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CONSTRUCTION CONSULTANTS

City Hall Salisbury
Malthouse Lane, Salisbury
SP2 7TU, UK

Suspended Plaster Ceilings Inspection

Prepared for

Kier Workplace Services

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Job No: H199006

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Revision	Amendments	Prepared By	Checked	Date

REPORT ON THE SUSPENDED PLASTER CEILINGS INSPECTION OF CITY HALL, MALTHOUSE LANE, SALISBURY

1. INTRODUCTION

1.1 AKSWard Ltd were instructed in 2019 by [redacted] of Kier Workplace Services to undertake a suspended plaster ceilings inspection of City Hall, Malthouse Lane, Salisbury.

1.2 The purpose of the appointment was to inspect the condition of the suspended plastered ceilings and to provide structural and plaster specialist report in accordance with ABTT guidance note number 20.

1.3 The 2019 site visit and inspections were undertaken on Monday 24th June 2019. The weather was dry and sunny. The survey was undertaken by [redacted] of AKSWard Ltd and [redacted] (Plaster Specialist, Stonewest Ltd) all in accordance with ABTT guidance note recommendations.

1.4 The inspection was limited to a visual survey, including photographic survey and measurements of the structural elements (but not a measured building survey). No structural opening works were undertaken during the survey and no material testing was undertaken for the purpose of this report.

1.5 Externally there was good ground level access around the building to undertake the visual survey. There was no external high-level access for the initial survey.

1.6 Internally the following areas have been inspected: Foyer, Servery / Kitchen, Auditorium, Alamein Room, Loft space. Access was provided to inspect these areas, including ladders and scaffold tower to gain access to high-level ceilings. The following access restrictions were encountered during the survey:

a) Foyer – access through the lighting panel opening (without possibility of getting into the space above ceiling).
b) Servery / Kitchen – access only through ceiling access hatch (without possibility of getting into the space above ceiling).
c) Auditorium – area of floor available to set scaffold tower was limited by the lighting box and the retractable seating.
d) Alamein Room – suspended panel ceiling, installed below the historic lath and plaster ceiling.
e) Loft space – timber floor installed over the ceilings, insulation placed over the ceiling, potential risk of asbestos fibres in the loft space preventing lifting of insulation.

1.7 The first report was limited by the adjustable seating in the auditorium being set out for performances and this limited access to the main ceiling soffit above. There had at this time been no access on to the roof or other areas of the City Hall.

1.8 Our initial report included in Appendix D of this report recommended additional survey work and a quote was provided for additional services.

1.9 For reasons beyond our control a re-visit was not organised until 16th August 2020. There had clearly been changes of personnel within the Kier Team and of course the impact of lockdown.

1.10 AKSWard Ltd were instructed in 2020 by [redacted] of Kier Workplace Services to undertake further site visits at City Hall, Malthouse Lane, Salisbury. The purpose of this further appointment was to complete the original survey and to comply with the ABTT requirements.

1.11 The first August 2020 site visit was undertaken on Thursday 13th August 2020 and was essentially to enable Kier to ascertain the access requirements to complete the ceiling survey to the auditorium. The weather was warm and sunny. The survey was undertaken by [redacted] of AKSWard Ltd and [redacted] of Kier Workplace Services together with the centre Manager.

1.12 The benefit of this second visit was access to the roof and other areas to give a better understanding of the building as a whole. The intention was to plan a re-visit with the plaster inspector and gain access via a scissor lift or other hydraulic platform.

1.13 The second August 2020 site visit was undertaken on Thursday 27th August 2020. The weather was warm and sunny. The survey was undertaken by [redacted] of AKSWard Ltd, [redacted] plaster specialist, Triton Ltd and [redacted] of Kier Workplace Services for part of the time.

1.14 An aluminium scaffold tower had been provided. This was not so useful as a scissor lift or hydraulic platform as there were height issues. However, the inspection was able to be concluded.

1.15 Just for clarity the same plaster inspector was used for both the 2019 and 2020 inspections. He had however, changed companies in the year between. Different engineers were involved as [redacted] had left the employment of AKSWard. However, [redacted] was [redacted] senior and undertook the QA review of the first report so was fully aware of the report requirements.

1.16 This report has been produced solely for use by Kier Workplace Services and should not be used by third parties without prior consultation with AKSWard Ltd.

1.17 A photographic record was made of the various surveys and this is included as Appendix A.

1.18 The City Hall floor plans have been annotated with site observations from the initial inspection and these are included as Appendix B.

1.19 The Plaster Specialist comments have been incorporated in the below report. The reports are included as Appendix C.

2. BRIEF DESCRIPTION OF BUILDING

2.1 City Hall was a three-storey detached building, irregular on plan.

2.2 The building was located at Malthouse Lane. The building abutted Fisherton Street on the South, Summerlock Approach on the West and Chapel Place on the North.

2.3 City Hall was approx. 78 m long (North / South) and 32m wide (East / West). The auditorium and stage part of the building was two-storey high, 45m long and 25m wide. The auditorium part of the building dates from 1937, and was extended with:

- the front three-storey part comprising bar, meeting room and offices
- side two-storey extension comprising lobby, staircase, offices
- rear two-storey extension comprising stage docks and dressing rooms

2.4 The external walls of the building were of brickwork construction. The roof over the auditorium was a gambrel roof. The roofs over the extensions were flat and / or mono pitched.

2.5 See appendix A for photographs of the building and appendix B for block plans.

3 OBSERVATIONS

3.1 Foyer

3.1.1 Good access below the ceiling was provided. Access above was only through the lighting panel opening in the ceiling, it was not possible to enter the ceiling void.

3.1.2 Structural parts supporting the suspended plaster ceilings.

3.1.2.1 The ceiling was suspended from the floor structure, originally forming the auditorium balcony. The structure was formed of deep cranked primary steel beams and secondary beams spanning between and supporting the stepped floor. The floor was presumably concrete cast on metal lath, tied to the steel beams with metal wire.

Photo 1 – Ceiling void above Foyer.

3.1.2.2 The ceiling structure was suspended with flat, twisted bars. These bars were hooked over the top flange off the secondary beams or fixed to the angles spanning between the secondary beam and masonry wall. There was no access to measure size and gauge of the ties. Beside flat bar ties, hessian wadding ties had been used to suspend the ceiling (ceiling over the part of Foyer abutting Auditorium). It was likely that the hessian wadding ties fixed to the secondary steel beams had metal wire reinforcement.

Photo 2 – Ceiling void above Foyer.

3.1.2.3 The substructure supporting the plastered ceiling was formed of mild steel flat bars placed in two layers and in orthogonal directions. Top layer was formed of 30x6mm flat bars, it was not possible to measure the exact size of the bottom layer flat bars but considering the construction of the ceiling in other areas they were likely to be 18x6mm.

Photo 3 – Hessian wadding ties supporting the suspended ceiling.

3.1.3 Suspended plastered ceiling.

3.1.3.1 The ceiling was formed of solid work (cementitious mortar) applied to expanded metal lath. The lath was fixed to the ceiling's substructure with metal wire and hessian wadding ties. The finish was undetermined (possibly anhydrous plaster). The decorative plasterwork was cast fibrous plaster panels (hemihydrate plaster and hessian / timber reinforcement). The ceiling over the Foyer comprised five large coffers in the centre of the span with light fittings in the middle. It was noted that modern timber frames were introduced to support the ceiling around the light fittings in the centre of the coffers.

Photo 4 – The suspended ceiling over Foyer.

Photo 5 – Timber frame around light fitting, over the coffer.

Photo 6 – Void over Foyer ceiling, timber frames over the coffers.

3.1.3.2 In the area of the front entrance and ticket office the historic suspended plastered ceiling was covered with a new structure, presumably plasterboard fixed over the original and historic elements.

3.1.3.3 Visually the ceiling plane had slight undulations, however the plain and decorative areas were sound and firm when pressure was applied. Cracking was seen intermittently, mostly along the South external wall and at approximately 4.0m centres. The cracking was below the painted surface and so was not active.

Photo 7 – Crack in Foyer ceiling.

3.1.3.4 Fretwork at HAVC intact, no sign of the plaster suffering from hydrolysis. Plaster key robust and firmly keyed into the expanded metal lath.

3.1.3.5 Visually, the general condition of the cast panels was satisfactory, wadding was firm and intact.

3.2 **Kitchen / Servery**

3.2.1 There was good access below this ceiling. Access above was only through the hatch opening in the ceiling, it was not possible to walk into the ceiling void.

3.2.2 Structural parts supporting suspended plaster ceilings.

3.2.2.1 The ceiling was suspended from the floor structure, originally forming the auditorium balcony, as per description in paragraph 3.1.2.

3.2.2.2 The ceiling structure was suspended with a few ties only. These ties were galvanized flat bars and appeared to be a modern alteration of the ceiling's structure. No hessian ties were observed in this area.

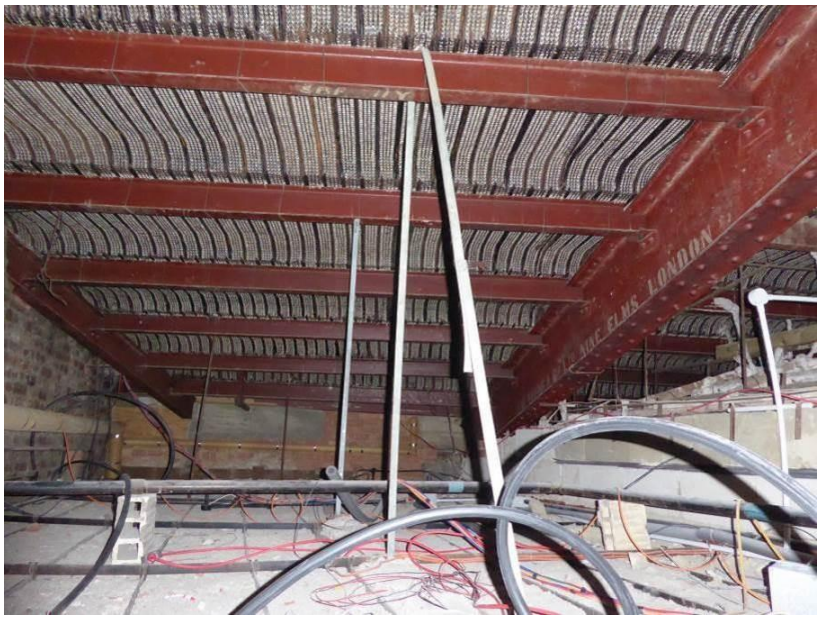


Photo 8 – ceiling void above Kitchen / Servery.

3.2.2.3 The substructure supporting the plastered ceiling was formed of mild steel flat bars placed in two layers in distinct orthogonal directions, like the ceiling over the Foyer. The flat bars (presumably 18x6mm) forming the bottom layer and supporting the expanded metal lath were placed at 350mm centres. The top layer was formed of 30x6mm flat bars placed at approximately 1080mm centres. These bars spanned between external wall and the wall separating the servery from the foyer, an overall distance of approximately 3.5m. They were suspended at mid-span with ties (see photograph above). Beneath the ceiling there was a partition wall installed up to the underside of the ceiling and likely to be providing support at the mid-span of the bars.

3.2.2.4 In the centre of the 3.5m span the ceiling had deflected, approximately 30mm, which was above the acceptable serviceability limit. The deflection most likely occurred before the partition wall was installed.

Photo 9 – Ceilings over the Kitchen.

Photo 10 – Ceiling over the Servery.

3.2.3 Suspended plastered ceiling.

3.2.3.1 The ceiling was formed of solid work (cementitious mortar) applied to expanded metal lath. The lath was fixed to the ceiling's substructure with metal wire and hessian wadding ties. The finish was undetermined (possibly anhydrous plaster). There was no decorative plasterwork in this area. There was no cracking in the ceiling over the Kitchen / Servery. Visually, the general condition of the cast panels was satisfactory.

3.3 **Auditorium**

3.3.1 Access beneath the ceiling was provided from a scaffold tower and it was restricted by the lighting rig. Access above was provided on our first and second visits though concerns over asbestos prevented access on our third visit. When we did have access, we were able to reach the central, flat part of the ceiling, although the timber floor did not allow us to inspect the details of the construction in the whole area. There was no safe access above the side vaults of the Auditorium ceiling.

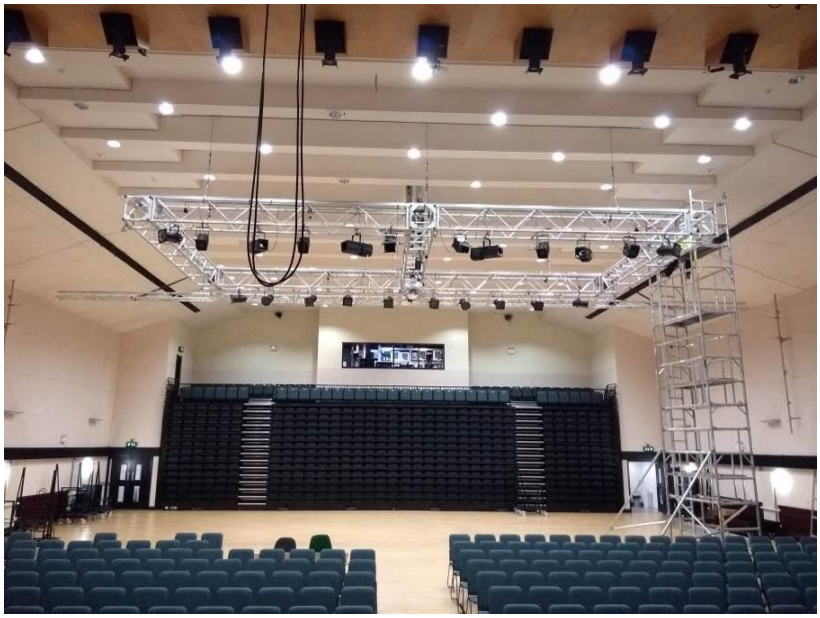


Photo 11 – Auditorium, retractable seating and lighting rig.

3.3.2 Structural parts supporting suspended plaster ceilings.

3.3.2.1 The ceiling was suspended from the roof structure, formed of steel trusses spanning over the auditorium, approximately 24 metres. The truss type was a flat vault gambrel truss. Spacing of the trusses was approximately 3.8m. See Appendix B for schematic drawings of the structure over the auditorium.

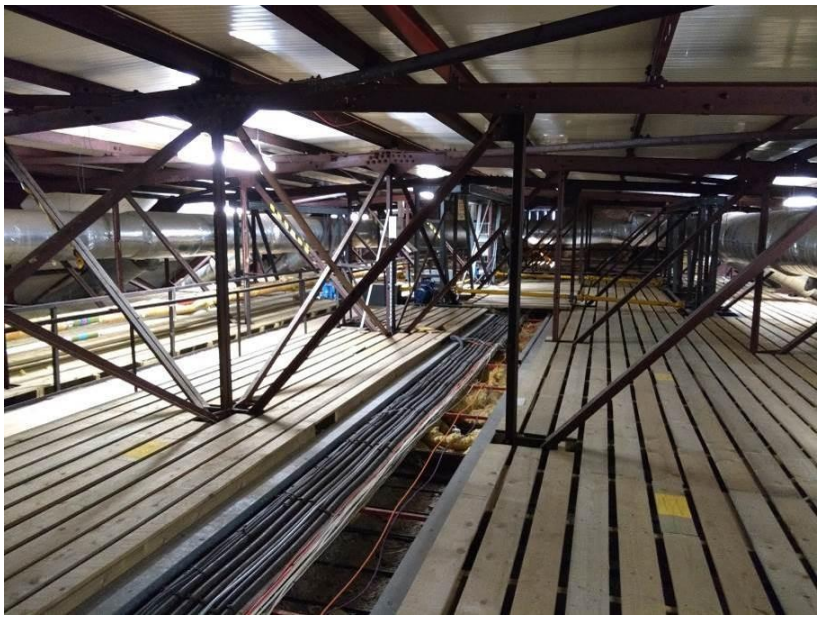


Photo 12 – Loft above Auditorium.

3.3.2.2 The connections in the trusses were formed with metal plates fixed to sections forming chords and struts with rivets and/or bolts. Presumably, trusses had been divided into sections for transport with the bolted connections assembled on site.

Photo 13 – Truss connection.

3.3.2.3 The trusses were formed with double steel angle sections - chords of 150x85x8 angles and struts of 60x50x6 angles. Lateral stability was provided by cross-bracing perpendicular to the trusses (in three lines) and diagonal bracing in the roof plane. All bracing was formed of steel angles.

3.3.2.4 The trusses supported purlins above formed of angle sections, placed at 550mm and 1120mm centres. The purlins supported lightweight, insulated roof cladding panels. We have not been given any information about the original type of roof covering installed over the building.

3.3.2.5 Beside the plastered suspended ceiling, the roof structure supported services (ventilation ducts, heating system, lighting rig hoist, data and electric cables) and a timber floor.

Photo 14 – Services in loft above Auditorium.

3.3.2.6 The substructure supporting the plastered ceiling was formed of steel angles, spanning between the roof trusses. The angles were fixed to the bottom chord of trusses at approximately 1.4m centres. The timber floor joists were bearing directly on the edge of the vertical arm of the angle. The floor structure was formed of 150mm deep by 45mm wide joists at 600mm centres and softwood floorboards placed with a gap between. The steel angles gave support to a flat ceiling over the central part of the Auditorium and vaulted ceilings on the sides, although the details differed depending on the area. The ceiling in the front part of the auditorium had been extensively altered, although the primary support system had not changed. Four types of ceilings were identified in the Auditorium area: high level ceiling, lowered ceiling, vaulted ceiling and stage ceiling. See following pages for details.

Photo 15 – Loft over vaulted ceiling -vent ducts,
no timber decking for access.

