

## Discovery and Excavation in Scotland

Updated on 15/06/2007

<b>LOCAL AUTHORITY:</b>	Edinburgh, City Of
<b>PROJECT TITLE/SITE NAME:</b>	Croft-an-Righ
<b>PROJECT CODE:</b>	HSCO-90131-2012-01
<b>PARISH:</b>	Edinburgh, City Of
<b>NAME OF CONTRIBUTOR:</b>	Gordon Ewart, Thorsten Hanke
<b>NAME OF ORGANISATION:</b>	Kirkdale Archaeology
<b>TYPE(S) OF PROJECT:</b>	Standing Building Recording
<b>NMRS NO(S):</b>	NT27SE 59
<b>SITE/MONUMENT TYPE(S):</b>	House
<b>SIGNIFICANT FINDS:</b>	None
<b>NGR (2 letters, 8 or 10 figures)</b>	NT 2696 7407
<b>START DATE (this season)</b>	4 November 2011
<b>END DATE (this season)</b>	14 June 2012
<b>PREVIOUS WORK (incl. DES ref.)</b>	
<b>MAIN (NARRATIVE) DESCRIPTION:</b> (May include information from other fields)	<p>Two short programmes of standing building recording were completed on newly exposed timberwork at second floor in the north range of Croft-an-Righ House ,which lies to northeast of the Palace of Holyroodhouse.</p> <p>The work was completed as part of a programme of repair and conservation focussed primarily on the plaster ceiling at first floor level in the north range and the room immediately above.</p> <p>The work comprised the detailed recording of newly exposed timber features, primarily a sequence of floor joists and fragmentary panelling in the North Range at second floor level. The work was completed over two stages – initially concentrating on the floor joists (November 2011) and later, on a fragment of painted panelling (June 2012).</p> <p>The results of the work suggest the sequence of building and repair at Croft-an-Righ comprises six main phases.</p> <p><i>Phase 1: Purchase of Croft-an-Righ House by the Earl of Airth</i> The acquisition of Croft-an-Righ House must have happened around the second decade of the 17<sup>th</sup> century after the marriage of the Earl of Airth (c 1591-1661) to Agnes Gray in 1612. Croft-an-Righ House was habitable by this time, but may not have possessed its current footprint.</p> <p><i>Phase 2: Extension of Croft-an-Righ House by the Earl of Airth</i> This must have happened soon after the acquisition of the house. The Earl spent considerable expenses on the extension of Croft-an-Righ and commissioned masons, quarries, slaters, wrights, smiths, glaziers, painters and plasterers. Given that this operation saw all major building trades involved, and given that it obviously included the creation of a ceiling over the first floor of the north range, there is indeed a strong indication that the current footprint of Croft-an-Righ House emerged during this building campaign.</p> <p><i>Phase 3: Rebuilding the house after a fire</i> Croft-an-Righ House had been destroyed in a blaze soon after the completion of Phase 2. Given that Gordon of Rothiemay's view of Edinburgh (1647) shows an intact building with a turreted two-storeyed west range and a one-storeyed north range, it seems that this rebuilding took place between c 1620 and 1647. It is most likely that the plaster ceiling over the first floor of the north range emerged in the context of this building campaign and it is possible that the space above the plaster ceiling was not</p>

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	<p>utilised for any residential purpose.</p> <p><i>Phase 4: Utilising the second floor of the north-range</i> The north range must have acquired its current cross-sectional profile after Gordon of Rothiemay had completed his view of Edinburgh around 1647. Given that the extant chimney disposition of the west range differs from that visible on Rothiemay's Edinburgh view, it appears that the entire upper floor of Croft-an-Righ House was altered after completion of Phase 3. With regard to the second floor of the north range, Phase 4 saw the introduction of dormer windows, fireplaces and decorated wooden wall panelling. The latter is characterised by the rhythmic arrangement of stiles, rails and panels, thus expressing 'classical' architectural ideas rather than the typical appearance of Scottish pre-Civil War wooden wall and ceiling decoration. It is not clear whether the panelling received its painted decoration immediately after the installation of the wooden walls. The style of the marble-imitating decoration appears to be 18<sup>th</sup>-century in character rather than 17<sup>th</sup>-century, although the panels could have been repainted during the 18<sup>th</sup> century.</p> <p><i>Phase 5: Restructuring the second floor of the north range</i> The second floor of the north range shows evidence for significant restructuring that must have been completed before c 1892. This building campaign saw the installation of three separate rooms, a wall-cupboard and a lath-and-plaster ceiling. It also included the reinforcement of the 17<sup>th</sup>-century ceiling joists; obviously in an attempt to relief the load-bearing ceiling timbers from vertical load. This operation coincided with the creation of a new substructure for a new set of floorboards and it may also have involved concealing the decorated wooden panelling with wall-paper and fabrics.</p> <p><i>Phase 6: Removal of partitions and remodelling the second floor after 1892</i> All but one of the partitions were removed after the publication of <i>Castellated and Domestic Architecture of Scotland</i> (MacGibbon and Ross, 1892). This operation saw the employment of grooved-and-tongued floorboards as well as industrial plaster board. Given the use of the latter, which was invented in the USA by the late 19<sup>th</sup> century and which appeared in Europe no earlier than WWI, it is feasible to suggest the second quarter of the 20<sup>th</sup> century for Phase 5.</p>
<b>PROPOSED FUTURE WORK:</b>	
<b>CAPTION(S) FOR ILLUSTRS:</b>	
<b>SPONSOR OR FUNDING BODY:</b>	Historic Scotland
<b>ADDRESS OF MAIN CONTRIBUTOR:</b>	4, Western Terrace, Edinburgh, EH12 5QF
<b>EMAIL ADDRESS:</b>	g_ewart@hotmail.com
<b>ARCHIVE LOCATION (intended/deposited)</b>	Archive to be deposited in NMRS

