

12183



STRUCTURAL REPORT
St. John's Church
Westwood Heath
Coventry

13 Allesley Old Road
Coventry
CV5 8BU

Telephone: 024 7667 8921
Fax: 024 7671 1721
Email: fwh@fwhaywood.co.uk
Website: www.fwhaywood.co.uk

December, 2020

1.0. Introduction

The Consultants were appointed by Jeff Smailes, the Office Administrator of Westwood Church, 45 Westwood Heath Road, Coventry, CV4 8GN, to carry out a structural survey on the roof of the Church. In past quinquennial inspections by the Church Architect, Mark Evans, he had identified issues with the roof tiles and also the internal plaster. Internally, the plaster has had small areas which have come away and therefore this survey is to comment on the condition of the roof tiles and the structure where exposed.

The survey was based on eight areas where the tiles were lifted to inspect the rafters and battens and to gauge the condition of the roof overall. The report is therefore to comment on the condition of the roof and also provide an idea of lifespan. It should be noted that the survey mainly deals with the external elevations of the roof, although an internal survey was carried out from ground level, but no other part of the Church was inspected. We also have not inspected any area which was covered, inaccessible or unexposed and we are therefore unable to report that any such part is free from structural defect.

2.0. Survey

The Church was constructed in 1844 and the roof is considered to be original to that time and therefore is over 150 years old. The Church is Grade II Listed and has had regular quinquennials, the last of which was undertaken in February 2020.

2.1. External Survey

Northern Elevation

Prior to the intrusive surveys, a visual inspection from ground level was carried out. Starting on the western slope of the porch, a general view is shown on photograph No. 1.



Photograph No. 1

Viewing is slightly restricted but from what could be seen there is some moss growth and an occasional disturbance to the tiles. What is noticeable is the gully at the base of the downpipe is full of leaves which should be cleared, and all of the above points are shown on photographs No. 2 and 3.



Photograph No. 2



Photograph No. 3

The eastern side of the porch roof is shown on photograph No. 4 and it is evident where there has been a replacement tile but this in fact has slipped and the gutter is also full of vegetation. These points are shown on photographs Nos 5 and 6



Photograph No. 4



Photograph No. 5



Photograph No. 6

Moving now to the northern slope of the nave roof as shown on Photograph No. 7, the ridge line is quite reasonable as are the main roof lines. To the tiles themselves, there are bands of feature tiles which are clubhead and reverse clubhead and at the western end, there is one missing as shown on photograph No. 8.



Photograph No. 7



Photograph No. 8

At the eastern end, there are signs of small amounts of fern growth and again the gutters are full of vegetation, all as can be identified on photograph No. 9. The remainder looked in a reasonable condition.



Photograph No. 9

Moving now to the chancel, as shown on photograph No. 10, the ridge line again looks in a reasonable condition. It is noted that there is a large amount of moss growth, as shown on photograph No. 11, and the gutters are full at the downpipes. It can also be seen where there is an occasional damaged tile or where one of the clubhead tiles has been replaced with a plain tile, these points being shown on photographs No. 12 and 13 respectively.



Photograph No. 10



Photograph No. 11



Photograph No. 12



Photograph No. 13

Southern Elevation

Starting at the chancel roof, as shown on photograph No. 14, the ridge line is reasonable as noted on the northern side. There is an occasional chipped and damaged tile, an example is shown on photograph No. 15 but the lines are reasonable.



Photograph No. 14



Photograph No. 15

Joining into this roof is the vestry, as can be seen on photograph No. 16, and again the ridge is quite reasonable as are the general lines but below the ridge, there is one missing tile, and this is identifiable on photograph No. 17.



Photograph No. 16



Photograph No. 17

On the western side of the vestry roof, as can be seen on photograph No. 18, there is again a large amount of moss build up, especially towards the southern side and also an occasional chipped tile, these points being shown on photographs No. 19 and 20.