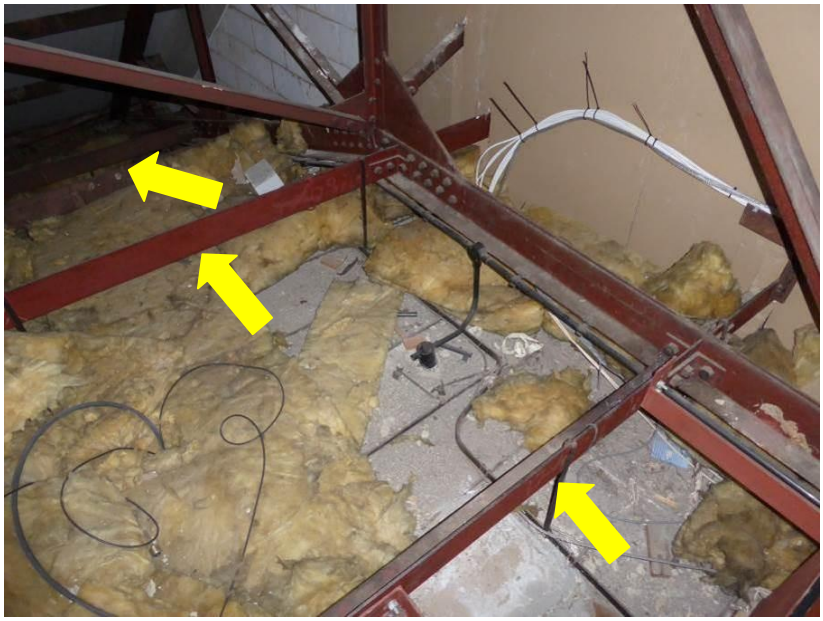


Photo 16 – Steel angles spanning between trusses
and supporting the suspended ceiling.

High level ceiling

3.3.2.7 Part of the ceiling was fixed directly to the underside of the steel angles, acting as secondary beams. The substructure was formed of mild steel flat bars (presumably 18x6mm) at approximately 350mm centres, fixed to the steel angles with metal wire ties, hooked over the vertical arm of the angle.

Photo 17 – Metal wire ties hooked over the angle arm.

Photo 18 – Metal wire ties fixing flat bars to the angle.

Lowered ceiling

3.3.2.8 Part of the ceiling with solid work lowered below the supporting angles level, approximately 500mm (this distance may vary across the ceiling area). The substructure supporting the plastered ceiling was formed of mild steel flat bars placed in two layers and in orthogonal directions to each other. The bottom layer was 18x6mm flat bars placed at approximately 350mm centres. Top layer was formed of 30x6 flat bars at approximately 1.0m centres. The top layer was suspended off the steel angles (secondary beams) with ties formed of mild steel twisted flat bars (15x3mm). The ties were hooked over the vertical arm of the angle and over the flat bar. Metal wire was used generally to fix expanded metal lath to the bottom layer of the supporting structure, although hessian wadding ties had been noted in a few locations.

Photo 19 – Suspended ceiling, visible junction with high level ceiling.

Vaulted ceiling

3.3.2.9 Part of the ceiling at the sides of the Auditorium, abutting the external walls. There was no good access to inspect the details of this ceiling construction from above. Considering the details of construction viewed in the loft, we assume that the construction of the vaulted ceiling is like the lowered ceiling, where the ties were fixed to the substructure and supporting angles (secondary beams) at closer centres.

Photo 20 – Void over vaulted ceiling.

Stage ceiling

3.3.2.10 This refers to the ceiling in the area abutting the stage. The original suspended plastered ceiling in this area was altered and covered with new structure formed of timber and plasterboard. The original ceiling's construction was equivalent to the lowered ceiling described above. The substructure and ties formed of flat bars were retained. The historic ceiling was locally removed to allow construction of the lowered ceiling and lighting platform over the Stage / front Auditorium. The modern ceiling and platform were suspended with flat bar ties (24x6mm) and equal angles (35x35x5) from the supporting angles (secondary beams). The connections between ties and platform substructure were bolted – either with a single bolt through the angle arm (in shear) or a single bolt welded to the tip of the flat bar and secured with a nut to the bracket or angle, fixed to the timber structure of the platform. The new ties were penetrating through the retained historic ceiling. The spacing of the ties was approximately 2.0m along the secondary beams (angles). The lighting fixtures were suspended directly from the secondary steel angles or from the lowered ceiling structure.

3.3.2.11 The timber structure of the platform was formed with 150mm deep by 47mm wide timber joists installed at 450mm centres. Every second joist was suspended to the supporting (roof) structure with metal ties. The deck was formed with softwood floorboards installed with gaps between.

Photo 21 – Historic ceiling substructure.

Photo 22 – Steel subframe supporting lighting rig.

Photo 23 – Suspension of the lighting rig.

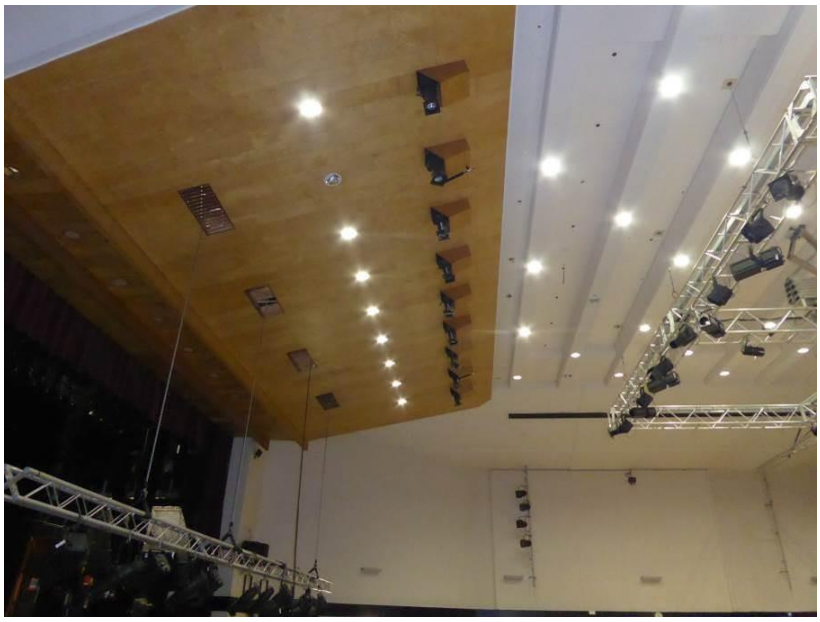


Photo 24 – Lighting rig, underside view.

3.3.3 Suspended plastered ceiling.

3.3.3.1 The ceiling was formed of solid work (cementitious mortar) applied to expanded metal lath. The lath was fixed to the ceiling's substructure with metal wire. The finish was indeterminate (possibly anhydrous plaster). The decorative plasterwork was cast fibrous plaster panels (hemihydrate plaster and hessian / timber reinforcement). The ceiling over the Auditorium comprised a large flat area in the centre and vaults on the sides, along the external walls. At the junction of the flat and vault ceilings a strip of ceiling was lowered and the step was generally finished with decorative Greek key panels.

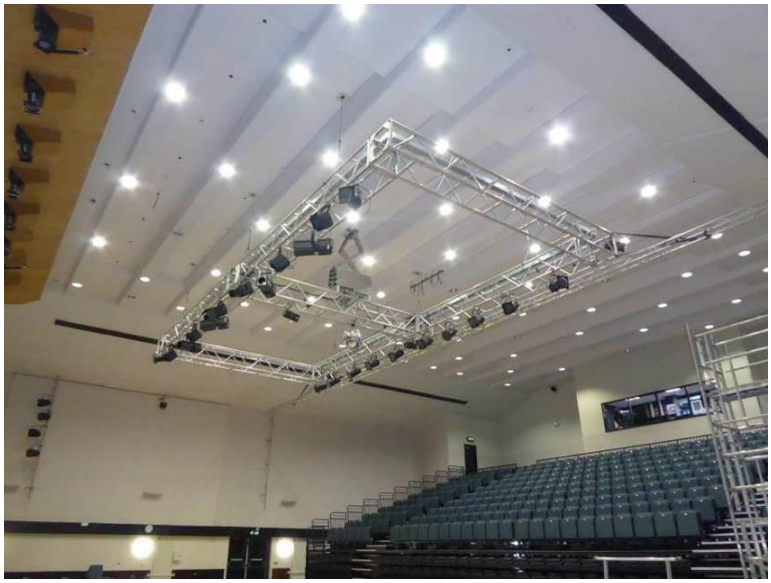


Photo 25 – Ceiling over the Auditorium.

3.3.3.2 Lighting boxes formed of timber battens and chipboard / fibreboard. The timber framing was fixed through the solid work and expanded metal lath (EML) to timber blocks with coach bolts. The fixings were tested with applied pressure in a few random locations across the ceiling and all of them were sound.

3.3.3.3 One of the side panels near to the stage exhibited a burn hole presumably caused by a hot lamp. See photo: A3.7 in Appendix A.

3.3.3.4 Plain, flat areas where inspected were firm under applied hand pressure. Typical weak points, such as HAVC locations were also sound.

3.3.3.5 The Greek key where inspected was cracked in several locations and unsound. The decorative panels are structurally only self-supporting and lightweight; hence these defects have not caused ceiling failure.

Panels assumed wadded only to 30x5mm flat bar and wadded at adjoining sections. It was not possible to ascertain if the wadding was reinforced or secure.

3.3.3.6 The cracking immediately in front of the lighting room was partially assessed on our third inspection from the scaffold tower. Ideally, we would have inspected from above. We have serious concerns over the management of ACM's having been allowed into the ceiling loft on two previous inspections. The area above the cracking is shown in photo: A2.7 in Appendix A.

3.3.3.7 If ACM's are present in the Main auditorium ceiling loft, then fibres will exist throughout the building. There were numerous openings in the main ceiling and combined with the lack of a properly encapsulated roof there is likely to often be a negative pressure in the audience space of the auditorium sucking fibres into this area. The expectation on the third visit was for the area shown in photo: A2.7 to be cleared and cleaned to enable a full and proper assessment of the overall ceiling condition to be made.

3.3.3.8 Cracking to left-hand side and right-hand side of the stage was noted. It appeared to be at the junction of historic suspended ceiling and modern ceiling infill. The immediate surrounding plasterwork was firm under applied hand pressure and sound.

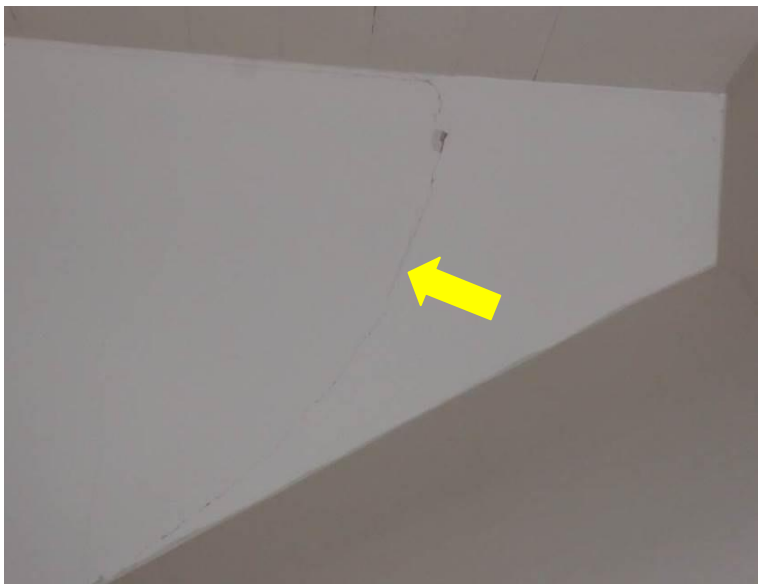


Photo 26 – Crack to the left-hand side of the stage.

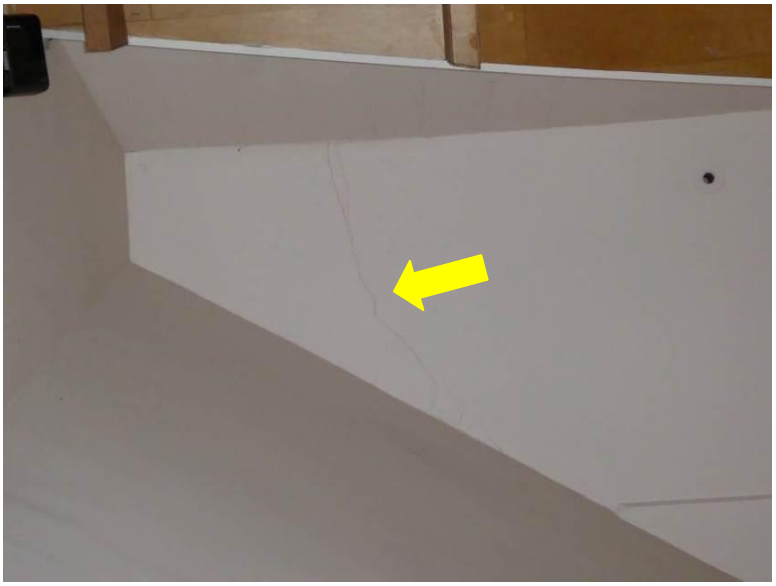


Photo 27 – Crack to the right-hand side of the stage.

3.4 **Alamein Room**

3.4.1 Limited access was provided below the ceiling due to the suspended tile ceiling installed beneath on to a timber frame. Access above was possible through the loft, but was limited by the insulation placed on the ceiling, services and other strewn debris.

3.4.2 Structural parts supporting suspended plaster ceilings.

3.4.2.1 The ceiling was suspended from the roof structure, as described in paragraph 3.3.2. The trusses over the Alamein Room did not support the timber floor. The access walkway was constructed from a steel angle frame and chipboard. Ventilation ducts were hung down from the top chords or propped on the bottom chords of the truss.

Photo 28 – Loft above Alamein Room.

3.4.2.2 The thermal insulation placed on top of the suspended ceiling did not allow investigation of the construction details. The ceiling plane had been lowered below the supporting angles (secondary beams) and twisted flat bar ties hooked over the vertical arm of angles had been noted. Wadding ties had been noted as well, although the metal ties seem to be the primary means of support, even if the number of ties seem to be lower than over the Auditorium. It was likely that the hessian wadding ties had been used to fix the decorative plasterwork elements.

3.4.2.3 It was likely that the substructure supporting the plaster ceiling was equivalent to the ceiling over the Auditorium, i.e. formed of two layers of flat bars suspended from the roof structure (steel trusses).

3.4.2.4 Staining on the supporting angles and purlins had been noted, which can indicate an issue with water penetration prior to the roof covering replacement. Corrosion of purlin bearings onto the external wall has been noted, together with cracking and displacement of the brickwork.

Photo 29 – Ceiling above Alamein Room.

Photo 30 – Staining on supporting angles (secondary beams and purlins) and wall.

Photo 31 – Surface corrosion of purlins bearing on external wall.

3.4.3 Suspended plastered ceiling.

3.4.3.1 These comments are based on a visual inspection of this area only and assumed similarities in construction with other areas. The ceiling over the Alamein Room seemed to be constructed at the same time as the Auditorium ceiling and had probably formed one ceiling over the Auditorium and Balcony in the past. The ceiling was formed of solid work (cementitious mortar) applied to expanded metal lath. The lath was fixed to the ceiling's substructure with metal wire. The finish was indeterminate (possibly anhydrous plaster). The decorative plasterwork presumably was cast fibrous plaster panels (hemihydrate plaster and hessian / timber reinforcement). It was not possible to ascertain if the wadding was reinforced or secure.

3.4.3.2 Numerous apertures were formed within the existing ceiling, where hangers had been installed to support the timber subframe for the lightweight, tiled suspended ceiling. Openings for ventilation ducts had also been cut in the historic suspended ceiling.

Photo 32 – The underside of suspended ceiling over Alamein Room.

Photo 33 – Tiled suspended ceiling and timber frame over Alamein Room.

3.5 **Other Internal Areas**

3.5.1 Photos A2.8, A2.9 and A2.10 show the rear wall of the auditorium within the SpireFM offices which were to the west of the sound room. These walls had recently been painted however a gap had appeared between the top of the wall and the ceilings over. This gap at the time of painting would have been filled and was therefore a clear indication that movement had taken place since the wall had been painted.

3.5.2 Similar movement was noted on the other side (east) of the building. Here shown in photo A2.13 were regular horizontal cracks through the concrete floor slab again demonstrating some movement between the Auditorium and the remainder of the building.

3.5.3 Photos A2.11, A2.15 and A2.16 show serious damp penetration in various distinct parts of the building demonstrating a general lack of maintenance rather that a combined structural effect.

3.6 **External areas (including main roof)**

3.6.1 The lack of a cover flashing to the west ridge of the main auditorium roof was most disturbing and will lead to much more significant issues. There were no signs as to what may have happened to this flashing but the roof staining does suggest that it had at one time been fitted. The lack of a cover flashing can be seen on google maps suggesting it had been missing for some time.

3.6.2 The poor fitting of flashings around the access door also demonstrated a poor quality of workmanship and another potential source for water ingress.

3.6.3 Photos A2.12 and A2.14 show external parts of the east elevation that had been painted with non-breathable coatings, possibly to try and prevent moisture ingress.

4 **CONCLUSIONS** – incorporating those from the Plaster Specialists report.

4.1 The main structure of the building, where inspected was generally structurally sound. There were minor signs of movement, but these should be anticipated in a building of this age. There was clearly some movement between the auditorium and the remainder of the building as noted in both the kitchen floor cracking and the spireFM wall movement.

4.2 There were concerns over general building maintenance and the recording of ACM's.

4.3 As discussed under observations in clause: 3.3.3.7 the presence of ACM's was very alarming as we were not prevented from accessing the area on two previous occasions and more alarmingly if they are within the ceiling space it would appear more than possible that they will be within public areas.

4.4 The missing roof flashing, poor attention to waterproofing details throughout that seem to have been left unabated raises serious concerns over the quality of the ceilings in the unseen areas such as the vaults. We were also disappointed at the poor attempt to provide access on a third occasion (second for the plaster inspector) potentially wasting fees on inconclusive investigations.

4.5 Most ceilings that have failed in recent years all generally relate back to some moisture ingress not properly dealt with. That is the grave concern here that the external fabric needs to be totally watertight and all ACM's remove before a full and proper ceiling assessment can take place. Ceiling soffit access in the auditorium needs to be provided by scissor lift or an hydraulic platform of some description. Both will of course need to not exceed the floor loading capacity and have pneumatic tyres.

