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Summary

The early form of the hall house at Dearden Fold Farm, a grade II* listed building and a building-at-risk, is evident from the survival of three trusses, two associated with the hall range and one with a cross-wing. Dendrochronological analysis of oak timbers from these trusses is consistent with primary construction in AD 1488.

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Introduction

This document is a technical archive report on the tree-ring analysis of oak timbers from Dearden Fold Farmhouse, Bury Old Road, Ainsworth, Bury, Greater Manchester (NGR SD75841036). This is a grade II* listed building (NBR 92142) which is also on the buildings-at-risk register (English Heritage 1998a). It is beyond the dendrochronological brief to describe the building in detail or to undertake the production of detailed drawings. As part of a multifaceted and multidisciplinary study of the building, elements of this report may be combined with detailed descriptions, drawings, and other technical reports at some point in the future to form either a comprehensive publication or an archive deposition on the building. The conclusions may therefore have to be modified in the light of subsequent work.

The earliest surviving features in the building have been dated to the late-fifteenth century on stylistic grounds (Corbett 1993) and comprise remnants of a timber-framed open hall with a possibly contemporary two-storey cross-wing to the east. Two original trusses survive in the hall range (Fig 1). The western truss (designated 'Truss 1' in this report, see Fig 2) was originally open, while the present eastern truss (designated 'Truss 2' in this report, see Fig 3) is closed against the cross-wing. A single truss (designated 'Truss 3' in this report, see Fig 4) survives in the eastern cross-wing. Substantial alterations were made to the building in the seventeenth, eighteenth, and nineteenth centuries.

Dendrochronological dating of the primary phase of construction was requested by Jane Harding from English Heritage primarily to provide a precise date for the original hall house and hence inform the forthcoming programme of repairs for this building-at-risk (English Heritage 1998a, 50).

Methodology

The general methodology and working practises used at the Sheffield Dendrochronology Laboratory are described in English Heritage (1998). The methodology used for this building was as follows.

A brief survey identified those oak timbers with the most suitable ring sequences for analysis. Those with more than 50 annual rings and some survival of the original sapwood and bark-edge were sought. The dendrochronological sampling programme attempted to obtain cores from as broad a range of timbers, in terms of structural element types, scantling sizes, and carpentry features, as was possible within the terms of the request.

The most promising timbers were sampled using a 15mm diameter corer attached to an electric drill. The cores were taken as closely as possible along the radius of the timbers so that the maximum number of rings could be obtained for subsequent analysis. The core holes were left open. The ring sequences in the cores were revealed by sanding.

The complete sequences of growth rings in the samples that were selected for dating purposes were measured to an accuracy of 0.01mm using a micro-computer based travelling stage (Tyers 1997). The ring sequences were plotted onto semi-log graph paper to enable visual comparisons to be made between sequences. In addition cross-correlation algorithms (Baillie and Pilcher 1973; Munro 1984) were employed to search for positions where the ring sequences were highly correlated. These positions were checked visually using the graphs and, where these were satisfactory, new mean sequences were constructed from the synchronised sequences. The *t*-values reported below are derived from the original CROS algorithm (Baillie and Pilcher 1973). A *t*-value of 3.5 or over is usually indicative of a good match, although this is with the proviso that high *t*-values at the same relative or absolute position must be obtained from a range of independent sequences, and that these positions are supported by satisfactory visual matching.

All the measured sequences from this assemblage were compared with each other and any found to cross-match were combined to form a site master curve. These, and any remaining unmatched ring sequences, were tested against a range of reference chronologies, using the same matching criteria: high *t*-values, replicated values against a range of chronologies at the same position, and satisfactory visual matching. Where such positions are found these provide calendar dates for the ring-sequence.

The tree-ring dates produced by this process initially only date the rings present in the timber. The interpretation of these dates relies upon the nature of the final rings in the sequence. If the sample ends in the heartwood of the original tree, a *terminus post quem (tpq)* for the felling of the tree is indicated by the date of the last ring plus the addition of the minimum expected number of sapwood rings which are missing. This *tpq* may be many decades prior to the real felling date. Where some of the outer sapwood or the heartwood/sapwood boundary survives on the sample, a felling date range can be calculated using the maximum and minimum number of sapwood rings likely to have been present. The sapwood estimates applied throughout this report are a minimum of 10 and maximum of 55 annual rings, where these figures indicate the 95% confidence limits of the range. These figures are applicable to oaks from the British Isles (Hillam *et al* 1987). Alternatively, if bark-edge survives, then a felling date can be directly utilised from the date of the last surviving ring. The dates obtained by the technique do not by themselves necessarily indicate the date of the structure from which they are derived. It is necessary to incorporate other specialist evidence concerning the re-use of timbers and the repairs of structures before the dendrochronological dates given here can be reliably interpreted as reflecting the construction date of phases within the structure.