Photograph No. 18

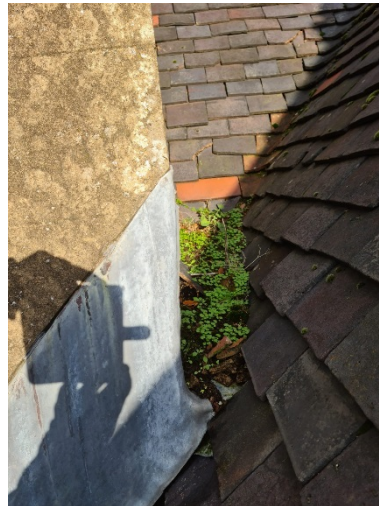


Photograph No. 19



Photograph No. 20

It is also evident that in the valley with the main roof, there is quite a large amount of vegetative growth which needs to be removed. The main chancel roof itself is in a reasonable condition and has had replacement tiles. There is still an occasional one which is chipped, and the above points are all shown on photograph No. 21.



Photograph No. 21

On the southern nave roof, this is shown on photograph No. 22, and the general lines are again quite reasonable. There is noted to be an occasional missing tile underneath the ridge, as shown on photograph No. 23, and also an occasional slipped tile.



Photograph No. 22



Photograph No. 23

At the western end, there has been recent work to the flashings which is clearly identifiable and generally this is all quite sound, and this is recorded on photograph No. 24.



Photograph No. 24

2.2. Internal Survey

Starting in the chancel, the roof consists of a series of collar tie rafters with a vertical post and triangulation at the wall head, a general view of which is shown on photograph No. 25.



Photograph No. 25

Starting on the northern side, there is evidence that there is potentially condensation damage on the underside as there is a slight sheen to the plaster which is between the rafters as can be identified on photograph No. 26.



Photograph No. 26

There are localised areas of cracking to the plaster and this can be made out on photograph No. 27.



Photograph No. 27

On the southern side of the chancel, there are again some minor localised cracks through the plaster and again staining, which is potentially from condensation, the above points being shown on photographs No. 28 and 29.



Photograph No. 28



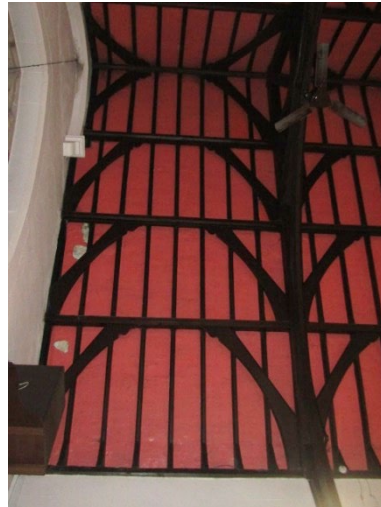
Photograph No. 29

Moving now into the nave, as can be seen on photograph No. 30, the roof has 5 bays which have 3 purlins to each pitch and also a ridge.



Photograph No. 30

In the north-western bay, there are 3 sections of deterioration which are shown in general on photograph No. 31 and then in more detail on photograph No. 32.

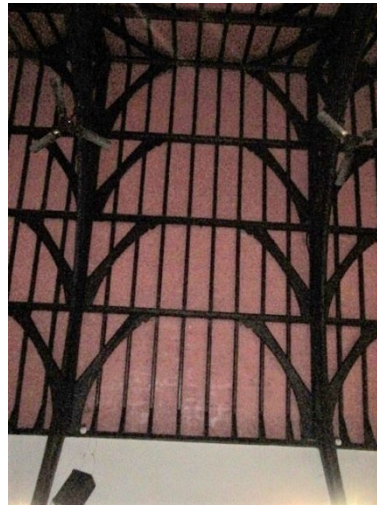


Photograph No. 31



Photograph No. 32

Generally, the timbers are all working quite adequately, and it is noted that the bays are braced, and a typical bay can be seen on photograph No. 33.



Photograph No. 33

In general, there are small areas of plaster damage which have been identified in the quinquennial report but the main item to note is that the roof timbers are in a reasonable condition with no indication of any failure. In the porch, there are collar tie rafters with a ridge, a general view being shown on photograph No. 34, and on the ceiling, there are items of storage, so viewing was slightly restricted. From what could be seen, there are irregularities in the plasterwork between the rafters but the timbers themselves were working quite adequately.



Photograph No. 34

The last area is the vestry where there is a suspended ceiling, a general view being shown on photograph No. 35.



