



Old Sarum Airfield

Hanger 3 structural survey report

Project no. 1455

Document no. 1455-INT-ZZ-ZZ-RP-S-0001

Revision

Date	Suitability	Revision	Comments
03.09.2025	S2	P01	First Issue

Quality Assurance Review

Prepared by: Chris Gross

MEng (Hons) MPhil PhD CEng MICE
Conservation Accredited Engineer
Director



Reviewed by: Margaret Cooke

BSc (Hons) CEng MIStructE
Conservation Accredited Engineer
Senior Consultant and Founder



Date: 01 September 2025

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Integral Engineering Design

84 Walcot Street Bath
BA1 5BD
01225 859 657

3.10 Clerkenwell Workshops 27/31 Clerkenwell Close London
EC1R 0AT
020 7096 0278

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1.0 Introduction

Integral Engineering Design have undertaken a structural survey of the masonry walls of Hanger 3 at Old Sarum Airfield following a fire in April 2025. This report details the structural damage and concludes that it should be possible to reconstruct the hanger. This conclusion will need to be verified by further detailed investigations and detailed design.

2.0 Our brief

Integral Engineering Design were instructed by Grenville Hodge of Old Sarum Airfield Ltd to undertake a structural survey of Hanger 3 at Old Sarum Airfield and advise on the feasibility of reconstructing the hanger following a fire on April 2025. Our brief was limited to visual structural inspection of accessible areas and we have not undertaken any intrusive inspection of the building fabric.

3.0 Inspection/investigations

Integral first visited the site on 6th June 2025 before the site had been cleared of fire debris. The site has now been cleared of debris and temporary support scaffolds erected to provide support to the external elevations as recommended following 6th June inspection. (See Appendix A for the recommendations of our 6th of June visit). The second survey visit took place on 20th August 2025. The weather was overcast with a moderate wind.

With the debris cleared and support in place it has now been possible to inspect all of the load bearing masonry walls. The load bearing masonry walls are the only parts of the structure standing following the fire in April 2025. The timber Belfast truss roof and sliding doors were destroyed during the fire.

The load bearing masonry walls were inspected from ground level. The inside faces of the northern and southern external walls were also inspected from the access walkways on the temporary support scaffolding. There were two access levels, one approximately 3m above internal floor level and one approximately 5m above internal floor level. The walls inspected are highlighted in Figure 1.

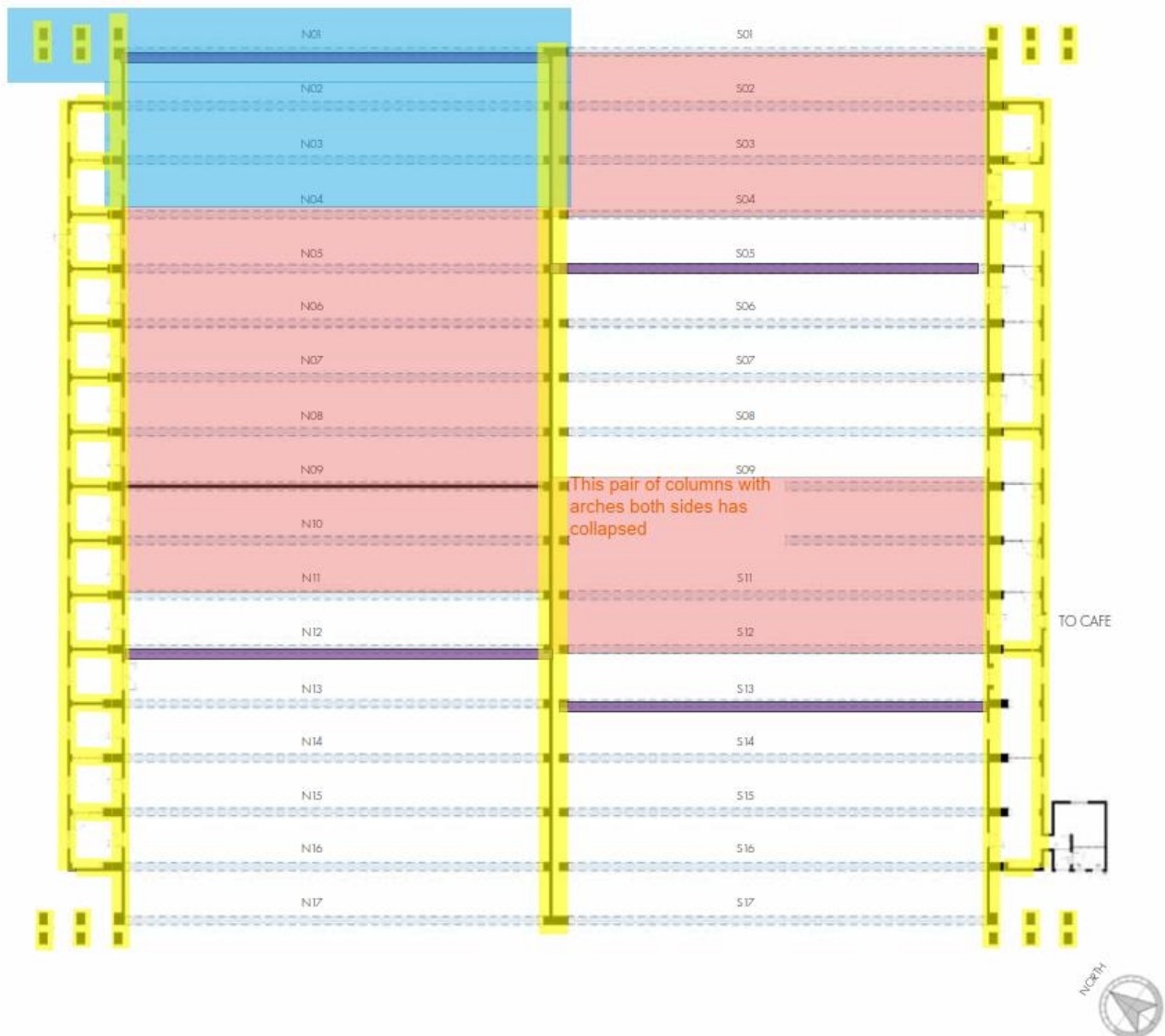


Figure 1 Plan showing structural walls surveyed highlighted in yellow

4.0 General description of building

Hanger 3 is Grade II* listed. The listing includes another double bay hanger (Hanger 1) and a single bay hanger (Hanger 2) on the same site. The hangers are currently on the Historic England Heritage at Risk register. Hanger 3 was constructed in 1918 to a standardised design that was developed in 1917 for use at airfields across the UK.

