



Guidance Notes: Making a Graveyard Plan

This work sheet provides:

- * an overview of different survey methods and key information
- * instructions for how to complete a sketch plan
- * instructions for how to survey using a grid or off-sets
- * instructions for drawing up your plan
- * a bibliography and online resources for further information
- *

This Guidance note has been prepared by the Carved Stones Adviser Project in conjunction with Jacqueline Aitken, Clyne Heritage Society

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1.0 Introduction

How to plan the graveyard will be influenced by 4 main factors; what work has been completed, what you want to use your plan for, your available resources and the ability for others to make use of your work in the future.

Why make a graveyard plan?

An accurate ground plan of a burial ground is a key element of any gravestone recording project. A plan will allow you to organise collection of information in the field and will be a key document of the project's archive enabling others to use your information in the future. A plan of a graveyard is valuable for many reasons including:

- * it allows individual memorials and family groupings to be located and descendants to easily find family gravesites
- * it provides a record of all features in the burial landscape including buildings, burial enclosures, trees, paths and other features
- * it enables changes in a site's appearance to be monitored over time to study the historical development of a graveyard including evidence of patterns of use, planting schemes and maintenance methods.

What stages are involved in making a graveyard plan?

A detailed plan should be drawn up before starting any memorial recording. This step

need not produce final master plan. A sketch plan can be to show the positions of gravestones from which the recording inscriptions and other attributes can be based. If resources allow, a carefully measured plan can be produced at a later stage. Making a plan involves the following steps:

1. preparation - find out what has been done before, to locate helpful documents and to find out about graveyard.
2. choose a survey technique e.g.:
 - * a sketch plan where the location of gravestones is plotted by eye
 - * using extra long tapes to make a grid or offsets to measure the position of gravestones by hand
 - * using specialist equipment, such as Electronic Distance Meter (EDM) and Global Positioning Systems (GPS) to plot positions electronically
3. create an outline of the graveyard, check this on the ground and against maps
4. carry out fieldwork part one - create a numbering system for the gravestones
5. carry out fieldwork part two - plot the position of the gravestones
6. draw up the graveyard plan
7. test the plan's accuracy - give your it to someone who doesn't know the site well and check that they find their way around the graveyard.

Remember if you produce a sketch plan initially and want to create a measured plan as your master plan you will need to complete stages 4 to 7 for each.



2.0 Preparation work

Before starting fieldwork it is necessary to carry out basic background research, to obtain the relevant permissions to start work and to familiarise yourself with health and safety procedures.

DOCUMENTARY RESEARCH

Documentary research - locating earlier survey work and helpful documents

Existing documents can help you to draw up a current outline and layout of a graveyard and may show how this has changed over time. It is a good idea to undertake documentary research at the same time as obtaining permissions. The people you contact for consent may also know of earlier survey work and other documents that would be helpful for your project. In some cases documentary research may be necessary to find out who to contact for permission to survey the graveyard.

The free CSA booklet *Researching Your Graveyard* published by Historic Scotland, includes information about archives and libraries in Scotland and the range of graveyard related records they hold.

How helpful are previous gravestone and graveyard surveys?

Earlier recording work can provide useful information on the location of memorials at the time the survey was completed. It is possible that errors and omissions may

occur in earlier surveys, so it is always be advisable to cross-reference existing plans to the gravestones found in a graveyard today. Some past surveys were date-selective, notably those produced by family history recorders, and in these cases certain stones, often post-1855 in date, will not be included on the plan. It is important to test if earlier plans are still accurate, as stones and other features may have been moved, uncovered or added over time.

Where can I get access to previous survey work?

It is a good idea to check both local and national collections for records dealing with your graveyard. Useful contacts including:

* LOCAL AUTHORITY SITES AND MONUMENTS RECORDS (SMRS)

Most of Scotland's Regions and Islands Areas have a Sites and Monuments Record (SMR) that lists information on all known sites within the area administered by a local authority. Public consultation of SMRs is usually limited and by arrangement only. The Council for Scottish Archaeology provides a summary of archaeological services in Scotland, which shows whether your council administers an SMR and their contact details. This is found online at <http://www.scottisharchaeology.org.uk>

Information is available online for the Aberdeenshire, Highland and West of Scotland Sites and Monuments Records at <http://www.pastmap.org.uk>



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* NATIONAL MONUMENTS RECORD OF SCOTLAND (NMRS)

The Royal Commission on the Ancient and Historic Monuments of Scotland (RCAHMS) records and surveys all forms of the built heritage in Scotland and makes this information available through the National Monuments Record of Scotland (NMRS). CANMORE is a searchable database of the NMRS and can be freely accessed online at <http://www.rcahms.gov.uk>

The NMRS can also be consulted in person or by correspondence at Royal Commission on Ancient and Historic Monuments of Scotland, John Sinclair House, 16 Bernard terrace, Edinburgh, EH8 9NX or Tel: 0131 662 1456.

* PASTMAP

PASTMAP <http://www.pastmap.org.uk> is a free online map based system to query Scottish national archaeological and architectural datasets including:

- * Historic Scotland's Listed Buildings and Scheduled Ancient Monuments of Scotland
- * National Monuments Record of Scotland (see above)
- * Scottish Sites and Monuments Records (see above)
- * Scottish Natural Heritage's Historic Gardens and Designed Landscapes

* LOCAL STUDIES LIBRARIES, ARCHIVES AND GENEALOGY CENTRES

For local contact details see your telephone directory or consult the Scottish Library and Information

Resources, which provides addresses and contact details of Scottish libraries and other information services <http://scone.strath.ac.uk/slir>

Your local library can give contact details of heritage or family history groups in your area. Other contacts include

* www.safhs.org.uk website of the Scottish Association of Family History Societies

* Council for Scottish Archaeology c/o NMS Chambers Street, Edinburgh EH1 1JF

* Scottish Genealogy Society Library and Family History Centre, 15 Victoria Terrace, Edinburgh, EH1 2JL, for more information visit their website at: <http://www.scotsgenealogy.com/>

What is a lair plan?