Photograph No. 35

Access could be gained to view above this level which showed that there are again collared rafters but there is a purlin and on top of the rafters, this is boarded, a general view being shown on photograph No. 36. The main item to note was the fact that there was no indication of any major structural failures and the roof timbers all appeared to be working quite adequately.

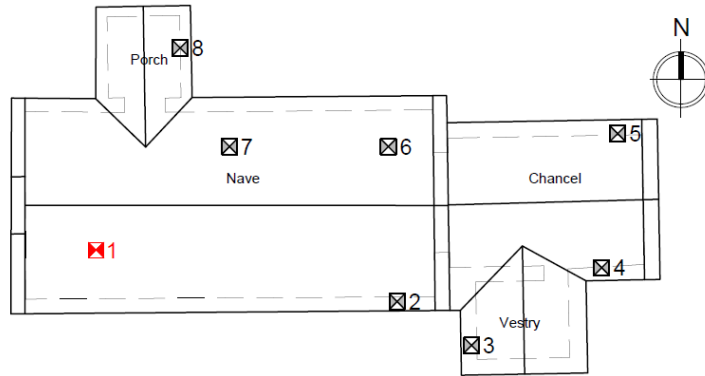


Photograph No. 36

3.0. External Intrusive Investigations

A series of investigations were carried out which involved the localised removal of the tiles to inspect the structure below. This was carried out on all the roofs and the findings are recorded below.

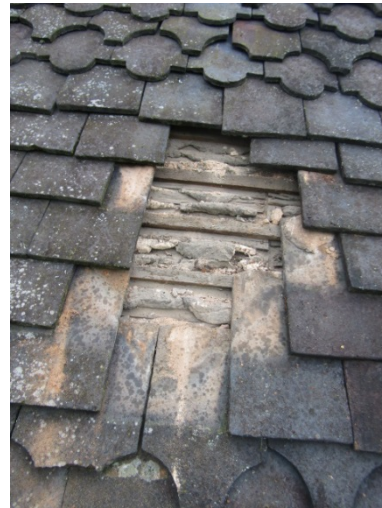
Area 1



This is at the western end of the southern pitch of the nave roof and a general view of the area inspected is shown on photograph No. 37 and in detail on photograph No. 38. This showed that the ceiling laths were fixed on top of the rafters and then the roofing battens on top, therefore there is very little space between the two.



Photograph No. 37



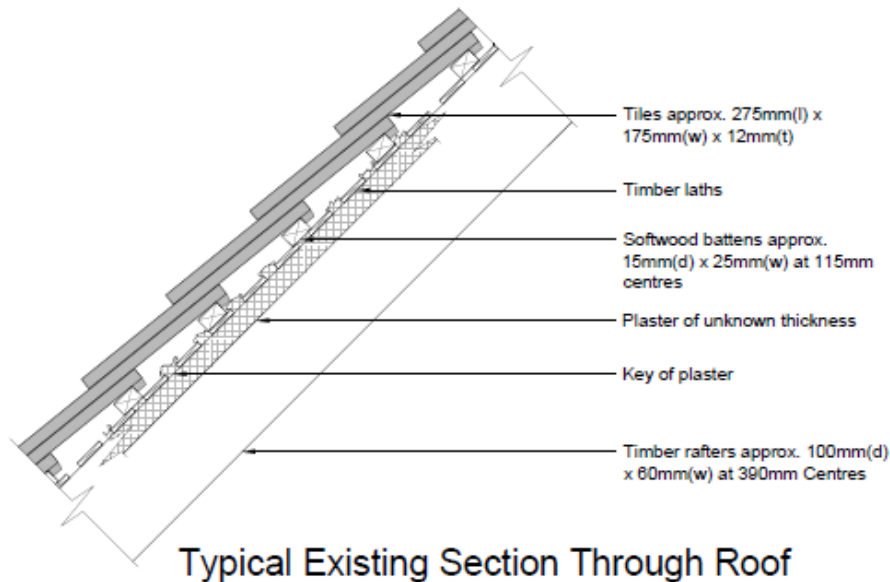
Photograph No. 38

It is evident that when the tiles were lifted, the top face of the ceiling could be seen with the plaster coming between the laths and there is a good key as shown on photograph No. 39.



Photograph No. 39

In the area inspected, the battens for the tiles were in a reasonable condition and the laths for the ceiling again were working quite adequately. There was an occasion where there was a slight split in the lath where it is nailed to the rafter but overall, it was working quite adequately. A typical section through the roof is shown below.



