Harper Building Diagnostics
recreating healthy environments

Report

The Old Rectory

Client:	Mr & Mrs Dixon Berry Farm, Clyst St Lawrence, EX15
Representative:	Mike Jasper
Project Address:	The Old Rectory, Clyst St Lawrence
Service:	Timber & Render Condition Assessment
Client Reference:	
Our Reference:	212238/The Old Rectory/Report
Site Visited:	20th, 21st & 22nd June 2022

office
The Old Shippen, Upton,
Clyst St Lawrence,
Cullompton Devon. EX15 2NP

contact
Exeter: 01392 555 432
London: 020 7060 6593
info@harperbd.co.uk

website
www.harperbd.co.uk

26th July 2022

Thank you for inviting me (Harper Building Diagnostic) to revisit The Old Rectory and undertake a Timber Condition Assessment.

1. Background

I initially visited The Old Rectory on 11th April 2022, where I was met by Mike Jasper and Rob Lillicrap, where we discussed concerns regarding the cracking of external render and internal plasterwork, and the deflection affecting several suspended timber floors; I was subsequently commissioned to return and further investigate the defects.

I returned with a thermal imaging camera around midnight 20th June in order to attempt to confirm the construction-type and condition of external walls, before returning for the following two days to further investigate the causes of the significant deflection that is affecting suspended floors and timber condition in general, and to evaluate the defective plasterwork and external render.

You will find a brief guide to timber decay and the tests undertaken in the appendix at the end of this report (see 6. Appendix).

I was ably assisted by Gareth Parks during my visit, who undertook sympathetic exposure works as requested. Thank you Gareth.

2. Summary

The following is a brief summary of my findings.

2.1 Thermal imaging revealed that the external walls to the Georgian range were constructed utilising a lightweight timber frame, and although the exact configuration and infill have not been established, considering previous experience of this vernacular construction method, it is thought likely to have a brick infill, with a lath and plaster internal finish to the walls.

2.2 The external render is severely defective, with large sections having detached from the walls. These cracks are shown to be facilitating water ingress, which presents a significant risk to the underlaying timber-frame, with decay thought likely, and subsequent movement in the timber frame could have caused the cracking of the render and internal plasterwork that we see today.

2.3 Considering the above, it is thought likely that further defects will present once the external rendering has been removed to reveal the underlaying timber frame.

2.4 Timber decay is affecting some ground floor joists, with high humidity readings recorded within the subfloor voids, potentially attributed to issues with ground water and/or surface water.

3. Observations

The following is a record of my observations.

3.1 External Observations

Although my primary concerns was to assess the condition of timbers, sound render is fundamental to the preservation of timber components, therefore I also assessed the condition of external render.

3.1.1 Render

The external render is severely defective, with extensive cracking evident to all elevations, and with large sections of render presenting a safety concern as it detaches further from the walls.
I undertook a condition assessment of the render utilising the hammer tapping method, which simply qualifies condition by sound, with areas of defective/delaminating render producing a hollow sound and well-bonded render sounding dull.

Figures 1-4 illustrate the extent of defective render, and although more quantitative testing methods could be employed (sonic hammer testing etc), even to the casual observer it is clear that the render is severely defective.

Although there can be a number of reasons for render to fail and it is not unusual to see more than one cause of failure when dealing with more than one elevation of a building; considering that we now know the underlaying structure is timber frame and infill, it is highly likely that the render has failed due to differential movement. This defect manifests as the underlying substrate moves/expands and contracts at vastly different rates to the render, with the bond failing under these circumstances.

As a consequence of the above, the building will suffer from rainwater ingress due to complete failure of the external render, further exacerbated during colder months as water gets in behind render and freezes at the wall interface, with the resultant hydraulic action blowing the bond between the render and the substrate.

Unfortunately I do not believe that the render can be conserved, and will require replacement in its entirety. Although I fully support the principle of like-for-like repairs, I would recommend consideration is given to opportunities to improve thermal performance, with the potential to use breathable insulated lime-render for replacement, while also considering sensitive thermal improvements around windows and doors.

Although the configuration and condition of walls is discussed in 3.2, needless to say, replacing the render with the appropriate lime-based material will help conserve the underlaying fabric.

