Investigation of moisture and its effects on traditional buildings

Principles and competencies

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RICS®

Historic England

PCA Property Care ASSOCIATION

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Contents

Explanatory notes

This document outlines the principles and competencies that surveyors and contractors should adopt to deliver best practice when investigating moisture-related issues in traditional buildings. It goes on to list specific items that surveyors and contractors should have knowledge of and consider at each stage of the diagnostic investigation and repair process.

This document is intended to be a framework that can be used for moisture investigations in buildings of all types and ages. It is important to note that the term 'traditional' refers to buildings with solid walls built from permeable materials such as brick, stone, earth, timber and lime-based mortars, plasters and renders. Traditional construction absorbs moisture but allows it to evaporate when conditions become drier. This is in contrast to modern construction, which relies on impermeable barriers to prevent moisture entering the fabric.

It should be appreciated that there are existing regulations, standards and guidance that will be applicable to traditional buildings. While it is not practical or necessary to list them all in this document, it is assumed that competent surveyors be aware of these documents and will understand when they should be applied in the diagnosis of moisture.

Additional considerations apply where a building is deemed to be a 'heritage asset', either by statutory designation (e.g. being a Listed Building) or by being identified as such by the local planning authority. Although measures to investigate and deal with moisture problems will still be determined primarily by technical issues, the potential impact on a building's heritage values and significance should influence the approach taken.

Consulting the relevant Historic Environment Record (held by the local Planning authority) will help to establish whether the building is a 'heritage asset' (either designated or undesignated), what might be important about it and whether statutory consent will be needed for any proposed works, including invasive investigations.

This document is aimed at those providing consultancy advice or surveys to owners and buyers of a building, and assumes that a non-invasive inspection will be undertaken initially, with an invasive inspection to follow if it is deemed necessary.

It is also assumed that impartiality in the context of this paper means that the surveyor is acting within the limits of their respective organisation's ethical standards and rules of conduct, and therefore any report will be impartial in that it gives a fair and unbiased opinion. For example, it is appreciated that surveyors and contractors may be asked to visit a property and provide a quotation to solve a damp problem, rather than just providing a report with no quotation included. In these cases, impartiality is taken to mean that the contractor will report objectively on the facts of the problem, only suggest remedial works that are proportionate to any defects discovered and respect the nature of the property.

It is also noted that, in the context of this document, the declaration of any conflicts of interest are stipulated in the knowledge that any report with a quotation may involve the surveyor or contractor being remunerated for work. However, what is intended is that any remedy specified by the surveyor or contractor does not contain a product, treatment or process that will benefit the surveyor or their firm financially without declaring this

to the client. Members are expected to follow their own organisation's guidance and regulations on ethics, rules of conduct and conflicts of interest.

The surveyor or contractor should be able to demonstrate knowledge and competence in each of the following items:

1 Understanding the building

1A Context

Figure 1: Parapet wall in poor condition (image © PCA)

1 How to build a holistic picture of the building beyond its appearance and characteristics at the time of inspection, including:

- The approximate original construction date.
- Construction materials and techniques – whether traditional or modern and the consequences of these materials in use.
- Setting – how the building sits in its environment (elevation, ground levels, drainage, wind exposure), the moisture and temperature 'stress' on the building, including reference to UK weather exposure zones, changes in precipitation, whether the building sits in an area prone to flooding and the ground conditions of the site.
- Alterations and additions – how the building has changed since it was first constructed, and document changes to materials used and the likely consequences of these changes in both construction and maintenance (e.g. retrofitting or use of impermeable mortars in repointing and rendering).

- Use – present and any past uses.
- The current condition of the building.

2 The heritage significance of the building – understand the concept of heritage values and significance, and appreciate the differences between various types of heritage asset designation (e.g. Scheduled Monuments, Listed Buildings, conservation areas, etc.).

1B Differences between old and new buildings

Figure 2: Damp penetration (image © Historic Environment Scotland)

1 Be able to clearly identify different building types and how to survey them accordingly.

2 Understand the ability for building materials used in traditional buildings to get wet and dry, and how this relates to the property being surveyed.