4.6 The plastered suspended ceiling over the Foyer has been retained in its original form, with minor alterations around the light fittings and in the front, entrance area. The supporting structure was of size and form adequate to support the suspended ceiling. It was not possible to access and measure the substructure in detail. The ties supporting the ceiling will need to be inspected when appropriate access is provided, to confirm their longevity.

4.7 There was no evidence of imminent failure to the plasterwork from our site inspections, however due to noted hairline cracking to ceiling's perimeter, monitoring of the ceiling will be required, including areas used for access past and present, to record any possible detachment.

4.8 The plastered suspended ceiling over the Kitchen / Servery has been altered. Although the substructure supporting the solid work on expanded metal lath seemed to be original, the supporting ties had been removed and replaced with new elements. Our opinion was that there was less ties than originally installed, hence the observed excessive deflection at the partition wall. We believe that the ceiling's structure was supported on the partition wall, which seemed to have sufficient load bearing capacity.

4.9 The supporting structure in this area was adequate and could be used to support new ties if remedial works are undertaken.

4.10 Similar to the ceiling over the Foyer, monitoring of the ceiling will be required in the areas used for access past and present, to record any possible detachment.

4.11 The supporting structure over the auditorium was retained in its original form, although alterations affecting the loading on the roof structure have been introduced, including: a modern lightweight composite panel roof covering, timber floor, hoist mechanism for the lighting rig, new ceiling and lighting platform structure next to the stage. The installation of the lightweight roof covering has probably compensated for the increased loading from the timber floor on the bottom chord.

4.12 Where inspected we have not noted any significant corrosion of structural elements except the bearings of the steel purlins in the external walls. Surface corrosion on steel trusses was noted in a few locations and this is part of the natural ageing process of the building structure. Although that is not a structural issue, the condition of the steelwork should be maintained and painted from time to time.

4.13 The plastered suspended ceiling over the auditorium was retained in its original form with some alterations, including: installation of lighting boxes in the central part of the ceiling, cutting holes in the ceiling for light fittings, local replacement of the original ceiling with the suspended lighting platform. These alterations have not affected the structural integrity of the ceiling. The integrity of the lights and their position within the downstand boxes should be examined by both a lighting and a fire specialist.

4.14 It is likely that the above alterations had some impact on the decorative panels of the ceiling, causing cracking and defects (hollow panels). The two cracks noted on right-hand side and left-hand side of the stage are not structural as the plasterwork was firm in the surrounding ceiling areas. It was likely that the cracks occurred at the junction between the historic ceiling and the modern replacement ceiling, due to the use of materials with different thermal characteristics used in their construction.

4.15 The fixings of lighting boxes have been checked in a few representative locations across the ceiling, and all of them were sound and there was no movement under pressure. In our opinion the substructure of the lighting boxes and the fixing details are sufficient provided they are fire safe.

4.16 The modern ceiling and lighting rig were suspended off the historic supporting (roof) structure, which we found to have sufficient capacity. The timber structure forming the platform was sufficient to transfer the loadings on the platform. The flat bar and angle ties used to suspend the platform structure had sufficient tensile capacity, but the connection details were not adequate and in future may cause failure of the platform structure. The welding of hardened steel bolts to mild steel flat bar, as shown on picture below, does not provide full strength and may be susceptible to fracture and there was no backup support mechanism.

Photo 34 – Tie connection in the lighting platform's suspension system.

4.17 We also noted un-secured bolts in these connections, which increases stress on the surrounding ties and connections. In our opinion the suspension system used for the lighting rig requires a detailed assessment to confirm its viability.

4.18 The shear connections between angles forming suspension frame, secured with single bolts also need a detailed structural assessment. Secondary strap fixings may be required to minimise the risk of failure.

4.19 The limitations in access to the plastered suspended ceiling over the Alamein Room did not allow us to make unequivocal conclusions. We presume that the original ceiling's structure had not been altered, but openings were cut through the solid work and expanded metal lath to allow installation of modern ties and ventilation ducts. The ceilings substructure and supporting ties should be inspected in detail when sufficient access can be provided.

4.20 The installation of modern tiled suspended ceiling has not had impact on the historic suspended plastered ceiling. The timber frame substructure spans between masonry walls with intermediate ties fixed to supporting (roof) structure. These ties cause additional point loadings (approx. 0.9kN) on the steel trusses or secondary beams (angles). That loading should not have any impact on performance of the trusses, but may affect the stability of the steel angles, hence location of these ties needs to be investigated in detail to confirm location of the ties.

4.21 Due to access limitations the condition of the suspended plastered ceiling could not be inspected in detail. The visual inspection from below proved decorative features were installed in this area. We have also noted some damage on the historic ceiling with abraded / broken pieces of plaster remaining. These should be removed to prevent future failure. Staining / discolouration on the ceiling was observed, which can be evidence of historic water penetration through the roof covering (see photo 35 on next page). Considering the visual observation and findings in other areas, we think that condition of the ceiling must be inspected in detail and this should include plain areas and decorative plasterwork.

4.22 In general, the supporting structures were of sufficient capacity to support the suspended plastered ceiling. Steel beams and trusses were not susceptible to deterioration, but two areas had been identified where water ingress could have occurred. This was the South gable wall of the historic Auditorium and the loft area over the Alamein room. Further assessment of the structure in these areas and specification of remedial works will be required as identified elsewhere.

4.23 Where inspected, the solid work and expanded metal lath were of good quality, with good bond between these two elements. The mild steel wire ties used to fix the expanded metal lath to the substructure and to tie flat bars forming the substructure were adequate as well. Due to the diameter of used ties corrosion may largely affect the performance of ties, hence inspection of areas indicated in paragraph 4.8 is required to confirm that the ties are sound. Hessian wadding ties where inspected seemed to be in good condition. When appropriate access is provided, ties across the whole ceilings should be inspected to confirm spacing, sizing and good condition of ties.

Photo 35 – Damaged underside of the ceiling over the Alamein Room.

4.24 Where good access was provided, there was no sign of defects indicating risk of immediate failure of the ceiling. Currently the cracking in the ceiling over the Auditorium next to the lighting room is the primary concern and access is required from above to assess the condition of the cracking and the surrounding ceiling. Minor defects of decorative plasterwork over the Auditorium need detailed assessment as well. We anticipate that for these areas appropriate remedial works will be required to eliminate any risks of failure.

4.25 Requirements for further assessments and monitoring are described in the 'Recommendations' section of this report.

5 RECOMMENDATIONS

5.1 The priority has to be ensuring a safe secure waeathertight envelope to the building. A sudden water ingress will rapidly destroy any internal ceilings whether in good condition or otherwise.

5.2 This has to start with the main auditorium roof covering and all walls and fabric that can be directly associated with impacting on the support and integrity of the suspended ceilings.

5.3 The second priority has to be dealing with all ACM's and ensuring that these are either removed or properly and safely encapsulated.

5.4 Following the initial two steps will lead to the ceilings being able to be properly assessed. Apart from a few areas highlighted the ceilings do appear to be generally sound but this can rapidly change as already mentioned above with a sudden moisture ingress.

5.5 In the Foyer area, provide safe access to the void above ceiling, to facilitate inspection of the whole area and assess condition of the ceiling's substructure, cast plaster panel attachments and plaster key attachments in the cracked areas.

5.6 In the Auditorium area, immediate access above the ceiling is required to inspect the cracking in the ceiling next to the lighting room. The inspection should include all decorative plasterwork. Following these surveys and knowing the extent of defective areas, remedial works to the ceiling will be required to prevent future risk of failure.

5.7 Safe access in the loft area over the Auditorium is required. All insulation and debris need to be removed and the Asbestos survey undertaken to confirm conditions for safe access. Means of safe access to the vaulted ceilings on the sides of the Auditorium need to be provided as well.

5.8 In the loft space over the Auditorium a detailed survey of ceiling ties beneath the timber floor deck will be required. We assume this will need to be undertaken by a couple of surveyors with use of an endoscope camera or similar equipment. The survey should confirm details of construction and distribution of the ties across the ceiling. Having safe access to the area over the vaulted ceilings must be included in the survey.

5.9 Having safe access to the void over the vaulted ceilings, both suspended ceiling and the supporting structure should be inspected for signs of water penetration. General survey and assessment of corrosion of steel structures should be undertaken.

5.10 The construction details of the modern lighting platform next to the stage must be investigated and a detailed risk assessment undertaken. Remedial works may be required to provide durability of the suspension system and prevent risk of future failure.

5.11 Safe access in the loft area over the Alamein room is required. All insulation and debris need to be removed and the Asbestos survey undertaken to confirm conditions for safe access. Access below the ceiling for detailed inspection should be organised by dismantling the tiled suspended ceiling locally and provision of ladder access to ceiling level. Having the access organised, all loose / abraded / broken pieces of plaster ceiling should be removed to prevent any future risk of failure.

5.12 At the time of the survey a full record of defects present in the suspended plastered ceiling should be undertaken for future reference.

Appendix A - PHOTOGRAPHIC RECORD

A1 – Photos from 24th June 2019

A2 – Photos from 13th August 2020

A3 – Photos from 27th August 2020

Photograph A1.1 – Main entrance - East Elevation.

Photograph A1.2– East / side elevation, auditorium external wall.

Photograph A1.3 – East elevation (North end).

Photograph A1.4 – North elevation.

Photograph A1.5 – West elevation, North end.

Photograph A1.6 – West elevation, central part to side of auditorium.

Photograph A1.7 – Front / South elevation.

Photograph A1.8 – Foyer ceiling general view.

Photograph A1.9 – Kitchen ceiling.

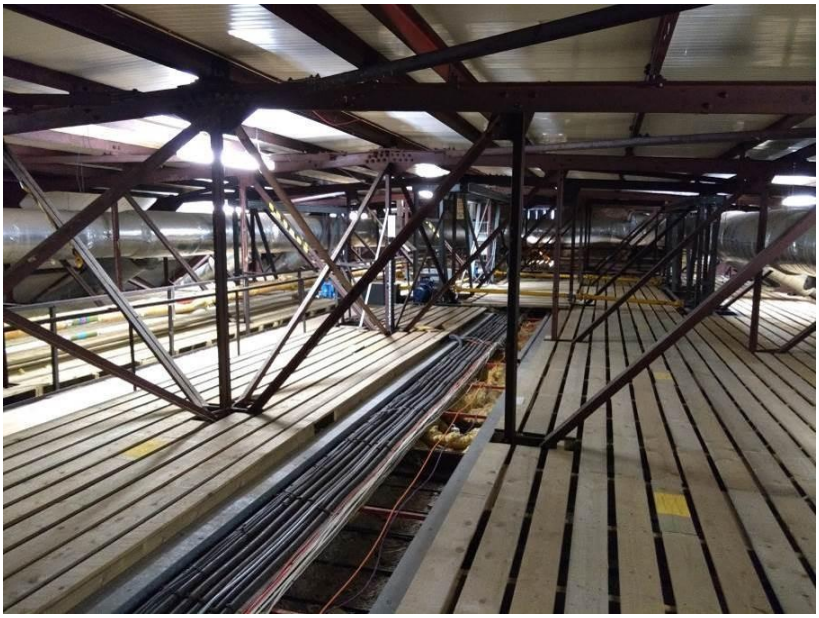
Photograph A1.10 – Kitchen servery ceiling.

Photograph A1.11 – Auditorium, view towards rear wall and stacked seating.

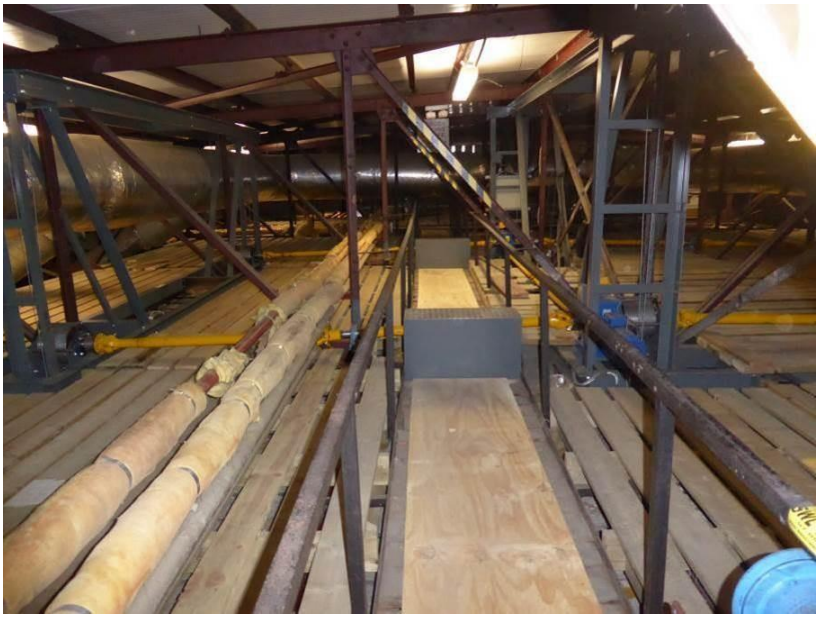
Photograph A1.12 – Auditorium, view towards stage.

Photograph A1.13 – Ceiling void over Kitchen / Servery.

Photograph A1.14 – Ceiling void over Foyer.



Photograph A1.15 – Loft over auditorium, general view.



Photograph A1.16 – Lighting rig hoist over auditorium.

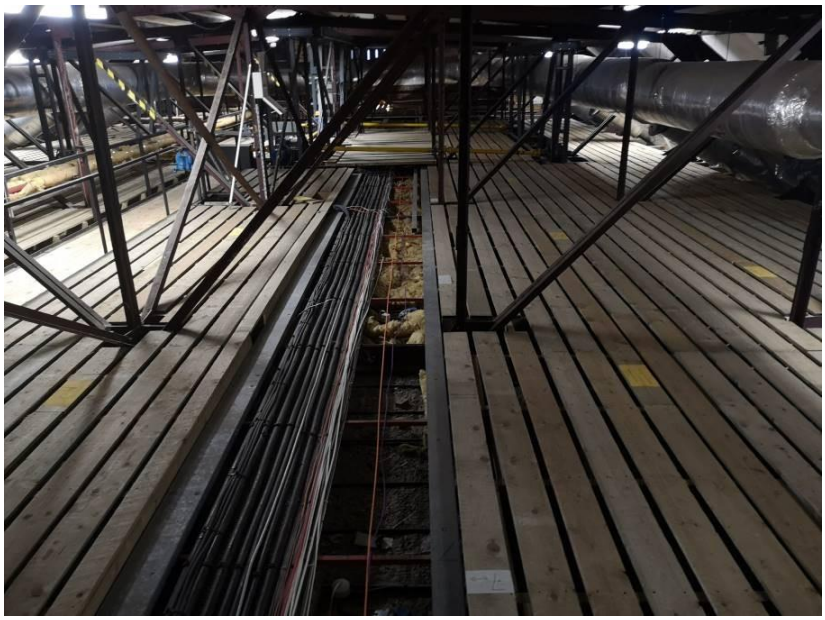
Photograph A1.17 – Lighting platform over Auditorium, next to stage.

Photograph A1.18 – Loft over Alamein Room.

Photograph A1.19 – Original ceiling above in the Alamein Room.

Photograph A1.20 – Suspended plastered ceiling – typical construction detail.

Photograph A2.1 – Auditorium ceiling showing downstand lighting boxes and section where there is no Greek key between High level and lowered ceiling. Possible recent repair.



Photograph A2.2– Trusses above main auditorium ceiling where access was permitted on our first and second visits but restricted due to concerns over asbestos on our third visit.

Photograph A2.3 – West elevation, look north along ridge line to main auditorium roof – note the missing ridge flashing.

Photograph A2.4 – Looking across roof towards the east – note east ridge line flashing is in place.

Photograph A2.5 – South elevation roof access door - Note the poor fitting flashing to top of door.

Photograph A2.6 – South elevation roof access door - Note the poor fitting flashing to top of door.

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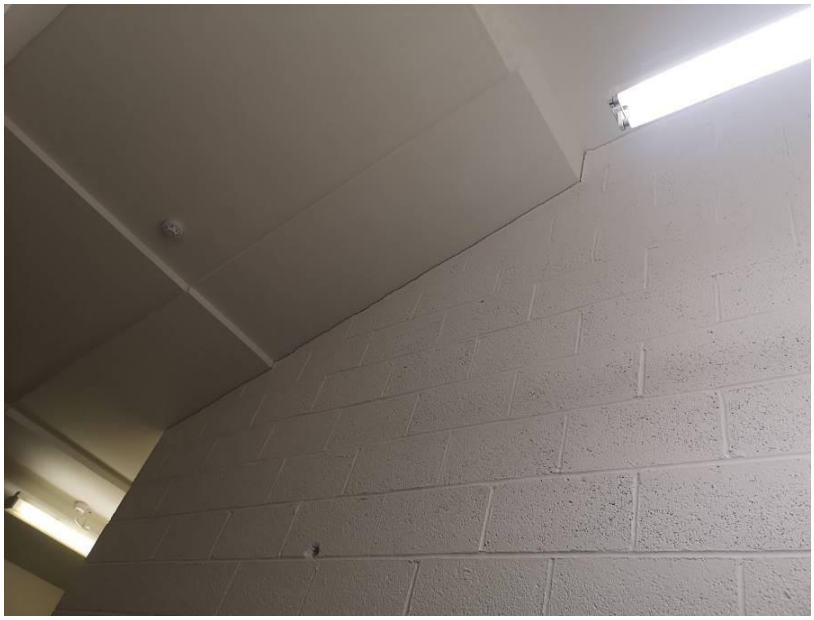
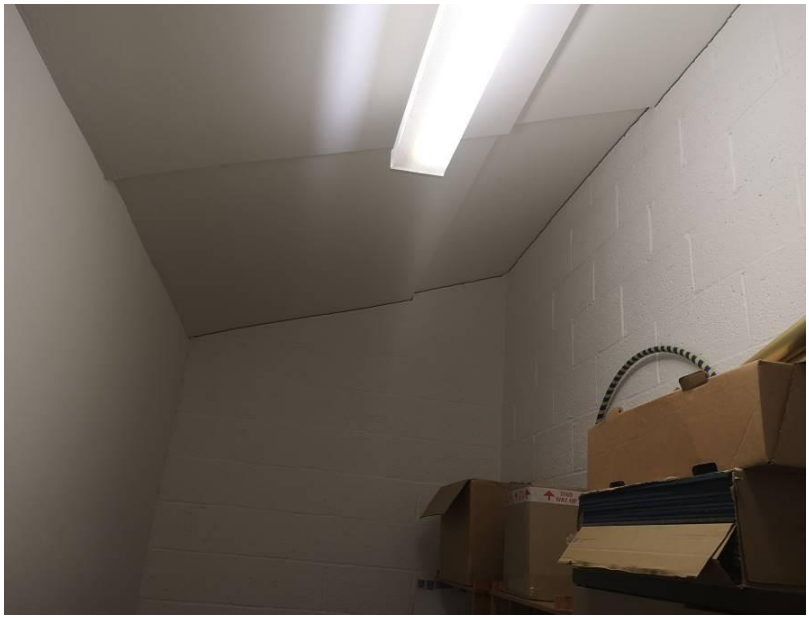
Photograph A2.7 – Loft side of high-level roof – showing numerous openings.