HISTORIC SCOTLAND PROPERTIES IN CARE  
MINOR ARCHAEOLOGICAL WORKS 2011

**Croft-an-Righ: Archaeological Survey, November 2011.**

**HS PIC Index Number: 90131**

**SITE:** Croft-an-Righ, Edinburgh

**N.G.R.:** NT 2696 7407

**DESCRIPTION:** Archaeological survey of exposed timbers over a 17<sup>th</sup>-century ceiling below.

**PROJECT CODE:** HSCO-90131-2012-01

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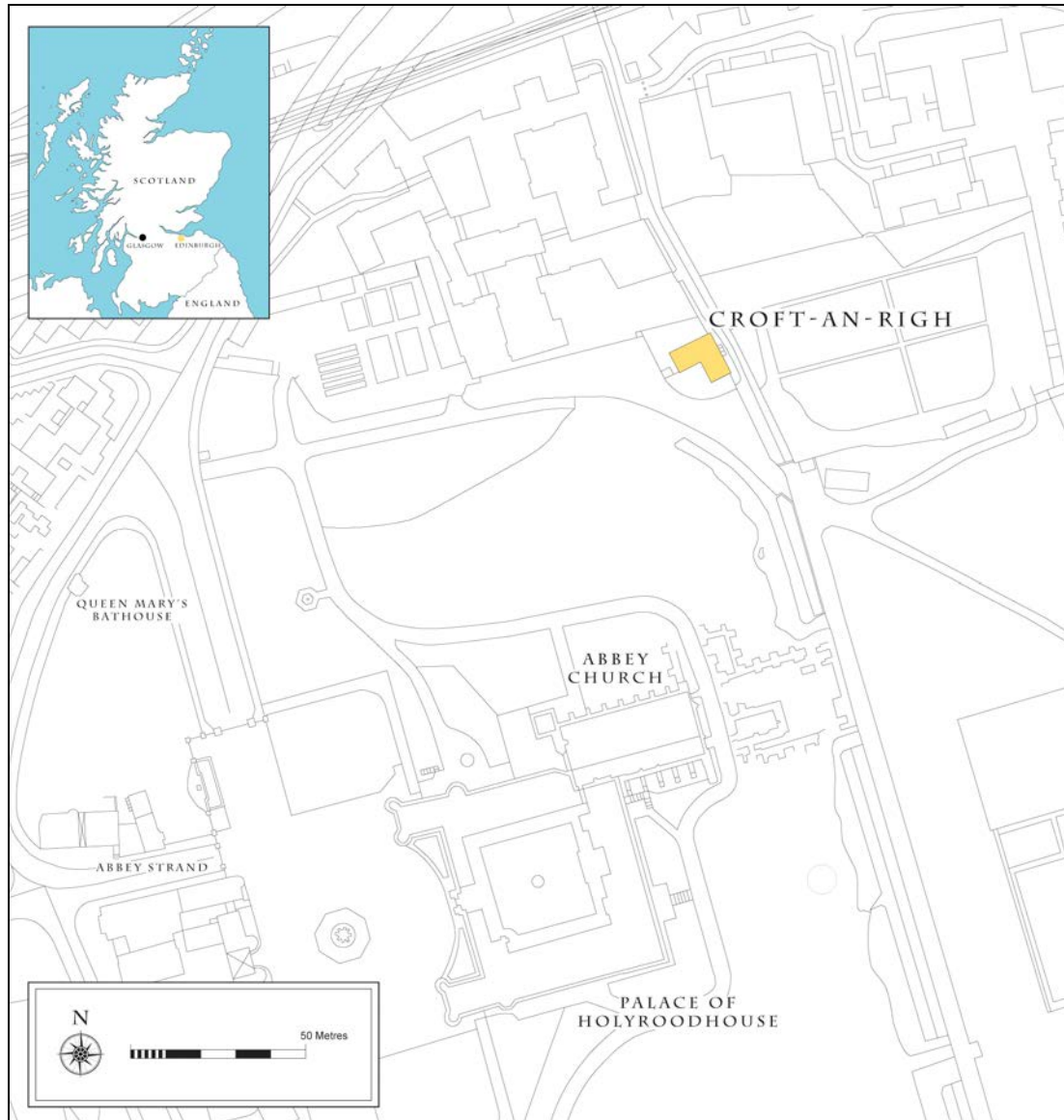
4 Western Terrace, Murrayfield, Edinburgh EH12 5QF.

JANUARY 2012

## INTRODUCTION

Under the terms of its Properties-In-Care (PIC) call-off contract with Historic Scotland, Kirkdale Archaeology was requested to undertake an archaeological record of historic timbers exposed during restoration work on a 17<sup>th</sup> century plaster ceiling below.

The work was completed over three days (4<sup>th</sup>, 7<sup>th</sup> and 29<sup>th</sup> November 2011).



**Figure 1:** Plan showing the location of Croft-an-Righ.  
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## ANALYSIS AND INTERPRETATION

The plaster ceiling at Croft-an-Righ House in Edinburgh (Fig. 1) has frequently been mentioned in works of scholarship, but, without any exception, these studies have simply either described its decoration or attempted to identify the school of plasterers.<sup>1</sup> The construction of the ceiling, on the other hand, has never raised any scholarly interest, and, equally, no serious research has so far been made on the spatial alterations of Croft-an-Righ House that have changed the appearance of its plaster ceiling in later times. By looking at Croft-an-Righ in a more holistic way, this short essay intends to elaborate on these overlooked yet important technical aspects, paying attention in particular to the arrangement of the joists and the characteristics of materials such as timber, nails and bolts. Later adaptations of the ceiling will be dealt with also.

Croft-an-Righ House is an L-shaped edifice that is located immediately northeast of the gardens of Holyrood Abbey (Fig. 1, Fig. 2). Judging by its architectural details, the mansion was erected during the 16<sup>th</sup> century, and this view is also shared by several authors on Scottish architecture.<sup>2</sup> Stately Scottish houses of this time were characterised by '(...) large (...) room[s] with paved floor[s], plastered walls, stone fireplace[s] and open timber ceiling[s] consisting of exposed joists spanning the room at intervals of about two feet and supporting both ceiling and walking floor of the room above.'<sup>3</sup>

Considering the ceiling mentioned in Apted's description, we recognise a structure that leaves both the load-bearing joists and the underside of the walking floor visible, usually decorating it with tempera paint. Given that ceilings using the combination of laths and plaster were virtually unknown in 16<sup>th</sup> century Scotland,<sup>4</sup> such a ceiling may originally have belonged to Croft-an-Righ House as well. The extant plaster ceiling at Croft-an-Righ has thus been interpreted as a specimen belonging to the early 17<sup>th</sup> rather than the 16<sup>th</sup> century,<sup>5</sup>

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<sup>1</sup> MacGibbon/Ross (1887-92), vol. 4, p. 436; Bankart (1908), p. 185; Jourdain (1927), p. 19; Edinburgh Architectural Association (1922), Plate 103 and p. 27.

<sup>2</sup> For the architectural history of Croft-an-Righ House, see in particular RCAHMS (2011) and MacGibbon/Ross (1887-92), vol. 4, pp. 434-7.

<sup>3</sup> Apted (1966), p. 27.

<sup>4</sup> Bankart (1908), p. 70 and Howard (1995), pp. 88-90.

<sup>5</sup> RCAHMS (2011).

an assumption that can claim some credibility since a part of Croft-an-Righ House was arguably destroyed by a fire during this period.<sup>6</sup>



**Figure 2:** The North-Range of Croft-an-Righ House.

Covering the first floor of the north wing, and spanning *c.*5m between the north and south walls, the underside of the ceiling displays an alternating pattern of squares and roundels, together with figural motives that fill the spaces in between (Fig. 4). It is indeed likely that this ceiling replaced a predecessor of (probably) similar dimensions, yet different design. Two redundant joist-stumps, both of which are ascertainable at second floor-level in the south wall, can be interpreted in this way (Figs. 5 and 6). These stumps sit immediately adjacent to the western faces of joists 023 and 025,<sup>7</sup> suggesting that the extant ceiling arranges its load-bearing elements on a module that was already defined by the first generation of Croft-an-Righ builders.

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<sup>6</sup> RCAHMS (2011).

<sup>7</sup> For the exact location, see appendix.

The structural skeleton of the extant plaster ceiling consists of 21 joists with scantlings, each averaging a dimension of *c.*150 x 200mm (Fig. 3).<sup>8</sup> These joists, which in all probability consist of conifers rather than oak,<sup>9</sup> have their middle-axis set roughly 500mm apart,<sup>10</sup> thus creating a structural unit where the plaster-base has to bridge 20 bays roughly 350mm wide. The latter happens by means of lathwork which is only occasionally nailed to the underside of the joists. In the remaining cases, the laths are not directly attached to the beams but to pit-sawn auxiliary boards that have been fastened with hand-made nails either to the lateral faces of the joists or to their underside (Fig. 7). The latter solution, in particular seeing the auxiliary board sandwiched between the joist and the laths, but also the tool marks and nails, proves that the auxiliary boards are contemporary with the load-bearing beams.

The boards became necessary because applying the decorative ceiling features required a (more or less) level substructure. The wrights, intriguingly, did not attempt to arrange the underside of the joists at a consistent height by bedding them on a wall-plate, but drove them directly into wall-pockets, where the beams sit immediately on the stones. Since medieval Scottish rubble masonry does not possess strictly horizontal joints, this method naturally leads to height-discrepancies. The wrights then dealt with the emerging problem through the application of auxiliary boards, which later received the lathwork.

