

An Introduction to Surveying

part 2

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Excavation Records

Features and small finds exposed in an excavation should be positioned on plan from the nearest convenient reference points by triangulation. Since the tape must always be held as nearly level as possible to obtain an accurate measurement, it will usually be necessary to drop a plumb-line down into the excavation. Alternatively, the pointed steel end of a ranging rod may be slipped through the loop on the end of the tape, and the other end of the rod held over the feature; this is a less accurate method, however.

Areas such as a paved brick surface with regular courses of bricks may be surveyed by measuring to at least four points, pairs of which lie on the same joint-lines. The bricks can then be measured in along and across the courses (Fig. 5).

The measurement of sections as soon as they are dug is of course essential. The surveyor should first examine the section and where necessary clean up or highlight indistinct areas with a trowel. The section should be discussed with the trench supervisor and his diggers, comparing visible details with the information recorded in the trench notebook. Only then should a start be made on the actual recording work.

A number of different methods are available for

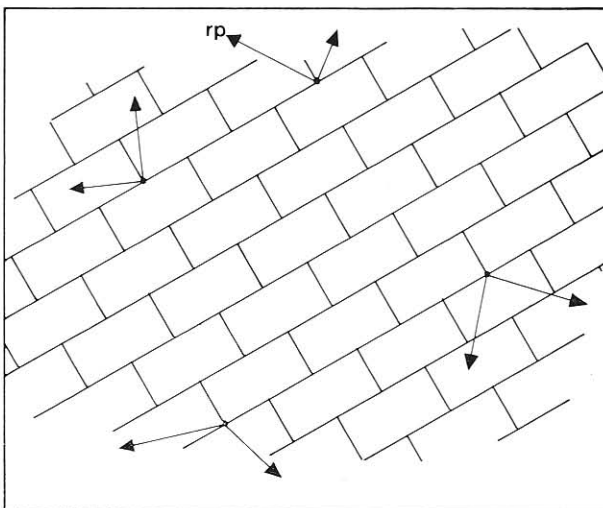


Fig. 5

measuring sections. One suggested procedure is to lay a timber straight edge along the top of the trench, wedging it up until a spirit-level shows it to be horizontal. (Alternatively a horizontal string line can be established at a convenient height along the face of the trench, supported by skewers at both ends and pulled tight.) A tape is then laid along the horizontal line, and vertical measurements are taken at frequent intervals with another tape or a yardstick. The spacing will depend on how quickly the layers and features slope up and down, but it will usually range between 3in. and 2ft.

The section should be plotted as it is recorded, on squared paper at a scale of at least 1in. to 1ft. After a little practice the vertical "meandering" of layers can be drawn in between levelled points by eye. Remember to measure in the ends of the straight edge or string line, so that the levels of these relative to the rest of the site can be determined as explained below. And never forget to record the layer numbers, checking that they correspond with the numbers noted in the trench book.

Building Surveys

Buildings may appear complicated, but essentially they are made up of separate boxes (rooms) divided by walls and floors. To survey any building thoroughly is a slow job, but it will rarely be necessary to locate accurately every brick or floorboard or roof tile. Openings, including those now bricked-up, should on the other hand always be recorded carefully.

Begin by sketching each external elevation roughly to scale, marking in doors, windows, roof lines and so on. The artist's trick of using a pencil held at arm's length will be useful in gauging proportions. Next, while still outside the building, sketch the outlines of each floor one by one, starting at ground floor (or basement if present and visible), and finishing with a roof plan showing ridge lines, rooflights, chimney stacks, etc. Each floor will generally be defined by a line of windows, doors or other openings, and these should be marked on the sketch plans.

Now go into the building and, starting again from the lowest storey, sketch out the plan of each room including internal walls, door openings, steps and staircases, trap-doors, fireplaces, etc. If the

building is small, these details can be added to the plan showing the outside features just drawn, but if it is large then it is probably better to put a room or group of rooms on to a separate sheet: external walls should be measured from both sides, so the plan already drawn will not be wasted. The windows and doors marked on this plan should ensure that no rooms are missed.