This type of plan is made by the graveyard owner and is used to show the layout of all the burial plots in a graveyard. The lair plan gives information on plot sizes and the name of the lair holder (but not necessarily the names of the people buried in a grave) and provides a number for each plot. Lair plans with surviving documentary sources, such as burial registers, can provide useful information about those people who were buried but not commemorated in a graveyard. Your local authority cemetery manager or local church group may be able to help you to locate a lair plan. In some cases if plans are working documents or in a fragile condition information may not be publicly accessible.



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How accurate are lair plans?

Lair plans are not always accurate or complete. It is important to remember that these plans only give lair owner information and do not necessarily include the location of the memorials above ground or list the persons interred. It should be possible in many instances to relate the position of memorial stones with burial plots, as well as providing evidence of any gravestones which have been moved. In some cases lair plans may only show the locations of recent burials and earlier burial plots may be unrecorded, especially in older disused historical graveyards. Many older graveyards do not have surviving lair plans.

At what stage do I use a lair plan?

A lair plan can provide useful information in the research stages of a recording project and when making a sketch plan. It is a good idea to make sure that your gravestone numbering system is compatible with the numbering system of graves included on any surviving lair plan. It may not be possible to give a gravestone the same number as a grave plot but it is a good idea to ensure that your graveyard plan at least shares the same orientation and correlates to the initial layout of grave plots. In practice this might be as simple as making sure that you number the gravestones in the same direction as the graves were laid out. This step will help to also make document research easier (see later section on Memorial Numbering System).

How useful are Ordnance Survey (OS) Maps?

The outline of a graveyard can be photocopied or traced from an Ordnance Survey map. It will be necessary to obtain the largest scale map available for your area, e.g. 1:1250 for urban areas, 1:2500 for rural areas or 1:10,000 for more remote areas. You can ask at your local library if they have OS maps of your area or a range of Ordnance Survey maps can be purchased from map retailers or official Ordnance Survey agents (see their website <http://www.ordsvy.gov.uk> for more details).

Do I need to know about OS Map copyright legislation?

You need to apply for a 'Paper Copying Licence' if you intend to copy or trace Ordnance Survey maps, as they are subject to copyright law. This can be done on-line or at your local 'Options' outlet. There is a charge for a licence which will cover a period of 12 months. The licence will allow you to make enlargements up to A3 size, which must be accompanied with Ordnance Survey copyright information. The Ordnance Survey offers a service called 'Superplan', which enables the public to order customised plot maps at a range of scales up to 1:200. It would be advisable for anyone interested in using Ordnance Survey maps to contact the OS direct and discuss copyright licensing restrictions. You can visit the Ordnance Survey web site at www.ordsvy.gov.uk for more information on copyright licensing, the national grid and where to find your local 'Options Outlet', or telephone the Ordnance Survey Helpline: 0845 605 0505.



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Is there a free OS map option?

An alternative source of map information would be to use Ordnance Survey maps older than 50 years (25" to 1 mile). Anyone can make copies from OS 1st and 2nd Edition OS maps and use those without infringing Copyright. These maps are not subject to any copyright laws and may be held in your local reference library or archive office, e.g. 1st and 2nd Edition Maps. The only drawback is that not all graveyards will be depicted on these maps, especially newer cemeteries

Can I use digitised maps?

You could try contacting your local authority planning department or archaeology unit (see your local telephone directory for contact details), who may be able to supply you with a digitised map (up to A3) using the Geographical Information System (GIS), if the facility is available.

Can aerial photographs help with making a graveyard plan?

Aerial photographs (AP's) can provide information about the shape of a graveyard and the location of stones within them. Unfortunately, most AP's are at such small or undetermined scale that they are not suitable for assisting in making an accurate graveyard plan. However, in some cases aerial photographs can be enlarged to provide a useful guide to draw up a sketch plan of a graveyard.

PERMISSION AND LEGISLATION

Do I need permission to carry out survey work in a graveyard?

An important part of the preparation work will involve making enquiries to establish the owner of the graveyard and asking their permission to carry out the graveyard survey. This should be done well in advance of the field work and information on ownership and management can be found by making enquiries with the following organisations or individuals:

- * Local authority cemetery manager (see your telephone directory or consult the Bereavement Services website <http://www.bereavement-services.org/>)
- * Minister (where relevant)
- * Local authority archaeologist or conservation officer (see telephone directory)
- * Historic Scotland, Longmore House, Salisbury Place, Edinburgh EH9 1SH. Tel: 0131 668 8600

Remember if that if you want to cut back vegetation - you will also need permission.

Will there be occasions when I shouldn't survey in a graveyard?

It may be worthwhile providing a project timetable to the graveyard manager and minister, as appropriate, so that they can advise you on any times when the site will be in use for worship, weddings, baptisms funerals or maintenance etc. and as a result inconvenient for recording work to take place.



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What type of legislation or other designations might apply to graveyards?

There are two main types of legislation that can be applied to graveyards (or individual features therein) - Listed Building status or Scheduled Ancient Monument status. Your Local Authority Planning Department should be able to tell you if any feature or part of the graveyard you are recording is listed or scheduled. Other ways to find out the status of a graveyard is to access Historic Scotland's databases online at PASTMAP <http://www.pastmap.org.uk>

Graveyards may also be protected by natural heritage designations, such as Sites of Special Scientific Interest or tree preservation orders, or acknowledged for particular natural or built heritage values, e.g. through listing in the *Inventory of Gardens and Designed Landscapes in Scotland* (again accessible through PASTMAP).

How will graveyard legislation affect my graveyard plan?

The legal protection applied to some historic graveyards may mean that it isn't appropriate to mark out a survey grid using ground-penetrating pegs. In such cases specific permission is needed for work that might affect the condition of a graveyard and its gravestones. It is a good idea to contact Historic Scotland (for scheduled sites) or your local authority archaeologists and planning department (for listed sites) to discuss the most appropriate survey method.

Where can I find out about graveyard legislation?

For more information download Historic Scotland's free electronic leaflet *Working in a Scheduled or Listed Graveyard or Burial Ground* from <http://www.scottishgraveyards.org.uk> <http://www.historic-scotland.gov.uk> or contact: The Publications Department, Scottish Conservation Bureau, Historic Scotland, Longmore House, Salisbury Place, Edinburgh Tel: 0131 668 8638.

