MarshDesign

STRUCTURAL DESIGN CONSULTANTS & SURVEY REPORTS

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STRUCTURAL INSPECTION REPORT
DATE: 03/03/23
REF: MDL - 6813

1. NAME OF CLIENT

ABM Developments

2. ADDRESS OF PROPERTY

Linthwaite Methodist Chapel
31a Chapel Hill
Linthwaite
Huddersfield
HD7 5NJ

3. DATE OF INSPECTION

03rd March 2023

4. WEATHER CONDTIONS

Dry with good visibility

5. PURPOSE OF INSPECTION

5.1 Clients Brief

We were commissioned by ABM Developments to attend site and undertake a visual inspection. To comment upon any evidence of any significant structural movement. Both internally and externally of the property.

Specifically, we were asked to comment upon the following: -

A. To provide a full structural survey of the building, specifically that the roof structure is dangerous and at risk of spreading further and potential collapse. Assessment of any further cracking/ movement to walls. Including advice for remedial repair works for any structural defects noted.

6. TYPE OF INSPECTION

A visual inspection was undertaken from ground floor level and easily accessible places only.

A photographic summary of any structural defects noted is included in Appendix 'A'.

7. DESCRIPTION

The original date of construction of the building circa 1867. Grade 2 Listed status. Built from locally sourced sandstone to the main elevations, with architectural stone elements and finishes to the front elevation entrance area. Finished in blue slate to the roof.

The windows and doors are of traditional timber design.

The floors are a mixture of suspended timber construction, with concrete slab to ground floor areas, with an estimate 8,000 sq. ft throughout.

8. OBSERVATIONS AND COMMENTS

8.1 General Overview

To comment upon the structural integrity/ condition of the building; any evidence of recent significant structural movement; structural integrity of supporting principal roof trusses, and suitability for redevelopment.

The survey was of a high level non-intrusive nature intended to identify the principal defects of both the internal and external building fabric and was limited to the main elements and their prime component(s).

The information was obtained by visual inspections made at ground level although wherever possible access was gained to upper levels. Specific roof details were also incorporated from the use of binoculars, as identified in the survey.

As the survey was a surface level activity without either specialist access or investigative equipment the defects listed within are not exhaustive however, within those limitations it should provide an appropriate reflection of the overall buildings structure and condition.

Stonework defects are frequent occurrences including at both low and high level, the latter locations also have to be considered in a safety context. Mortar pointing is of particular significance and the timely replacement is an ever present need. In addition, low level masonry adjacent to roadways is adversely affected by vehicle spray and especially winter salting operations.

The boundary walls have several defects and requires to be checked especially with the potential safety issues of loose masonry etc.

8.1 General Internal Areas

There is no cause for concern with the hairline cracks up to 1-3mm on the ceilings and internal perimeter and party walls. This minimal cracking throughout can be attributed to thermal and general seasonal movement; debonding and drying out of original plaster. **Pic Ref: General Internal Areas**

Cracking is identified between 5-10mm at numerous junctures of masonry walls throughout the building. Again replicated to wall and ceiling junctures. This we believe is historical and deemed not ongoing. No cause of major concern. P**ic Ref: General Internal Areas**

Generally there are minimal signs of deflection to floors, and the door heads typical in buildings of this period. This is an indication of historical settlement and subsidence. Believed historical and not on-going; not down to more recent movement. **Pic Ref: General Internal Areas**

Moderate lateral cracks identified within the building between 10-15mm will require remedial works in the form of stitching by a mason, before the areas are hidden by the proposed internal wall/ floor lining systems. Along with any dry lining and independent internal party walls. **See item 9.0**

The existing internal perimeter walls show minimal to moderate signs of leaning outwards approximately 40mm overall. This is noted at all 1st floor levels. This is due to the high sided elevations and lack of any internal lateral restraint, which has allowed the walls to bulge out wards. These are deemed historical as part of the original buildings structures, and not progressive. However further intrusive investigation advised during the proposed renovation works. With the introduction of lateral restraint to all proposed floor levels; including eaves. (see item 9.0) Generally - Minimal cracking noted to areas of exposed masonry internally.

It was not possible to observe the conditions of all solid/ concrete floors as they were covered with debris. However what was noted didn't indicate any major structural defects such as sinking floors due to subsidence. Further investigation required.

The structural timbers throughout the suspended floors show signs of deflection; not within current span table loadings. With shear collapse in the attic floor area. Additional loadings of former stock have exaggerated this.

There have been various additional structural internal openings undertaken through the lifecycle of the building. Openings will have a mixture of steel and pre-stressed concrete lintels throughout. Further intrusive investigations are required. Seek further advice from structural engineer.

There are signs of historical water ingress to areas around certain apertures and various walls and ceilings. Further intrusive investigation required.

There is general deflection noted to the main principal truss details throughout the attic area. However, one truss had sheared and the extent of the failure is best viewed from the mezzanine area. The timber roof structure in this area shows signs of significant movement and deflection. Major structural remedial repairs are required to this roof truss. All purlins and associated rafters on observation seem to be in fair condition. On further inspection any noted remedial works can be picked up during proposed conversion works. There are also signs of staining from historical water ingress. **Pic Ref: 22-30 & 44-56 Internal Areas** There is a series of strengthen remedial repairs using timber and steel restraint straps. These include the introduction of various timber propping, bracing, pattresses and splicing, however, these must be upgraded to ensure the long term stability of the roof structure.

