
SURVEYING GUIDELINES

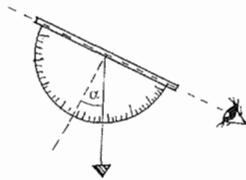
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Equipment

- 5 metre steel tape (Because a steel tape is fairly stiff, it will let you take vertical as well as horizontal measurements while standing on the ground.)
- A3 sketch pad with a firm back, or sheets of paper fixed to a clipboard
- pencils - 2H, HB and 2B
- pencil sharpener
- eraser
- metre stick

For larger buildings or outdoor spaces, you will also need

- a 20-metre steel tape (or longer)
- some timber stakes to drive into the ground
- a large ball of string



Another useful tool is a **clinometer**. It is used to work out the height of things. You can make one of these yourself - your maths teacher may be able to help.

Bring a **camera** if you can. Use it to photograph whole facades, typical doors or windows or details which are too complicated to draw, such as decorative carvings or interesting ironwork. Later, when you make your models or drawings, you may discover that your photographs include important information which you did not notice at the time. A tripod and a small builder's level will help you to take more accurate photographs.

Working in pairs and in teams

You should be able to survey a single room in your own home by yourself. But for other surveys work in **pairs**. One person holds the end of the tape and records the measurements while the other reads them off the tape and calls them out to their partner.

If you are surveying a large or complex building, divide up the work by assigning different floors or parts of the building to different pairs. Some measurements running the whole length of the building will help to tie together the work of different pairs when everyone is back in the classroom.

Sometimes, you will need to work in **teams**. A team consists of as many pairs as are needed to complete the survey in the time available. First, each team makes its own survey. Then, back in the classroom, each team makes a complete set of drawings using the measurements it has taken. This is particularly valuable if you cannot easily return to the building to re-check measurements - if you have to travel some distance to the building, or have to make special arrangements to get access to it. A measurement missed by one team may have been taken by another. Puzzles and discrepancies which emerge during the drawing phase can often be sorted out in discussion between teams.

Measurements

Measurements are always written in **millimetres**. This means that you don't have to write "mm" after every measurement you record on your drawings. Centimetres are never used in an architectural survey.

Deciding what to measure

Before you start your survey, you must decide what it is for.

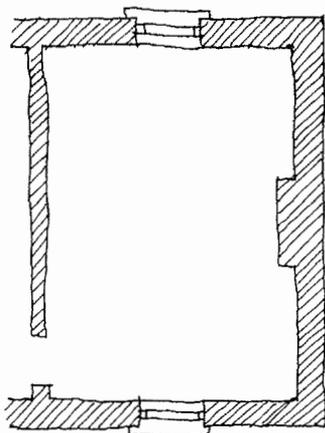
If you want to re-design your bedroom, you don't need to know the thickness of the outside walls of the house. But you do need to measure the position and dimensions of doors, windows, built-in cupboards, radiators, light switches and electric sockets, and the size of any furniture in the room.

If you just want to make a model of the outside of the building, there is no point in gathering information about the rooms inside. Instead, you will need to record the length and height of the building, doors and windows, the shape of the roof, chimneys, steps, porches and so on.

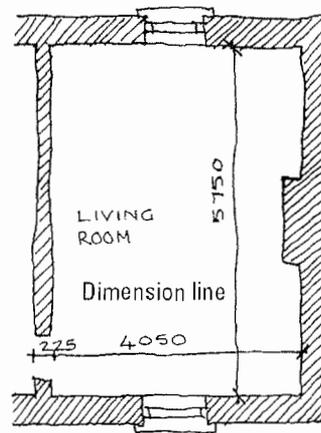
Surveying a room

First, have a good look around. Then draw a rough plan of the room. Do this as carefully as you can, noting the shape of the room and the approximate position and width of doors, windows, recesses and any other major features. You will be recording your measurements on this drawing later. Make it as big as you can so that you will have plenty of room to write.

Start by measuring the length and width of the room. Draw **dimension lines** on your plan to show where the measurements were taken. Write each measurement beside its dimension line.