Results

Almost all the timbers in the roof, plates, and posts associated with the primary phase of construction are of oak (*Quercus* spp.).

The sampling programme was constrained by the limited number of suitable timbers, both with regard to surviving bark edge and the number of tree-rings retained within them. In addition, the sapwood frequently disintegrated upon coring and several timbers suffered from deep shakes which hamper successful coring.

A total of 12 timbers were selected as most suitable for sampling (Tables 1-2; Figs 2-4). The samples were numbered **01-12** inclusive. In two cases, a second core was taken from the same timber because the first core broke with the loss of the critical bark edge; these cores were labelled **01A**, **01B**, **07A**, and **07B**. The samples can be grouped into six types according to the structural element represented:

All 14 samples were examined in the laboratory and 10 samples from nine timbers contained sufficient rings for reliable analysis (Table 1). Samples **02**, **04**, **07A**, and **07B** all had too few rings for analysis. The duplicate cores **01A** and **01B** from the north principal rafter of truss 2 were combined to make a single composite sequence, labelled **01**. The resultant nine series were initially compared with each other. Five sequences were found that matched together to form an internally consistent group (Fig 5; Table 3). A 92-year site mean chronology was calculated, named DEARDON (Fig 5, Table 4). The site mean was then compared with dated reference chronologies from throughout the British Isles. Table 5 shows the correlation of the mean sequences at the dating position identified for the sequence, AD 1397-1488 inclusive.

The four unmatched samples were compared with dated reference chronologies from throughout the British Isles and northern Europe. None of these were successfully dated.

Interpretation

The 92-year chronology DEARDON is dated AD 1397 to AD 1488 inclusive. It was created from five timbers, three of which retained possible or definite bark-edge (Fig 5). If the last surviving ring of these three samples is taken to indicate felling date, then sample **03** was felled in summer AD 1487, sample **01** in winter AD 1487/8, and sample **05** in spring/summer AD 1488. This apparent lack of contemporaneity in bark edge dates could be explained either as erosion of the apparent bark edge of timbers **01** and **03**, with timber felled for the construction in AD 1488, or alternatively by felling having commenced in the summer of AD 1487 and ended in the summer of AD 1488 perhaps with the intention of creating a stockpile of suitable material with which to construct the building. Alternatively the last phase of felling could have occurred during construction when a shortage of suitable timber in the material to hand became apparent, or an error during timber finishing necessitated the provision of additional timber. If stockpiling of timber in advance of construction were the correct interpretation of the evidence it would be contrary to the widely accepted view that the majority of timber-framed buildings at this period were constructed from green timber (Rackham 1990).

All the dated samples derive from trusses 1 and 2 from the hall range. Hence, whilst similarity of construction and style point to contemporary construction of an eastern cross-wing, this has not been confirmed by dendrochronological analysis.

The present dendrochronological evidence points to construction in AD 1488.

Conclusion

The objectives of the sampling programme were restricted to determining the date of the primary phase of construction of the hall house at Dearden Fold Farm, which has clearly undergone a series of alterations and additions. Samples were taken only from timbers which appeared to have remained in their original location, although the presence of reused timbers in later alterations suggests that fragments of the original hall construction also survive within the house in a dislocated state.

The dendrochronological analysis of timbers from Dearden Fold Farm indicates the original construction of a hall house on the site dates to AD 1488. No dates were forthcoming for the cross-wing and therefore the contemporaneity of the hall-trusses and the cross-wing can neither be confirmed nor refuted by this analysis.

Acknowledgements

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Figure 1 Plan of Dearden Fold Farmhouse showing location of surviving trusses (after Corbett 1993), and numbering used in this report

