

WEYBREADS LTD

CONSULTING STRUCTURAL ENGINEERS

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Mrs J McCourt
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JA/23/010
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Dear Mrs McCourt

184 Clay Street, Thornham Magna. Engineers Report.

1.0 Introduction.

Further to our meeting at the above property on 4th May I am pleased to report as follows, with specific regard to the damage caused by a recent fire within the dwelling.

The property comprises a grade II Listed, two-storey semi-detached dwelling, of predominantly rendered timber frame construction, capped by a large thatched, duo-pitched timber roof. A single-storey clay lump and brick-walled lean-to wing projects from the North (rear) elevation, capped by a clay pan-tiled timber roof structure. A check on the Listed building's register indicates the original main dwelling structure is dated early to mid-17th Century, with alterations dated to the 20th Century. Set on relatively level ground, the building faces a single storey brick outbuilding to the North, offset by an earth pathway. The South elevation faces onto gardens. The East elevation abuts the neighbouring property on the East boundary, separated by a masonry Party Wall. The West elevation faces onto the access driveway to the dwelling, projecting Southwards towards 'Clay Street' which serves as the access to the property, running East to West beyond the Southern boundary. The site topography is generally level, there are a number of trees around the property, all located a considerable distance away from the dwelling.

Concern has been raised regarding the structural integrity of the main two-storey dwelling, following a significant fire in the Living Room. This report should be read in conjunction with Weybreadds Ltd drawing '23/010 D1'.

2.0 Survey Data.

A visual survey was undertaken around the building, internally and externally at ground and first floor levels. The thatched duo-pitch main roof and raised flat ceiling structure is presumed to be supported off a traditional timber arrangement, the roof was inaccessible for inspection. The clay pan-tiled roof covering to the North wing is supported off 4" x 2" timber rafters, supported near their midspan by a 6" x 2" purlin, spanning East to West, propped off external and internal wall lines. The Western bay of the North wing has a raised flat ceiling structure, supported off 3" x 2" ceiling joists, spanning onto the main dwelling North wall. The main dwelling superstructure comprises a traditional oak stud framework construction clad in cement render externally, with typically 4" x 6" studs springing from approximately 6" x 7" sole plates on masonry plinths, projecting up to support the first floor and roof structures above. The East Party Wall separating the dwelling from the neighbouring property predominantly comprises facing brick masonry construction. The lean-to has only been marginally impacted by the fire

on the dividing wall to the main dwelling, the projecting wall structures were not inspected in detail.

The first floor to the main dwelling typically comprises 3" x 5" oak joists at 490mm centres, spanning North to South across the Living Room, supported at their midspan by a 9" x 9" oak principal spine beam. The joist ends are built into the external walls, where they sit on 5" x 3" bearing rails. The joists across the Kitchen to the West span East to West between the gable wall and internal partitions. 9" deep oak cross beams provide lateral restraint to the principal framework at first floor level, with profiled steel straps fixed to the South external wall, and traditional tenon joints into the North wall framework. The ground floor comprises a ground-bearing concrete slab.

Following a recent fire within the ground floor Living Room the exposed internal timber framework has become damaged and charred throughout. The key defects are categorised as follows:

i. First Floor.

The floor joists remain in sound condition across the majority of their span, where they have been protected by ceiling plaster finishes. Their end bearings on the external walls to the North and South however are charred with varying degrees of severity. Bradawl penetration testing on a number of the timbers indicated the majority of joist end bearings only suffered a minor degree of degradation, however several timbers, particularly on the North end near (a) have more substantial damage.

ii. Principal Beams.