Draw a rough plan of the room

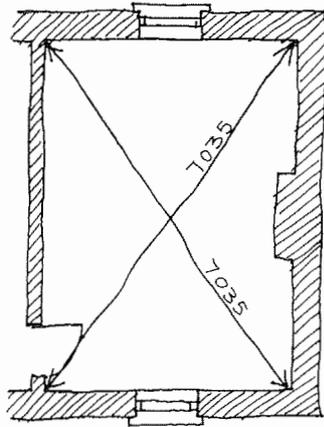


Measure the length and width of the room

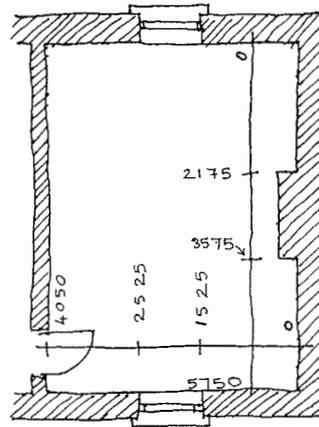
Sometimes, the corners of rooms are not proper right angles. This can cause you a lot of trouble later when you try to draw the plan accurately - you will think you got

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your measurements wrong. To avoid this, take **diagonal measurements** from corner to corner of the room. If the two diagonal measurements are the same, there is generally no problem. If the measurements are different, record them on the same plan.

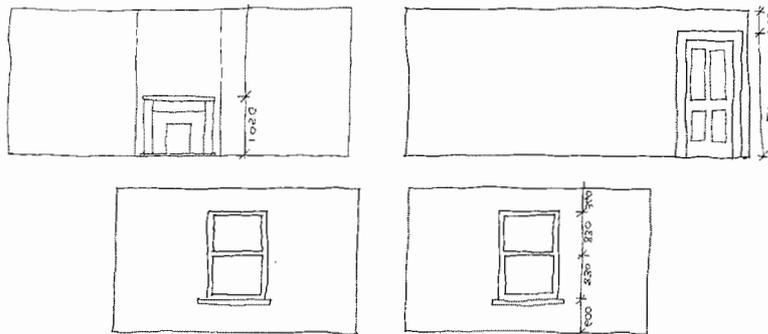


Check diagonal measurements



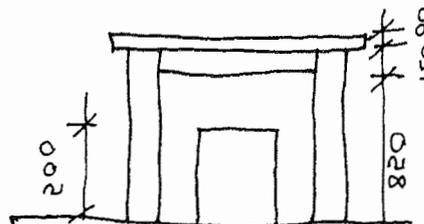
Take running measurements

Next, starting in one corner, take **running measurements** along one wall. Note on your plan where each window, door, recess and so forth starts and finishes. When you get to the next corner, start at zero again and measure the second wall. Continue around the room, measuring from zero at each corner, until you get back to where you started.



Wall elevations

Now record the heights of things. Draw a rough elevation of each wall of the room. Then measure the heights of ceilings, doors, windows, cupboards etc. Note the measurements on your elevations, using dimension lines just as you did on your plan.



Detail

If you come across something you want to measure in detail - an interesting fireplace or window, for example - make a separate sketch of it at a larger scale. Use another sheet of paper, if necessary. This will mean that your main drawing does not get too crowded.