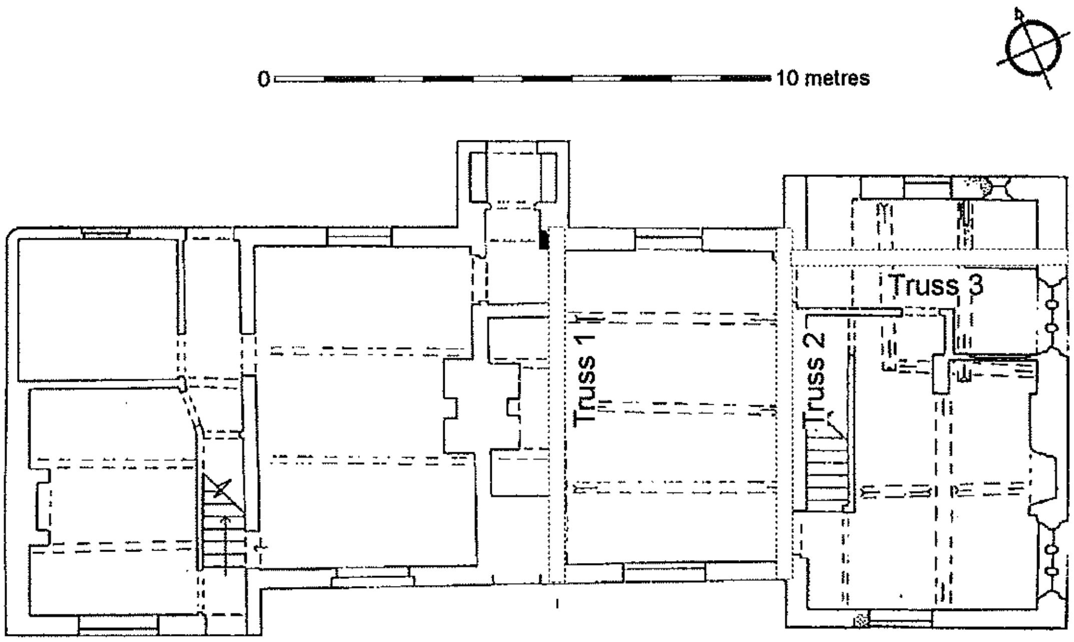

Figure 2 East-facing, idealised elevation of truss 1 (equates with section E-E1 in Corbett 1993) indicating sample locations

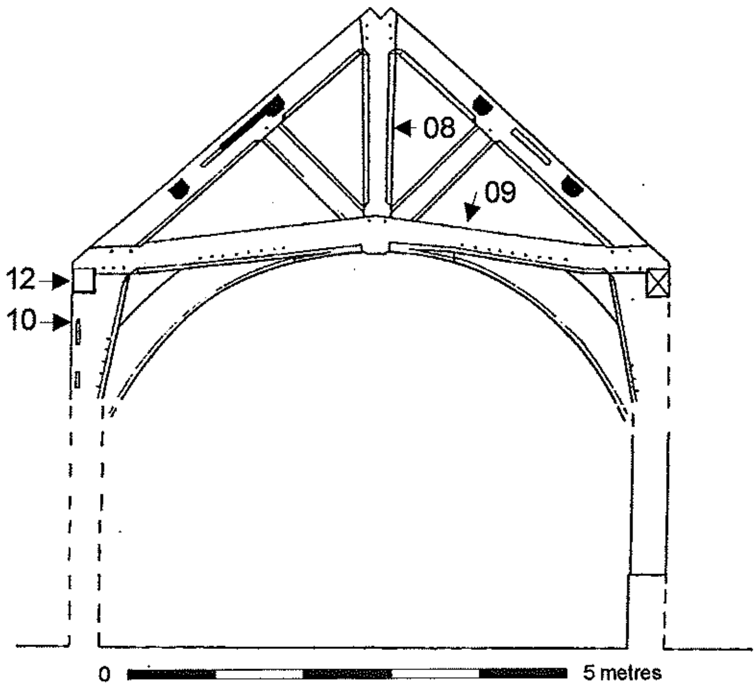

Figure 3 West-facing, idealised elevation of truss 2 (equates with section D-D1 in Corbett 1993) indicating sample locations