Principal floor spine beam 'ExB2' has suffered a substantial amount of charring degradation across three sides of its section where exposed beneath the line of original ceiling plaster. An inspection of the mortise and tenon joints at its end bearings on beams 'ExB3' and 'ExB4' indicated they too have suffered fire damage, with degradation of the reduced timber section forming the tenon protrusion (b). Cross beams ExB3 and ExB4 have similarly suffered surface charring, most significantly on the sides facing into the Living Room. Their tenon joints have suffered damage similar to those identified on beam ExB2, the steel straps fixing these two beams to the external South wall appear sound (f), straps are not present at the North wall interface (e). Cross beam ExB3 has suffered charring almost across its full section where it has been notched down to approximately 9" x 2" adjacent to a staircase passing over (g) within the neighbouring property. Similar to ExB2, floor bearing rails ExB5 and ExB6 which support the floor joist ends have suffered substantial charring damage on faces exposed to the fire. ExB6 is more significantly affected than ExB5. The 6" x 6" bressummer beam over the Living Room fireplace 'ExB1' has suffered a minor degree of superficial charring damage to one end, over its bearing onto the brickwork fireplace South cheek wall. The bressummer has a long bearing on the masonry here, there is at least a 6" length of undamaged timber bearing onto the brickwork immediately adjacent to the fireplace opening.

iii. Wall Framework.

The North wall studwork has suffered charring across its height where exposed within the Living Room. Bradawl penetration testing indicated the damage was superficial where tested. A section of the North wall structure and skirting boards in the first floor bedroom directly above the floor boards near (a) has a moderate degree of charring damage. Again, bradawl tests indicated the principal framework has not suffered a substantial loss across each studs cross-section. The South wall (c) to the ground floor Living Room has suffered more noticeably, with a number of studs experiencing significant charring across the majority of their span. An inspection of the wall in a hole exposed in the plaster finishes on the Eastern first floor bedroom South wall indicated the fire damage does not extend any significant distance beyond first floor level, there is a minor degree of charring in the wall studs and skirting board above the joists but, where visible, this is superficial.

Timber framework in the partition between the Living Room and Kitchen is mostly concealed by infill structure and finishes, where visible the stud framework appears to have only suffered a minor degree of charring degradation. The East Party wall is predominantly brickwork construction and structurally unaffected by the fire, with all mortar beds and masonry blackened in parts but remaining intact. A small panel of studwork over a door adjacent to the fireplace is moderately charred at (g), the adjacent studwork to the Southeast corner is largely intact and undamaged, due to protective plaster finishes. The kitchen walls are largely unaffected by the fire, in some areas they are slightly charred, notably around the North end. The damage is superficial, with the framework cross sections not reduced.

The lintel to the South wall window comprises studs laid flat with infill studs between the sections. The timber is in reasonable condition however it is over-spanned and bowed. The lintel over the door into the North lean-to is unaffected by the fire due to plaster protection on the Living Room face.

The ground floor slab is unaffected by the fire.

3.0 Comments/Recommendations.

The fire damage has been mostly contained to within the ground floor Living Room space, worst around the South elevation. Considering how the fire has had enough time to spread throughout the room and across to the kitchen area the building structure has performed relatively well and predominantly remains intact, with only isolated areas requiring repairs. Where plaster finishes have been present, such as on the first floor it can be seen to have provided an effective fire barrier, with minimal damage visible where it was present, compared to the exposed joist ends and bearing rails, some of which are significantly charred.

Across the Living Room the timber frame should be stripped of all remaining finishes and condition of concealed timbers verified. For the majority of the framework it is acceptable to retain it without requiring structural repairs, charred faces should be blast cleaned back to a clean timber face. Soft blasting material should be used such as soft sand, corn cob grit or dry ice to prevent over-erosion of the sound timber. More substantially damaged areas will require repair, such as wall studs at (c). Bowed and charred lintel L1 requires replacement. The most heavily charred joists (a) and any others of similar condition should be replaced rather than attempting splice repairs requiring slender platework with multiple fixings transmitting loads through shallow joists. The 3" thick floor bearing rail ExB5 should be acceptable for retention following blast cleaning, the joist end bearings will need to be improved, this can be achieved by fixing a secondary oak section to the original timber to achieve a minimum 3" thick end bearing to all joists. Use 125 x 75 oak with M10 bolts at 200mm spacing, with ends recessed and pelleted (max. 20mm) into the timber. The floor bearing rail to the South elevation ExB6 is significantly charred across its cross section and requires replacement. Provide a minimum 125 x 75 (or match ExB5 overall size) oak with concealed, pelleted bolt or screw fixings back to the timber frame wall.