This leads to the question as to whether the wrights were more concerned with creating a level surface for the floor-construction. Given that the upper side of the joists is devoid of any regular nail pattern (Fig. 8), it, however, appears that no floorboards were firmly fixed to the load-bearing joists. It may thus be concluded that the original floor was of a fairly provisional character, if there was any floor at all.<sup>11</sup> The extant floor, consisting of machine-sawn grooved and tongued conifer boards cut to a dimension of 113 x 7mm, does not belong to the original ceiling but must have been introduced either during the 20<sup>th</sup> or the later part

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<sup>8</sup> For the exact dimensions, see appendix.

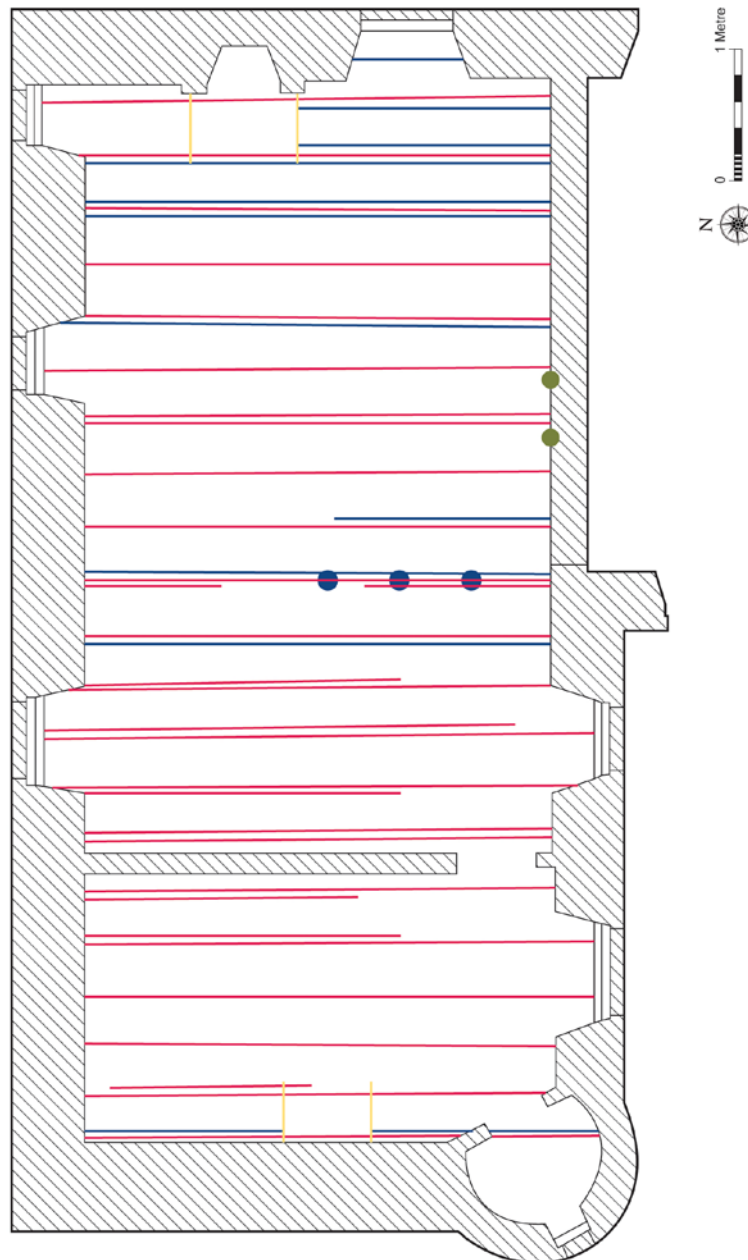
<sup>9</sup> The joists show a very dark surface and, without seeing the sap- and hardwood, it is not easy to determine the exact species.

<sup>10</sup> For the exact dimensions, see appendix.

<sup>11</sup> This raises the question as to how the second floor at the north-range of Croft-an-Righ House was used. Dating the fireplaces and windows could help to answer this question.



of the 19<sup>th</sup> century.<sup>12</sup> These floor boards are nailed to a set of machine-sawn conifers that, in functional terms, very much resemble the auxiliary boards already mentioned. These elements are either fixed to the upper side of the beams or to their lateral faces. In the latter case they span from wall to wall, thus effectively assuming the shape of auxiliary joists.

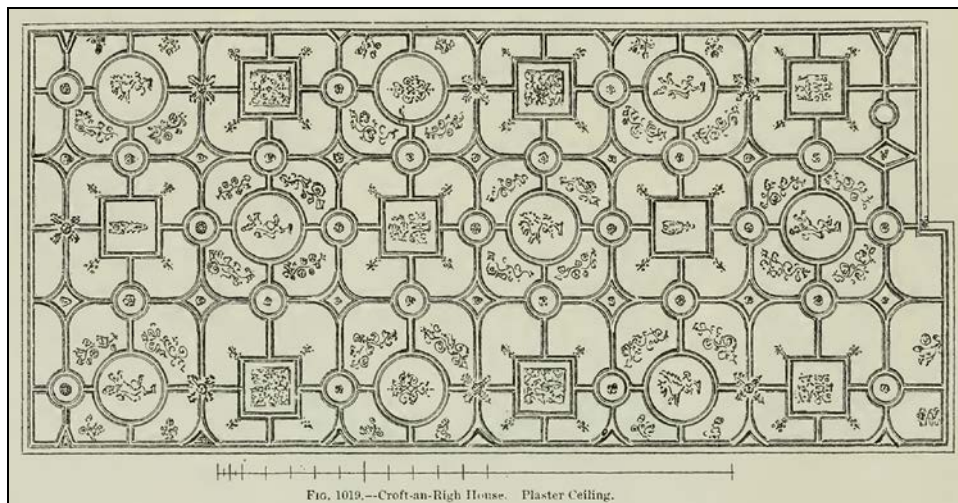


**Figure 3:** Plan of the structural skeleton of the plaster ceiling, showing a) the joists and auxiliary boards of the original ceiling (red); b) the beams belonging to the 19<sup>th</sup> and 20<sup>th</sup> centuries (blue); c) likely residuals of a predecessor ceiling (green) and d) residuals of a removed partition (yellow).

<sup>12</sup> A plan published by MacGibbon and Ross sees the second floor divided in three individual apartments, thus proving that the extant partition pre-dates the 20<sup>th</sup> century. Two of the three partitions shown by MacGibbon and Ross have been removed subsequently, suggesting that alterations happened during the 20<sup>th</sup> century. The toolmarks ascertainable at the beams (regular vertical saw-kerbs) are typical for the 19<sup>th</sup> and early 20<sup>th</sup> century. See Louw (1992).



Croft-an-Righ House saw yet another alteration during the 19<sup>th</sup> or the 20<sup>th</sup> century which lead to the incorporation of an additional set of auxiliary joists. Regarding the tool marks, these beams closely resemble the auxiliary timbers mentioned in the previous paragraph, it may thus be assumed that both types of joists had been cut more or less in the same period. However, this additional set of joists is of a different size averaging at a dimension of roughly 75 x 180mm, and the beams are not related to any type of floor construction. Being tied through substantial bolts to (a fairly small number) of the original joists, it seems that their intended function was to reinforce the ceiling – this could have been, for instance, in order to accommodate the ceiling for taking heavy furniture, or – more likely – it was a reaction to damage that had already occurred. The purpose of the beams would thus have been to protect the fragile plaster decoration from any further damage by minimising the deflection of the original joists.