Cracks thought to be significant are identified in red, typically these fractures are 2-7mm wide, with areas of previous repairs highlighted green (these repairs often featuring hard cement-based mortars)

Figure 1: Easterly Elevation

Figure 2: Southerly Elevation

Figure 3A: Westerly Elevation

Figure 3B: Westerly Elevation

Figure 4: Northerly Elevation

3.1.2 Thermal Survey

I noted considerable variations in the thickness of external walls, both at, and between, ground floor and first floor levels, and was suspicious that the construction method was not all that it seemed; I used a Flir E8 thermal imaging camera in the hope it could provide an insight into what lay beneath the rendered covering, and was able to confirm that the Georgian range had been built utilising a lightweight trussed-timber frame method rather than being of solid wall construction (see Fig.5&6).
The discovery of the timber frame and associated risks from moisture, makes dealing with the defective render a more urgent matter.

I also assessed moisture-related issues and heat loss from the fabric, and although there are realistic expectations regarding the thermal efficiency of The Old Rectory, I thought it sensible to identify any potential areas that could be sympathetically improved during the proposed essential works at the property.

Accepting that the timing of my visit was suboptimal in terms of temperature differential between outside and indoor temperatures (a 10C difference is

preferable to assess heat loss), I requested that the central heating was left on during the day in order to better assess thermal performance and condition. As could be expected for such a period property, significant heat loss was identified around fenestration (see Fig.7-9). Furthermore, thermal anomalies associated with moisture ingress were noted behind many sections of render, particularly evident around the extensive cracking that features on all elevations (see Fig.9).