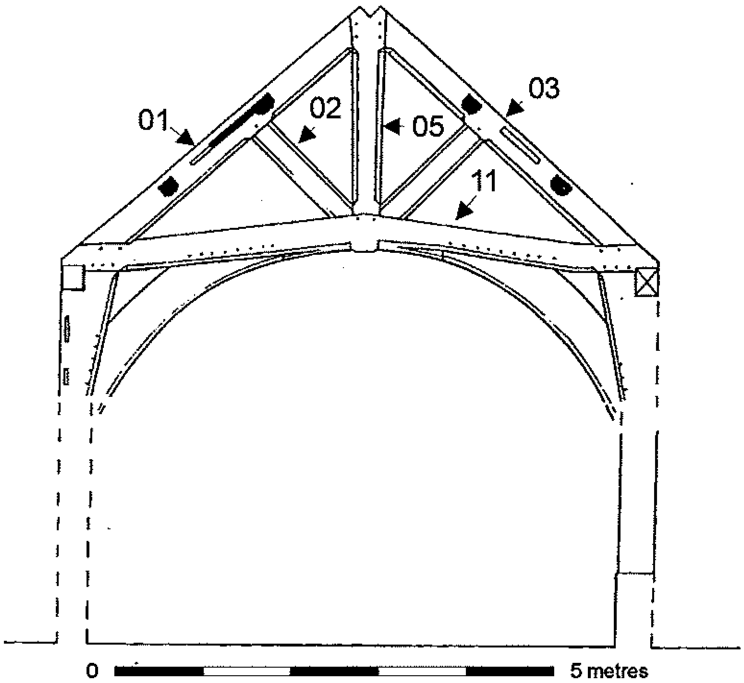

Figure 4 North-facing, idealised elevation of truss 3 (equates with section B-B1 in Corbett 1993) indicating sample locations

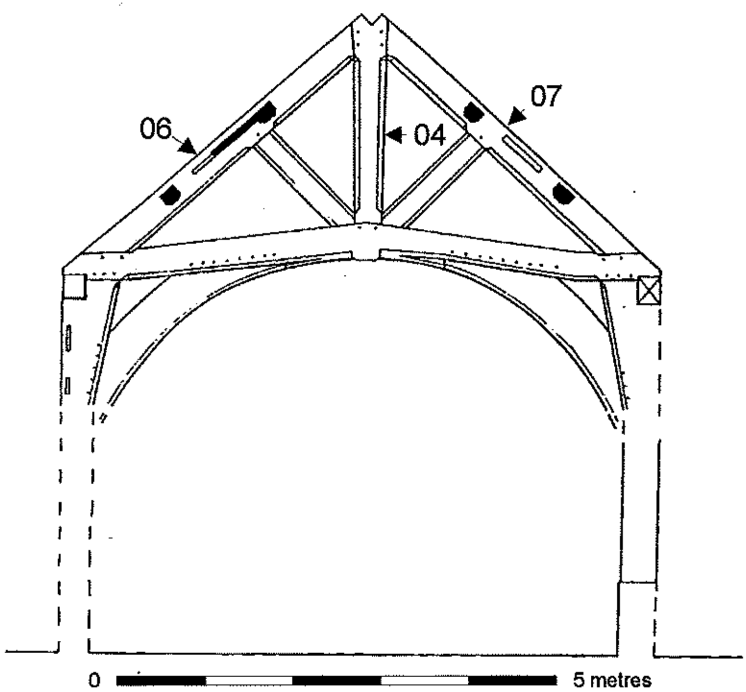

Figure 5

Bar diagram showing the chronological positions of the 5 dated timbers. The felling period for each sequence is also shown