Photograph A2.8 – Gap at top of recently painted wall to SpireFM offices.



Photograph A2.9 – Gap at top of recently painted wall to SpireFM offices.



Photograph A2.10 – Gap at top of recently painted wall to SpireFM offices.

Photograph A2.11 – Serious damp penetration to internal stair walls.

Photograph A2.12 – Part east elevation – Note brickwork has been painted with a non-breathable paint.

Photograph A2.13 – Regular east/west floor cracks to kitchen terrazzo finished floor at first floor level.

Photograph A2.14 – Part tile hun east elevation. Note tiles and some of the brickwork have been painted with a non-breathable coating.

Photograph A2.15 – Curved wall to abandoned ground floor offices showing serious signs of damp penetration.

Photograph A2.16 – The dressing rooms to the north-east corner exhibited signs of severe damp penetration.

Photograph A3.1 – Main auditorium ceiling on third visit.

Photograph A3.2– Main auditorium ceiling on third visit showing vaulted ceiling to the side.

Photograph A3.3 – Typical detail of downstand lighting box showing gaps between horizontal and vertical boards.

Photograph A3.4 – Typical gap between down stand lighting box and main ceiling as shown in photo A3.3 above.

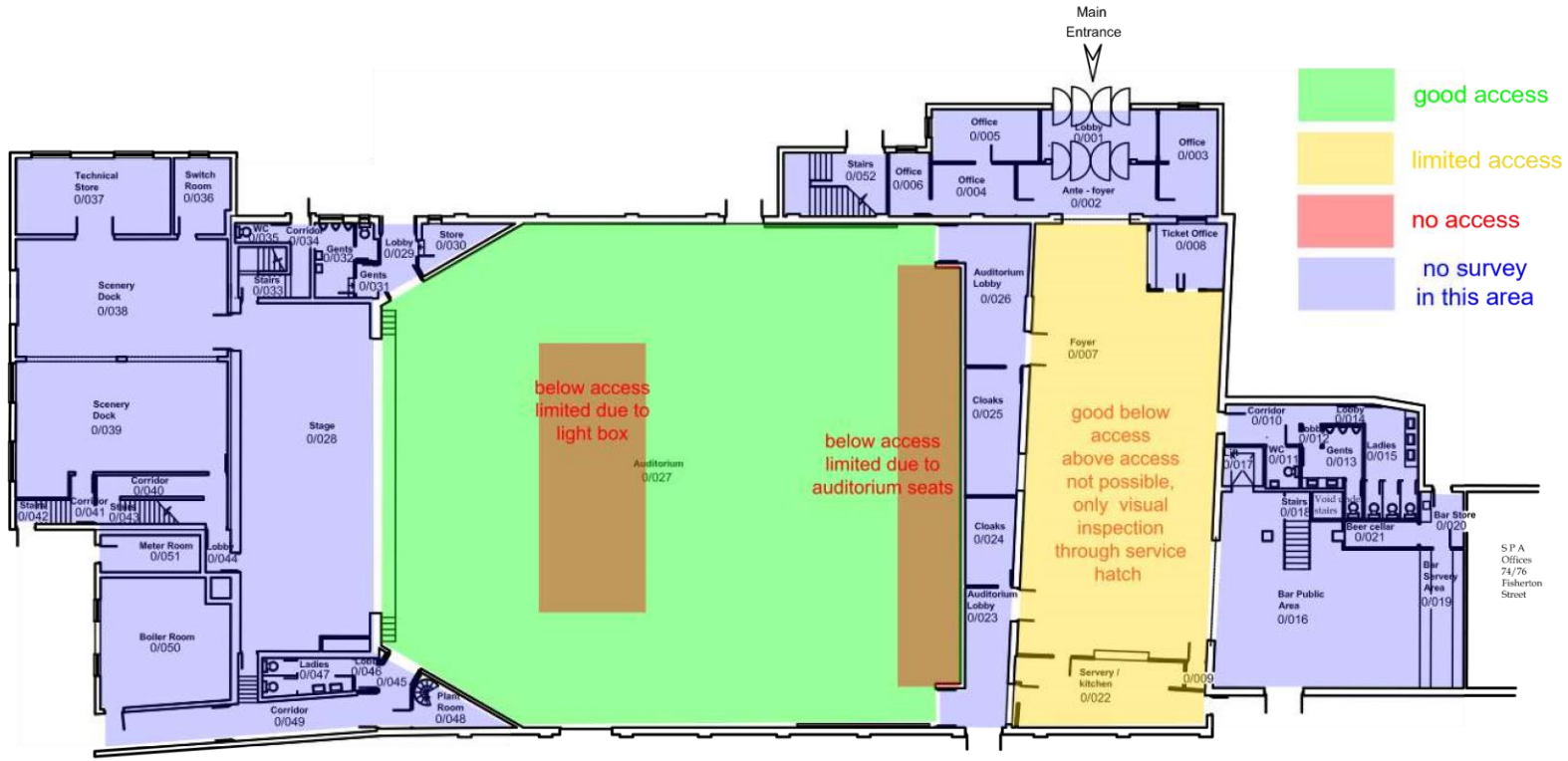
Photograph A3.5 – Typical gap between down stand lighting box and side lowered ceiling as shown in photo A3.2 above.

Photograph A3.6 – Typical light fitting to bottom of downstand showing over-sized opening in plasterboard.

Photograph A3.7 – Hole noted to side of light fitting near to stage – appeared to have ‘burnt through’

Appendix B – BLOCK PLANS

ACCESS CHART – GROUND FLOOR



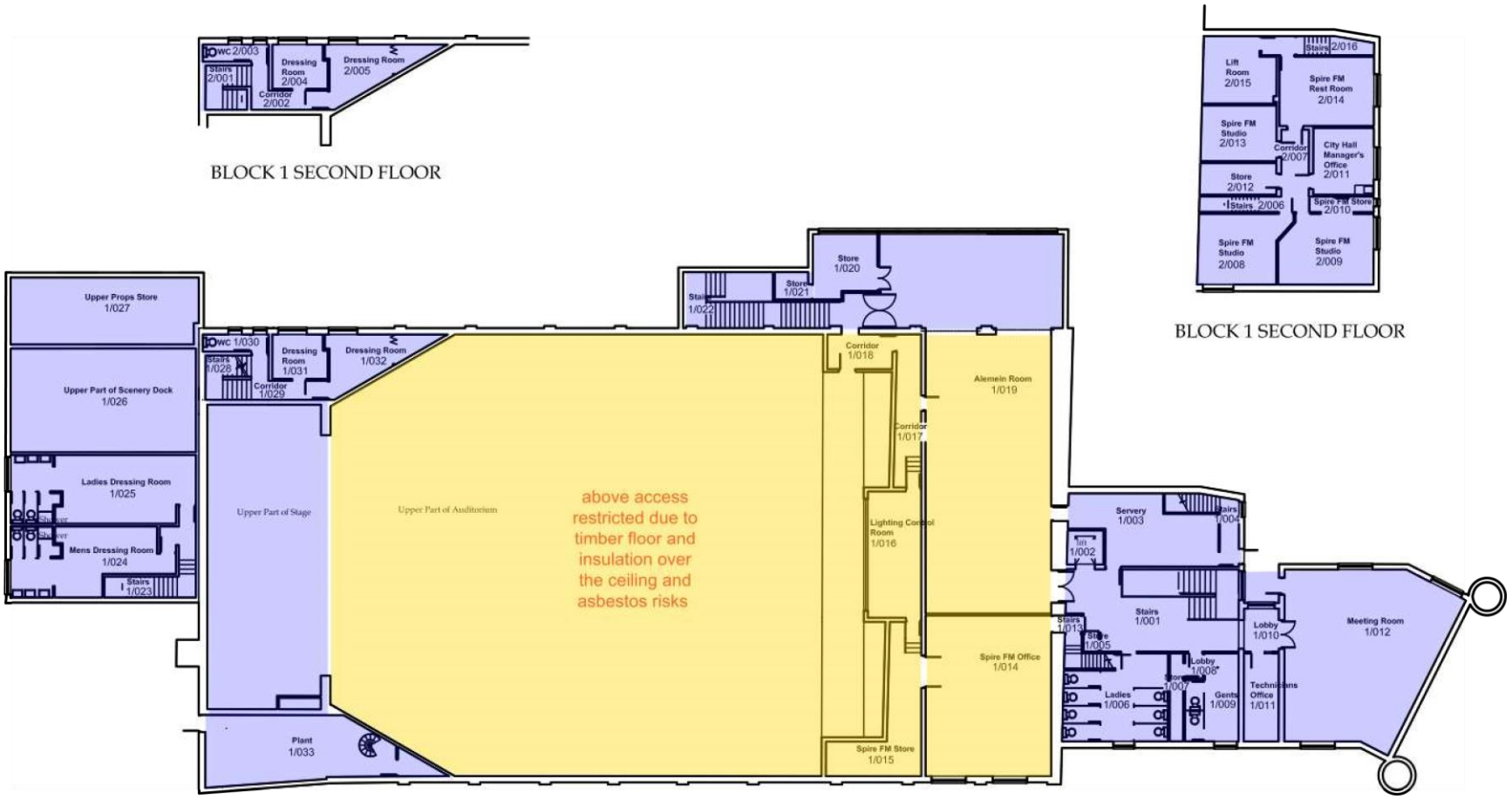
BLOCK 1 GROUND FLOOR

AKSWard
CONSTRUCTION CONSULTANTS

SITE VISIT & SURVEY
24TH JUNE 2019, WJZ

AKSWard

ACCESS CHART – FIRST FLOOR

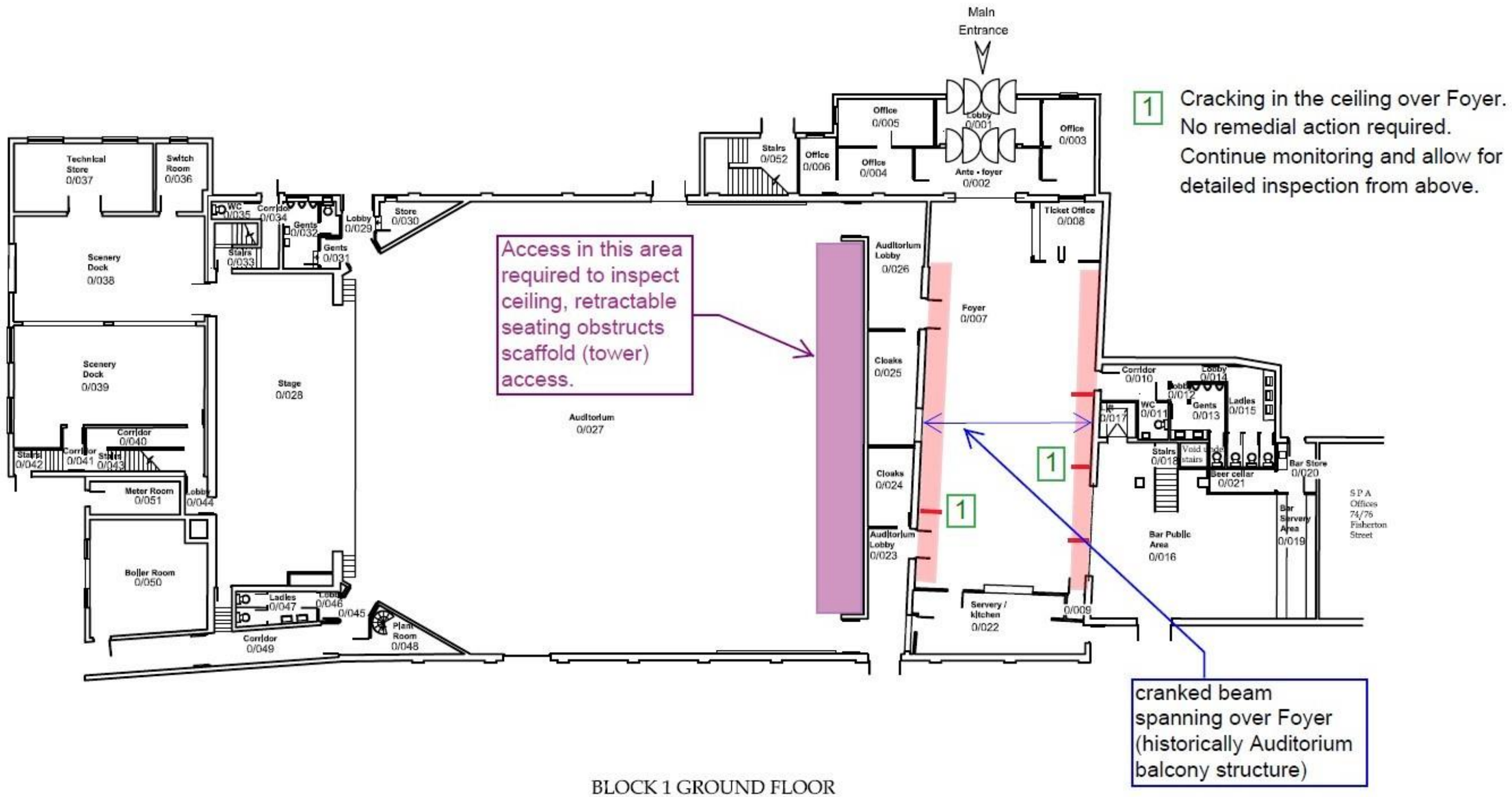


AKSWard
CONSTRUCTION CONSULTANTS

SITE VISIT & SURVEY
24TH JUNE 2019, WJZ

AKSWard

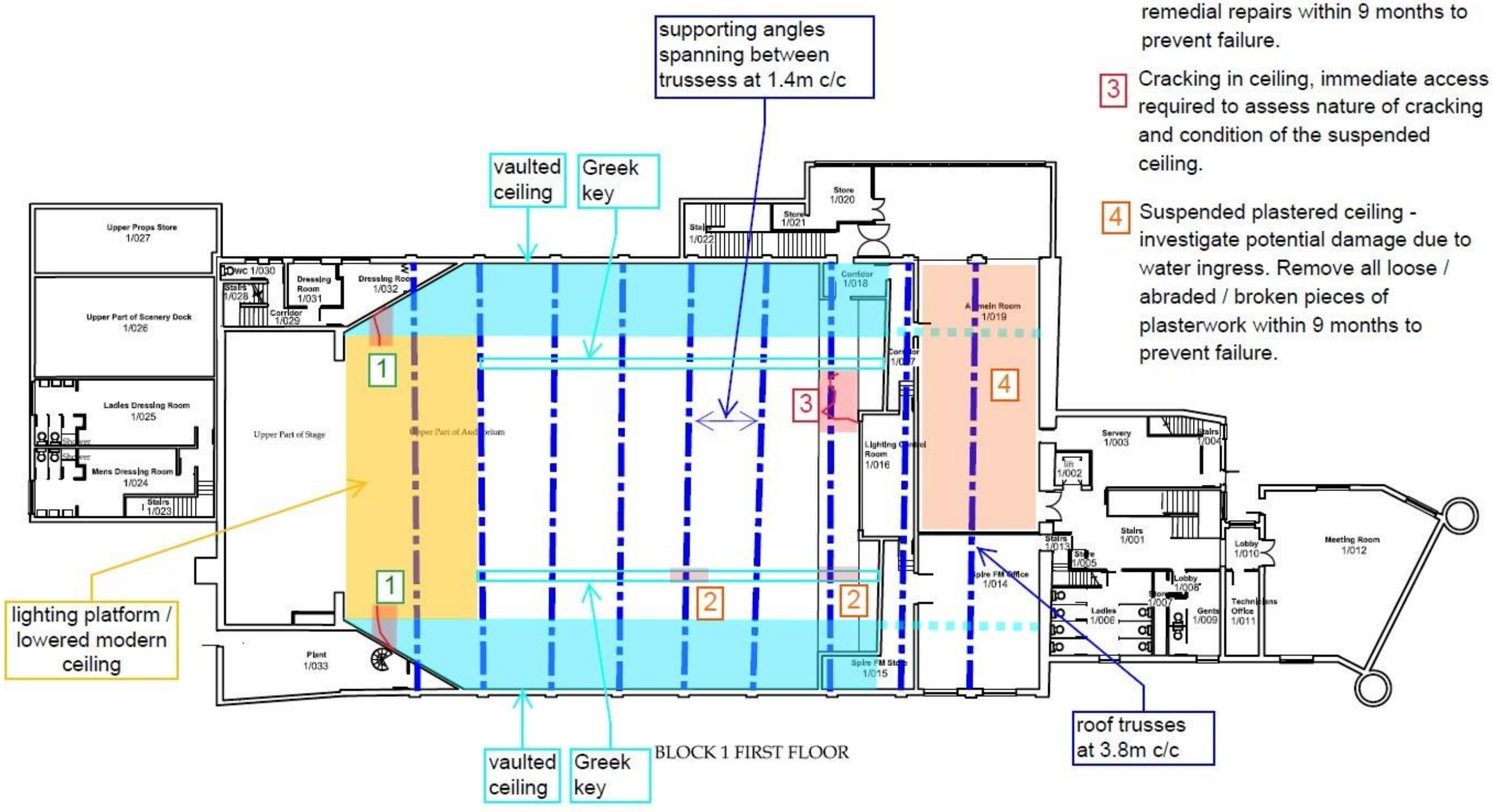
STRUCTURES AND DEFECTS CHART – GROUND FLOOR



BLOCK 1 GROUND FLOOR

AKSWard

STRUCTURES AND DEFECTS CHART – FIRST FLOOR



BLOCK 1 FIRST FLOOR

1 Cracking on right-hand and left-hand side of the stage, not a structural issue but requiring repair and monitoring.

2 Cracking in Greek key decorative panels. Requires assessment and remedial repairs within 9 months to prevent failure.

3 Cracking in ceiling, immediate access required to assess nature of cracking and condition of the suspended ceiling.

4 Suspended plastered ceiling - investigate potential damage due to water ingress. Remove all loose / abraded / broken pieces of plasterwork within 9 months to prevent failure.

