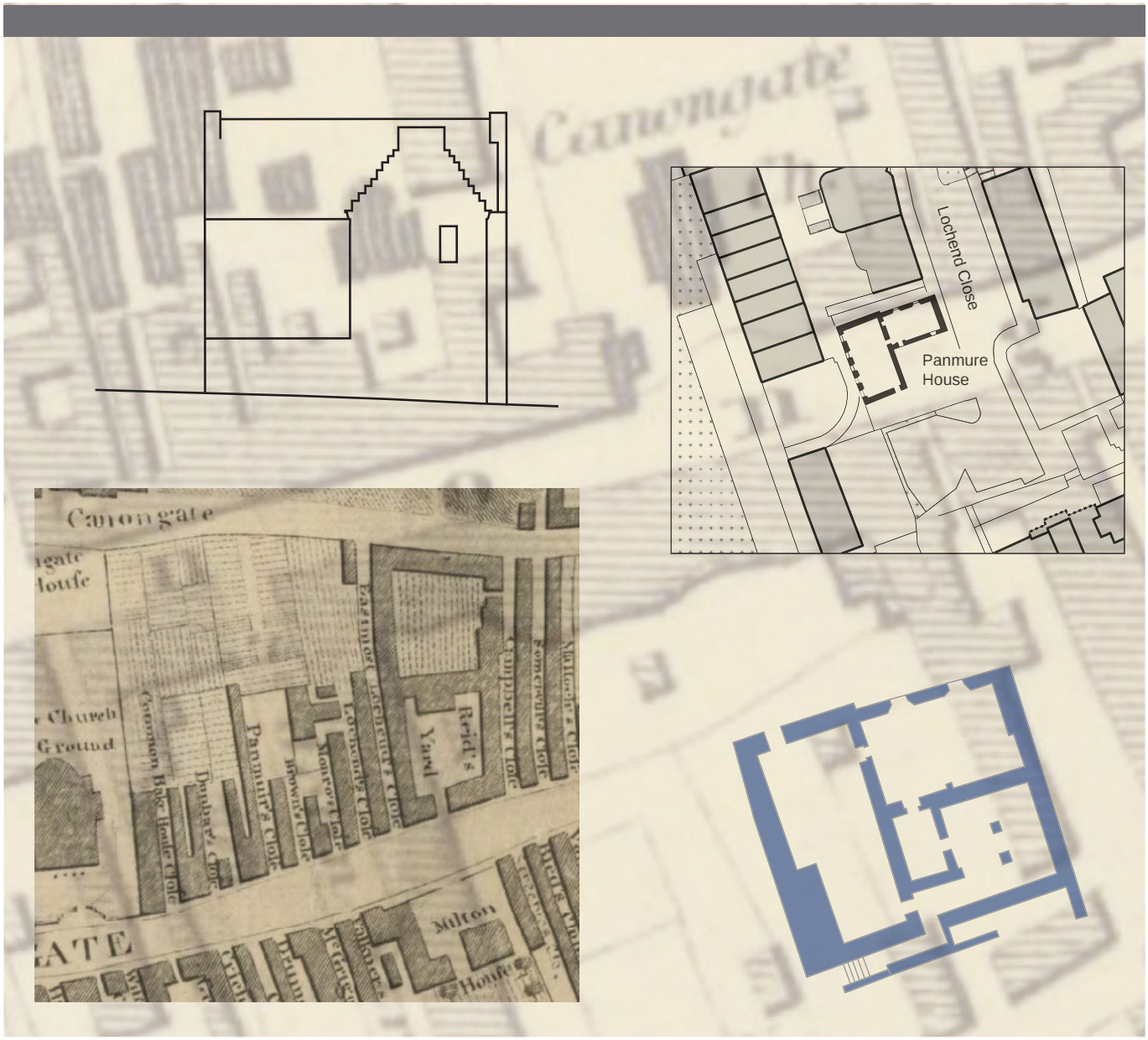
Scotland's Urban Past
YOUR TOWN YOUR STREET YOUR STORY

An introduction to Recording Buildings

A guide to good recording practice



Our built heritage is very rich and varied; we all interact with it daily and (perhaps unconsciously) mostly take it for granted. However, the history and study of our built environment is of growing interest to the wider public. It is increasingly common practice for volunteer heritage groups and heritage professionals alike to collaborate in the recording of our shared built environment with considerable benefits for the wider community. One of the aims of the Scotland's Urban Past project is to significantly increase the capacity for this engagement in Scotland and to facilitate and guide community groups that wish to record the historic and built environment of their towns and cities.

www.scotlandsurbanpast.org.uk

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An introduction to recording buildings

WHY PRODUCE A GUIDE?

The following guidance notes have been prepared to help those with no previous, or only limited, experience in buildings recording to undertake a basic survey – either drawn or photographic – of any building type, regardless of complexity, size or age. The origin of the word 'survey' means to observe, and good observation is key to understanding and producing an accurate record of your chosen subject matter. A record might consist of original or historic documents (for example architects' plans), maps, a written description, photographs and sketches or measured drawings. As every record you create will be site-specific, there will inevitably be variations in what is included dependent on individual circumstances. The end product may be a brief note with a sketch and photo or alternatively the work may become an in-depth study, with detailed drawings, descriptions and historical information brought together from a variety of sources. All this information can be entered into the online national database Canmore where it will join and complement other material produced or collected by RCAHMS since 1908.

RECORDING WITH THE SCOTLAND'S URBAN PAST PROJECT

This guide is intended to walk you through the process of graphically recording buildings and architectural detail, where appropriate to do so. It has been created in the context of the Scotland's Urban Past project where the range of survey equipment available to participants is likely to be limited. It describes traditional survey methods using such instruments as plane table, alidade and tape measures. These items may be supplemented by some relatively inexpensive, optional items such as electronic hand-held distance meters and levels that use a visible red laser beam.

Although many of the examples used in this guide are of predominantly 18th and 19th century remains, the same techniques can be used to record all types of buildings and sites.

What is graphic recording?

Graphic recording aims to produce a set of drawn illustrations that provide a record of a building or a wider site at a specific point in time. This can then be viewed and used for research by other interested parties, either immediately or in the future.

A graphic record of a building or structure normally takes the form of a combination of plans, elevations and section drawings. These can be complemented by drawn details of well-preserved or unique features, and if you are an experienced draughtsperson other views such as perspective or orthographic can also be created as desired.

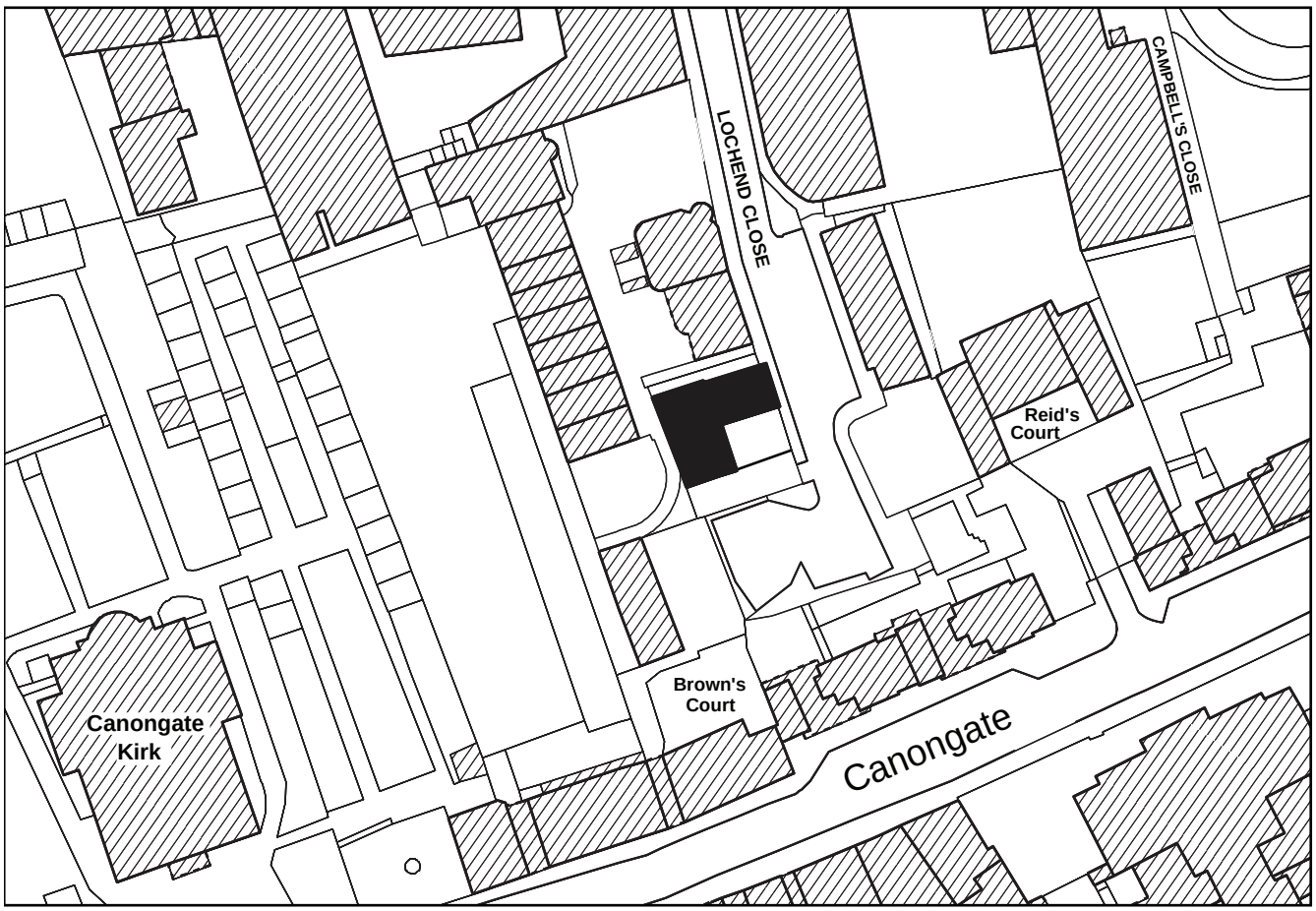
A great benefit of graphic recording is the process of surveying itself because the surveyor is required to spend time looking at and understanding the building. It allows the surveyor to form an idea of how a structure works, because undertaking either a sketch or a scale drawing is a subjective process requiring a good understanding of what is to be drawn. Creating a drawing – particularly a measured scaled drawing

that accurately records the proportions of a building – can often help resolve issues that are not readily apparent to the eye. The principal forms that a survey drawing (or an architect's plan) will take are as follows:

Also see 'Reading Architectural Drawings'

Plans

A plan drawing shows what you would see if you sliced through a building horizontally, lifted off the top part and looked down. To show the greatest amount of information in a plan the slice is usually taken just above the level of the window sills to show floor layout, position of doors, windows, fireplaces etc. A separate plan is usually made for each storey of the building. Solid elements – such as walls – can be delineated by a thicker line that can be shaded or hatched in the drawing to emphasise different materials and/or phasing.



