The Archaeology of Standing Structures

MARTIN DAVIES

Although archaeologists regularly undertake investigations of standing structures, there are few texts which provide a procedural methodology to guide such work. In response to this situation, a systematic approach to the study of standing structures was developed by the author at the Port Arthur Historic Site where he was a Staff Archaeologist. This paper, which is a modified version of that approach, discusses the central importance, to all future analyses and interpretations, of determining a structure's evolutionary development. The paper equates the procedures involved in the study of structures with those followed in archaeological excavation work. The author is currently working as a consultant for the Bicentennial Programme of the National Trust of Australia (N.S.W.)

1. INTRODUCTION

Standing structures are the material products of human behaviour and as such are the subject of archaeological investigations. Whilst there are a number of manuals and methodological procedures in the archaeological literature which discusses excavation techniques, there is a lack of similar works on standing structures. The traditional methods of employing photographs and measured drawings, and more recently photogrammetry, although sufficient to record the spatial relationships of the various components of a structure, fail to record a host of other information. Such data are crucial to the analysis and interpretation of a structure and to an understanding of the people who designed, built, occupied and altered it.

This paper discusses a procedure for recording and interpreting a standing structure. The procedure is described in Sections 2.01–2.03. In Section 2.1, the paper applies the stratigraphic sequence matrix, initially developed by Edward Harris,[1] to the analysis of structures and demonstrates this application by a worked example in Section 2.2. In Section 2.3, the paper discusses the integration of evidence from standing structures with that recovered from archaeological excavation. In addition, a guide to the actual process of the fieldwork is provided in Section 3. The paper assumes that the practitioner or student has a prior knowledge of building terms, construction details and architectural styles. There is a large number of architectural digests, guides and manuals which deal with these subjects. There are also handbooks on photography and drawing techniques. Furthermore, the paper does not indicate avenues for relevant historical research.

Structures have the capacity to shed light on a range of research topics such as cultural change, social values and organisation, settlement mechanics, technological systems and the attitudes of designers, owners, builders and occupants. This has been clearly demonstrated by the research of John James[2] on the contractors and the contracting organisations in medieval France, and of Henry Glassie[3] on cultural change and attitudes of a population in Virginia, in the United States. Both used explicit methodologies to deal with complex transformations of structures, James on Chartres Cathedral and Glassie on the folk housing of Middle Virginia, and recognised that these transformations were value-laden in archaeological terms.

In any investigation there must be a rationale for undertaking recording work. In Australia a common rationale is to satisfy the requirements of the Australia ICOMOS Charter for the Conservation of Places of Cultural Significance which states '... the existing fabric [be] recorded before any disturbance of the place' (Article 23). However, the notion of fully recording a site or structure is a fallacy. There are vast amounts of data available and the choice of which to record is a purely subjective one. For example, some of the information which would be rarely, if ever, recorded in a structural study includes indications of the size of the circular saw blades used to cut the timber members; evidence of the method of cutting these members (that is whether slabbing, tangentially or rift-sawn cut); the accuracy of hammer blows on nails and the amount of timber bruising; builders' marks and so on. Practitioners must decide on the data they require for their particular research design or purpose.

However, there is some information which must be recorded if future analysis and interpretation of the structure or its component elements is to be undertaken. This is the information which provides the evidence of sequential development and dating. The key exercise in any investigation of a standing structure is to determine its sequential development (the activites of construction, alteration, demolition in the order in which they occurred) and to place this within a chronological framework. Without this it is impossible to place the structure or any of its component elements within any historical, technical or social framework. Such an exercise can be compared with the central task of identifying the stratigraphic sequence in an archaeological excavation.

The data which are relevant to determining and dating this sequential development are:

1. Stratigraphic relationships: whether an element is introduced before or after its adjoining elements.
2. Building materials: the fabric of which an element is made; the sources from which it was obtained.
3. Manufacturing technology of the building materials: the process by which the materials were made or transformed for use.
4. Construction technology: the way elements fit together, including their methods of attachment, size and dimensions.
5. Direct dates: date plaques, manufacturers' marks, graffiti.
6. Use-wear patterns: the evidence of functions and extent of use.

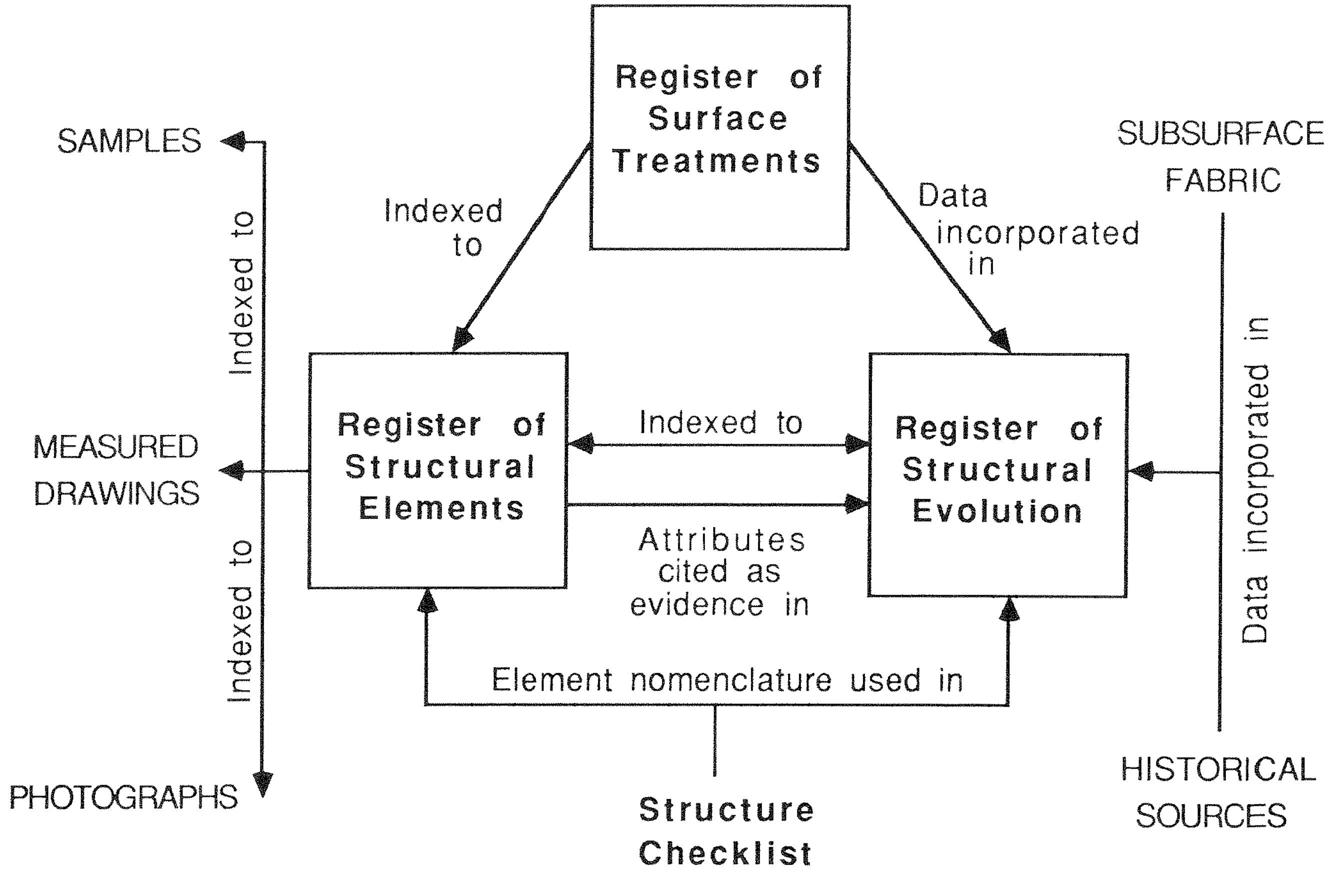


Fig. 1: The structural recording system. Diagrammatic representation of the relationship between the three registers, the data derived from archaeologically excavated subsurface fabric, historical sources and the samples, drawing and photographic records.