Figure 5

Figure 6

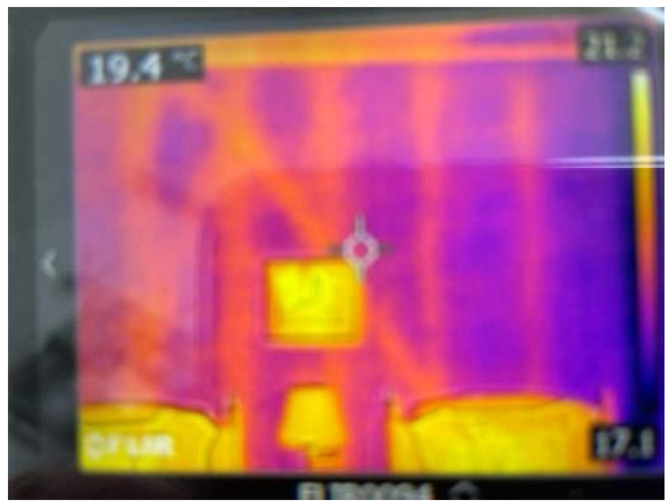


Figure 7

Figure 8

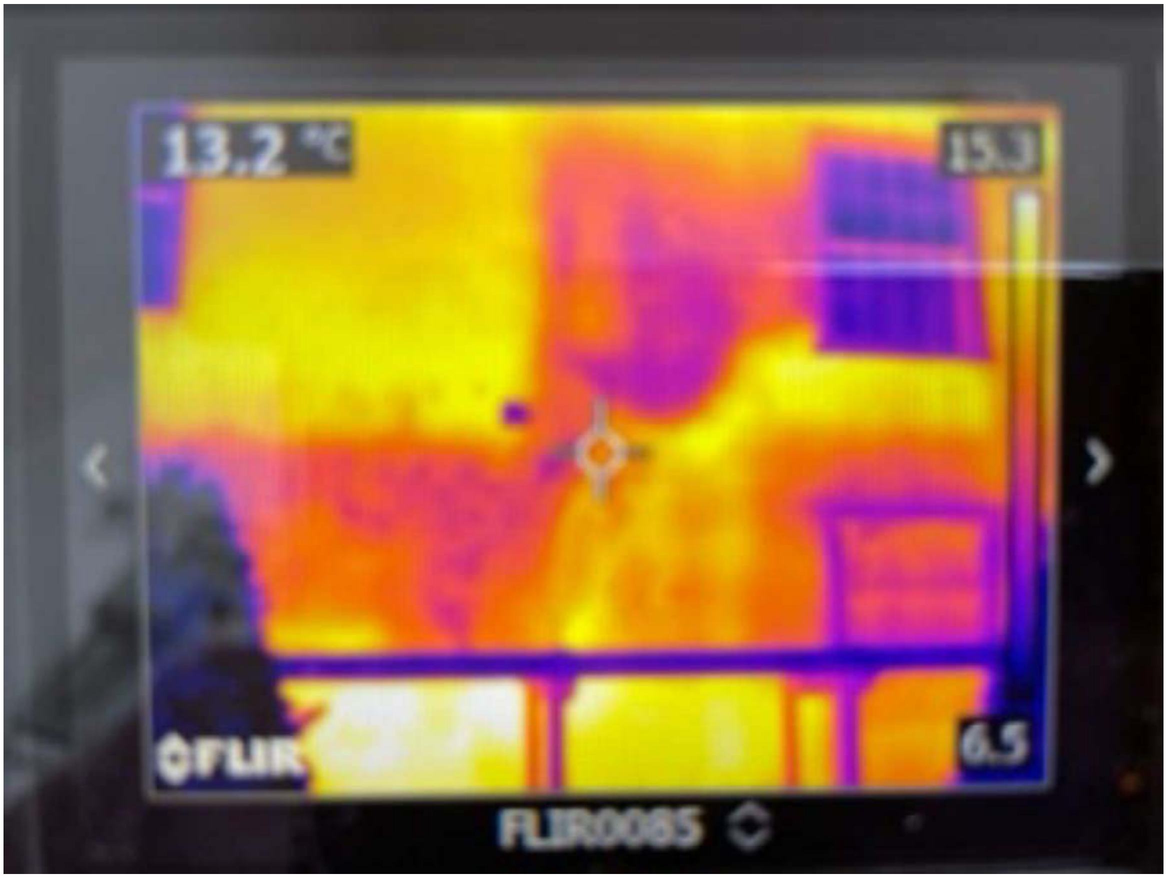
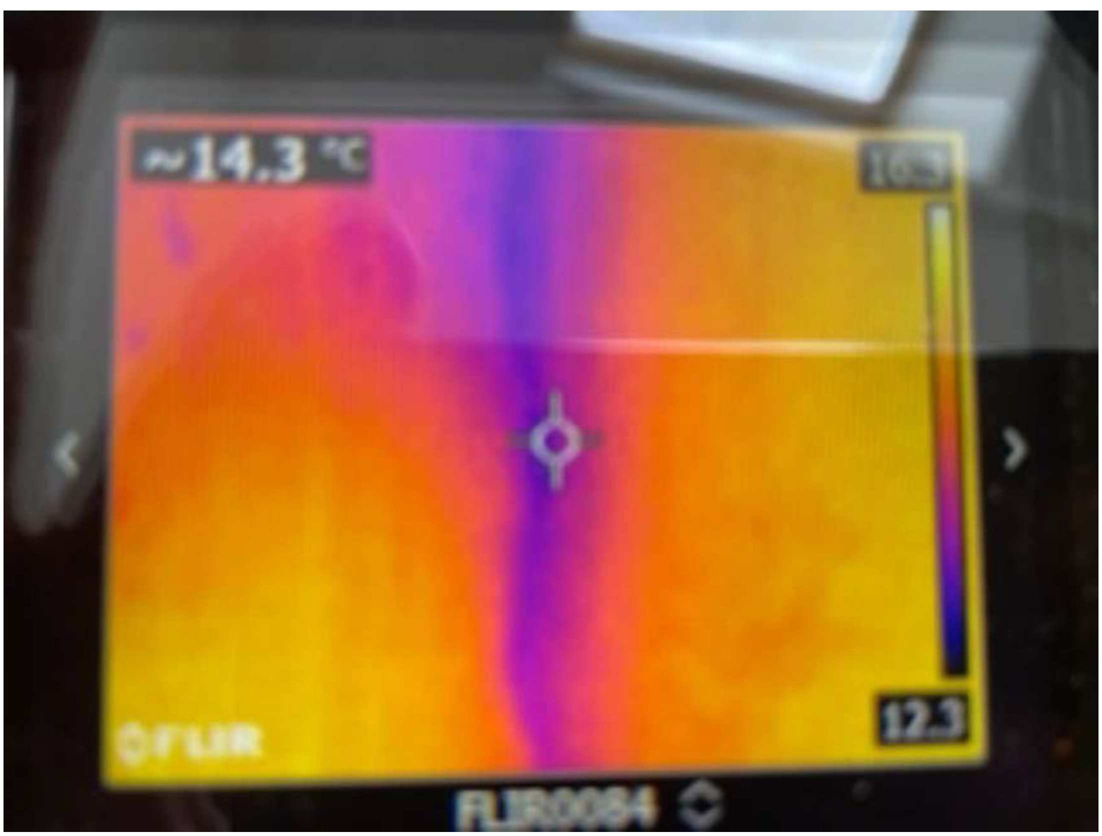