C – PLASTER INSPECTOR REPORTS

C1 – Report of 24th June 2019

Stonewest

City Hall Salisbury -
Suspended Plaster Ceiling Inspections

Survey Date: 4th July 2019

Doc Ref No: 56588-SS-01

Principal & Specialist Contractors in Restoration, Conservation & New Build Masonry

E: info@stonewest.co.uk **T:** 0208 684 6646 **F:** 0208 684 9323 **W:** www.stonewest.co.uk
Stonewest Ltd, 67 Westow Street, Crystal Palace, London, SE19 3RW

Controlled Document			
	Name	Position	Date
Prepared by:	R Dickinson	Project Manager	04/07/2019
Checked:			

Revision Record					
Rev	Date	By	Summary of Changes	Checked	Approved

This report has been prepared for the sole benefit, use, and information of the commissioning Client:

Client Details
AKS Ward Ltd
7 Bancroft
Hitchin
Hertfordshire
SG5 1JQ

It is assumed that all readers are familiar with the site, and with the techniques of historic plaster conservation.

Any reader not familiar with the site or with the conservation of historic plaster should not draw any conclusions, nor initiate any works on the basis of this report.

Contents

1. *Introduction*

Stonewest were commissioned to undertake a survey of the suspended plaster ceilings, namely; Auditorium, Foyer, Servery/Kitchen & Alemein room.

We attended site with the structural consultants (AKS Ward Ltd) dated Monday 24th June 2019.

The purpose of the survey was to inspect the condition of the suspended plaster ceiling.

1.1 What This Report Is

This report is limited to the discussion of the suspended plaster ceilings only.

1.2 What this survey is not

A thorough review to the historic damage or decay drivers, inspecting the relevant parts of the building, both internally & externally.

Inspection of the structural parts supporting the suspended ceiling, past/present source(s) water and movement.

Exhaustive discussion surrounding traditional plaster ceilings, their construction and vulnerability.

1.3 Survey Limitations

The extent of the survey was limited due to the following constraints:

Upper part of the auditorium/Alemein ceiling inaccessible (Below fixed walkways) or where debris/insulation remains. The removal of these obstructions was deemed unsafe for risk of Asbestos Containing Materials.

Restricted access to the Lower part of the Alemein ceiling due to a suspended tile ceiling.

Stalls, circle seating stage and lighting rig prevented access to the lower part of the Auditorium ceiling.

No safe walkways to gain access to the upper part of the Foyer ceiling.

Since no off-site historical research has been undertaken, the significance of historic damage cannot be properly assessed.

1.4 Contents of the submission

Survey summary report to plasterwork condition.

Considerations in respect of potential remedial treatments.

1.5 Issues covered and discussed within this summary document:

Where accessible, assessment of the plaster ceiling condition.

Form of construction/plaster constituents.

Condition of the attachment to the ceiling and supporting structure.

2. Annotated Survey RCPs

The following mark-ups have been provided to illustrate, approximately, the building fabric in respect to as found defects.

Upper, and lower inspections were independently carried out and annotated. Only then have the two been reviewed in tandem.

The following drawings therefore illustrate the part, while the whole has been summarised in the summary section herein.

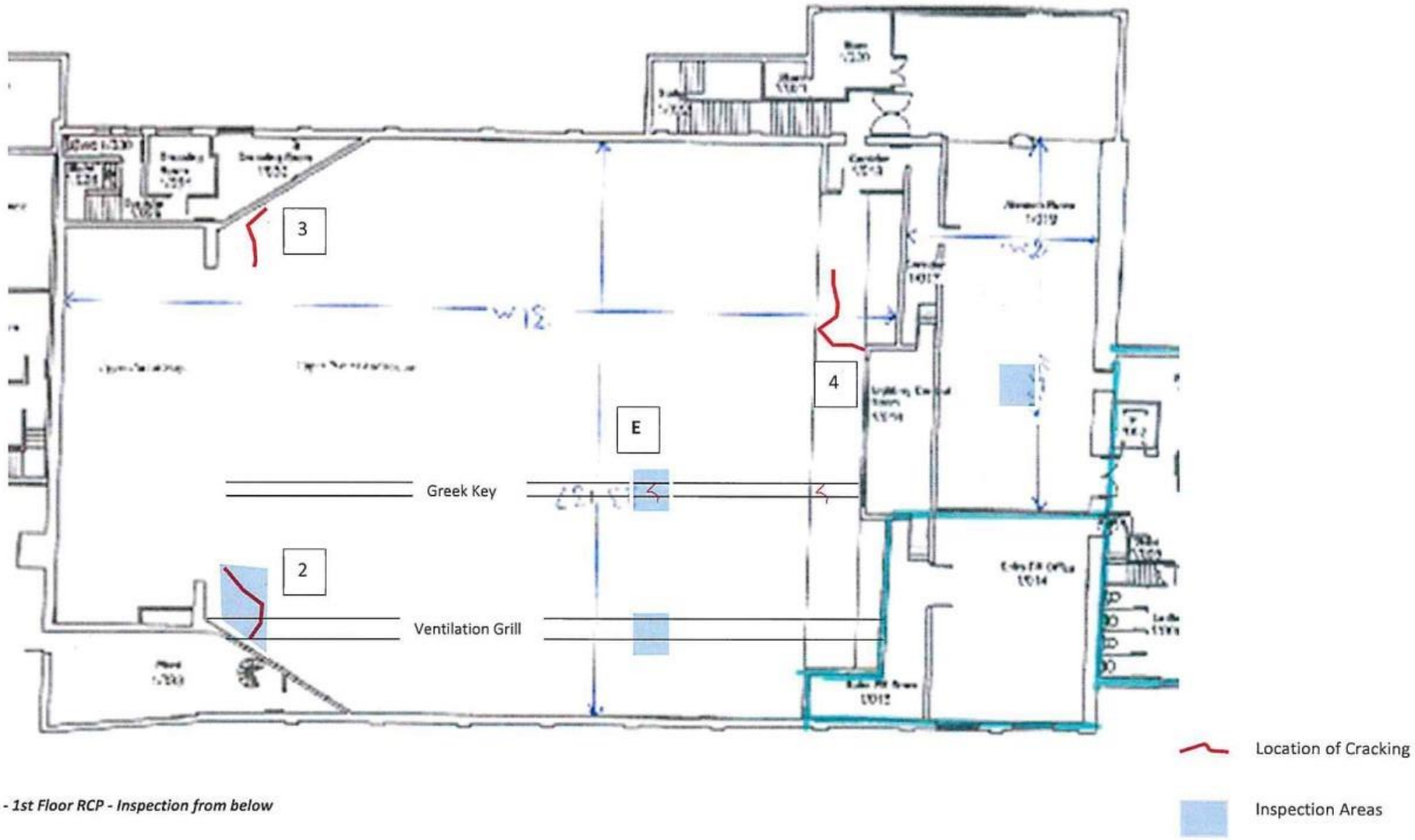


Figure 1 - 1st Floor RCP - Inspection from below

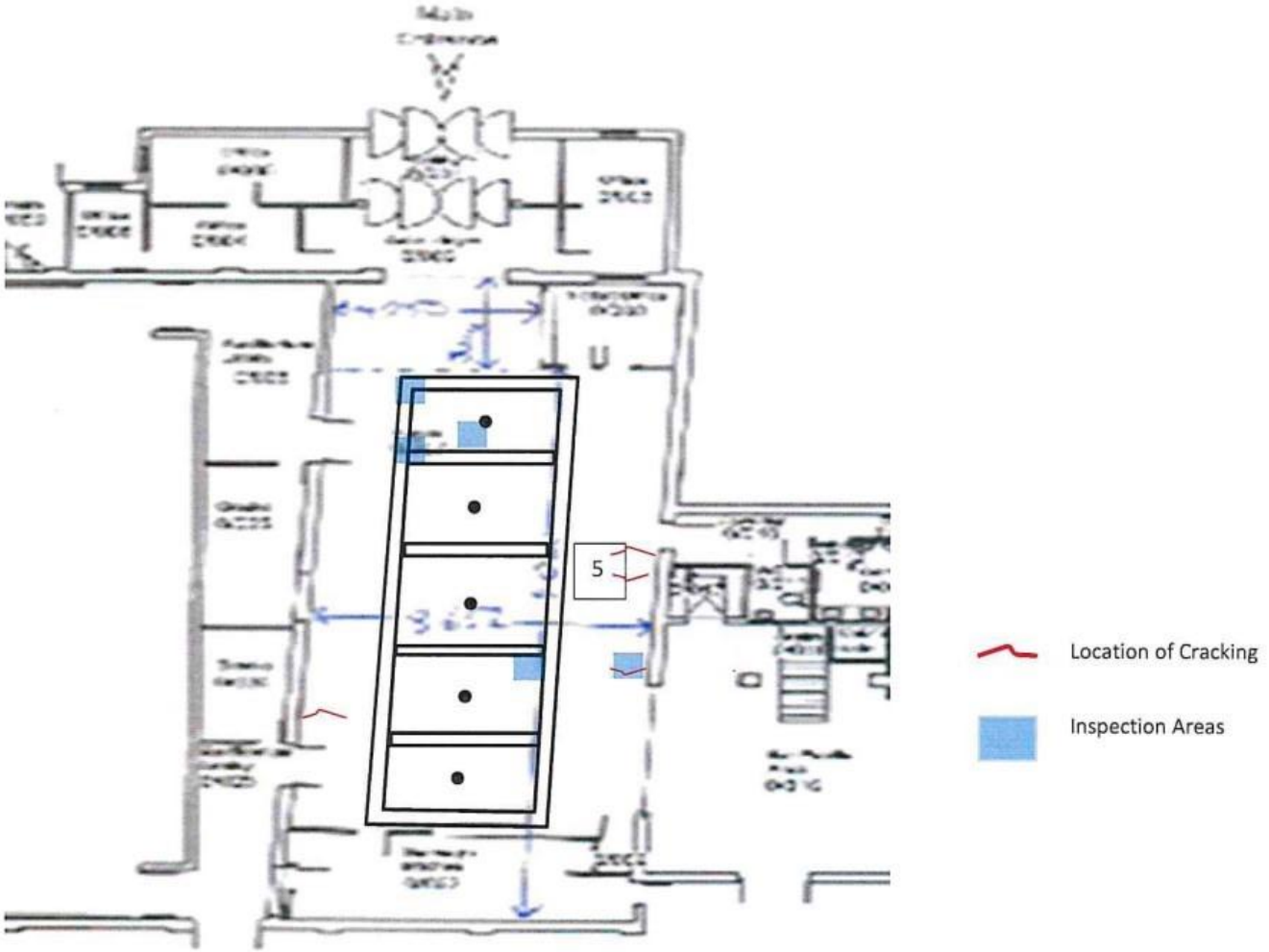


Figure 2 - G floor RCP - Inspection from below

3. *Defect Schedule*

Legend		Action long term ≥ 12-24 months	Action short terms ≤9 months	Action Immediate
Reference	Illustration	Defect	Comments	Legend
		Cracking	Projecting parts of the Greek key between and adjaent to cracking are loose. Remove debris from above these plaster casts. Loose/cracked areas cut out and made good.	
2		Cracking	Currently sound however, visual appearance undermines this and so it may be desirable to make good this crack. Continue to minitor crack.	
3		Cracking	Ditto	
4		Cracking	Access required to inspect the plasterwork and establish if this area is un-sound/live.	

5		Cracking	Continue to monitor cracking	

Table 1 - Defect Schedule

4. *Discussion*

Foyer (Inc. Servery/kitchen)

Form of Construction	Inspection from Below:
Plain flat surfaces: Solid work applied to expanded metal lath. Solid work formed in cementitious mortar, finish undetermined (Possibly anhydrous plaster). EML fixed to suspended MS 30x5 flat bar with tying wire. **Decorative Plasterwork:** Cast fibrous plaster panels (Hemihydrate plaster & hessian/timber reinforcement) Panels wire & wad to MS 30x5 flat bar, c/w additional unreinforced wadding Panels wadded at adjoining junctions.	Visually, the ceiling plane has slight undulations, (Circa several mm) most noticeable down sight lines, however, the plain and decorative areas were sound and firm to applied pressure. Cracking was seen intermittently, and typically at the perimeter areas. The cracking was below the painted surface and so not active/live. It is plausible that people(s) gaining access to the ceiling void naturally traverse the perimeter areas closes to the walls, resulting in the outward thrust of the solid work below and therefore cracking. Fretwork at HAVC intact, no sign of the plaster suffering from hydrolysis. **Inspection from Above:** No walkways to gain access other than visual inspection via a hatch in the servery/kitchen & foyer light fixture. Plaster key robust and firmly keyed into the expanded metal lath. Visually, the general condition of cast panels was satisfactory, wadding firm and intact.

Auditorium

Form of Construction	Below:
Plain flat surfaces: Solid work applied to expanded metal lath. Solid work formed in cementitious mortar, finish undetermined (Possibly anhydrous plaster). EML fixed to suspended MS flat bar with tying wire. **Decorative Plasterwork:** Cast fibrous plaster panels (Hemihydrate plaster & hessian/timber reinforcement)	Plain flat areas where inspected were firm to applied pressure. Typical weak points, such as HVAC locations were also sound. Greek key where inspected was cracked in several locations and unsound. Another area that could be closely seen had like results. Fortunately, the decorative panels serve just that function and so structurally are only self-supporting and lightweight, otherwise failure would have been expected thereafter. Cracking to LHS & RHS stage appear to be the junction between past repairs. The immediate surrounding plasterwork was firm to applied pressure and sound. Cracking immediately in front of the lighting room could not be accessed.

Panels assumed wadded only to MS 30x5 flat bar, and wadded at adjoining sections.	**Above:** Visual inspection was only possible. Damage to the Greek key was likely to be from applied force, either historic or from the recent roof works undertaken (Apparent from new timber decking above roof space & insulated roof panels) however, debris was still apparent and strewn above. These panels are quite thin, 1/8" – 1/16" THK therefore susceptible to damage. Unable to ascertain if wadding is reinforced or secure.

Alemein Room

Form of Construction	**Below:**
Plain flat surfaces: Solid work applied to expanded metal lath. Solid work formed in cementitious mortar, finish undetermined (Possibly anhydrous plaster). EML fixed to suspended MS flat bar with tying wire. **Decorative Plasterwork:** Cast fibrous plaster panels (Hemihydrate plaster & hessian/timber reinforcement) Panels assumed wadded only to MS 30x5 flat bar.	Suspended tile ceiling prevented access; visual inspection only possible. Ceiling a continuation of the original scheme and carried forward from the Auditorium. Numerous apertures formed within existing ceiling where hangers have been installed to support the timber and again, light weigh MF tile ceiling. **Above:** Visual inspection was only possible, but hindered by strewn debris & insulation. Unable to ascertain if wadding is reinforced or secure.

Method of supporting suspended fibrous plaster:

Form of Construction

Decorative Plasterwork:

Cast fibrous plaster panels fixed with hemihydrate and hessian canvas wadding, c/w tying wire.

Above:

In the absence of close examination to the attachment of fibrous plasterwork, we would reasonably assume that the wadding is unreinforced.

However, or at least in a single instance, we were able to illustrate that a wad has been reinforced.

Further instances of clip wadding to tying wire was also observed.

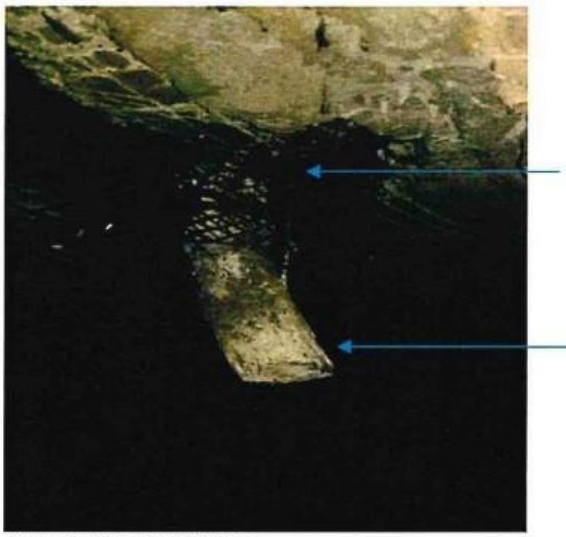


Figure 3 - Wire & Wad Fixing

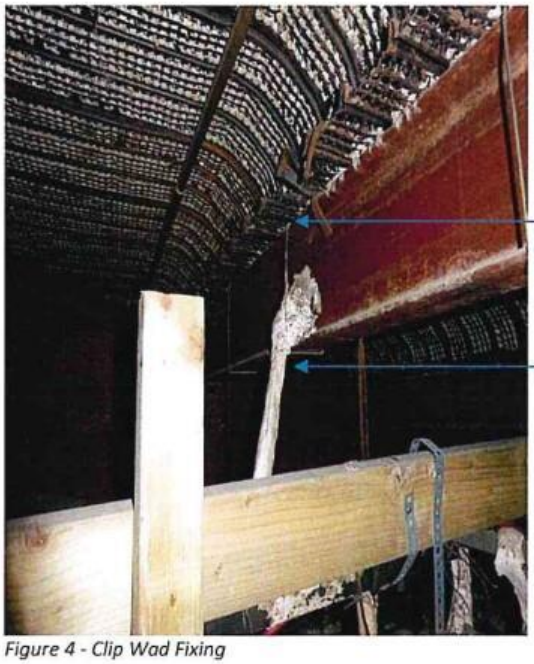


Figure 4 - Clip Wad Fixing

5. *Conclusions*

Foyer (Inc. Servery/Kitchen):

We found no evidence of immediate failure to the plasterwork from our lower site investigation; however, we recommend the continued inspection of perimeter areas where cracked, and or where used for access past and present. This is to monitor any possible detachment.

