

Slating & Tiling

TIPS **36**

Conversion of plan to pitched dimensions

It's easy to measure up something that is relatively small using a tape measure or ruler, but it becomes more difficult when the thing in question is bigger than you are – like a building – especially when you are unable to reach the ridge without a scaffold.

To overcome this there are ways of counting tiles or brick courses, and multiplying by the average module size – such as brick courses 75mm high or plain tiles 165mm wide. But there are times when there is no physical building to measure, only a set of plans, and then measuring the distance between lines on the plan with a scale rule and measuring angles with a protractor are essential skills.

When measuring anything to obtain volumes, areas, and lengths of material, there are short cuts, rules of thumb and mathematical tables to help you, and pitched roofing is no exception. Here are some of the more useful methods.

Natural secants

Degrees	Factor
12.5°	1.0243
15°	1.0353
17.5°	1.0485
20°	1.0642
22.5°	1.0824
25°	1.1034
27.5°	1.1274
30°	1.1547
32.5°	1.1857
35°	1.2208
37.5°	1.2605
40°	1.3054
42.5°	1.3563
45°	1.4142
47.5°	1.4802
50°	1.5557
52.5°	1.6427
55°	1.7434
57.5°	1.8612
60°	2.0000

~ If the rafter pitch is 27.5°, and the horizontal dimension is 4.2m, then the rafter length would be 4.735m (1.1274 x 4.2 = 4.735).

Scales

The scale of a drawing is normally indicated in the title box but may not be accurate, especially if the drawing has been reduced on a photo copier or faxed.

Provided there are some dimensions written on the drawing, such as a setting out grid or a door height, it is possible to compare the dimension with the scaled measurement. Once you are certain that the scale is correct you do not need to use a scale rule to take dimensions.

A scale of 1:50 says that dimensions on the drawing are 50 times smaller than in real life. Therefore any distance measured on that drawing with a tape measure, multiplied by the scale (1:50), will give the true dimension on site.

Of course, scale rules are more accurate than a tape measure and easier to use on a desk.

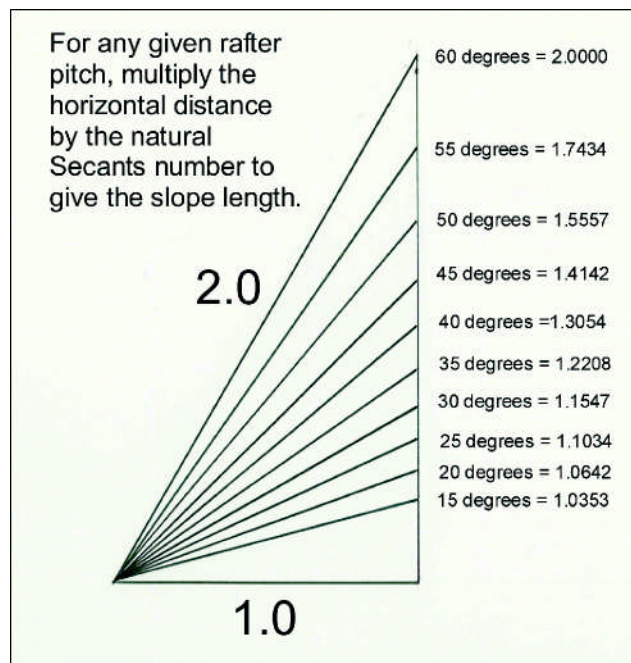
Graphic

If you only have a roof plan and know the rafter pitch, draw the angle relative to the straight line that forms the gable end of the roof using a large protractor. The distance along that line, between the fascia board and the ridge board, will be the scaled length of the rafter. This does not work for hips and valleys as they will always be a shallower angle than the main rafter pitch.

If you need to draw a right angle or need to draw a vertical line from a horizontal line, the corner of a sheet of A4 paper is always 90 degrees.

Natural secants tables

If you have a roof plan and no section through the building showing the length of the rafter, provided you know what the rafter pitch should be it is possible to calculate the rafter length from the horizontal distance from



the fascia board to the ridge board.

We know that the rafter length will always be longer than the horizontal distance from the fascia board to the ridge board and will vary with the angle (pitch) of the roof. The steeper the rafter the longer it will be.

There is a direct mathematical relationship between the horizontal distance and the rafter length for any given angle. Like Sine, Cosine and Tangent in trigonometry there are other relationships, one of which is Secants. Natural secants are tables of the relationship between the angle and the hypotenuse of a triangle when the horizontal (adjacent) distance is one.

When using the tables, you look up the angle (pitch). The figure found should be used to multiply the horizontal distance, and the result will be the rafter length (see table).

Total roof area

If you are measuring the total area of a pitched roof, and all rafter pitches are the same, it is not essential to measure each roof slope separately and add them together, especially if there are a lot of small roof slopes.

By measuring the length and width of each rectangular part of the building, and using the natural secants figure for the rafter pitch, all three can be multiplied together and the answer will give the total roof area. A

hipped roof will have the same roof surface area as a mono pitch, or duo pitch (gable to gable), for the same building footprint.

Tips

- Never trust the scale of a drawing that has been copied or faxed.
- If you have lost your calculator, or are poor at maths, draw the roof to scale and measure the rafter length.
- Natural secants tables can give you a multiplication factor for any angle down to one minute of angle. Half a degree is a more realistic figure on site.
- Calculating the total roof surface area is a good final check after all the fine calculations have been completed. It is easy to miss a roof slope on a complicated roof.

Compiled by Chris Thomas
The Tiled Roofing Consultancy
2 Ridlands Grove, Limpsfield Chart
Oxted, Surrey RH8 0ST

tel 01883 724774

Email:

chris.thomas@thetiledroofingconsultancy.com

To view previous Slating & Tiling Tips,

go to

www.thetiledroofingconsultancy.com