Figure 9

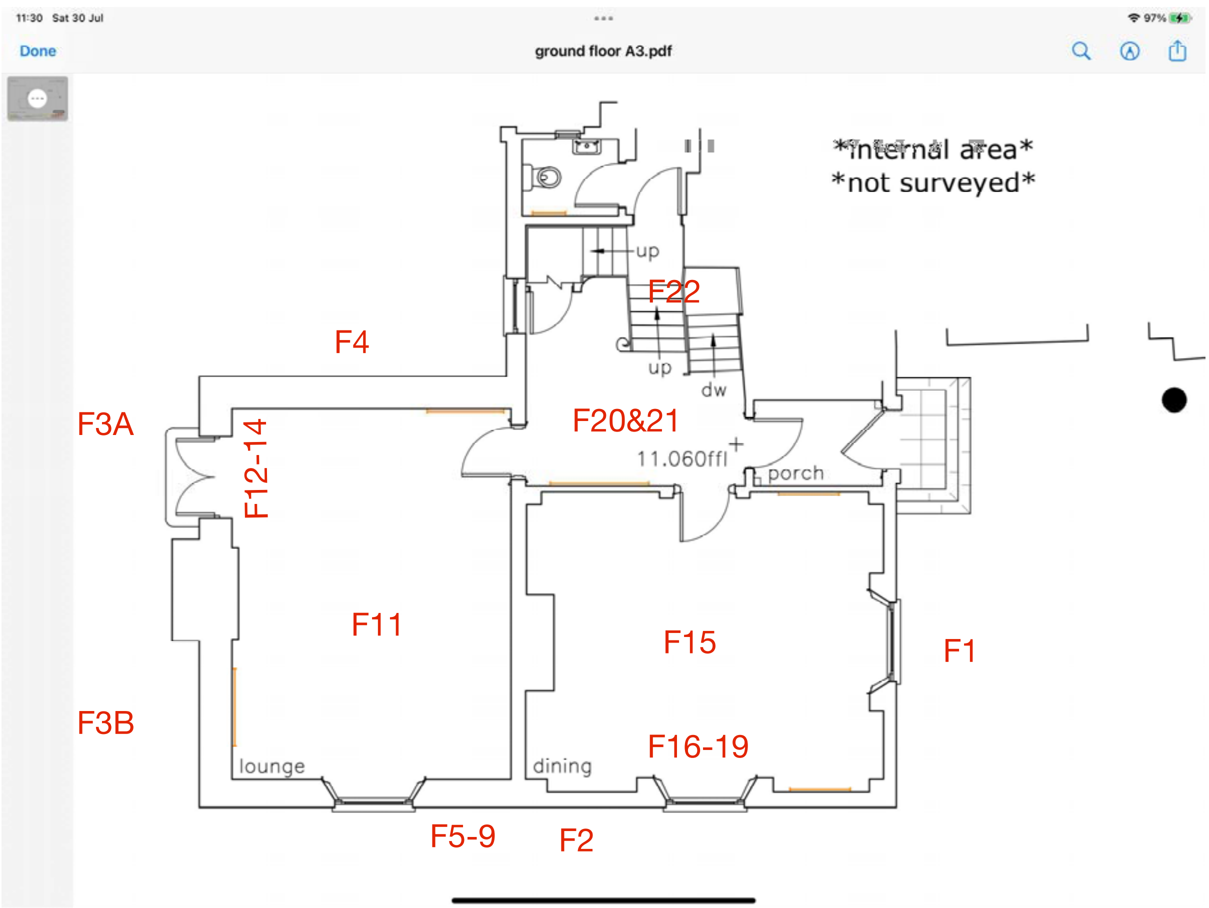


3.2 Internal Observations

My work primarily involved investigating the condition of timber flooring components and assessing other damp-related issues.

I commenced my assessment in the ground floor rooms, with Figure 10 providing an annotated plan of the layout, with references to photographs .

Figure10: Ground Floor Plan



3.2.1 Lounge

The Lounge was fully furnished (see Fig.11). We focussed our attention on the area of the floor that was most deflecting, with the carpet rolled back along the westerly elevation.

Wood decaying fungal mycelium (Coniophora puteana) was noted on the underside of the underlay (see Fig.12).

FIGURE 11: LOUNGE

FIGURE 12

SHOWING FUNGAL MATERIAL ON UNDERLAY AND FLOORBOARDS.