As originally constructed the hanger had brick masonry external east and west elevations and a central line of brick masonry piers supporting the two roof truss spans. The roof trusses were timber Belfast trusses. Brick buttresses provided support to the truss bearings on the external walls. The external walls between the buttresses are half brick thick masonry panels with large windows at high level between the buttresses. At the northern and southern ends the hanger had large sliding doors which ran on tracks supported by brick masonry piers at the end of each elevation. Along the eastern and western elevations there were a series of small single storey rooms. These rooms have been added to over the history of the building and the connection to the main hanger space altered. It is not known when these alterations took place.

Following deterioration over a number of years and storm damage in January 2024 19 of the 34 roof trusses had collapsed. Other areas of roof were being supported with temporary scaffolding. The north western door support masonry piers had collapsed along with the northern end of the western elevation as had a number of the central masonry piers. A Fielden + Mawson report 9765 / A04 in March 2024 concluded that only three of the remaining roof trusses could be repaired and the rest would require complete replacement. Full details of the condition and truss and masonry repair required in March 2024 are detailed in the Fielden + Mawson report.

The fire in April 2025 destroyed the remaining roof trusses and their collapse, along with the collapse of the sliding doors, resulted in some further damage to the masonry walls including the collapse of the south eastern door support masonry piers and the upper part of the southern end of the western elevation.



Figure 2 Hanger viewed from north during survey inspection (August 2025)

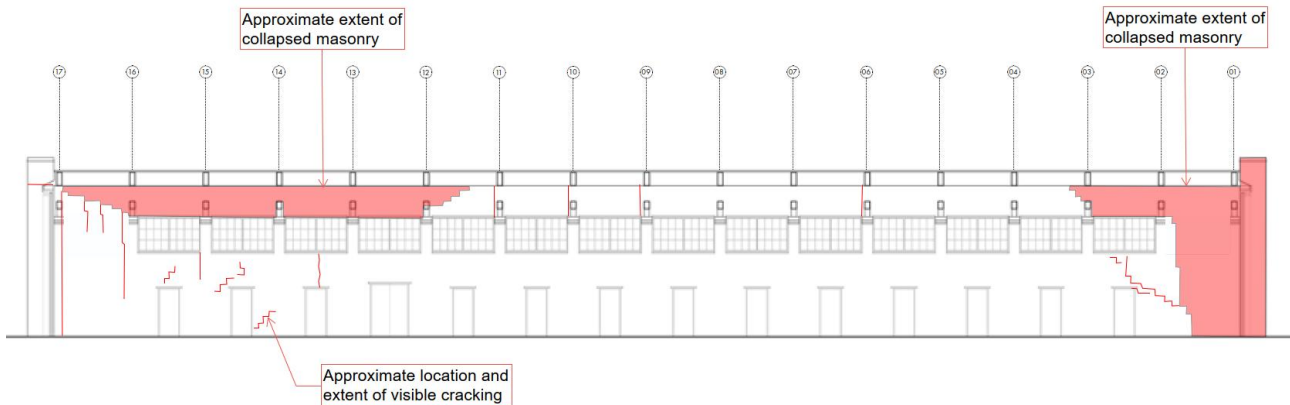


Figure 4 North western elevation viewed from inside the hanger

The condition of this elevation will be discussed beginning from the northern end (grid line 01) and progressing along the wall to the southern end.

The door support masonry piers at the northern end have collapsed. Masonry from these piers is currently stored on site. Almost the entire wall height between GL01 and GL02 has collapsed along with the masonry panel above the high level window between GL02 and GL03. At lower level between GL02 and GL03 there is some diagonal cracking to the masonry, likely to have been caused as the door support piers and end section of the wall collapsed. The tops of the buttresses on GL02 and GL03 have collapsed above the high window head level. The top of the remaining section of buttress on GL03 is twisted on plan.



Figure 5 Wall collapse between GL01 and GL03



Figure 6 Masonry stored on site from collapsed door support piers

Between GL05 and GL07 there are several areas of brickwork above the windows that have been repaired in the past with modern brick. On the southern side of GL06 there is a vertical crack between the brick panel above the window and the brick buttress. There are similar cracks to the southern side of GL09, GL10 and GL11. At the GL11 crack the concrete lintel over the window is also cracked in this location.



Figure 7 Example of past brick repair and vertical crack between buttress and wall panel



Figure 8 Lintel crack GL11

Between GL06 and GL12 there are masonry arches in the wall at low level between the buttresses. These arches have been infilled with brick masonry and small single leaf doorways built into the infill. It is assumed that these were the original access points to the single storey rooms running along the outside of the main elevation. Between GL02 and GL06, and GL12 and GL17 conventional doorways allow access to the side rooms. These appear to have been added at a later date and are not part of the original construction.



Figure 9 Infilled arch with doorway inserted

From the midpoint between GL11 and GL12 until GL17 the top section of masonry above the high level windows has collapsed. In addition the buttresses above window head level on GL12, GL13, GL15, GL16 have collapsed. The buttress on GL14 has not collapsed but is crack through its entire section three brick courses above window cill level. The buttress at GL13 is cracked at the level of the window cill. The buttress on GL15 is cracked 4 courses and 10 course above window cill level.



Figure 10 Masonry collapse between GL11 and GL17

The concrete lintel above the window between GL11 and GL12 has dropped by one brick at the bearing on GL12. This is likely to have occurred as the wall above it collapsed and it is just by chance that the lintel ended up resting on its bearing location, but a brick lower.



Figure 11 Lintel between GL11 and GL12

The door support piers at the southern end of the western elevation are still standing. However there is some damage to these piers. It appears this damage likely occurred when the doors collapsed during the fire. At the locations of some of the major cracks the cracked surface appears to be relatively fresh and unweathered which indicates they have not been present for a significant amount of time.

