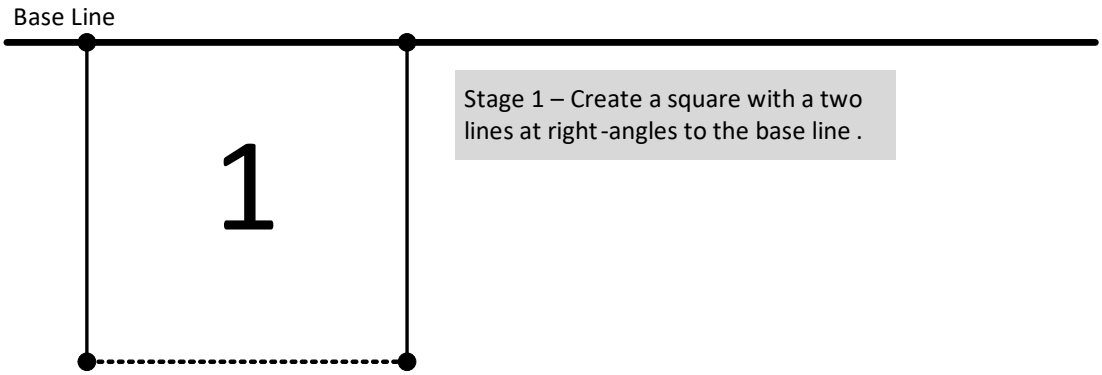
Basingstoke Archaeological & Historical Society (BAHS)