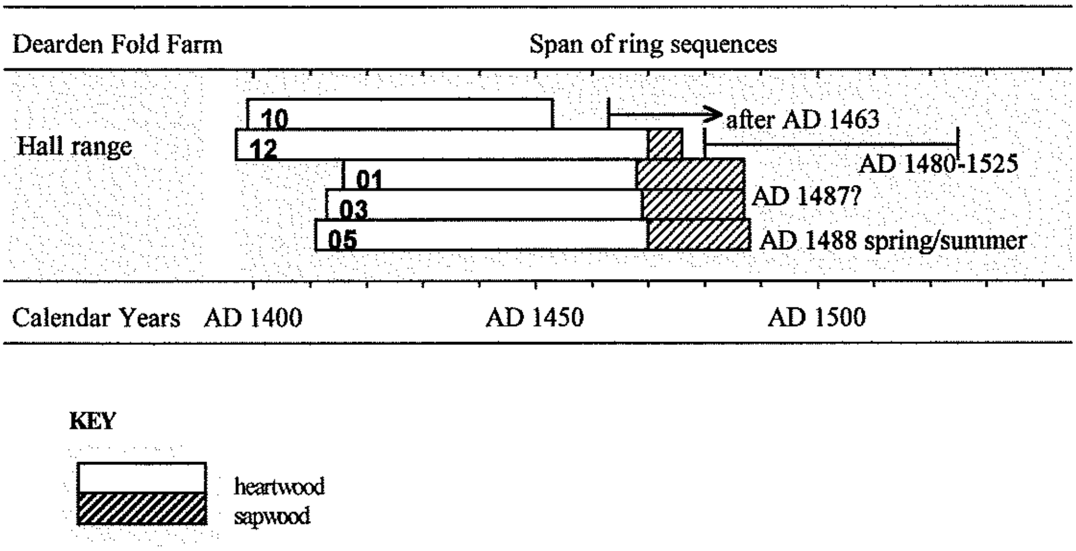

Table 1

List of samples

Core No	Origin of core	Cross-section size (mm)	Cross-section of tree	Total rings	Sapwood rings	ARW mm/year	Date of sequence	Felling period
01	Truss 2: north principal rafter	320 x 165	Half	71	19 +b?	3.19	AD 1416-87	AD 1487/8?
02	Truss 2: brace to north principal rafter	255 x 60	Half	*c* 39	-	-	unmeasured	
03	Truss 2: south principal rafter	315 x 165	Half	75	18 +b?	2.11	AD 1413-87	AD 1487?
04	Truss 3: king post	280 x 140	Half	*c* 37	-	-	unmeasured	
05	Truss 2: king post	265 x 180	Quarter	78	18 +bs	2.35	AD 1411-88	AD 1488 spring/summer
06	Truss 3: east principal rafter	300 x 150	Half	73	17 +bw	2.41	undated	
07	Truss 3: west principal rafter	295 x 110	Half	*c* 30	-	-	unmeasured	
08	Truss 1: king post	310 x 235	Half	61	12 +b?	2.45	undated	
09	Truss 1: tiebeam	400 x 230+	Whole	75	h/s	1.43	undated	
10	Truss 1: south post	580 x 320	Half	55	-	1.98	AD 1399-1453	after AD 1463
11	Truss 2: tiebeam	305 x 200	Whole	51	-	1.91	undated	
12	Truss 1: south wall plate	250 x 240	Whole	80	6	2.35	AD 1397-1476	AD 1480-1525

Total rings = all measured rings, +value means additional rings were only counted, the felling period column is calculated using these additional rings.
sapwood rings: h/s heartwood/sapwood boundary, ?h/s possible heartwood/sapwood boundary, +bw = bark-edge winter felled, +bs = unmeasured spring growth also present
ARW = average ring width of the measured rings

Table 2

Summary showing the structural function of the sampled timbers

Structural element	Sample numbers	Description
Truss tiebeams	**09** and **11**	The tiebeams from trusses 1 and 2 were sampled (Figs 1, 2, and 3)
Principal rafters	**01**, **03**, **06** and **07**	Six cores from four principal rafters from trusses 2 and 3 (Figs1, 3, and 4)
King posts	**04**, **05** and **08**	All three surviving king posts (Figs 1, 2, 3, and 4)
Plates	**12**	The truncated southern wall plate of Truss 1 (Figs 1 and 2)
Braces	**02**	Brace running from the tiebeam to the north principal rafter in Truss 2 (Fig 3)
Posts	**10**	The south post from Truss 1 (Fig 2)

Table 3

t-value matrix for the timbers forming the chronology DEARDON.
KEY: - = *t*-values under 3.0, \ = no overlap

	03	**05**	**10**	**12**
01	7.67	4.72	-	4.97
03		5.10	-	4.21
05			3.57	3.92
10				3.52

Table 4

Ring-width data from site master DEARDON, dated AD 1397- 1488 inclusive

Date	Ring widths (0.01mm)										No of samples									
AD 1397							271	347	192	228							1	1	2	2
AD 1401	192	191	249	264	230	218	131	122	115	112	2	2	2	2	2	2	2	2	2	2
	182	196	255	224	264	271	307	290	243	323	3	3	4	4	4	5	5	5	5	5
	266	264	295	302	276	220	212	222	268	246	5	5	5	5	5	5	5	5	5	5
	249	285	248	287	223	262	303	373	312	343	5	5	5	5	5	5	5	5	5	5
	290	246	299	372	301	248	332	372	324	253	5	5	5	5	5	5	5	5	5	5
AD 1451	268	280	267	308	259	311	251	238	214	289	5	5	5	4	4	4	4	4	4	4
	285	242	120	111	115	111	129	121	126	138	4	4	4	4	4	4	4	4	4	4
	137	119	145	121	118	139	89	101	120	134	4	4	4	4	4	4	3	3	3	3
	144	126	134	135	171	160	126	153			3	3	3	3	3	3	3	1		

Table 5

Dating the mean sequence DEARDON, dated AD 1397- 1488 inclusive. *t*-values with independent reference chronologies

Area	Reference chronology	*t*-values
Cheshire	Old Abbey Farm Bridge, Risley (Nayling 1998)	4.25
East Midlands	East Midlands Master (Laxton and Litton 1988)	4.63
Greater Manchester	Stayley Hall (Leggett 1980)	6.13
Northern Ireland	Belfast (Baillie 1977)	4.61
Yorkshire	Elland Old Hall (Hillam 1984)	4.27
Yorkshire	Wakefield Golden Cock (Groves and Hillam 1990)	5.02
Yorkshire	Nostell Priory (Tyers 1998)	4.52