At the eaves level, a few tiles were removed to secure the ladder, but it could be seen that the rafters, which are approximately 100mm deep x 55mm wide at just over 400mm centres, are set on a wall plate. There are also new softwood battens which have been introduced so there has been a repair at this point and these can be identified on photograph No. 40. In general, the timbers seemed in a reasonable condition showing no signs of any significant structural distress.



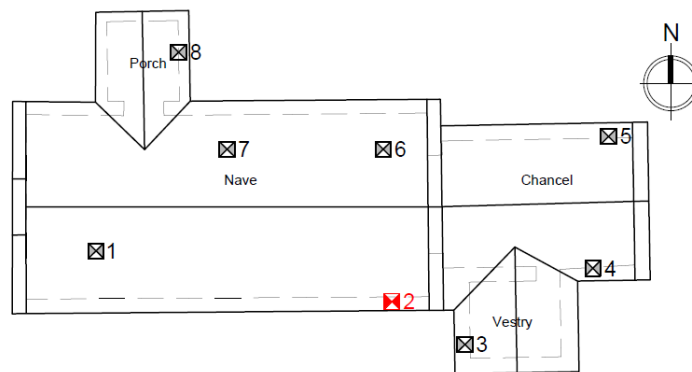
Photograph No. 40

Looking along the line of the roof, there were slight undulations in the tiles which potentially is an indication of the nail fixings to the battens failing so that there is a slight slump in the line which can all be appreciated on photograph No. 41.



Photograph No. 41

Area 2



This was taken at the eastern end of the nave roof above the eaves, a general view of which is shown on photograph No. 42. This showed an identical detail to area 1 and it can clearly be seen on photograph No. 43 where the roof battens and the laths for the ceiling overlap.



Photograph No. 42



Photograph No. 43

The battens supporting the tiles are 27mm wide x 15mm deep at approximately 120mm centres as shown on photograph No. 44.



Photograph No. 44

There is again a reasonable key to the plaster through the laths but there was an indication that the nail fixings are corroding an example being shown on photograph No. 45.



Photograph No. 45

At the eaves level on top of the wall head, there is no ceiling plaster, therefore the rafter could be viewed which was in a reasonable condition. It was evident that to the back of the inner wall plate, there was a localised area of beetle infestation and a general view of the area is shown on photograph No. 46 and the beetle attack on photograph No. 47. It should be noted that this would appear to be quite localised.



Photograph No. 46



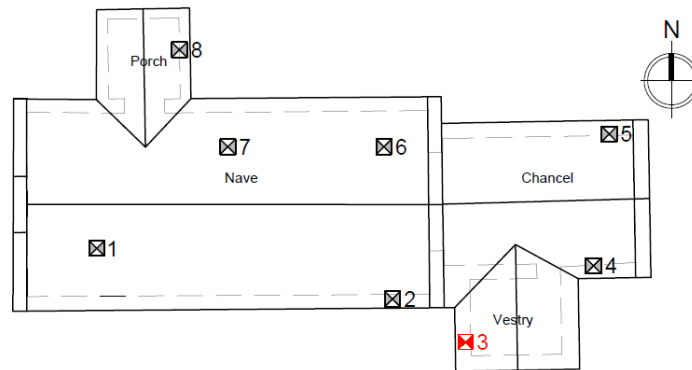
Photograph No. 47

On the battens, the nails are corroding which is causing a very slight split which can be seen on photograph No. 48.



Photograph No. 48

Area 3

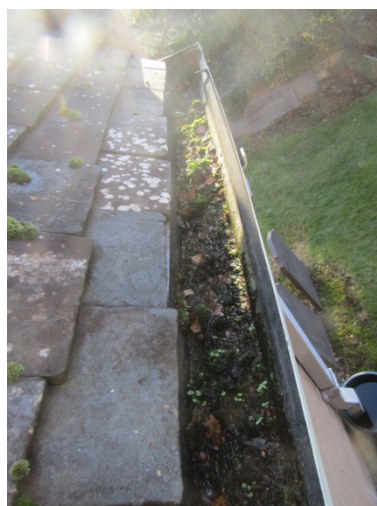


This is on the western side of the vestry roof and a general view of this area is shown on photograph No. 49.



