ADAM POWER ASSOCIATES (RICKINGHALL)
Consulting Civil/Structural Engineers

The Old Chapel
The Street
Rickinghall
Suffolk
IP22 1BN

Tel 01953 668664
albanie@adampower.co.uk

Sarah Dawkins
205 The Street,
Thornham Magna
IP23 8HB

R/21/077
25th May 2021

Dear Sarah,

205 The Street, Thornham Magna. Engineer's Report

1.0 Introduction.

Further to your recent instructions and my site inspection on 23rd April I am pleased to report as follows on the above property, with particular reference to the structural condition of the lean-to wing on the East elevation of the main dwelling. This report should be read in conjunction with Adam Power Associates drawing "R/21/077 D1".

The property comprises a large two-storey detached, historic (1795 date marking present on one of the internal walls) dwelling of predominantly rendered timber frame and masonry construction, capped by large, clay pan-tiled duo-pitched timber roofs. A single storey timber-framed lean-to projects from the East of the main dwelling near the South gable end. Additional wings project eastwards near the North end of the building, these did not form part of our survey. Set on relatively level ground the building faces gardens and outbuildings to the East, the South overlooks the grounds of the neighbouring property. The West elevation faces the main access road 'The Street', offset by a small garden. The North elevation fronts onto gardens and a dirt track driveway, which serves as access to the property from the road to the West. There are a number of trees within the grounds of the property, there are no significant trees near the East lean-to wing that formed the focus of the survey.

Concern has been raised with respect to the condition of the East lean-to ground floor wall which has rotated outwards, away from the internal structure, and the stability of the first floor study area above.

2.0 Survey Data.

A visual survey was undertaken around the southern end of the main building and lean-to, internally and externally at ground and first floor level. The lean-to ground floor comprises a small living room area adjoining the main living room to the West. At first floor level it comprises a small study area, with a sloped ceiling and duo-pitched dormer opening in the roof elevation. Access to the study is via a staircase on the South gable, which also serves the corridor to adjoining bedrooms in the main dwelling. Externally the lean-to faces onto a paved patio area.

The original lean-to timber roof over this portion of the property comprises a traditional arrangement of timber rafters supported off two rows of purlins, supporting a clay pan-tile finish. The purlins take intermediate support from principal rafters cut into the roof, forming the dormer opening. The first floor structure forming the study comprises 5" x 3" timber joists, spanning between the internal masonry wall dividing the living rooms, and the roof eaves wall to the East. The East facing wall on the lower side of the lean-to roof is of rendered timber frame construction, founded off a 600mm high brickwork plinth. A 7" x 6" head plate is present to the top of the studwork, serving as the bearing line for the roof and first floor. There is a substantial outward rotation visible in the wall head plate and studwork, plumb line measurements indicate an approximate difference of 65mm between the top and bottom of the studs at the worst area near the middle of the living room. Here, the beam itself has rotated approximately 100mm out from the vertical. The brick plinth is relatively straight and plumb, the wall rotation is primarily isolated to the timber framework above. The lean-to roof appears relatively level externally, with no big sags or distortion visible.

The first floor joists have been laid above the head plate, end bearings to joists over this plate in a number of places are either poor or missing, with several joists hanging in the air, held up by the surrounding floor structure. In the study the first floor sags noticeably and is soggy underfoot, particularly near the middle of the room around the dormer, coinciding with the area of greatest rotation in the wall head plate below. Near the North end of the living room there is a splice lap joint in the wall head plate which has prised apart. At the center of the room there is a circular steel tie bar, projecting from the outside face of the head plate through to the main living room where it is fixed back to a substantial timber beam in the first floor.

A trial hole was excavated on the lean-to external wall, exposing a straight flint footing. The exact depth could not be established due to restrictive access, however it was no less than 350mm deep on subsoil that was becoming clay at the base of the excavation. There are no signs of notable foundation movement to date.

3.0 Comments/Recommendations

The primary reason for the lean-to wall movement and subsequent issues related to the floor appears to be related to the first floor structure visible over the living room. The traditional purlin roof arrangement exerts a horizontal thrusting force at eaves level into the head plate. Typically the plate would then be fixed back by horizontal tie beams or bars across its span, providing lateral restraint against the outward thrust.