HEALTH AND SAFETY

There is an increasing awareness of the risks posed to all graveyard users by the presence of unstable gravestones and, in recent years, there have been a number of accidents to members of the public in graveyards including fatalities, resulting from unstable memorials. It is ultimately the responsibility of the organiser of a graveyard project to ensure that volunteers are made aware of potential hazards. For more information see Historic Scotland's free electronic leaflet *Health & Safety for Historic Graveyards: Guidance for visitors and volunteers* (available as detailed above).

What can I do to reduce the risks?

A field visit should be undertaken at the chosen graveyard to assess possible risks. These risks might include overgrown areas, ruinous structures, used syringes, presence of grazing stock etc. Remember if that if you want to cut back vegetation - even on a non-statutory site - you will need permission.



3.0 Survey Methods

GENERAL INFORMATION

What scale is best for my graveyard plan?

The most suitable scale will depend on the size of the graveyard and the number of memorials to be planned. It is generally accepted that a scale of 1:200 or, with larger graveyards, 1:250 or even 1:500 is most appropriate. Extremely large graveyards can be broken down into manageable areas and planned separately. If you can obtain the use of a computer to draw up the graveyard plan a larger scale of 1:100 can be used.

A simple approach is to enlarge the OS 1:2,500 scale maps by a factor of ten, to produce a plan at scale of 1:250 which should be large enough to represent a grave plot by a rectangle with a unique number. It is important to photocopy the map outline of a graveyard with a scale, so that subsequent enlargements are also to scale. Remember the relative scale of buildings and paths can become distorted, and thus less accurate, when enlarged on the photocopier.

Should I plan a large graveyard in sections?

Breaking down a large site into distinct areas can make the task of plotting gravestone positions more manageable. When planning a graveyard in sections it is useful to use paths and other features as internal boundaries to separate discrete areas. A much smaller overall plan can be produced showing how all the sections fit together.

How do I compose/read a grid reference for the site of a graveyard?

The location of a graveyard is denoted by a grid reference, which is an essential way of pinpointing a feature on an Ordnance Survey map. You can do this by using the grid-lines on the map and to calculate the northing and easting co-ordinates to six or eight figures. A full grid reference will also include the identification of the appropriate 100 kilometre square of the National Grid, which is given in the margin of each map e.g. NT542 973 or NT5423 9734. Alternatively, you can use a handheld GPS to obtain a grid reference, which can be accurate to within 3-5 metres. Plot the position of the graveyard from the centre of the site.

What's the best way to the number the gravestones?

You will need to devise a memorial numbering system so that you can identify individual stones. The unique number for an individual stone should be used on your plan, photographs and recording forms, so that all references to one memorial can be readily associated together.

Ideally your system should follow the same general orientation as any lair plans (see earlier section). A convenient places to start numbering the stones might be at the beginning of a row of memorials at the corner of the graveyard or by a main feature which will may be easy to identify on the plan, such as a church.

Larger graveyards with many memorials may need to be divided into sections, each with an identifying letter and



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its own numerical sequence e.g. A1 - A20, B1 - B20, C1 - C20. This method may be more convenient than one long numerical sequence and make it easier to find the numbers on the plan and locate the stones again. Where stones are not found in straight rows you may have to think about an alternative numbering system that preserves the relative positions of the stones. It is easy to miss out a stone, especially when they are not in straight rows, so the numbers should be checked and re-checked.

Make sure you get permission from the graveyard owner if you want to place a temporary marker (such as a garden tag) in front of the gravestone to denote its number. Remember that grass-cutting is likely to disturb most if not all of the tags. Make a master list of gravestone numbers and correlate this to distinguishing feature of the gravestone such as its design, stone type or name of first person commemorated in its inscription. This will make it easier for recorders to following the memorial numbering system during fieldwork.

How should I plot the position of a gravestone?

If you are making a measured survey the reference points will produce a measured location for each memorial that can then be transferred to the plan. You can replace these points by a symbol once the field plan has been completed. If you are making a sketch plan positions can be plotted in by eye directly onto a outline drawing of the graveyard. The minimum number of reference points needed to plot an upright gravestone is one. The maximum number of reference points will depend on the scale of your plan. There will be no point in measuring numerous points, if when you

come to plot them up on your plan they overlap one another to become one large blob! Be consistent with where you take a measurement from, e.g. if you record the central point on the east face of the first memorial continue in the same way with the rest of the gravestones. Plot a minimum of two points for horizontal stone, for example, two central points at either end of the length of the table tomb.

Remember you need to write the number of each gravestone next to its reference points or map plot, if making a sketch plan. Unless you have obtained permission to insert temporary markers on ground to number gravestones (e.g. garden tags etc.) it is a good idea to take down further details might include the type of stone or name of first person commemorated to make it easier to test the plan against gravestones in the field.

MAKING A SKETCH PLAN

What is a sketch plan?

A sketch plan is made by plotting stones and features by sight, perhaps incorporating Ordnance Survey and Aerial Photograph information, and does not require surveying skills or equipment. It is the minimum standard for planning a graveyard. It should normally take about a day to complete a sketch plan, depending upon the size of the graveyard and number of gravestones to be plotted. If resources allow may be more labour saving in the long run to making a measured plan from the outset of a project.



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What makes a good sketch plan?

It is important to think about the approximate relationship between monuments, buildings and other features and reflect this on the plan. This may take some time but the outcome will be a more accurate plan that can later be used successfully by someone else to identify stones. Figure 1 showing Colinton Parish Church Graveyard is an excellent example of a well drawn and accurate sketch plan.

How much detail should I include on the sketch plan?

When one or more features/memorials become altered in the graveyard it becomes much more difficult to calculate the relative positions of features and stones. By including as much detail as possible, as the graveyard landscape changes over time future users of the plan will have the greatest opportunity of recognising features on the ground to judge where individual stones are located. This recognition process can be further enhanced by adding symbols to the plan to differentiate between the different types of gravestones, and by providing a key on the finished plan (see section on drawing up your plan).

How accurate will my finished sketch plan be?

An accurate sketch plan should be completed using a consistent strategy and be tested by someone who is unfamiliar with the graveyard to locate memorials in the graveyard.