Location plan of Panmure House, Canongate, Edinburgh. In this monochrome drawing, the focus of the plan is shown solid black and represents the 'L' plan footprint of the building. Other roofed structures are shown hatched, with linear features and open spaces outlined. Scale 1:1,000

Site plans

A site plan also shows a building from above, albeit from a higher vantage point and at a smaller scale. Whilst the previously described plan might show the layout and details of a building's interior, a site plan is produced to show a building in its wider context. It can show its setting and relationship to other buildings and structures, earlier or later in date. A site plan can show many things, for instance how buildings, structures and landscapes can constitute a design concept or how development over different eras can combine to form an architectural mosaic.

Location maps

A location map is used to show your 'area of interest', whether it be individual features (for example, the distribution of street furniture), single structures (for example, buildings), entire streets or open areas such as parkland. These maps should be at an appropriate scale to show the geographical location of your project and include place names and local reference points. The scale you choose will depend on the size of your project area but is unlikely to be smaller than 1:10,000 – more often this scale is used for topographic or landscape mapping – and more typically between 1:1,250 and 1:2,500. The level of detail of man-made features at these scales tends to, necessarily, be limited to outline shapes only. Natural features can be illustrated using contours or symbols known as hachures, which are short line segments drawn in the direction of the slope (see below). Steeper slopes are represented by thicker, shorter strokes, while gentler slopes are represented by thinner, longer and farther spaced strokes. (See also the glossary)

An example of turf walled structures and slopes in a relict landscape depicted by hachures.

Elevations

An elevation is a square-on view looking directly on to an upstanding structure or wall to show the position and dimension of features viewed from the outside. A rectangular detached building, for example, would need four elevations to represent it fully. A semi-detached house would need only three elevations. Most elevations tend to show building exteriors, but in some cases it may be appropriate to draw elevations of walls in individual rooms. Elevations can also depict shadows – particularly on a façade –that can serve to emphasise textures and design elements.

Sections

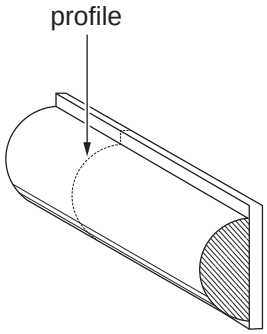
A section drawing represents what you would see if you made a vertical slice through a building, removed one section and looked into the other (think about slicing a cake to reveal the contents under the icing). It allows you to show floor levels, ceiling heights and wall thicknesses within a structure. Sections are typically cut at right angles to the axes in a building. A single section will probably suffice to explain the workings and the materials used in the construction of most structures but you might need to consider more than one. Similar to plan drawings, solid elements such as walls, floors, roofs and stairs are commonly represented as shaded or hatched areas or in heavier line to distinguish them.
Section lines can be indicated directly onto your plan with arrows to indicate which way the section is looking.

Profiles

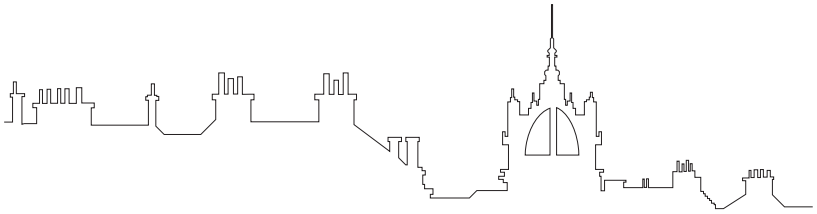
A profile is an outline of a form or structure seen from the side. A profile diagram is useful for emphasising mouldings of a building or showing the changes in elevation of a surface along a given line – it represents graphically a 'skyline'.

Details

A detail can be a drawing of a single architectural feature or a small diagram showing construction or composition. An architectural detail is a small piece of the whole; it may be something that characterises an entire building.



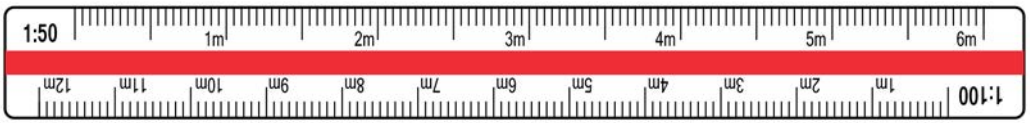
a) The line of a profile through a half round moulding.



b) profile of a city skyline

Drawing Scales

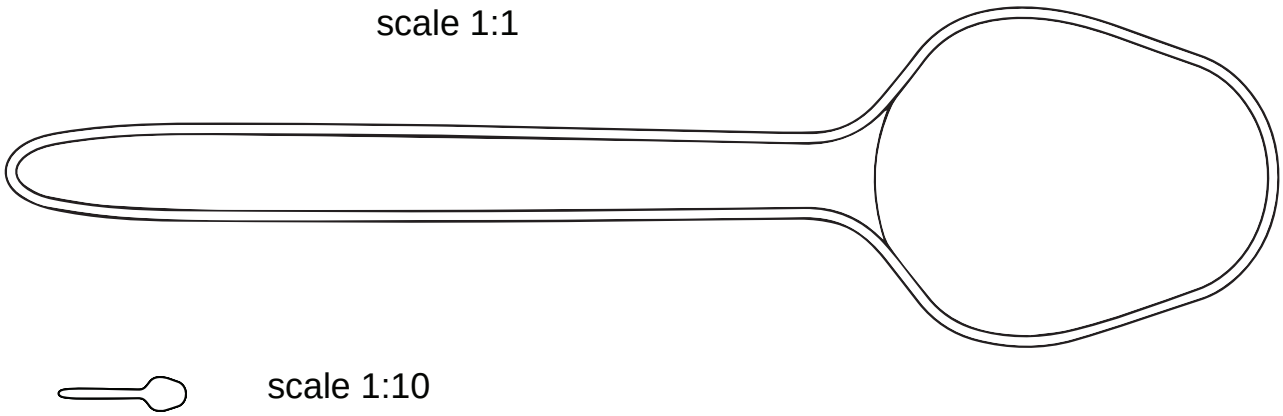
Before undertaking a survey with the aim of creating a drawing you will need to make informed decisions on what the key elements of a structure are and how best to depict them; the level of detail will vary according to scale.



A scale ruler is designed to allow you to work out the actual dimensions of a distance on a scaled drawing. Maps, architectural and archaeological drawings are scaled to allow for large areas, structures or items to conveniently fit on a reasonable size of paper. Be careful when selecting the scale on the ruler, as there are normally two scales provided on each edge

Big or small?

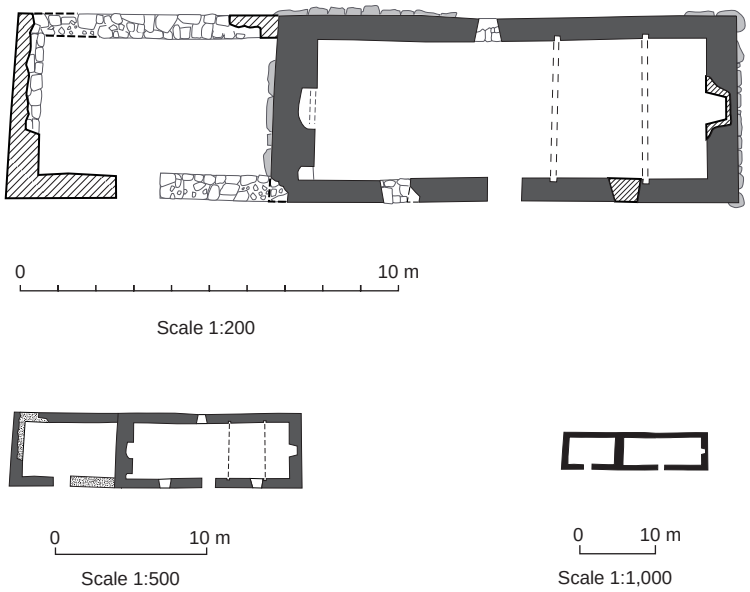
Confusion is often caused by the terms 'large scale' and 'small scale' in measured survey. In simple terms, as the number gets smaller, the scale ratio gets larger – ratio 1:10,000 (or one to ten thousand) means that the sizes of objects on the map are 1/10,000 of their size on the ground whereas the ratio 1:100 (one to one hundred) means that the size of objects on the map is 1/100 of their size on the ground. Because 1/100 is a larger fraction than 1/10,000, 1:100 is the larger-scale map (in the same way that a half a slice of cake is larger than a quarter of a slice of cake).



The example above shows a plastic spoon life-sized (1:1 larger scale) and reduced by a factor of 10 (1:10 smaller scale). It is not appropriate to attempt to show the detail of the spoon at the smaller scale. If an object is depicted at scale 2:1 it would be twice the actual size. Small elements of architectural detail are sometimes best shown at scales larger than life-size.

What scale should I use?

Before putting pencil to paper you should decide exactly what it is you want to depict – the size and form of a building and its significant structural components. Too small a scale will make it impossible to depict important architectural detail. Too large a scale is likely to take too much time and effort, with little, if any, useful gain in information. It is better to show a building in its entirety at a small scale and enlarge specific areas as separate drawings if you want to show more complex detail.



