

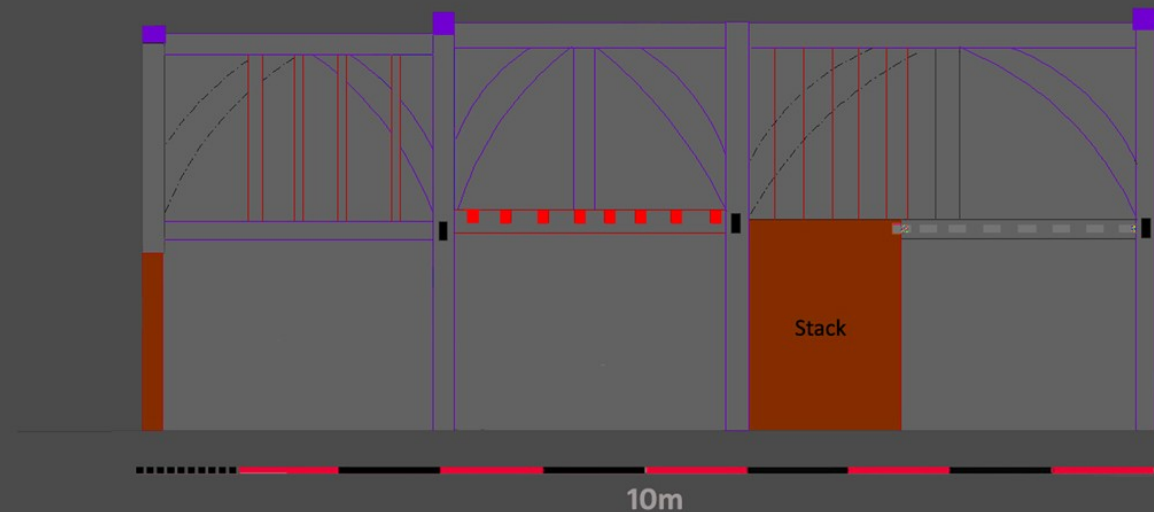
# Guidance for Historic Buildings

## Guide No. 4. Dendrochronology

### Key:

- Period A: 15th century
- Period B: 16th century
- Brickwork
- Period A Dendro targets

The Mint House  
South facing elevation of the Kitchen Arcade



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## Guide No. 4: Dendrochronology.

Dendrochronology, also known as tree-ring dating, can be an invaluable tool if a precise date is desired for a building. However, it should be noted that a precise felling date for a tree is not always obtained and some preliminary investigations can aid a successful programme. The science works by comparing rings in a sample removed from the building to a master chronology; weather conditions in a specific regional area can alter the way a tree grows, with a 'good' year creating a wider ring than a 'bad' year. This regional pattern of growth has been compiled over the years at laboratories across the UK and can provide reliable comparisons.

In the first quarter of the 21<sup>st</sup> century, there have been significant improvements in the ability of Dendrochronology to obtain confident dates for timber samples. In the late 20<sup>th</sup> century, English Heritage (now called Historic England) produced an informative guidance booklet which is freely available on their web-site (English Heritage 1998), which states that Dendrochronology can date as far back as far as 5000 years BC and beyond in Ireland, with an almost complete chronology in England. This date has most likely increased in range and accuracy today.

It is important to understand as much as you can about the building as well as understanding the process of the selection of suitable timbers and sampling by a scientist.

### ***Steps that individuals or groups can take***

1. It is essential that a Dendrochronologist should be consulted as early as possible before development starts so that costings, timings and the potential of the timber can be planned in the programme and budgeted for. Any drawings such as plans, measured sections and the name/address of owner must be provided.

2. Make sure the species of timber is right; oak is the best for accurate dating whereas elm can be difficult and pine is moderately successful. Consider **careful and controlled** stripping of paint to assess the timber type and don't forget you will need Listed Building Consent (LBC) to do this. Paint can hide important surface marks such as carpenter's setting out marks and apotropaic marks which may be damaged by aggressive paint removal. Consider something softer such as dry ice blasting or steam systems (particularly *DOFF*) or even poultice based systems such *Peelaway* or *Kling-strip*, but it is important to seek advice on this and important to note that bark, sapwood and the delicate, wood infested 'frass' should be left intact and not removed. An experienced dendrochronologist may be able to assess the suitability simply by inspecting the surface but only a core sample will be definitive.