It appears in this case this restraint has been removed, internally the remains of pegged tenon joints for the original ceiling joists can be seen on the inside face of the plate. This indicates a flat ceiling structure was once present, tied robustly into the head plate, which would have provided such lateral restraint. These have since been removed and newer, more slender joists installed at a slightly higher level to form the study floor.

In some older ceiling structures the joists often were orientated as shallow, wide timbers, as these tenons appear to indicate. It is possible the study was a more modern addition, perhaps with the roof space being converted. It may be the builder installed the newer, deeper, narrower joists as they may have felt these shallower timbers would be undersized for the higher vertical loads imposed by a habitable floor space compared to a typical loft storage area. The new joists however are not tied into the wall plate or roof structure, they are only crudely bearing off the top of the beam, if at all. The subsequent loss of lateral restraint meant the wall head plate had to take thrust forces on significant spans it was not designed for and became over spanned, leading to the exhibited outward wall rotation and prising open of the splice joint. The floor joists then detached from their bearings which has led to the sagging in the study floor. The tie

bar present in the middle of the room may have then been a more recent addition as an attempt to restrict any ongoing movement, on balance this appears the likely scenario as the hole drilled in the head plate for the tie is horizontal, not in the same plane as the significantly rotated timber section. The homeowner has recently moved in to the property, it is unknown the timeline of any such potential previous remedial works and whether the wall rotation has developed since the tie was installed. Additional tie beams should be provided and the splice joint plated up to stabilise the wall and roof against potential future outward rotation (drawing detail 1 and section A-A). New timber posts should be provided to pick up the inner face of the rotated beam, built off the sole plate to improve its vertical support (section B-B). A new bearing rail should also be installed, spanning between the inside faces of the new posts, to provide a sound bearing to the first floor structure (sections A-A and B-B). Preliminary calculations indicate the study floor joists are not over spanned and are suitable for retention.

It is also possible the dormer was a more modern addition as part of the roof space conversion to a study. This will have increased loads to the roof and subsequent thrusting forces on the head plate, but such an increase is not substantial, and the cutting through the purlins to form the opening has not significantly affected roof continuity.

A number of tiles on the lean-to have lifted due to moss developing. There are also areas in the study where the internal ceiling plaster appears to have delaminated from the timber rafters, where the moss is most prevalent, there are no signs of damp staining. The dormer valley is also blocked with moss, such areas are prone to rainwater backing up and penetrating the roof space. These areas should be cleared and the roof timber condition verified.

4.0 Summary.

i. The outward wall movement is isolated to the timber studwork frame and its head plate on the lower eaves wall, the sole plate and plinth are in satisfactory condition.
ii. It appears to have been caused by the removal of ceiling ties, with the remains of their tenon joints visible on the head plates' internal face. It does not appear at this stage such movement is linked to the foundation profiles or bearings on the subsoil.
iii. A steel tie bar is present, possibly added at a later date to restrict future outward movement, it is unknown whether this has stopped all movement or whether it is ongoing.
iv. Provide two additional steel tie bars across the living room, in a similar fashion to the existing tie, to reduce the plate spans (drawing section A-A).
v. Provide four new posts to improve head plate vertical support off the sole plate, and a new bearing rail to support the loose/detached study floor joists, fixed to the inside face of the new posts (sections A-A and B-B).
vi. Provide a steel plate to strengthen the open plate splice joint (drawing detail 1).
vii. Clear out areas of roof moss and realign affected tiles, strip plaster locally to check the delaminated area in the study is not concealing any timber decay that could be linked to moisture ingress from the raised tiles and blocked dormer valley gutter.

I trust that this is clear but if you need anything further please contact me. It should be noted that I have not inspected parts of the structure which are covered, unexposed or inaccessible and I am therefore unable to report that any such part of the property is free from defect.

Yours sincerely,

[redacted]

Jason Albanie BSc IEng MICE
Director