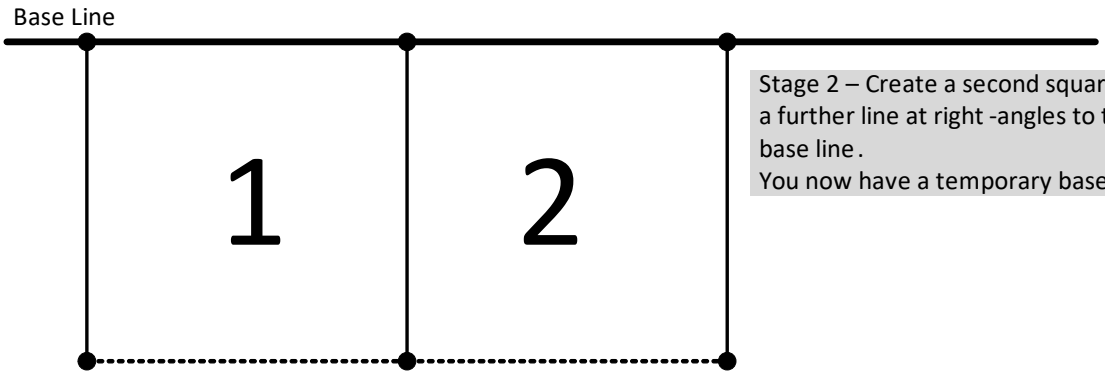
Survey Techniques

How to set up a grid for a site; for geophysical surveys and field walking

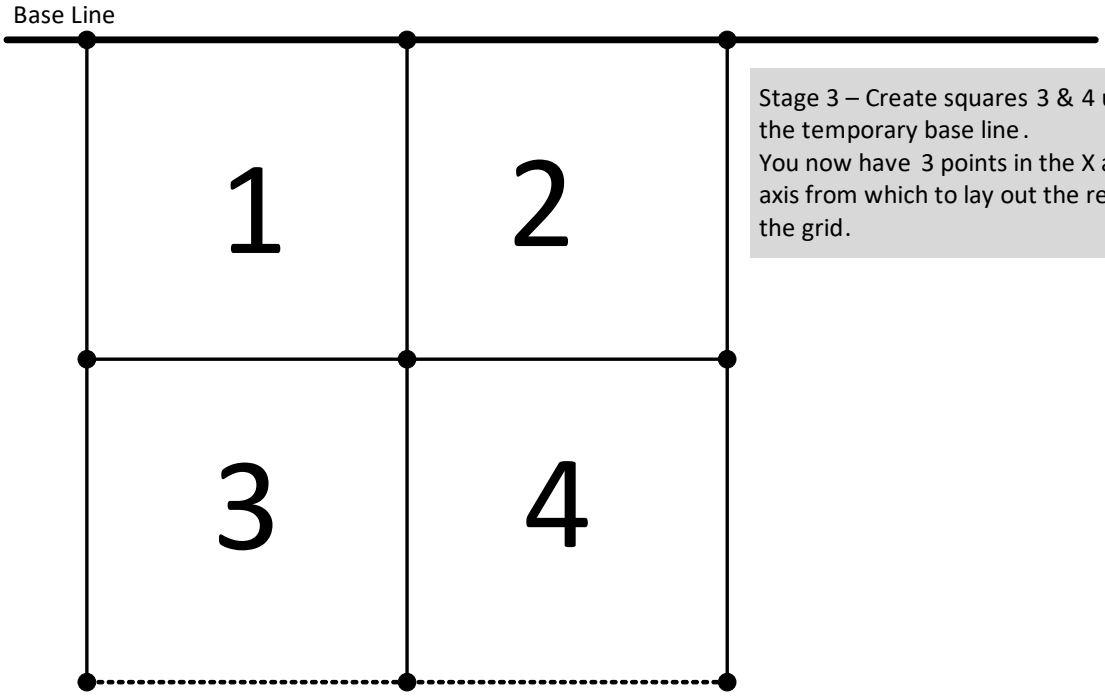
Contents



Stage 1 – Create a square with a two lines at right-angles to the base line .



Stage 2 – Create a second square with a further line at right -angles to the base line .
You now have a temporary base line



Stage 3 – Create squares 3 & 4 using the temporary base line .
You now have 3 points in the X and Y axis from which to lay out the rest of the grid.

How To Set Out A Grid

Think before you plan

We use a grid as a reference to understanding the position of features or finds in two dimensions so that when we draw plans or analyse results we can align them relative to other features in the landscape. When you first arrive at a site where a grid is to be set up you need to tune into what you see around you. Setting up a grid on level ground in a rectangular field is fairly straight-forward, but most of the time the area to be surveyed will not be level and the field boundaries will not form a neat rectangle. The sorts of things that you should consider are:

- Is the grid for one off use or will it need to be re-established?
    - On a site that is going to be dug for multiple seasons you need to consider having some solid reference points that you can return to
- For a landscape, fieldwalk, or geophysical survey:
    - The survey will usually be done using 10 or 20 M squares
    - Is there an optimum way to cover the ground to be surveyed?
    - Are there any obstacles such as trees or structures that need to be worked round?
- Do you understand the shape of the area to be surveyed?
    - Is there an OS map that gives you a birds eye view of the shape of the field?
    - Otherwise you should measure or pace out the field to understand its shape

Using Ranging Poles

We use 2 M ranging poles as a quick way of being able to determine that we have a straight line across the survey area. The way they are used is that they are put in place and aligned by eye so that when you look down the line of poles you can only see one pole. You will need a helper to put the poles in place and re-position them, according to your instructions, so that they are aligned.

When starting out to establish a base line, you might place the first pole in position, and then pace out about 10 M to next pole and 10 M to the pole after that. Once you have tapes in place, you can use measurements to space the poles equidistantly.

The principle is that you can always create a straight line between two points, but if you have 3 or more, then the third and subsequent poles will always be in a straight line.

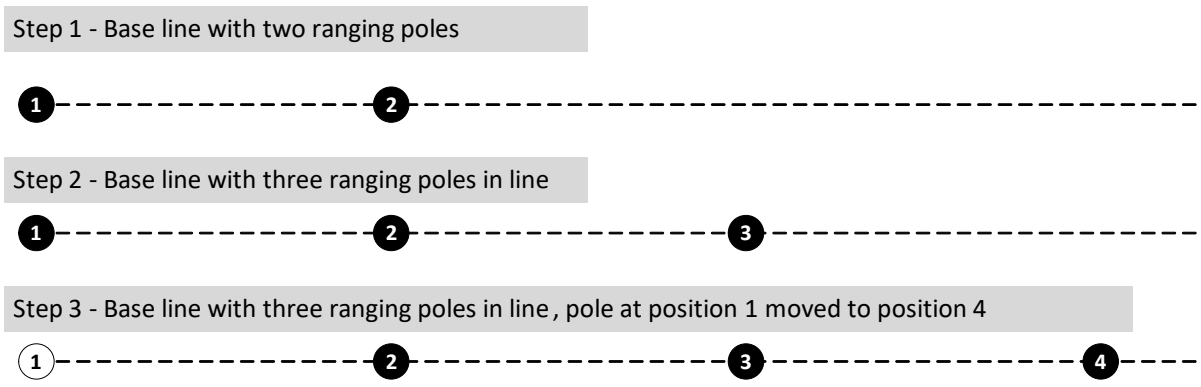


Figure 1- Using ranging poles to establish a base line

You will not have an infinite supply of ranging poles, so provided you put a peg or another marker such as a bamboo can at the position of the first pole you can always move it to become the fourth pole in the sequence.

Establishing A Baseline

The baseline for the grid should usually run along its longest edge. It needs to be straight, otherwise it will introduce errors into the grid. The simplest way to create the base line is to put a peg at one end and run out the longest measuring tape you have in a straight line. If the base line is below about 30 M in length and the ground is reasonably level, pulling the tape taught between two pegs will suffice.