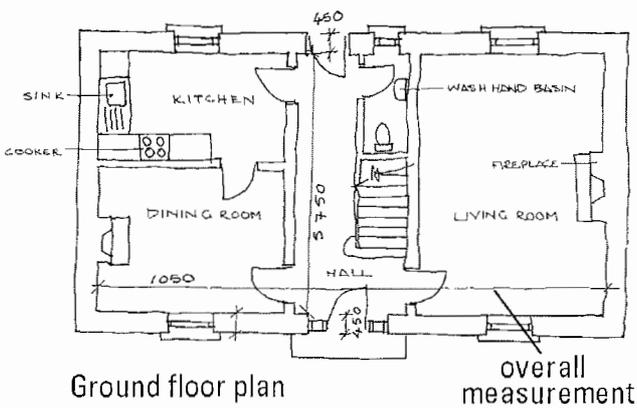
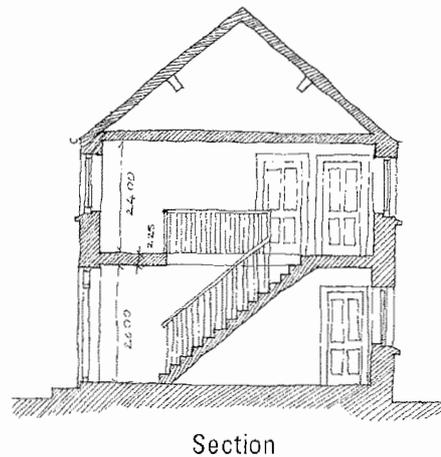
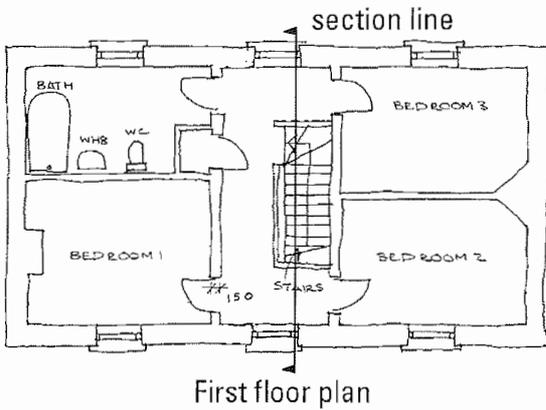
Surveying a building

Indoors

If you are surveying a whole building, you will have to survey each of the rooms inside, as well as any halls, stairways, landings etc. (If there are several identical rooms, you need only survey one of them.)

Measure and record anything which is part of the building or which is “built in” - steps, stairs, kitchen fittings, WCs, baths, showers and washbasins, built-in wardrobes, fireplaces etc. Don’t worry about details like light switches or electric sockets.

You will also need to get one or two overall measurements which take in the whole width and length of the building. This will help you to fit all of the rooms together correctly when you come to do your drawings.



Try to measure the thickness of the walls and floors of the building. Sometimes this is difficult to do. The outer walls, and any interior walls which support the floors above, are usually the thickest. Other interior walls may be thinner. The thickness of upper floors can often be measured where the stairs meet the landing.

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If you are not able to find a place where you can measure the thickness of a wall, you may be able to work it out. If you have taken overall measurements of the whole width and length of the building, and you have the internal measurements of each room, you can usually calculate how thick each wall is.

If you can't get or are unable to calculate measurements of wall or floor thicknesses, it is reasonable to assume that outside walls are about 300 mm, interior walls are about 120 mm and floors about 200 mm thick.

Outdoors

If you are surveying the outside of the building, make a sketch of each facade (elevation) you want to measure. Note doors, windows and any other important features. Then take measurements.

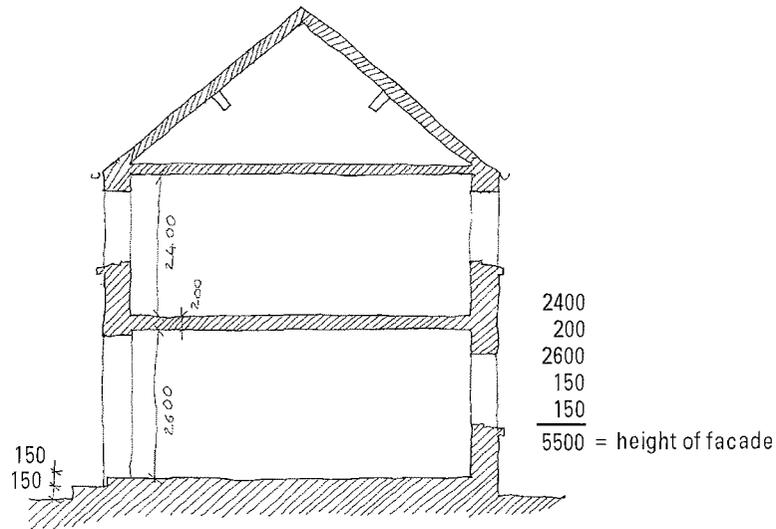


It is usually easy enough to measure the parts of the building near the ground. Take **horizontal measurements** along each wall just above the window sills. Note where windows, doors and any other features start and finish. Measure right around the building, starting at zero at each corner. Then take **vertical measurements** as high as you can reach from the ground. As you go along, note all of your measurements on the sketches you have made.

