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Surveying the moisture contents of cavity-filled timber-framed dwellings

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This paper describes a method of surveying the moisture contents of timber in those timber-framed dwellings which have had the cavity between their cladding and the sheathing thermally insulated after occupation. It gives guidance on moisture levels likely to be acceptable for the timber frame and suggests remedial action should high moisture levels be found.

INTRODUCTION

An estimated 5000 existing timber-framed dwellings have been thermally upgraded after occupation by filling the cavity between the cladding and the sheathing to the timber frame. This has been most common in Scottish housing. This process is contrary to accepted building practice¹ since it is believed that it will enhance the risk of rain penetration and timber rot.

In some instances, surveyors have down-valued a cavity-filled timber-framed dwelling or recommended that it is unsuitable as security for a loan, and sometimes Building Societies have refused to lend money on such properties. Such assessments would imply that the cavity fill ought to be removed to ensure adequate long-term performance.

Although this use of cavity fill is considered inappropriate, where it has already been used in timber-framed housing, it is proper that individual properties should be considered on their merits and not automatically condemned. They should be surveyed in such a way that any *actual* problems of rain penetration can be identified.

The method of surveying the moisture contents of timber components of such dwellings which is described in this paper is recommended in addition to a standard survey² of timber-framed dwellings. It was developed during detailed inspections undertaken by BRE Scottish Laboratory staff and is based on techniques and interpretations developed at BRE's Princes Risborough Laboratory. Because of the need to limit disruption and

damage to decoration the method is not fully comprehensive. (This is the case with all surveys.) However, the method should give results which are indicative of the condition of the timber framing.

MEASUREMENT OF MOISTURE CONTENTS

As simple access to structural timbers from the outside is blocked by the outer cladding, the basis of the method is to measure moisture contents in the floors and frame from the inside at prescribed locations using an electrical resistance/conductance moisture meter.

Electrical moisture meters do not, in general, give absolute values of moisture content. Readings, particularly those taken in plywood, fibreboard or timber treated with copper/chrome/arsenic compounds, which are higher than the values quoted as being acceptable should be checked before taking major actions. Moisture contents based on weighing and drying samples of the materials³ are the most suitable for calibration.

Emphasis is placed on measurements at the base of walls close to the intersection of members. At these locations there is likely to be more bridging of the cavity, and water which enters the cavity at other locations is likely to run down to the base. Moisture-content readings taken at the inside of timber members in these locations are indicative of overall conditions since water is conducted readily over the surface of timber, especially in the capillary path formed between pieces of timber.

Before taking readings, the surveyor should beware of electrical wires beneath the carpet and within the frame and should test the conductivity of any floor coverings since they may conduct electricity and give false high readings. The position of wires can be located by means of a hand-held metal detector. The same instrument can be used to locate the position of studs by detecting the presence of nails.

The first measurements should be in the skirting and flooring around the perimeter of the house (Figure 1).

These readings may indicate areas where further investigation is needed.

Structural timbers in some locations may have higher moisture contents than those in others. The following locations therefore require special consideration when a survey is being carried out:

Behind cracks in external cladding

Where flooring and skirting measurements have given high readings

Around cavity bridges such as ventilators

Behind unrendered (rather than rendered) walls

Behind any vertical joints between external claddings

Restrictions on access to the locations due to fixed furnishings or ground-floor construction may mean that the surveyor has to drill through floors and internal linings or, in certain instances, through the outer cladding. Details of the drilling necessary for inaccessible

under-buildings, first-floor structural timber, and for external access are given in Figure 2.

To supplement moisture-meter readings, all accessible timber and timber-based components should be visually inspected for evidence of mould or damp staining. Internal wall surfaces should also be inspected for damp stains. Where there is visual evidence that dampness has occurred at some time, moisture-meter readings should be extended to indicate the source and extent of the problem. In such a case inspection of structural timbers with a fibre-optic viewer may be required.

Where direct access to timber is possible

Moisture-meter readings should be taken at the locations described below and shown in Figure 1:

In timber skirtings 10 mm up from the floor at 1 m intervals along the perimeter wall, and in timber, chipboard or plywood floors 10 mm from the skirting at the same intervals.

Under the ground floor in all timber members at 2 m intervals around the perimeter, 10 mm from the intersection of members.

