

Castlemans Cottage Roof

Mr Ashley Bryant

225131

Structural Appraisal

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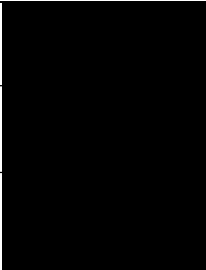
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1.0 Introduction

1.1 Appointment

MNP were appointed by Ashley Bryant to visit site to inspect the reportedly defective beam seen in the Master Bedroom and to provide a repair detail.

During the site visit, undertaken after removal of all tiles, inspection of the said beam revealed no signs of significant decay. However, the generally poor nature of other parts of the roof structure was evident. This report describes a number of thematic structural issues that should be addressed as suggested before roof tiles are replaced.

1.2 Heritage Significance

Castlemans Cottage (Knowl Hill RG10 9UT) is included at Grade II on the National Heritage List for England with entry number 1154670. The entry dates from 1967 and typically of that time the description is minimal.

WARGRAVE BATH ROAD SU 87 NW (south side) Hare Hatch 3/18 Castlemans 26.1.67 II Country house, now sub-divided into 3 flats. Mid C18 altered C19 and C20. Brick, plinth with moulded capping, moulded brick strings at floor levels, painted cornice string over second floor windows. Parapet, to old tile roof with flanking chimneys. 3 storeys and cellars. Entrance front: main part of 5 bays. Sash windows with glazing bars. 6-panelled central door with arched radiating and enriched wrought iron and cast lead fanlight, in Tuscan porch of piers, wall pilasters and entablature. Early C20 one storey wing to right hand, and early C19 2 storey wing to left of former stables now divided into 2 cottages. V.C.H. Vol.III p.192 B.O.E. (Berkshire) p.258.

From the list description, the roof in question is to one of the cottages of the early C19 2 storey wing (cottage nearest the Country House).

1.3 Phased Development

The raised ceiling heights of the rear rooms (both at ground and first floors) are suggestive of significant internal changes.

The phasing and detail of structural changes is unclear, but the differing nature of the roof in terms of materials (age, quality and species) and structural configuration suggest changes were made to the original roof structure.

It is possible that the extension had traditional tied trusses and that alterations were made to the roof with high-collared trusses introduced above the rear rooms to accommodate more generous ceiling heights.

1.4 Heritage Approach

The historic nature of the roof structure should be respected as befits its Grade II listed status, with repair works specified and undertaken with a conservation-minded ethos based on appropriate guiding principles.

In short, the principles would include: undertaking works only when necessary, with minimum intervention and maximum retention of valued fabric. Where possible works should be reversible, aesthetically compatible (or unseen), and go-with-the-grain of the building (visually, structurally, and materially).

While many of the timber rafters and purlins would probably not now be considered adequate for structural use in a building structure, the justification for ongoing structural use is their time proven ability. Unless obviously distressed, fractured or deteriorated (through human damage, insect or fungal decay) their capacity to function adequately is considered appropriate in this assessment.

Where members are damaged, the presumption is for retention of the member, with remedial measures including addition of supplementary structure (new rafters of the same material and section set alongside and screwed / bolted together), local repair, packing, strapping and improving fixings. Full removal and replacement is considered a last resort.

1.5 Insect Infestation and Fungal Decay

1.5.1 Insect Infestation

Like humans, wood boring insects prefer their food to be nutrient rich and readily digestible. Insects therefore tend to be drawn to the 'tastier' outer layers of tree-growth known as sapwood when sufficiently moist. They will usually avoid sapwood if too dry. It is therefore common to see insect flight holes in the surface ½ inch of a timber (that may even have turned to dust) with sound heart wood immediately below. Once a timber has dried sufficiently the insect population migrates elsewhere and no further damage is done.

The presence of flight holes is not necessarily an indication of significant structural damage. Unless recent emergent dust is seen by the flight holes, insect infestation can usually be assumed to have ceased.

1.5.2 Fungal Decay

Fungal Decay (even dry rot!) only occurs in moist conditions. Typically, a timber moisture level above 20% is conducive to decay.

Mould and tendrils associated with fungal decay appear when the fungus is active, migrating or sporing. Timbers affected by inactive fungal decay can be powdery to the touch or present cuboidal cracking. However the decay will not spread if moisture levels are controlled.

Often decay is limited to areas that are consistently damp, perhaps below a fractured and leaking roof tile, a dripping pipe or split gutter, or where in contact with masonry or cement mortar / concrete.

Fungal decay can also affect the heartwood, leaving sapwood apparently sound.

Decayed timber does not always need to be removed, but should be considered structurally compromised.

1.5.3 Timber preservative treatment.

As noted above, while it remains dry, a timber will not decay or be prone to insect infestation.

Timber preservatives are poisons that kill insects boring through impregnated layers and surface fungal growth. As soon as a surface is cut (ie at ends when shaping to length) it becomes vulnerable.

The best way of preventing insect and fungal deterioration is to avoid water ingress through good detailing, to ensure good ventilation to aid drying, and the use of breathable materials (such as lime mortars), that draw moisture away.

2.0 Observations

2.1 Construction

The roof is of traditional cut timber construction: rafters, ridge board, purlins, props, tied trusses, high collared trusses and wall-plates.