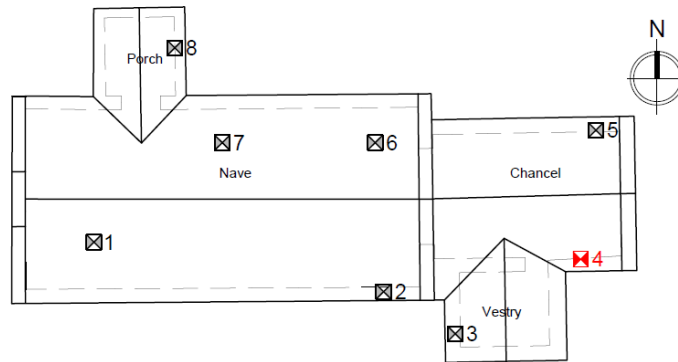
Photograph No. 49

It is evident, as can be seen on the photograph above, that there is boarding on top of the rafters and then the battens are fixed to the boarding. Generally, this all appears to be working quite adequately and there were no signs of any major distress. The one item to note is that the guttering was full of vegetation as noted on photograph No. 50.



Photograph No. 50

Area 4



This is the lower area of the southern elevation of the chancel roof, a general view of which is shown on photograph No. 51. This has the detail of the laths and the battens being fixed to the top of the rafters and the fixings of some of the laths is slightly poor at the edges. It is also evident, as noticed on the remainder, that the tiles are bedded, and this can be seen in more detail on photograph No. 52.



Photograph No. 51



Photograph No. 52

The plaster key is quite reasonable coming through the laths but there are signs that the nails fixing the battens are corroding which is splitting the timber as shown on photograph No. 53.



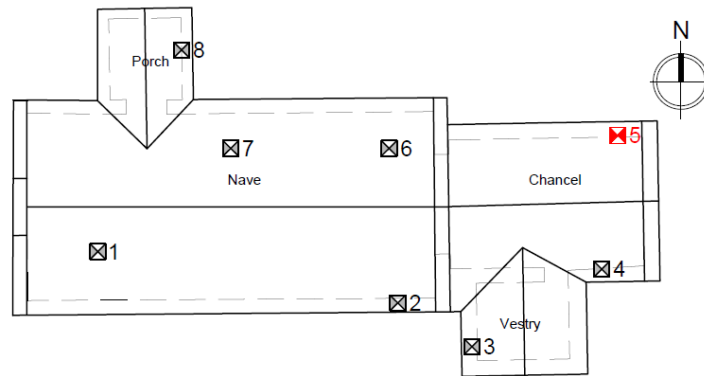
Photograph No. 53

The lower batten at eaves level isn't securely fixed and can be slightly moved and the wall head does need to be cleared out. From the eaves, looking along the roof the line of the tiles was quite reasonable and as previously noted there is an occasional cracked and damaged tile and a general view from this upper section can be seen on photograph No. 54.



Photograph No. 54

Area 5



This is to the lower section of the chancel roof on the northern elevation at the eastern end and an area was exposed at the eaves which showed that there was a similar arrangement as per the remainder of the roof. A general view of the area where it was exposed can be seen on photograph No. 55.



Photograph No. 55

What is evident is that the battens are starting to split at the nail positions and a more detailed view is shown on photograph No. 56 and then splitting of the battens with the nail on photograph No. 57.



Photograph No. 56



Photograph No. 57

It could also be seen that there was a small amount of beetle infestation to the battens and towards the lower section, there is a small area of rot where one could be removed, and the above points are shown on photograph No. 58 and 59.



Photograph No. 58



Photograph No. 59

The plaster itself would appear to have a reasonable key, however, on the lath there is a small amount of beetle infestation as shown on photograph No. 60 and again on photograph No. 61 which also shows where it has been split by the corroding nailing fixing.



Photograph No. 60



Photograph No. 61

Just above here to the main section, a further area was inspected which did show a reasonable plaster key but a similar situation and again it is clearly evident that the sequence of construction was that the rafters were constructed, then the ceiling laths put in place and then the roofing battens on top. The splitting at the end of the battens and the laths is clearly evident and this is all shown on photograph No. 62, which is a general view, and then in more detail on photograph No. 63.



