ADDENDUM REPORT ON THE CONDITION OF THE SURVIVING STRUCTURAL FABRIC FOLLOWING THE FIRE

(POST INVESTIGATION)

ST PETER'S CHURCH ROPLEY

FOR THE ROPLEY PAROCHIAL CHURCH COUNCIL

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1.00 INTRODUCTION

Andrew Waring Associates were further commissioned by Andy Bonner of the Ropley PCC to visit site and report upon the condition of the structural fabric surviving the catastrophic fire of 19th June 2014. This report follows an initial assessment and report made by us in March 2015.

This report followed full clearance of the fire debris from the building, making safe of the remaining fabric, short term weather-protection of some elements, removal of the bells and opening up works to examine the fabric.

The following elements were exposed, investigated and examined during an assessment made during the 9th-14th October 2015,

1. The building foundations.
2. The detailed condition of the walls of the building.
3. The floor.
4. The Bell Tower

The purpose of the investigation was to determine;

1. How and/or if the surviving elements of the structural fabric might be incorporated into the re-built Church and,
2. Determine if and what are the constraints identified upon so doing, brought about by the size or condition of each element.

Site visits were made by us on alternate days throughout the investigation period to examine the fabric. Records of those visits in the form of photographs taken at the time are appended throughout this report, for information and reference. On the remaining days the site was visited and supervised by the project Architect.

At the same time as the opening-up works were conducted, Wessex Archaeology carried out a recording/watching brief, and have also produced a record report of their findings. They have also recorded an historical perspective of the likely development of the fabric which is useful back ground reading on page 2 of their report.

2.00 BACKGROUND

The fire led to the loss of the entire roof of the Church and resulted in significant damage to the bell tower.

The cleaning up operation has seen the removal of remaining unsafe sections of the roof structure and all the debris from within the Church.

Subsequent works have seen work undertaken to secure the site and protect wall heads from the weather as far as possible without constructing a temporary roof over the fabric.

3.00 INSPECTION AND FINDINGS

The structural fabric of the Church was inspected both externally and internally. It is proposed to describe each element of the fabric individually, in the following order;

3.1 - West Wall – Nave Section

View Of Nave Section of the West Wall

The West wall was further examined by excavating a hand dug trial pit internally - test pit 8 and externally – test pit 6. The foundations of the building were exposed and recorded and the underlying strata were assessed.

Also, the wall construction was exposed, again both internally and externally.

The foundation to this wall revealed a flint base internally in the south-west, and a concrete footing externally at this point. It is clear that the west elevation has been re-faced in the past, and the corner buttress added, suggested to be during the Victorian extension and re-modelling when the brick and flint faced walling of the north extension was also built. The outer face of the earlier nave was over skinned, being built off a concrete footing.

The west wall construction above the slab was investigated. The wall was visually identified as having been damaged by the fire, more probably by the sudden quenching of the extinguishing of the fire in fact, which has caused visible widespread and fracturing of the embedded flint and exfoliation of the cob matrix at the surface. Cracks in larger flints were found to be of 150mm depth into the wall, and cob in the region of 50mm deep was found to be very friable.

Further examination at height and opening up of the wall over an extensive area confirmed that this fracture damage to the flint and friable failure of the cob matrix is virtually the full surface area of the nave west wall has been affected.

View of Fractured Flint in West Wall

A hole was completely excavated through the wall to examine the interface of the later Victorian flint facing externally. This was in fact confirmed as a facing, and found to be solely of flint, no evidence of ferrous tying was found to the original gable wall. The overall wall thickness, including the Victorian flint facade was found to be in the order of 850mm.

3.2 - West Wall – Aisle Section

View Of Aisle Section of the West Wall

The aisle section of the West wall was further examined by excavating a hand dug trial pit internally - test pit 9, and externally – test pit 7. The foundations of the building were exposed and recorded and the underlying strata were assessed.

The foundation to this wall revealed a concrete footing, bearing into chalk but the depth of which could not be fully determined due to the presence of fractured and disturbed human remains.

