

1.0 Property description:

- Property type:

Grade 2 listed building, former hotel and public house, of brick construction with stone detailing. Proposed for conversion to apartments.

- Below ground wall construction:

Solid brick masonry retaining walls. Walls are mostly painted but with some areas of direct applied plaster/render.

- Below ground floor construction:

Stone flagged floor with some thin section concrete toppings in areas.

- Existing waterproofing:

No specific measures in place.

(Present conditions are as identified within the design strategy section).

2.0 Design strategy:

There are a number of considerations here that influence design proposals. In the first instance, you have provided specific and clear instruction in relation to the requirements of the survey and any design proposals. This includes the following:

- A damp survey identifying the root causes of damp
- A report with findings and diagnosis
- An options appraisal considering both traditional and modern methods
- A holistic remediation strategy suitable for a historic building
- Assessment of the provided design for cavity drainage and whether this just addresses symptoms rather than cause.

In respect of methodology of inspection (assessing extent of dampness), where we can for example, see liquid water, this (depending on position), can be indicative of groundwater ingress, but we are also concerned with the extent of any capillary dampness affecting the interior.

Not every basement comes under hydrostatic pressure, leading to water ingress, however in older structures where there would be no external barrier tanking, it is typical that the retained earth holds some degree of moisture as a result of rainfall, and that this wicks through the masonry to evaporate from the internal face of the wall.

That water typically contains salts which are dissolved and held in solution within the water. These salts can originate from the ground, or from within the building materials that water moves through to reach the interior.

Where water wicks through a structure and then evaporates from the internal face, i.e. changing from a liquid into vapour (a gas), the salts come out of solution and can precipitate as a solid crystalline deposit, either on the face of the wall, or where vapour permeable finishes/coatings are present, the salts can form beneath these and cause a spalling effect, where the paint (for example) blows off the face of the wall.

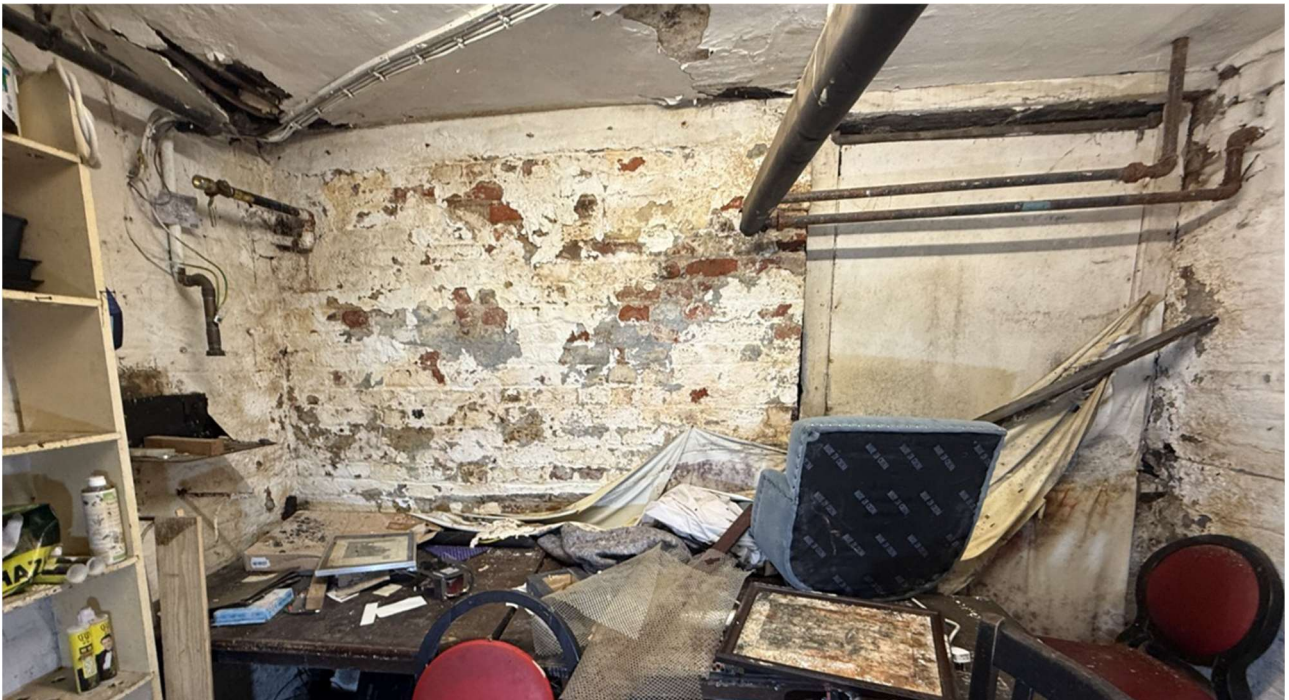
This is visually identifiable and as such, looking for these efflorescent salts is a relatively simple way in which we can assess extent and history of dampness present within substrates.