Photograph No. 62



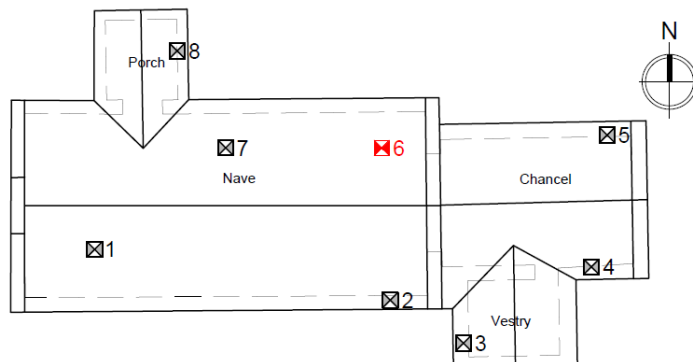
Photograph No. 63

From this position, it is possible to inspect the small flashings to the end parapet wall and it was evident that there is a degree of repointing required as shown on photograph No. 64.



Photograph No. 64

Area 6



This is the main nave roof on the northern elevation and this area is to the lower part of the eastern side and a general view of the two areas which were exposed can be seen on photograph No. 65.



Photograph No. 65

Looking along the line of the roof, looking to the west, the line of the tiles is generally quite reasonable, however, there is an occasional slight sag in the line of the tiles indicating that the battens have dropped slightly and this can be seen on photograph No. 66.



Photograph No. 66

Starting at the lower eaves section, the rafters are 100mm x 60mm at 390mm centres with the tiling batten being 25mm wide x 15mm deep at 115mm centres. The main item to note is that there is again slight splitting of the batten through the corroded nail fixing as can be appreciated on photograph No. 67.



Photograph No. 67

On the upper section, as shown on photograph No. 68, the relationship of the laths for the ceiling and the battens is similar and again there is a reasonable plaster key coming through the laths with just an occasional section having broken off and this can be seen on photograph No. 69.



Photograph No. 68



Photograph No. 69

The main item to note is that the nails are corroded on the battens, a further example being shown on photograph No. 70.



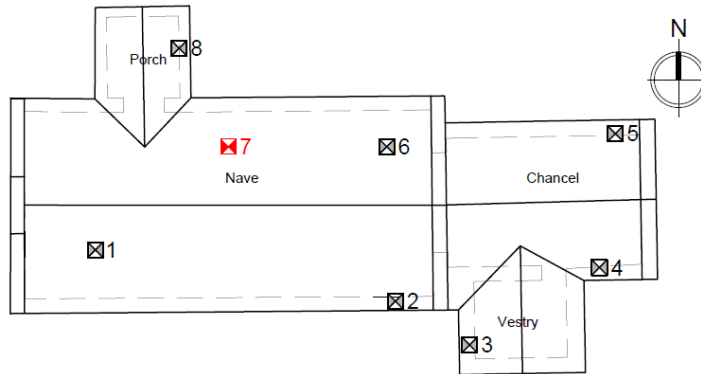
Photograph No. 70

Whilst at the eaves, it was noticeable that the guttering was full of vegetation as noted on the survey from ground level and a further record is shown on photograph No. 71.



Photograph No. 71

Area 7



This is taken to the east of the porch on the main nave roof and where the lower eaves was exposed, as shown on photograph No. 72. There is again evidence where the battens are splitting. The remainder is all as previously recorded on the other areas and this section is shown in more detail on photograph No. 73.



Photograph No. 72



Photograph No. 73

The upper area of roof which was exposed can be seen on photograph No. 74 and it was noticeable that there was moss and a small fern growth on the roof as identified on photograph No. 75.



Photograph No. 74



Photograph No. 75

The general condition of the tiles, looking along the roof in both directions, was reasonable, which is recorded on photograph No. 76 looking to the east, and photograph No. 77 looking to the west.



Photograph No. 76



Photograph No. 77

In the area exposed, as shown on photograph No. 78, there is again fern growth beneath the tiles.



Photograph No. 78

The plaster key is quite reasonable but in this instance there was slight beetle infestation in the batten and the above points are shown on photographs No. 79 and 80.