Sketch Plan Methodology

1. Start the exercise by becoming familiar with the shape, size and layout of the graveyard before beginning your sketch plan, as this will help you to establish how much paper space will be needed to represent clearly all or part of the graveyard and its memorials.
2. Pace out the graveyard to gain a sense of relative distances (see figures 4 and 5).
3. The graveyard boundary can be drawn freehand onto plain paper attached to a drawing board, or more suitably by using the outline from an Ordnance Survey map. (See Preparation section)
4. Starting at one corner of the graveyard, or at another convenient place, mark the locations of the memorials, buildings, paths and other features by sight.
5. Larger graveyards may need to be divided into sections and drawn separately and features like paths can be used to distinguish between the different sections.
6. Number the memorials in a systematic manner as you proceed and provide a symbol key to identify different types of monument.
7. Add a note that the sketch plan is not to scale and include a North arrow
8. Include the name of the surveyor, the date when the sketch plan was made and a national grid reference.



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PROS

- A sketch plan can be completed in a shorter time than other surveying methods
- It is possible for one person to carry out the work
- No surveying equipment or skills are necessary

CONS

- The final result will not be an accurate representation of the graveyard, memorials or its features
- A more accurate plan may need to be made at a later stage in the graveyard project, incurring more overall time spent in making a plan
- It may be more difficult to join different sections of the plan together to obtain an overall picture of the graveyard and memorials
- The sketch plan may not be easily understood or interpreted by other people who may want to use it in the future, as compared to a more accurate measured plan.

HAND MEASURED TECHNIQUES: TAPED OFFSETS AND THE USE OF A GRID

What is a measured plan?

A measured plan of a graveyard can be made using traditional surveying equipment, and some knowledge of the skills required including geometry and technical drawing. Two methods are

suggested here for making a measured graveyard plan:

- A. taped offset (illustrated by the plan from Whithorn, figure 2)
- B. the use of a grid (illustrated by the plan from Markinch, figure 3)

Method A is the simpler of the two, and method B would be used by someone with some surveying experience. The basic skills are fairly simple and can be picked up easily.

What is the base-line and how do I construct it in the graveyard?

Both taped offsets and the use of grid involve laying down a base-line in the graveyard using measuring tapes and ranging poles. Select an area of the graveyard free from obstacles and lay down a base-line which runs from one side of the graveyard to the other. Older graveyards are likely to be more irregular in shape than modern cemeteries, and you may find that the position of the base-line will be dependent on the shape of the graveyard and the number of obstacles to be avoided. It may be convenient to place the base-line along the boundary wall of a square or rectangular shaped graveyard or along the frontage of a building, as long as the line of sight is uninterrupted.

From this main base-line you will either take offsets (Method A) or set up a grid (Method B) and take measurements from the base-line to the memorials, buildings, paths etc.



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How can I limit the number of errors in my measured plan?

It is important to remember that on a significantly sloping graveyard, measuring on the ground will introduce distortions onto your plan. Therefore, measurements should always be made in a horizontal plane, i.e. holding the tape tight and horizontally above the ground. Once you have established your base-line, any offsets or measurements along the contour of the slope will not be distorted.

It would be useful to have someone with a little experience of surveying to supervise the different sections of the graveyard to be surveyed. It can be easy for errors in measuring to be made which could dramatically affect the accuracy of the final plan. These mistakes could be picked up by the person overseeing the project who could also ensure that a consistent standard of work was maintained by volunteers throughout the whole exercise.

What resources do I need to make measured plan?

It will take at least two or three people to make a fairly accurate graveyard plan, or more if different sections are to be planned simultaneously. You may be able to borrow some of the equipment from your local museum, local authority archaeology unit, college or surveying firm. It may be more practicable for a Society to purchase equipment if there is a long term programme of graveyard survey planned. The following items may be found at your nearest art suppliers, survey suppliers or general iron mongers.

Equipment

- Two 30m tapes
- Surveying Arrows or pegs and hammer
- Ranging Poles - you could make them yourself from broom handles, for example, or borrow them from local museum, college, firm of surveyors or estate agents
- Twine cut into 100m lengths (Orange nylon)
- A good quality Compass (e.g. Silva)
- Squared paper (graph paper) and tracing paper
- Drawing pens, e.g. Rotring
- Drawing board and drawing film, e.g. permatrace

Instructions for surveying with Method A: off-sets (figure 2)

Using figures 4 and 5 as guides, measure out the distances along the dotted lines and enter them on the rough plan. Starting on the west side, lay out the 30-metre tape from the south point A along the line of stones (figure 4). Measure from the west wall at various points to stones, to check that they are correctly inserted, as the wall may not be parallel to the row of stones.

With the scale rule mark on the plan a cross for each stone, measuring to the centre of the stone, and with running measurements to the centre of the next stone. Check the distance of the last stone to the north dyke to see if the plan is correct. Row A is now completed. Next, do the same with each row in turn, marking each stone on your plan. Sometimes the stones are not in a straight line; in this case, for every stone measure the running distance from the previous stone, and also the deviation of the stone from the tape.



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When all the stones are plotted on the plan, return to position A with the plan and insert the stone numbers, using pencil. It is easy to miss out a stone, so it should be checked and rechecked. It does not really matter where your starting point A is; depending on the shape of the graveyard and the lay-out of the stones, select the most convenient place for logical numbering (extracted from Betty Willsher's 1984 work *How to record Scottish Graveyards*).

Instructions for surveying with Method B. the use of a grid (figure 3)

This is the method a surveyor would use, and is the more accurate. If a surveyor is willing to help, it will be most useful. However, the Markinch survey was carried out by this method by a team of school-children. Using figures 2 and 3 as guides, measure out the distances along the dotted lines and enter them on the rough plan.