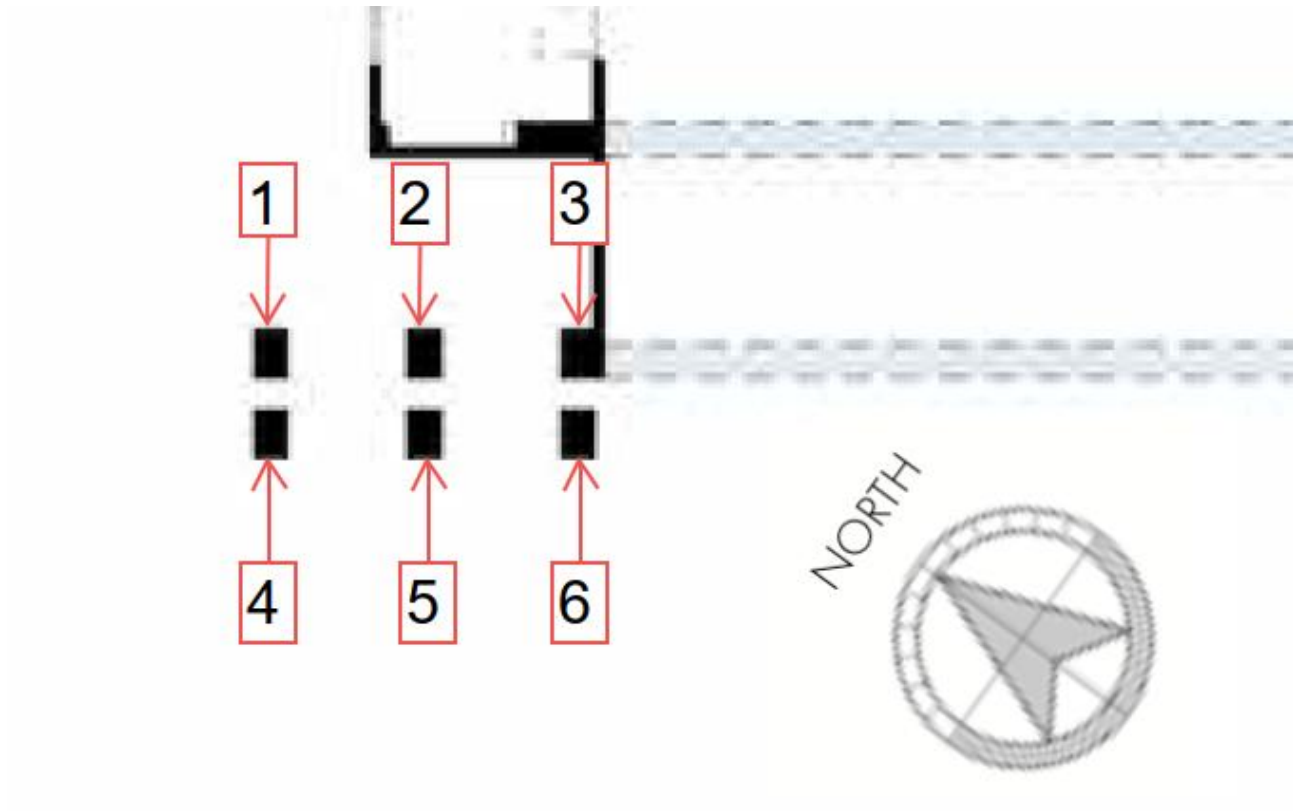


Figure 12 Plan of door support piers southern end, western elevation

There is a vertical crack running the full height of the wall between pier number 3 in Figure 12 and the main wall of the elevation to the north of the pier. Pier number 3 has rotated on plan clockwise such that the north western corner has moved to the east by 25mm. this has caused the crack observed. There are a number of cracks to the masonry arches linking the six piers at high level. There are also a number of vertical and diagonal cracks to the western elevation between GL17 and GL14. It is likely that all these cracks are a result of the doors collapsing which has pulled on the top support rails which were fixed to the door support piers.



Figure 13 Crack between wall panel and door support piers on GL17



Figure 14 Rotation of pier 3



Figure 15 Cracking to the top of door support piers and connecting arches

Unless specifically mentioned above concrete lintels appear to be in reasonable condition. All timber lintels over the doorways into the side rooms have been burnt by the fire and will require replacement.



Figure 16 Example of fire damaged timber lintel

The condition of this elevation will be discussed beginning from the northern end (grid line 01) and progress along the wall to the southern end.

The door support piers at the northern end are standing and appear generally to be in reasonable condition. There are some minor cracks to the arches between piers and at approximately three quarters of the way up the north western pier. The collapse of the sliding doors in January 2024 appears to have caused little damage to these piers.



Figure 19 Cracking to northern door support piers



Figure 20 Cracking to northern door support piers

Between GL01 and GL 02 there is evidence of past repairs. The lower half of the wall panel appears to have been rebuilt in the past. Whilst the rebuilt brickwork appears to be in good condition there is vertical cracking between the rebuilt section and the piers of GL01 and GL02 where the new brick is not well bonded to the original. At high level there are some minor diagonal cracks. There is a historic vertical crack between the high level wall panel and the pier on GL02 which has been repaired with mortar in the past but is now opening up again.



Figure 21 Wall panel between GL01 and GL02 with rebuild section at lower level viewed from south east (outside hanger)



Figure 22 High level cracking between GL01 and GL02 including historic repaired cracks

Between GL06 and GL07 the doorway into the single storey side room has been infilled in the past with brickwork. The concrete lintel remains in place. At high level there is a diagonal crack in the panel above the high level window. The brickwork below the high level window lintel on GL06 has cracking.

On GL07 to GL15 there are vertical cracks between the high level masonry panels above the windows and the buttresses there are likely to have been caused by thermal expansion and contraction of the very long elevation over decades. The elevation at this level would have been in direct sunlight for much of the day as it is above the side room roof level and the minimal overhang from the main roof would have given little or no shading to this wall.