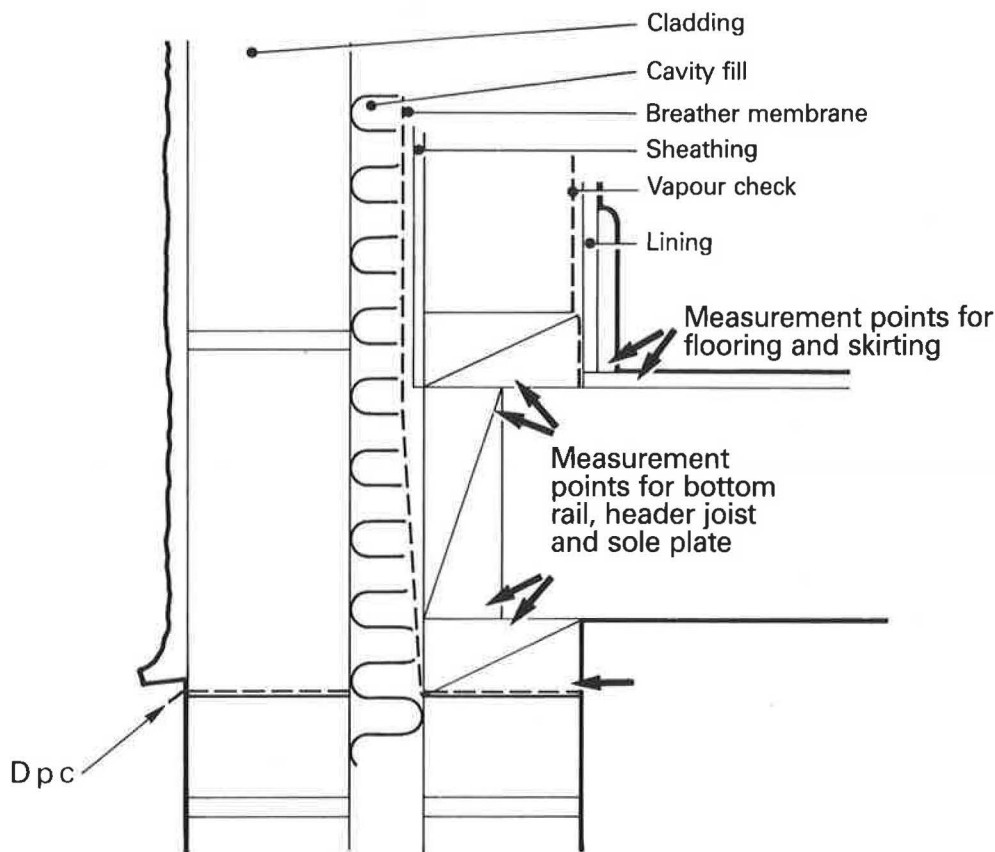


Figure 1 Locations of measurement points from inside the dwelling on each floor level and under the ground floor

Alternative means of access to structural timbers

Where direct access to structural timbers is not possible, it will be necessary to:

Drill pairs of holes 25 mm apart and about 3 to 8 mm in diameter.

Use long-reach moisture-meter probes at least 200 mm long.

Access to ground-floor and first-floor structural timbers can be gained as shown in Figure 2: (a) through the lining, (b) through the skirting and floor boards or (c) through the outer cladding.

Initially, to minimise damage, only one of the three types of drilling illustrated in Figure 2 should be used. It is suggested that sets of readings are taken at a minimum of eight locations with at least one set in the timbers of each wall. When working from the inside, moisture-content readings can be supplemented by examination through larger holes using a fibre-optic viewer to check for mould growth or damp staining.

All holes must be repaired with appropriate material afterwards to prevent moist air percolating into the inner cavity or water entering the outer cavity.

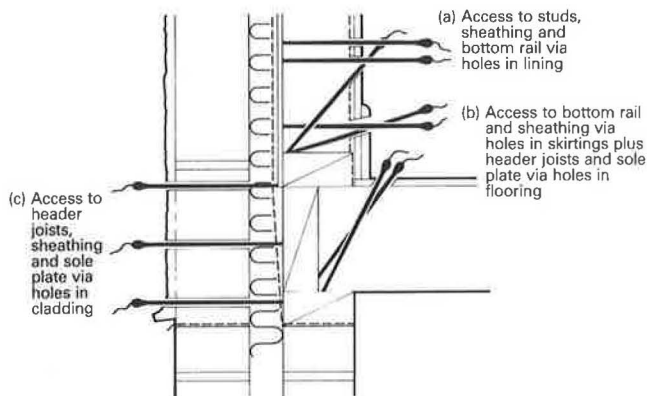


Figure 2 Positions of access holes drilled in lining or cladding, or in flooring and skirting, to obtain measurements from structural timbers and sheathing at ground or first-floor level

INTERPRETATION OF RESULTS AND CONSEQUENT ACTION

Moisture-meter readings will vary owing to seasonal change and local weather conditions. The values given below are for solid softwood.

Where moisture-meter readings are below 20% in December, January and February (ie the wettest and coldest times of the year) or below 18% at other, drier, times of the year, it is unlikely that any decay will occur.

Where moisture contents in timber are more than 20%, there is a risk of decay. In these locations the cause of dampness must be determined and necessary remedial measures implemented. This will inevitably require further survey work which may entail opening up parts of the walls. Widespread readings slightly above 20% may be due to condensation rather than rain penetration and indicate poor ventilation within the dwellings. In this case the ventilation rate within the house or under-building must be increased and moisture contents re-checked after about 1-2 months.

High readings may be due to plumbing or rainwater leaks, condensation, poor ventilation of the under-building or rain penetration. The latter could be caused by faults in the external face of the building or by the cavity fill.

Where it is established that high moisture contents of timber are the result of the presence of cavity fill, remedial measures must be undertaken which prevent rain penetration through the insulant. This could involve improved waterproofing of the cladding by sealing cracks and joints in the cladding, rendering areas of walling, or the removal of all or part of the cavity fill.

REFERENCES

- 1 **National House Building Council.** Timber-framed dwellings. *Practice Note 5*. London, NHBC, 1982.
- 2 **Timber Research and Development Association.** *Structural surveys of timber-framed houses*. High Wycombe, TRADA, 1984.
- 3 **Timber Research and Development Association.** *Moisture content in wood*. High Wycombe, TRADA, 1983.