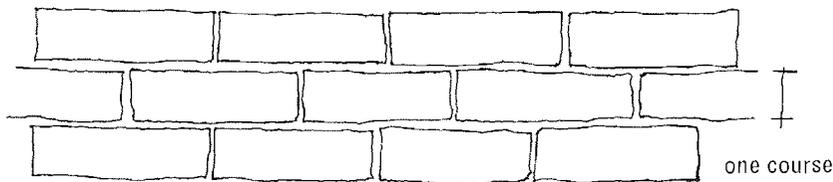
You may also want to record what building materials are used or the colours of different finishes. Don't forget to draw in chimneys, gutters, rainwater pipes and any other details - these will make your final drawings much more realistic looking. Here are a few techniques for measuring higher parts of the building.

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1. Use the vertical measurements that you took indoors. In a two-storey building, for example, the height of a ground floor room + the thickness of the floor + the height of a first floor room will be about equal to the height of the facade. (You may find that the ground floor inside is a little above ground level outside. You can check this at the front or back doorstep, and add in the measurement to arrive at the height of the facade.)



2. If the building has a facade of brick or stone, measure the height of one “course”. (Course = height of one brick/stone + one joint.)

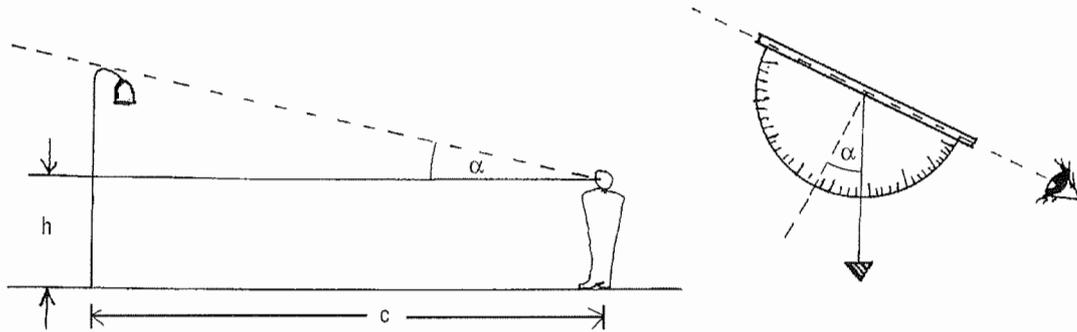


Count the number of courses in the height of the building. Multiply the height of one course by the number of courses to find the height of the facade. You can use this technique to calculate the height of windows, the depth of window sills, and the height and position of any other features. To calculate the horizontal distance between two windows, count the number of bricks or stones between them. Don't forget to include the width of the joints.

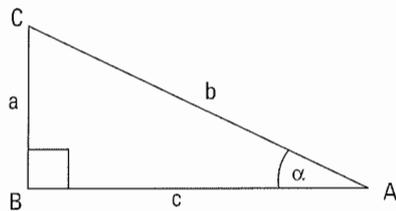
3. If the building has a very uniform pattern of windows, for example, you can measure the arrangement on the ground floor, then apply the same measurements to upper floors.
4. Use a clinometer.
Stand in front of the vertical object - a lamp post for example - whose height you

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want to measure. Measure the distance 'c' between you and the lamp post. Measure the distance 'h' between your eye level and the ground. Aim the sight of the clinometer at the top of the lamp post and read the angle 'α' between the weighted string and the 90° mark on the protractor.