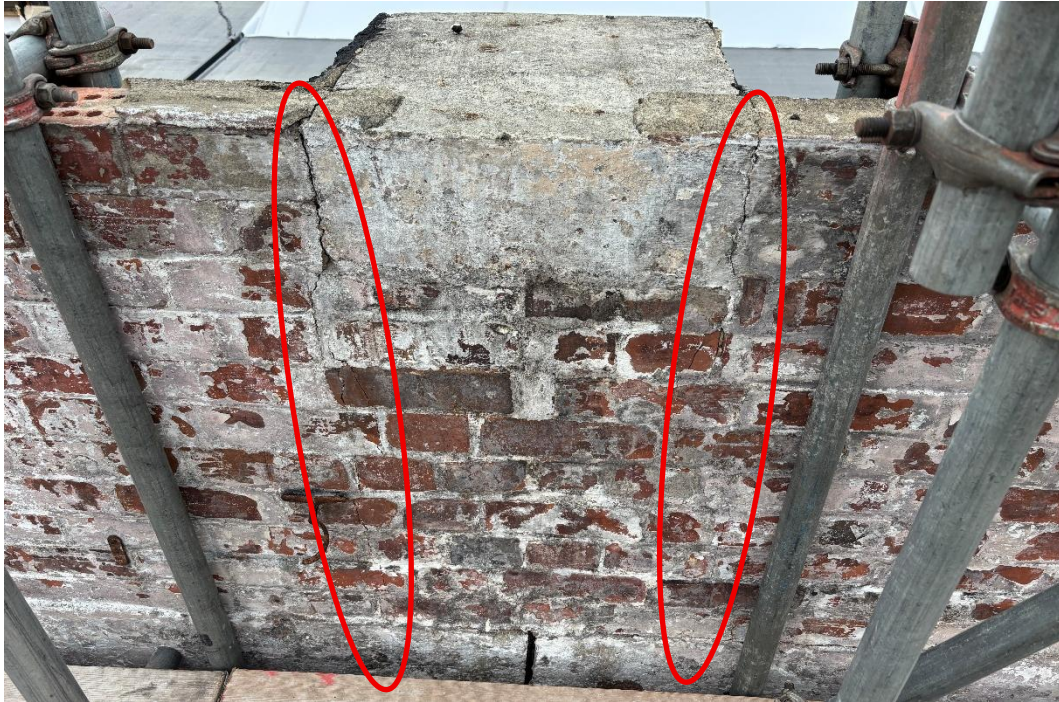


Figure 23 Example of cracking between high level masonry panels and buttresses

Between GL07 and GL08 there is some damage to the concrete lintel over the door opening into the side room. There is a small area of brick missing at low level adjacent the door opening. There is a circular opening through the wall at door lintel height which has some minor cracking around it.

Between GL08 and GL09 there is a diagonal crack above the door lintel which extends horizontally across at door lintel height to the door between GL09 and GL10. The door between GL09 and GL10 has been infilled with masonry in the past. The crack then extends diagonally from the blocked doorway towards the ground at GL10. The doorway between GL10 and GL11 has been infilled with masonry in the past

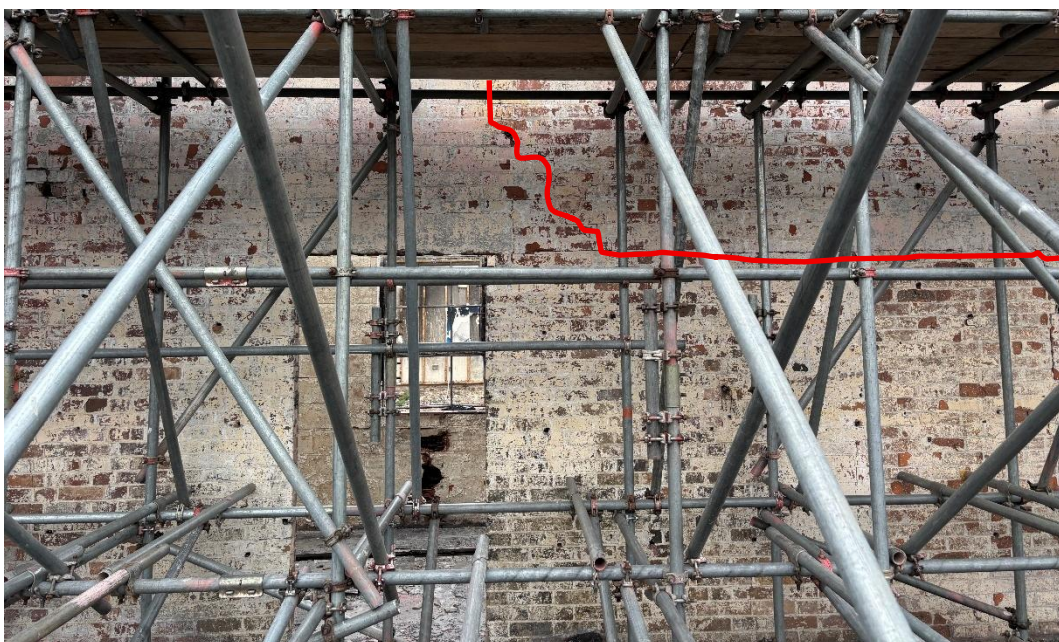


Figure 24 Cracking between GL08 and GL10

At the high level windows the concrete lintels that bear onto the buttress at GL11 have cracks at their bearings. The window lintel between GL12 and GL13 has significant cracks and concrete spalling to the underside with the reinforcement visible.



Figure 25 Cracking to lintel bearings GL11



Figure 26 Lintel between GL12 and GL13

Between GL12 and GL16 there are a series of diagonal and horizontal cracks to all masonry panels between the doors. In some instances these cracks extend above the door lintel height. The buttress on GL14 has a horizontal crack at approximately 1.5m above floor level. Above this height the buttress has been moved on plan towards GL15 by 20mm. The buttress on GL16 has cracked in a similar manner and moved towards GL17 by 36mm. The buttress on GL 15 doesn't appear to have moved or cracked. However given the extent of movement on GL14, GL16 and to the wall panels between GL12 and GL16 this seems unexpected. It is likely the buttress on GL15 has moved to some extent, but it was not possible to determine how during the visual survey.

All of the movement and cracking at this end of the elevation is likely to be associated with the collapse of the sliding door support piers. The piers collapsed during the fire when the sliding doors fell out of the building pulling the door tracks away from the building and consequently the masonry piers as well. As these fell away from the building it appears they also pulled with them the masonry wall between GL16 and GL17 and caused the cracking and movement in the masonry to GL12. The masonry from the collapsed door support piers is currently on site.