7. Style: architectural form, layout and design, and ornamental detailing.

To these can be added evidence from comparative analysis, historical sources and archaeologically excavated subsurface material.

2. THE SYSTEM

The procedure outlined in this paper is designed to record a wide range of information including the diagnostic data outlined above. The procedure is based on that formulated by the Port Arthur Conservation Project.[4] This system complements the various archives which record spatial relationships: photographs, measured drawings and photogrammetry. The system also satisfies a number of other requirements. It facilitates amalgamation of information derived from a number of sources (not just from the standing structure); it is flexible in that recording priorities can be set and the most important information collected initially, whilst at the same time ensuring new material can be incorporated at later stages. For example, the priorities on a structure which is subject to conservation works would be to record those elements (and their evidence of sequential development) which were to be removed, destroyed, disturbed or obliterated by the works and those elements which are temporarily uncovered and subsequently concealed. Given that the majority of historical archaeology work occurs on conservation projects or as part of cultural resource management work, the archaeologist often works closely with architects, planners, engineers, curators and interpretation officers and the system must be able to provide information to all these users.

The system consists of three interrelated components:

1. Register of structural elements.
2. Register of surface treatments.
3. Register of structural evolution.

The broad relationship of these three components to each other and to other sources of evidence and recording data is set out in Figure 1.

2.01 Register of structural elements

This register records the attributes of each structural element, in particular those diagnostic ones outlined earlier. For example, the structural elements can include composite items such as 'wall', 'door', 'roof' or individual items such as 'wall stud', 'door architrave', 'rafter'. A checklist of standard nomenclature is an essential aspect of the system. The attributes recorded include location, size, material, method of attachment and features such as manufacturing and manufacturers' marks, wear patterns etc. The register also provides a central index to samples, drawings, or photographs and to the other two registers. A worked example of the recording sheet is shown in Figure 2.

2.02 Register of surface treatments

This register records the various layers of paint, paper, varnish, graining, dirt — 'treatments' — which have been applied to or accumulated on the surface of an element. The sequence of successive applications can also relate to various structural elements. Comparison of the layers on adjoining elements can indicate at what stage in the sequence of applications these elements were introduced. Similarly patches, indentations and ridges remaining on surfaces following removal of elements indicate at what stage in the sequence of applications these elements were introduced and/or removed. A worked example of the recording sheet is shown in Figure 3.

2.03 Register of structural evolution

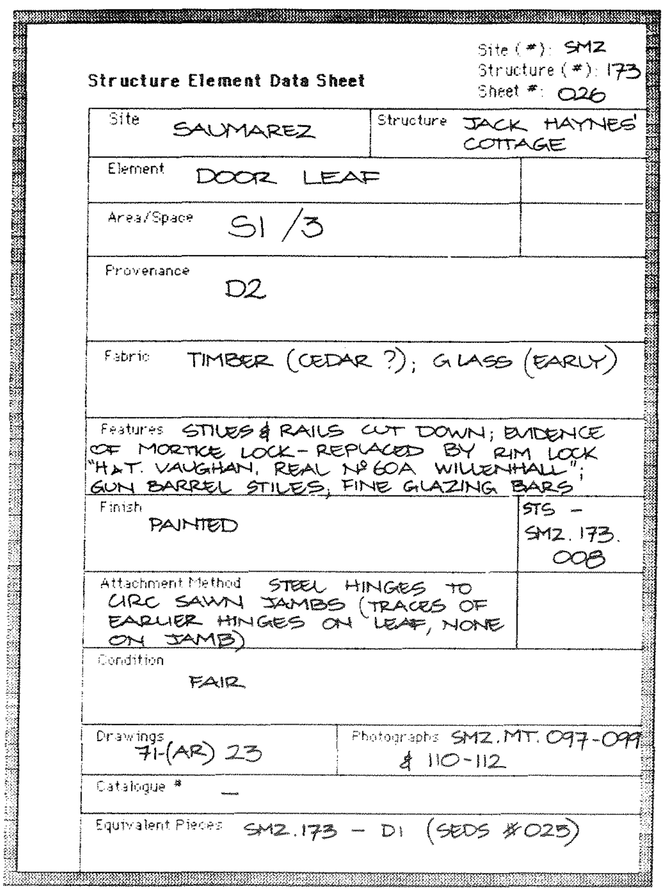
This register records the evidence of sequential development, establishes the sequence and places it within a chronological framework. A structure, in much the same way as an archaeological site, is the result of numerous activities: combinations of construction, destruction, repair, alteration and reinstatement, which occur at specific periods of time. The notions of stratigraphic deposition, disturbance and relationships, although central to excavation theory and practice on archaeological sites, can be equally applied to standing structures. Fabric can be overlaid by later fabric, and fabric can be cut and later fabric introduced. The concept of feature interfaces also applies to standing structures: an interface of destruction is formed when fabric is removed. In some cases traces are left to indicate the nature and extent of this missing fabric, in other cases there are none. However, the stratigraphy of a structure is complicated by the fact that later fabric is regularly introduced leaving little or no disturbance to existing fabric (for example window glass).

The development of a structure can be revealed by ordering all the activities in the sequence in which they occurred. Studying the stratigraphic relationships between elements allows a relative dating sequence to be established. The absolute chronology is provided by studying the evidence of manufacturing technologies of the building materials, construction technology, style, etc. and by applying the dating logic of the *terminus post quem* (earliest possible date) and *terminus ante quem* (latest possible date). Historical sources can assist in formulating both the relative sequence, by depicting, describing or alluding to elements which are no longer *in situ* and for which all physical evidence has been obliterated, and the absolute chronology by providing dates and/or date ranges. Evidence derived from archaeological excavation can also assist determining both the relative sequence of the standing structure by elucidating stratigraphic relationships and by incorporating subsurface features and deposits in the sequence, and the absolute chronology by providing dates obtained from artefactual analyses.

A worked example of the structural evolution data sheet, which records all the evidence of sequential development, is shown in Figure 7. The elements are listed, relevant evidence cited, individual sequences for each element established and dates proposed. These individual sequences are amalgamated into an element matrix on the reverse of the recording sheet and the major phases of activities are identified. This phasing operation is equivalent to identifying phases in an archaeological excavation. The activities involved in each phase are then set out on another recording sheet (structural evolution interpretation sheet) and the phases themselves arranged chronologically in a matrix (Fig. 8).

2.1 Stratigraphic sequence matrix

An explicit methodology is required to articulate all the relevant data and present it in such a way that the activities and events are clearly defined. This has been achieved by using a modified version of the stratigraphic sequence matrix developed by Edward Harris.[5] Harris' methodology was devised to apply the laws of stratigraphic succession,



Structure Element Data Sheet

Site (#): SMZ
Structure (#): 173
Sheet #: 026

Site: SAUMAREZ
Structure: JACK HAYNES' COTTAGE
Element: DOOR LEAF
Area/Space: S1 /3
Provenance: D2
Fabric: TIMBER (CEDAR ?); GLASS (EARLY)
Features: STILES & RAILS CUT DOWN; EVIDENCE OF MORTICE LOCK - REPLACED BY RIM LOCK "H.&T. VAUGHAN, REAL Nº 60A WILLENHALL"; GUN BARREL STILES, FINE GLAZING BARS
Finish: PAINTED | STS - SMZ.173.008
Attachment Method: STEEL HINGES TO CIRC SAWN JAMBS (TRACES OF EARLIER HINGES ON LEAF, NONE ON JAMB)
Condition: FAIR
Drawings: 71-(AR) 23
Photographs: SMZ.MT.097-099 & 110-112
Catalogue #: —
Equivalent Pieces: SMZ.173 - D1 (SEDS #025)