At this stage it may be convenient to sketch sections and elevations to show construction details to be recorded, such as floor sections (where accessible), door and window heads, and the roof space; followed by elevations of internal walls, with evidence of bricked-up openings and other alterations; and structural items such as cast-iron columns. The brush will be useful here to clean up details.

Measurement should begin with the external walls, taking running dimensions from one corner to reduce cumulative errors (Fig. 6).

Internally, measure all walls and diagonals on plan across rooms—it is surprising how few rooms are truly rectangular! Heights should be measured externally from a datum level of concrete or a brick course; hooking the tape to a ranging rod will extend one's reach to about 10ft. above ground level. Above this height, the tape can be hung from open windows. Inaccessible heights can be estimated on a brick building by counting the brick courses

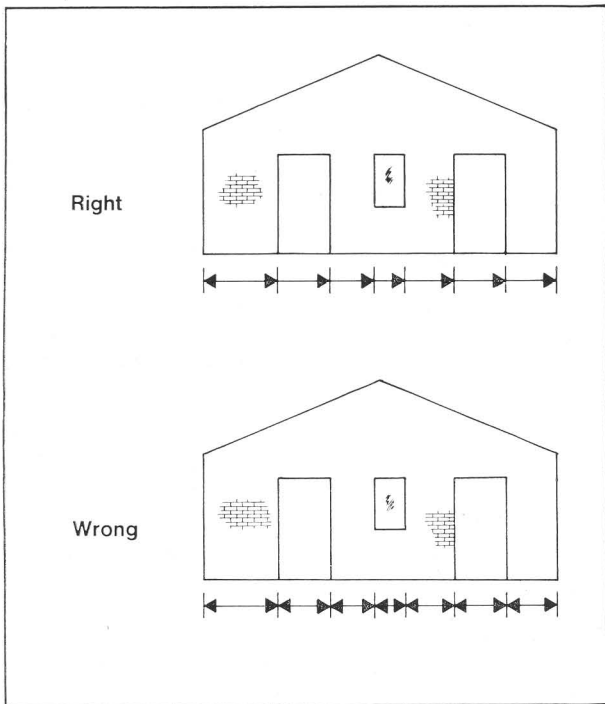


Fig. 6

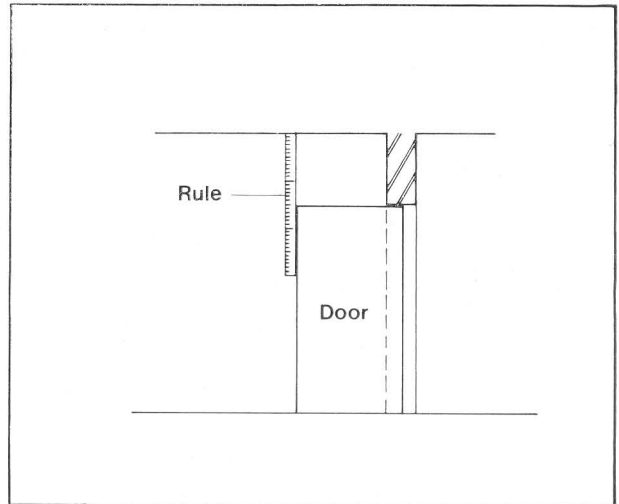


Fig. 7

and relating the number to the height of say 12 brick courses, measured in several places and averaged (normally one brick course with mortar joint is 3in. high). Roofs can be measured externally if you have a ladder and courage, but it is safer to rely on photographs and measurements taken inside the roof space: eaves projections can be determined from the upstairs windows. Ceiling heights internally can be measured by taking a yardstick up the side of an open door to touch the ceiling (Fig. 7).

Don't forget to measure wall thicknesses at doors and windows: a suspiciously thick wall can conceal a bricked-up room or cupboard, with maybe interesting prospects for finds.

Materials of construction, decorative finishes and other details should be noted: for this and other tasks a portable tape or cassette recorder can be very useful, but each room should be clearly identified on the tape before making a description.