However, if the base line is longer, or has complications like a slope or a dip, you should use ranging poles to ensure that the base line is straight. Remember, a field boundary may not be as straight as it first looks, especially if the ground is not level.

Once you have established the base line, leave the pegs in place so that you can come back to it and layout tapes etc again if you need to.

How to get a right angle

A grid is formed using squares, this means that we need to have an easy way to make sure that any grid lines measured from the baseline are at a right angle to the base line. The easiest way to do this is to use triangles with side ratios of 3, 4, 5. The two short edges of the triangle should be measured along the base line and the grid line.

For instance, you would take a tape and peg one end of it at the 10 M mark on the base line. Then you would measure 4 M on the tape at what you judge to be a right angle, and put a peg in the ground to mark the point and then thread the tape around the peg and bring it back to the base line 3 M away from 10 M (either 7M or 13M). The long edge of your triangle should be 5M long to make a right angle (i.e. 9M since you already have 4M for the other short edge). If this is not the case, either peg the tape at the 9M length, or get someone else to hold it there. Then go back to the 4M peg and adjust its position until it is at 4M and the 5M edge of the triangle is taught. You should then have a right-angle. Put a peg in the ground at this position.

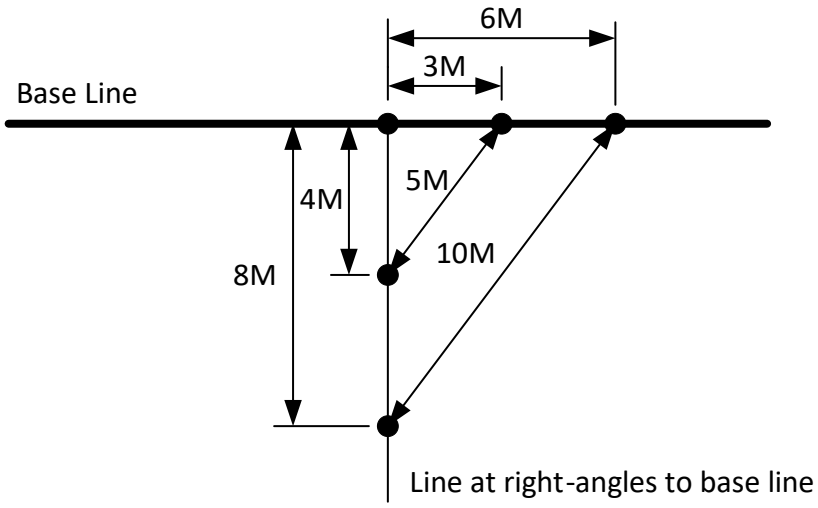


Figure 2 - Using 3,4,5 triangles to measure a right-angle to a base line

Then repeat the process by measuring 8M out from the base line, measuring 10M along the long edge to a position 6M away from the 10M point (4M or 16M). Once you have the second peg in place you will have three points which will be in a straight line at a right angle to the base line.

Run out the tape to 10M or 20M depended on your grid square size making sure that it is straight and aligned to the 3 points. Use 3 ranging poles to make sure that the line is straight and runs through the measured right angle.

Creating A Grid

The grid is formed by planning a succession of lines at right angles to the base line. Draw two right-angles lines at either 10 or 20M apart on the base line to create your first grid square. Check that the length of the unmeasured side of the square, opposite the base line, is either 10 or 20M. If it is not, then you will have to check your measurements.

The final check is to check the diagonal length between the corners of the square, for a 10M square, this will be 14.142M and for a 20M square, this will be 28.284M.

The next square in the grid can be formed by measuring in another right angled line at 10 or 20M along the base line. Once this is done the 3 measured square corners can be used to set up a new temporary base line with a tape. You then repeat the original process to form 3 more squares measured from the temporary base line. Once these squares are in place you are in the position to add more grid squares as required.

Field Survey Grids

For a field survey, once you have the four starting squares in place, you can use ranging poles to extend the grid, by placing them in the corner of the grid square and then measuring out the length of the grid square and aligning the pole with the poles in the other grid squares. You should measure the distance between the poles every now and again to make sure that the grid is still square.

Across a large area, you will need to use bamboo canes to mark the square corners, placing one at each grid intersection. After a while you should find that you can add extra rows to the grid relatively quickly.

Site Grids

For a site grid, you should use 10M grid squares. You should aim to measure in all of the squares to ensure that the grid is as accurate as possible. You can still use ranging poles to get the first pass level of accuracy, put you should double check and make any adjustments in the position of the grid squares.

The corner points in a site grid should be marked with their position from the base line in terms of X, Y using a visible peg and a label. This is so that when plans are drawn, the plan can be measured into its position on the grid by running a tape between the relevant grid pegs.