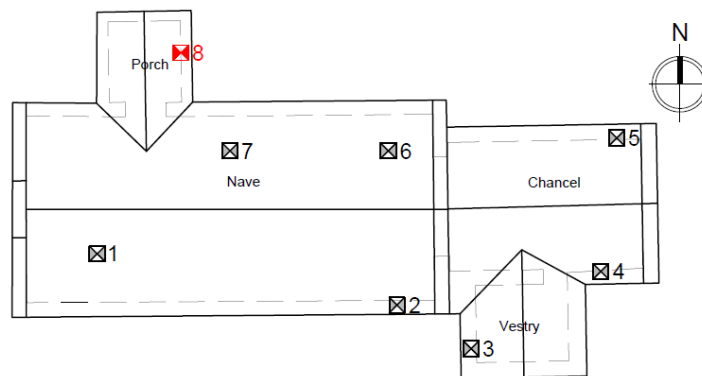


Photograph No. 79



Photograph No. 80

Area 8



This is on the eastern slope of the porch as shown on photograph No. 81.



Photograph No. 81

This is of similar construction to the main nave and the plaster key was quite reasonable and there is just very minor evidence of splitting of the battens and a more detailed view can be seen on photograph No. 82.



Photograph No. 82

Looking from this position, at the junction with the buttress, there is vegetation in the small back gutter and the main gutter itself is full of vegetative growth, these points being shown on photographs No. 83 and 84.



Photograph No. 83



Photograph No. 84

4.0. Discussions and Recommendations

The construction details of the roof are quite consistent throughout the Church, the one area of slight difference being in the vestry where there is boarding to the ceiling onto which the battens are fixed. The actual tiles, despite being 150 years old, are in reasonable condition insofar as the nibs on the back are still intact and the tiles themselves have not deteriorated.

The main issue with the roof is the battens and the fact that the nails have corroded over time. There are examples in nearly each area exposed where the corrosion of the nail has split the batten a typical example being shown in detail on photograph No. 85



Photograph No. 84

When the nails corrode, then there is an expansion which thus splits the relatively thin timber batten or lath. At present, there was no indication of major failure, however looking along the lines of the tiles, that there were small areas where the line was starting to sag slightly which is an indication that the battens have dropped

The method of construction was that the laths for the ceiling were fixed to the top of the rafters and then the roofing battens directly on top as can also be appreciated on the photograph above. This gives little gap between the underside of the tiles and the ceiling plaster. Internally, there were areas where there was a sheen to the plaster which is more than likely condensation. Condensation, in simple terms, occurs when warm moist air hits a cold surface and returns to a liquid state and with there being a lack of gap between the ceiling and the underside of the tiles, there is no insulation and very little airflow, hence condensation is likely to occur.

The actual key of the plaster in the areas inspected, was quite reasonable, although it is appreciated that internally, small areas have dropped. However, there was no indication that there will be wholesale failure of the ceiling plaster at this time. Due to the fact that there has been localised areas of failed plaster and the laths have the same issue as the roofing battens in that often the ends have split, then providing a protective netting, which can be a relatively fine mesh, on the underside of the rafters internally would be prudent.

The actual roof structure internally when viewed from floor level, showed no major signs of failure. Externally, the rooflines were quite satisfactory for a building of this age as there were no major undulations.

It is considered that should the timbers be failing, there would be a noticeable sag or undulations in the roof lines, which is not the case, as can be identified in the survey section when looking from the eaves level.

In terms of timescale for major roofing works, the main issue will be the battens and therefore the recommendation will be that the roof will need re-covering within the next 5 years. In the interim period, carrying out regular maintenance would be recommended, and it has been noted that this is already being carried out noting that flashings have recently been replaced.

In the first instance, a small contract to ensure that all flashings are well pointed to the stonework and also that where there are small back gutters and valleys, these are completely cleared of vegetation. The vegetation traps moisture which can then ingress through the tiles and as noted with the plaster being directly behind, this can lead to problems and issues of plaster failure.

There is quite a large covering of moss over areas of the roof which again would be better removed as it is felt that this again holds moisture on the tiles which can lead to an accelerated deterioration of the tile itself. In the immediate short term, the most pressing matter is to make sure that the gutters are all fully cleared so that the water can adequately discharge, and this includes making sure that downpipes and gulleys also fully function.