Once you have these three pieces of information you can use trigonometry to calculate the height of the post = h + a. You already know the value of 'h'. To calculate the value of 'a' use trigonometric tables and the equation below. The angle B is 90° (because the lamp post is vertical). The angle A is 'α' = the angle measured on the clinometer.



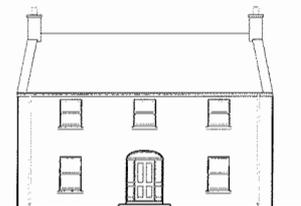
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

5. Use a camera. Instructions on how to do this are given below.

Using a camera

Use a 35 mm camera with wide-angle lens (24 mm), if possible. If the back of the camera is held parallel to the face of the building, the photograph of the building will have the same proportions as the building itself. If the camera is tilted up or down, or held at an angle to the building, you will get a distorted photograph.

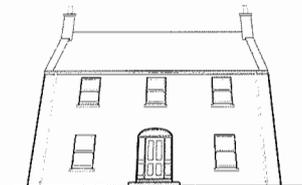
Lines of the roof converge because the camera is not parallel to the roof surface



Camera parallel to the facade.
No lines converge on the facade.



Camera rotated to the right.
Lines converge to the right.



Camera rotated upwards.
Lines converge upwards.

To make sure the camera is parallel, use a tripod. Use a small builder's level to make sure that the camera is not tilted.

Taking the photographs

1. Position yourself in front of the building so that you can see the whole facade in the viewfinder of your camera. Stand as close to the building as you can get without having to tilt the camera. Aim straight at a point directly opposite to you on the building facade. Take a photograph. A metre stick placed against the building in the photograph will give a scale that will allow you to take measurements from the photographs.
2. Repeat this procedure for each facade of the building.
3. It is not always possible to photograph a whole facade at once without tilting the camera.
 - If the building is too high, try to photograph the upper part from the upper floor of a building across the road.
 - If the building is too long, you will need to take a series of photographs. Stand at the same distance from the building for each photograph. Make sure that each photograph overlaps the one before it, so that no part of the facade is left out.
 - If the facade has very deep indentations (a central block with two projecting wings, for example), take separate photographs of each part. Stand at the same distance from the facade for each photo.
4. Take some measurements and record them. Take an overall measurement of the length of each facade and a few detailed measurements of parts of the facade (a standard-sized block, or a window that is repeated several times, for example). These notes will allow you to produce a set of photographs or drawings which are all to the same scale.

