall performance of any installation:

W	SW	S	SE	E
78%	94%	97%	94%	78%

Cadcorp<sup>®</sup> SIS can be used to assist in the surveying of properties so that any investments in solar thermal or photovoltaic can be targeted on those properties where the best returns will be made.

### Step 1: Aerial Imagery

By using Aerial Imagery is it possible to deduce the roof types of your stock. It should be noted that a domestic installation will require roof space of at least 5m<sup>2</sup>

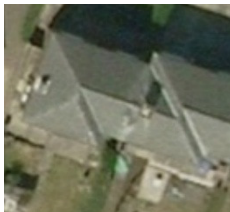
Roof types fall into these main categories:

- ◆ Flat
- ◆ Pitched
- ◆ Mono Pitched

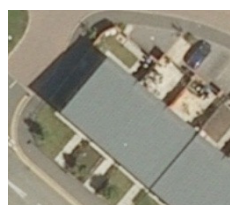
Flat roofs can still be used for installations but the costs might be increased by the additional work required.



Pitched roofs can advantageous as they give a couple of placement opportunities, and some, depending on the design of the roof, might give more.



Mono Pitched roofs are mainly seen on more modern properties. These can be problematic especially if the orientation of the roof is North.



An additional benefit of using Aerial Imagery is that you can check to see if trees or other buildings might create shadows that will affect the efficiency of installation:



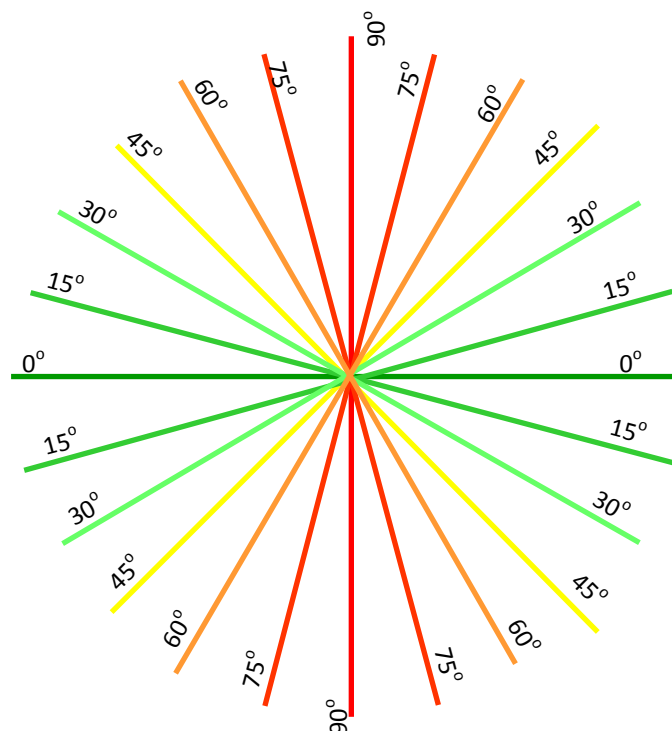
## Step 2: Creating an overlay

The second step involves creating an overlay that will capture the information on the roof orientation.

We will need the following columns adding to the Schema:

1. Number of Vertices
2. Roof Type
3. Roof Orientation

1. Number of Vertices. The number of vertices column uses a system property: `_np&`. This column is used for quality control purposes. When creating the lines that are used to calculate the roof orientation it is important to ensure that each line only has two vertices. More than this will cause the formula to give incorrect results.
2. Roof Type. As you record the roof orientation additional information on the roof could be captured.
3. Roof Orientation. This column will return the angle of the line in relation to due south. A roof that is perfectly orientated to south will return a value of 0. A roof that is orientated directly East or West will give a value of 90.



The formula for calculating the angle of the line is thus:

$\text{Round}(\text{ATan2}(\_sy\#, \_sx\#) * (180/3.14159265), 1)$

This formula basically calculates the tangent of the line which is then converted to an angle.

### Step 3: Data Capture

The data capture involves creating lines that follow the line of the roof of a property that is most suitable for the installation. It is important to remember that multiple properties can be captured at once. There is no requirement to create lines for single properties as long as the properties are all facing in the same direction. This can be especially beneficial in areas of terraced properties. Properties on Cul-de-Sacs, tend to have properties that face in all different directions.

In the example to the right the line string is “snapped” on to the Mastermap Topology Building Outline. This will make for accurate results.



Some areas will be more challenging, especially Cul-de-Sacs! In the 2<sup>nd</sup> example right, we have multiple roof aspects and orientations. Remember the main roof aspect might not be the most suitable but another aspect might provide an alternative.



#### Step 4: Capturing the results back to your property database.

It is useful to be able to save the results against your property data. If the lines crossed your property address seed points you could be able to use a SIS spatial query to capture the data. It will be more likely that your property addresses will not coincide with your lines.:

Instead create an overlay of Mastermap building polygons for your property stock. This can be achieved by selecting all your properties and then using a query to select only those building polygons that contain your address points.

Secondly capture your property reference against each polygon, this can be achieved via the spatial query (retrieve a value from a contained item).

You are then ready to capture the roof angle to your property polygons.

I achieved this by adding a schema column to my property polygons table with the following formula:

```
FindItem("Roof Aspect Table", 4, 2).roof_angle#
```

Where:

**Roof Aspect Table** is the table containing the lines describing the roof aspect

**4, 2** captures data from lines where they crossing the geometry of a polygon

**roof\_angle#** is the column in the Roof Aspect Table that contains the angle. The data in this column will need to be copied from the column containing the formula that calculates the angle, this can be achieved in table view by using the Fill Column button.