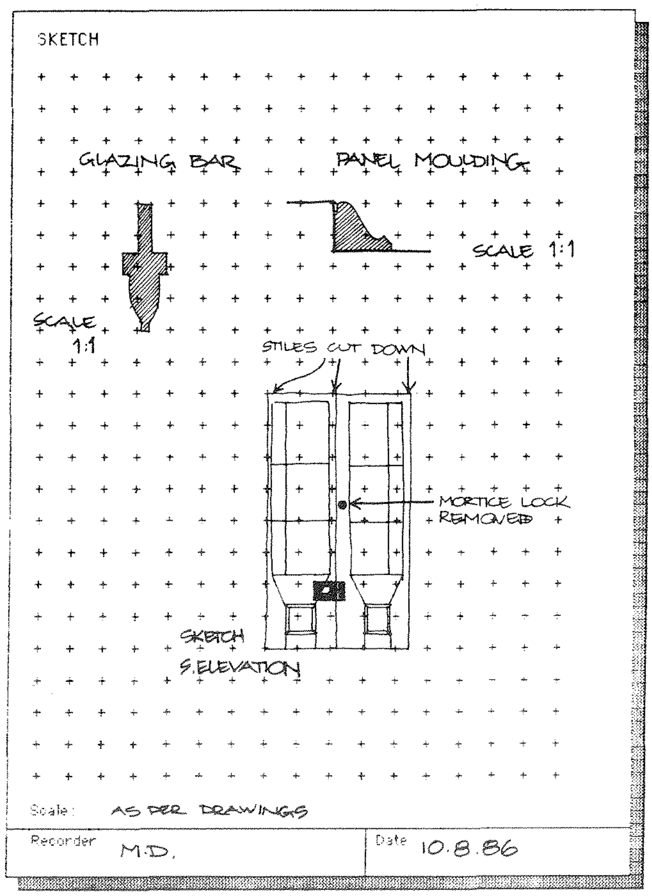


Fig. 2: Worked example of a Structural Element Data Sheet (obverse and reverse).

superposition, original horizontality and original continuity to the interpretation of archaeological deposits. The units of stratification identified in an excavation are ordered in a matrix with the undisturbed preoccupation deposits at the bottom and the most recent at the top, the sequence being thus read from bottom to top. The process of constructing a matrix has been described by Harris and readers are directed to his publication. Section 2.2 of this paper illustrates the application of the matrix to a standing structure and demonstrates the process of formulating a matrix.

Harris demonstrated that it is the stratigraphic sequence which is central to the interpretation of an archaeological excavation and that the chronological dating of the units is a secondary task. Similarly, the stratigraphic sequence is central to the interpretation of standing structures. However, two modifications to Harris' method are suggested. It is a common occurrence in a structure that, although some elements are stratigraphically *under* adjoining elements, they are chronologically *later* than these overlying adjoining elements. For example, concrete underpinning of a sinking foundation. The concrete is stratigraphically under the foundation but, as it has been introduced after the foundation, it is chronologically later than the foundation. Similarly, supports for sagging roof rafters would be stratigraphically under the rafters but chronologically later than them. Harris appears not to be particularly concerned with this situation as his work relates primarily to buried sites in which it would seldom occur. It appears that in accordance with Harris' method, these chronologically late elements would be placed in the matrix below the elements they physically support. The modification to Harris' method is made that, where the evidence is sufficient, these chronologically late elements in the matrix are placed above the elements they physically support. For example, the concrete underpinning would be shown in the matrix above the foundations; the roof supports would be above the rafters. Thus chronological factors are being introduced in establishing the relative sequence. Although it would be more sound to separate the pure stratigraphic evidence from the chronological evidence, as Harris states with respect to archaeological excavation, in practice it has proved simpler to consider the two jointly, hence both are recorded on the one form (the structural evolution data sheet).

The consequences of this modification are that the matrix reflects the actual sequence in which elements were introduced and activities took place. This allows for the changes to the structure and their frequency through time to be correlated with historical events such as changes in occupancy and function. It also allows rapid dating of any particular element, thus providing a more reliable base for conservation and interpretation decision-making.

A further modification to Harris' method is the use of coded symbols to denote how each element has been identified (Fig. 4). The advantage of this code is that it immediately indicates how incomplete the sequence and the understanding of a structure would be if only one source of evidence was employed.

Although its primary application is to order the various stratigraphic relationships the matrix can be used to unravel potentially complex and confusing structural situations. If the matrix is constructed as the physical stratigraphic evidence is recorded, and it is advisable that it is, there are two advantages. Firstly, it identifies which relationships have not yet been recorded and, secondly, it identifies any inconsistencies in the sequence. The latter occur where the stratigraphic relationships have been identified as follows: Element C is above (i.e. later than) Element B, Element B is above Element A, Element A is above Element C. This results in the matrix seen in Figure 5. Such an inconsistency indicates to the recorder that either an error has occurred in identifying the stratigraphic relationships between A and C,

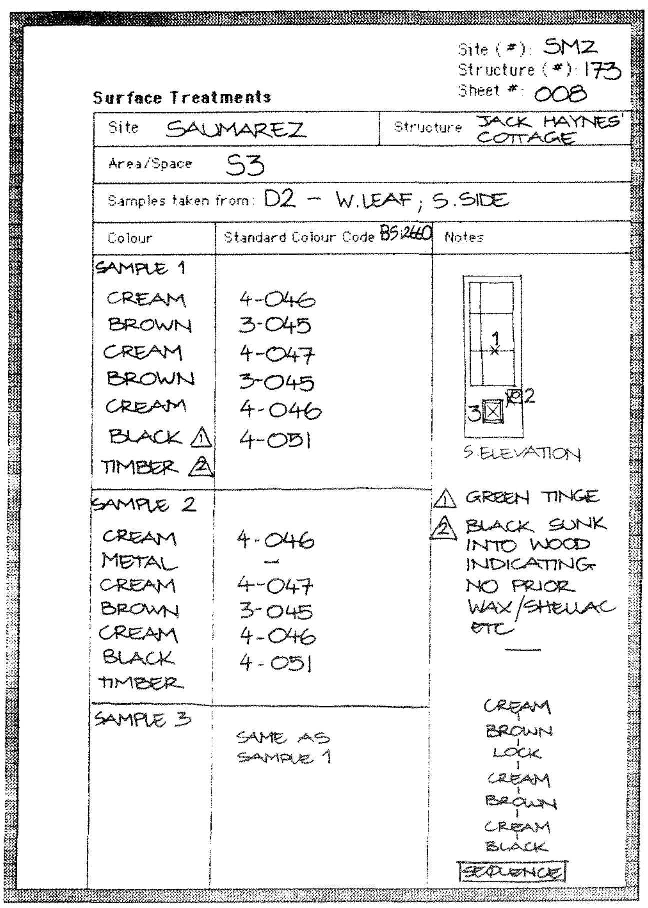


Fig. 3: Worked example of a Surface Treatment Sheet.

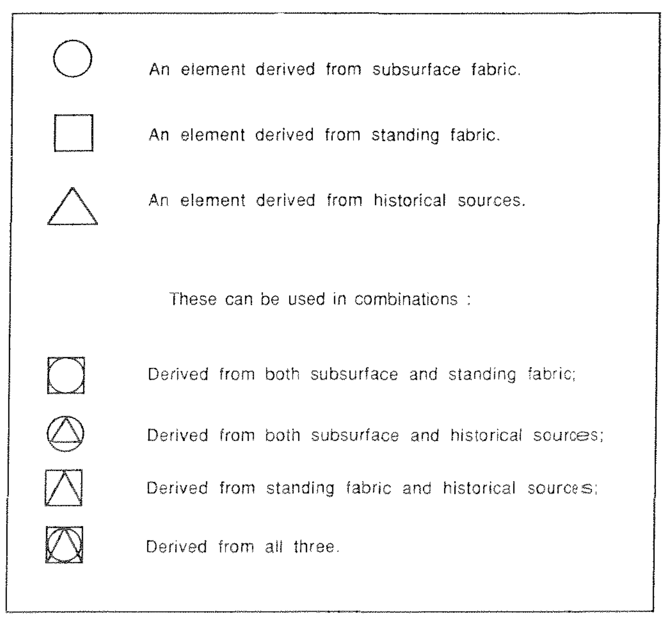


Fig. 4: Codes used in the matrix to identify sources of an element.