We have been informed that when the roof was re-felted the slate off one half of the roof was stored it on the opposite pitch which caused the truss the fracture. There as been additional live loading from stock stored to the whole floor area with has caused further movement and deflection to the structure.

The accessible cellar areas to the main building shows no signs of any recent or ongoing movement. The area itself showed no real signs of severe penetrative damp. Minimal cracking noted to all walls deemed historical and not ongoing. All within tolerances. Though further investigation required to ascertain general structural integrity of exposed footing areas during proposed renovations. **Pic Ref: 10-11 Internal Areas**

The existing internal perimeter walls show minimal signs of leaning & bulging. These are deemed historical as part of the original buildings structures, and not progressive. However further intrusive investigation advised during renovation. With the introduction of lateral restraint to all proposed floor levels; including eaves. (see item 9.0)

8.1.2 General External Elevations

The main external walls to the property are of stone solid/ cavity fill construction being approximately 550/600mm thick. External openings are surrounded by stone lintels and cills. A visual examination at all ground and first floor elevations has revealed evidence of any moderate/ major defects and potential on-going movement to all elevations.

There is no cause for concern with the hairline cracks up to 1mm on all faces of the walls, slight lateral movement cracks around apertures of 1-3mm. Where there any slight degree of lateral cracks up to 5mm some additional external repointing may be required.

On further intrusive investigations any moderate cracks found between 10-15mm will require remedial works in the form of stitching by a mason. (see item 9.0)

There are no further signs of any other movement in the form of moderate/ major cracks, both internal and external. Non mirrored internally.

General lintels to the all elevations above the doorways and windows have slightly settled, highlighted by minimal lateral cracking. This settlement/ subsidence is believed historical and not ongoing. No cause for concern. **Pic Ref: General External Areas**

There has been delamination, detachment, efflorescence, erosion, flaking, friability, pitting, damp, salt fretting, spalling, and weathering to areas of stonework. Caused by general weathering, airborne contaminants and splash back from the hardstanding areas in general . Pointing in general remedial repairs required in these areas. **Pic Ref: General External Areas**

There is further delamination to the architectural stone on the front elevation. Failure has occurred over time through the wetting and drying cycle, and possibly exacerbated by frost attack. Remedial works in the form of sandblasting/ cleaning and epoxy resin/ mortar repairs. **Pic Ref: 1-6 External Areas**

The original and replacement cement pointing in general is in fair condition for its age and requires attention to sporadic areas. This should be remedied during any future refurbishment/ renovation works. Traditional lime mortars are advised as modern techniques using cement don't allow the wall to breath and let out moisture.

The direction of the way the front elevation has twisted suggest historical movement during initial settlement. Further exacerbated by soil shrinkage to the clay substrata, and on going movement over the lifecycle of the building during dry periods. This suggests historical rotation to the front corner of the foundations.

Additionally; further differential movement noted to the building may be due to different foundation levels in relation to the main property found within the clay substrata; Low bearing capacity ground settlement of foundations and substructure; differential loadings; foundation size and types will also be contributing factors.

The gable ends to the building shows signs of moderate movement and cracking. All within tolerances. Deemed historical. However further intrusive investigation works required.

Although there has been leaning noted externally at high level to all the aforementioned elevations estimated between 40 -75mm, the structure complies in engineering terms with the middle-third rule for the stability of masonry structures (movement less than 1/6 wall thickness).

The independent stone stair structure to the rear of the building has moved away from the rear property suggesting subsidence due to inadequate foundations. This will need to be removed completely during the proposed works. **Pic Ref: 16 External Areas**

8.1.3 General External Areas

The external roof show minimal signs of deflection and moderate signs of spread. Though there is moderate deflection to the central ridge line. **Pic Ref: 9 External Areas**

The main roof has undergone historical upgrades; roof tiles have been re-laid, and potentially loose copping stones re-bed removing any safety implications. Although externally it looks to be in fair order, internally severe structural issues have been identified which need to be addressed to rectify potentially dangerous hazards. See conclusions.

The chimney stacks to the building show minimal signs of movement at high level. Lack of pointing and sustained water ingress; frost attack over a period of time has contributed to the movement. Deemed structurally sound. Further investigation required during roof renovations.

The combination of settlement over the lifecycle of the building, the type of construction (how the walls have been tied together) and additional ongoing seasonal movement could also be contributing factors.

8.1.5 General

It is common practice to categorise any structural damage. These are set out in the BRE Digest 251. See below:

0 - Hairline cracks less than 0.1mm. No action required. Hairline cracks are classed as negligible.

1 - Fine cracks of up to 1mm. Fine cracks can be treated easily using normal decoration.
Damage generally restricted to internal wall finishes; cracks rarely visible in external brickwork.

2 - Slight crack widths up to 5mm. Cracks easily filled. Recurrent cracks can be masked by suitable linings. Cracks not necessarily visible externally; some external repointing may be required to ensure weather-tightness. Doors and windows may stick slightly and require easing and adjusting.

3 - Moderate crack widths of 5 to 15mm (or several of e.g. 3mm). Cracks that require some opening up and can be patched by a mason. Repointing of external brickwork and possibly a small around of brickwork to be replaced. Doors and windows sticking. Service pipes may fracture. Weather-tightness often impaired.