Figure 27 Cracking to southern end of wall (GL15 – GL17). Collapsed section of wall to right hand side of image



Figure 28 Cracking to buttress on GL16

Unless specifically mentioned above concrete lintels appear to be in reasonable condition. All timber lintels over the doorways into the side rooms have been burnt by the fire and will require replacement.

5.3 Central masonry piers

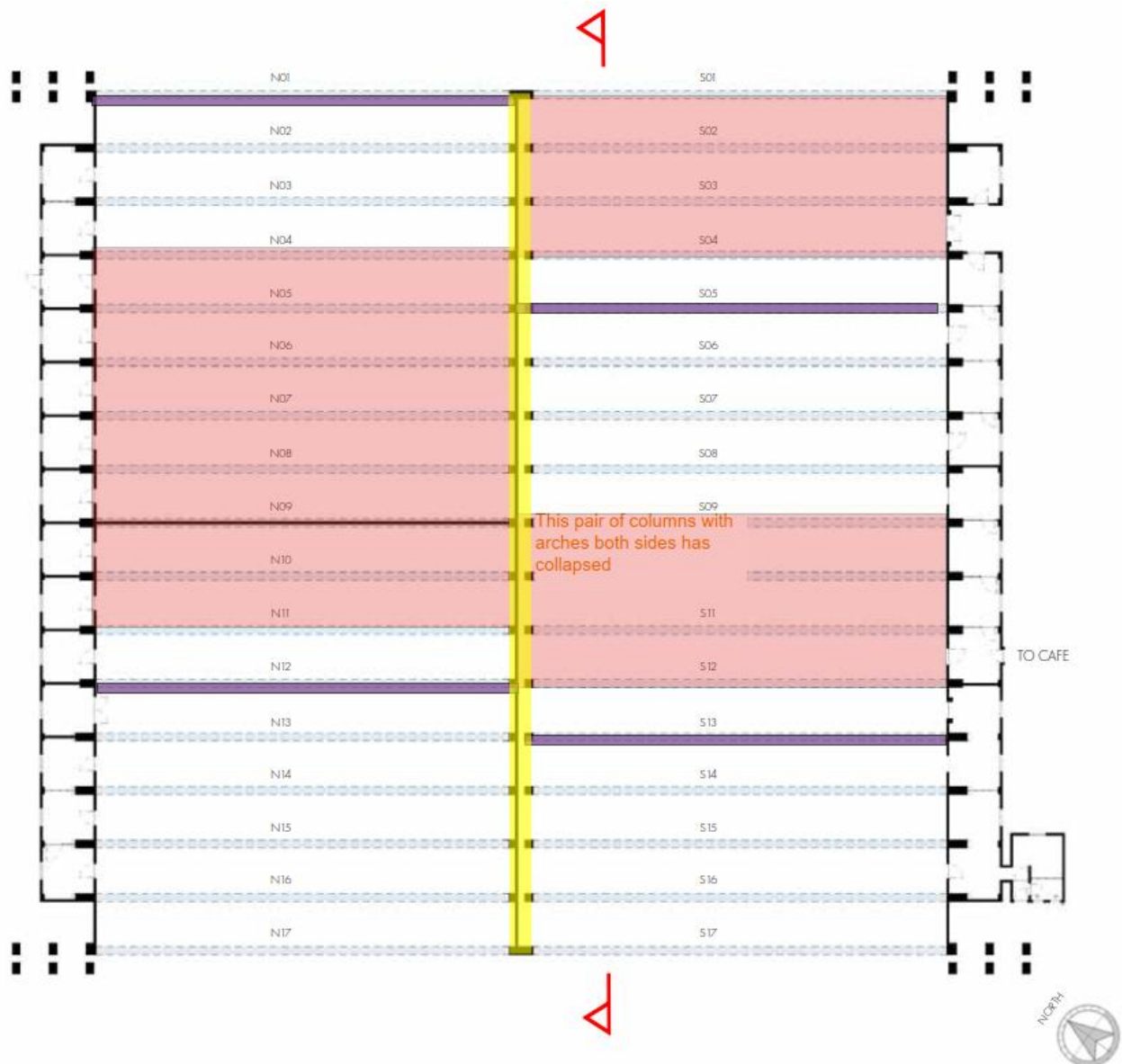


Figure 29 Plan showing central line of piers highlighted

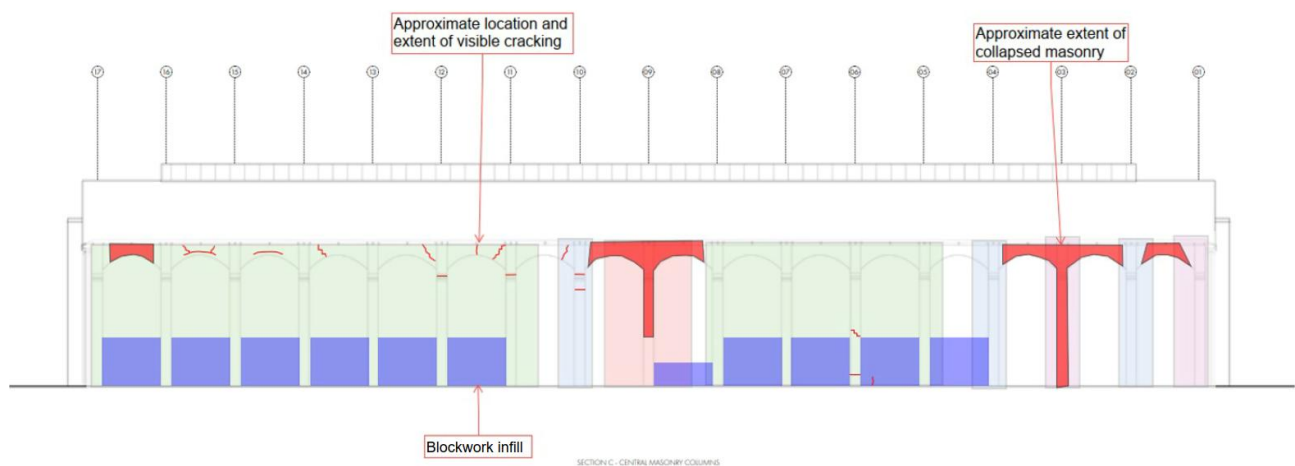


Figure 30 Elevation on central masonry piers looking north west

The condition of this masonry will be discussed beginning from the northern end (grid line 01) and progress along the wall to the southern end.