**Figure 4:** Underside elevation of the plaster ceiling (MacGibbon/Ross, 1897-92, p. 435).

This operation probably coincided with the introduction of the partition that nowadays divides the second floor of the north-range into two separate chambers. The partition, constructed as a half-timbered wall and stretching from the north to the south wall, sits on an iron girder between joists 050 and 057, and it is only indirectly attached to the original ceiling architecture. This happens via an iron bracket, which, tying together joists 050 and

057,<sup>13</sup> also supports the partition (Figs. 9 and 10). This bracket uses the type of bolts mentioned above.

All the modern items used at Croft-an-Righ House, that is to say both types of auxiliary joists and various furring pieces, expose similar tool marks and employ the same type of fixings. Given that these modern items are structurally related to the extant floor and wall surfaces, it may be concluded that the plaster ceiling at Croft-an-Righ was reinforced and 'updated' in one single operation, and this happened probably in the earlier part of the 20<sup>th</sup> century. The original ceiling is almost certainly a replacement of a predecessor-structure and very clearly exposes its structural skeleton. All in all, its details closely fit into the general practice of building in early 17<sup>th</sup> century Edinburgh.



**Figure 5:** Redundant joist-stumps adjacent to joist 023.

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<sup>13</sup> For the exact location, see appendix.

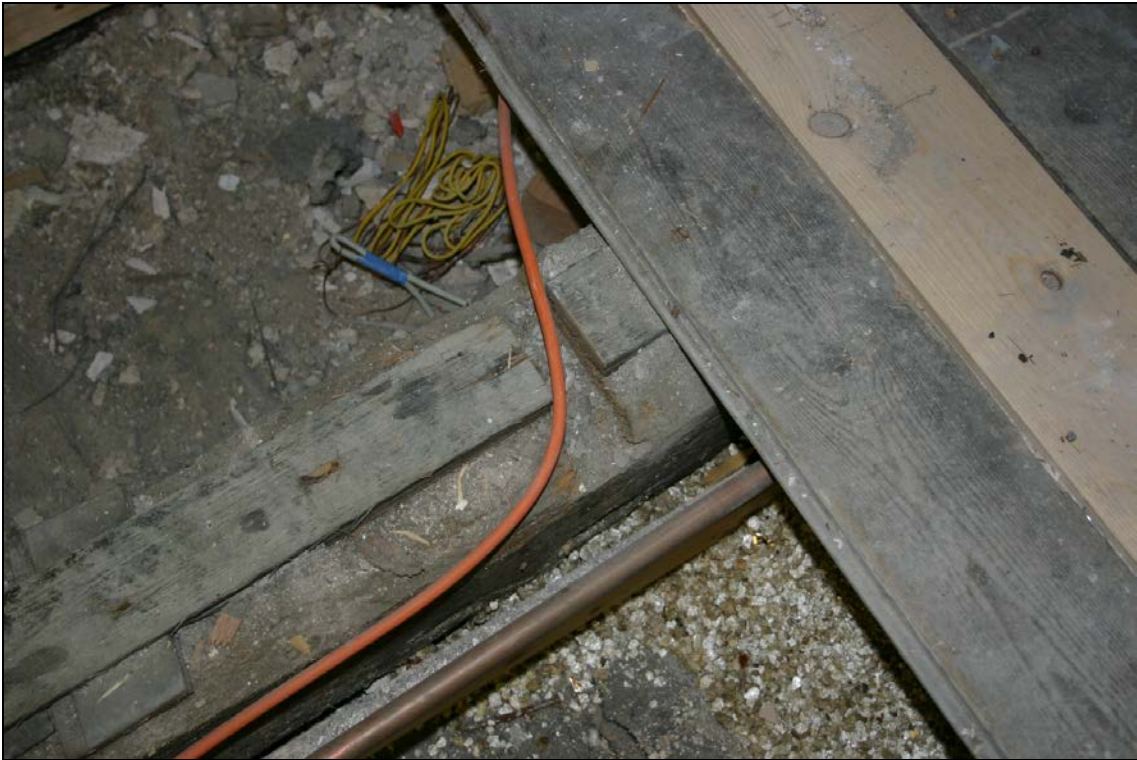


**Figure 6:** Redundant joist-stumps adjacent to joist 025.



**Figure 7:** Auxiliary board, hand-made nails and lathwork at joist 057.





**Figure 8:** Floor boards and top of joist 047.



**Figure 9:** Iron bracket and partition at joist 050.



**Figure 10:** Iron bracket and partition at joist 050 (detail).

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RCAHMS, CANMORE

(<http://canmore.rcahms.gov.uk/en/site/52523/details/edinburgh+28+30+croft+an+righ+croft+an+righ+house/>), accessed 29.12.2011.

## APPENDIX: TYPOLOGY OF TIMBER

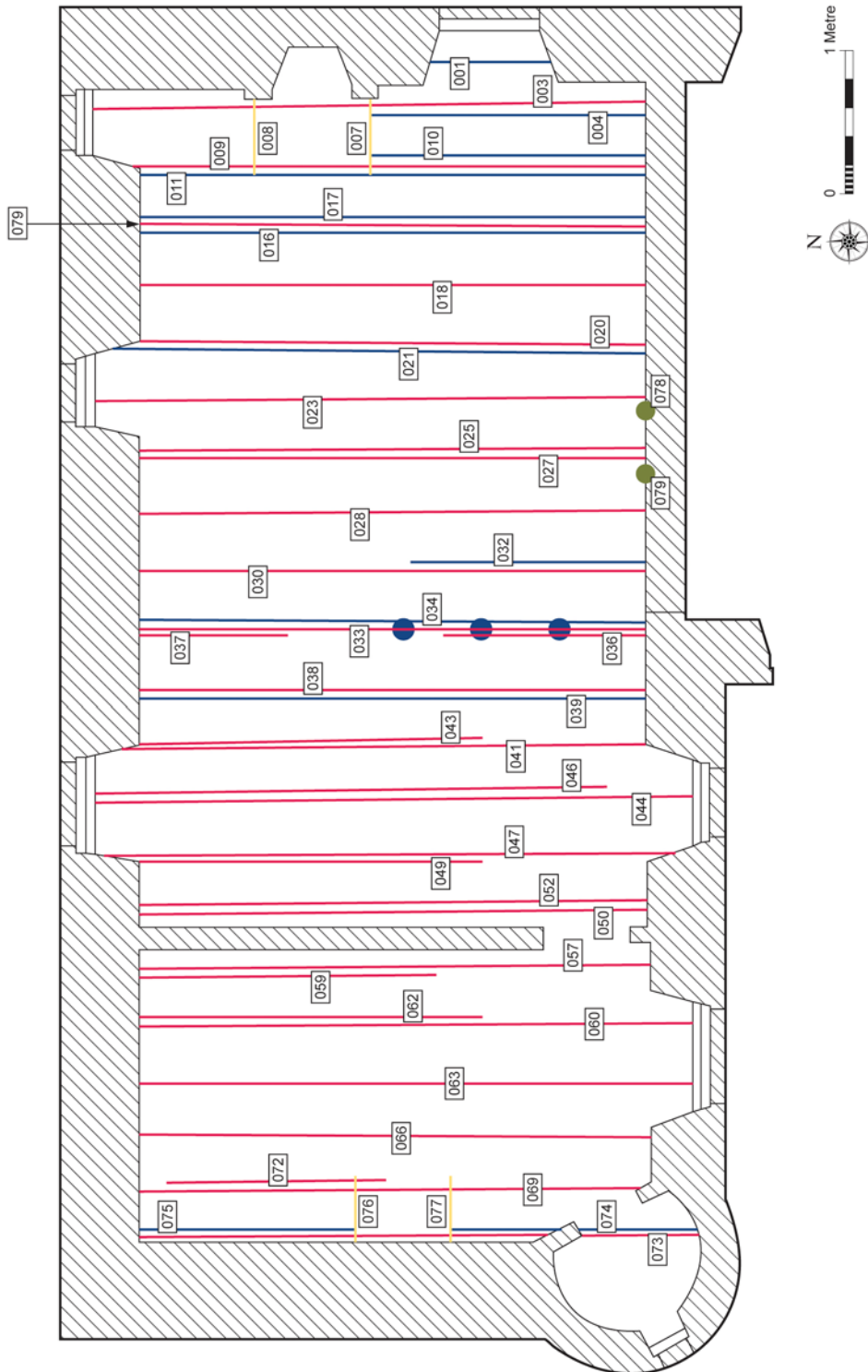


Figure 11: Location of numbered features discussed in the text.