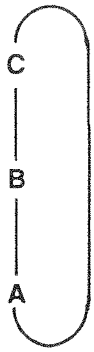


Fig. 5: Matrix revealing an inconsistency in the recording process.

or A or C were incorrectly identified as representing the one context or unit. It is this initial task of identifying or defining discrete 'units' in a structure which is crucial to constructing a matrix and in turn to interpreting correctly that structure. The task is equivalent to defining units of stratification in an excavation. It should be recognised that the processes of formation of a structure are as complex as those which have formed an archaeological site. Given the vast number of individual elements which constitute a structure, it is impractical to consider each as a separate unit and list its stratigraphic relationships. As a consequence, identical elements can be grouped and considered as a single unit such as boards in a floor or shingles in a roof. This corresponds to regarding a buried brick wall in an excavation as a single unit of stratification rather than each brick as a separate

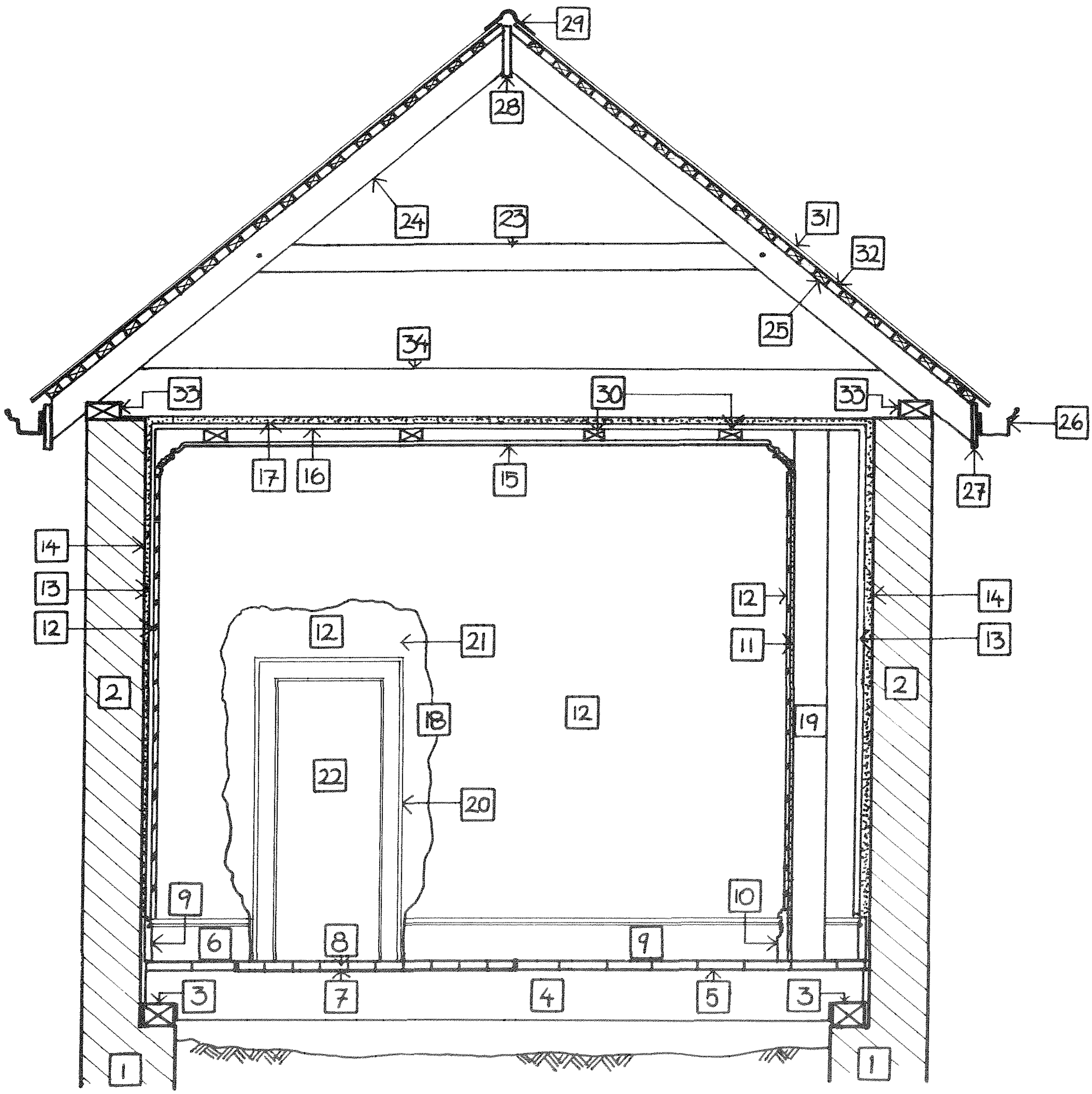


Fig. 6: Section through a structure. The numbers identify discrete units/elements. Units 7, 18 & 32 represent feature interfaces: removal of flooring, removal of paint, plaster and wall, removal of shingles respectively; Units 12, 13 & 16 are paint layers; Units 3, 4, 5, 6, 9, 24, 25, 27, 33 & 34 are pit-sawn timbers; Units 8, 19, 23 & 30 are circular-sawn timbers; Units 10 & 20 are band-sawn.

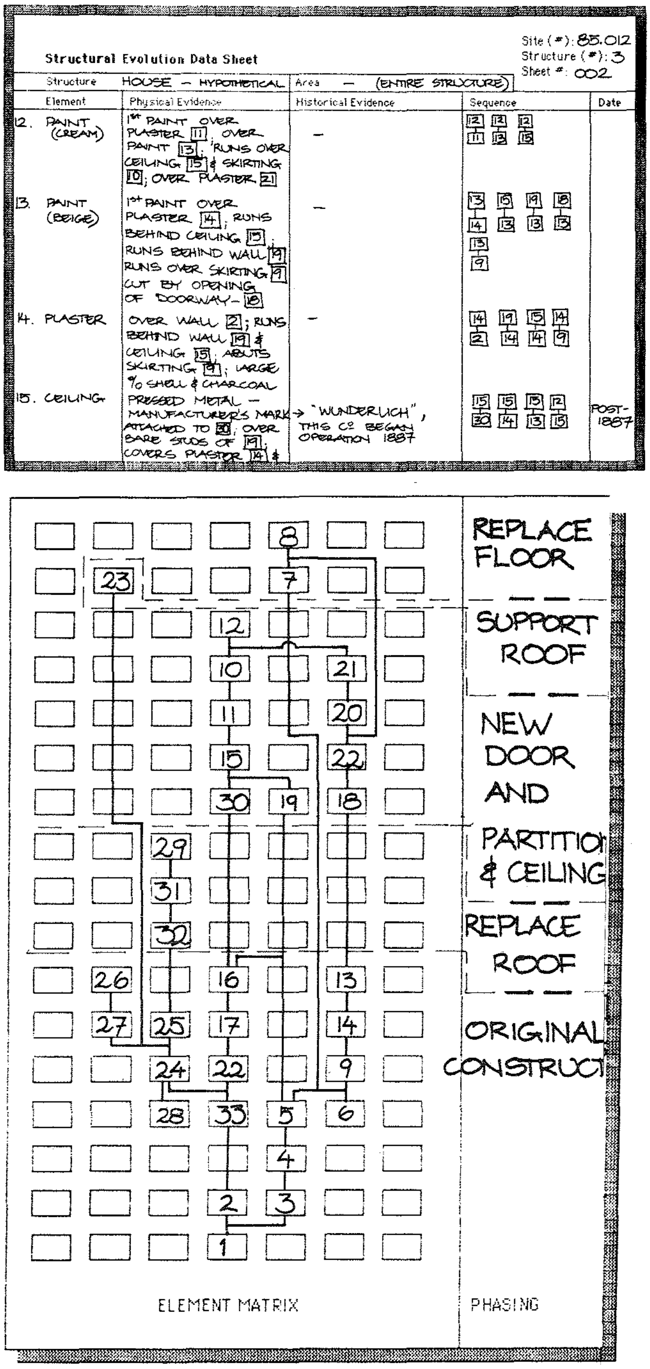


Fig. 7: Worked example of Structural Evolution Data Sheet (obverse and reverse).

unit. It is this procedure, the grouping of elements, which if incorrectly carried out will produce inconsistencies in the matrix. For example, a floor consisting of three separate sections (identified by differences in board size) represents three separate units and would be recorded and entered in the matrix accordingly.