Establish a base line, using a clear part of the boundary of the yard. Set up two poles, the length of the yard between them. Connect them with twine and mark off this line with pegs at 10-metre intervals. At one of these 10-metre marks, lay off a line at an angle of 90° to the base line. Figure 7 shows how this is done. From one 10-metre mark (A) mark off two points on either side of A and equidistant from it, and place pegs at these two points, and attach to them equal lengths of string. Extend the strings until they meet at a point above A, marked D on figure 7. This will give a line from A to D which is at right angles to the base line. Using a string marked at 10-metre intervals, take this line across the yard, and mark off 10-metre intervals with pegs. Now carry out the same procedure

from each 10-metre peg on the base line, and you will have a grid of rectangles as in figure 8, e.g. A0 C3.

Now an accurate chart of the position of each stone can be made. Rope off a rectangle and, using coloured tape, mark metres on the string. On the plan draw in each stone by measuring its distance from the sides of the rectangle. Cross-check by using diagonal lines - see figure 9. Each stone should be marked on the plan using the following code:

Method A is simpler and is therefore recommended for those with no experience of surveying. Figure 2 shows the graveyard at Whithorn, Wigtownshire; the plan was made by Method A. It gives a fairly accurate plan and will be satisfactory if the graveyard is small, or if it is large but with a regular setting of stones. Method B, used for making the Markinch plan (figure 3) takes longer, but if the graveyard is irregular in contour, with stones set out of line and facing in cross directions, this method will facilitate making the plan and numbering the stones in logical sequence. There may be all sorts of obstacles such as trees, paths, large monuments or adjacent stones that overlap. However, these are in practice invaluable as an aid to dividing the graveyard up into manageable areas. (extracted from Betty Willsher's 1984 work *How to record Scottish Graveyards*).



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ELECTRONIC SURVEY METHODS

Electronic Distance Meter (EDM)

What is an EDM?

This surveying method uses lasers and a prism to measure from a known position, both the distance and angles of individual gravestones, buildings and other features in a graveyard. An EDM unit consists of two items of equipment, i.e. 1) a theodolite with a measuring head placed on top of a tripod and 2) a handheld prism connected to a ranging rod. The most accurate method of making a graveyard plan involves the use of an EDM.

The main disadvantage of using EDM is that you will also need to find a skilled surveyor to operate it, and to download the information onto a computer for processing into a plan. Apart from the surveyor operating the EDM, you will need another willing volunteer (unskilled) to assist the surveyor by holding a prism against each of the points to be surveyed. This high technology piece of equipment is an expensive commodity and most groups may not have the financial resources to make such a major purchase. You may be able to borrow EDM equipment at your local college or local authority archaeology department who may provide assistance and advice on the subject. You could also try browsing through the *Yellowpages* directory for information about surveying equipment suppliers.

Where do I set up my first EDM station?

Your first EDM station should be set up at a convenient place in the graveyard that gives the maximum view of the entire graveyard, and from this station all points are measured. This two person task involves one individual staying with the theodolite at the station taking the recordings, and the other person placing the ranging rod at the desired points to be surveyed at each gravestone. More than one station may have to be utilised if the surveyor cannot view the whole graveyard from the first station, e.g. graveyards on different levels, on slopes or parts obscured by buildings etc.

How many reference points do I record at each gravestone?

You can record as many or as few reference points as necessary to produce your desired plan. If you take one reference point at each gravestone you will produce a plan with point information rather than shapes to designate the location of memorials. It is advisable to take three points if you want to produce a plan which shows the shape of the gravestone base. Using taped offsets or a grid to manually record the locations of gravestones can inevitably produce inconsistency errors, whereas the EDM system calculates this information and saves it onto a digitised memory card. This information can be either downloaded onto a computer to produce a plan or sent away to be processed professionally, to produce an accurate plan.



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What are the advantages of using EDM?

This method is by far the quickest and accurate way of producing a graveyard plan, but a perfectly useable accurate plan can be made using measuring tapes and a drawing board, and can involve more of the community in the process making it more fun and providing a sense of achievement for the participants.

Global Positioning Systems (GPS)

What is GPS?

The Global Positioning System (GPS) is a world-wide satellite-navigation system formed from a constellation of 24 satellites and their ground stations. In simple terms GPS works because the computer inside the GPS receiver calculates its location using orbital and distance information from satellites. To obtain a location reading the receiver needs to lock onto three satellites (latitude and longitude), or 4 satellites (latitude and longitude and altitude) for a 3D reading. Basic GPS hand-held receivers are widely available at a cost of as little as £100. Advanced forms of GPS, called Differential GPS, can make measurements to better than a centimetre, however these fall outside the resources available to most individuals, therefore the guidance below concentrates upon Basic GPS hand-held receivers.

Can GPS be used to plan a graveyard?

GPS is not designed for surveying but rather a tool for determining location. Surveying using a GPS will produce a range of in-built errors, meaning it is unsuitable for producing even a rough plan of a graveyard. In general, a handheld GPS is only accurate to about plus or minus 20 metres (although accuracy of three to five metres will be available with EGNOS compatible receivers from 2004 onward). This level of accuracy is insufficient to record the location of individual monuments, although it could be used to plot the site of a graveyard on a remote hillside, for example. Points to consider include:

- * GPS accuracy is wholly determined by the ability to access satellites by line of sight. Access can be reduced by satellite availability, cloud cover and overhead obstacles like foliage and trees.
- * When recording the corners of standing buildings you may get a larger error due to the building itself obstructing the view of the sky and satellites. In a test exercise four corners of the church building were recorded and the SW corner produced a 49m error (under heavy foliage) and the NE corner produced an error of 11m.
- * Error levels change according to weather, overhead obstacles and satellite availability and as such are never constant throughout the day.
- * It is not possible to determine the direction of the error recorded and so this cannot be corrected on the plan.
- * Gravestones in close proximity to each other may produce the same readings.



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- * During a test exercise the least error recorded when plotting a gravestone was 6m and the highest error recorded was 9m.

Where can I find out more about GPS?

Useful GPS Websites include:

- www.globalpositioningsystems.co.uk
- www.gpsy.com (The Global Positioning Systems (GPS) Resource Library)
- www.trimble.com
- www.aero.org

4.0 Drawing Up Your Graveyard Plan

How do I draw up my plan?

The plan should be completed on plastic film such as Kodatrace or Permatrace (architects film), to prevent any dimensional distortions and ensure its permanence. You may be able to obtain squared permatrace, alternatively you can fix squared paper to a wooden drawing board using masking tape, covered with the plastic film. Use a hard pencil as the surface of the drafting paper is very abrasive.