Levelling

Accurate levelling is the one task that calls for relatively expensive equipment and a degree of experience. Normally, a surveyor's level will be used to "bring" a level on to the site from a nearby Ordnance Survey Bench Mark (shown on large-scale maps as "B.M." followed by the value, related to Ordnance Datum, and visible on the ground as a plate or in permanent structures such as walls or pillars in the form of a stone or brick incised with an upward-pointing arrow-head—in this case the level given is that of the short cross-piece at the head of the arrow). A temporary bench mark is established on the site—typically a stout nail set into a wall—and its level determined. The levels of reference points and other required points can then

be related to that of the temporary bench mark using the level and a levelling staff, which is a stout accurately calibrated scale held vertically at each point in turn. The staff readings give the level of the point relative to the instrument: the booking of readings and their "translation" into the levels of each point are well described in Fryer and Thomas (see below).

If trenches are small and near to reference points, local levels of features and finds can be related to the reference points using a spirit-level set on a yardstick or straight piece of wood. One end of this is put on the reference point or, if on sloping ground, at a measured height above it; one person then holds the stick over the feature, while another measures the vertical distance with a tape.

On excavations of large areas where no reference points survive close at hand, it is usual to maintain the levelling instrument on site (protected from weather and stray knocks) and to level in each feature and small find as they are exposed.

As with measurements on plan, levelling should be made "self-checking" by taking reference point levels with the instrument in more than one position, and by levelling back to the original Bench Mark (and to others if available). A properly-used instrument should be able to determine relative levels on the site to within $\frac{1}{4}$ in., and absolute levels to within $\frac{1}{2}$ in., accuracy usually better than the accuracy of local level measurements and quite adequate for most purposes.

Internal floor levels in buildings can be related to site levels through open doors, and by measuring up to window sills from both sides of the wall.

Inventories and Equipment Records

An inventory is a record of goods and possessions. These can indicate conditions of life and work, adding a human context to the recording of inanimate objects. Exact position will not often be important, but relative positions can be significant. An inventory carried out in an orderly way, supplemented by photographs, will give us this information.

The suggested sequence is to work up from the lowest level floor by floor, finishing in the roof space; deal with all rooms on one floor before moving up to the next level. In each room, deal with objects along the walls working systematically from the entrance round and back to the door, before turning to what remains in the middle of the room.

Draw first a rough sketch plan and wall elevations, showing cupboards, shelves, tables, etc. Indicate the relative positions of each item, noting them with an alphabetic and/or numerical key. Work

round the room recording all the required information item by item; once again a portable tape recorder is extremely useful. If someone who lived or worked in the building can be persuaded to talk about the way things were used, so much the better. Take any required measurements, and finally photograph as much as possible.

Don't forget cupboards, lofts, and spaces under stairs.

In recording machinery and equipment, a similar procedure can be adopted. Measurement may be involved, in which case the sketch-note-measure-photograph procedure can be followed. Maker's plates and other embossed or raised lettering can be "rubbed" onto paper by brass-rubbing methods, to give a full-size accurate record. The original maker's drawings often survive for industrial plant such as steam engines, and it will save a great amount of labour if these can be located before attempting a site survey. It must be remembered however that such plant frequently undergoes rebuilding or alteration during its working life, so there will nearly always be some recording to do.

Outline Surveys

The outline survey is perhaps more of a technique than another kind of survey. It is being used in studies such as vernacular architecture and industrial archaeology, where one is concerned or obliged (often by the abundance of material) not so much to record each case in detail, but rather to establish for comparative study a large number of examples. From these, individuals may be chosen for a more detailed survey. As an illustration, the Welsh School of Architecture in a study of iron industry housing in South Wales has so far indexed some 3,650 buildings.

A great deal of time in the field can be saved by the use of carefully-designed record cards, on which the relevant information is concisely recorded. The C.B.A. cards for industrial archaeology have been described by Paul Carter (*the London Archaeologist*, Vol. 1, No. 10), while the cards developed at Manchester University for the study of vernacular architecture are illustrated in Brunskill (see below).