There is usually an initial temptation to group elements rapidly in order to simplify the sequences. However, the rationale for the grouping must be recorded and accordingly such grouping is best done during the analysis as part of the phasing operation. James demonstrated this is in his research on Chartres Cathedral.[6] Prior to his work, researchers had discussed and disputed the constructional sequence of the major sections of the building (nave, choir, transepts and porches). Their arguments were based primarily on stylistic criteria. James examined the structure in terms of its stratigraphic relationships and demonstrated that all the previously proposed sequences were incorrect. He adopted a procedure which recorded not major groupings of elements but individual minutiae such as mouldings, coursing heights, stone finishes and, most importantly, the actual geometry and standard measures used in creating these features. He discovered that certain patterns emerged consistently throughout the whole structure. By plotting their location he concluded that the entire edifice was raised as a whole in a series of building campaigns and that the patterns were due to each campaign being the work of a single contracting crew.

The matrix can have a wide variety of applications. It has a 'micro' use in being able to order the actual sequence in which each individual element was introduced and can, therefore, reveal construction processes. For instance, the members in a roof (trusses, purlins, rafters and battens) would be shown by the matrix stratigraphically occurring in the sequence of their introduction (truss followed by purlin, followed by rafters, followed by battens). The matrix can also have a 'macro' use in being able to order the sequential development of an entire site consisting of numerous structures.

The register of structural evolution ensures that not only is the developmental history of a structure established but that the basis for that history is permanently recorded. This is all the more imperative if such evidence is to be lost in the course of conservation or redevelopment works. The system regards the traditional methods of depicting structural change (composite plans and series of overlays showing the structure at various periods) as the presentation of the final interpretation of the evidence, not the means of recording it. The evidence must be recorded and cited as the basis of these drawings. As an adjunct to this the evidence must be readily accessible and a system of cross-referencing, achieved either by computer or by manual indexes, is important if the evidence is to be retrieved by both the recorder and future researchers. Small, haphazardly organised notebooks, even if they do contain the requisite information, are worthless if the information cannot be retrieved.

2.2 Worked example

This is intended to illustrate how both a matrix is constructed and the recording sheets are used. Figure 6 depicts a cross-section through a hypothetical structure.

The relevant stratigraphic and dating information is recorded on the structural evolution data sheets and the elements ordered in a matrix, as shown in Figure 7.

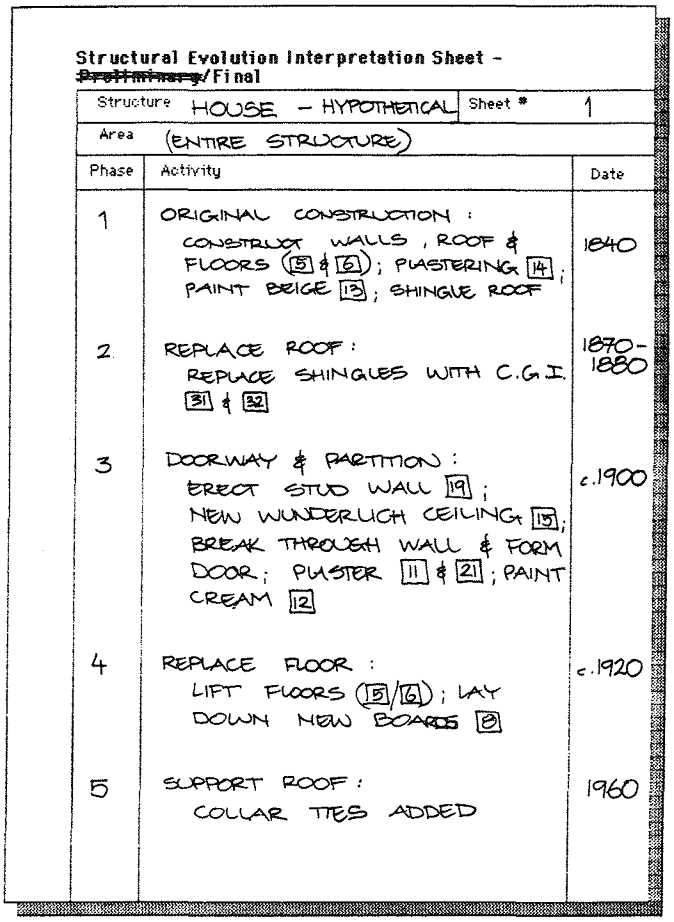
The various phases and the activities involved in each are recorded on the structural evolution interpretation sheet and are ordered chronologically in a matrix, as shown in Figure 8.

The result is the sequence of construction, alteration and removal which has occurred in this structure.

For actual case studies readers are directed to the work by Davies and Egloff on the Commandants' Residence at Port Arthur[7] and by Davies on 'Dundullimal' at Dubbo.[8]

2.3 The integration of standing and subsurface data

As structures consist of discrete units which can be considered as representing separate activities that occurred in a relatively short space of time (either construction or destruction) they differ from subsurface remains whose units of stratification, in simplistic terms, can either represent such distinct activities or long occupation and deposition that occurred over an extended period of time. As the matrix proposed in this paper orders distinct activities in the


Structural Evolution Interpretation Sheet - ~~Preliminary~~/Final

Structure: HOUSE – HYPOTHETICAL		Sheet # 1
Area: (ENTIRE STRUCTURE)		
Phase	Activity	Date
1	ORIGINAL CONSTRUCTION: CONSTRUCT WALLS, ROOF & FLOORS (15 & 16); PLASTERING 14; PAINT BEIGE 13; SHINGLE ROOF	1840
2	REPLACE ROOF: REPLACE SHINGLES WITH C.G.I. 31 & 32	1870-1880
3	DOORWAY & PARTITION: ERECT STUD WALL 19; NEW WUNDERLICH CEILING 15; BREAK THROUGH WALL & FORM DOOR; PLASTER 11 & 21; PAINT CREAM 12	c.1900
4	REPLACE FLOOR: LIFT FLOORS (15/16); LAY DOWN NEW BOARDS 8	c.1920
5	SUPPORT ROOF: COLLAR TIES ADDED	1960