It is important to remember where to position your plan on the drawing paper as you may run out of space. With a large area, several plans will need to be fitted

together. Make sure that all sections of a larger plan have the grid marked on them so that the different parts can be joined together.

What equipment will I need?

You will need to obtain a range of drawing pens with different nib sizes, which can be found at most art shops. Buildings and boundary walls require a fairly thick pen, gravestones require a thinner pen, and paths will require an in-between thickness of nib.

How do I represent the gravestones on my plan?

Gravestones need to be numbered, using manuscript or stencil lettraset. Each stone should be marked on the plan using a standardised set of symbols to differentiate between the different types of memorial found in a graveyard, e.g. flatstone, tablestone, headstone / footstone, obelisk, pedestal stone and chest tomb. The addition of symbols on a sketch plan would provide useful information to identify stones on the ground.

What should I include on my plan as well as gravestones?

All visible graveyard features should be included and clearly labelled, e.g. church, burial enclosures, paths, and trees. The plan should include a North point, grid reference, and name of surveyor or group who made the plan and date.



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How should I archive my plan?

Once you have finished plotting all the gravestones and features onto your plan it can now be inked in, labelled and titled. At this stage different sections of the planned graveyard can be joined together to make a complete ground plan. The final version of the plan must be tied into the report, notes and photographic records so that it is possible to identify and locate each feature recorded. It is important to be explicit about the methodology that has been used, e.g. on plan note what information was included/ not recorded or perhaps note that your plan is not to scale.

It is important that your finished plan is properly archived so that individuals and researchers interested in a particular graveyard can access your plan information. You can deposit a graveyard plan with your local archivist office, library and local authority archaeology unit. A copy should also be sent to the RCAHMS.

5.0 Bibliography

www.ejclark.fsnet.co.uk - '*Drawing a Graveyard Plan*' by Evan J Clark (2002), this website provides a step by step guide on how to make a graveyard plan, with useful diagrams

www.neep.demon.co.uk - '*A Scale Plan of the Graveyard*' by Rod Neep

Mytum, H 2000. *Recording and Analysing Graveyards*, Practical Handbook in Archaeology 15, Council for British Archaeology

Willsher, B 1985. *How to record Scottish Graveyards* Council for Scottish Archaeology

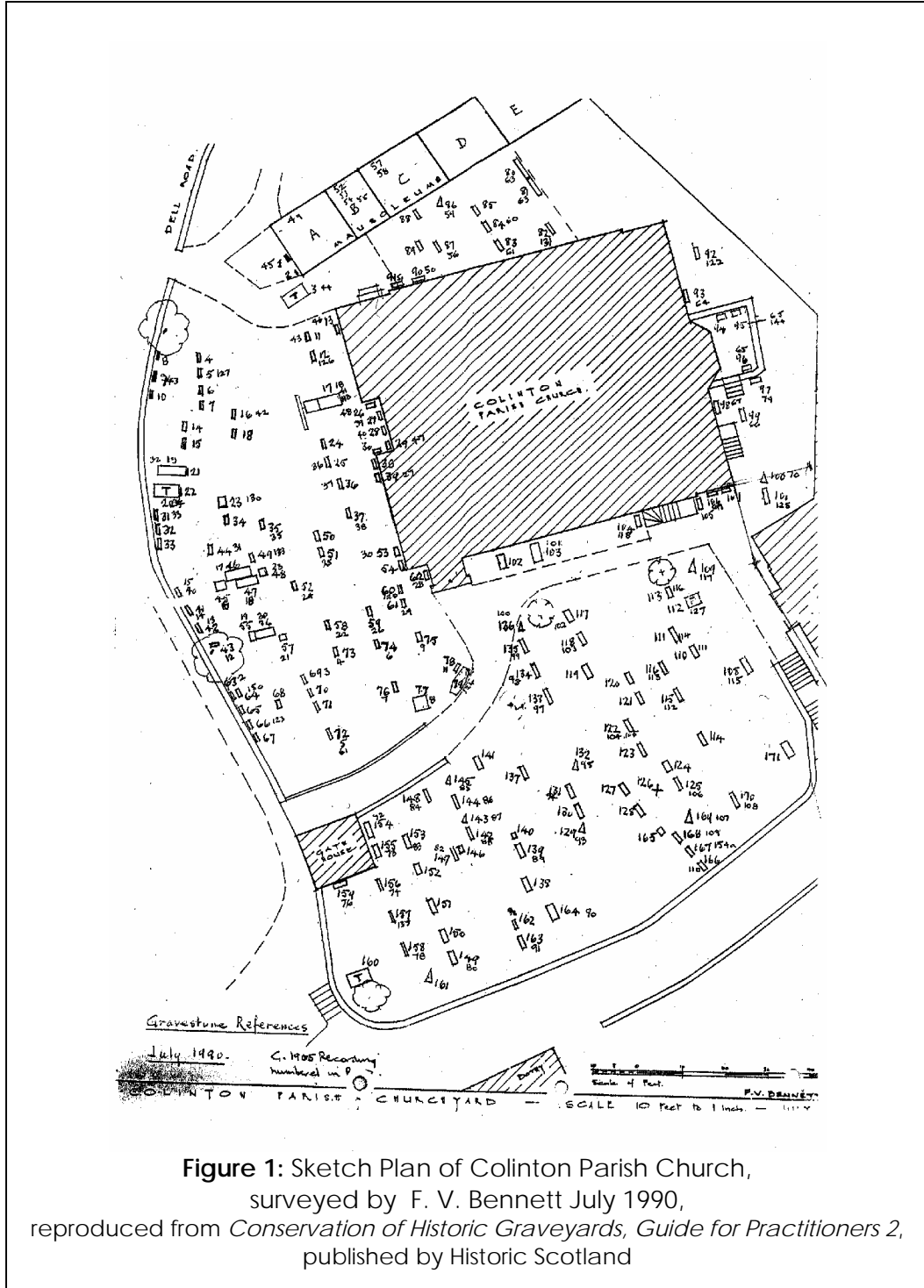


Figure 1: Sketch Plan of Colinton Parish Church, surveyed by F. V. Bennett July 1990, reproduced from *Conservation of Historic Graveyards, Guide for Practitioners 2*, published by Historic Scotland