In such a structure, the pattern of this is generally more prevalent on perimeter ground retaining walls, to internal walls where abutting the retaining walls, and to internal walls at low level where bearing into the earth beneath. There was limited access to substrates here given the stored items within the space, however in any case, observations were as follows:

Condition of retaining wall to right, versus internal dividing wall to left:



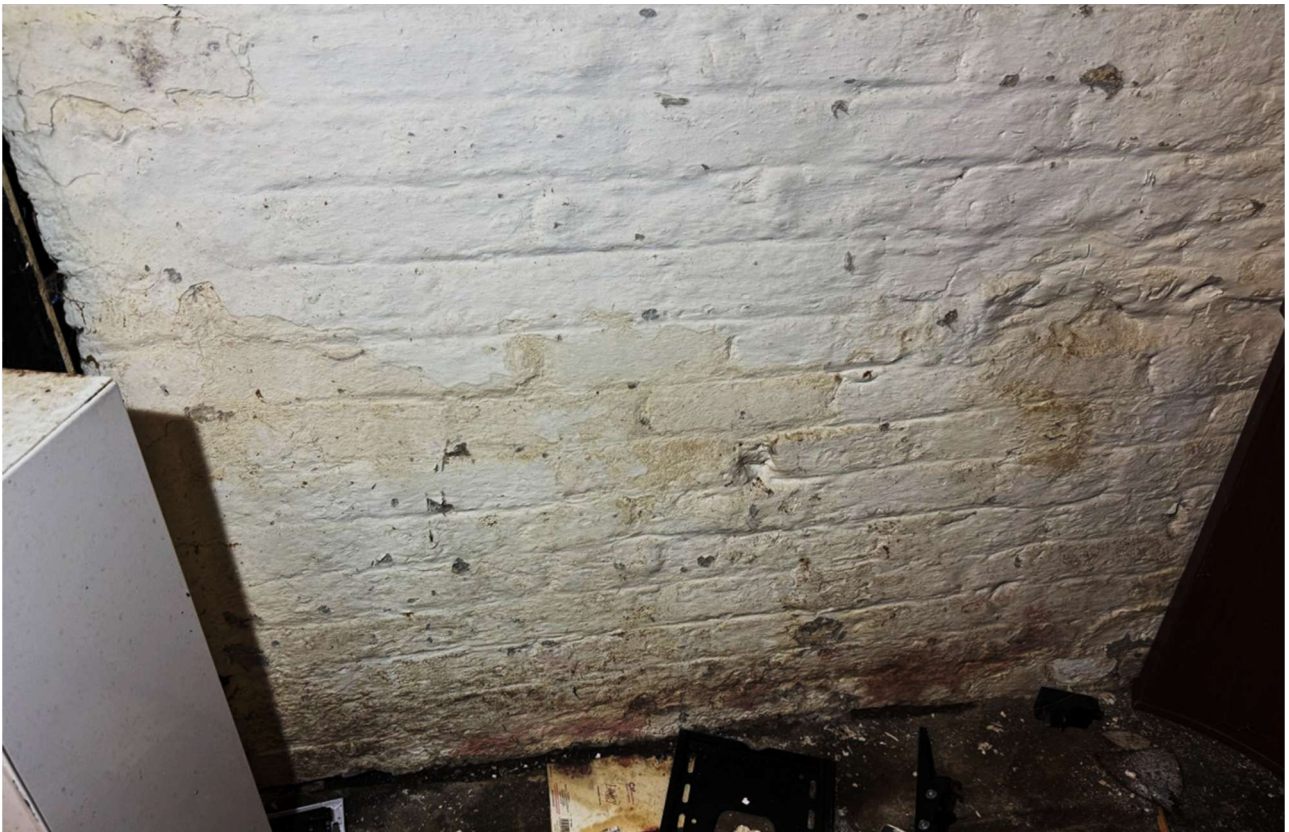
Continuation of the retaining wall condition, to the other wide of the internal pictured above, full height spalling paint:



Visible capillary dampness to joints/cracks in stone flag floor:



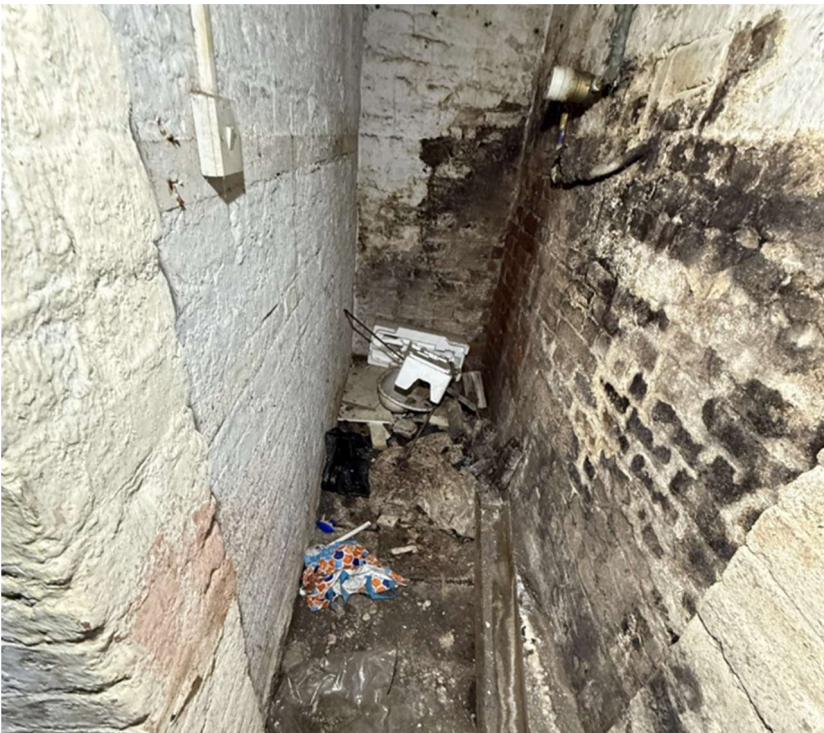
Contrast adjusted to highlight, but this is an internal wall (stairs are on the other side), note the discolouration at lower levels and spalling at the base of the wall, compared to higher level which is comparatively unaffected.



Low level spalling of applied coatings, again an internal wall.



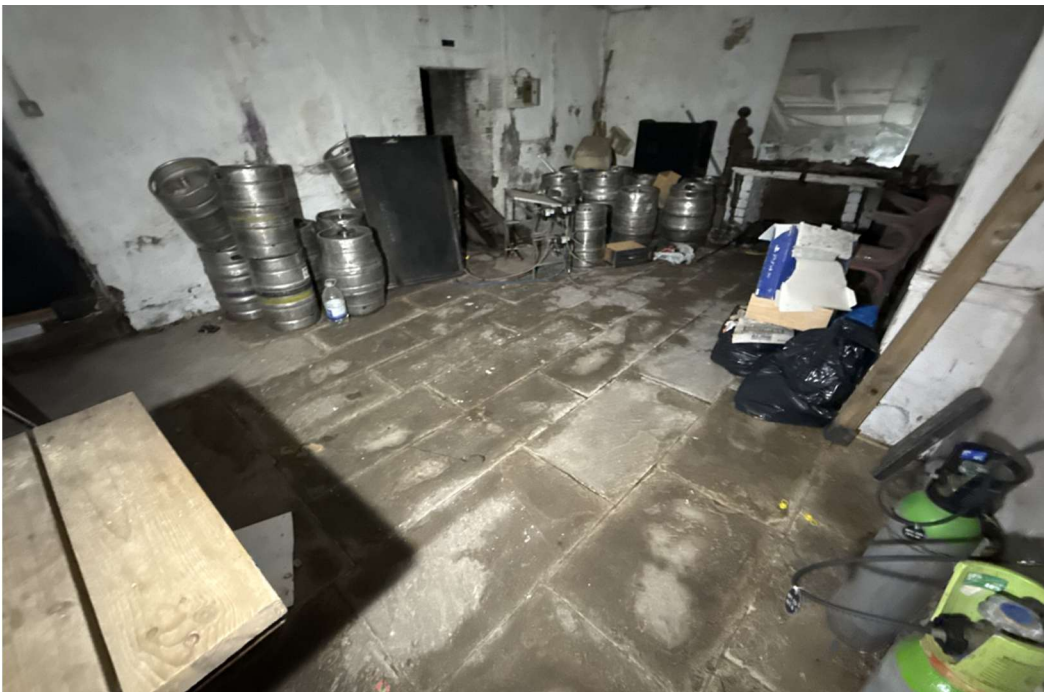
Retaining wall to right, internal wall to left:



The brown powder caught in cobwebs is frass, which is waste from wood boring insects. This was the area where there was ingress from above, and this may have triggered the issue, but it is likely active given the conditions within the space and would benefit from closer inspection subject to works progressing.



This room includes a barrel drop. These inevitably allow for some water ingress through the metal hatches above these, and there was some standing water beneath at the time of inspection.



This water likely causes or contributes to the capillary dampness evident within the flags in this area.

Walls here have received a direct applied coating, which has completely delaminated in areas and then has been painted over, with paint spanning to masonry where this has become exposed.

This is an example of efflorescence causing paint to bubble and spall, which as stated demonstrates evaporation from the face of the substrate.



Similar within the beer cellar to rendered and painted walls:



In summary, conditions are typical within this type of structure.

In respect of diagnosis and identification of root cause, there have been issues of ingress from above, one area being local to the wood worm, which is mid-footprint and associated with roof/leaks above, and then the barrel drop, which includes an unsealed hatch over, which is exposed to rainfall and allows water to enter the basement as a result.

The rain that falls on the access hatch over the barrel drop, is the same rain that falls onto the ground to the rest of the perimeter of the building, and while there are areas of hardstanding externally, it is inevitable that water will access the ground and wet the earth in contact with the porous masonry, and that water will wick through to access the interior as a result.

From a treatment perspective, it's not practical to wholly address the root cause.

Many heritage structures are affected by high external ground levels, and a solution to that can be to lower these levels, but that is more practical where the extent of retained earth is limited, i.e. not circa two metres and to the full perimeter of such a large building.

What we would consider is the guidance provided within British Standard 8102 (2022) which advises a process of design, including guidance in relation to the design of measures for buildings of historic significance.

BS8102 advises a process of design, which in brief includes the following:

1. Assessment of site
2. Assessment of structure
3. What is the space being used for and how dry does it need to be (grade of environment).
4. Design of measures to achieve that.
5. Then various other considerations – consideration of defects, strategy for repair, influence of historic nature/features upon design.

To assess site in an existing building we can (as above) consider the nature of the structure, and if permeable and without effective existing barrier tanking materials (the case here), then the extent of evident moisture affecting the interior, where that moisture is associated with retained earth, provides a mechanism for site assessment.

So we can clearly see areas of efflorescence (proves evaporation of water from substrates) upon retaining walls, resulting from moisture within the retained earth externally.

It should be noted that assessment of site based upon any inspection, is an assessment of conditions at a point in time. While it is probable that conditions will remain fairly consistent, the guidance within BS8102 is that 'even where site examination indicates dry conditions, the risk of waterlogging at some future time should be assumed', and we are advised to assume risk associated with factors like leaks from drains water mains, which can cause hydrostatic pressure to bear, where a below ground structure has otherwise generally just contained capillary dampness.

Here we also do not have perfect information, there is no occupant to advise on any history of periodic ingress, we can just see the conditions s they are at present.

In respect of consideration of structure, beyond the permeability of this, it influences the options in respect of measures to protect, but I will come back to this.

In respect of usage and environmental grades, for occupied habitable space, this would typically require a grade 3 environment.