If rainwater, during heavy storms, starts to overspill, then this will sit on the wall head and cause rot to the wall plate and the ends of the rafters. The timbers generally showed no major signs of distress, however, there were small areas where beetle infestation (woodworm) was noted. These areas were not considered excessive and often this is induced where there is slight softening of the timbers through damp ingress. Generally, the laths and tile battens didn't show extensive damage with only small areas where the ceiling lath had small holes indicating beetle damage. Where this was identified, then the wall plate was still functioning, therefore it is not considered that immediate intervention is required but during the re-roofing works, then allowance for some minor areas of timber replacement would be prudent.

In planning any scheme of re-covering, it should be appreciated that due to the close relationship of the roof battens and the ceiling laths, with the former often being on top of the latter, that the ceiling will most likely be lost during the works. Removing the roofing battens and corroded fixings will cause significant vibration through the timber causing a disturbance to the plaster. In the reinstatement then this will provide an opportunity of including insulation, suitable roofing felt and air gaps.

On the roof, in any longer term proposed works, it is felt that a large percentage of the tiles could be reused as these are in a reasonable condition. At this stage, it is felt that potentially 75% could be reused as long as there is care taken in their removal and subsequent storage.

Overall, the recommendation is that in the short term a small contract is let to clear all the back gutters, main gutters and to check and point the flashings, along with replacing the missing tiles, there being a few noted on the ridge.

When accessing these tiles, then great care should be taken on the methodology as often, using crawler ladders etc, can in fact cause further damage to the tiles and therefore suitable protection should be used so that this does not occur.

Following this initial work then the recommendation is that, until the roof is recovered, a roofer inspect twice a year to replace any missing or slipped tiles and again ensuring that gutters are all clear. This will aid the longevity of the roof in this interim period before a major phase of re-roofing is carried out. During these works, the condition of the tiles can be monitored and most especially the batten slip.

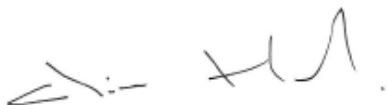
5.0. Conclusions

The roof tiles themselves on the Church are in fact in quite a reasonable condition and the issue moving forward is in fact the condition of the battens. The fixing of the battens to the rafters is with a small nail and this over time has corroded and thus expanded which has split the batten which is relatively thin. The concern in the longer term is that this continues, and the battens start to slip. There are localised areas where this can be identified along the roof where there is minor slump in the line of the tiles, that being said the actual lines of the roof structure and ridge are in fact quite reasonable.

From the internal survey from the floor level, the roof timbers and trusses are all working quite adequately and the fact that the majority of the tiles are intact has provided good protection to these timbers. The loss of plaster in some areas is due to the laths being fixed on top of the rafters directly on top of which are fixed the roof battens. Therefore, the underside of the roof is immediately adjacent to the top of the ceiling plaster. This will lead to condensation where warm air will hit a cold surface from the uninsulated roof and thus this over a longer term can cause deterioration. Also, where there are areas of vegetation on the roof this will induce damp and as the ceiling plaster is immediately underneath and thus will be affected. It is therefore recommended that, as there have already been small areas of plaster falling and despite the fact that in the majority of the areas inspected, the plaster key was in fact quite reasonable, that a fine mesh is placed on the undersides of the rafters to protect the congregation below.

On the roof covering itself, it should be programmed that it is re-covered in the next 5 years where it would be hoped that some 75% of the tiles could be reutilised as these are all quite reasonable. In the interim period, ensuring that the roof covering is fully intact to protect the timbers below and the gutters are cleared, is strongly recommended. This work should include regular clearance of the small back gutters behind buttresses at the porch roof junction, the valley with the vestry roof and also removal of the moss and small fern growths.

Overall, for a roof of some 150 years, it has been maintained and is in quite a reasonable condition but it is felt that the battens and the laths for the plaster are coming to the end of their serviceable life and hence in the relatively short term, will need replacement. During replacement, there has been identified some small areas of beetle infestation to the timbers but overall, it would be expected that there would only be localised repairs that are required.



.....
Clive Haywood

B.Eng(Hons), C.Eng., M.I.Struct.E.
Conservation Accredited Engineer

Dated: 23rd December 2020