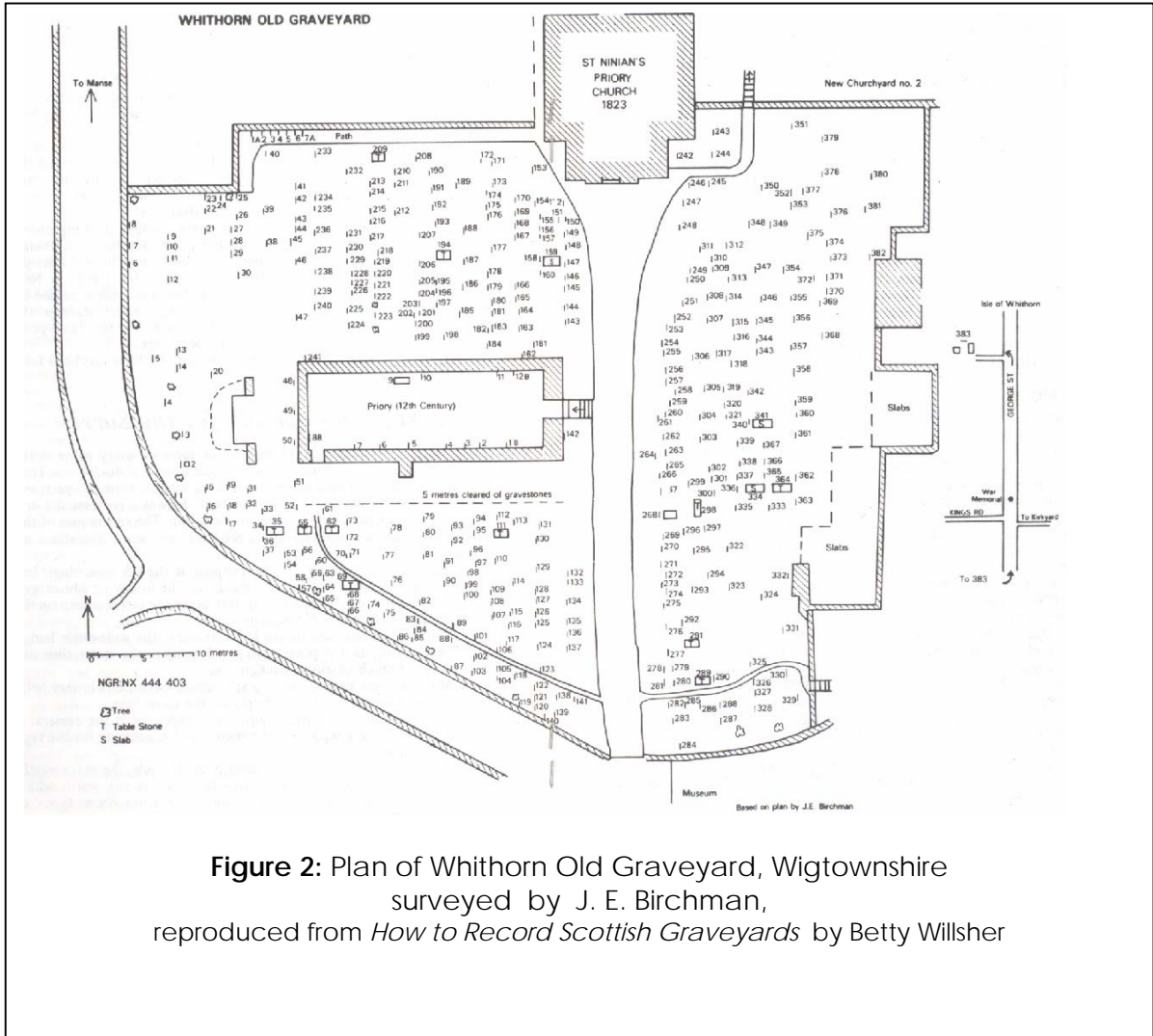
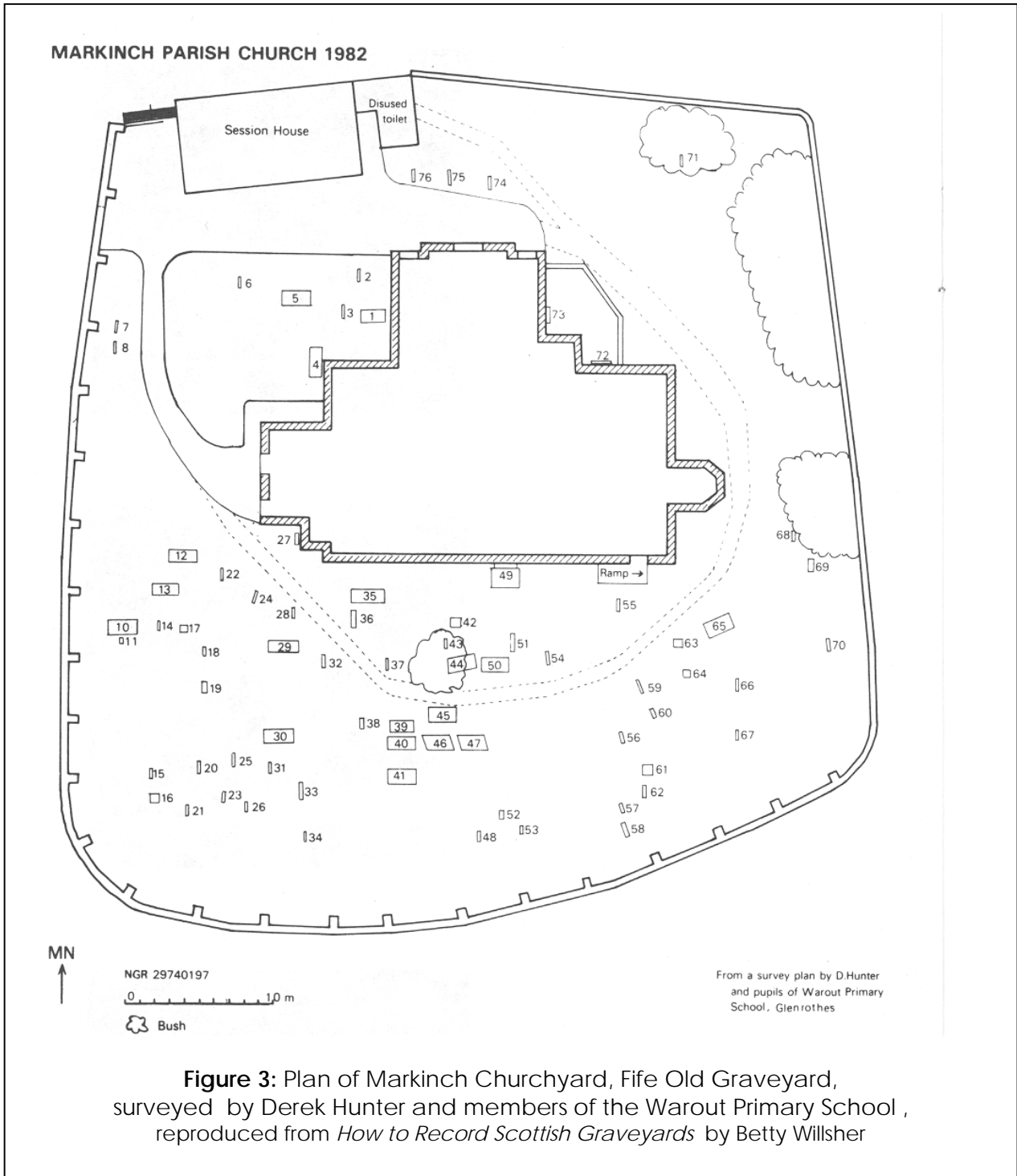