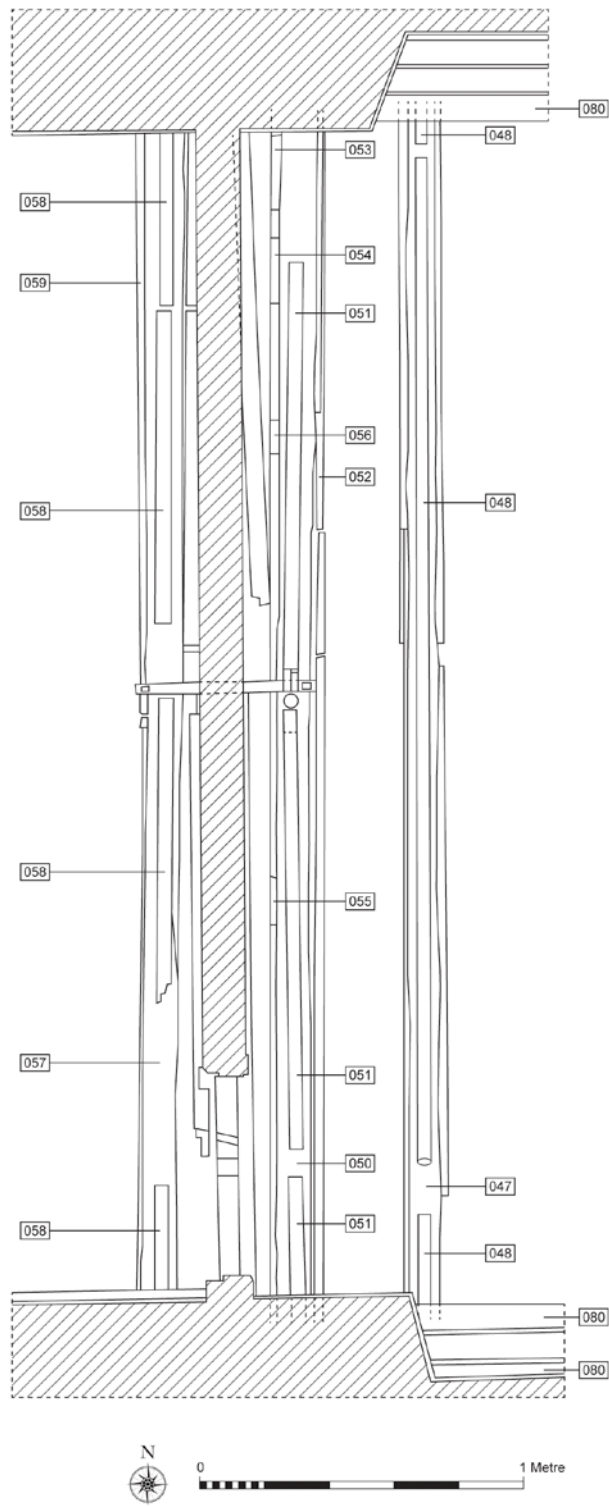


Figure 12: Detailed location of numbered features discussed in the text.

01001-01006

Axis 0

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Auxiliary Joist (001)	45 x 72mm	None	Machine-sawn (vertical kerbs)	Nails and nail holes (top)	Nails (round head)
Auxiliary Joist (002)	45 x not ascertainable <sup>14</sup>	Not ascertainable	Not ascertainable	Not ascertainable	Not ascertainable



No.001: View from northwest showing auxiliary joist 001 (axis within window-bay).

<sup>14</sup> Auxiliary joist 001 sits on top of auxiliary joist 002 and conceals it entirely.

01003-01008

Axis 1

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (003) <sup>15</sup>	130 x 175mm	None	Adzed	None	None
Auxiliary Joist (004)	32 x 165mm	None	Machine-sawn (vertical kerbs)	Nails and nail holes (top)	Nails (round head)
Furring Piece (005)	65 x 50mm	None	Machine-sawn (vertical kerbs)	None	Nails (round head)
Furring Piece (006)	65 x 10mm	None	Machine-sawn (circular kerbs)	None	Nails (round head)
Trimmer (007)	30 x 160mm	None	Machine-sawn (vertical kerbs)	None	Not ascertainable
Trimmer (008)	30 x 160mm	None	Machine-sawn (vertical kerbs)	None	Not ascertainable



Nos 003, 004 & 008: View from north-west showing joist 003, auxiliary joist 004 and trimmer 008 (first axis in front of e-wall).

<sup>15</sup> Joist 003 is lowered to a dimension of 32 – 88mm in front of chimney. This treatment obviously provided space for some sort of substructure that must have been related to the floor-area immediately in front of the fireplace. It is impossible to say unequivocally whether this happened by the time of the construction of the ceiling or at some later stage – both are possible. The two trimmers (007 and 008) linking the chimneypiece with joist 009, however, are machine-sawn and it may thus be concluded that the fireplace is not contemporary with the original ceiling but was incorporated at a later date.

01009-01014

Axis 2

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (009) <sup>16</sup>	115mm x unascertainable	None	Adzed	Handmade nails <sup>17</sup>	None
Auxiliary Joist (010)	75 x 180mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>18</sup>	Bolts <sup>19</sup>
Auxiliary Joist (011)	65 x 150mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>20</sup>	Not ascertainable <sup>21</sup>
Auxiliary Joist (012)	50 x 65mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>22</sup>	Nails (round head)
Furring Piece (013) <sup>23</sup>	66 x 45mm	None	Machine-sawn (vertical kerbs)	None	None
Furring Piece (014) <sup>24</sup>	65 x 10mm	None	Machine-sawn (vertical kerbs)	None	None



Nos. 009-011: View from northwest showing joist 009 and auxiliary joists 010-011 (second axis from left).

<sup>16</sup> Joist 009 is partially lowered by a range of 45mm in front of chimney. For interpretation, see FN 2.

<sup>17</sup> Two redundant nails (square shaft, 6mm wide)

<sup>18</sup> Nail holes were created by the nailing of floorboards.

<sup>19</sup> Bolts match those bolts found at axis 3, 10, 11, 15 and 16. Size of head 22 x 22mm. Joist bolted with six bolts set at a distance of c.820mm.

<sup>20</sup> Two redundant nail holes of uncertain purpose.

<sup>21</sup> Joist is concealed by auxiliary joist 012.

<sup>22</sup> Nail holes were created by the nailing of floorboards.

<sup>23</sup> On top of joist 009 in front of chimney.