4 - Major cracks - Extensive damage, 15 to 25mm. Extensive damage which requires breaking-out and replacing sections of walls, especially over doors and windows. Windows and door frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Service pipes disrupted. Typical crack widths are 15 to 25mm, but also depends on number of cracks.

5 - Severe cracks - Structural damage, greater than 25mm. Structural damage that requires a major repair job, involving partial or complete rebuilding. Beams lose bearing, walls lean badly and require shoring. Windows broken with distortion. Danger of instability. Typical crack widths are greater than 25mm, but depends on number of cracks.

Generally - Defects are associated with the roofs, the most common being accumulations of debris/rubbish and weed/plant growth on the roof surfaces, and in both the gutters and discharge pipes. Consequent blockages can obviously have an adverse effect on user operations, the building's water tightness and ultimately it's structural performance.

Generally - Where locally sourced stone have become exposed and subject to the effects of corrosion and specialist remedial measures are sometimes necessary.

Generally - Seasonal movement can cause soil shrinkage to the clay substrata, and on going settlement in dry periods. Minimal near by flora will cause the removal of this moisture in the substrata can cause significant changes in the volume of the soil resulting in ground movement. The distance of the aforementioned flora from the main property negates any undermining the existing foundations due to the proximity of the roots. Future excess water through wet periods will swell, enough to cause further movement to the foundations with subsequence ground heave. Contribution to further minimal cracking may also be caused by the proximity of localised traffic to the adjacent road. No cause for concern.

9. REMEDIAL WORKS

On further intrusive investigations during the proposed renovation works the recommended remedial works are advised. Seek further advise form structural engineers on findings.

9.1 Remedial Crack Stitching

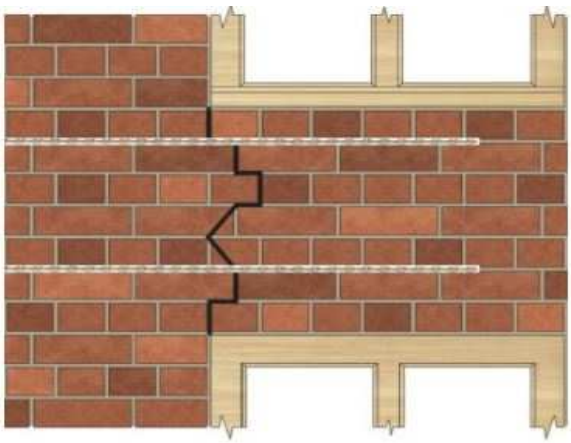
Crack stitching is a permanent solution to cracks in masonry walls. It involves embedding stainless steel helical bars into horizontal slots into the mortar bed joints of your wall to restore structural integrity. **See table below:**

Wall Thickness	Depth of Slot	Depth of Bar
102mm	30mm	20mm
215mm	40mm	30mm

To be installed both internally and externally to the infilled masonry. Ensure the mortar is completely removed to reveal the top and bottom faces of the masonry. Remove all loose material (you can use a blow out pump) and then flush the joint with water. Normally vertical spacing is every 4 - 5 in brickwork & 2 - 3 stone courses. Cut a slot in the mortar bed just over 500mm either side of the vertical crack and to the correct depth, dependent on the wall thickness. Mix the anchor grout thoroughly using the paddle mixer and load into the gun. Pump the grout to the back of the slot in a continuous even bead to approximately two thirds of the slot depth.

Push the helical bar firmly into the grout, making sure that the bar extends 500mm either side of the crack. Apply a second bead of grout into the slot making sure that the bar is completely covered and with the trowel provided force the grout into the slot until it is approximately 10mm from the surface and ensuring that the bar and grout are firmly packed. Finish by making good the bed joint and filling the vertical crack. Finish of the render to match.

Example:



9.2 Lateral Restraint

The internal perimeter walls should be strapped at all new suspended floor levels, at not more than 2.0 metre centres using galvanised mild steel, or other durable metal straps 1200mm, which have a minimum cross-section of 30mm x 5mm. Notch in strap flush with top of floor joists to a minimum of 3nr joists.

Lateral restraint will be required to existing/ new roof structure and tied into gable walls @ 2.00m centres. See current building regulations.

Example:

9.3 Lateral Restraint External Method

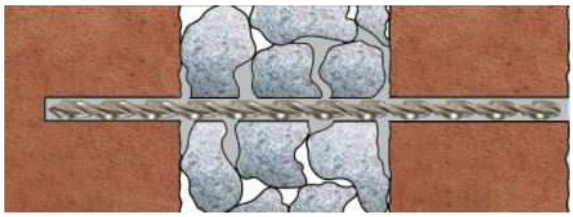
Dependent of the internal independent structure proposed, we would advise on the following method to tie in the perimeter elevations:

Using a 12mm threaded bar with self-cutting end, the BowTie HD is inserted through a clearance hole in the wall and driven through the floors, connecting them together using the diaphram action of the floor. The tie end is then bonded into the masonry. Further investigation required to check most suitable option.