3. Timber selection is crucial; structural beams, floorboards and panelling are good targets and it may be possible to gain dates from end grain, particularly *in-situ* panelling, after cleaning and polishing. The timber must be wide enough; ideally you can count at least 100 rings. Once the timber has below 50 rings then dating can be problematic. A lot of buildings may have timber that has only 30 rings but this is no good for dating. The question is, how do you count the rings with *in-situ* timber? This can only be achieved in section and most buildings do not have such timber exposed unless it has been cut or it has been dismantled. Look for un-painted timber in areas where this may have occurred; this will not be straight forward!

4. Distressed trees and consequently the timber, is not useful and samples should be free from knots.

5. Bark is not necessary for dating but is useful as the outer inch of sapwood gives the felling date under ideal circumstances. There is a difference between the date the timber was used in construction and the date of felling; an incomplete ring of sapwood indicates the tree was felled

before the ring growth was complete. If an unexpectedly early date arises from the programme, this may indicate the re-use of timber from elsewhere.

6. If sapwood is present, a date sometime after felling can be given which may not necessarily date the building *per se*.

7. Drawings and written observations about the timber *in-situ* may be helpful with regards to understanding the specific phases and ensuring the correct timbers are targeted. It is important that an experienced buildings archaeologist has produced a study of the building first in order to inform the next stage.

8. Quite often the success of a programme of Dendrochronology cannot be assessed until the timbers have been seen by the scientist undertaking the work. The depth of the rings is crucial; 1-2mm between rings is the normal range whereas 10mm is too wide and 0.5mm is too tight. Core samples can always be taken first and assessed to see if the timber is suitable for Dendrochronology. Sometimes slices can be taken from repairs to timber rather than cores drilled (Fig.1).



**Fig.1. Drill core bit and resulting timber core.**

9. Some thought will need to be given to available space and safe access to the building by the Dendrochronologist; will boards need to be fitted in the roof for safe working conditions; will traffic be problematic if timbers are approached externally; will scaffolding be necessary; is there adequate lighting and power supply; are there any trip hazards or areas that need to be made safe?

10. If the building is a Scheduled Monument, have you discussed the proposed programme for with the Local Planning Authority Conservation Officer and/or Historic England? Although the samples removed are small in diameter (Fig.2: up to 15mm diameter), permission will need to be secured before-hand but not if it is a Listed Building.



**Fig.2. Small 15mm hole left behind is filled with a plug.**

11. Be aware that engaging with a programme to undertake Dendrochronology will take time; whilst there will be some flexibility to choose a laboratory to undertake the work, a Laboratory should be

chosen based on their reputation, proven experience and ideally references from organizations such as Historic England. It is also vital to select a company who has a track record of working in a specific region with a chronology database that has been proven over a period of time.

12. Once the results are in, they will need to publish; this usually is published in the Vernacular Architecture Journal as well as on individual laboratory web-sites.

Finally, the following tips are provided:

- Retain any timber that is removed during repair works
- Avoid power washing exposed timbers as this may remove sapwood
- Label any timbers removed during repair so their origins are recorded
- Try to target timber that has a good working space around it; the power tools used can be 60cm in length (Fig.3)
- Try to obtain 8-10 timbers to be sampled for each building or phase
- Make documentary records of the process (Fig.4)



**Fig.3.**Dr. Martin Bridge from the Oxford Dendrochronology Laboratory extracting a core.

TABLE 4 Suggested prompt sheet for the assessment of standing buildings. Some adaptations may be needed for specific building types such as bellframes and crucks

<b>1 The building</b>	(outstanding feature which distinguishes the building inserted here, eg fierce dog, carved ceiling)			
BUILDING CONTACT INFORMATION	NGR TEL SURVEY/REPORT/PLANS/NONE			
<b>2 Access</b>	PARKING KEYS EASE OF PERSON ACCESS EASE OF EQUIPMENT ACCESS LADDERS/STAIRS POWER POSITION OF POWER POINT AVAILABILITY OF POWER LENGTH OF CABLE REQUIRED LIGHTING FLOOR SAFE CLEAN VENTILATION BIRDS BATS			
	Y/N Y/N GOOD/POOR GOOD/POOR 240/110v/N ALWAYS/LOCKED/KEY GOOD/POOR/NONE Y/N/BOARDS REQUIRED Y/N Y/N/POOR/EXCESSIVE Y/N Y/N			
<b>3 The timbers</b>	LOCATION SPECIES NO OF TRUSSES NO OF TIMBERS ACCESSIBLE NO SUITABLE RE-USED CONVERSION SAPWOOD BARK			
	Y/N/H/S	Y/N/H/S	Y/N/H/S	Y/N/H/S
	Y/N	Y/N	Y/N	Y/N
COMMENTS				

**Fig.4.** Historic England prompt sheet which can easily be filled in by owners/groups commissioning a programme of Dendrochronology.