The Use of Photography

It is not within the scope of this introduction to describe the techniques of record photography, beyond emphasising that the aim should be to produce sharp and well-contrasted pictures with scales where appropriate; with this in mind it is perhaps worth mentioning that whilst monochrome prints can be produced from colour slides, their

quality usually leaves much to be desired, and that for publication purposes half tone is the usual medium for illustrations.

However thoroughly a survey is logged on paper, photographs can play a valuable role. It should not be necessary to stress that photographs are an important part of the published account of an excavation or building survey, but they can also ease the task of preparing final drawings and reports, by clarifying complicated details and — rarely, one hopes! — showing up items omitted during the fieldwork.

Photogrammetry or photographic surveying is well known to archaeologists from its aerial application to locating sites, and is much used by map-makers. Its potential as an alternative to a survey measured on site is as yet undeveloped, but such work as has been done offers interesting possibilities including the scope to “reconstitute” demolished buildings in record form.

Plotting the Survey

All work should be carried out with a view to publication, and this will normally include drawings. To avoid wasted effort it is well worthwhile consulting the editor of the publication before preparing the final drawings. These are best drawn in indian ink on tracing paper, either tracing from a field sheet drawn to scale or setting out field dimensions in pencil before inking in the scale drawing. Reference points, although used for this setting out operation, would not be shown on the final drawings unless they represent a significant feature, and dimensions too would only be included on site plans and excavations to show thickness of material or the size and location of particular features. Building surveys will be more fully dimensioned.

The scale used will vary from perhaps 1/2500 for a location plan showing the site in relation to the surrounding area, to 1in. to 1ft. or larger for sections. Details may be up to full size or even larger. As drawings will normally be reduced for publication, it is essential that the lines and lettering on the final tracing are thick enough to take the required reduction — lettering when reduced should be at least $\frac{1}{8}$ in. high for the smallest notes, and proportionally larger for titles, etc. Lettering can be done by hand, but nowadays stencils and applied lettering (e.g. “Letraset”) are available for most of us not gifted with a neat hand. Hatching, or patterns of line or shading, can also be obtained on sheets to be applied to the finished drawing. A variety of hatching effects will distinguish structures

of different dates or different materials. Never shade a drawing in pencil, as this will reproduce with a blotchy, uneven effect.

No drawing is complete without a title although if it is one of a number to be published in an article, it is usual to omit the name of the site from sections and detailed plans; a drawn scale in feet and another in metres (remember the drawing will usually be reduced for reproduction, and the original may shrink anyway); a north point for plans; the dates of survey and drawing; and a note of those responsible for each stage of the survey.

Further guidance on the drawing up of surveys may be found in Fryer and Pannell (see below).

In Conclusion

The methods described above have been found to give satisfactory results in a reasonable time. It must be stressed, however, that there are other methods available which can give good results. In the space available it has not been possible to give an exhaustive account of surveying techniques, and in particular no reference has been made to plane tabling. This uses fairly sophisticated equipment, and is best suited to large open sites. These are relatively uncommon in London, but the interested reader is recommended to lucid explanations of plane tabling in Fryer and Thomas (see below).

The choice of a method will be influenced by personal experience and the nature of the work to be done; there will inevitably be times when a method has to be improvised to solve a difficult or unusual problem. Useful guidance is contained in the books listed below.

R. W. Brunskill, *Illustrated Handbook of Vernacular Architecture*, (1970).

D. H. Fryer (Durham University). *Surveying for Archaeologists*, (1971, 4th edn.)

L. V. Grinsell, P. Rahtz, A. Warhurst, *The Preparation of Archaeological Reports*, (1962).

F. R. Huggins, *Building Surveys*, (1956).

J. P. M. Pannell, *Techniques of Industrial Archaeology*, (1966).

W. N. Thomas, *Surveying*, (1961, 5th edn.)

Acknowledgements

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