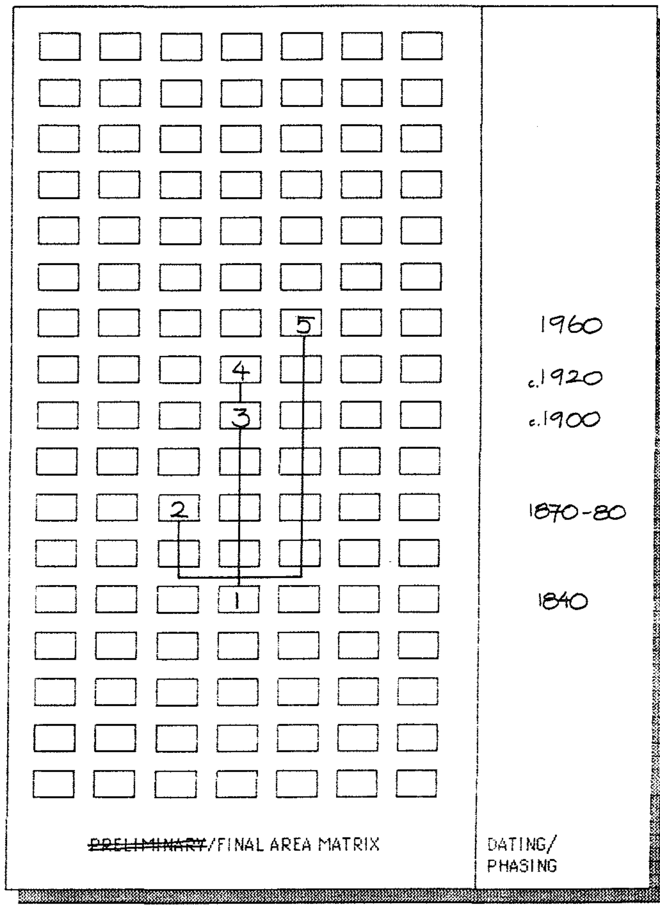


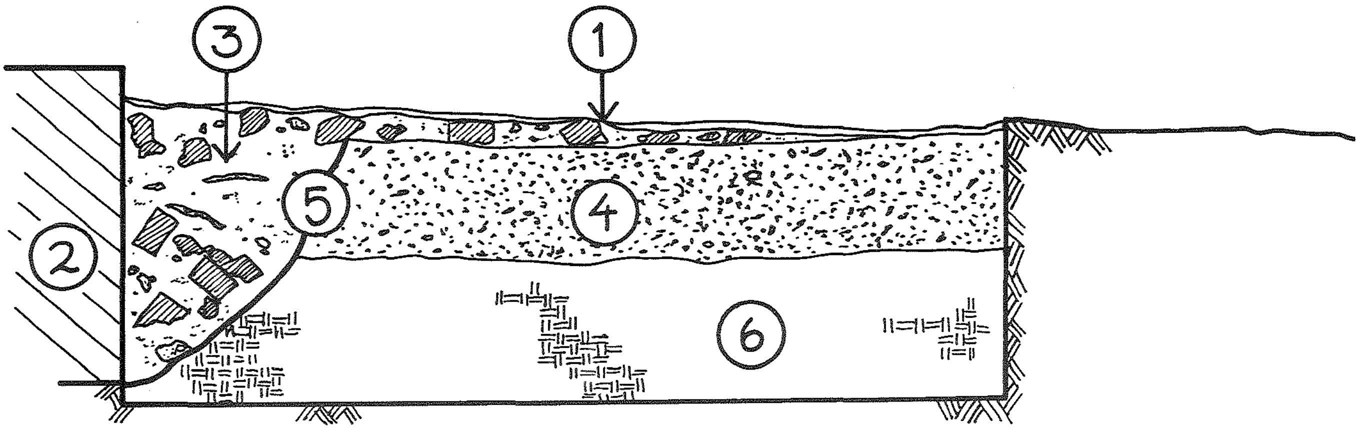
Fig. 8: Worked example of Structural Evolution Interpretation Sheet (obverse and reverse).

sequence in which they occurred into a chronological framework, it is difficult to include these occupation/deposition units when integrating standing and subsurface data. No such difficulty is encountered when trying to integrate units which represent distinct activities. These units can be structural features or deposits which have been created in a short period of time. The following examples will serve to illustrate both these situations and to demonstrate the integration process.

An excavation has been undertaken in the room shown in cross-section in Figure 6. The deposits are shown in a section drawing (Fig. 9). The foundations of the room are regarded as a unit of stratification and are entered in the unit matrix.

Compare the matrices derived from the excavation and the structure in terms of the activities they depict (note: only the flooring sections of the latter are shown to simplify the example). Figure 10 shows this comparison. Assimilate the two matrices. If shown in strict stratigraphic terms the matrix would be as seen in Figure 11. However, this is similar to the situation discussed in Section 2.1 where new fabric is introduced stratigraphically below but chronologically after existing fabric. In this case the occupation units are stratigraphically *below* the floor but have been deposited chronologically *after* the floor has been

Fig. 9: Section drawing of the subfloor deposits excavated in the structure depicted in Figure 6. The numbers identify units of stratification. Unit 1 is occupation dust; Unit 2 is the wall footing; Unit 3 is constructional debris; Unit 4 is fill; Unit 5 is a feature interface; Unit 6 is undisturbed basal material.



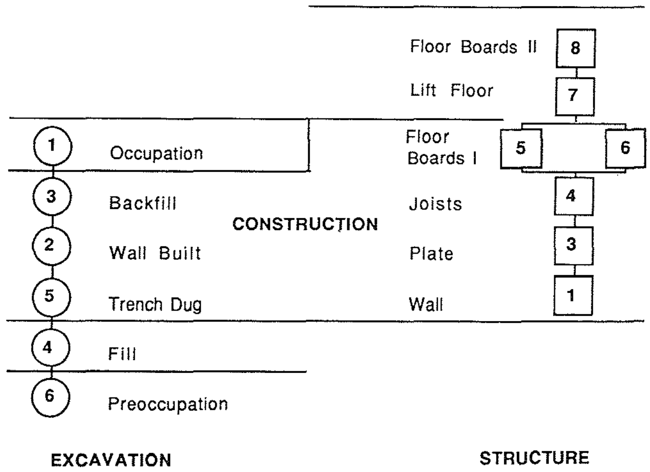


Fig. 10: A comparison of the matrices obtained from the excavation and the standing structure.

laid. Accordingly the occupation deposits are shown in the matrix above the flooring (Fig. 12).

Phase the matrix and place the phases in their own sequence matrix (Fig. 13). Place the phases within a chronological framework. The problem of integrating long occupation/deposition units becomes apparent (Fig. 14). The solution is either to omit them completely, to include them as shown above or to include them in a matrix which is not placed within a chronological framework. The latter would appear as shown in Figure 15.

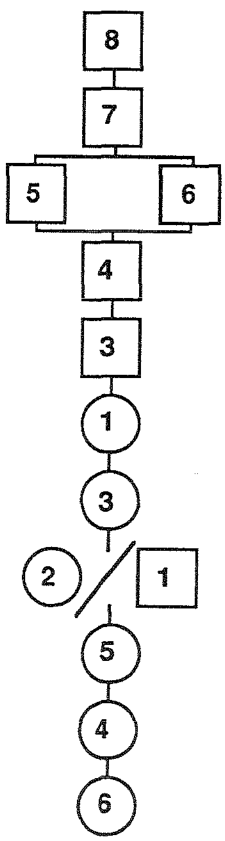


Fig. 11: Matrix created from combining the excavation and standing structure matrices. This is based purely on the vertical position of each unit (i.e. the floor 5 & 6 is above the occupation deposit 1.

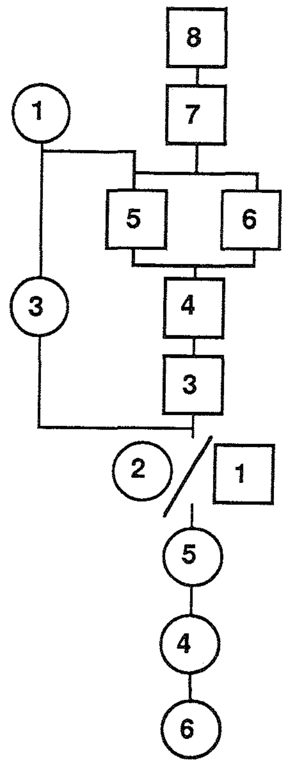


Fig. 12: Matrix created from combining the excavation and standing structure matrices indicating there are no stratigraphic relationships between the excavation units 1 & 3 and the standing structure.