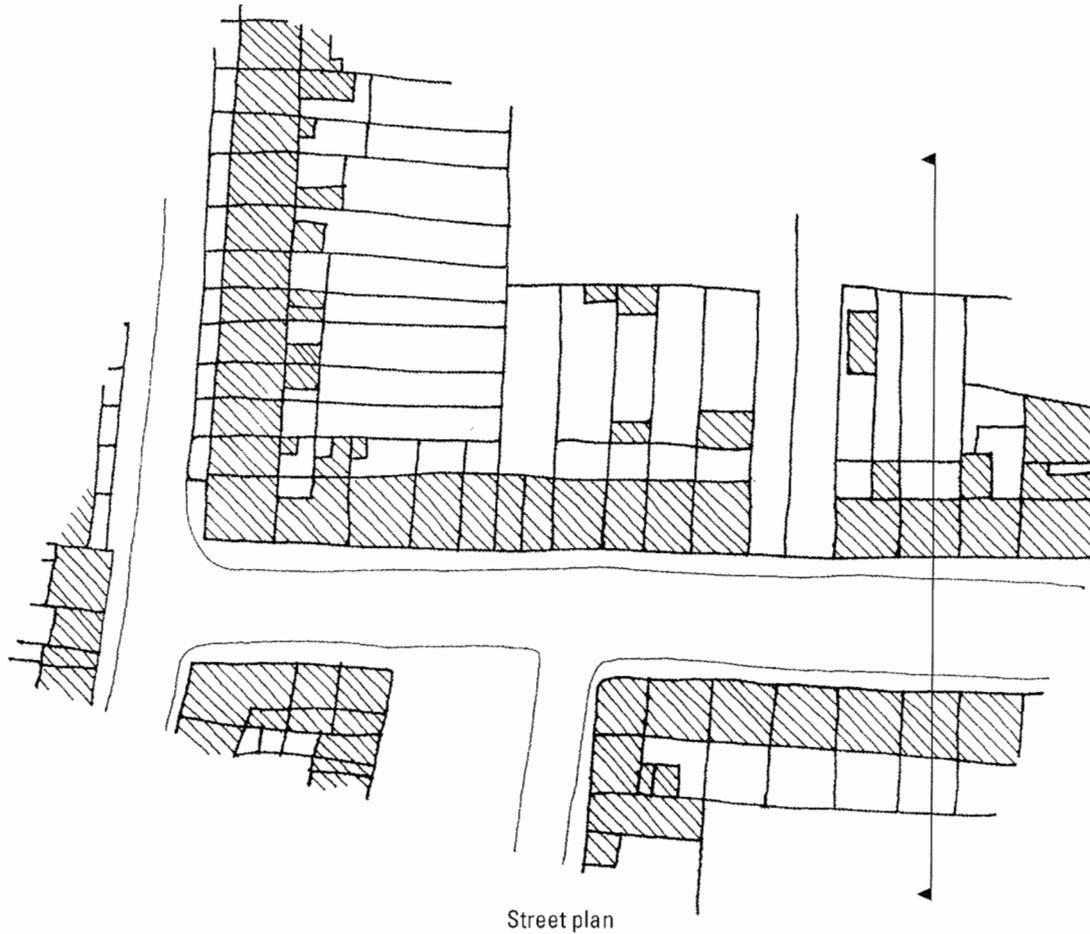
Surveying sites or public spaces

Remember - measurements are always recorded in millimetres. You need to measure and note the roads, paths, walls and fences, trees and boundaries together with the position and size of any existing buildings.

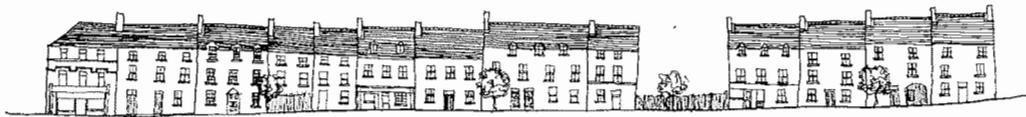
Try to get an Ordnance Survey (OS) map of the place you want to survey. Maps at the scales of 1:2500, 1:1250 or 1:1000 are the most useful. Make an enlarged photocopy of the area you intend to survey, and take it with you on your site visit. You won't need to measure the things that are already on the map. Just measure and record any changes or extra information that you need for your survey.

An Ordnance Survey map will not have any information about the heights or facades of buildings. If you want to draw **street sections** or **street elevations**, follow the instructions for measuring a building outdoors, given earlier in these Guidelines.

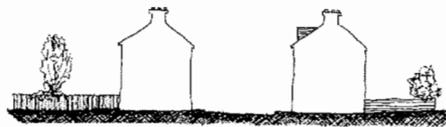
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Street plan