Safe access should be made available in the ceiling void to inspect the whole of the ceiling, thus allowing the full condition of cast plaster panel attachments, as well as plaster key attachment in cracked areas.

Auditorium:

Immediately, access is required to assess the condition of cracking around the lighting control room.

Full retraction of circle seating & removal of the seating area around the stalls is required to fully inspect the ceiling condition, including safe access in the ceiling void.

Remedial works required to the Greek key where cracked, the extents of which will be known once full access is available.

Alemein Room:

Access is required to assess the stability of plain flat areas, suspended above the existing suspended tile ceiling.

Intermittent apertures have been formed, with abraded/broken pieces of plaster remaining. These should be removed to prevent future failure.

Access & removal of debris/insulation undertaken to allow the inspection of cast plaster attachment.

C2 – Report of 27th August 2020

TRITON
BUILDING RESTORATION

City Hall Salisbury -
Suspended Plaster Ceiling Inspection

Survey Date: 27th August 2020

Doc Ref No: 5015_20200831_City Hall Salisbury

Triton Building Restoration, 14 Saxon Business Centre, Windsor Avenue, London, SW19 2RR
www.tritonrestoration.co.uk, www.tritonconservation.co.uk

Controlled Document			
	Name	Position	Date
Prepared by:	[redacted]	Senior Contract Manager	31/08/2020
Checked:			

This report has been prepared for the sole benefit, use, and information of the commissioning Client:

Client Details
AKS Ward Ltd
7 Bancroft
Hitchin
Hertfordshire
SG5 1JQ

It is assumed that all readers are familiar with the site, and with the techniques of historic plaster conservation.

Any reader not familiar with the site or with the conservation of historic plaster should not draw any conclusions, nor initiate any works on the basis of this report.

Contents

Figures

Tables

1. *Introduction*

Triton Building Restoration were commissioned to undertake a survey of the suspended plaster ceiling in the Auditorium.

We attended site with the structural consultants (AKS Ward Ltd) dated Thursday 27th August 2020.

The purpose of the survey was to inspect the condition of the suspended plaster ceiling.

1.1 What This Report Is

This report is limited to the discussion of the suspended plaster ceiling only.

1.2 What this survey is not

A thorough review to the historic damage or decay drivers, inspecting the relevant parts of the building, both internally & externally.

Inspection of the main structural parts supporting the suspended ceiling, past/present source(s) water and movement.

Exhaustive discussion surrounding traditional plaster ceilings, their construction and vulnerability.

1.3 Survey Limitations

The extent of the survey was limited due to the following constraints:

Upper part of the auditorium ceiling inaccessible.

Restricted access to the lower part of the ceiling due to retracted seating & lighting rig.[1]

Since no off-site historical research has been undertaken, the significance of historic damage cannot be properly assessed.

Form of construction to upper part of the ceiling gleaned from plaster inspection dated 24th June 2019.

1.4 Contents of the submission

Survey summary report to plasterwork condition.

Considerations in respect of potential remedial treatments.

1.5 Issues covered and discussed within this summary document:

Where accessible, assessment of the plaster ceiling condition.

Form of construction/plaster constituents.

[1] Refer to figure 1 for location.

Condition of the attachment to the ceiling and supporting structure.

2. *Annotated Survey RCPs*

The following mark-ups have been provided to illustrate, approximately, the building fabric in respect to as found defects.

Upper part of the ceiling gleaned from plaster inspection dated 24th June 2019 and lower inspections were independently carried out and annotated. Only then have the two been reviewed in tandem.

The following drawings therefore illustrate the part, while the whole has been summarised in the summary section herein.

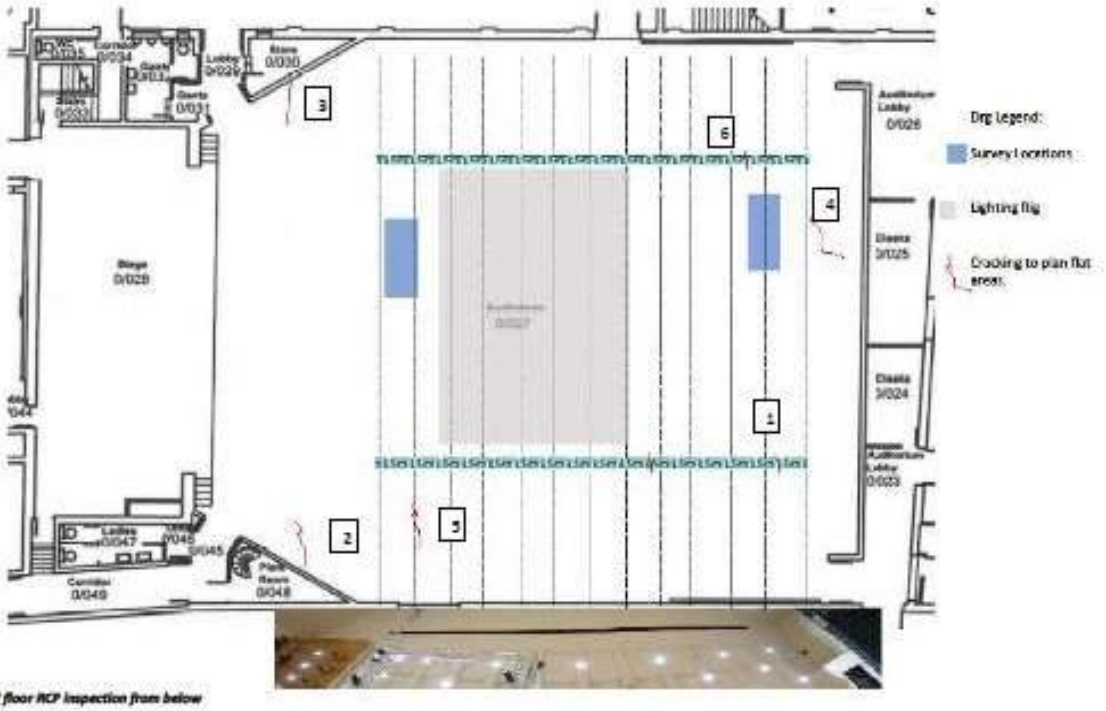


Figure 1 - 2nd floor RCP inspection from below

3. *Defect Schedule*

Legend	Action long term: 12-24 months	Action short term: 3-9 months	Action immediate

Reference	Illustration	Defect	Comments	Legend
1		Cracking	Projecting parts of the Greek key between and adjacent to cracking are loose. Remove debris from above these plaster casts. Loose/cracked areas cut out and made good.	
2		Cracking	Currently sound however, visual appearance undermines this and so it may be desirable to make good this crack. Continue to minitor crack.	
3		Cracking	Ditto	
4		Cracking	Access required to inspect the plasterwork and establish if this area is un-sound/live.	

Author: [redacted]

5		Cracking	Visual inpsection, unable to sound out from below. Continue to minitor crack.	
6		Cracking	Projecting parts of the Greek key between and adjoent to cracking are loose. Remove debris from above these plaster casts. Loose/cracked areas cut out and made good.	

Table 1 - Defect Schedule

4. Discussion

Auditorium

Form of Construction	Below:
"Plain flat surfaces: Solid work applied to expanded metal lath. Solid work formed in cementitious mortar, finish undetermined (Possibly anhydrous plaster). *EML fixed to suspended MS flat bar with tying wire.* *Decorative Plasterwork: Cast fibrous plaster panels (Hemihydrate plaster & hessian/timber reinforcement)* *Panels assumed wadded only to MS 30x5 flat bar, and wadded at adjoining sections"*[2] Light Troughs **Approx. 1/8" fibre board** of early construction. Troughs fitted to timber battens which in turn are fixed to the ceiling.	Visual inspection from nearest to the stage[3] revealed a p/b (plasterboard) ceiling, occurring between the light troughs in this single location. It was unclear from the survey location the purpose of this secondary ceiling finish and whether is was suspended below the existing ceiling or if the ceiling had been removed from above.  Second survey location was firm to applied pressure and typical of the conditions when surveyed dated 24th June 2019. Generally, except for several additional cracks identified, previously identified cracks were in a like condition. *"Plain flat areas where inspected were firm to applied pressure. Typical weak points, such as HVAC locations were also sound.* *Greek key where inspected was cracked in several locations and unsound. Another area that could be closely seen had like results. Fortunately, the decorative panels serve just that function and so structurally are only self-supporting and lightweight, otherwise failure would have been expected thereafter.* *Cracking to LHS & RHS stage appear to be the junction between past repairs. The immediate surrounding plasterwork was firm to applied pressure and sound.* *Cracking immediately in front of the lighting room could not be accessed"*[1]. 13 no. light troughs have been retrospectively applied to the ceiling. It was unclear from below the fixing method of battens to the ceiling. Gaps between the troughs and ceiling do not appear to be recent movement which was clear from the cutting-in from finishing trades/decorators.

[2] Plaster inspection dated Monday 24th June

[3] Refer to figure 1 for survey locations.

Above:

"Visual inspection was only possible.

Damage to the Greek key was likely to be from applied force, either historic or from the recent roof works undertaken (Apparent from new timber decking above roof space & insulated roof panels) however, debris was still apparent and strewn above.

These panels are quite thin, 1/8" – 1/16" THK therefore susceptible to damage.

Unable to ascertain if wadding is reinforced or secure"[4].

[4] Plaster inspection dated Monday 24th June

5. *Conclusions*

Auditorium:

Access is still required to sound out the cracking outside the control room, however, from visual inspection we can see that the site condition is not progressive.

Access between the lighting rig & over retractable seating is still required to fully inspect the ceiling condition, including safe access in the ceiling void.
At the time of surveying, the site team were advised that the ceiling void was not to be accessed due to ACM.

Generally, where sounded out from below, the ceiling was sound and firm to applied pressure. Fortunately, the form of construction, namely the EML provides a good mechanical key with a large surface area into which the plaster can mechanically key into.

Remedial works required to the Greek key where cracked, the extents of which will be known once full access is available.

Fixing of light trough TBC. We would expect spring toggle or similar anchors employed to fix the battens to the ceiling but could not ascertain. Structural advisors to confirm adequacy from loadings of fixtures. We did observe that the lightweight form of construction does not appear to be robust enough for the long-term maintenance of down lights.
This dues to the post emplaced stress that the troughs will experience through their life cycle.

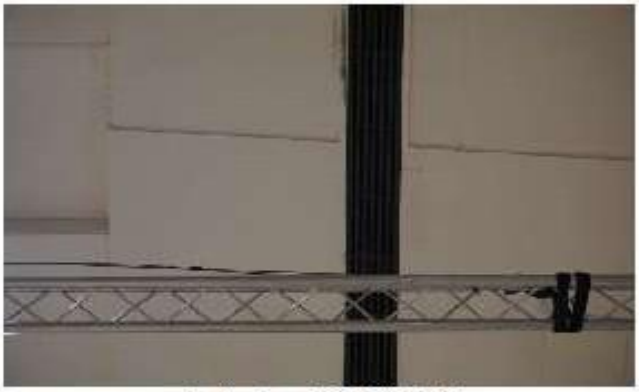
Remaining concerns are the type of attachment and condition between secondary mild steel frame and EML, ditto for light troughs.
Once access is available to the upper part of the ceiling, these connections can be inspected.

APPENDIX A

Author [redacted]

Auditorium - 20200927 (1)

Auditorium - 20200927 (3)



Auditorium - 20200927 (4)

Auditorium - 20200927 (5)

Auditorium - 20200927 (6)

Auditorium - 20200927 (7)

Auditorium - 20200927 (8)

Auditorium - 20200927 (10)

Auditorium - 20200927 (11)

Auditorium - 20200927 (12)

Auditorium - 20200927 (13)

Auditorium - 20200927 (14)


Auditorium - 20200927 (15)

Appendix D – AKSWARD LTD REPORT FROM JUNE 2019

Contents

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[redacted]

SENIOR PROJECT ENGINEER

.....

[redacted]

OPERATIONS DIRECTOR

Revision	Amendments	Prepared By	Checked	Date
	Report issue	[redacted]	[redacted]	03/09/19

REPORT ON THE SUSPENDED PLASTER CEILINGS INSPECTION OF SALISBURY CITY HALL, MALTHOUSE LANE, SALISBURY

3. INTRODUCTION

3.1 AKSWard Ltd were instructed by [redacted] of Kier Workplace Services to undertake a suspended plaster ceilings inspection of Salisbury City Hall at Malthouse Lane, Salisbury. The purpose of the appointment was to inspect the condition of suspended plastered ceilings and to provide structural and plaster specialist report.

3.2 The site visit and inspections were undertaken on Monday 24th June 2019. The weather was dry and sunny. The survey was undertaken by [redacted] (Structural Engineer, AKSWard Ltd) and [redacted] (Plaster Specialist, Stonewest Ltd).

3.3 The inspection was limited to a visual survey, including photographic survey and measurements of the structural elements (but not a measured building survey). No structural opening up works have been undertaken during the survey. No material testing was undertaken for the purpose of this report.

3.4 Externally there was good ground level access around the building to undertake the visual survey. No high-level access was provided externally.

3.5 Internally the following areas have been inspected: Foyer, Servery / Kitchen, Auditorium, Alamein Room, Loft space. Access was provided to inspect these areas, including ladders and scaffold tower to gain access to high-level ceilings. Following access restrictions were encountered during the survey:

a) Foyer – access through the lighting panel opening (without possibility of getting into the space above ceiling).
b) Servery / Kitchen – access only through ceiling access hatch (without possibility of getting into the space above ceiling).
c) Auditorium – area of floor available to set scaffold tower was limited by the lighting box and the retractable seating.
d) Alamein Room – suspended panel ceiling, installed below the historic lath and plaster ceiling.
e) Loft space – timber floor installed over the ceilings, insulation placed over the ceiling, potential risk of asbestos fibres in the loft space preventing lifting of insulation.

3.6 The Client requirement was to deliver the report in accordance with the ABTT Guidance Note 20. This below report follows the Guidance Note as far as practicable.

3.7 The report has been produced only for use by Kier Workplace Services and should not be used by third parties without consultation with AKSWard Ltd.

3.8 The City Hall floor plans have been annotated with site observations and these are included as Appendix A.

3.9 A photographic record was made of the surveys and this is included as Appendix B.

3.10 The Plaster Specialist comments have been incorporated in the below report. The report is also included as Appendix C.

4. BRIEF DESCRIPTION OF PROPERTY

5.13 The City Hall was a three-storey detached building, irregular on plan.

5.14 The building was located at Malthouse Lane. The building abutted Fisherton Street on the South, Summerlock Approach on the West and the Chapel Place on the North.

5.15 The building was approx. 78 m long (North – South) and 32m wide (East – West). The auditorium and stage part of the building was two-storey high, 45m long and 25m wide. The auditorium part of the building dates to 1937, and was extended with:

- the front three-storey part comprising bar, meeting room and offices;
- side two-storey extension comprising lobby, staircase, offices;
- rear two-storey extension comprising stage docks and dressing rooms.

5.16 The external walls of the building were brickwork construction. The roof over the auditorium was a gambrel roof. The roofs over the extensions were flat and / or mono pitched.

5.17 See Appendix A for block plans and appendix B for photographs of the building.

6 OBSERVATIONS

6.1 Foyer.

6.1.1 Good access below the ceiling was provided. Above access was only through lighting panel opening in the ceiling, it was not possible to enter the ceiling void.

6.1.2 Structural parts supporting suspended plaster ceilings.

The ceiling was suspended from the floor structure, originally forming the auditorium balcony. The structure was formed of deep cranked primary steel beams and secondary beams spanning between, and supporting the stepped floor. The floor was presumably concrete cast on metal lath, tied to the steel beams with metal wire.

Photo 1 – Ceiling void above Foyer.

The ceiling structure was suspended with flat, twisted bars. These bars were hooked over the top flange off the secondary beams or fixed to the angles spanning between the secondary beam and masonry wall. There was no access to measure size and gauge of the ties. Beside flat bar ties, hessian wadding ties had been used to suspend the ceiling (ceiling over the part of Foyer abutting Auditorium). It was likely that the hessian wadding ties fixed to the secondary steel beams had metal wire reinforcement.

Photo 2 – Ceiling void above Foyer.

The substructure supporting the plastered ceiling was formed of mild steel flat bars placed in two layers and in orthogonal directions. Top layer was formed of 30x6mm flat bars, it was not possible to measure the exact size of the bottom layer flat bars but considering the construction of the ceiling in other areas they were likely to be 18x6mm.

Photo 3 – Hessian wadding ties supporting the suspended ceiling.

6.1.3 Suspended plastered ceiling.

The ceiling was formed of solid work (cementitious mortar) applied to expanded metal lath. The lath was fixed to the ceiling's substructure with metal wire and hessian wadding ties. The finish was undetermined (possibly anhydrous plaster). The decorative plasterwork was cast fibrous plaster panels (hemihydrate plaster and hessian / timber reinforcement). The ceiling over the Foyer comprised five large coffers in the centre of the span with light fittings in the middle. It was noted that modern timber frames were introduced to support the ceiling around the light fittings in the centre of the coffers.

Photo 4 – The suspended ceiling over Foyer.

Photo 5 – Timber frame around light fitting, over the coffer.