01015-01017

Axis 3

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (015)	130mm x unascertainable	None	Adzed	None	None
Auxiliary Joist (016)	75 x 180mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>25</sup>	Bolts <sup>26</sup>
Auxiliary Joist (017)	65 x 150mm	None	Machine-sawn (vertical kerbs); hand-sawn (irregular kerbs) <sup>27</sup>	None	Nails (round shaft) <sup>28</sup>



Nos. 015-017: View from northwest showing joist 015 and auxiliary joists 016-017 (third axis from left).

<sup>24</sup> On top of auxiliary joist 011.

<sup>25</sup> Pattern refers to floorboards.

<sup>26</sup> Bolts match those bolts found at joists 2, 10, 11, 15 and 16. Size of head 22 x 22mm. Joist bolted with six bolts set at a distance of c.820mm.

<sup>27</sup> The sides of the joist are machine-sawn, the top is obviously hand-sawn.

<sup>28</sup> Diameter of head c.10mm. Material appears to be modern.

01018 - 01019

Axis 4

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (018)	175 x 200mm	None	Adzed	None	None
Furring Piece (019)	65 x 32-57mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>29</sup>	Nails (round head) <sup>30</sup>



Nos. 018 and 019: View from northeast showing joist 018 and furring piece 019 (third axis from right).

<sup>29</sup> Nail holes were created by the nailing of floorboards.

<sup>30</sup> Diameter of head *c.* 11mm, nail spacing *c.* 650mm.

01020- 01022

Axis 5

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (020)	130 x 190mm	None	Adzed	None	None
Auxiliary Joist (021)	65 x 150mm	None	Machine-sawn (vertical kerbs); hand-sawn (irregular kerbs) <sup>31</sup>	Nail holes (top) <sup>32</sup>	Nails (round head) <sup>33</sup>
Furring Piece (022) <sup>34</sup>	62 x 36-65mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>35</sup>	Nails (round head) <sup>36</sup>



Nos. 020-022: View from south showing joist 020, auxiliary joist 021 and furring piece 022 (second axis from left).

<sup>31</sup> The sides of the joist are machine-sawn, the top is obviously hand-sawn.

<sup>32</sup> No recognizable nail pattern.

<sup>33</sup> Diameter of head c.11mm, nail spacing c.650mm.

<sup>34</sup> Sits on top of joist 020.

<sup>35</sup> Nail holes were created by the nailing of floorboards

<sup>36</sup> Diameter of head c.11mm, nail spacing c.650mm.



01023 - 01024

Axis 6

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (023)	160 x 205mm	None	Adzed	None	None
Furring Piece (024)	62 x 36-55 m	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>37</sup>	Nails (round head) <sup>38</sup>



Nos. 023 and 024: View from north showing joist 023 and furring piece 024 (second axis from left).

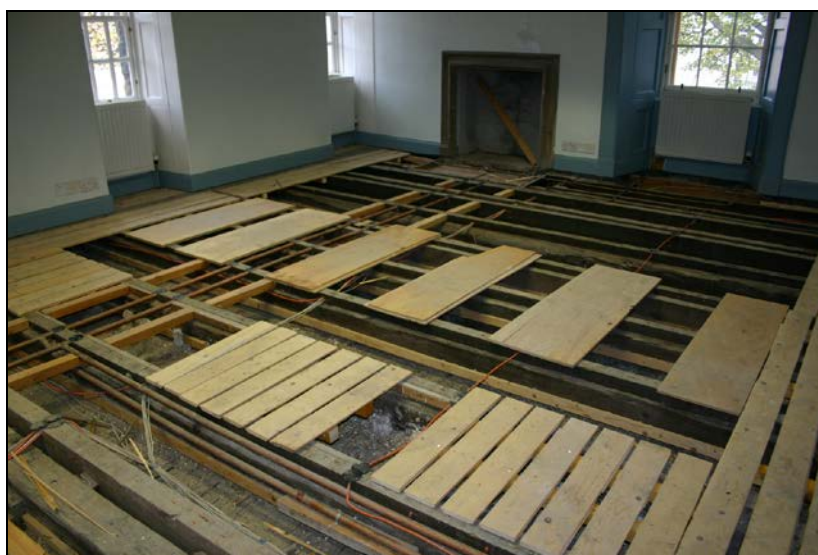
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<sup>37</sup> Nail holes were created by the nailing of floorboards

01025 - 01027

Axis 7

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (025)	140 x 190mm	None	Adzed	None	None
Furring Piece (026)	65 x 35-65mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>39</sup>	Nails (round head) <sup>40</sup>
Auxiliary Board (027)	29 x 70-115mm	None	Sawn (irregular diagonal kerbs)	None	Nails (square shaft, handmade) <sup>41</sup>



Nos. 025 and 026: View from northwest showing of joist 025 and furring 026 (third axis from left).

<sup>38</sup> Diameter of head c.11mm, nail spacing c.650mm.

<sup>39</sup> Nail holes were created by the nailing of floorboards.

<sup>40</sup> Diameter of head c.11mm, nail spacing c.650mm.

<sup>41</sup> Set at a distance of c.900mm.

01028 - 01029

Axis 8

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (028)	165 x 180mm	None	Adzed	None	None
Furring Piece (029)	65 x 40-55mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>42</sup>	Nails (round head) <sup>43</sup>



Nos. 028 and 029: View from northwest showing joist 028 and furring 029 (second axis from left).

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<sup>42</sup> Nail holes were created by the nailing of floorboards.

<sup>43</sup> Diameter of head *c.* 11mm, nail spacing *c.* 650mm.

01030 - 01032

Axis 9

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (030)	175 x 195mm	None	Adzed	None	None
Furring Piece (031) <sup>44</sup>	65 x 30-62mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>45</sup>	Nails (round head) <sup>46</sup>
Auxiliary Joist (032) <sup>47</sup>	60 x 170mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>48</sup>	Nails (round head) <sup>49</sup>



No. 030: View from northwest showing joist 030 (second axis from left).

<sup>44</sup> In three pieces.

<sup>45</sup> Nail holes were created by the nailing of floorboards.

<sup>46</sup> Diameter of head c.11mm, nail spacing c.650mm.

<sup>47</sup> Auxiliary joist 030 has a length of c.1400mm.

<sup>48</sup> No recognisable nail pattern

<sup>49</sup> Diameter of head c.10mm, nail spacing c.400mm.

01033 - 01037

Axis 10

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (033)	150 x 220mm	None	Adzed	3 holes (top) <sup>50</sup>	None
Auxiliary Joist (034)	75 x ca. 180mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>51</sup>	Bolts <sup>52</sup>
Furring Piece (035) <sup>53</sup>	65 x 25mm	None	Machine-sawn (vertical kerbs)	None	None
Auxiliary Board (036) <sup>54</sup>	35 x 115mm	None	Sawn (irregular diagonal kerbs)	None	Nails (square shaft, handmade)
Auxiliary Board (037) <sup>55</sup>	25 x 80mm	None	Sawn (irregular diagonal kerbs)	None	Nails (square shaft, handmade)



Nos. 033 and 034: View from north showing joist 033 and auxiliary joist 034 (second axis from right).

<sup>50</sup> Hole 1: square cross-section, c.20 x 22mm, depth: c.30mm; hole 2: round cross-section, diameter c.18mm, depth c.35mm; hole 3: round cross-section, diameter c.18mm, depth c.35mm.

<sup>51</sup> Nail holes were created by the nailing of floorboards.

<sup>52</sup> Bolts match those bolts found at joists 2, 3, 11, 15 and 16. Size of head 22 x 22mm. Joist bolted with six bolts set at a distance of c.780mm.