The central line of masonry support is constructed from pairs of brick piers on each grid line. The piers are joined at the top. Each pair of piers has a masonry arch spanning between, linking all of the pairs along the length of the hanger. Modern non-loadbearing blockwork panels, approximately 2.5m high have been constructed at low level between the piers on GL04 to GL17.



Figure 31 Central masonry piers looking north west

The masonry piers on GL01 and GL03 have collapsed. The arches spanning between GL01 and GL02, GL02 and GL03, GL03 and GL04 have collapsed. The masonry piers on GL02 and GL04 have cracking to the tops.



Figure 32 Collapsed pier and arches GL01 to GL04

The blockwork panel between GL05 and GL06 is damaged at its base and potentially unstable. It appears to have received an impact at its base. The scarring from the impact looks very recent and it could have been caused by a strike from the excavator being used by the clearance contractor following the fire. There is a horizontal crack to the base of the western pier on GL06 and the pier appears to have rotated slightly. The exposed mortar surface in the crack is not weathered and suggests the cracking and movement have occurred recently. It is not clear if this has happened as a result of the fire or from an impact on the adjacent blockwork panel, however the latter appears more likely as there is no blackening or fire damage to the crack surfaces.



Figure 33 Damage to blockwork panel GL05 to GL06

Between GL06 and GL08 there is some historic surface damage to the brickwork. This however is not a structural issue.

The masonry piers on GL09 have collapsed to approximately 2.3m above floor level. As a result the arches between GL08 and GL09, and GL09 and GL10 have collapsed.



Figure 34 Collapsed pier GL09

On GL10 the piers have a horizontal crack that extends through their full width at approximately two thirds their height. There is a crack to the adjacent arch between GL10 and GL11. Similar cracks are present in the piers on GL11 and the arch between GL11 and GL12. It is likely both arches will require rebuilding as the cracks are too significant to repair.

The arches between GL12 and GL16 have smaller cracks which can likely be repaired insitu. The arch between GL16 and GL17 has collapsed.



Figure 35 Cracking the arch between GL15 and GL16



Figure 36 Collapsed arch GL16 to GL17

5.4 Single storey rooms north western elevation

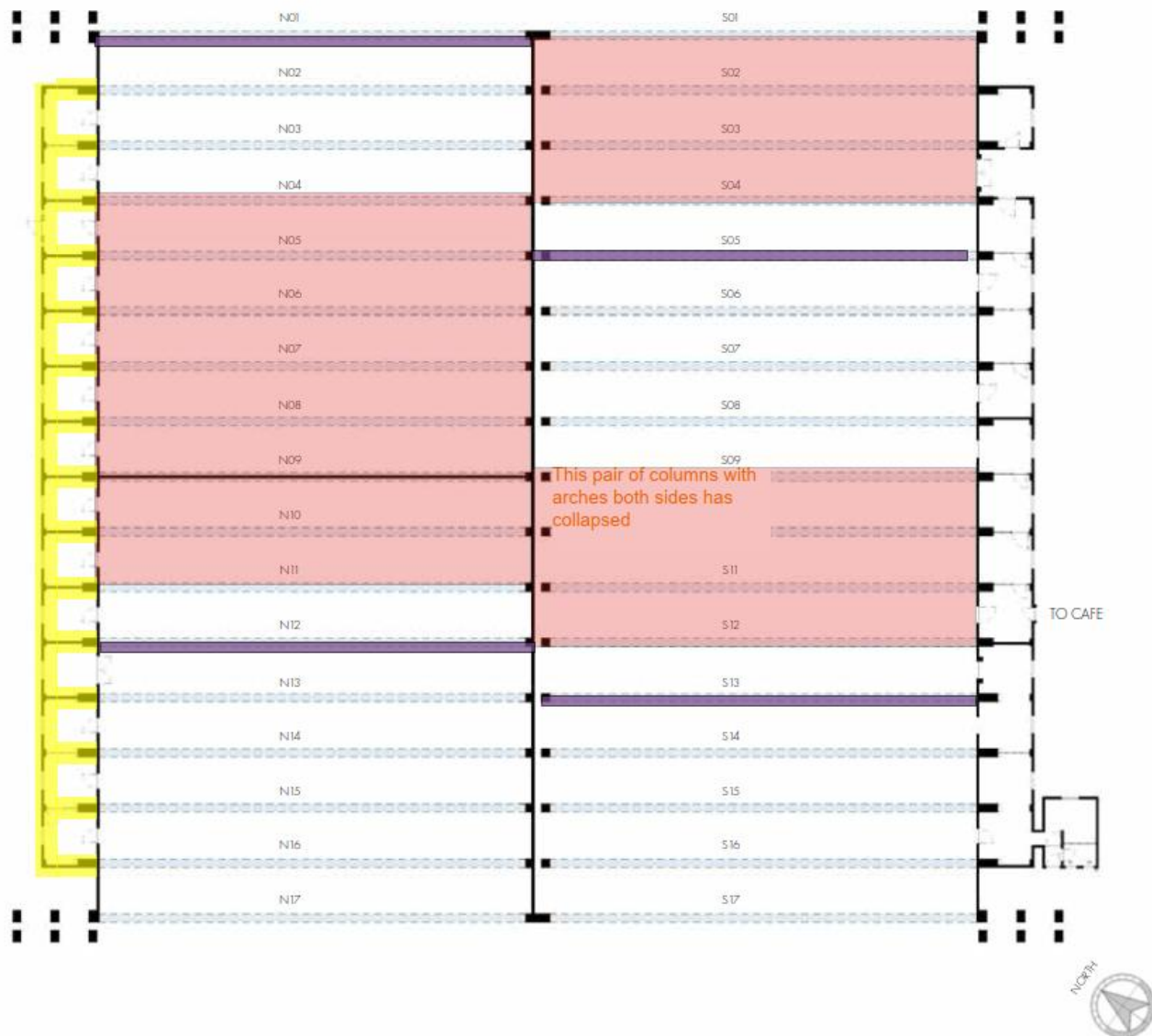


Figure 37 Plan showing north western single storey rooms highlighted

The single storey side rooms do not appear to be constructed to the same high quality as the main hanger building. There have been a number of alterations over the history of the building. The external walls appear to have originally been single skin brickwork, approximately 100mm thick. In many of the rooms a skin of concrete blockwork has been added internally to the external wall. The blockwork and original brickwork are not tied together. Consequently in many locations the two leaves are separating, in some areas very severely.



