

Roof frame survey and repair schedule

Location : 10 Worsborough Village, Barnsley. S70 5LW

20/10/16

General description.

The property currently known as 10 Worsborough Village is a large stone built house, constructed in 1696 as the vicarage for the adjacent St Mary's parish church. The roof structure is an oak timber frame construction, with a high proportion of original timbers and some later additions / alterations.

The roof frame follows a fairly standard layout, consisting of 5 Bays and 4 simple oak trusses (referred to as Trusses 1- 4 from South West to North East), with large section tie beams and an upper and lower purlin run on each pitch of the roof. The tie beams are coggled over an oak wall plate, sitting directly on top of the masonry wall, and a carved oak corbel sits within the wall, coggled around the underside of the wall plate. The corbel projects into the roof space and would have provided a small amount of cantilevered support and additional bearing for the tie beam. There are no gable trusses, with the purlin ends resting in the masonry walls. All the original common rafters have been replaced with new timbers.

At the north eastern end of the building a gabled extension has been built, extending to the north west. An additional truss for this roof (Truss 5) sits on top of an internal oak top plate in line with the north western wall plate (but separated at one end by a framed doorway) with similar upper and lower purlins extending back from the stone gable, to connect with the purlins of the main roof. The internal top plate is supported by a number of small oak posts, and a large carved jowl post directly below Truss 4, the northern most truss of the main roof.

The roof timbers are generally in excellent condition, with some signs of degradation in areas of sapwood as expected but with sound heartwood throughout. Unsurprisingly, problem areas are generally confined to points of direct contact with masonry, such as wall heads and gables. It is also no surprise that the only extensive decay in major timbers appears to be at the foot of the truss supporting the gable roof, as the foot of these principle rafters also support the bottom of the valley and will therefore have always been vulnerable to any leakage of water.

At some point, the roof has undergone major alteration, both as a deliberate decision to re-design the roof space and possibly also as the consequence of damage to the original structure. The major change has been to the tie beams, all of which have had the central portion removed, to create a usable space within the roof. Only the ends of the ties remain, supported on the corbels on the masonry walls. The rooms on the second floor of the building would almost certainly have been higher at one time, possibly even vaulted, but most likely, with the tie beams forming the second floor ceiling. This is suggested by the presence of decorative carving on both the corbels and the jowl post, something that is unlikely to have been done had these timbers sat in an unused and unseen roof space. Prior to removing the ties, new raised collars have been scribed and fitted to the north east face of the principal rafters on the three remaining trusses of the main building, with their dovetail housings secured both by skewed pegs and mechanical fasteners. The fitting of the new collars has been carried out to a very high standard, with tight joinery and no obvious sign that the trusses have splayed since the tie beams have been removed. Additional remedial work has been carried out on Truss 4 as only its south eastern end sits on a stable masonry wall. The jowl post to the north west has been strengthened with a large iron brace, fitted between the face of the post and the underside of the principal rafter. On the opposite side, a diagonal metal tie connects the remnant of the tie beam to a point beneath the floor. The new raised collar has also been strengthened with an iron brace. As the feet of all the principal rafters now sit on the remains

of the tie beam, which in turn is not centered on the masonry wall, one clearly visible consequence of cutting the tie beams has been that remaining sections (essentially now forming unbraced stub ties) have all rotated downwards to the inside of the building.

The second major alteration to the original design is that Truss 2 no longer exists, and the purlins it would have supported are now instead supported by masonry walls. On one side is a large area of new concrete block-work but to the other side is a section of much older masonry, and a masonry chimney. The presence of the chimney may indicate that the original truss, assuming it was present, may have been damaged by fire, or water leaking around the chimney opening. Although there are no sections of the truss remaining, the carved chamfer stops on the purlins to either side suggest that it was there when the roof was originally constructed, as they are also present on either side of the other three trusses.

At some point one of the oak purlins has also been shortened, with the missing section replaced with a pitch pine beam.

Description of bays and trusses

In order to identify the location of any significant issues with the frame, the roof space has been described by the rooms into which it has been divided. The first room consists of Bay 1, Truss 1 and Bay 2. Bay 3 forms the second room with the presumed Truss 2 separating it from the first room and Truss 3 forming its northern eastern wall. Likewise the third room is made up from Bay 4, with Truss 3 forming one wall and the jowelled Truss 4, the other. The far room is Bay 5 with Truss 4 forming the internal wall and the purlins running into the masonry gable. Truss 5 supports the purlins running across the gable extension, Bay 6, to its masonry wall.