Softwood timber floorboards were suffering fungal damage, with oak joists showing both fungal and beetle damage, being worst affected close to the bearing-ends. I used a Tramex moisture meter and recorded high moisture levels (above 20%) throughout the exposed area (see Fig.13), reaching moisture fibre saturation in locations close to the westerly wall; providing the optimal conditions required for fungal initiation.

In common with all other areas assessed, I used a hygrometer to measure humidity within the subfloor void. Figure 14 shows readings of 89.8%rh (relative humidity), with the moisture content of joists reflecting the high humidity levels within the sub-floor void. As a consequence of lifting floorboards and creating improved air circulation, I would expect the real sub-floor humidity levels to have been significantly higher. Of note, 90%rh is equivalent to 20%WMC, the *at risk* threshold that supports fungal development.

I found the 4 joists directly in front of the French doors to be decayed and requiring repair, however as further opening-up works commence, it is likely that more joists will be found to be defective.

It is thought likely that the rainwater discharged by the two downpipes directly outside the westerly elevation will contribute significantly to the subfloor humidity.

FIGURE 13

SHOWING HIGH MOISTURE READINGS.

FIGURE 14

HYGROMETER SHOWING SUB-FLOOR HUMIDITY

Additional to repairing the defective floor joists, and in order to provide a long term solution to the dampness that has facilitated the decay, I recommend the causes of subfloor dampness are further investigated. This investigation could include an assessment into the condition of nearby drainage and consideration how ground levels and surface water can be better managed around this area in particular, and the property in general.

The existing configuration of the joist bearing-ends means that they will always absorb moisture, accelerating deterioration, therefore I recommended that the joists-ends are isolated from masonry, and consideration is given to providing support from a sleeper wall.

3.2.2 Dining Room

Figure 15 shows the Dining Room.

Figure 15: Dining Room

A section of the perimeter floorboard was lifted in front of the Southerly elevation. Again the joist-ends bear onto masonry, which has lead to the timbers absorbing moisture and facilitating decay. Deathwatch beetle damage (DWB) was noted to the sapwood portion of several joists, with some of the tunnelling presenting as recent activity (see Fig.16-19).

Three joist-ends in front of the southerly window were identified as requiring repair, however considering the recent/ongoing DWB activity mentioned, there is a risk that other timbers have also been affected. It is advised that further floorboards are lifted to provide a better understanding into the extent of decay-related issues.

Figure 16

Figure 17

DWB Damaged floor joist

Note light coloured flight holes, indicative of recent DWB activity

Figure 18

Figure 19

Recording high moisture content.

3.2.3 Hall

A floorboard was lifted within the hall. Immediately noticeable was the greater depth to the sub-floor void, with humidity levels and associated wood moisture content recording lower in this area (see Fig.20&21).

I did not note any significant timber decay in this area.

Figure 20: Hall

Figure 21: Showing low moisture content

3.2.4 Under-stair Cupboard

Recent DWB activity was noted in the under-stair cupboard, with the oak wall plate severely defective and requiring replacement to prevent consequential movement of the bearing joists and stairs (see Fig.22).

This space is likely to suffer poor air circulation, therefore it is advised the timbers are periodically monitored and that I am contacted should concerns arise.