9.4 Helical Wall Tie - To Areas of Dishing and Bulging

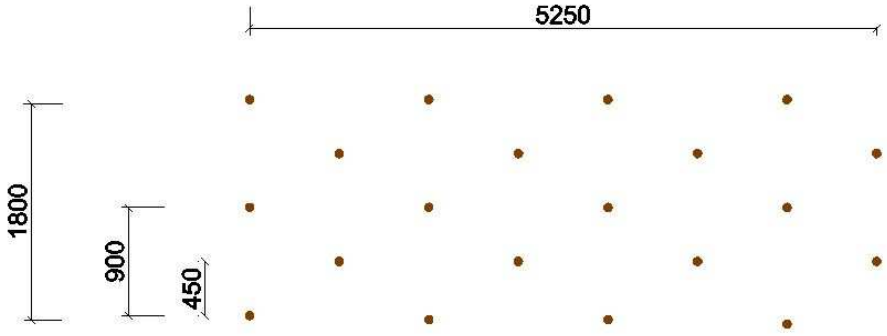
Installing grouted CemTies in a grid pattern that connects the inner and outer stone skins will stabilise the bulging walls and enhance their load bearing capacity. Further intrusive investigation required. Seek further advise from competent building contractor and structural engineer.

Theses are a profiled & twisted remedial wall tie that are driven into a pilot holes. Using work hardened blades cut a spiral interlock into the stone walls as the cavity ties are driven by a series of impacts. Tiny 6mm pilot holes enable extremely quick wall tie installation with minimal disruption to the facade or to cavity insulation. Use helical ties in all masonry types. A setting tool in a hammer drill facilitates the easiest and fastest retrofit wall tie replacement system available.



In the case of stone; Tie in a grid pattern @ 450 centres horizontal and 750 centres vertical to the middle of the elevation. An estimated 15-20 number in total over an estimated 4-5.0m distance or 2-2.5 ties per m².

Example:



9.5 Specific Design Requirements

Removal of existing roof supported from beneath using structural scaffolding and 'Acrow' propping to align the principal trusses into the correct positions. Installation of structural steel/ plates to repairs

Seek further design from structural engineer.

9.6 Geopolymer Injections

On further intrusive investigation in the form of trial pits to check existing foundations stability. Any ongoing movement to areas identified, there may be scope for further remedial works which will help limit any further seasonal/ differential movement to existing foundations within the clay subsoils etc.

The use of resin injection grouting. The chemical mixture expands and fills small cavities in the foundations and the soil. It then hardens, providing support to the building.

For further information see examples of specialist contractors.

www.subsidence.geobear.co.uk

www.saugroup.co.uk

10. CONCLUSIONS AND RECOMMENDATIONS

10.1 General Foundation Movement

From our visual examination of the property there is no evidence of any recent or on-going foundation movement and no signs of structural failure, however we would also recommend a drainage survey to check integrity of pipework, which may indicate any contribution to any historical settlement/ subsidence caused by leaking drains.

Drainage Survey, to include all internal drains: Budget Cost - **£500**

There is no visible recent subsidence resulting in any major cracking, distortions, both internally and externally to the load bearing walls, which would be indicative of this type of movement.

10.2 Foundation Movement North West Hipped Extension

The West elevation has shown considerable movement over its lifecycle. Further intrusive investigation required to expose existing foundations in the form of trial pits.

With the West elevation wall twisting/ leaning as described, consult further with structural engineer on the proposed best practice on prevention of any further progressive movement, and subsequent provision of repairs schedules. This may involve underpinning to areas of existing foundations.

10.3 Roof Structure

The extent of the structural movemnet and deflection to the prinicpal roof truss member is a major concern and significant structural remedial repairs will be required to ensure its long term stability. Consult further with the structural engineer on the proposed internal configuration works on the required steel splice plate strengtheing and introduction of steel tie bars to each individual truss to prevent further spread and potential collapse. The methodology for the requireed remeidal works, including the removal of the roof covering and safe storage of the slates to be discussed further during the construction phase.

10.4 General

In general the building shows only minor structural defects as mentioned within this report. These can be repaired with simple remedial works, in the form of Helibar crack stitching, wall ties to bulging walls and internal lateral restraint strapping to proposed suspended floor to prevent further lateral spread to elevations.

10.5 Costs

We would not put a cost to required structural remedial works at this stage, as subject to further intrusive investigations and cost benefit analysis.

10.6 Conclusion

It is our opinion that the buildings are of a permanent and substantial construction; believed to be structurally sound, and we can see no areas of major concern. That they can be converted into a habitable dwellings, with moderate structural remedial works carried out during the proposed conversions. Seek further advice from structural engineer for preferred options.

With the proposed internal perimeter and party walls, two number suspended floors, will introduce the required lateral restraint and structural integrity required. Consult further with structural engineer on design options.

Since our previous inspection in February 2022, the structural movement in the roof does appear to be progressing, with significant cracks forming to the ceilings below and patches of plaster now falling away.

If structural remedial works are not undertaken in the immediate future then the roof structure is at risk of collapse which would cause major structural damage to the whole fabric of the building.

Overall, and in consideration of the nature and wide variety of uses, the buildings are in dilapidated condition, although there are specific structural defects which are identified and If no structural remedial works are undertaken then the property will be put on the “at risk” register.