An example of a small, ruinous single storey building showed drawn at different scales. Scale has a direct bearing on the way in which particular drawing conventions are applied and the level of detail that can be shown.

Details or features

If you want to show how certain pieces of the building were constructed, you might make a detail drawing of that part; scales of 1:20, 1:10, 1:5 up to life size can be used to illustrate particular features of a building or details on objects of interest, such as carved stones, moulding profiles and small areas of architectural form, as required.

Understanding the process of generalisation, that is, using fewer lines and different line thicknesses to represent a structure at varying scales, is also crucial to the success of the depiction. The smaller the scale, the more generalisation takes place but overall shape and form must not be lost.

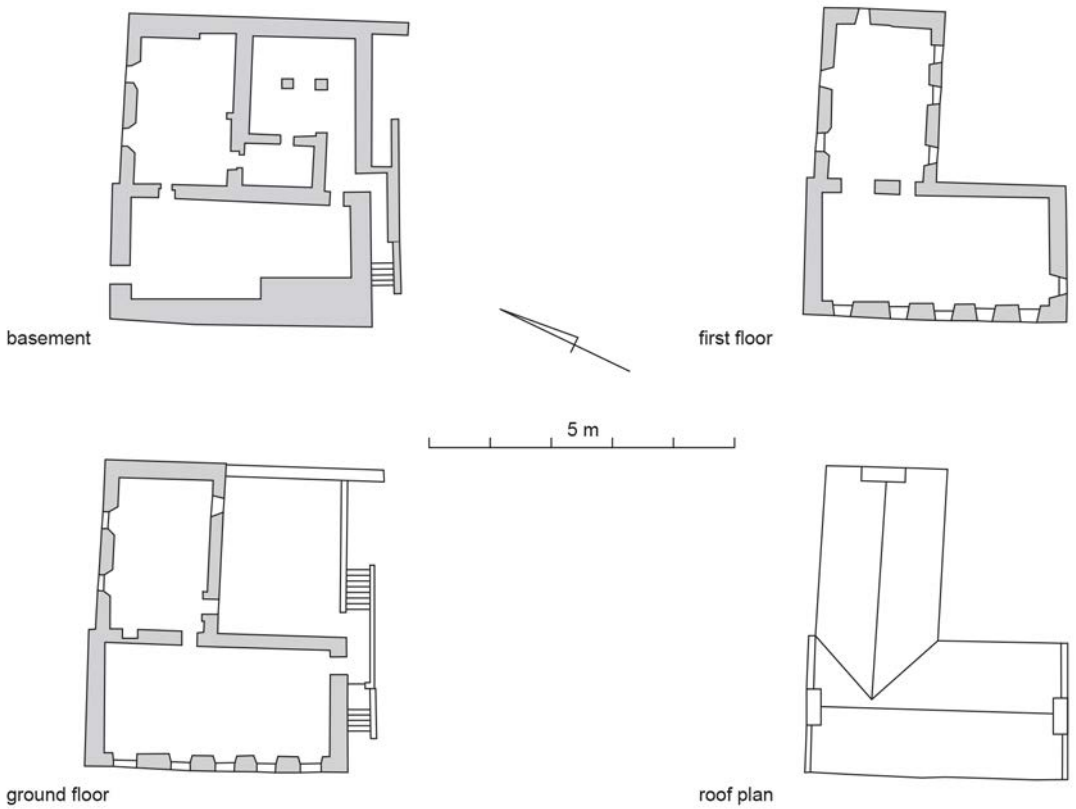
The bigger an object or area really is, the smaller the scale of the drawing has to be to enable it to fit onto your drawing board. You might choose to draw a single house at a scale of 1:50 (1 drawing unit = 50 units on the real building). But if you want to draw a plan showing all of the houses on an estate, you might need to choose a smaller scale of 1:200. Similarly to plan an entire neighbourhood would require an even smaller scale, such as 1:1,000.

Another important consideration is fitting the drawing onto your drawing sheet or page! If too large a scale is used, the resulting survey may need to be spread over more than one sheet and this can be both inconvenient and unwieldy.

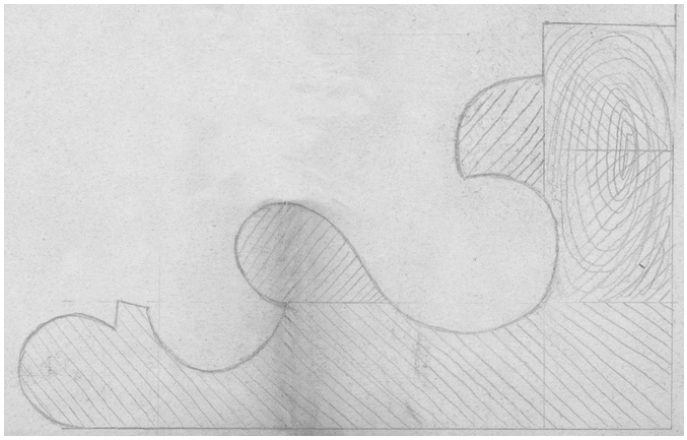
The logical approach is to create a suite of illustrations at different scales. A range of survey scales is recommended for the various options outlined below.

Site plans

A scale of 1:200 to 1:1,000 is used for a site plan to show the relationship of a group of buildings. A scale in this range allows the illustrator to represent some of the character of the structures, together with their relative positions, and structural elements such as blockings and straight joints.



Panmure House, Canongate, Edinburgh. This series of simple floor plans shows the layout of a 17th century two storey town house with basement. There is sufficient information to indicate wall thicknesses and openings, but architectural detail and phasing are lacking.



Pencil drawing of architectural detail drawing held in the National Collection.

A section of wall-head cornice showing segmental timber construction detail (for new roof of 1854 possibly). DP158246

Publication

In fields outside art, technical survey drawings, or plans of buildings or machinery and other things, are often called 'drawings' even when they have been transferred to another medium by printing.
Survey drawings (or derivatives from them) are often undertaken with a view to incorporating them into a publication or report. Frequently these will be A4 or smaller in size, so consideration has to be given to the size of the original drawings otherwise reduction will affect both the printed quality and the ability of the drawing to do its job properly.
Working to a reduction ratio of 50% or 25% (or half linear and quarter linear as it is sometimes called) provides reasonable flexibility without sacrificing clarity.

Drawing materials and techniques

Basic equipment:

- clipboard/drawing board (with paper, tracing paper, or polyester film fastened with masking tape)
- pencil (test whether HB, 2H, 4H or 6H is best for you, depending on the medium)
- eraser and pencil sharpener
- ruler (scaled)
- set square
- magnetic compass
- camera
- extracts from OS maps showing the site and any other available mapped data.

If your site survey drawing is likely to be the only record of your site then it would be advisable to try to use a dimensionally stable archive medium, such as polyester drafting film, a material that maintains its original dimensions in conditions such as rain. Drafting film provides a semi-transparent, waterproof surface and you can edit pencil lines easily with an eraser, as you would on normal paper.

Drafting film is a relatively abrasive medium and it is best to use hi-polymer (4H–6H) lead pencils to achieve clean lines that will not be accidentally wiped away. Well-sharpened or propelling lead pencils are good for scale drawings. They make a clean, sharp line and don't smear easily.

Media for drawing

Paper comes in different sizes and qualities, ranging from newspaper grade up to high quality and relatively expensive paper sold as individual sheets. Papers can vary in texture, hue, acidity and strength when wet. Cartridge paper is the basic type of drawing paper sold in pads.

Tracing paper is named as such because an image can be traced onto it. When tracing paper is placed over an image, the image is easily visible through the tracing paper. Tracing paper can be used, for example, to experiment with phasing over a half-finished drawing, and to transfer a design from one sheet to another.

When choosing your media consider the circumstances in which you will be using it: paper and tracing paper are not much use in a damp or rain-affected environment, and are not dimensionally stable, that is the ability of a material to maintain its essential properties or original dimensions in perpetuity.

Using polyester drafting film gets around the problem of weather prejudiced surveying as it is a waterproof medium. Drafting film is anti-static and accepts ink or lead, erases cleanly and provides excellent dimensional stability. Film won't tear or discolour and is excellent for archaeological and architectural applications; it is highly translucent for tracing, gives sharp reproductions and is compatible for use with laser printers and photocopiers. Polyester drafting film is available on rolls or in single sheets at various sizes.

Using graph paper

With graph paper, you can easily make and control the scale that you choose to use for your drawing by marking out the distances, or 'scale metres' on your paper. To recap, if the scale you choose is 1:50, then 20mm on the graph paper will represent 1 metre (1,000mm) on the building. If you want your drawing to be at a scale of 1:100, then 10mm on the graph paper will represent 1,000mm on the building, and so on. If you are using drafting film you can use it as an overlay and transcribe all your data directly onto it.

The width of a pencil lead

Remember that when using a scale of 1:100, the drawing will only be accurate to within 5cm because the pencil lead will probably be up to 0.5mm thick. At a scale of 1:100 the pencil line (0.5mm) will represent 50mm (5cm). So the fine accuracy of your measurements is not absolutely crucial. As the scale of a plan decreases, so the details that can be included in the drawing decrease. At 1:200, any feature measuring less than 20cm will be too small to draw on the plan, because each pencil line will represent 10cm. At 1:500 this applies to features of approximately 50cm in size.