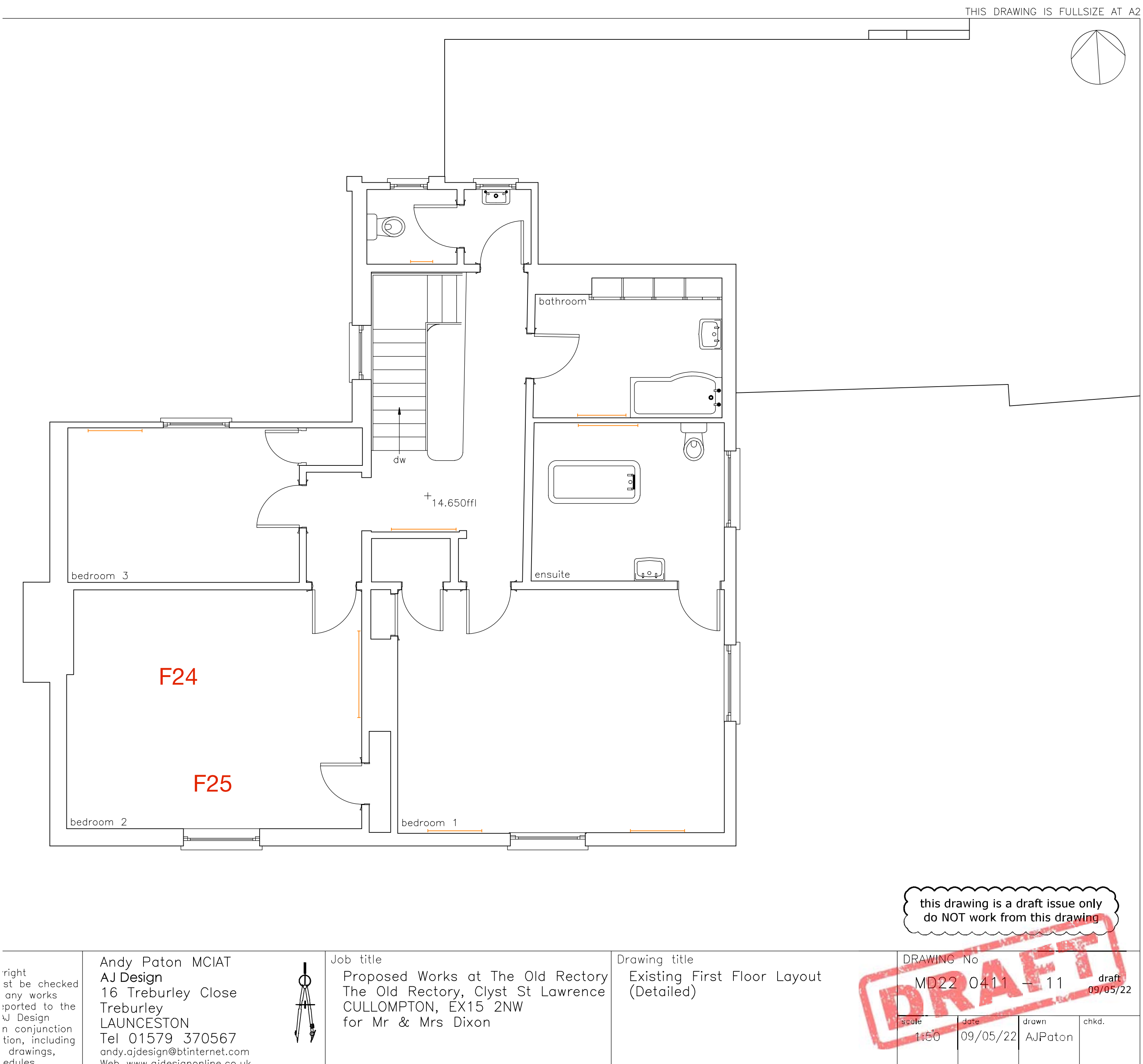
Figure 22

3.2.5 The Gold Room (first floor bedroom)

Although we did not extensively investigate the sub-floor timbers, I did not observe any significant timber-related defects on the first floor area. However, there was some cracking of plasterwork, which is likely associated with the aforementioned movement in the timber-framed walls.

Figure 23 shows the First Floor plan.

Figure 23: First Floor Plan



A section of floorboard was lifted from in front of the southerly window. Although water staining was noted towards the bearing-ends of several joists, moisture levels were low and no decay was observed in this albeit limited inspection (see Fig.24&25).

Figure 24

Figure 25

Recording low moisture content (9.6%WMC)

3.2.6 Plaster
cracking to wall and ceiling plaster was common in all rooms within the Georgian range of The Old Rectory, thought highly likely to be a consequence of movement and deterioration of the timber-framed construction (see Fig.26-29).