The wall construction above the slab was investigated and confirmed as clay brickwork with an external flint facing, and this has largely survived the effects of the fire intact, without significant structural damage.

The internal decorative hard plaster had detached as a result and this has been removed.

The wall appears to be able to be preserved in the fabric of any new proposal, subject to the applied load and resulting foundation pressures.

3.3 - South Wall – Western Section

The western section south wall foundation was exposed and examined internally in test pit 8. The findings were similar to the west wall as described above, and this can be described as a flint base, reasonably well founded in chalk.

View of Western Lower Section of South Wall

The south wall was visually observed to be damaged by fire in a similar manner as the west wall; cracking in the flint and widespread friable cob matrix damage. This was investigated in

a similar fashion to the west wall by opening up and exposing the flints to approximately 300mm depth. Cracked flints were found and the cob matrix friable to 50-75mm depth.

It was concluded immediately after this stage of the investigation that the wall surface on the south and west walls would have to be repaired, since the cracked flint and unstable surface are considered unsatisfactory.

The extent and depth of the cracked flint would in my opinion make the wall structurally unstable, the strength of the wall being reduced by at best 150mm and at worst 225mm depth – thus rendering it 40% weakened.

The friable cob matrix damage will also lead to gradual wall decay/erosion if left, and the inability to apply any decorative surface to a satisfactory standard would be unsatisfactory

A decision was made at this point to try and determine a repair strategy for the wall face and to then test this it insitu. A variety of attempts were made to install a stainless steel twisted wire tie into the cob matrix, expecting that this would be satisfactorily anchored to resist a pull out load, so that a new flint and cob facing might be bonded to the unaffected core of the wall.

Driving the tie into the cob was un-successful. Drilling a pilot hole was successful after four attempts, and applying a resin grout into the hole allowed the twisted wire to be adequately anchored,. The wire tie resisted a pull out load in the order of 40kg and when a suitable safety factor was applied this would be adequate.

Photograph of Wire Tie and Pull Out Test

Clearly, the success or otherwise of such a installation does rely upon being able to drill a pilot hole through the random flint/cob matrix, but it is considered possible that this could be achieved in any process of repair, however this is of course assuming that the wall fabric is as found in the opened up[locations which may not of course be widespread.

The fact that the actual position of such ties is not critical, either visually or from an engineering perspective suggests that it could be successful as a strategy. This would enable the wall to be repaired and successfully utilised in retention of this element of the fabric in any proposed re-construction.

The foundation and wall is considered adequate to re-support future loads with the proviso that the magnitude of such loads and method and location of application does not change significantly.

In my opinion therefore, if the wall fabric generally is as found in the opening up holes, it is possible that the west and south nave wall could be repaired and retained. If the fabric of the cob is however found to be unable to accept a tie, and a pull out test, an alternative solution will need to be found.

3.4 - North Wall

The north wall is composed of two distinct sections, the western Victorian part and the earlier eastern Chapel wall. The methods of construction are, as one might expect, totally different. The Victorian section is of brick, faced externally with flint, and the earlier section of flint and stone rubble.

Photograph of Eastern Section of North Wall

There are elements of brick where a window has been infilled and the height of the wall raised as part of the Victorian re-modelling.

The wall has been affected to a much lesser extent by the fire. Damage has been restricted to plaster becoming loosened which has since detached.

Foundations to the wall were exposed in test pits 1 – externally on the eastern end and 9 internally. Opportunities for more extensive exposure were restricted by a grave mid-length and a lean to structure nearer the eastern end.

However, on the Victorian wall section, the concrete footing similar to that found on the south wall in pit 7 was again confirmed as being of concrete, extending to some depth, but the full extent could not be confirmed due to the presence of disturbed human remains.

The foundation and wall is considered adequate to re-support future loads with the proviso that the magnitude of such loads and method and location of application does not change significantly.

3.5 - East Wall

Photograph Of Part of The East Wall

The East wall foundations were exposed in pit 2 externally to the north, and mid length externally in pit 3. In both cases the wall was founded directly on chalk strata at some depth. This area of the church fabric was dug into the site and hence the competent soils have been used as a founding material

The wall has not been affected by any significant extent by the fire; however the wall is in poor condition, having a distinct outwards eastern lean.