<sup>53</sup> Length: c.460mm.

<sup>54</sup> Length: c.2700mm.

<sup>55</sup> Length: c.1480mm.

01038 - 01040

Axis 11

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (038)	150 x 210mm	None	Adzed	None	None
Auxiliary Joist (039)	75 x 165mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>56</sup>	Bolts <sup>57</sup>
Furring Piece (040) <sup>58</sup>	65 x 18mm	None	Machine-sawn (vertical kerbs)	None	None



Nos. 038 and 039: View from south showing joist 038 and auxiliary joist 039 (second axis from left).

<sup>56</sup> Nail holes were created by the nailing of floorboards.

<sup>57</sup> Bolts match those bolts found at joists 2, 3, 10, 15 and 16. Size of head 22 x 22mm. Joist bolted with six bolts set at a distance of c.770mm.

<sup>58</sup> Length: 480mm.



01041 - 01043

Axis 12

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (041)	145 x 220mm	None	Adzed	None	None
Furring Piece (042) <sup>59</sup>	65 x 38mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>60</sup>	Nails (round head) <sup>61</sup>
Auxiliary Board (043) <sup>62</sup>	28 x 70mm	None	Sawn (irregular diagonal kerbs)	None	Nails (square shaft, handmade)



Nos. 041 and 042: View from southeast showing joist 041 and furring 042 (fourth axis from left).

<sup>59</sup> Furring piece 042 is composed of five layers of "strips" ranging in thickness between 8 and 15mm.

<sup>60</sup> Nail holes were created by the nailing of floorboards.

<sup>61</sup> Diameter of head c.10mm, nail spacing c.650mm.

<sup>62</sup> Length: 3150mm.



01044 - 01046

Axis 13

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (044)	120 x 230mm	None	Adzed	None	None
Furring Piece (045) <sup>63</sup>	65 x 35mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>64</sup>	Nails (round head) <sup>65</sup>
Auxiliary Board (046)	30 x 40-90mm	None	Sawn (irregular diagonal kerbs)	None	Nails (square shaft, handmade)



Nos. 044, 045 and 046: View from south showing joist 044, furring 045 and auxiliary board 046 (second axis from left).

<sup>63</sup> Furring piece 045 is composed of three layers of 'strips' ranging in thickness between 8 and 15mm.

<sup>64</sup> Nail holes were created by the nailing of floorboards.

<sup>65</sup> Diameter of head c.10mm, nail spacing c.650mm.

01047 - 01049

Axis 14

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (047)	130 x 230mm	None	Adzed	None	None
Furring Piece (048) <sup>66</sup>	60 x 32mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>67</sup>	Nails (round head) <sup>68</sup>
Auxiliary Board (049) <sup>69</sup>	70 x 28mm	None	Sawn (irregular diagonal kerbs)	None	Nails (square shaft, handmade)



Nos. 047, 048 and 049: View from south showing joist 047, furring 048 and auxiliary board 049 (second axis from right).

<sup>66</sup> Furring piece 048 is composed of three layers of 'strips' ranging in thickness between 8 and 150mm.

<sup>67</sup> Nail holes were created by the nailing of floorboards.

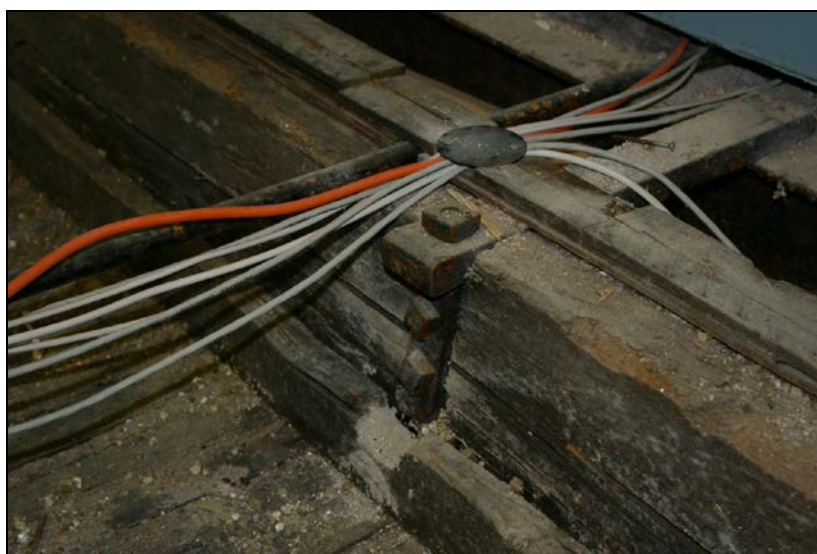
<sup>68</sup> Diameter of head c.8mm, nail spacing c.650mm.

<sup>69</sup> Length: 2250mm.

01050 - 01056

Axis 15

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (050) <sup>70</sup>	155 x 215mm	None	Adzed	None	None
Furring Piece (051)	62 x ca. 2 – 8mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>71</sup>	Nails (round head) <sup>72</sup>
Auxiliary Board (052)	30 x ca. 100mm	None	Sawn (irregular diagonal kerbs)	None	Nails (square shaft, handmade)
Board (053) <sup>73</sup>	30 x 70mm	None	Sawn	None	Unascertainable
Board (054) <sup>74</sup>	30 x 70mm	None	Sawn	None	Unascertainable
Board (055) <sup>75</sup>	30 x 70mm	None	Sawn	None	Unascertainable
Board (056) <sup>76</sup>	30 x 110mm	None	Sawn	Nails (square shaft)	Unascertainable



Nos. 050, 051 and 052: View from northwest showing joist 050, furring 051 and auxiliary board 052.

<sup>70</sup> Joist 15 (050) is linked to joist 16 (057) by means of a metal bracket that is fastened to both joists with bolts that are identical to those employed at joists 2, 3, 10 and 11. The bracket serves as load-bearing substructure for a partition wall that divides the formerly undivided space into two rooms.

<sup>71</sup> Nail holes were created by the nailing of floorboards.

<sup>72</sup> Diameter of head 4mm.

<sup>73</sup> The board is (probably) nailed to the western side of joist 050 and sits on a strip.

<sup>74</sup> The board is (probably) nailed to the western side of joist 050 and sits on a strip.

<sup>75</sup> The board is (probably) nailed to the western side of joist 050 and sits on a strip.

01057 - 01059

Axis 16

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (057) <sup>77</sup>	145 x 210mm	None	Adzed	None	None
Furring Piece (058) <sup>78</sup>	62 x 25mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>79</sup>	Nails (round head) <sup>80</sup>
Auxiliary Board (059)	ca. 30 x ca. 100mm	None	Sawn (irregular diagonal kerbs)	None	Nails (square shaft, handmade) <sup>81</sup>



Nos. 057, 058 and 059: View from southwest showing of joist 057, furring 058 and auxiliary board 059.

<sup>76</sup> The board, which is tongued and grooved, is (probably) nailed to the western side of joist 050 and sits on a strip. Two redundant nails stick from the top of board 056 (length c.30mm)

<sup>77</sup> Joist 16 (057) is linked to joist 15 (050) by means of a metal bracket that is fastened to both joists with bolts that are identical to those employed at joists 2, 3, 10 and 11. The bracket serves as load-bearing substructure for a partition wall that divides the formerly undivided space into two rooms.

<sup>78</sup> The furring piece consists of four parts. Length of part a: 760mm, length of part b: 1520mm, length of part c: 1290mm, length of part d: 500mm.

<sup>79</sup> Nail holes were created by the nailing of floorboards

<sup>80</sup> Diameter of head c.110mm, nail spacing c.650mm.