Bay 1/Truss 1/ Bay 2

This first room is the only area of the roof space to have been renovated and as such, the trusses are all painted and there is no access to the wall head to allow inspection of the wall plate. The fact that the purlins are not horizontal, and all slope down towards Truss 1 suggests that the plate may be degraded and compressed by the weight of the truss and roof. However, as this is speculation, this area is not scheduled for any repairs at this stage. The purlin ends into the south western gable have degraded and have been repaired recently with sections of steel angle bolted to the lower arris and cemented into the wall. While these repairs are not visually pleasing, they are functional and as there is little need to change them, they will not appear on the schedule of repairs. If they were to be changed at a later date, steel angle could be resined into a slot in the upper surface of the purlin, and bolted in place, effecting a similar type of repair but with no obvious sign of intervention. There are no other signs that repairs are required in this area. As with the far end of the building, the purlins here span two bays (4.1m), and were probably scarfed over the missing Truss 2. These ends are now enclosed in the masonry internal wall

Bay 3/Truss 3

Bay three effectively forms the central section of the timber roof, structure, although the actual dimensions of the bays are completely irregular. The purlins in this section of the roof are short, spanning this bay only. Again one set of ends are lost in the masonry dividing wall but the others are clearly scarfed over the next set of long purlins (6.2m) running to the north east gable. All four short purlins are in reasonable condition but the lower north west purlin has been repaired at some stage, close to the masonry internal dividing wall. A section of timber has been inserted and the whole area supported on an oak brace, notched into the underside of the purlin and running back to the base of the wall. It is proposed that this purlin be repaired. (Repair 1)

In this bay, Truss 3 appears to be in very good condition with no need of any repairs. As with much of the unpainted oak timbers in the rest of the roof, the timbers have been coated in a surface timber treatment. The truss shows a very neat, partially housed bridle, notched at its apex to take the ridge beam

Throughout the roof, none of the original rafters remain. At some stage they have all been replaced, and packers added to the back of the (bowing) purlins. Consequently the new rafters now spring from the outer arris of the plate, exposing all the neat pockets cut into the top plate to take the original rafters. The rafter pockets are interesting historic features and consequently any repairs to wall plates should aim to preserve as many of these as possible. Whilst there has been some decay of the oak wall plates, they are in reasonable condition and remedial work here, as with much of the building are best focused on stabilising the masonry wall head and inserting a damp proof course beneath the timbers.

Bay 4

This bay has a number of structural issues.

The purlins here originally formed one end of the long purlin timbers, running from the far gable to Truss 3. However, the part of the lower south east purlin which spans this bay has been removed and replaced by a pitch pine beam, fitted into the purlin scarf on truss 3 but resting on a small timber ledger, coach screwed to the face of Truss 4. This method would probably have allowed insertion of a replacement purlin without first having to remove part of the roof but it is structurally unsound given the minimal area of support provided by the ledger. The pine purlin is not a sympathetic repair and should be removed and replaced with a new oak one. (Repair 2). The remaining original purlins show the usual degradation on arrises but appear to be sound within. The upper and lower north west purlins support valley timbers and show no sign of deflection at this point.

The north western wall plate originally ended in the middle of this bay where it formed a corner turning north east, to become the wall plate of the gable extension forming Bay 6. Consequently the valley between the two roofs lands at this point. Historic water damage from the leaking valley has resulted in the complete loss of original timbers at the intersection of the two plates. This section requires repair. (Repair 3).

The opposite wall plate running along the south east wall is in fair condition but has a top plate scarf situated directly over one of the openings for the garret windows, where it effectively becomes a window header for a short distance. This is perhaps the one place where a joint should be avoided and interestingly, is the wrong way round with the longest timber forming the unsupported underside of the joint. The inside lower arris of the plate has also been heavily chamfered where it forms the window header, further reducing its strength. While there is minimal point load from the common rafters at this point it would be prudent to ensure a sound connection at this joint as the window openings below the plate are to be reinstated (Repair 4).

The jowl post is fairly small and shows no sign of deterioration. All other timbers seem sound, and again have neatly formed bridle joints at the truss apex.

Bay 5

As in Bay 1 the purlin ends where fitted into the gable wall have suffered past damage and are already supported from beneath with lengths of steel angle. Again, whilst not a tasteful repair the steel does appear to provide adequate support for the purlin ends. It is not clear how much of the original purlin ends remains buried in the wall, or whether what remains has been in any way protected from moisture to prevent any further degradation. This is worth checking if relatively easy to do once the roof has been removed. The timbers in this area all appear sound.