After any remedial structural repairs have been carried out, periodical general maintenance is of good practice. We would also advise to monitor and report on any changes in the future and seek further advise if deemed appropriate; where further intrusive investigations can be conducted during the proposed conversion works.

Trial pits will be required externally to expose the foundations to corners to the building. This is to ascertain whether the movement is all historical and that there is a further requirement for potential injection grouting.

With the recommendations in our report carried out to our satisfaction, we would not envisage any further significant movement in the future. If the existing conditions remain stable.

10.0 LIMITATIONS

This a full structural report.

We have commented upon the general structural integrity of the building. Specifically that the roof structure is dangerous and at risk of spreading further and potential collapse. Assessed further cracking/ movement to walls. Included advice for remedial repair works for any structural defects noted.

This report is not an expert witness report suitable for legal purposes.

We have not inspected woodwork, damp proof membranes or other parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part is free from defect.

We have not at this present time conducted any intrusive or destructive testing of the fabric of the property, in particular we cannot confirm that the property is free from asbestos or high alumina cement construction.

This report has been prepared for the sole benefit of ABM Developments

The liability of Marsh Design Limited and their employees shall not extend to any third party. This report, or any part of it, should not be passed on to any third party without the express permission of Mr. D. Haigh, with whom the copyright remains.

Yours faithfully,

D. Lee MCIOB
Chartered Builder & Building Surveyor

Report check and approved by:

D. Haigh B. Eng (Hons)
Director
For and on behalf of
MARSH DESIGN LIMITED

MarshDesign

Photographic Reference -

Internal Areas

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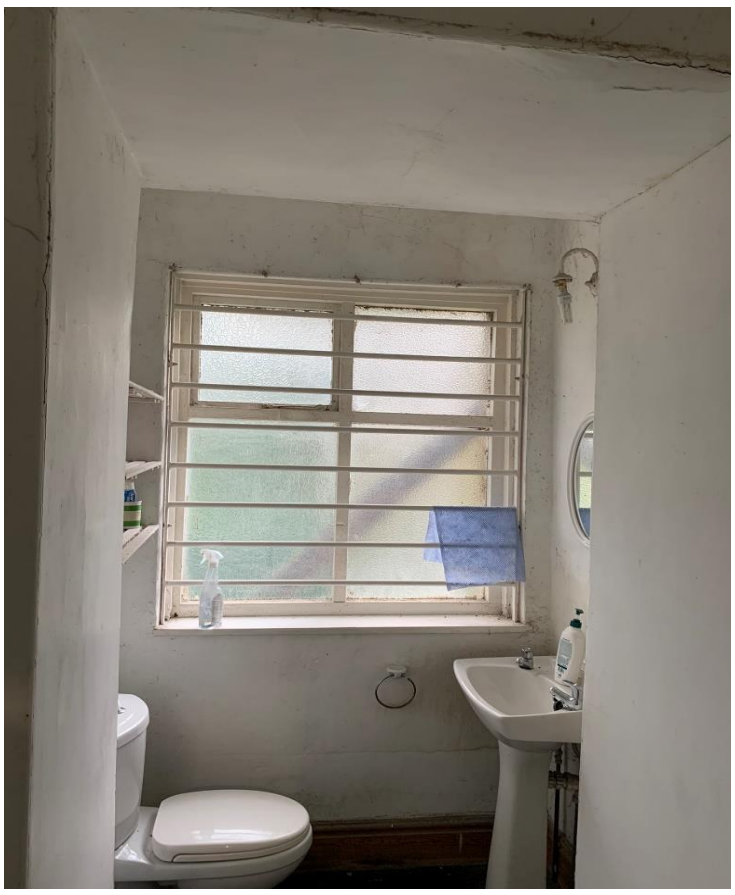

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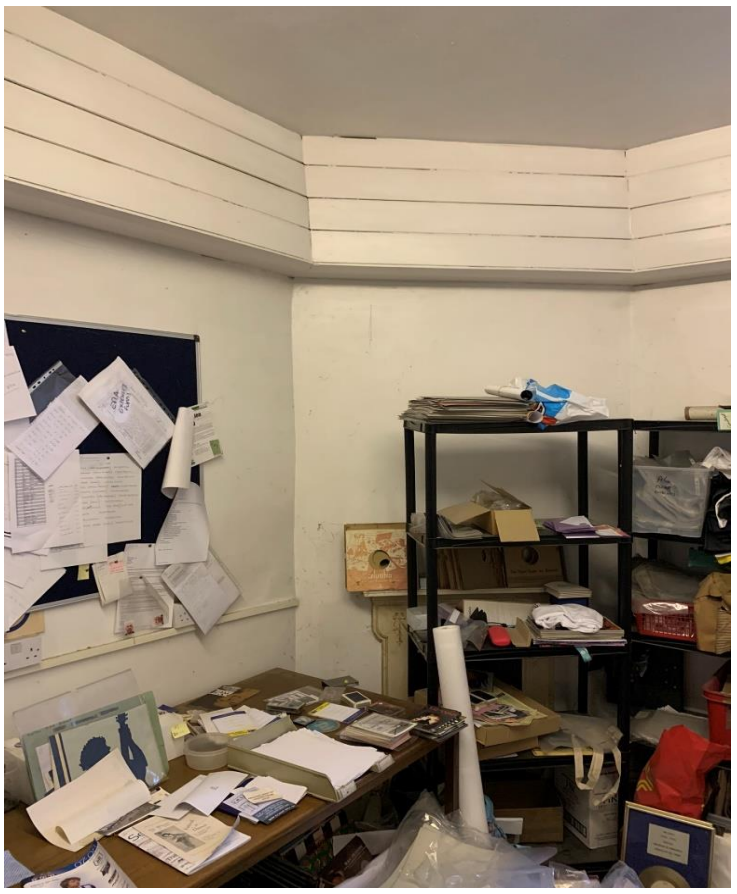