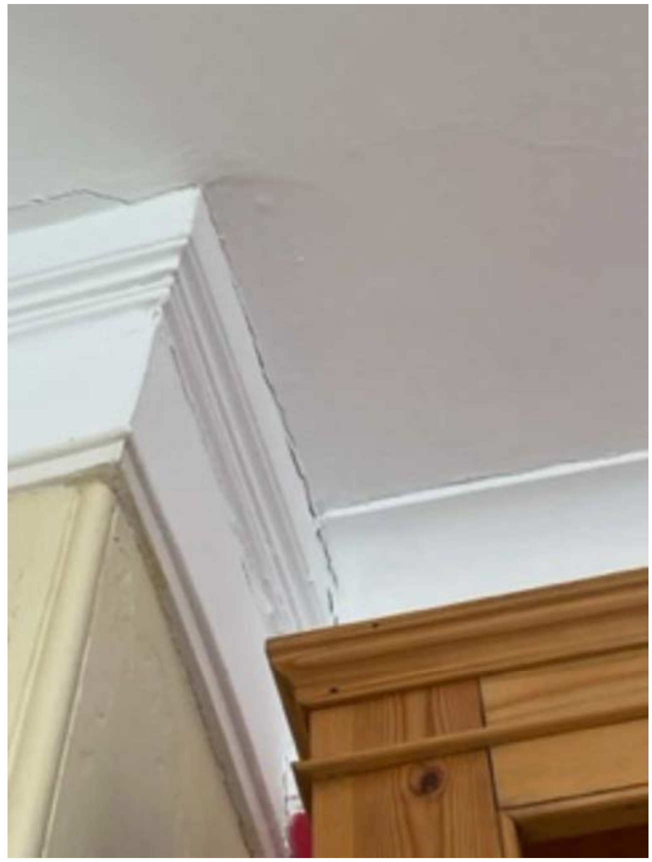
As there is potential for further cracking to manifest during the remedial works, it is recommended that any repair of plaster is undertaken after the timber-framed elevations have been assessed and repaired as appropriate, and after the external rendering has been completed.

Figure 26

Figure 27

Figure 28

Figure 29

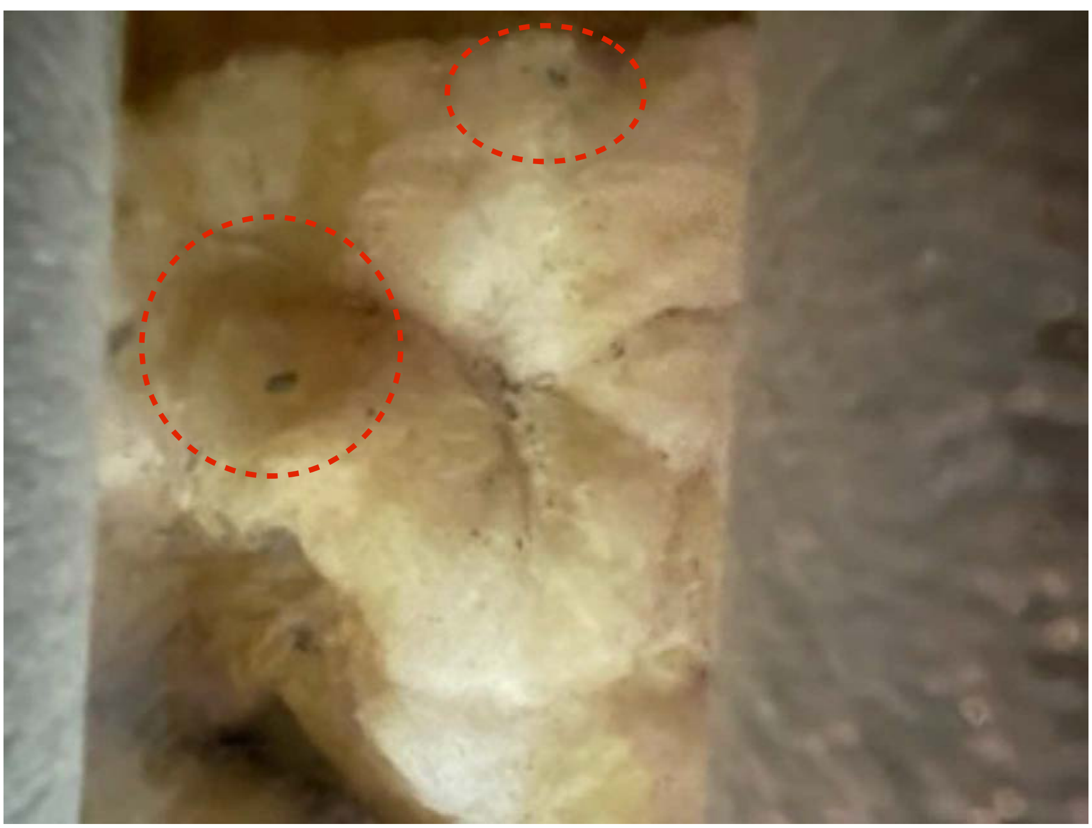


3.3 Roof Space

Although I attempted to inspect the roof spaces, access was very limited. That said, of those timbers closely inspected, I did not encounter significant defects. However, I did note several adult DWB scattered around and small areas of DWB damage (see Fig.30&31). Considering the low numbers of DWB and associated damage appears contained within the sapwood, and that the property is adequately heated and ventilated, I do not believe this to be significant. It is advised that the roof space is periodically inspected and I am contacted should you have any concern that the beetle population is growing.