Figure 16 indicates that the integration of subsurface data can occur either at the element-recording stage or at the phasing stage. This is demonstrated below. The excavation sequence is phased independently of the structural sequence (Fig. 17). When combined they produce the same result as in the earlier example, though in this case the phases have to be renumbered in the final structural matrix (Fig. 18). Integrating at this phasing stage is recommended when the investigations and analyses of the structure and the excavation have been carried out independently.

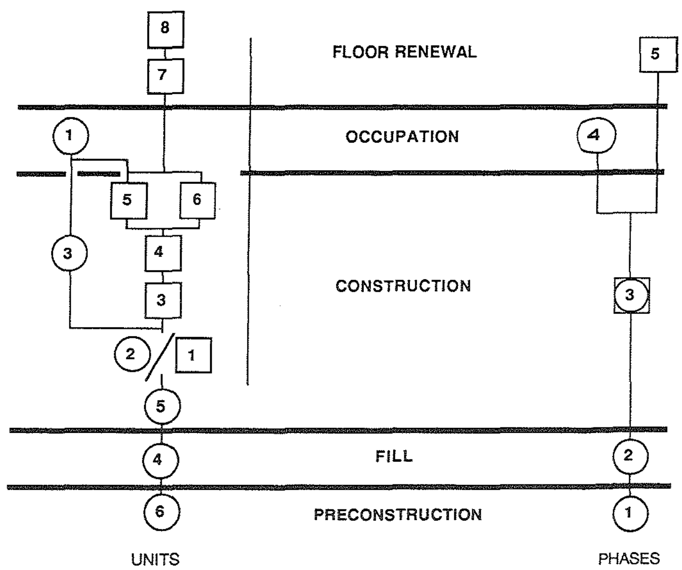


Fig. 13: Phasing the matrix shown in Figure 12.

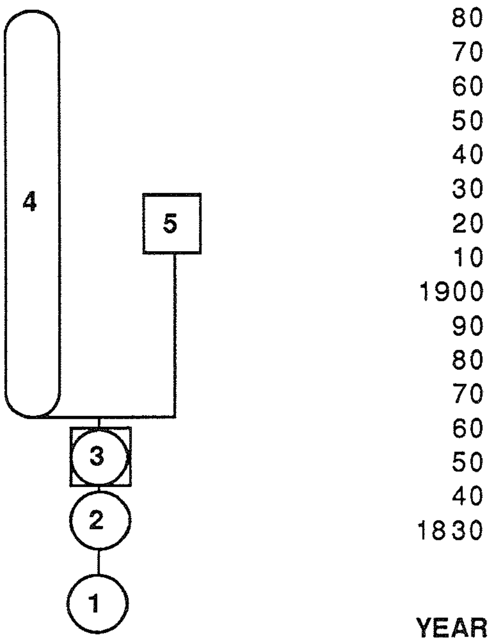
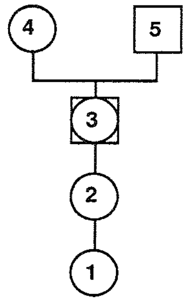


Fig. 14: The phased matrix shown in Figure 13 placed in a chronological framework.



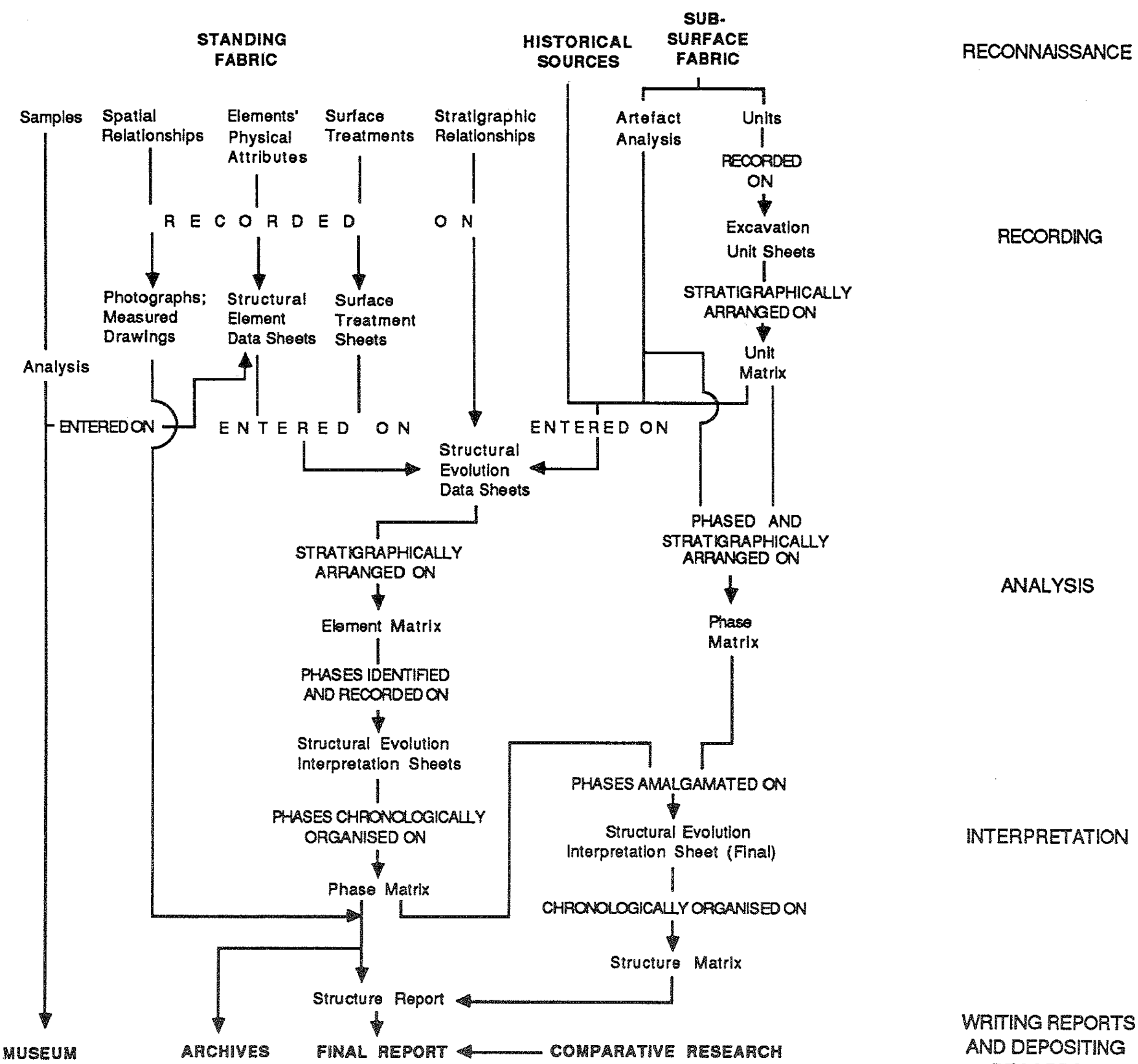
PHASE	DATE
1	PRE-1830
2	1830-40
3	1840
4	1840 → 1986
5	1920-30

Fig. 15: The phased matrix shown in Figure 13 not *placed in a chronological framework.*

3. FIELD PROCEDURES

This section is a general guide to the actual process of investigating a structure in the field, from reconnaissance to the production of a report. An outline of the process and of the use of the various data sheets is represented in Figure 16.

Fig. 16: The structural investigation. An outline of the process involved from reconnaissance to completion of the final report. (Based on Harris 1977: Figure 31).