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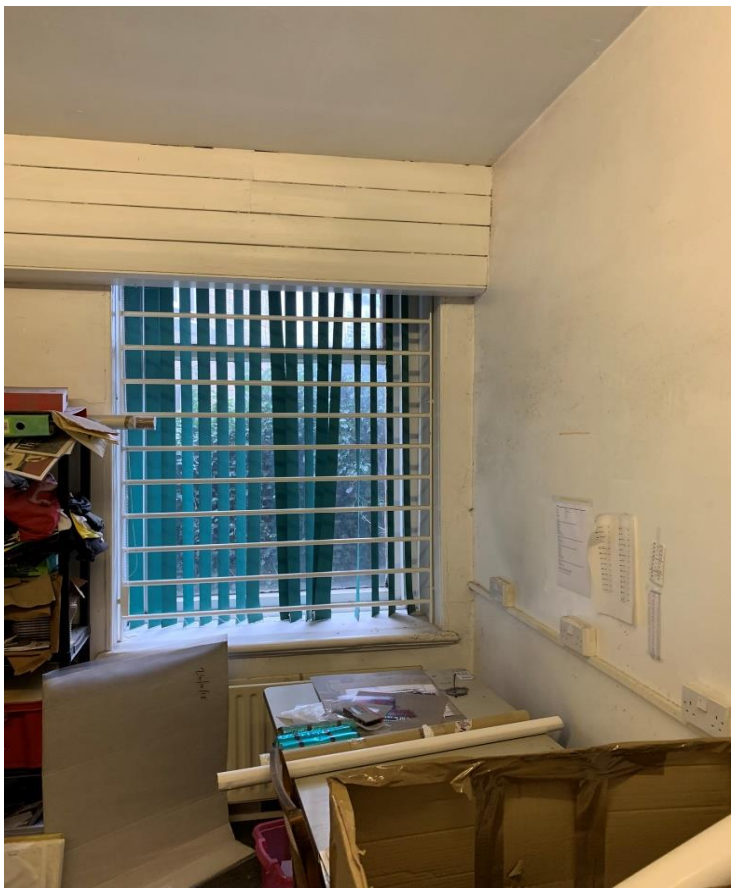

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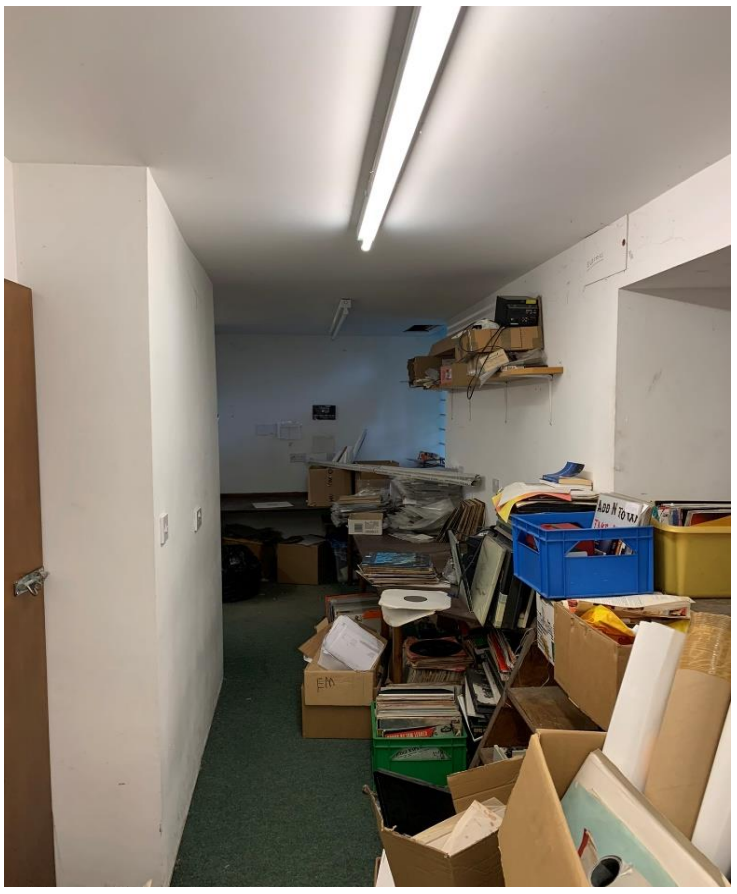