Photograph Of External Face of Eastern Vestry Wall

3.6 - Eastern Section of South Wall

The south east corner buttresses and 13th century eastern section of the south wall are both in very poor condition, expressing vertical and lateral distortions and significant out of plumbness. The wall was measured as being 350mm out of plumb at the old eaves level. The foundations to the corner buttress were exposed in pit 5 and found to be founded on silt. Test pit 4 exposed the south wall base which was found to be supported on a silty clay. Both foundations are shallow and fully account for the historic distortions and current movements demonstrated in the upper wall sections.

It is clear that the wall and foundation cannot be relied upon to support with any confidence at all, any new fabric, and this section should be carefully taken down and rebuilt on a reliable footing. Underpinning of the wall would involve a significantly greater excavation and result in solving only part of the structural problem of this section of the building. The

out of plumbness is considered significant and such that any future roof load that is re-applied would require support independent of the existing wall fabric.

View Of The East Section of the South Wall

View of The East Section of South Wall Externally – Showing Out of Plumbness

3.7 - The Tower

The upper sections of the tower suffered extensively in the fire, resulting in destruction of the bell frame and damage to the bell mechanisms. The upper timber framework is also very extensively damaged and the roof collapsed. The mid-section timber framing is very badly damaged, particularly around the beam to post and brace to post junction where the strength of the fire has penetrated the joint faces.

The foundations to the tower were exposed in pit 4 and were found to be of concrete at depth formed in the reliable chalk.

Investigation of the stonework and flint cob of the lower section of the tower revealed that this had in fact been protected by the thick oak nave to tower door, which has clearly offered a delaying effect upon the damaging effects of the nave fire.

In my opinion the base of the tower is likely to be able to be incorporated into the proposed new building, and is likely to be able to support new upper sections and bell frames, subject of course to an assessment of bells a, positioning and bell frame.

In my opinion the timber elements of the upper tower cannot be relied upon to form a safe structure and should be carefully taken down. Some observations have been expressed that the timbers may be able to be re-milled and re-used, but fire damage into the joints will make this highly improbable and impractical.

3.8 - Nave North Aisle – Western End

Photograph of Nave North Aisle Pillars

The north aisle nave arches and pillars are constructed of natural stone and have been very badly affected by the fire. In my view they are sited very near the probable seat of the fire and given their slender dimensions were heated to elevated temperatures and cooled in reverse equally comparatively rapidly. The stones are universally damaged by cracking.

The extent of the visual cracking in all of the the pillars was probed and found to be quite extensive, in some cases 170mm deep and much of the surfaces exfoliated in quite thick slabs in the order of 30-40mm thick.

Photograph of Pillar Damage

The arches above the pillars are formed in a natural stone voussoir with brick above. The arches have been extensively damaged, with significant spalling being apparent in all cases.

In my opinion these arches and pillars cannot be relied upon in any way and are considered to be almost of a dangerous nature in their current condition. I do not consider that they can be repaired insitu or refaced. In my opinion they should be carefully taken down.

It is possible that any new proposal may wish to improve upon sight lines, this being a current relevant topic in modern ecclesiastical buildings, and it may prove possible to span this aisle with a single girder as an alternative, given that the span is supporting roof load only and in the region of 12m.

3.9 - Chancel Arch

Photograph of Chancel Arch – North Side

The chancel arch has been significantly damaged by the fire which has caused extensive spalling, penetrating such that not only the decorative surfaces have been damaged, but the integrity of the arch and the base corbel support too.

The brick support buttress and pillar on the north side are however less affected, due partly to its bulk and the fact that brick and protective plaster have not been adversely affected.

However there is some minor evidence, expressed as cracking in the inner faces of the pillar, that the chancel arch thrusts may be currently causing rotational movement of the support column northwards.

In my opinion the arch and support pillar requires a very significant amount of repair work, both to the stone quoins and brickwork.