3 Recognise that traditional buildings are constructed with different detailing and performance expectations from modern buildings, and that moisture presence in such buildings may not be down to a construction failure.

4 Understand that occupation patterns can influence the moisture within the building.

5 Understand the differences between modern and traditional construction in terms of moisture movement and thermal performance.

2 Understanding moisture

Figure 3: Defective rainwater disposal (image © Historic Environment Scotland)

1. Demonstrate a clear understanding of the relationships between temperature, relative humidity, vapour pressure and the equilibrium moisture content of building materials.
2. Understand the ways building materials interact with moisture in the air.
3. Appreciate the ways that moisture moves in its liquid and gaseous states within porous materials.
4. Understand the difference between porosity and permeability.
5. Understand how water enters and moves in permeable materials.
6. Understand the influence of hygroscopicity on building materials and salts on moisture levels.
7. Understand typical sources of moisture in buildings (external, internal, ground, building services and drains).
8. Understand how heating, ventilation and moisture are interrelated.
9. Understand humidity control and the difference between absolute moisture content of air and relative humidity.
10. Be aware of the effects of human occupation of a building on moisture variables (for example, through washing/showers, drying of wet clothes and cooking).
11. Understand how buildings react to temperature changes and what thermal gradients are.

12 Understand and be familiar with techniques and equipment that may be used to identify the presence of moisture in building materials and in the air. Understand their uses and limitations and be able to determine which methods of moisture measurement are appropriate for the property.

13 Understand the difference between direct and indirect moisture measurement techniques.

14 Understand the difference between invasive and non-invasive techniques, and their implications.

15 Demonstrate knowledge of the techniques and types of devices used to locate and measure moisture in the built environment, including, for example:

- gravimetric moisture analysis
- gas-carbide meters
- proxy materials (e.g. timber and ceramic dowels)
- electrical resistance meters
- capacitance meters
- microwave meters
- thermal imaging devices
- anemometers
- hygrometers
- thermometers (air and surface)
- thermo hygrometers
- atmospheric data loggers.

Figure 4: Elevated moisture in a wall (image © PCA)

16 Understand how to record this information in an unambiguous format that can be understood by the client and can be used in diagnosis.

17 Be aware of long-term monitoring methods and equipment.

18 Be aware that traditional building fabrics may be subject to seasonal fluctuations/ cycles.

19 Understand the movement of moisture in buildings and the factors that influence the rate and susceptibility of building elements to free water, including porosity, permeability, vapour pressure, vapour pressure differential, human activity and how these relate to building materials, construction types and internal environments.

3 Understanding moisture-related building defects

Figure 5: Defective rainwater gutters and downpipes (image © PCA)

1 Understand what causes deterioration of building fabric including, for example, the following:

- porous materials
- freeze and thaw cycles, wetting and drying cycles, soluble salts
- organic growth (including moulds)
- non-porous materials
- corrosion of metals
- timber: insect infestation and decay.

2 Understand the main mechanisms of dampness in buildings, as outlined in this document.

3 Be able to recognise and identify evidence of infestations by the most commonly encountered wood-destroying insects, and take steps to determine whether the infestation is active.

4 Be able to identify the most common forms of wood-decaying fungi that affect buildings, and understand the conditions necessary for growth.

5 Understand how past interventions and consequential changes in the building could influence moisture accumulation in the fabric.

6 Understand why dampness may be manifest in a building:

7 Understand sources of dampness, ventilation, heating and insulation positions/types and the impact these have on moisture levels.

8 Understand the reasons for surface mould and condensation in buildings.

9 Understand the significance of salts in assessing moisture problems, how salts can move through the building fabric and how this might influence a resistance meter. Understand how such salts can damage building materials.

10 Understand the potential effects of some impermeable wall and floor coverings.

11 Consider the influence of existing external ground levels, drainage, cold areas and ventilation.

Figure 6: Dry rot under a suspended timber floor (image © RICS)

4 Condition assessment

1. Be able to conduct a thorough inspection of a building to enable assessment of its condition and identification of possible sources of moisture, including above- and below-ground water supply services.
2. Discuss observations made by, and with, the building occupier or buyer and understand what their concerns might be.
3. Recognise that defects may not be caused by the original design but could be the consequence of alterations.
4. Understand the differences between, and uses of, the standard levels of building survey and how assessment of any defects related to building pathology should be communicated to the client.
5. Consider existing maintenance regimes (or lack of), as well as the introduction of future planned preventative maintenance.