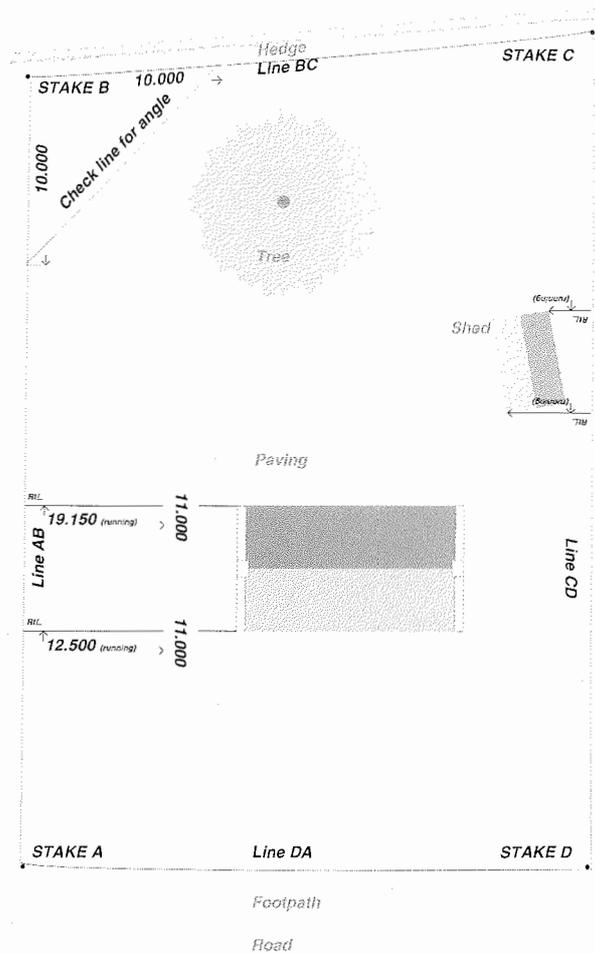
Street elevation



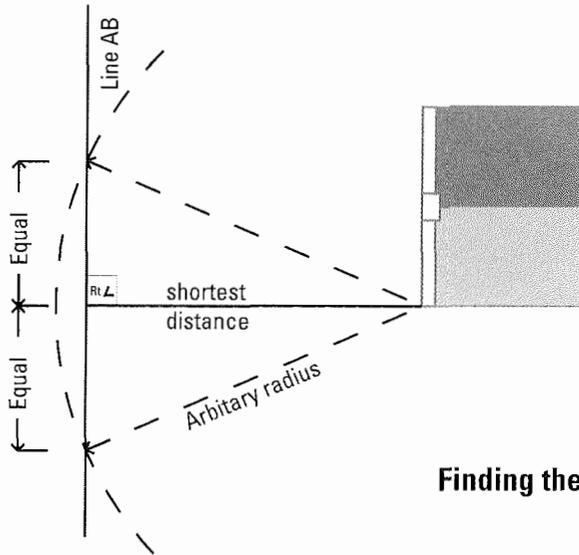
Street section

If you have to draw a site plan from scratch, follow these instructions.

1. Place a stake in the ground near to, but not at, each corner of the site. Tie a string from stake to stake right around the site. (Unless the ground is very uneven, let the string lie along the ground.) Everything on the site will be measured from the lines made by the string. These are called the base lines.



2. Draw a rough plan of the shape made by the stakes and string.
3. Now measure the distance between the stakes: AB, BC, CD and DA. Record these on your plan. The angles between the strings will probably not be right angles. To find the correct angle at a stake, measure out to two points an equal distance along the strings. Then measure the distance between these two points. (When you get back to the classroom, you can use these measurements - and some trigonometry - to calculate the angles at DAB, ABC, BCD and CDA.)
4. The position of the site boundaries and of buildings and other features on the site are all measured from the string "base lines" and then added to your plan. For example, if you want to find the exact position of one corner of a building, measure the distance between that corner and the nearest point on the nearest string. (If you measure to the nearest point on the string, your measuring tape will be at right angles to the string.) Then measure from that point on the string back to the nearest stake.



Finding the nearest point on the baseline

To locate a building on the site, you will need to do this at least twice, measuring from two different corners of the building to a string.

Putting all of your measurements together to make a site plan drawing back in the classroom is a bit like a geometry exercise. If you get puzzled, ask your maths teacher for help.

Presentation - Drawings, Models or Photographs

You have several choices for presenting the results of your survey.

1. Make a complete set of scale drawings - plans, sections and elevations. Use all the information you have gathered in measurements and photographs to work these out.
2. Make a model. Again, all the information you gathered in measurements and photographs will help.
3. Use the photos themselves for your display. If you had to take several photos for one facade, cut and paste them to show the complete facade. The display could also include close-up photos of interesting details - stonework, carving, metalwork, decorative plasterwork. These can be at any scale you wish.