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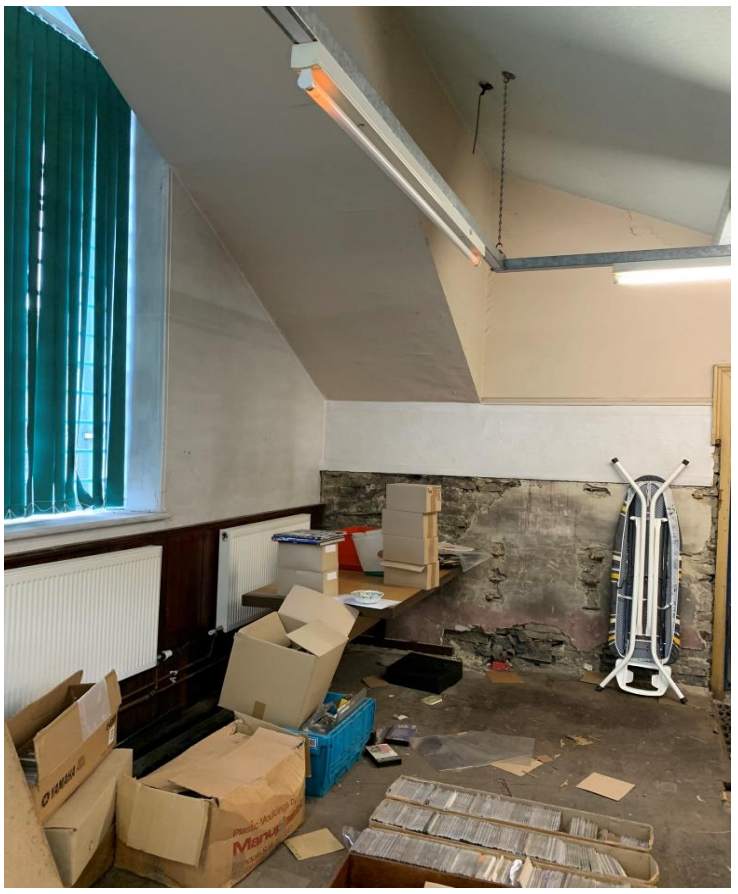

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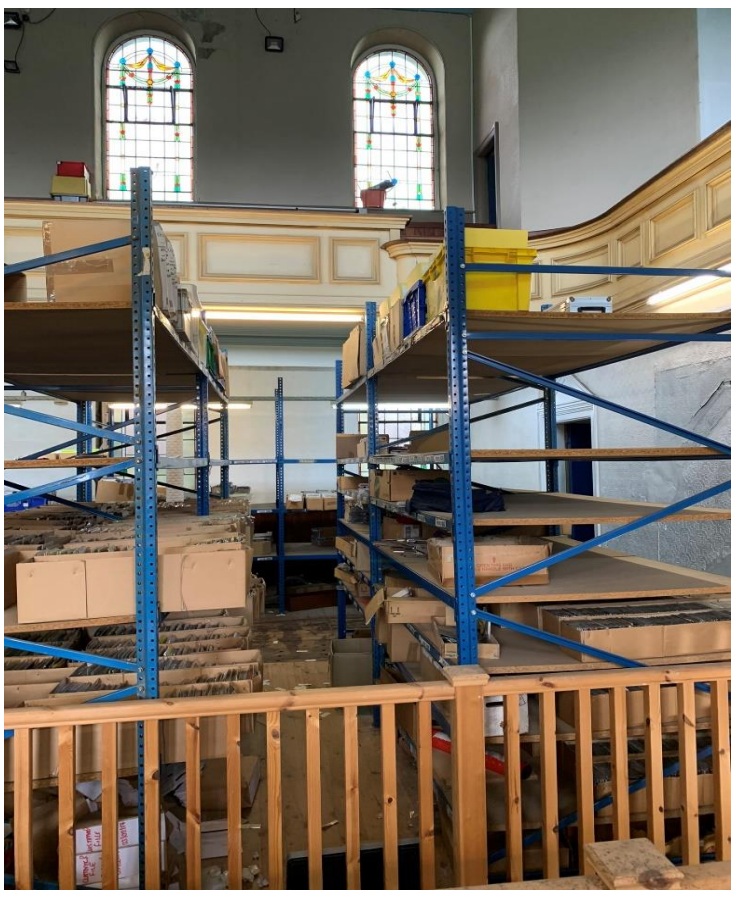

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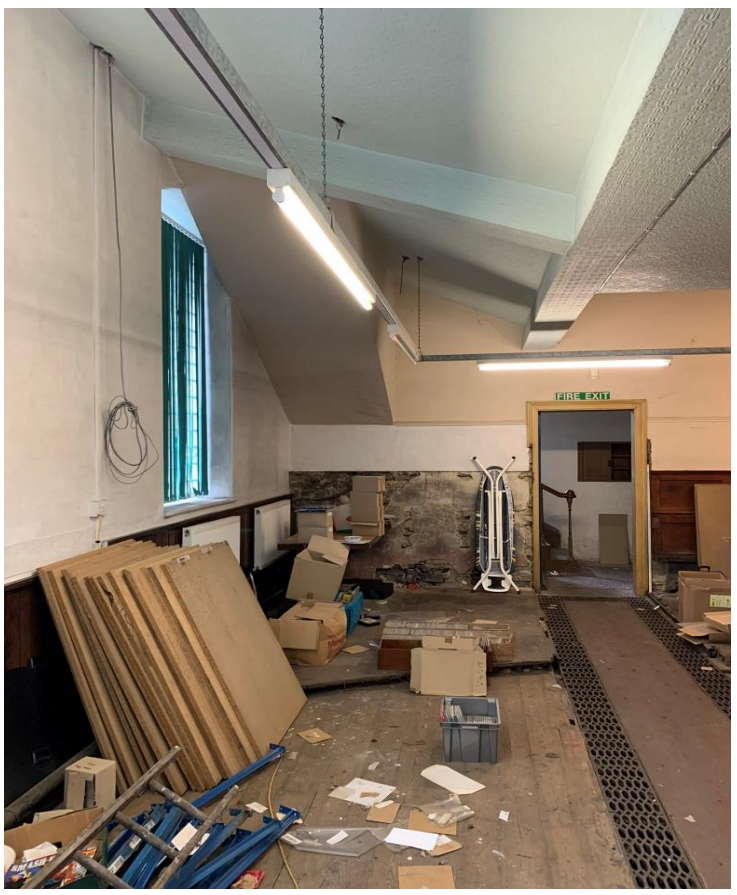