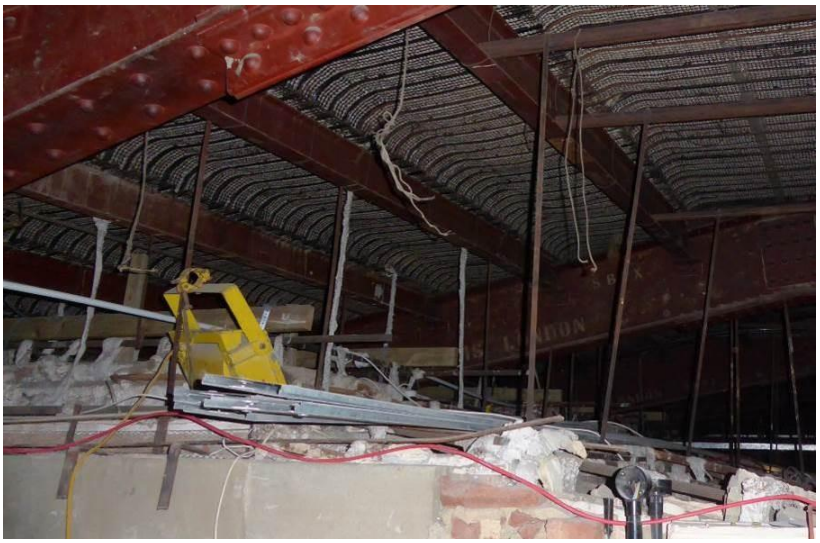

Photo 6 – Void over Foyer ceiling, timber frames over the coffers.

In the area of the front entrance and the ticket office the historic suspended plastered ceiling was covered with new structure, presumably plasterboard fixed over the historic elements.

Visually the ceiling plane had slight undulations, however the plain and decorative areas were sound and firm when pressure was applied. Cracking was seen intermittently, mostly along the South external wall and at approximate 4.0m centres. The cracking was below the painted surface and so was not active / live.

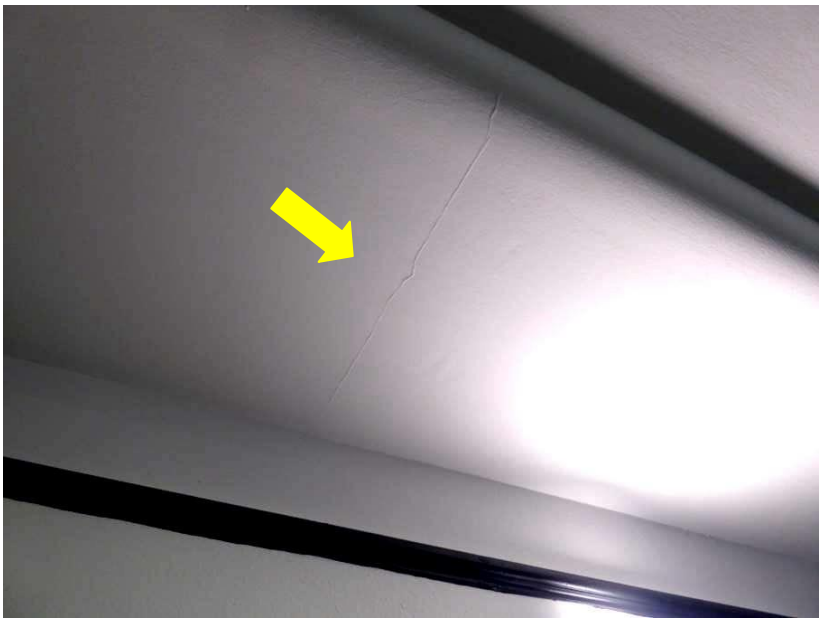

Photo 7 – Crack in Foyer ceiling.

Fretwork at HAVC intact, no sign of the plaster suffering from hydrolysis. Plaster key robust and firmly keyed into the expanded metal lath.

Visually, the general condition of cast panels was satisfactory, wadding firm and intact.

6.2 Kitchen / Servery

6.2.1 Good below access to ceiling was provided. Above access only through access hatch opening in the ceiling, not possible to walk into the ceiling void.

6.2.2 Structural parts supporting suspended plaster ceilings.

The ceiling was suspended from the floor structure, originally forming the auditorium balcony, as per description in paragraph 3.1.2.

The ceiling structure was suspended with a few ties only. These ties were galvanized flat bars and they seemed to be modern alteration of the ceiling's structure. No hessian ties were observed in this area.

Photo 8 – ceiling void above Kitchen / Servery.

The substructure supporting the plastered ceiling was formed of mild steel flat bars placed in two layers and in orthogonal directions, like the ceiling over the Foyer. The flat bars (presumably 18x6mm) forming the bottom layer and supporting the expanded metal lath were placed at 350mm centres. The top layer was formed of 30x6mm flat bars placed at approximately 1080mm centres. These bars were spanning between external wall and the wall separating the Servery from the Foyer, on overall distance of approximately 3.5m. They were suspended in the mid span with ties (see photograph above).

Beneath the ceiling there was a partition wall installed up to the underside of the ceiling and likely to be providing support at the mid-span of the bars.
In the centre of the 3.5m span the ceiling was deflected at approximately 30mm, which is above the acceptable serviceability limit. Presumably the deflection occurred before partition wall installation.

Photos 8 and 9 – Ceilings over the Servery and the Kitchen.

6.2.3 Suspended plastered ceiling.

The ceiling was formed of solid work (cementitious mortar) applied to expanded metal lath. The lath was fixed to the ceiling's substructure with metal wire and hessian wadding ties. The finish was undetermined (possibly anhydrous

plaster). There was no decorative plasterwork in this area. There was no cracking in the ceiling over the Kitchen / Servery. Visually, the general condition of the cast panels was satisfactory.

6.3 Auditorium.

6.3.1 Access beneath the ceiling was provided from a scaffold tower and it was restricted by the lighting box and the retractable seating. The above access was provided over the central, flat part of the ceiling, although the timber floor did not allow us to inspect details of the construction in the whole area. There was no safe access above the side vaults of the Auditorium ceiling.

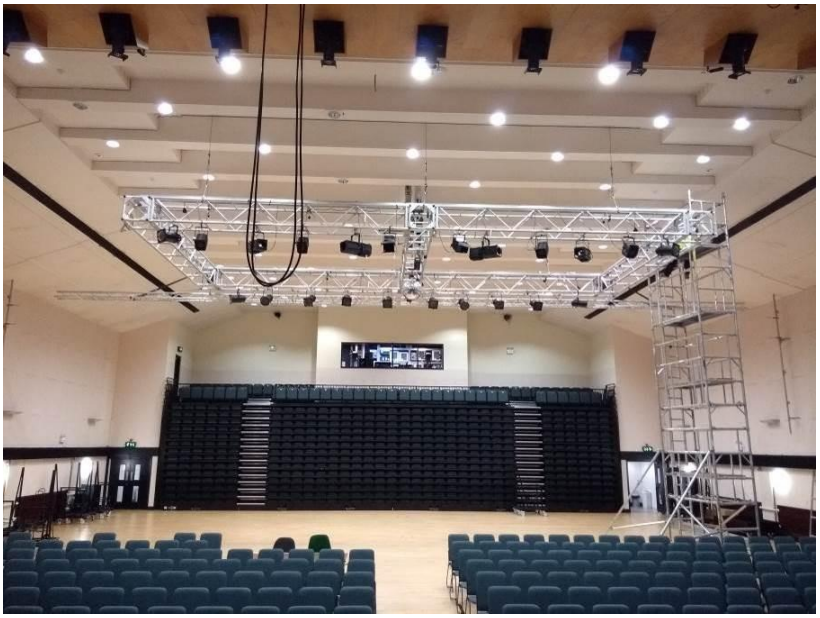

Photo 10 – Auditorium, retractable seating and light box.

6.3.2 Structural parts supporting suspended plaster ceilings.

The ceiling was suspended from the roof structure, formed of steel trusses spanning over the auditorium, approximately 24.0meters. The truss type was flat vault gambrel truss. Spacing of the trusses was approximately 3.8m. See Appendix B for schematic drawings of the structure over the auditorium.

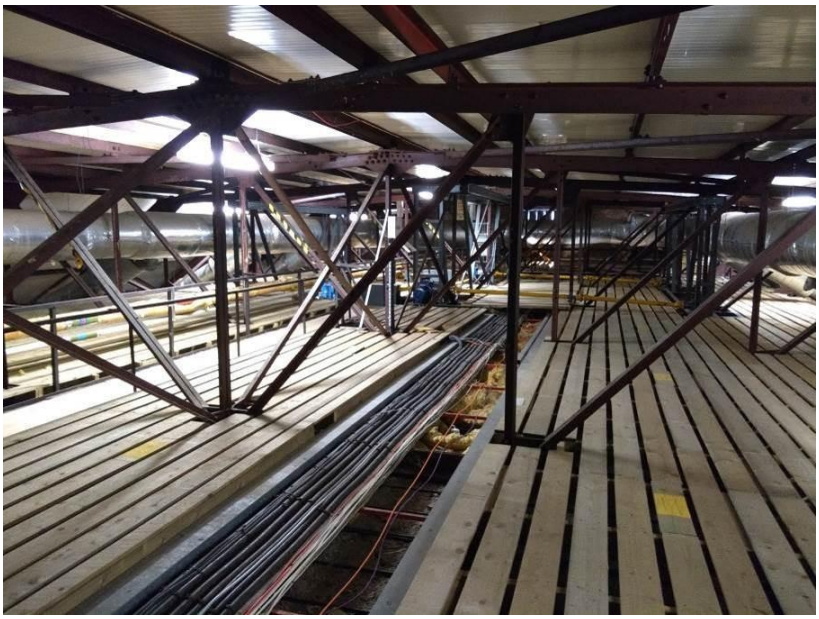

Photo 11 – Loft above Auditorium.

The connections in the trusses were formed with metal plates fixed to sections forming chords and struts with rivets and/or bolts. Presumably trusses had been divided into sections for transport and assembled on site.

Photo 12 – Truss connection.

The trusses were formed with double steel angle sections - chords of 150x85x8 angles and struts of 60x50x6 angles. Lateral stability was provided by cross-bracing perpendicular to the trusses (in three lines) and diagonal bracing in the roof plane. All bracing was formed of steel angles.

The trusses were supporting purlins formed of angle sections, placed at 550mm and 1120mm centres. The purlins were supporting lightweight, insulated roof panels. We have not obtained information about the original type of roof covering installed over the building.

Beside the plastered suspended ceiling, the roof structure supported services (ventilation ducts, heating system, light box hoist, data and electric cables) and a timber floor.

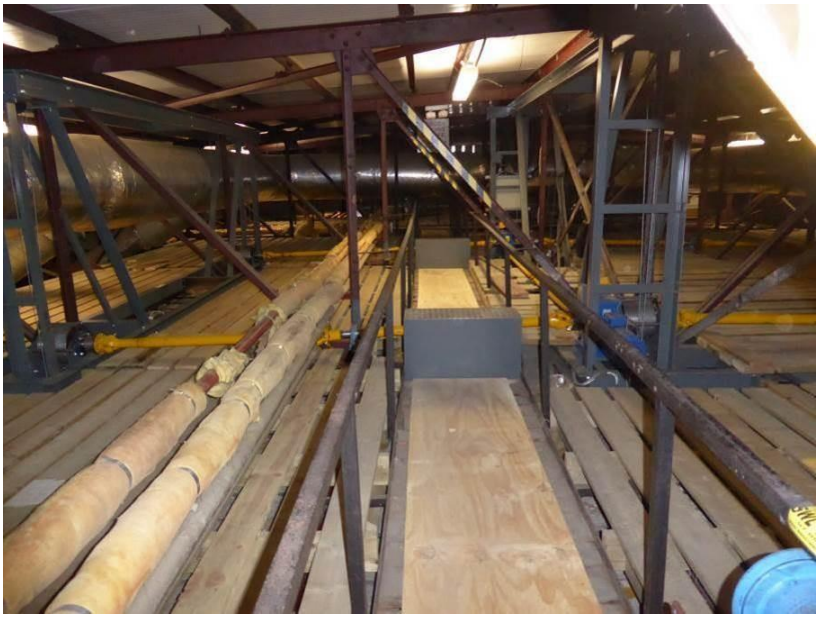

Photo 12 – Services in loft above Auditorium.

The substructure supporting the plastered ceiling was formed of steel angles, spanning between the roof trusses. The angles were fixed to the bottom chord of trusses at approximately 1.4m centres. The timber floor joists were bearing directly on the edge of the vertical arm of the angle. The floor structure was formed of 150mm deep by 45mm wide joists at 600mm centres and softwood floorboards placed with a gap between. The steel angles gave support to a flat ceiling over the central part of the Auditorium and vaulted ceilings on the sides, although the details differed depending on the area. The ceiling in the front part of the auditorium had been extensively altered, although the primary support system had not changed. Four types of ceilings were identified in the Auditorium area: high level ceiling, lowered ceiling, vaulted ceiling and stage ceiling. See following pages for details.

Photo 15 – Loft over vaulted ceiling -vent ducts,
no timber decking for access.

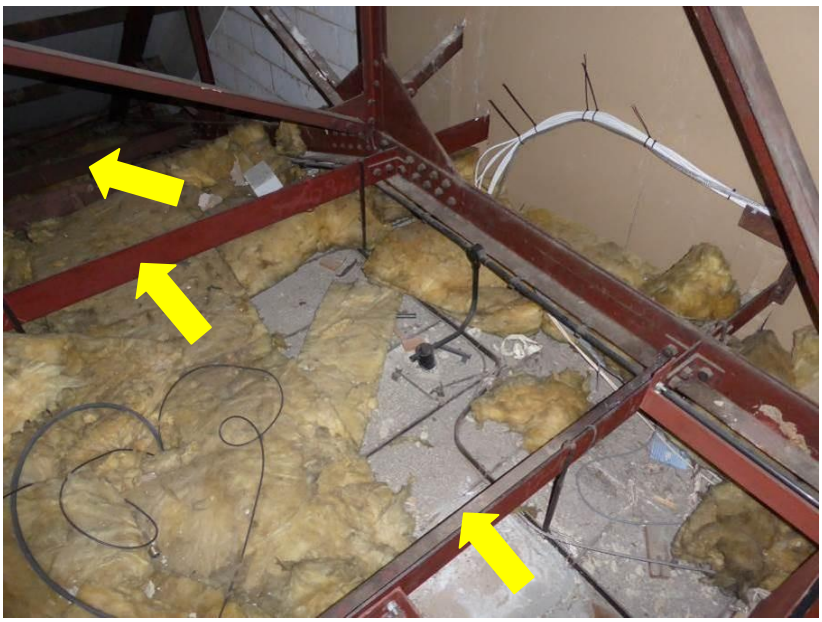

Photo 14 – Steel angles spanning between trusses
and supporting the suspended ceiling.

High level ceiling

Part of ceiling was fixed directly to the underside of the steel angles, acting as secondary beams. The substructure was formed of mild steel flat bars (presumably 18x6mm) at approximately 350mm centres, fixed to the steel angles with metal wire ties, hooked over the vertical arm of the angle.

Photo 15 – Metal wire ties hooked over the angle arm.

Photo 16 – Metal wire ties fixing flat bars to the angle.

Lowered ceiling

Part of the ceiling with solid work lowered below the supporting angles level, approximately 500mm (this distance may vary across the ceiling area). The substructure supporting the plastered ceiling was formed of mild steel flat bars placed in two layers and in orthogonal directions. The bottom layer was 18x6mm flat bars placed at approximately 350mm centres. Top layer was formed of 30x6 flat bars at approximately 1.0m centres. The top layer was suspended off the steel angles (secondary beams) with ties formed of mild steel twisted flat bars (15x3 mm). The ties were hooked over the vertical arm of the angle and over the flat bar. Metal wire was used generally to fix expanded metal lath to the bottom layer of the supporting structure, although hessian wadding ties had been noted in a few locations.

Photo 17 – Suspended ceiling, visible junction with high level ceiling.

Vaulted ceiling

Part of the ceiling at the sides of the Auditorium, abutting the external walls. There was no good access to inspect details of the ceiling construction from above. Considering the details of construction viewed in the loft, we assume that the construction of the vaulted ceiling is like the lowered ceiling, where the ties were fixed to the substructure and supporting angles (secondary beams) at closer centres.

Photo 18 – Void over vaulted ceiling.

Stage ceiling

This item refers to the ceiling in the area abutting the stage. The original suspended plastered ceiling in this area was altered and covered with new structure formed of timber and plasterboard. The original ceiling's construction is equivalent to the lowered ceiling described above. The substructure and ties formed of flat bars were retained. The historic ceiling was locally removed to allow construction of the lowered ceiling and lighting platform over the Stage / front Auditorium. The modern ceiling and platform were suspended with flat bar ties (24x6mm) and equal angles (35x35x5) from the supporting angles (secondary beams). The connections between ties and platform substructure were bolted – either with a single bolt through the angle arm (in shear) or a single bolt welded to the tip of the flat bar and secured with a nut to the bracket or angle, fixed to timber structure of the platform. The new ties were penetrating through the retained historic ceiling. The spacing of the ties was approximately 2.0m along the secondary beams (angles). The lighting fixtures were suspended directly from the secondary steel angles or from the lowered ceiling structure.

The timber structure of the platform was formed with 150mm deep by 47mm wide timbers installed at 450mm centres. Every second joist was suspended to the supporting (roof) structure with metal ties. The deck was formed with softwood floorboards installed with gaps between.

Photo 19 – Historic ceiling substructure.

Photo 20 – Steel subframe supporting lighting platform.

Photo 21 – Suspension of the lighting platform.