It is unlikely that this repair work can be carried out insitu and dismantling significant sections of the arch and pillar will be required to make a successful and meaningful robust repair of this part of the fabric.

3.10 - Chancel Aisle

Photograph of the Chancel Aisle Pillars and Arches

The chancel aisle pillars are of rendered/plastered brick. The pillar elements of the aisle appear intact and to have not been significantly affected by the effects of the fire, the plaster whilst damaged by cracking has afforded some shielding.

However the brick arches have been adversely affected by the intensity of the fire; presumably because of their closer proximity to the roof structure. The intensity of the heat has caused the plaster to blow on the arch faces and soffite, and the brickwork has been damaged on the exposed surfaces throughout. There is a significant fracture at the crown of the most eastern arch which clearly passes all the way through the arch thickness.

It is clear that the structural integrity of the arches have been adversely affected.

Given that the nave aisle arches, the chancel arch and the chancel aisle arches have been adversely affected by the fire and their structural integrity required significant repair, there is clearly a significant question to be considered regarding their overall relationship and mutual support during any repair strategy. The individual arch thrusts will need to be considered during any repair process and the out of balance forces will require extension temporary vertical, lateral and tying support.

This must be considered in the re-construction process otherwise there may be adverse resulting forces imposed on the west and east walls.

3.11 - Floor

The floor to the building was examined by trial holes 10,12 and 13. The floor was found to be ground bearing with a number of below floor features which do not appear to have affected adversely the performance or integrity of the surface. Notably there is a damp proof bitumen membrane beneath the parquet.

The floor appears to be stable structurally, albeit that in some patches there has been scorching and wetting damage.

In my opinion the floor can remain and be re-used if required.

3.12 - External Fabric Faces

The external elevations are of flint work throughout, with a mixture of stone and brickwork quoins. There is a marked difference in the quality of the flint work on the original fabric and the later additions and facings; particularly the eastern end of the north aisle wall and gable return in the north-east corner.

In general terms however, the external wall faces have not been damaged by the fire, with the exception of disruption to masonry at eaves plate level (where this disruption is very localised) and the upper parts of the tower of course.

DISCUSSION

In the course of the fire, there were clearly elevated temperatures in the building and the affects of this are clear to see. The roof was totally destroyed and there is widespread spalling of stonework, both structural and decorative.

In addition to smoke damage, plaster finishes have been lost from the walls over a significant area.

There is very widespread spalling of stonework, particularly the more slender constructions, exposed on all or three sides where the temperature increase would be most rapid and most

significant and these areas will prove very challenging indeed to effect an insitu repair which retains any original fabric. There will also be extensive temporary support required to safely execute this type of work, particularly on the aisle arches.

Those walls that are of brickwork construction have survived in the best condition due, in part, to the fact that they are at the building's northern side and not where the fire was at its hottest.

The walls, as one would expect, given the age of building, are generally of significant width and solid construction. The nave west gable and the western section of the southern wall require significant repair in order to be retained. A repair strategy for the damaged flint cob areas has been derived and tested insitu in limited areas and found to be effective, but this is highly dependent upon finding similar conditions throughout the wall that were found in the test repair areas, which cannot of course be guaranteed or predicted until the work commences.

If this repair technique is utilised the work will be slow to complete, since it must be undertaken in discrete small sections, no more than 1.5m long and 1.0m high. This work will be restricted by lime hydration periods during successive lifts and will therefore be slow.

The most significantly affected fabric is the north aisle arcade and chancel arch; the stonework to the main load-bearing elements is extensively spalled and discoloured by the temperature of the fire.

These elements will be extremely difficult to repair in-situ requiring extensive temporary works, and little of the original fabric would be retained. Given the scale of damage, these elements would, in my view, most sensibly need to be re-built in their entirety.

There is no evidence of structural movement of the main walls generally, with the exception of the south vestry wall and the building generally appears to be well founded.

SIGNED: …….

NIGEL CHALLIS B.Eng.C.Eng. MIStructE

DATE: ……