Figure 38 Example of inner blockwork and brick skin separating

It appears that many of the dividing cross walls were also later additions. They are not tied to the main hanger buttresses or to the single storey external walls, consequently they offer no lateral restraint to the external elevation of the single storey area. There is cracking between the majority of the cross walls and the external wall. Similar cracks exist at the buttresses.



Figure 39 Dividing wall separating from external wall



Figure 40 Dividing wall separating from buttress

Along the central section of the single storey rooms between GL06 and GL13 the external wall is leaning out away from the main hanger. At the worst location the lean is approximately 20mm over the full height of the wall. Provided the wall had sufficient restraint this may be deemed structurally acceptable. This is based on the assumption that the structural element of the wall is the original brickwork only and the inner leaf has no structural function.



Figure 41 Cracking between dividing wall and external wall showing external wall leaning to left

Many of the external windows had timber lintels. These have been lost or severely damaged in the fire and are no longer structurally adequate.

5.5 Single storey rooms south eastern elevation

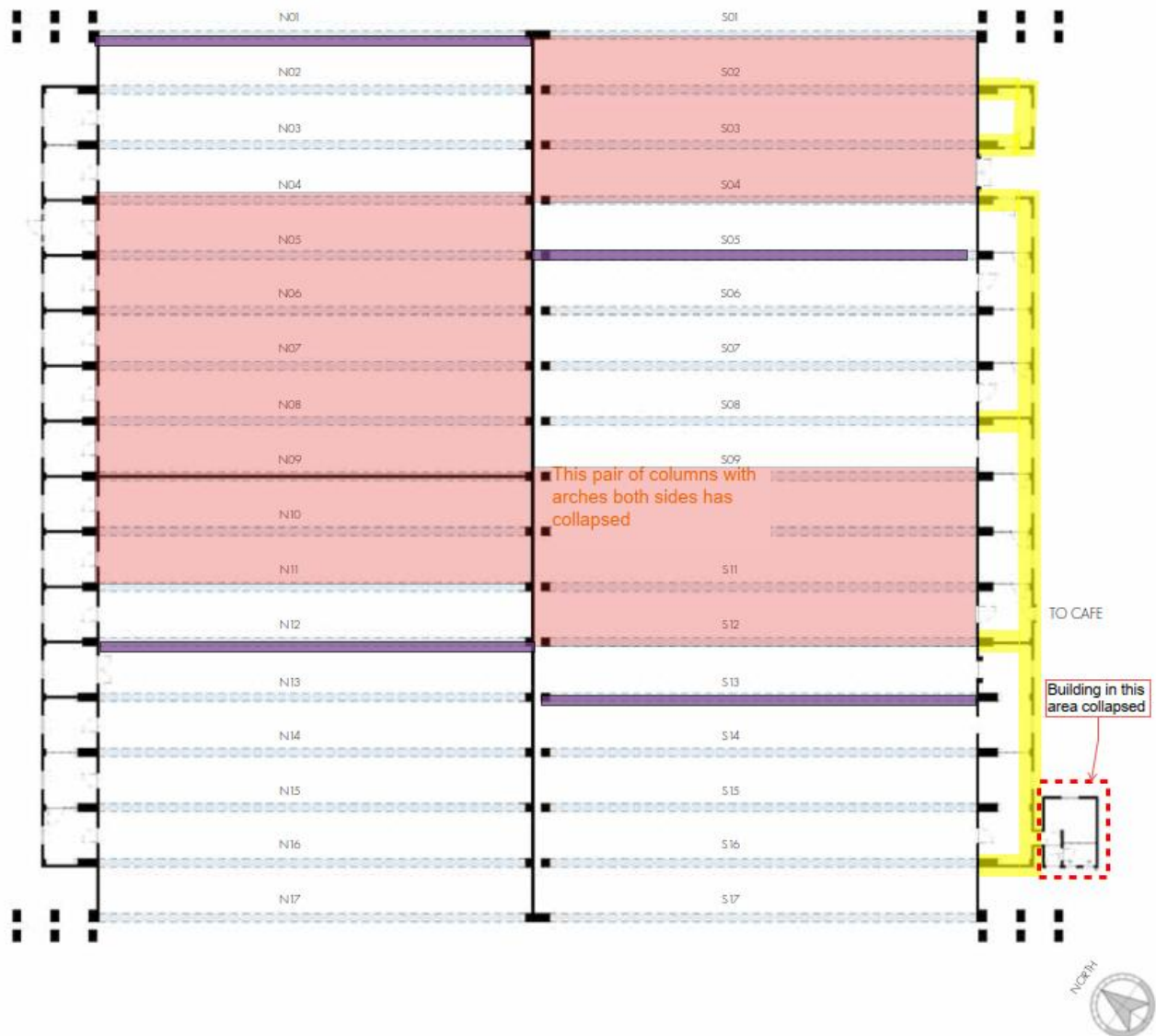


Figure 42 Plan showing south eastern single storey rooms highlighted

The single storey side rooms do not appear to be constructed to the same high quality as the main hanger building. There have been a number of alterations over the history of the building. The external walls appear to have originally been single skin brickwork, approximately 100mm thick. In many of the rooms a skin of 50mm thick extruded hollow light weight clay blocks has been added internally to the external wall. The clay blocks and original brickwork are not tied together, consequently in many locations the two leaves are separating, in some areas very severely.



Figure 43 Example of inner clay block separating from brick outer leaf

Many of the same structural issues are present in the single storey rooms on this side of the hanger as on the north western side. There are fewer internal cross walls and the ones present have more widespread cracking across the walls in addition to not being tied into the main hanger walls or the external walls.