Line weights

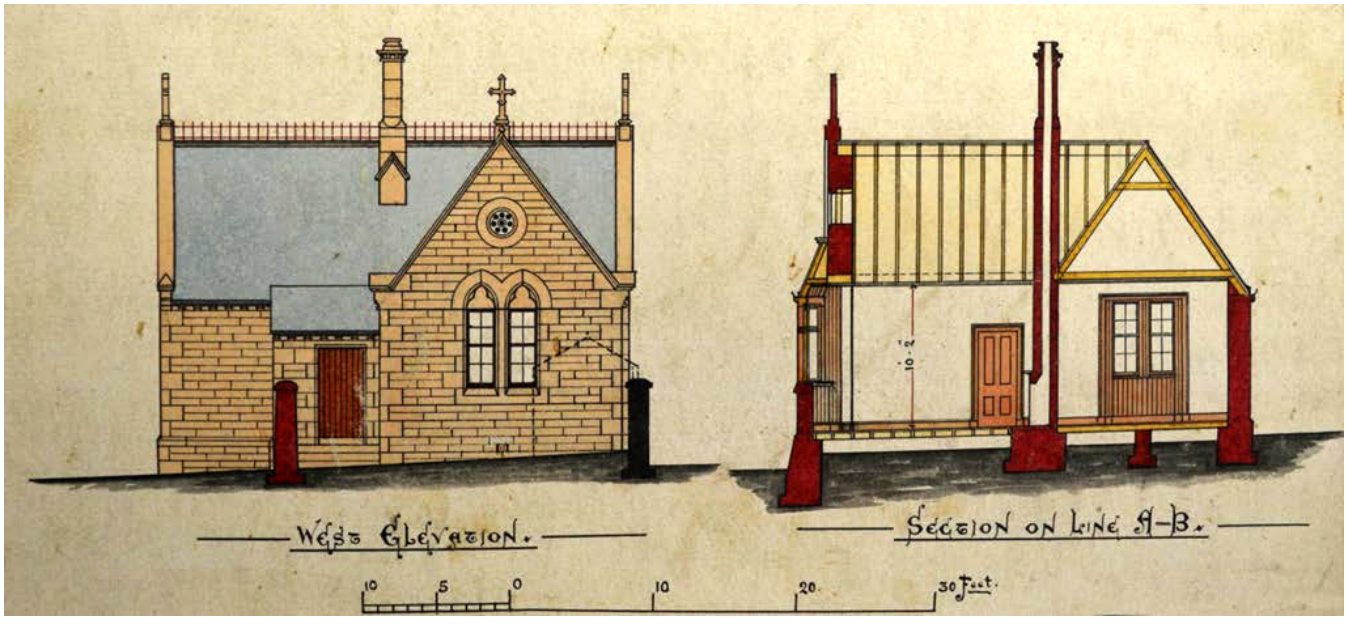
Three basic types of line are used in survey drawings: thin solid, thick solid and dashed. A thin solid line is the most used and describes the outline and all features of the building. A thicker solid line is used in plans and sections to show where the walls, floor, ceilings, roofs, stairs, etc of a building have been bisected to create that view. A broken line is usually used in plans to represent an unseen structural feature above sill height such as a balcony or gallery.

Colour, detail and texture on scale drawings

When you do a scale drawing, you should consider the level of detail as though you were looking at the building from a distance. This imaginary distance affects colours and textures. If you look at a building from a distance, you may not be able to make out the joints between the brickwork or where one roof tile ends and the next begins. Door handles and other fittings may just appear as amorphous blotches on a front door and something similar also happens to colours. As you move further away from them, the less distinct and vibrant they become, like mountains viewed from a distance, or houses and fields viewed from an aeroplane window. The amount and sharpness of detail you show, and the brightness of colours on the drawings, depend on the scale of the drawing. You cannot show a lot of detail on small-scale drawings. Bright colours which might look fine on a 1:50 elevation of a house may look garish if they are used for the same house shown at a scale of 1:200 and you should consider the use of colour carefully before applying it. If you don't want to apply colour to an original drawing you could produce copies or even a colour overlay/underlay.

Historically, colour was used according to standard conventions in plan, elevation, section and detail drawings. One reason for this is that it provided a vivid and uniform understanding of a structure that could not be communicated any other way at the time. Architectural drawings made in the later 19th and early 20th century used the following conventions

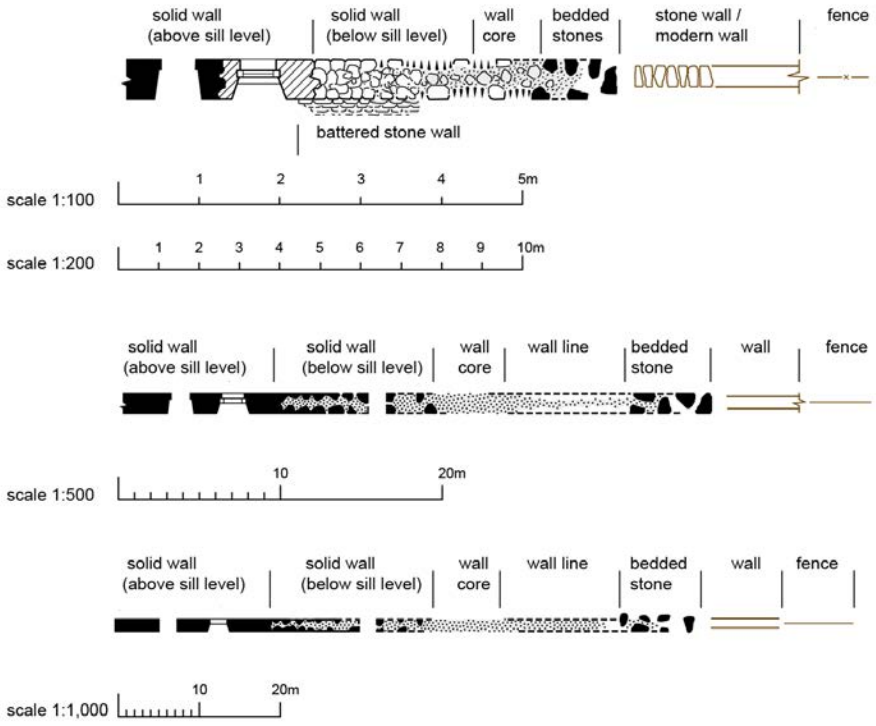
Brick	red (pale on plans and elevations, dark on sections)
Stone	yellow ochre (pale); indigo used for sections and details
Concrete	grey
Wood	sepia (pale on plans and elevations, dark on sections)
Iron and steel	dark blue (pale on plans and elevations, dark on sections)
Plaster	light yellow ochre used for sections and details
Tiles (floor)	red
Tiles (roof)	red brown (pale on plans and elevations, dark on sections)
Slate	grey green



Tain, Castle Brae, St Duthus's Collegiate Church, Caretaker's Cottage.
Extract from a late Victorian architects plans -West Elevation; Section on Line A-B; (original scale 1/16":1')
Signed and Dated "A Maitland & Sons, Architects, Tain 22/8/1884"

Drawing symbols: structural features

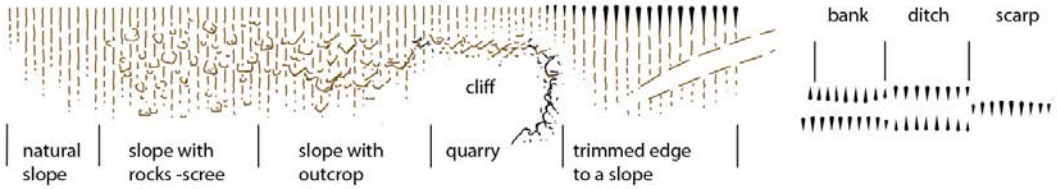
A specific set of conventions and symbols is used to depict structural features at various scales; the most relevant to the needs of the surveyor are illustrated below.



A specific range of symbols are used for drawing buildings, particularly if they are ruinous or appear as archaeological features. The larger the scale, the more representative the drawing can be; the smaller the scale the more generalisation as the examples above show.

Drawing symbols: structural features

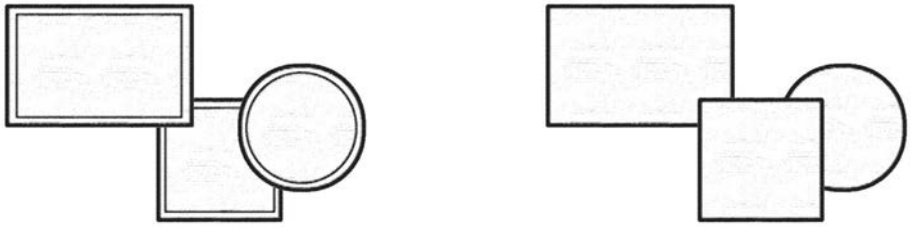
A specific set of conventions and symbols is also used to depict natural features at various scales; the most relevant to the needs of the surveyor are illustrated below.



Drawing conventions used for mapping natural and other topographical features.

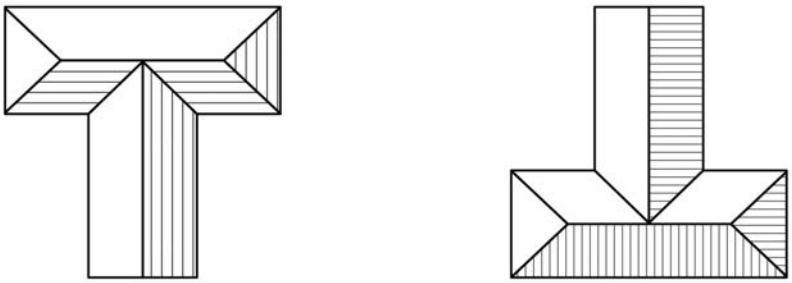
Drawing tips

Always remember to include the following items on your sketch or field survey: (1) drawing title, (2) your name, (3) the date, (4) the scale, (5) National Grid Reference if appropriate, (6) North point. If your drawing is one of a number of different drawings it would be useful to number them in sequence.
To emphasise the horizontal and vertical dimensions in the outlined edges of a building use a bold line. A thick profile line with a thin inside line lends more massive appearance to a building drawing. By overlapping lines you can also create a sense of height or depth to an otherwise flat drawing.

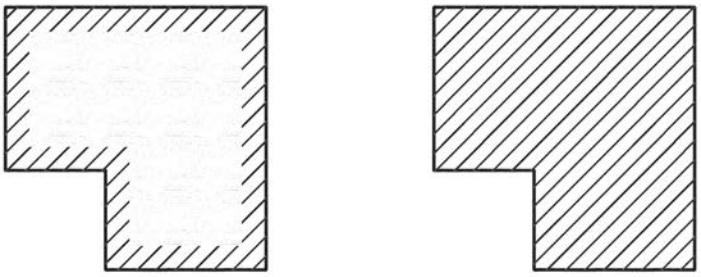


Two examples that use different line weights to suggest height, depth and phasing in two-dimensions

You can add texture to a drawing of a building with a pitched roof to create a three-dimensional quality. The direction of the lines can indicate the actual building materials and the direction in which they were laid or indicate the slope of pitched surfaces. Ideally the sun sides of the roof should have a lighter texture than the shaded sides or you can simply leave them unshaded.