Calculations indicate that the 9" x 9" principal floor beam 'ExB2' is acceptable as a minimum 8" x 8" cross section when designed to current standards, including checks on charring for ½ hour fire compliance on exposed timberwork. This beam should be blast cleaned back to sound timber and the remaining section size verified. If it reduces to less than 200mm x 200mm then it should be strengthened with two 125mm x 50mm oak sections, glued and screwed, or bolted to the sides of the existing beam beneath the floor joists. Support to the beam end bearings requires improvement as the tenon joints are overly charred. This can be achieved by providing traditional purpose-made steel shoes that complement the existing fabric of the historic listed property (detail 1).

The timber frame studwork is cement rendered externally on the South elevation, where exposed internally it can be seen that the expanding metal lathe has become corroded possibly due to moisture ingress from above, which has then become trapped by the impermeable cement finish. This oxidation process can then exacerbate these effects as the rusting expands

the lath, cracking the render, allowing more moisture to penetrate the wall structure and become trapped at lower levels above the plinth. The rebuilt section of the South wall should therefore be recoated in a partial lime-cement render with breathable finishes such as limewash or linseed oil-based paint. Such a render will provide a high tensile bond strength to reduce cracking whilst minimising potential for water penetration.

The cross beams ExB3 and ExB4 tying the principal framework together at first floor level retain sound fixings on the South elevation where the steel straps appear to remain intact. On the North elevation however they are reliant on pegged tenon joints to provide the horizontal restraint, these connections have suffered charring and require improvement, traditional steel twist straps should be provided at locations marked (e) to rectify this (detail 4). The connection of existing steel straps at (f) will need to be assessed by the contractor following the blast cleaning of the associated beams, the fixings may need adjusting if the timber cross sections are reduced. The notched section to ExB3 at the staircase opening is undersized and substantially charred, splice repair a new 3" thick oak section across this area (g). ExB3 is substantially charred between the stairs and South wall (h), this replacement piece should be extended across to the South wall so it can pick up the existing steel strap, following the blast cleaning of the existing timber beam near the South corner, see detail 5.


A Party Wall surveyor may need to be employed to provide specialist advice on remedial works related to the structure embedded within the Party Wall line to the neighbouring property prior to any works commencing in this area. A robust temporary works scheme will need to be designed and installed by a competent contractor before the repairs are undertaken, using a system of Acrow props and temporary bearing rails and needles. See drawing detail 2 for guidance.

4.0 Summary.

- i. The building has suffered fire damage, predominantly in the Living Room to the East, worst in the Southeast corner.
- ii. The principal timber frame structure is in reasonable condition, there is widespread surface charring damage which should be blast cleaned. Large areas of the timber frame remain relatively unaffected, due to protective plaster finishes providing an effective fire barrier.
- iii. There are several areas requiring localised repairs or replacement across the Living Room, notably the Southeast external wall ground floor studwork, first floor beams and their respective tenon joints, first floor bearing rails and a number of floor joist ends, which have suffered more substantial charring as a result of being exposed to the fire.
- iv. Repair the frame as indicated on drawing D1, incorporating a robust temporary support works scheme.
- v. Contractor to expose and verify condition of all concealed framework and connections, repairing in similar fashion to those identified above and on the drawings.
- vi. Re-render the stripped and repaired sections of South wall in partial lime-cement render with breathable coatings, e.g. limewash or linseed oil-based paint.

I trust that this is clear and sufficient, but please do let me know if you have any queries or require further advice. It should be noted that I have not inspected woodwork or other 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,


Jason Albanie BSc (Hons) I.Eng MICE
Director for Weybreads Ltd