Cont.

Table 2 — *Waterproofing protection – Grades of performance for below ground spaces*

Grade ^{A)}	Performance definition
1a	Seepage ^{B)} and damp areas ^{C)} from internal and external sources are tolerable, where this does not impact on the proposed use of below ground structure. Internal drainage might be necessary to deal with seepage.
1b	No seepage ^{B)} . Damp areas ^{C)} from internal and external sources are tolerable.
2	No seepage ^{B)} is acceptable. Damp areas ^{C)} as a result of internal air moisture/condensation are tolerable; measures might be required to manage water vapour/condensation ^{D)} .
3	No water ingress or damp areas ^{C)} is acceptable. Ventilation, dehumidification or air conditioning necessary; appropriate to the intended use ^{D), E)} .
^{A)} The agreed grade should meet with the client's expectations for the intended use of the below ground space. Reducing the grade could increase the risk of not meeting the expectations of the client for the intended use of the below ground space.	

As above, grade 3 is where no water penetration from an external source is acceptable, and heating/ventilation/dehumidification must be provided and operated, sufficient to manage vapour and prevent issues of high relative humidity or condensation.

In a modern structure, achieving grade 3 would lead to the installation of comprehensive measures, which cover and isolate all parts of the structure which ultimately connect to the ground, i.e. wall masonry walls including internals, and the full floor footprint.

This then entirely conceals the historic fabric.

As stated, there is now guidance in the British Standard in relation to historic buildings:

5.2.3 Buildings of historic significance or protected by legislation

A pragmatic approach should be taken when dealing with buildings of historical or architectural significance. Efforts should be made to limit or prevent actions that could reduce the value of such buildings for future generations.

Maintaining exposed features can have implications on the environmental grade that can be achieved (see Table 2), and the implications of this upon the proposed usage should be discussed with the client [see 6.2.4, 1)].

This provides the opportunity to design more sensitive measures where for example we would maintain exposed historic features. As above, this can impact on the environmental grade that can be achieved, and the potential implications of this 'should be discussed with the client'.

In practice, it comes down to a risk assessment and good design. What do we mean by this?

For us, we look at what the implications of moisture are upon the space and end users, and from a design perspective, we typically seek to design measures where it provides a level of protection, and critically future flexibility, so that if for example, the groundwater regime does change, there are options to improve the protection without causing significant loss (cost and disruption).

For context, at the time of writing we are appointed to design for three major civic schemes, grade 2* to grade 1, where the spend on each individual scheme is in seven figures, and this is the approach to design that we are working through with the design teams and clients.

In those cases we have a direct connection to the end user. The added consideration here is that the end user is either a tenant, or whoever the building is sold to, and so there is perhaps greater difficulty in the discussion around the implications of exposed areas of potentially damp substrates.

We would list these implications below:

- Evaporation from the face of the walls, i.e. the introduction of water vapour into the internal living space. This may result in an increased volume of vapour within a property.
- Vapour is always present within the air around us, and occupation will always introduce vapour via cooking, washing, cleaning and breathing.
- Elevated vapour levels can encourage condensation and facilitate the germination of mould. It requires approximately 70% relative humidity, at which point, mould spores which are ubiquitous and in the air all around us, can absorb enough moisture from the air, to germinate, with the other requirement being a food source, i.e. organic materials such as textiles and paper. At this level of humidity, this is when you can start to see black spot mould forming on free standing objects, not necessarily in direct contact with damp substrates.
- Environmental controls (heating and ventilation) are necessary in any occupied property to deal with vapour resulting from general occupation, in order to prevent issues of condensation and mould. Therefore, if elevated levels are anticipated because of exposed wall areas, there may be greater requirement for the controls, in order to prevent issue.
- Evaporation from the face of the walls will result in a degree of salts forming (efflorescence), this can affect aesthetically and may then require physical removal.
- Walls containing capillary moisture may be visibly darkened.
- Stored items including furniture placed against walls containing moisture, may result in moisture bridging to stored items, or resulting in localised conditions conducive to germination and growth of mould.
- Where groundwater has accessed walls in the long term this can result in soluble salts present within the ground (typically nitrates and chlorides), moving into the structure when these are dissolved within the groundwater which then accesses the structure. When that water evaporates, meaning a change from its liquid, into its gaseous state, the dissolved salts cannot change into a gas, and are deposited in the wall. These salts are hygroscopic, meaning that they are capable of absorbing moisture from the air. Hygroscopic salt contamination can result in visible dampness where there is no other issue (penetrating dampness for example). May be less of an issue on exposed brickwork versus similar contamination in a plaster finish for example, but noted as a risk irrespective.
- Enhanced risk when properties are vacant and likely unheated, principally in respect of mould germination and growth.