Two examples of different shading effects that can also be used to indicate slope, textures and materials.



Two examples of crosshatched shading to emphasise solid objects

Survey Methods

The next four main sections provide an outline of survey methods that can be carried out with simple surveying equipment:

- Field sketch
- Annotated/dimensioned field sketch (running sizes)
- Tape and offset survey (extended baseline survey and running sizes)
- Plane table and alidade survey.

Each of these methods can provide a very useful record in its own right. However, often the most effective way to survey a site is to use a combination of the different methods.

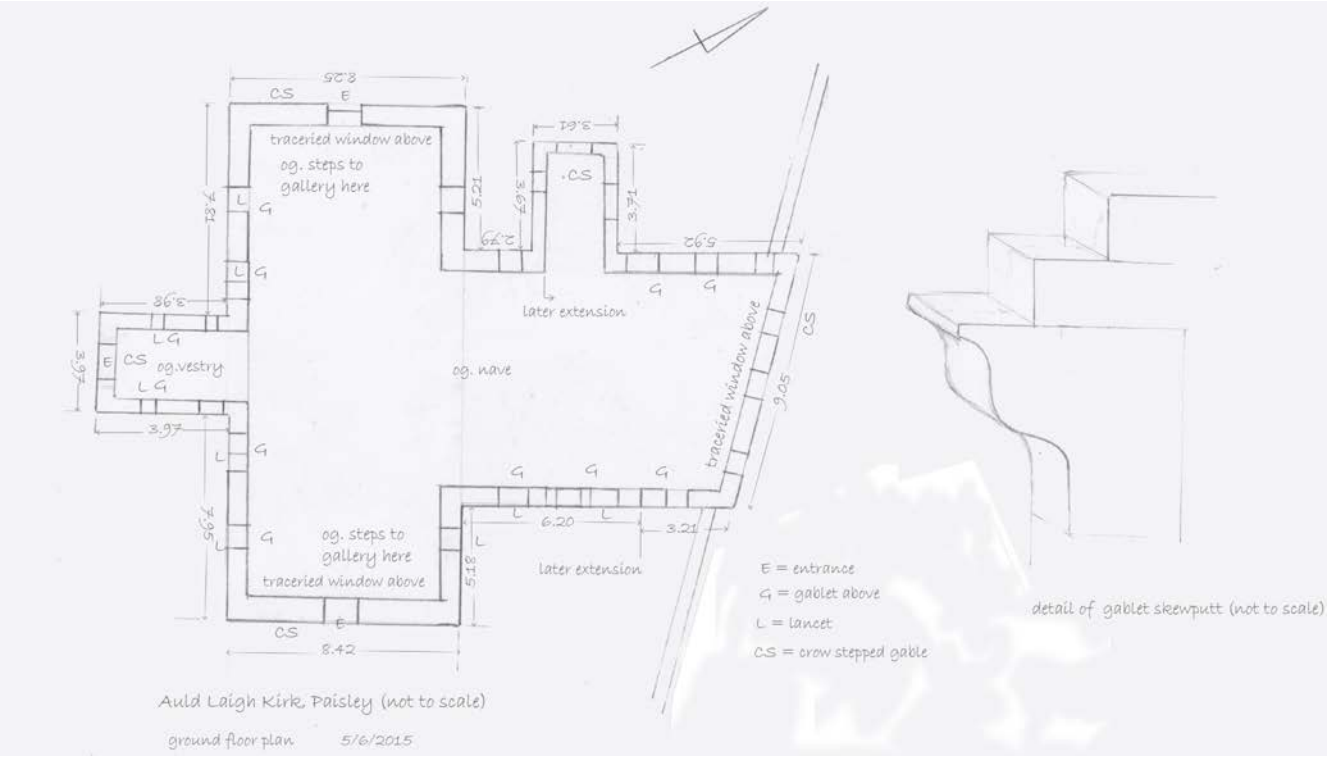
Basic equipment:

- clipboard/drawing board (with paper, waterproof paper, or polyester film fastened with masking tape)
- pencil (test whether HB, 2H, 4H or 6H is best for you depending on the medium
- eraser and pencil sharpener
- ruler (scaled)
- set square/T-square
- magnetic compass
- camera
- extracts from OS maps showing the site and any other available mapped data.

Field sketch

A field sketch usually takes the form of a simple plan or site plan that represents a vertical bird's eye view of your site. Undertaking a field sketch provides an extremely useful way to gain an overview of your chosen building(s) or site. It is an ideal way to assess the number of buildings and other structures present, as well as aspects of their construction, phasing and spatial relationship. A well-drawn field sketch can provide a very useful record of a site or building in its own right, or may become the first stage in the process of producing an accurate scale drawing. At its simplest, a field sketch need only show building outlines and orientations – often referred to as the footprint.

If there are reliable contemporary maps available that provide you with information that will assist, you could use these as a starting point or perhaps an aerial view from a source such as Google or Bing maps. Be aware, however, that the information that any map contains might be outdated or incorrect and you should double check measurements on site; there is a strong case for – at least initially – creating your sketch independently to avoid any prejudices or misleading influences.



Sketch of the groundplan of the Paisley Arts Centre, formerly the Laigh Kirk. The sketch is not to scale but manages to show the configuration and the ground floor openings. Inset is an example of architectural detail.

Annotated/dimensioned field sketch (running sizes)

You can increase the value of your sketch by adding notes and measurements. This will particularly help you if you intend to carry out further work such as writing a site description from a scale drawing. The aim is to annotate your sketch plan with accurate measurements to show all the necessary dimensions for someone who has not seen the building to be able understand it and construct a scale drawing from the information it contains. Ideally the sketches should be neat, in proportion and large enough to allow the required dimensions to be clear and legible.