Figure 2: Plan of Whithorn Old Graveyard, Wigtownshire surveyed by J. E. Birchman, reproduced from *How to Record Scottish Graveyards* by Betty Willsher



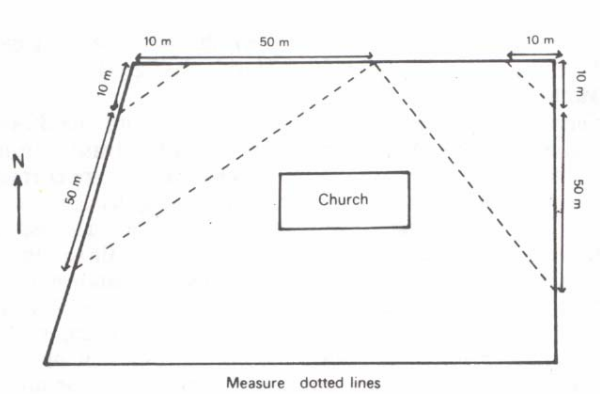


Figure 4: Rough plan of the graveyard (measure dotted lines)

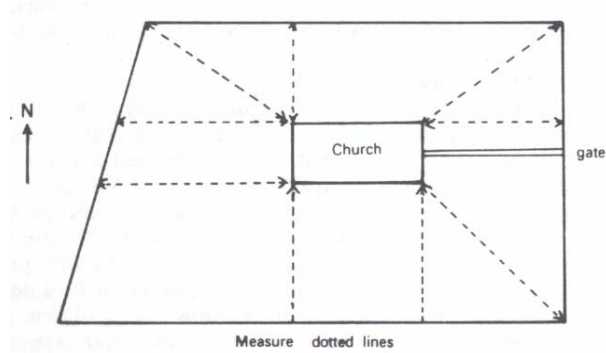


Figure 5: Measuring the graveyard (measure dotted lines)

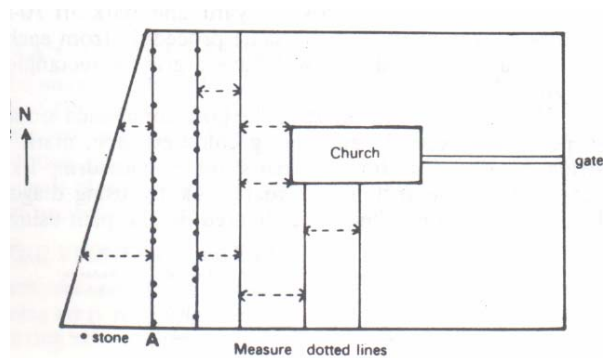


Figure 6: Method A: plotting the stones on the plan (measure dotted lines)

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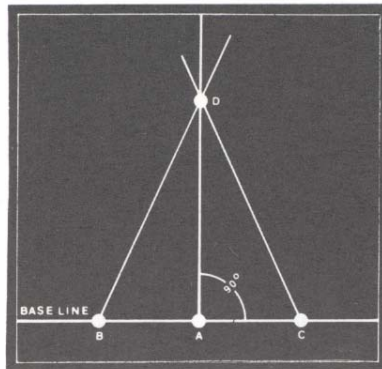


Figure 7: Constructing a 90° angle

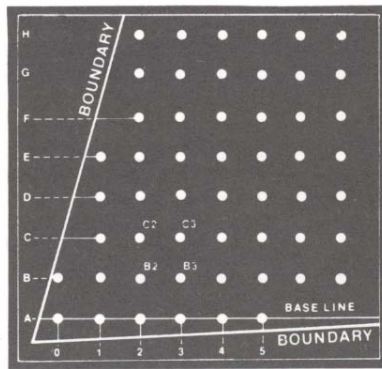


Figure 8: grid of the graveyard

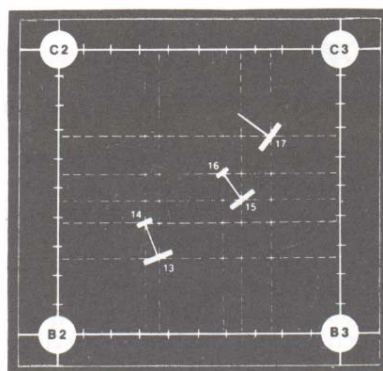


Figure 9: Plotting the stones by Method B

Figures 4 to 9 produced from *How to Record Scottish Graveyards* by Betty Willsher