Figure 7: Poor maintenance (image © Historic England)

5 Diagnosis and recommendations

1. Provide a holistic diagnosis that identifies and deals with causes, rather than focusing on symptoms.
2. Understand that dealing with damp is often a staged process. Recognise how to deal with the obvious defects first (including, for example, matters such as ventilation, ground levels and lifestyle). Then, allow a period for monitoring and natural evaporation, and reassess before moving on to other treatments.
3. Be able to identify where further focused investigations may be needed (for example, sampling or opening up). Understand their implications and that permission will be required from the building owner.
4. Understand that where the survey terms require recommendations for remedial works, they must be proportionate to the defect and the significance of the building.
5. Recognise that any recommendations for works should bear in mind any legislative or regulatory issues. Understand that any introduction of permanent new modern materials to a Listed Building is likely to require prior Listed Building consent. Any works proposed to a Listed Building will require justification.
6. Where possible, consider all options for repair that minimise the impact on heritage value and significance.
7. Understand and consider the significance of the building, both as a whole and in the materials and components used in its construction, and the implications of this for any works proposed. Be aware that a detailed heritage impact assessment is required where listed building consent is needed.

Figure 8: Collapsed plaster due to water penetration via lead parapet gutter (image © Historic England)

6 Legal requirements

6A Planning and Building Control

1 Consider when and/or whether Planning and Building Control restrictions will apply.

2 Understand legislation relating to specific types of properties (e.g. Listed Buildings) and areas, and that conflict can exist between building control and planning/Listed Building consent requirements.

3 Understand that not all buildings, or all parts of a building, may have the same level of significance and that they might need to be considered differently depending on the individual facts that apply. Traditionally constructed buildings are not all the same and should not be expected to perform equally. There should be an awareness and consideration of regional variations in vernacular styles and quality of materials used. This is likely to have an impact on decisions made. Listed Buildings have been identified as having greater national significance and will require additional consideration.

6B Other legislation, regulations and standards

1 Understand that legislation, regulations and standards are subject to change. Keep up to date and be aware of revisions, updates and new relevant documents.

2 Knowledge of the following legislation and guidance that may also apply to any recommendations (this list is not exhaustive):

- *Party Wall etc. Act* 1996
- Health and safety legislation and CDM Regulations
- BS 7913: Guide to the conservation of historic buildings

3 Be aware of Historic England, PCA and RICS guidance documents – as well as the many additional useful guidance documents from SPAB, Cadw, Historic Environment Scotland, IHBC, BRE and others – and understand how these can be used in practice but taking into consideration their limitations in the context of the building being considered.

4 Understand when legislation/regulations are mandatory and when they provide guidance, as well as when they do and do not apply.

7 Report

In addition to the content typically included in a professional and impartial survey report (e.g. client, surveyor and property details; limitations and exclusions), the report should include the following information:

1. A summary of the surveyor's observations, including an Assessment of Significance.
2. The importance of regular building maintenance and how a lack of even basic maintenance can lead to problems arising. This is especially important and relevant to roofs, gutters, hidden gutters, rainwater disposal and changes in external ground levels.
3. An impartial diagnosis of the damp problem, which should be clearly explained and laid out systematically to communicate the relevant risks to the reader.
4. Where recommendations for the repair and recovery of moisture-affected structures are stated, the solutions should be clearly explained and prioritised as appropriate.
5. The client should be provided with alternative options for which each should include advantages and disadvantages and the relevant cost and time implications.
6. Where monitoring and staged interventions are appropriate or beneficial, the client should be informed of the reasons for these options, together with the likely cost and time implications of such recovery strategies.
7. Where appropriate, clearly state whether the building concerned represents a financial risk to the buyer/lender and why.
8. Any conflicts of interest should be clearly stated.