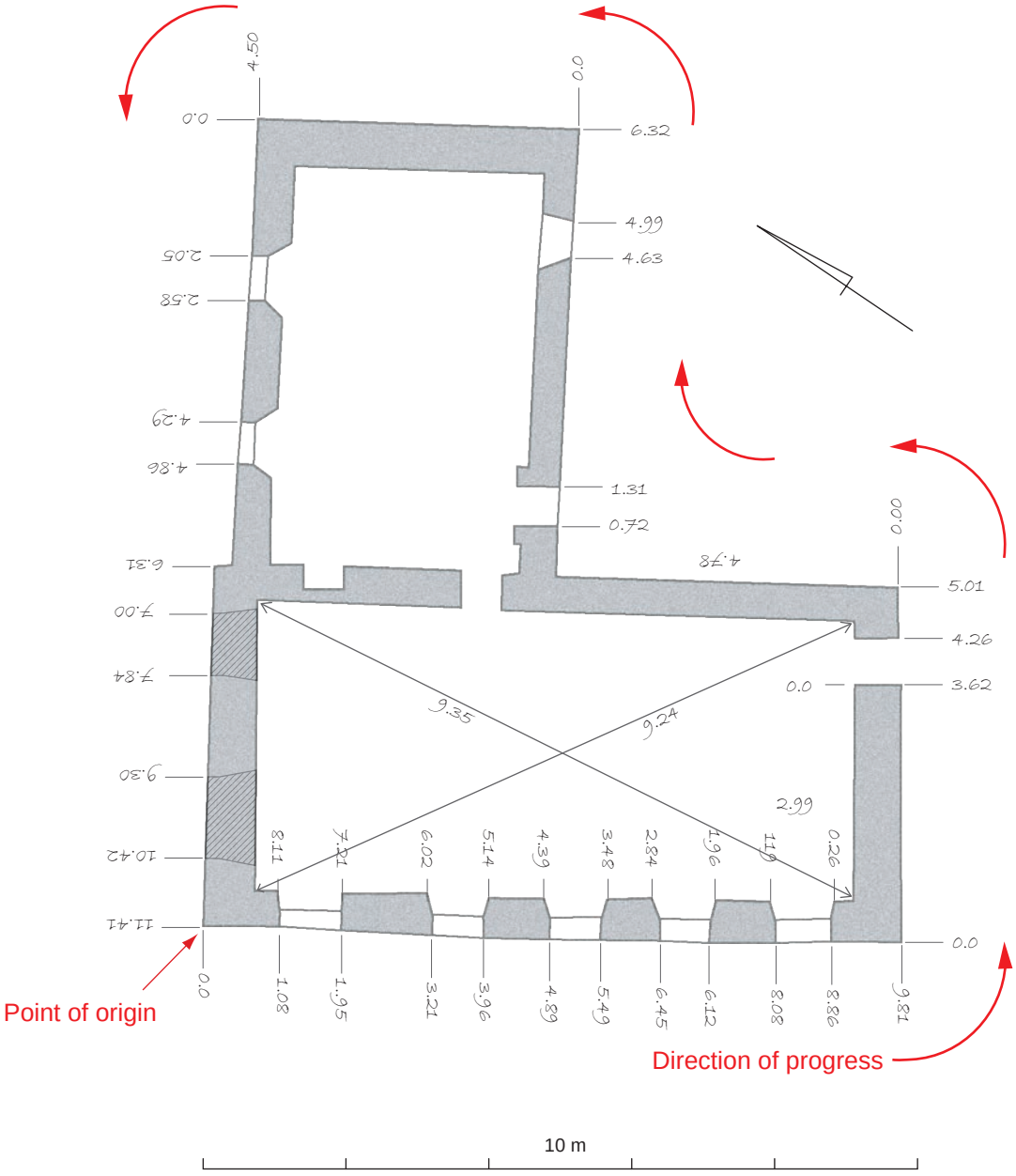


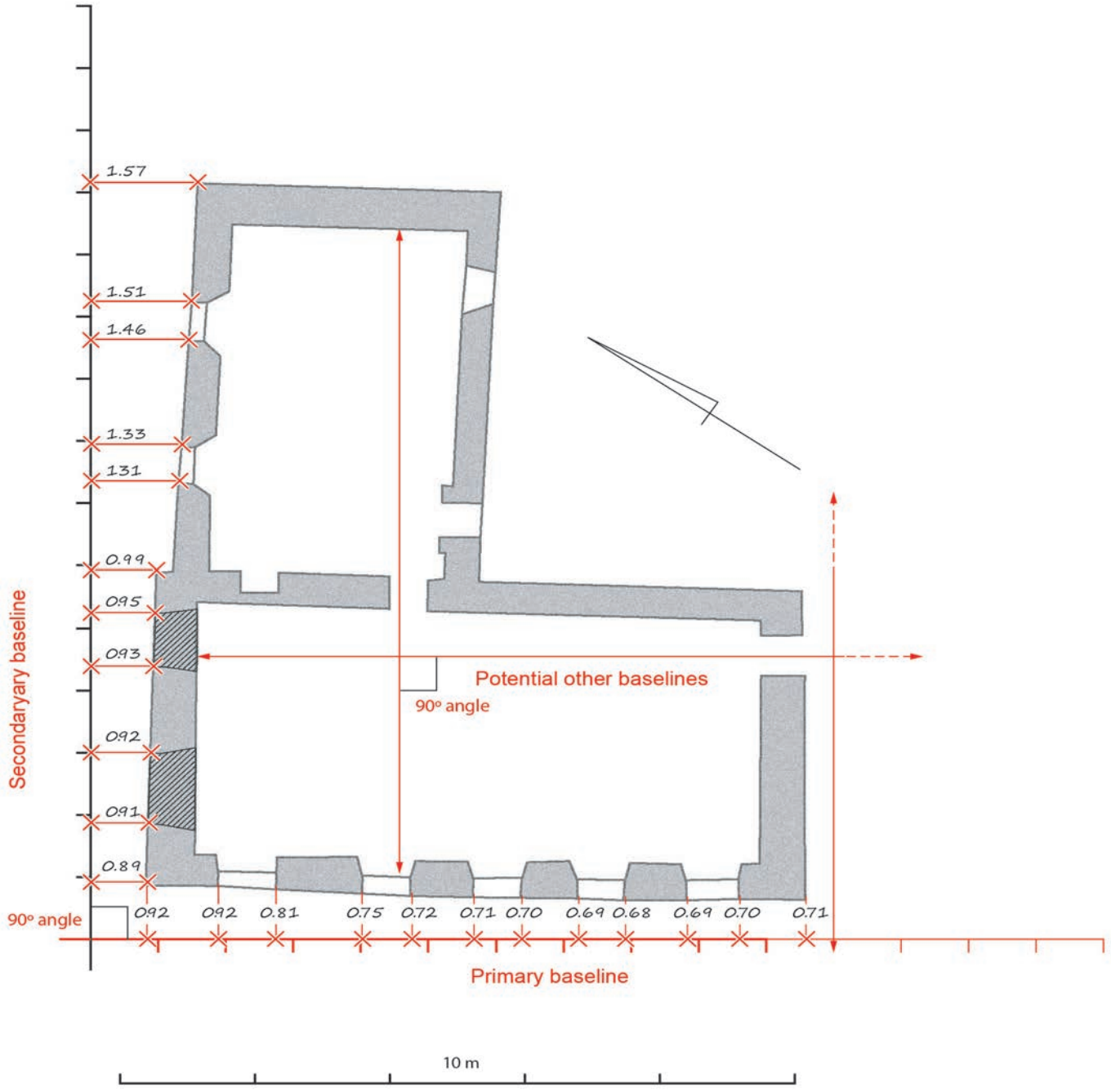
Diagram showing an example of running sizes to record ground floor plan of townhouse

Cumulative measurements, known as 'running sizes', taken from a single point of origin are preferable to a series of separate measurements. You can repeat the process for different planes of a structure or, where it is feasible to do so, run in a clockwise direction round a room, or building. The origin point for running sizes should be clearly marked, although you may have several on a complex site. Include diagonal measurements to check such things as room proportions and wall thickness measurements where possible. If you are recording running sizes of an interior remember to measure the diagonals to ensure that you have the correct proportions; few buildings have true right angles. If it is possible to do so, you should also record wall thicknesses, which are likely to vary depending on their location within a building. This information can often help inform the chronology of a building that has been modified over time. Note also any significant changes in floor or ground level and provide height information where possible. This method is appropriate for plans, elevations or details of buildings/structures with relatively simple geometry.

Scaling a dimensioned sketch

If you produce a dimensioned sketch, the information can be readily used to create a scaled plan or elevation, even off-site. A scaled drawing provides an accurate plan of a structure or site; it is a drawing where measurements taken directly from the plan can be easily converted into the actual dimensions on the ground.

Creating a scaled drawing can help significantly in the interpretation process. During the process you will be recording what is there today – what the building/structure comprises and how it might have changed over time, in both appearance and use.



Example of tape and offset measurement to record external wall plan - or footprint - of townhouse

Tape and offset survey (extended baseline survey and running sizes)

Tape and offset survey can be used to create accurate, scaled plans of both discrete features (such as a single building) and wider areas (such as parkland), although it is best suited to open and uncluttered environments.

This method involves establishing a 'primary baseline' parallel to and/or through the features you want to map, and measuring the distance to the features from this known line.

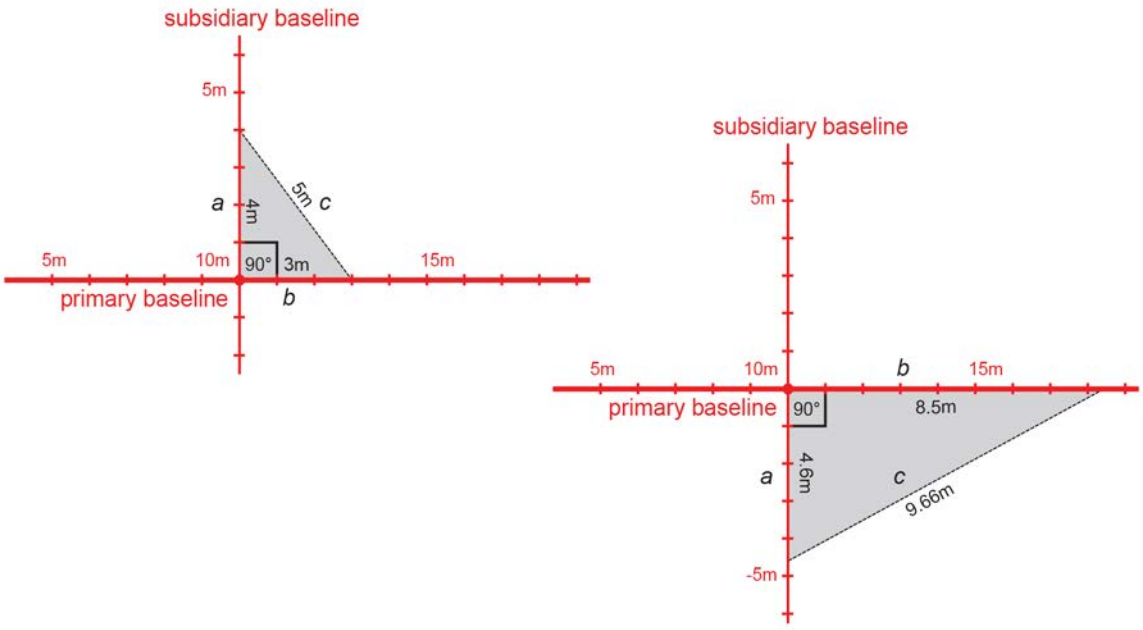
The baseline can be a string line and/or a measuring tape laid out taut and anchored at each end. The length of the baseline is determined by the size of the area you want to survey.
When you have determined the scale you will be working at, you can transcribe the line onto your drawing media – you might find it useful to use graph paper under a transparent overlay.

To record points of interest, measure along the baseline (or tape), then take a measurement at right angles from the baseline to the point you wish to record; plot these measurements directly onto your drawing sheet.

The accuracy of a right angle can be checked quite easily by using a set square or Pythagoras' theorem (3–4–5 triangle).

Pythagoras' theorem

Geometry enables us to set one line perpendicular (at right angles) to another. If the lengths of the sides of a triangle are in a ratio of 3:4:5, a right angle will be created between the two shorter sides. This is known as Pythagoras' theorem, or the Pythagorean equation, where the square of the two shorter sides added together (in this example, $3\times3 + 4\times4 = 9 + 16$) equals the square of the diagonal side, or the hypotenuse (in this example, $5\times5 = 25$), as shown below.

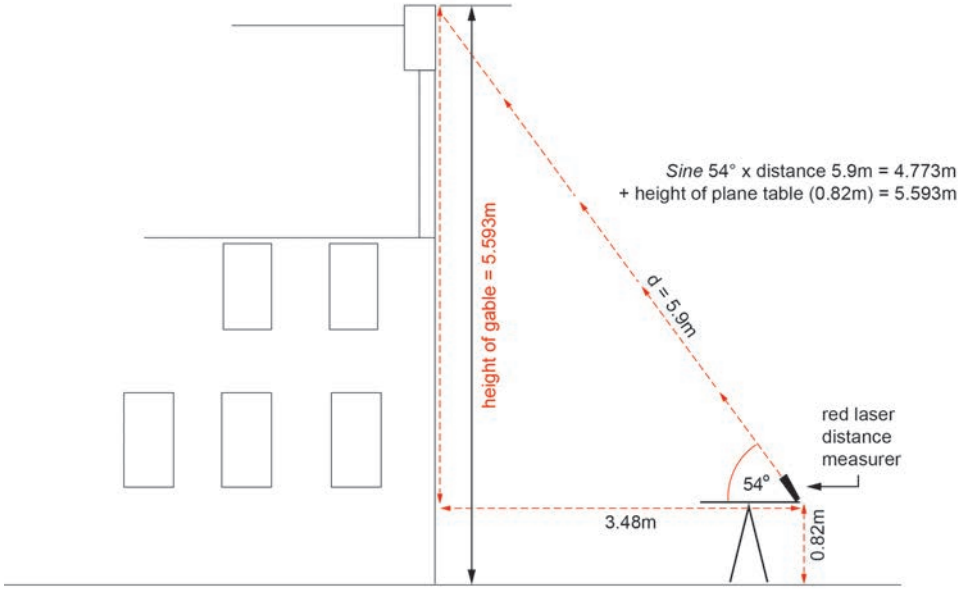


Two examples of 3-4-5- ratio triangles used to set up two survey baselines at right angles to each other This applies to other, easily remembered number sets which are straight multiples of the 3:4:5 ratio, such as 6:8:10 and 12:16:20, known as Pythagorean triplets.