Figure 30

Figure 31



4. Conclusion and Recommendations

Although I found The Old Rectory to be a very well maintained property, significant defects were found to be affecting the Georgian range.

Having established that walls were built using a trussed timber-framed method of construction, and that external render and internal plasterwork are severely defective, it is recommended that further investigations are undertaken to establish the condition of the timber frame and its infill.

Decayed flooring timbers were identified in the Lounge and Dining Room respectively, which will require repair and further investigation as remedial works commence.

Please do contact me to discuss any detail within this report or for any further assistance with this project.

Kind regards,

Lee Harper MSc Timber Building Conservation, CSRT
Consultant

6. Appendix

6.1 Timber Decay Guidance Note

As timber is a hygroscopic material (absorbs water and humidity from the atmosphere), its moisture content is dynamic, with moisture levels rising and receding in response to local environmental conditions. Therefore timber deterioration can be controlled by correcting any building defects that have facilitated water ingress and high humidly, and then maintaining low levels of humidity, therefore creating dry environmental conditions.

Although timbers with a wood moisture content above 20% are at risk from fungal infection, it is not inevitable that timbers will become infected by wood-rotting fungus at these moisture levels. Fungal initiation requires 27%WMC (approx. fibre saturation point, species dependent), and other environmental factors (including temperature and air movement), to align to facilitate the fungal infection. However, wood boring beetles are able to develop in timbers with much lower moisture levels, needing moisture levels to be maintained below 10-12% for eradication of the beetle populations (species dependent). Therefore, although the remedial strategy should be focussed on the environmental control of fungal infections and beetle infestations, maintaining dry timbers (timbers having a moisture content below 20%) can remain a challenging proposition, especially for those sections of timber components located in potentially humid environments (inc sub-floor voids, roof spaces) and those sections of timber embedded in, or close to, masonry walls.

6.2 Background - Timber Preservative Treatments

Although fungicidal and insecticidal preservatives have been used for the past century, these 'treatments' have very limited efficacy in scenarios where timber components can be expected to retain high moisture content.

To reiterate, the only way timber decay and deterioration can be controlled, is by controlling its moisture content. Therefore, although preservative treatments could be used as a temporary measure to help resist the fungal development or reinfection, and in an attempt to manage deep-seated beetle populations, maintaining drying timbers is the only long term solution.

Applying a targeted preservative application may be justifiable where timber components are in high risk locations eg where a sound timber is located against a wall that has been recently affected by a significant fungal outbreak, or when a timber bearing-end is embedded in presently damp masonry, as a holding measure while the masonry dries-out. In general, each repair scenario requires careful consideration, more so in a building conservation context.

6.3 Testing

The following tests were undertaken;

6.3.1 Moisture Profiling

Resistance meters were used to evaluate the moisture content of timbers in order to understand the level of risk from biological deterioration.

6.3.2 Microdrill investigation

A microdrill resistance device was used to evaluate the subsurface condition of suspect timber components.
The device pushes a 2mm (approx.), needle into the subject timber, measuring resistance across the section. Low resistance is indicative of decay and the exact location of any defects was recorded for reference.
The minimum number of tests are undertaken to realise the most information.

6.3.3 Thermal Imaging
A Flir E8 thermal imaging camera was used to inspect the building construction methodology, evaluate thermal performance and moisture defects.

6.3.4 Tap Test (render condition assessment)
Render was tapped with the rubber handle of a hammer, with defective areas sounding hollow and annotated of photographs of the relevant elevation.

Head Office: The Old Shippen, Upton, Clyst St Lawrence, Cullompton Devon. EX15 2NP .
Harper Building Diagnostics is a trading name of Harper and Barrett Ltd.
Registered in England and Wales No:05575049 .
Registered office:16 Bond St, Wakefield, W.Yorks. WF1 2QP .
VAT Reg. No: 9098074 96

office
The Old Shippen, Upton,
Clyst St Lawrence,
Cullompton Devon. EX15 2NP

contact
Exeter: 01392 555 432
London: 020 7060 6593
info@harperbd.co.uk

website
www.harperbd.co.uk