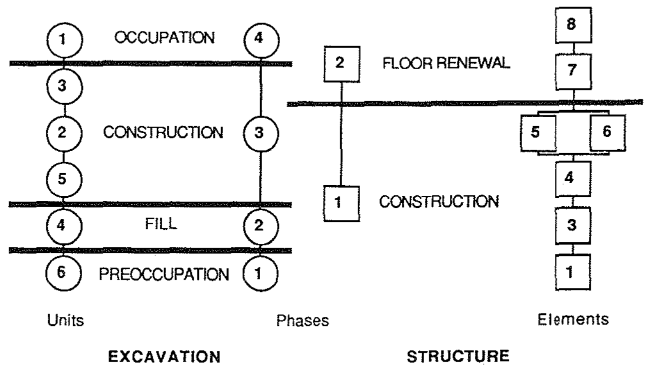


Fig. 17: Phasing the matrices from the excavation and the standing structure independently.

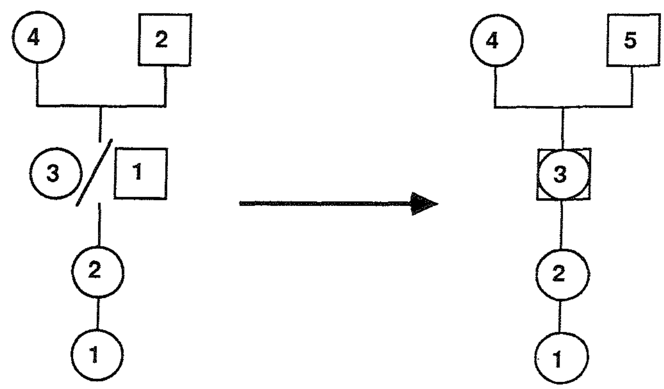


Fig. 18: Integrating the phased matrices shown in Figure 17. In the right matrix the phases have been renumbered.

Once the reasons for investigating a structure are defined the first step is reconnaissance. This involves looking at various features such as construction techniques, detailing, joinery, materials, junctions and breaks in elements and materials etc. The most rewarding areas to investigate are the subfloor and roof spaces, for it is in these relatively inaccessible areas that evidence of change is unlikely to be concealed as occurs in the occupation zone between these two spaces. A ground plan (either measured or sketch) should be prepared on which spaces, doors and windows can be numbered for easy and standardised referencing. A general photographic coverage of the structure in its environs can be done at this stage.

The recorder can now proceed to determine the structural development. This is done either by proposing hypotheses and testing them on the structure or by amassing the data in order to produce what Glassie describes as a 'natural corpus'[9] from which patterns can be extracted, though in practice one would probably employ a combination of these two approaches. The recorder must ensure that the discrete units in the structure are correctly identified. In a large structure it is advantageous to subdivide the structure into overlapping 'areas' to make the matrices more manageable. In this case phased matrices are prepared for each 'area' and synthesised into a single matrix. The units are numbered to facilitate the recording and construction of the matrix. The numbering can be done according to the whole structure or according to the various 'areas'. The recording is done on the various data sheets.

The stratigraphic relationships between each element are recorded, as are the attributes of each element and its surface treatments. These jobs can be done concurrently or as separate exercises. The datable attributes and the sequences of surface treatments are entered onto the structural evolution data sheets.

Mention should be made at this point of the problems created by the reuse of building materials. Although an element may appear to have an early chronological date (as determined by some of its datable attributes), and appear in an early stratigraphic position (as determined by its stratigraphic relationships), on closer examination it may in fact be reused and thus have a late introduction date. An early position in the evolutionary sequence would thus be incorrect. There are no simple guidelines by which to identify reused elements. However, in general, if there are surface treatments and traces of earlier attachments whose existence cannot be explained by the present location or function, then the element has been reused. For example, floorboards which have their undersides limewashed and have nail holes which do not correspond to the present nailing pattern would be identified as reused. Another way to identify reused elements is to determine the present method of attachment and establish whether the date of this method matches that of the element itself. If not, then the element has been either reused or stored for a period of time and then used. For example, if undressed pit-sawn timbers are attached to circular-sawn structural members, with bullet-headed steel wire nails, then one would conclude that as the date of the method of attachment (mid-late 20th century) does not match the date of the timbers (pre-1870s) then the pit-sawn timbers have been reused or stored for a period of time and then used.

As recording proceeds, the matrix is constructed with new relationships being added and problems and inconsistencies being identified and solved. Any available data derived from historical sources or archaeological excavation could be entered on the structural evolution data sheets during this stage.

Photographic coverage of all exterior and interior elevations, and measured drawings, are undertaken and indexed onto the structural element data sheets. Detailed photographs and drawings of complex features and stratigraphic relationships should also be done. Samples, such as mortar, timber and brick, may be taken and any analysis (chemical composition, species etc.) recorded onto the appropriate structural element data sheet. These samples would be bagged and tagged with provenance and structural element data sheet number.

Once the matrix has been completed the phasing can proceed. This involves analysing the data to determine patterns or consistencies between the elements. This allows phases of activity to be identified which are set out on the structural evolution interpretation sheet. These would have been roughly identified by the recorder during the investigation work. The phases are then set out chronologically in matrix form and those from an archaeological excavation could be incorporated at this stage (if the data was not incorporated at the recording stage). Depending on the complexity of the structure, these phases could be further arranged into construction programmes. Interpretation of the evidence is required in both this and the phasing operations.

The structural report itself would include such topics as:

1. General description.
2. Setting.
3. History of the site prior to construction.
4. Structural development.
5. Changes in building materials through time.
6. Changes in construction techniques through time.
7. Functional operation and changes through time.

The data records (including recording sheets, photographs and measured drawings) are either placed in an archive or included as appendices in the report. Samples would be lodged in a museum collection.

If comparative work is done on other structures, the results would be incorporated in a final report. This report places the structure within social, technical or historical frameworks and answers the research questions posed prior to commencement of the fieldwork investigation.

4. CONCLUSION

The structural recording system proposed in this paper attempts to place the investigation of standing structures on a firm methodological footing. Though daunting at first, the procedures can be streamlined depending on the nature of the structure and the purpose of the study. Although the matrix operation may be complex, the simple fact is that some structures are bewilderingly complex and an explicit methodology is required to order the vast quantities of data which are generated.

The investigation procedures follow the logical stages of reconnaissance, recording, analysis, interpretation and presentation of the results. This ensures that the evidence which forms the basis of each stage is well documented.

Archaeologists have long recognised that the subsurface archaeological record is a non-renewable resource and that they have a responsibility for that record. It should similarly be recognised, by all practitioners in the field of building conservation, that standing structures are also a non-renewable resource and that we have a responsibility to both present and future generations to record systematically and interpret those structures which we are to conserve, disturb or destroy.

ACKNOWLEDGEMENTS

I would like to thank Kristal Buckley and Brian Egloff for their invaluable assistance in all stages of the formulation of these procedures; Richard Morrison who initially suggested the use of the Harris matrix on standing structures; and Kate Clark, a volunteer at Port Arthur, who first put Morrison's suggestion into practice.

NOTES

1. Harris, E. 1977. *Principles of archaeological stratigraphy,* Academic Press, London.
2. James, J. 1981. *The contractors of Chartres,* Mandorla Publishers, Dooralong, New South Wales.
3. Glassie, H. 1975. *The folk housing of Middle Virginia,* University of Tennessee Press, Knoxville.
4. Davies, M. & Buckley, K. in press. *The Port Arthur archaeological field procedures manual,* Port Arthur Conservation Project, Department of Lands, Parks and Wildlife, Hobart.
5. Harris, op. cit.
6. James, op. cit.
7. Davies, M. & Egloff, B.J. 1986. The Commandants' Residence at Port Arthur: an archaeological perspective, *in* Ward, G.K. (ed.) *Archaeology at ANZAAS, Canberra,* Canberra Archaeological Society, Canberra, pp. 46–55.
8. Davies, M. in press. Recording, analysing and interpreting timber structures — 'Dundullimal', a case study, *Built in Wood Conference Proceedings,* Australia ICOMOS, Brisbane.
9. Glassie, op. cit.: 13–14.