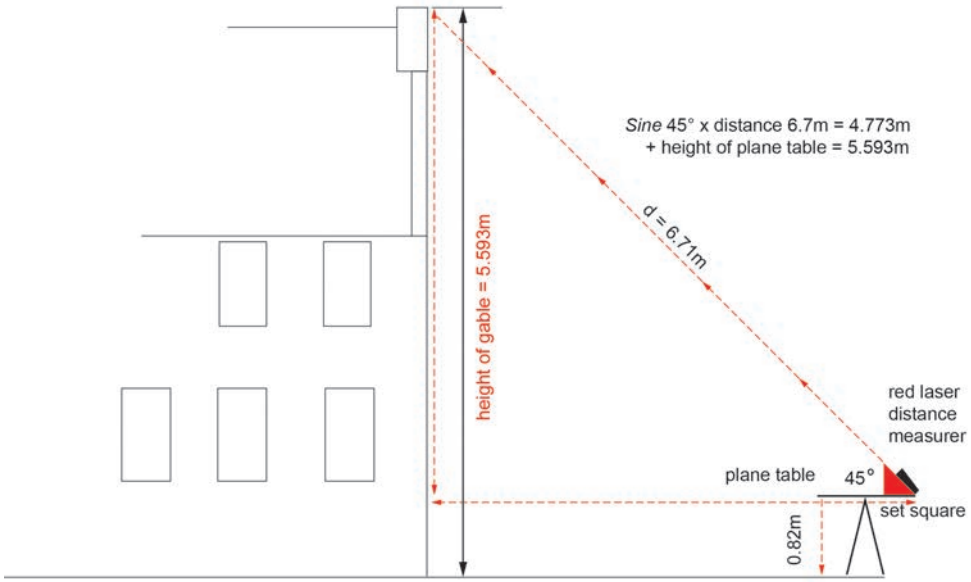
While these are easiest to use, the equation works for other numbers too. For example, 4.6 × 8.5 × 9.66 is a right-angled triangle, as shown in the diagram above, as is a triangle measuring 2.5 × 5 × 5.59, but 3:4:5 is the easiest to remember!

Shown below is a simple method for calculating the height of a building using the calculator function on a mobile phone and a basic hand-held laser measuring device. Bear in mind that more sophisticated laser measuring devices have numerous functions available and can perform the calculation onboard. themselves.

In the first of the two diagrams the angle 54° as shown in the example is arbitrary; it is based on an angle measured with a protractor from the plane table to the top of the building.



In the second diagram the angle 45° is governed by the fixed angle of the set square, requiring the table to be sited in a position that allows the top of the building to be viewed.



Simple method for calculating the height of a building using Sine on a calculator

Producing an elevation drawing

Additional survey equipment that might be required for recording an elevation:

- ladders please refer to health and safety section
- spirit line level
- plumb bob
- red laser spirit level and tripod

Creating a scaled elevation drawing is a fairly straightforward way of adding a third, vertical dimension to the drawn record of your site. This process is simplified if a scaled building plan has been created beforehand.

An elevation presented with a plan on the same drawing sheet gives a good, clear representation of a building. While the measurement methods described are more complex, an elevation can be drawn as a field sketch on site with dimensions added, enabling you to draw this up formally and neatly off site.

Measurements taken for creating an elevation drawing are usually taken from a horizontal line – known as a datum line. The datum line may be a recognisable feature in the architecture or, more usually, an artificial line in the form of a string or chalk line set up across the face of the building. If you use a string line it will need to be fixed into position and levelled.

A string line is certainly the most effective type of datum line, as it can be set up to intersect the middle of windows and doors, so that tops and bottoms of the features can be measured easily and noted in a clear way. Where the datum string does not touch the building or it is difficult to take a measurement, a builder's spirit level can be used to transfer the datum onto the structure.

Next, you will need to establish a horizontal zero point on the datum line. In the case of a straight-sided building, you might choose the left edge of the building. If surveying an irregularly shaped building, you might chose a point to the left of any detail that you wish to measure in. (A scale rule is marked from the left, so it is always easier to measure and plot the distances in the same direction.) Measuring an elevation is similar to carrying out a tape and offset survey. Each point that you want to fix requires one measurement along the datum line and one measurement up or down from the datum line.

In certain circumstances it might be easier to collect a series of measurements for the height of a building from the interior, particularly if there are stairways that give access to roof spaces. Recording the elevation of a building exterior that exceeds the height of reasonable safe access at ground level should be avoided. Some alternative methods for establishing heights of structures are covered above.

If a drawn plan exists, your elevation drawing can be started by laying a piece of transparent drawing film over the plan to trace off the positions of the building corners, door and window openings or blockings that will be included in the elevation. From these points, where the distance along the building is known, a semi-rigid steel tape can be used to measure up or down from the datum line to obtain the height. The positions of the datum line and of the points are then plotted onto your elevation drawing.

Once the detail of these known points has been plotted onto your drawing, you will have the bare bones of an elevation. You can now start adding detail for which you need a distance along the datum as well as a height. You might want to record distances and heights onto a sketch survey, or (an easier option) a second person can take measurements and call them out as you draw.

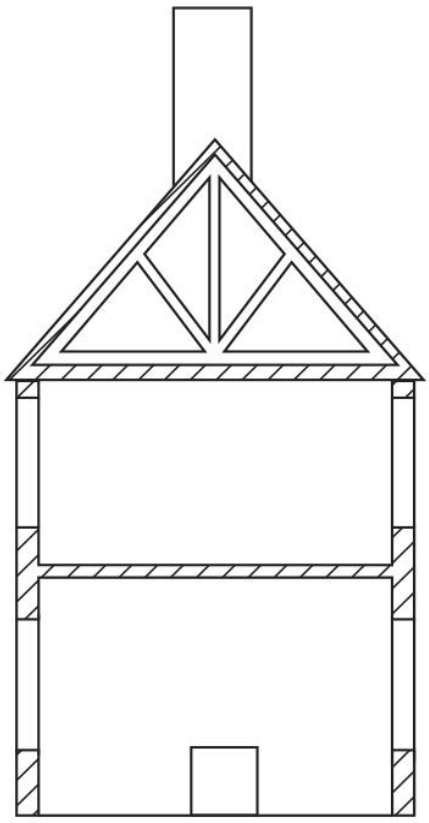
Once the outlines have been plotted onto the elevation, it is easier to plot minor detail by measuring from the nearest building feature, for example a set of running sizes can be taken to record the position and form of all the minor details that you wish to depict and can be added bit by bit until the elevation is complete.

Examples of a simple elevation of a domestic building – end gable and façade showing form and location of openings. Although there is no scale bar the general proportions can be gauged from the relative size of the doorway.

Creating a section

The methodology for creating a section drawing shares many of plans, and in most cases requires information from both these sources. A successful section drawing should combine aspects of both exterior and interior planes, heights, widths and thicknesses to show heights and vertical angles which are not possible to represent in plan view.

Ideally, free and easy access throughout all parts of a building is required to construct an accurate section, but the reality is that this is rarely an option. For example, buildings may be too high, lines of sight may be obscured, and roof spaces, whole floors or rooms may not be accessible for any number of reasons.



An example of a section drawing through the same building shows wall thicknesses, the configuration of the roof trusses and the location of a ground floor fireplace – all features that cannot be verified from an external viewpoint. The section drawing right was created at the same time as the plan and elevation, and shows the kind of features that can be recorded in such a view plane.

These are common problems and even the most modern digital technology can struggle in the face of such obstacles. On the positive side, it would be unusual not to be able to create some level of section drawing from available resources, measurements, archive material and a bit of informed guesswork.

If you have previously been able to record a plan and/or elevation of the building, you will already have taken most of the key measurements you will need to create a 'wireframe'. These key measurements will provide points that you can plot onto your drawing, and from which you can take further measurements to build up the level of detail required for your section.

Plane table and alidade survey

Equipment required for a plane table and alidade survey:

- plane table
- tripod
- alidade
- spirit level
- 30m tape
- polyester drafting film
- hi-polymer 6H pencil
- masking tape
- pin
- scale ruler
- compass
- ranging rod for sighting
- plumb-bob

A plane table (or plain table as it was known prior to 1830) is a simple device used in surveying to provide a solid and level surface on which to make field drawings, charts and maps. The early use of the name plain table reflected its simplicity and plainness rather than its flatness (or plane). The first historical reference to plane table surveys was in the mid-16th century, but it is likely that the methodology was used long before this.

Plane table surveying is a very effective way of getting to grips with all the basic rules of survey to record angles and distances. Modern digital technological instruments are designed and constructed on these same fundamental principles. Plane table surveying is best carried out by a minimum of two people, but can be done by a single person depending on such issues as survey area and time constraints.

This method of survey allows a surveyor to plot and create an accurate scale drawing on site. The idea is to scale down your subject matter to a size where it will fit onto your drawing board.

A plane table is simply a drawing board which is fixed to a stand, usually a tripod, levelled and orientated. The table is used, along with a sighting device called an alidade, which is used to observe the points of interest you identify on your site. A simple alidade is basically a ruler with a sight at each end.

Don't be in too much of a hurry to get started – take time to have a good look at the site or building that you are going to record. On a building, the obvious features that you would want to record are the corners, door and window openings, fireplaces, etc. More subtle features that you would look out for are changes in wall direction, straight joints, blocked doors or windows, changes in the building fabric, etc.