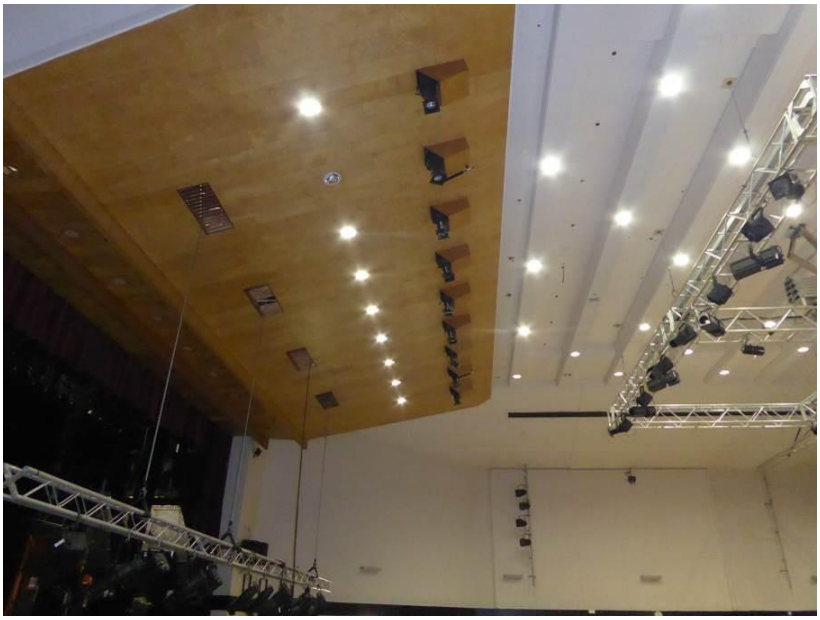

Photo 22 – Lighting platform, underside view.

6.3.3 Suspended plastered ceiling.

The ceiling was formed of solid work (cementitious mortar) applied to expanded metal lath. The lath was fixed to the ceiling's substructure with metal wire. The finish was indeterminate (possibly anhydrous plaster). The decorative plasterwork was cast fibrous plaster panels (hemihydrate plaster and hessian / timber reinforcement). The ceiling over the Auditorium comprised a large flat area in the centre and vaults on the sides, along the external walls. At the junction of the flat and vault ceilings a strip of ceiling was lowered and the step was finished with decorative Greek key panels.

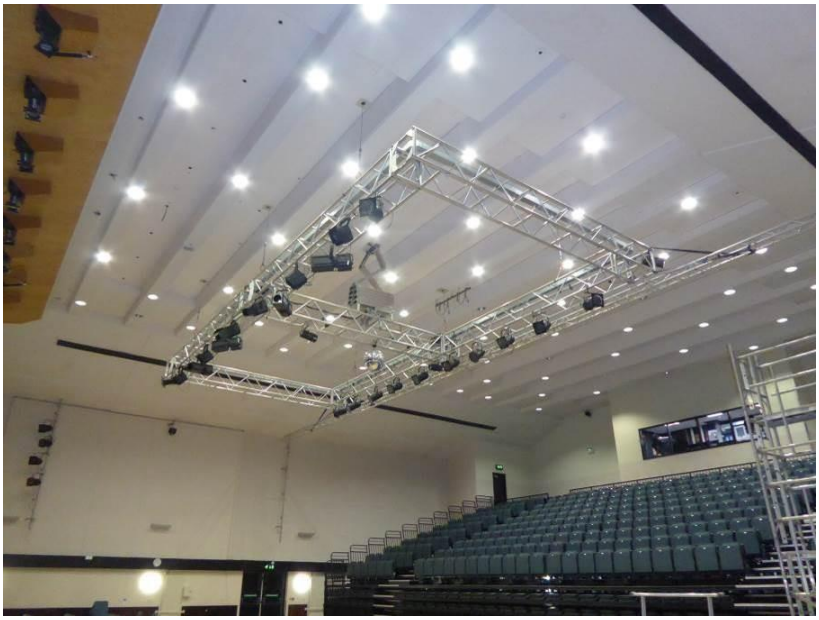

Photo 23 – Ceiling over the Auditorium.

Lighting boxes formed of timber battens and chipboard. The timber framing was fixed through the solid work and EML to timber blocks with coach bolts. The fixings were tested with applied pressure in a few random locations across the ceiling and all of them were sound.

Plain, flat areas where inspected were firm under applied pressure. Typical weak points, such as HAVC locations were also sound.

The Greek key where inspected was cracked in several locations and unsound. The decorative panels are structurally only self-supporting and lightweight; hence these defects have not caused ceiling failure. Panels assumed wadded only to 30x5mm flat bar and wadded at adjoining sections. It was not possible to ascertain if the wadding is reinforced or secure.

Cracking immediately in front of the lighting room could not be accessed.

Cracking to left-hand side and right-hand side of the stage was noted. It appeared to be at the junction of historic suspended ceiling and modern ceiling

infill. The immediate surrounding plasterwork was firm under applied pressure and sound.

Photo 24 – Crack to the left-hand side of the stage.

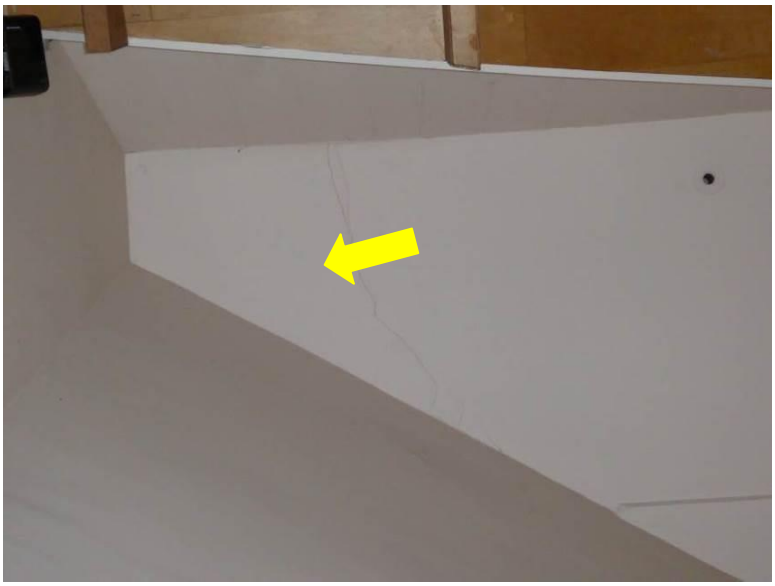

Photo 25 – Crack to the right-hand side of the stage.

6.4 Alamein Room.

6.4.1 Limited access was provided below the ceiling due to the suspended tile ceiling installed on to a timber frame. Above access was possible through the loft, but the accessibility was limited by insulation placed on the ceiling, services and other strewn debris.

6.4.2 Structural parts supporting suspended plaster ceilings.

The ceiling was suspended from the roof structure, as described in paragraph 3.3.2. The trusses over the Alamein Room did not support the timber floor. The access walkway was constructed from a steel angle frame and chipboard. Ventilation ducts were hung down from the top chords or propped on the bottom chords of the truss.

Photo 26 – Loft above Alamein Room.

The thermal insulation placed on top of the suspended ceiling did not allow investigation of the details of construction. The ceiling plane had been lowered below the supporting angles (secondary beams) and twisted flat bar ties hooked over the vertical arm of angles have been noted. Wadding ties have been noted as well, although the metal ties seem to be the primary means of support, even if the number of ties seem to be lower than over the Auditorium. It is likely that the hessian wadding ties have been used to fix the decorative plasterwork elements.

It is likely that the substructure supporting plaster ceiling is equivalent to the ceiling over the Auditorium, i.e. formed of two layers of flat bars suspended from the roof structure (steel trusses).

Staining on the supporting angles and purlins has been noted, which can indicate a water penetration issue prior to roof covering replacement. Corrosion of purlins' bearings onto the external wall has been noted, together with cracking and displacement of brickwork.

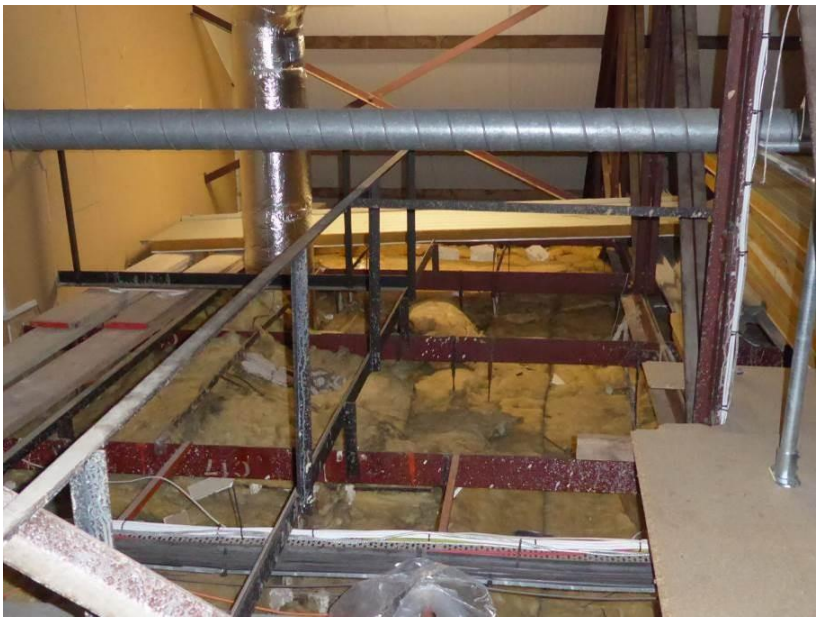

Photo 27 – Ceiling above Alamein Room.

Photo 28 – Staining on supporting angles
(secondary beams and purlins) and wall.

Photo 29 – Surface corrosion of purlins bearing on external wall.

6.4.3 Suspended plastered ceiling.

The below comments are based on a visual inspection of this area only and assumed similarities in construction with other areas. The ceiling over the Alamein Room seemed to be constructed at the same time as the Auditorium ceiling and had probably formed one ceiling over the Auditorium and Balcony in the past. The ceiling was formed of solid work (cementitious mortar) applied to expanded metal lath. The lath was fixed to the ceiling's substructure with metal wire. The finish was indeterminate (possibly anhydrous plaster). The decorative plasterwork presumably was cast fibrous plaster panels (hemihydrate plaster and hessian / timber reinforcement). It was not possible to ascertain if wadding is reinforced or secure.

Numerous apertures were formed within the existing ceiling, where hangers had been installed to support the timber subframe for the lightweight, tiled suspended ceiling. Openings for ventilation ducts have been cut in the historic suspended ceiling as well.

Photo 30 – The underside of suspended ceiling over Alamein Room.

Photo 31 – Tiled suspended ceiling and timber frame over Alamein Room.

7 **CONCLUSIONS** – incorporating those from the Plaster Specialists report

7.1 The main structure of the building, where inspected was structurally sound. There were no signs of displacements or cracking indicating any structural issues.

7.2 The plastered suspended ceiling over the Foyer has been retained in its original form, with minor alterations around the light fittings and in the front, entrance area. The supporting structure was of size and form adequate to support the suspended ceiling. It was not possible to access and measure the substructure in detail. The ties supporting the ceiling will need to be inspected when appropriate access is provided, to confirm their suitability.

There was no evidence of immediate failure to the plasterwork from our lower site inspection, however due to noted hairline cracking to ceiling's perimeter monitoring of the ceiling will be required, including areas used for access past and present, to record any possible detachment.

7.3 The plastered suspended ceiling over the Kitchen / Servery was altered. Although the substructure supporting the solid work on expanded metal lath seemed to be original, the supporting ties had been removed and replaced with new elements. Our opinion was that there was less ties than originally installed, hence the observed excessive deflection at the partition wall. We believe that the ceiling's structure was supported on the partition wall, which seemed to have sufficient load bearing capacity.

The supporting structure in this area was adequate and could be used to support new ties, if remedial works are undertaken.

Similar to the ceiling over the Foyer, monitoring of the ceiling will be required in the areas used for access past and present, to record any possible detachment.

7.4 The supporting structure over the auditorium was retained in the original form, although alterations affecting the loading on the roof structure have been introduced, including: modern composite panel roof covering, timber floor, hoist mechanism for the light box, new ceiling and lighting platform structure next to the stage. The installation of lightweight roof covering compensated for the increased loading from timber floor on the bottom chord.

Where inspected we have not noted any deep corrosion of structural elements except the bearings of steel purlins in the external walls. Surface corrosion on steel trusses was noted in a few locations and this is part of the natural ageing process of the building structure. Although that is not a structural issue, the condition of the steelwork needs to be monitored over time.

7.5 The plastered suspended ceiling over the auditorium was retained in its original form with some alterations, including: installation of lighting boxing in the central part of the ceiling, cutting holes in the ceiling for lighting fittings, local replacement of the original ceiling with the suspended lighting platform. These alterations have not affected

structural integrity of the ceiling, although the nature of the cracking next to the lighting room must be investigated in more detail.

It is likely that the above alterations had some impact on the decorative panels of the ceiling, causing cracking and defects (hollow panels). The two cracks noted on right-hand side and left-hand side of the stage are not structural as the plasterwork was firm in crack surrounding. It is likely that the cracks occurred at the junction between the historic ceiling and the modern replacement ceiling, due to different materials used in their construction.

The fixings of lighting boxes have been checked in a few representative locations across the ceiling, and all of them were sound and there was no movement under pressure. In our opinion the substructure of the lighting boxes and the fixing details are sufficient.

7.6 The modern ceiling and lighting platform were suspended off the historic supporting (roof) structure, which we found to have sufficient capacity. The timber structure forming the platform was sufficient to transfer the loadings on the platform. The flat bar and angle ties used to suspend the platform structure had sufficient tensile capacity, but the connection details were not adequate and in future may cause failure of the platform structure. The welding of hardened steel bolts to mild steel flat bar, as shown on picture below, does not provide full strength and may be susceptible to fracture.

Photo 31 – Tie connection in the lighting platform's suspension system.

We also noted un-secured bolts in these connections, which presumably increase stress on surrounding ties and connections. In our opinion the suspension system used for the lighting platform requires detailed assessment to confirm its viability.

The shear connections between angles forming suspension frame, secured with single bolt need detailed structural assessment as well.

7.7 The limitations in access to the plastered suspended ceiling over the Alamein Room do not allow us to make unequivocal conclusions. We presume that the original ceiling's structure had not been altered, but openings were cut through the solid work and expanded metal lath to allow installation of modern ties and ventilation ducts. The ceilings substructure and supporting ties should be inspected in detail when sufficient access is provided.

The installation of modern tiled suspended ceiling has not had impact on the historic suspended plastered ceiling. The timber frame substructure spans between masonry walls with intermediate ties fixed to supporting (roof) structure. These ties cause additional point loadings (approx. 0.9kN) on the steel trusses or secondary beams (angles). That loading should not have any impact on performance of the trusses, but may affect the stability of steel angles, hence location of these ties needs to be investigated in details to confirm location of the ties.

Due to access limitations the condition of the suspended plastered ceiling could not be inspected in detail. The visual inspection from below proved decorative features are installed in this area. We've also noted some damage on the historic ceiling with abraded / broken pieces of plaster remaining. These should be removed to prevent future failure. Staining / discolouration on the ceiling was observed, which can be evidence of historic water penetration through the roof covering (see picture on the next page). Considering the visual observation and findings in other areas, we think that condition of the ceiling must be inspected in detail and this should include plain areas and decorative plasterwork.

7.8 In general, the supporting structures were of sufficient capacity to support the suspended plastered ceiling. Steel beams and trusses were not susceptible to deterioration, but two areas had been identified where water ingress could have occurred. This was the South gable wall of the historic Auditorium and the loft area over the Alamein room. Further assessment of the structure in these areas and specification of remedial works will be required.

7.9 Where inspected, the solid work and expanded metal lath were of good quality, with good bond between these two elements. The mild steel wire ties used to fix the expanded metal lath to the substructure and to tie flat bars forming substructure were adequate as well. Due to the diameter of used ties corrosion may largely affect the performance of ties, hence inspection of areas indicated in paragraph 4.8 is required to confirm that the ties are sound. Hessian wadding ties where inspected seemed to be in good condition as well. When appropriate access is provided, ties across the whole ceilings should be inspected to confirm spacing, sizing and good condition of ties.

Photo 32 – Damaged underside of the ceiling over the Alamein Room.

7.10 Where good access was provided, there was no sign of defects indicating risk of immediate failure of the ceiling. Currently the cracking in the ceiling over the Auditorium next to the lighting room is the primary concern and access is required to assess the condition of cracking and surrounding ceiling. Minor defects of decorative plasterwork over the Auditorium need detailed assessment as well. We anticipate that for these areas appropriate remedial works to eliminate failure risks.

7.11 Requirements for further assessments and monitoring are described in the 'Recommendations' section of the report.

8 RECOMMENDATIONS

8.1 In the Foyer area, provide safe access to the void above ceiling, to facilitate inspection of the whole area and assess full condition of the ceiling's substructure, cast plaster panel attachments and plaster key attachments in the cracked areas.

8.2 In the Auditorium area, immediate access is required to inspect the cracking in the ceiling next to the lighting room. This may require temporary removal of the retractable seating to allow access from the scaffolding or scaffold tower. The inspection should include all decorative plasterwork. Following the surveys and knowing the extent of defective areas, remedial works to the ceiling will be required to prevent future failure.

8.3 Safe access in the loft area over the Auditorium is required. All insulation and debris need to be removed and the Asbestos survey undertaken to confirm conditions for safe access. Means of safe access to the vaulted ceilings on the sides of the Auditorium need to be provided as well.

8.4 In the loft space over the Auditorium a detailed survey of ceiling ties beneath the timber floor deck will be required. We assume this will need to be undertaken by a couple of surveyors with use of an endoscope camera or similar equipment. The survey should confirm details of construction and distribution of the ties across the ceiling. Having safe access to the area over the vaulted ceilings must be included in the survey.

8.5 Having safe access to the void over the vaulted ceilings, both suspended ceiling and the supporting structure should be inspected for signs of water penetration. General survey and assessment of corrosion of steel structures should be undertaken.

8.6 The construction details of the modern lighting platform next to the stage must be investigated and assessed in detail. Remedial works may be required to provide durability of the suspension system and prevent future failure.

8.7 Safe access in the loft area over the Alamein room is required. All insulation and debris need to be removed and the Asbestos survey undertaken to confirm conditions for safe access. Means of safe access to the vaulted ceilings on the sides of the Auditorium need to be provided as well. The below access for detailed inspection should be organised by dismantling the tiled suspended ceiling locally and provision of ladder access to the ceiling level. Having the access organised, all loose / abraded / broken pieces of plaster ceiling should be removed to prevent future failure.

8.8 At the time of the survey a full record of defects present in the suspended plastered ceiling should be undertaken for future reference.