<sup>81</sup> Nail spacing c.300-550mm.

01060 - 01062

Axis 17

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (060)	145 x 205mm	None	Adzed	None	None
Furring Piece (061) <sup>82</sup>	52 x 57mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>83</sup>	Nails (round head) <sup>84</sup>
Auxiliary Board (062) <sup>85</sup>	25 x ca. 150mm	None	Sawn (irregular diagonal kerbs)	None	Nails (square shaft, handmade)



Nos. 060 and 061: View from southwest showing joist 060 and furring 061 (second axis from right).

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<sup>82</sup> The furring piece consists of four parts.

<sup>83</sup> Nail holes were created by the nailing of floorboards

<sup>84</sup> Diameter of head c.11mm, nail spacing c.650mm.

<sup>85</sup> Length: c.2900mm.

01064 - 01065

Axis 18

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (063)	140 x 155mm	None	Adzed	None	None
Furring Piece (064) <sup>86</sup>	65 x 28-48mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>87</sup>	Nails (round head) <sup>88</sup>
Furring Piece (065) <sup>89</sup>	Unascertainable	Unascertainable	Unascertainable	Unascertainable	Unascertainable



Nos. 063 and 064: View from southwest showing joist 063 and furring 064 (third axis from right).

<sup>86</sup> The furring piece consists of two parts. Length of part a 1910mm, length of part b: c.3590mm.

<sup>87</sup> Nail holes were created by the nailing of floorboards

<sup>88</sup> Diameter of head c.11mm, nail spacing c.650mm.

<sup>89</sup> The furring piece sits at the underside of joist 061 and obviously belongs to the original construction stage.



01066 - 01068

Axis 19

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (066)	135 x 215mm	None	Adzed	None	None
Furring Piece (067) <sup>90</sup>	65 x 25-55mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>91</sup>	Nails (round head) <sup>92</sup>
Furring Piece (068) <sup>93</sup>	55 x 55-68mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>94</sup>	Nails (round head) <sup>95</sup>



Nos. 066 and 067: View from north showing joist 066 and furring 067 (fourth axis from left).

<sup>90</sup> Length: c.1060mm.

<sup>91</sup> Nail holes were created by the nailing of floorboards

<sup>92</sup> Diameter of head c.11mm, nail spacing c.650mm.

<sup>93</sup> Length: c.3500mm.

<sup>94</sup> Nail holes were created by the nailing of floorboards

<sup>95</sup> Diameter of head c.11mm, nail spacing c.650mm.



01069 - 01072

Axis 20

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (069)	150 x 215mm	None	Adzed	None	None
Furring Piece (070) <sup>96</sup>	67 x 20mm 65 x 38-55mm 52 x 58mm 50 x 60mm	None	Machine-sawn (vertical kerbs)	Nail holes (top) <sup>97</sup>	Nails (round head) <sup>98</sup>
Furring Piece (071) <sup>99</sup>	65 x 38-55mm	Unascertainable	Unascertainable	Unascertainable	Unascertainable
Auxiliary Board (072) <sup>100</sup>	15 x 140mm	None	Sawn (irregular diagonal kerbs)	None	Nails (square shaft, handmade)



Nos. 069, 070, 071, 075 and 076: View from northeast showing joist 069, furring 070, auxiliary board 071 and trimmers 075 and 076 (second axis from right).

<sup>96</sup> The furring piece consists of four parts. Length of part a: 200mm, length of part b: c.1180mm, length of part c: 1300mm, length of part 4: 1800mm.

<sup>97</sup> Nail holes were created by the nailing of floorboards.

<sup>98</sup> Diameter of head c.11mm, nail spacing c.650mm.

<sup>99</sup> The furring piece sits at the underside of joist 061 and obviously belongs to the original construction stage.

<sup>100</sup> Length: c.1470mm.

01073 - 01077

Axis 21

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist (073)	100 x 175mm	None	Adzed	None	None
Auxiliary Joist (074) <sup>101</sup>	65 x 170mm	None	Sawn (regular vertical kerbs)	Nail holes (top) <sup>102</sup>	Nails (square shaft)
Auxiliary Joist (075) <sup>103</sup>	65 x 170mm	None	Sawn (regular vertical kerbs)	Nail holes (top) <sup>104</sup>	Nails (square shaft)
Trimmer (076)	65 x 168mm	None	Machine-sawn (vertical and circular kerbs)	Notch <sup>105</sup>	None
Trimmer (077)	65 x 168mm	None	Machine-sawn (vertical and circular kerbs)	Notch <sup>106</sup>	None



Nos. 073 and 075: View from south showing joist 073 and auxiliary joist 075 (first axis from left).

<sup>101</sup> Not attached to original joist

<sup>102</sup> Pattern refers to floorboards.

<sup>103</sup> Not attached to original joist

<sup>104</sup> Pattern refers to floorboards.

<sup>105</sup> The notch (dimension: 55 x 40mm, depth 70mm) is located 170mm in front of the w-wall.

<sup>106</sup> The notch (dimension: 55 x 40mm, depth 70mm) is located 170mm in front of the w-wall.

01078 - 01079

**Joist-stumps**

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Joist-stump (078)	140 x 150mm	Not ascertainable	Not ascertainable <sup>107</sup>	None	None
Joist-stump (079)	140 x 150mm	Not ascertainable	Not ascertainable <sup>108</sup>	None	None



**Nos. 078 and 079:** View from north showing joist-stumps 078 and 079.

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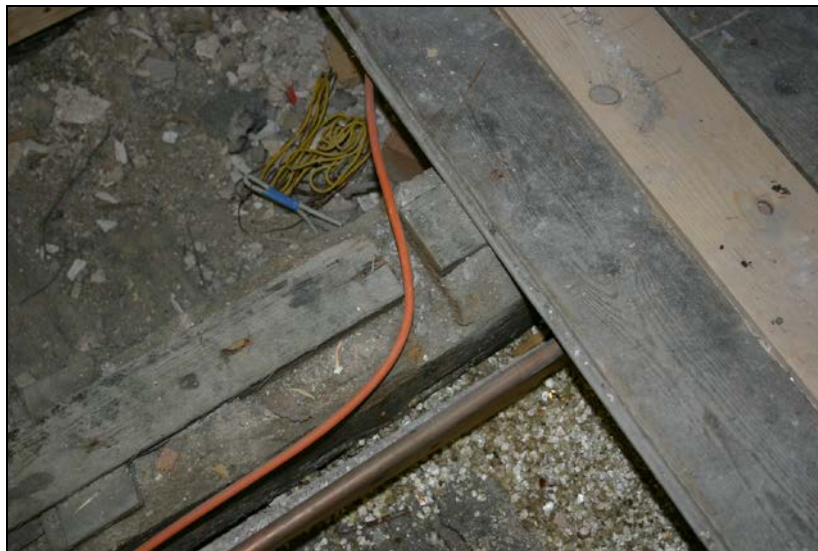
<sup>107</sup> Only the cross-sectional area is visible. Given the general circumstances, it is likely that the joist was adzed.

<sup>108</sup> Only the cross-sectional area is visible. Given the general circumstances, it is likely that the joist was adzed.

01080

**Floorboard**

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Floorboard (080)	113 x 20mm	None	Machine-sawn	None	Modern Nails



No. 080: View from northeast showing floor-board 080 at axis 14.

01080

Laths

Item	Cross-sectional Dimension	Assembly Marks	Tool Marks	Redundant Features	Fixings
Laths (081)	20 – 80mm x unascertainable	None	Split	None	Not ascertainable



No. 081: View from northeast showing lathwork 081 at axis 16.