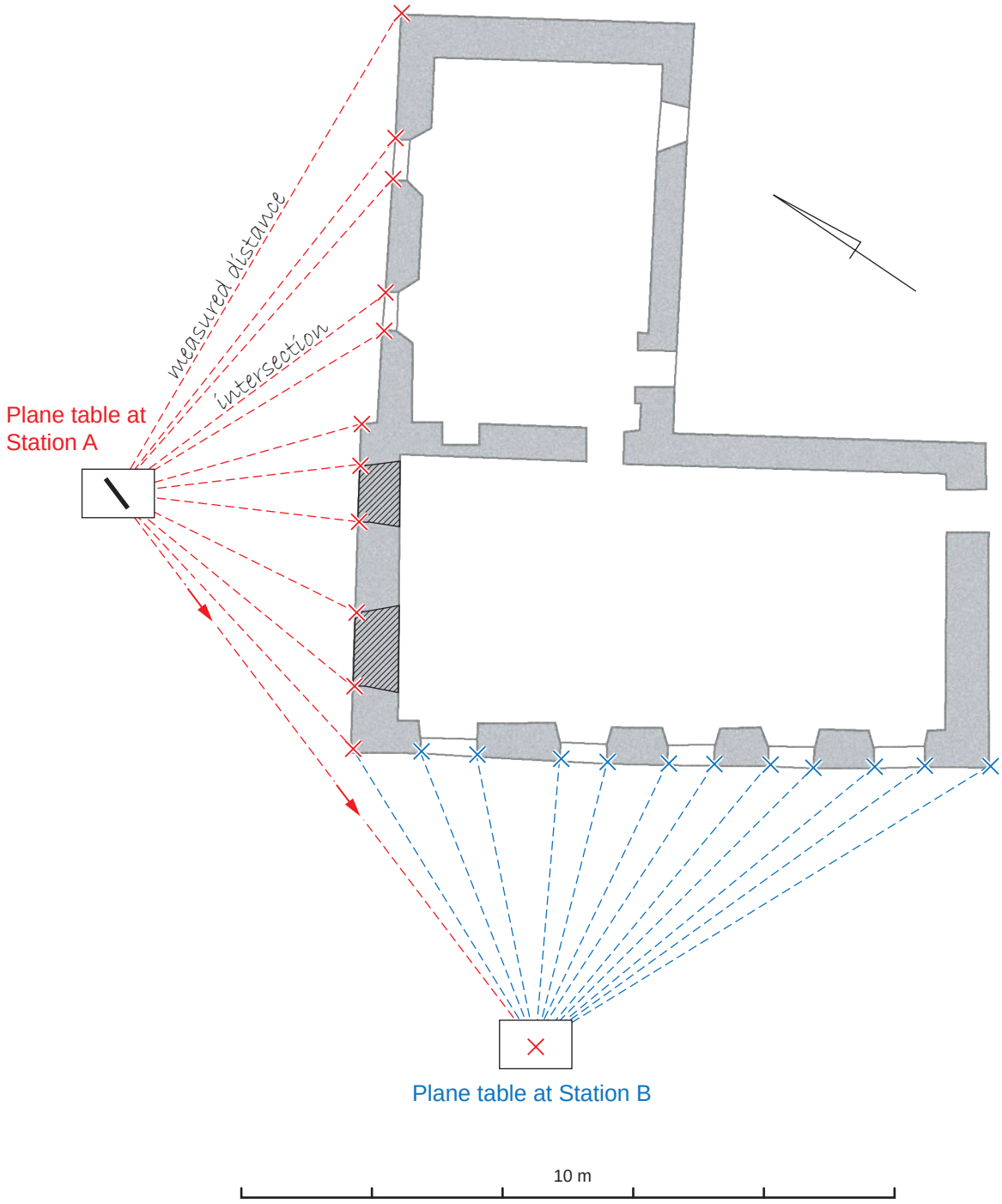


Diagram showing lines of sight from plane table survey stations to points of interest on a standing building. Rather than employing two tables this supposes that Station B was established from Station A initially and then moved – using Station A as its backsight, or point of reference. This sequence can then, theoretically be repeated around the building.

Selecting a survey station

Once you have satisfied yourself that you understand what it is that you want to record with the plane table, you will need to select a position to set it up; this is called a survey station. Ideally, this location will provide you with a line of sight to as many of the main points of interest as possible. It is particularly important to be able to see easily identifiable features such as corners and other places where a change in alignment might occur. To begin, set up the tripod legs over your selected location.

Select your chosen drawing medium, secure it with masking tape to the drawing board surface and attach it to the tripod. Adjust the tripod so that the board is at a suitable height for the user and is set horizontally using a spirit level. When you have done this you can rotate the board so that its long axis corresponds to that of your building or site as required.

When you are satisfied that you are set up correctly, mark the direction of north onto your plan. If feasible, mark the point on the ground directly under the centre of the table – a plumb-bob will probably be needed for this. If you know that you will need to set up other stations within sight of the first station in order to complete your survey, this is an essential step.

For all plans it is important to know whether the area you are going to survey will fit onto the drawing board at your chosen scale. Check this beforehand by measuring the maximum extents of the survey area. If all the steps have been done to your satisfaction you are now ready to begin surveying!

Firstly, in the method described below, a pin is positioned in the (centre of) the board representing the point on the ground – your survey station. The pin provides a fixed point from which observations and measurements can be taken. Once the survey has begun, the plane table should not be moved; you should be careful when moving around the table not to bump into it or lean on it too heavily.

Place the alidade securely against the pin and rotate it accordingly to observe each of the selected points of interest to be recorded through the sight vane of the alidade. Mark each line of sight around the periphery of the drawing sheet (these are known as rays) with a pencil and record the measurements between the pin and the points taken (measuring tape, red laser distance measurer, etc). It is good practice to write the measurement next to the drawn ray for future reference. Subsequently, each point can plotted along the ray at the selected scale, using a scale ruler.

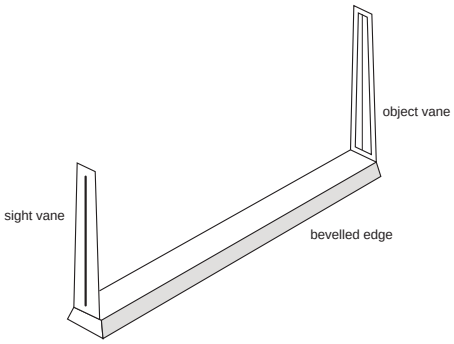
Take observations and measurements to as many points as required, allowing the shape of your survey to be recorded. These plotted points create a very accurate framework around which the rest of your plan can be constructed. This method is most useful for plans of single buildings or small sites within a radius of 30m from the plane table and where lines of sight are not obscured or angles likely to be too acute.

Larger areas and complex sites

In some circumstances the scale and complexity of a site might require multiple stations to be set up. The second station should be sighted and plotted accurately onto the plan (as a point) and clearly marked on the ground. Ideally, it should be located within easy reach of (less than 30m away from) the first station.

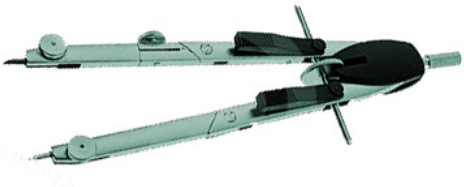
Glossary

Alidade – a device that allows one to sight a distant object and use the line of sight to draw a line on a plane table in the direction of the object or to measure the angle to the object from a known point. Angles measured can be horizontal, vertical or in any chosen plane. The alidade's primary use is for creating maps in the horizontal plane.



Compass – the magnetic compass, which functions as a pointer to 'magnetic north'.

Compasses (or pair of compasses) – a technical drawing instrument that can be used for drawing circles or arcs.



Dividers – scale instruments, similar to compasses, used to measure distances, particularly on maps.

Hachures – an effective mode of representing relief on a drawn plan. Their purpose is to indicate the direction and steepness of a slope; the thickness, shape and density of the distribution of hachures on a drawing illustrate the general sense of steepness. Applied properly this method can successfully communicate quite specific shapes of terrain, both natural and man-made.

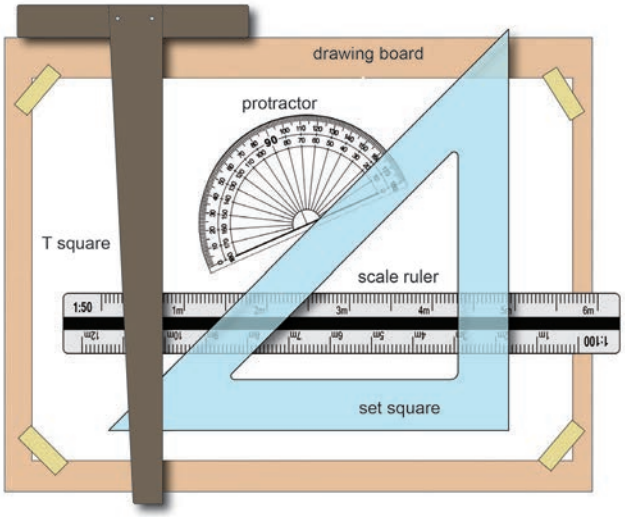
Line level – a level designed to hang on a builder's string line to indicate a horizontal plane.

Phasing – the identification of a particular stage in a process or change in a development i.e. Phase 1 being the oldest and phase 5 the most recent, related to events occurring over a specified period of time or the order in which something is constructed.

Plane table – a device used in surveying to provide a solid and level surface on which to make field drawings, charts and maps.

Plumb-bob (or plummet) – a weight, usually with a pointed tip on the bottom, that is suspended from a string and used as a vertical reference, or plumb-line.

Protractor – an instrument for measuring angles, typically in the form of a flat semi-circle marked with degrees (in two directions) along the curved edge.



Ranging rod – a surveying instrument, usually marked off in red and white striped sections; it has multiple uses. Frequently they are used for marking the position of survey stations, as well as for ranging the straight lines of sight or rays onto a drawing.

Set square – an instrument used for drawing vertical and inclined lines.

Scale ruler – a ruler marked with a range of calibrated scales (ratios) for drawing and measuring from reduced scale drawings.

Sketch – most often a simple hand drawing to illustrate the essential features of a structure in plan or elevation view or to illustrate particular detail.

Spirit level (or bubble level) – an instrument designed to indicate whether a surface is horizontal (level) or vertical (plumb).

T-square – an instrument used for drawing horizontal lines which are absolutely level.

Tripod – a three-legged standing device used to support surveying instruments.

Notes

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