Finally, a sketch plan should be made of the grid relative to known features on the site so that there is a bird’s eye view of the grid. This may come in handy at a later point in time when an overall site plan is being prepared and there are discrepancies that need to be resolved.

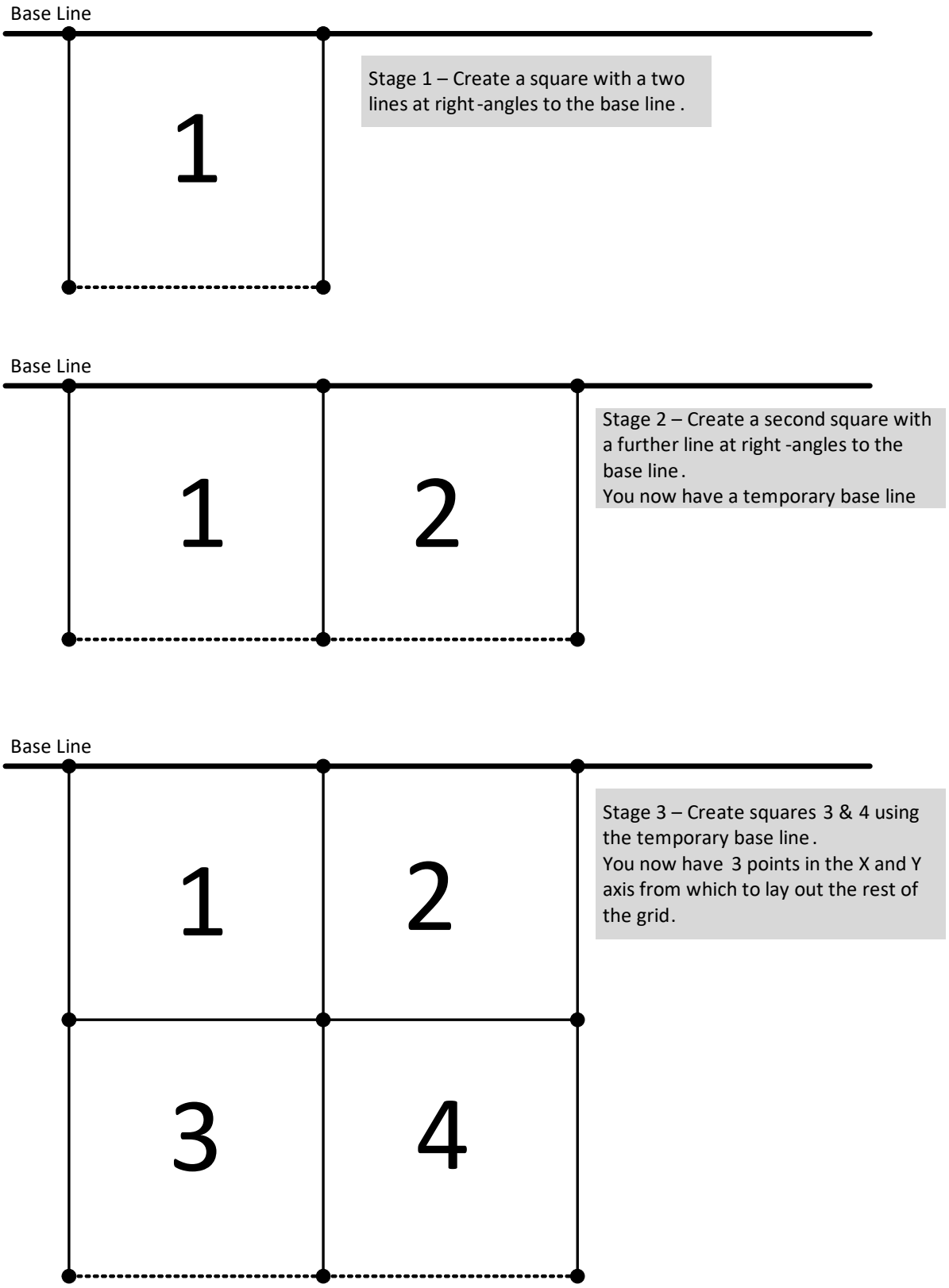


Figure 3 - The initial stages of creating a grid

Survey Look Up Tables

The theory behind the measurement and planning of right angles is based on Pythagorus theorem which is that the square of the hypotenuse of a right angled triangle is equal to the sum of the square of the other two sides. The 3, 4, 5 ratio is easy to use (9 + 16 = 25), and the following table has a set of equivalent ratios that might be useful in the field:

Shortest side	**Longest side**	**Diagonal**
3	4	5
6	8	10
9	12	15
12	16	20
15	20	25
18	24	30

Diagonal measurements of different sized squares:

Square side dimension	**Diagonal dimension**
5M	7.071M
10M	14.142M
15M	21.213M
20M	28.284M
25M	35.355M
30M	42.426M