Bay 6

Bay 6 forms the extended area of the building to the north west, and is separated from the main building by Truss 5, sitting above a top plate supported by the jowl, door posts and a fairly random collection of studs. Nearly all of these are in fair condition but there is again a major issue at the foot of the valley where the two roofs meet, and where there has been significant decay as a result of water ingress. This is the most urgent repair required in the building. A fairly complicated repair will be required here. (Repair 5). The internal ends of the Bay 6 purlins have been shaped to connect to their counterparts in the main roof but no longer do so. This may be a result of the rebuilding of the western gable into which the other ends of these purlins run, once again supported on lengths of steel angle. The connections should be re-established. (Repair 6).

Repair Schedule

Repair Number	Location	Fault	Proposed repair
Repair 1	Lower North West Purlin, Bay 3	Damaged and repaired purlin approx 450mm. Oak brace added below, notched into lower arris of purlin (causing further damage)	Temporary support of purlin. Removal of old patch and brace. Scribe new dry oak patch, resin and fix in place. Steel strong back added to upper side of purlin if required. However, extent of damage to purlin may require scarfing new purlin end, or complete replacement with 3.2m new oak purlin.

Repair 2	Lower South East Purlin, Bay 4	Poorly supported pine beam replacing original oak purlin.	Support or remove roof. Remove existing purlin. Replacement with 3.3m new oak purlin. Hidden connection on back of Truss 4 principal rafter, with steel strap on upper face to connect to remains of original purlin. Other end scribed to fit in original purlin scarf housing on back of Truss 3 principal rafter. Purlin chamfers and stops could be replicated to match existing on original purlins.
Repair 3	North West Wall plate and principal rafter foot. Bay 4	Original plate timber completely lost for approx 800mm in each direction. Valley timbers currently supported on softwood packers to form temporary wall plate. Possible damage to foot of principal rafter.	Support valley. Remove packers and clear all decayed plate to sound wood. Repair wall head. Add DPC. Simple top plate scarf of new oak plate to existing timbers in both directions. Repair principal rafter foot as required with new mortice and tennon connection to plate.
Repair 4	South East Wall plate, Bay 4	Unsupported open top plate scarf over window opening.	Check condition of plate scarf and introduce additional fixings as required. Strengthen joint with steel plate spanning joint on outside face if required.

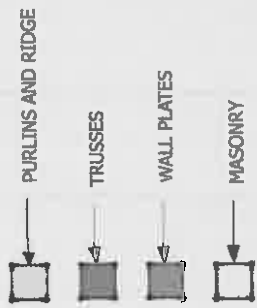
Repair 5	Principal rafter foot, top plate, wall plate. Bay 6	Severe degradation to the foot of Truss 5 principal rafter and to the load bearing end of the internal top plate on which it sits. Top plate end barely supported on masonry wall. Severe decay to end of associated Bay 6 north wall plate. Potential for truss spread with failure of principal/top plate mortice and tendon.	Top plate requires immediate temporary support and principal rafter secured to prevent possible spread. Extent of damaged timber not clear but minimum repairs require new section of top plate (approx 800mm) to be scarfed to original timber. New section of wall plate to link to new top plate. New oak slip tennon to be inserted into foot of principal rafter to connect to new mortice in top plate. Excessive decay to rafter foot will require new scarfed rafter end (approx 500mm) with incorporated tennon.
Repair 6	Purlin connection to main roof purlins. Bay 6	Purlins not connecting to main roof purlins but are instrumental in supporting valley timbers. Split in upper north purlin.	Discrete oak packers required to re-establish connection to main roof purlins. Added mechanical connection. Steel strap to upper face. Split purlin requires clamping, resin repair and mechanical fixing.

Conclusion.

Overall the roof timbers are in good condition with only a few areas that require significant attention. The entire frame has at some time been coated with an unidentified product (presumably some form of pest treatment). This is unsightly, probably unnecessary and will need to be carefully removed as the roof space is refurbished.

While some of the purlins may look a little 'weathered', all now have packers on their upper faces to accommodate new rafters which are external to the original rafter position. These packers will already be providing additional support and reducing the purlin loading. Wherever possible the wall plates should be lifted, the wall heads consolidated and the plates replaced on DPC. These plates may require some attention if their undersides are significantly degraded. This should only require the removal and replacement of the bottom face, so preserving the original rafter pockets on the upper face. In all cases the proposed repairs should aim to have minimal visual impact and should retain as much original material as is practically possible.

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ROOF - PLAN VIEW