Where properties are tenanted, there is a consideration in relation to Awaab's law. Awaab's Law has increased the focus on damp and mould responsibilities across the wider housing sector, including expectations placed on private landlords under existing housing and health and safety legislation.

Private landlords have a legal duty to ensure their properties are free from serious hazards that could affect tenants' health, including persistent damp and mould. Failure to investigate and resolve mould issues within a reasonable timeframe may result in enforcement action by the local authority under the Housing Act 2004, including improvement notices, civil penalties, prosecution, rent repayment orders, or restrictions on letting the property.

Persistent inaction can also expose landlords to compensation claims where tenants suffer illness, property damage, or loss of amenity as a result of prolonged exposure to mould or damp conditions.

So there is a conflict between preservation of features in a below ground structure, and the use of that space for occupation, where that space is tenanted.

From a features perspective, there is not a great deal within the space, in that walls are generally plain brickwork, however I noted the following:

Brick arch with timber lintel (proposed B06 – dressing room):



Brick/stone alcoves (B03 – kitchen):



Stone flagged floor - :



The alcoves are designed for removal to allow formation of a kitchen.

The brick arch, we can potentially work around that and leave the timber and the arched header course directly above, to maintain the feature.

With regard to the flagged floor, a dry floor is required in a habitable space, stored items, fitted kitchens and more will be placed upon the floor. If capillary dampness is present, that will detrimentally affect whatever is placed over, and therefore we would propose that the floor be protected.

It can be possible to lift a flagged floor and reinstate this above protection, but if proposing to fit typical floor finishes – carpets/tiles/lino etc., it's not a substantial gain for a significant outlay in respect of lifting and relaying, and my advice would be to replace the flags with a new floor construction.

In respect of the method of protection, there is a consideration in respect of the use of traditional versus modern materials.

Traditional materials. implies porous lime plasters or renders, which readily allow water to wick through and evaporate from the internal face.

The implications of this in a below ground structure may be similar to leaving wall areas exposed, in respect of the vapour that would be introduced internally.

There is some risk of curing issues where walls are significantly wet.

There is scope for precipitation of efflorescent salts to continue in association with evaporation from the face of the wall. Where these form within the depth of a material, formation of the salt crystals can have a damaging affect on the plaster, i.e. spalling.

Where water contains hygroscopic salts, typically nitrates and chlorides, these salts are capable of absorbing moisture from the air, and so can give a consistently damp appearance, particularly during humid conditions.

In summary I would state that the specification of such materials, are unlikely to be successful, where applied in below ground structures. In historic structures, limewash would be more typical in a cellar space, being somewhat more sacrificial versus the wall build-ups that would be employed above ground.

I would be open to discussion in respect of exposed areas of feature wall and limewashing, but ideally internal walls and at higher levels.

Generally within listed buildings where there is requirement to achieve a dry environment within a below ground structure, we employ Type C Drained Protection, commonly referred to as 'cavity drainage'. This is not 'tanking' in that it does not provide a physical barrier to block water out, it is a method of collecting and removing any penetrating water, whilst isolating any internal fit out from the structure.

This is sympathetic within a historic structure, in that it is 'reversible', and can be removed in the future should that be required.

The limitation on this is really the existing floor construction. As stated, flags are perhaps not the ideal finish, and while I appreciate that this is not a conservation concern, we would also have issue with it from the perspective of installing cavity drainage.

With this system, the structure should provide a degree of resistance to the penetration of water, and while that is achievable with masonry in isolation, a flagged floor in the condition of what we have here is not suitable and we would recommend replacement.

What follows is the detail of the proposed system to facilitate conversion to habitable space.