Figure 44 Cracking to masonry cross wall

The external walls are leaning away from the main hanger building. the walls lean out by approximately 41mm over the 2.5m wall height. This puts the centre of gravity outside the middle third of the wall thickness at its base. When the centre of gravity is outside the middle third the wall is potentially unstable under its own self weight. With the roof now missing following the fire there is no top restraint to this wall and, with limited return walls, it should be considered unstable and access around the wall restricted. This is based on the assumption that the structural element of the wall is the original brickwork only and the inner leaf has no structural function.



Figure 45 Cracking between cross wall and external wall showing external wall leaning to left

There is cracking along the external face of the full elevation. This is typically around the window and door openings and is typical of cracking caused by thermal movement. The elevation faces south east and therefore will absorb a significant amount of heat from the sun which is likely to have caused large thermal movements over the lifetime of the building.



Figure 46 Example of cracking the external wall

6.0 Conclusions

The main external walls of the hanger have structural defects many of which are likely to have occurred over a significant period of time due to the gradual deterioration of the hanger and poorly detailed and executed structural alterations over the history of the building. Other issues are likely to have occurred more recently due to the collapse of sections of the roof before April 2025. The most recent areas of damage caused by a storm in January 2024 are detailed in the Fielden + Mawson report 9765 / A04.

There is no doubt that the fire in April 2025 has caused further damage, most significant of which is the damage caused by the collapse of the doors and their tracks. This has caused the collapse of the southern support piers on the south eastern elevation and damaged the southern support piers on the north western elevation. Damage has also occurred to the elevations adjacent these towers as they collapsed.

There is no evidence of heat damage to the main structural walls. Significant areas of the roof and the doors at the north eastern end had already collapsed before the fire and the collapse of the remaining roof trusses does not appear to have caused further damage to the masonry walls.

As a result the extent of work required to restore the hanger is not significantly different to the situation before the fire. The Fielden + Mawson report 9765 / A04 concludes that only three of the 34 roof trusses could be repaired. The rest required complete replacement. Therefore compared to the situation before the fire there are an additional three roof trusses to construct from new. There is also one more set of door support pillars to rebuild and some additional cracking to be repaired. All areas of masonry that require reconstruction should be able to reuse their original foundations which are still in place and appear to be undamaged.

In conclusion the majority of the masonry structural walls and piers have not been damaged by the fire and can be reused in their current condition provided historic cracking is addressed. The walls have not been damaged by the heat of the fire and are generally plumb. Timber elements including the roof and timber lintels will required complete replacement as was the case before the fire in April 2025.

7.0 Appendix A

Grenville Hodge
Old Sarum Airfield Ltd
The Control Tower
Old Sarum Airfield
Salisbury
Wiltshire
SP4 6DZ

6th June 2025

Dear Grenville

Old Sarum Airfield – Hanger 3

We visited site to make an initial inspection of Hanger 3 at Old Sarum Airfield on Friday 6th June 2025. During the visit the clearance contractors were working within the central part of the southern half of the hanger. Our initial inspection was visual and access was only made where deemed safe to do so. The primary purpose of our inspection was to enable us to establish how the asbestos clearance could progress in a safe manner. At the time of our visit a good amount of progress had been made in clearing the debris in the main space of the southern half of the hanger. Debris clearance had not started in the main space of the northern half of the hanger or in any of the small cellular side rooms to the north and south of the main hanger.

During our site visit the masonry walls were the only structural elements standing with all of the roof structure and sliding doors having been lost to the fire that occurred in April 2025. The structural masonry elements consist of the southern elevation, the northern elevation, the central spine wall, the sliding door gear towers and the single storey cellular spaces outside the main southern and northern elevations. The east and west elevations were formed by the large sliding doors that gave access to the hanger.

High level areas of the northern elevation above the high level windows have collapsed at both the eastern and western ends of the elevation. The north western sliding door tower had collapsed. Two masonry columns within the central spine wall had collapsed along with the arches to each side of the columns. Two further arches in the central spine wall had collapsed. From past reports and discussion with the site owner and their agent it is clear these areas had collapsed prior to the fire in April 2025.

The south eastern sliding door tower has also collapsed. This occurred during the fire when the eastern sliding doors failed and fell eastwards away from the building. It appears the doors and their steel head track have pulled the masonry tower over. The collapse of this sliding door tower has caused some damage to the masonry at the eastern end of the southern elevation.

As the roof has been entirely lost in the fire the southern, central and northern masonry walls have lost their head restraint and as a result there is the potential for them to become unstable. We need to undertake some further work and analysis on the stability of some sections of the walls in order to determine if some temporary propping is required to provide stability in the temporary case before reconstruction of the roof and to allow the debris and asbestos clearance to progress.

From our initial inspection there is no obvious indication that the fire has significantly damaged the main masonry walls. From reviewing the Fielden + Mawson Design and Condition Report 9765/A04 and from verbal information from the building owner and their agent it is clear there were a number of areas that had collapsed prior to the fire and structural cracking to areas of the brickwork prior to the fire. The small amount of additional damage to the masonry caused by the fire is detailed above.

The Fielden + Mawson report details that the proposed repair of the hanger involved constructing new trusses for the majority of the roof with only three trusses deemed repairable. The trusses would have required removal in order to be repaired. Therefore there is little additional repair work to be undertaken following the fire, compared to the planned work before the fire. The masonry walls do not appear to have been affected by the heat of the fire and are able to be repaired and rebuilt along with the roof trusses. Some temporary support may be required to some areas of the walls until the roof is reconstructed. Temporary support would have been required during the planned repair and reconstruction detailed in the Fielden + Mawson report.

As noted above an assessment of the stability of the walls will now be undertaken. Immediately the top of two of the buttresses on the northern elevation are unstable as they have cracked and dislocated at the high level window height. The cracking has been caused by historic collapse of the masonry in this area prior to the fire. We recommend that the tops of these buttresses are dismantled and the bricks carefully labelled and stored off the ground on site for use in their reconstruction. This will allow safe access to this area for the debris clearance contractors and for further structural surveys.

Following debris and asbestos clearance a full detailed structural survey will be required in order to inform the repair methodology and details.

Yours sincerely



Chris GROSS MEng (Hons) MPhil PhD CEng MICE
Director
Conservation Accredited Engineer
cdg@integral-engineering.co.uk