2.2 Typical defects and suggested remedial action.

2.2.1 Rafters

Rafters are supported by the wall plate, a mid-pitch purlin and rest against a ridge board. Original rafters were probably all of a single length between wall plate and ridge. Some rafter lines are now of two timbers that lap at the central purlin.

The rafters were a mix of quarter-sawn or rectangular-sawn timbers (circular saw, hand sawn or band sawn) or oak and perhaps of softwood. The presence of nails on multiple surfaces may be suggestive of reuse or turning of some rafters.

Most rafters show signs of limited insect damage, however unless particularly weakened these members should be retained.

Only one was noted as being affected by fungal attack. Suggest this is retained (it supports the lathe and plaster ceiling) and a new rafter placed adjacent.

Compromised support at the ridge board. Pack ridge board locally as required using ply sheet or softwood planks (screwed to the ridge board) so that the rafter alignment is corrected. Where the skew nailed connections are poor, use screws to skew fix or small angle cleats and screws to secure in place.

2.2.2 Ridge Board

The ridge boards are not 'spanning' members. Their only purpose is to receive a rafter (at a particular alignment) and to transfer the compressive force through to the opposing rafter. It is worth noting, older roofs did not have ridge boards but each opposing rafter had a pegged joint to ensure they leaned against one another. (this is seen in the high-collared trusses to this roof).

The ridge boards display numbered carpenter's marks, with numerals indicating the numbered truss that they connected to.

All ridge boards showed signs of fungal decay. This was probably associated with gaps in the ridge tiles (missing mortar) allowing frequent water ingress.

Where the decay affects the ability of the ridge board to receive the rafter's nails or screws, they should be replaced.

When removed, the ridge board should be kept on site (perhaps screwed to underside of adjacent rafters) to maintain the historic record.

The ridge boards may also need to be removed to allow access for the repair of the trusses (see truss repairs).

2.2.3 Purlins

The purlins align with the underside of the rafters. Some rafters are pegged (timber pegs) to the purlins. Purlins are either rectangular and saw-cut being converted from large trees, or of lightly shaped whole-section timbers. They are clasped below the truss chords, supported by raking props or set above the high collar. Along the end elevation, the purlins are supported by diagonal props rising from walls below or beams at ceiling level.

No deterioration to the purlins or the props was noted. Therefore, remedial works are not anticipated.

2.2.4 Wall Plates

The wall plates are bedded on the tops of the brick masonry walls. They have a dual purpose of receiving (and supporting) the rafter feet and also the purpose of resisting any tendency for the rafter feet to push outwards. Opposing wall plates are typically tied using dovetail joints on the ends of the truss tie beams and also at return walls.

Dry rot in the form of cuboidal cracking was noted on the sides of some wall plate sections. In other areas the decay had reduced significant depth of section to powdery consistency.

Replacement of the decay affected lengths of wall plate are recommended. The replacement timber should be air-dried oak, bedded in lime-based mortar. Cement should be avoided as this will promote decay. The wall plates should be replaced in lengths that span between points of restraint.

Joints with any supported truss tie beams and rafter feet (likely to be notched into wall plate) should be replicated to maintain the transfer of forces as indented when constructed. The high collar truss rafters appear to have metal bracketry that wraps over the wall plate (to be retained as functional brackets).

2.2.5 Tied Trusses

Truss 1 (to the party wall over the master bedroom) appeared in a sound condition. Internally, hairline cracks were seen in the finishes to the tie beam. They did not have the appearance of a defect associated with failure associated with over stressing of timber (in either tension or bending) and may be a reflection of concealed historic joints in the member. If in the future, the hairline cracks enlarge, repair from inside the master bedroom, using steel plates or threaded rod, set in resin, in cut grooves would be appropriate.

The tops of both front and rear trusses over bedrooms 2 and 3 were both affected by decay at their ridge.



Truss over bedroom 2. (decay at apex)



Truss over bedroom 3. (decay to end of king post).

The truss over bedroom 2 is a high collared truss (over vaulted ceiling) with the apex formed by a pegged tenon and open-ended mortice joint. As can be seen in the photo, access to this joint is restricted by adjacent timbers (ridge boards and hip rafter) which will need to be removed to affect the repair. As works are needed to these members anyway, their removal will allow access for a glued and screwed spliced-timber repair to reconstruct the decayed joint.

The truss over bedroom 3 is a tied truss with king post and two diagonal struts. The top of the king post (actually a tensile member, whose outwardly tapered end bears onto the principal rafters) is highly decayed. The joint should be reconstructed using glued and screwed spliced-timber repairs. Adjacent timbers can be eased out of position to allow access.

The bottom end of the king post is also outwardly tapered to receive the diagonal struts. Repair to the bottom of the same king post is required. If sound, glue and screw the fractured piece back on. If not then replace the affected section.

The recommended repair glue is a high-build epoxy resin by Wests Ltd. The bonding strength exceeds the tensile and shear capacity of timber, meaning the adjacent timber will fail under load before the bond. The screws are used to hold the joint in position while the glue cures.

If close inspection shows similarly located decay in other trusses, repairs should be undertaken in the same manner.

3.0 Recommendation

We suggest a site meeting with the Built Heritage Officer to consider the above and agree the principles of repair outlined above.

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