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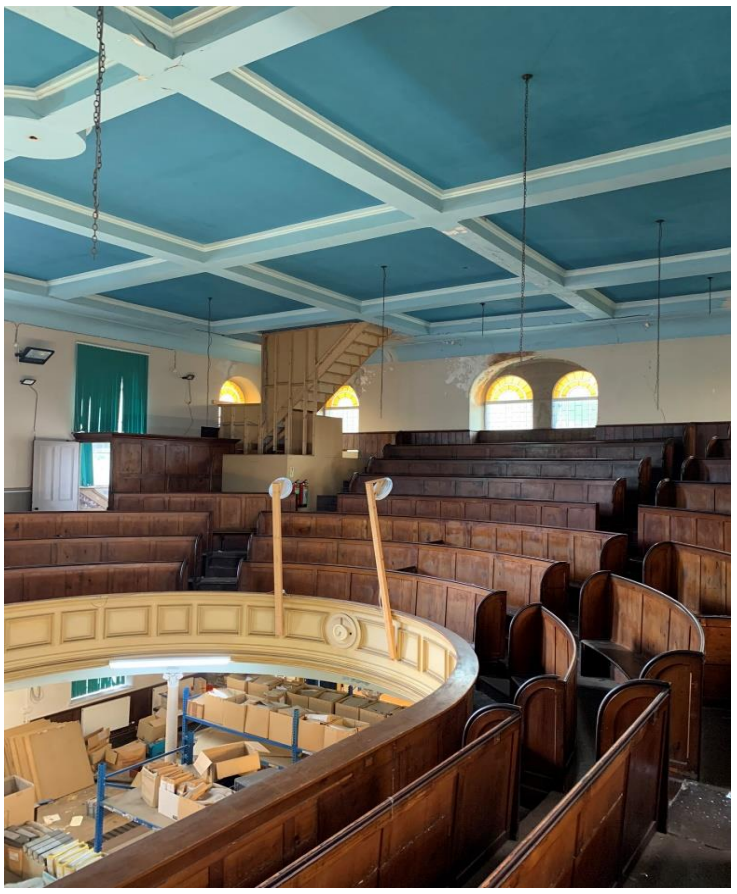

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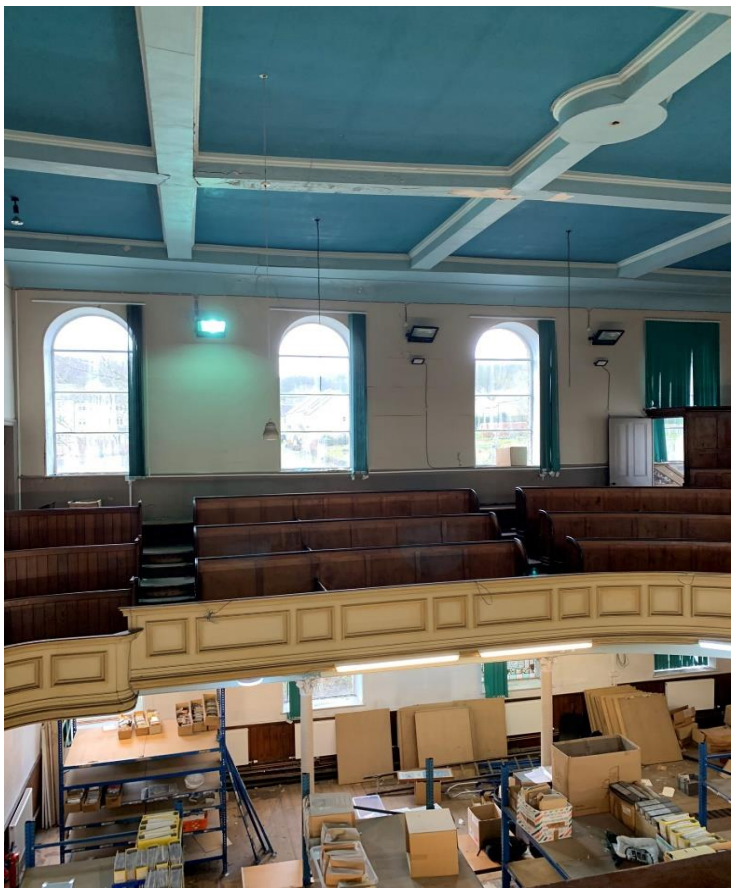

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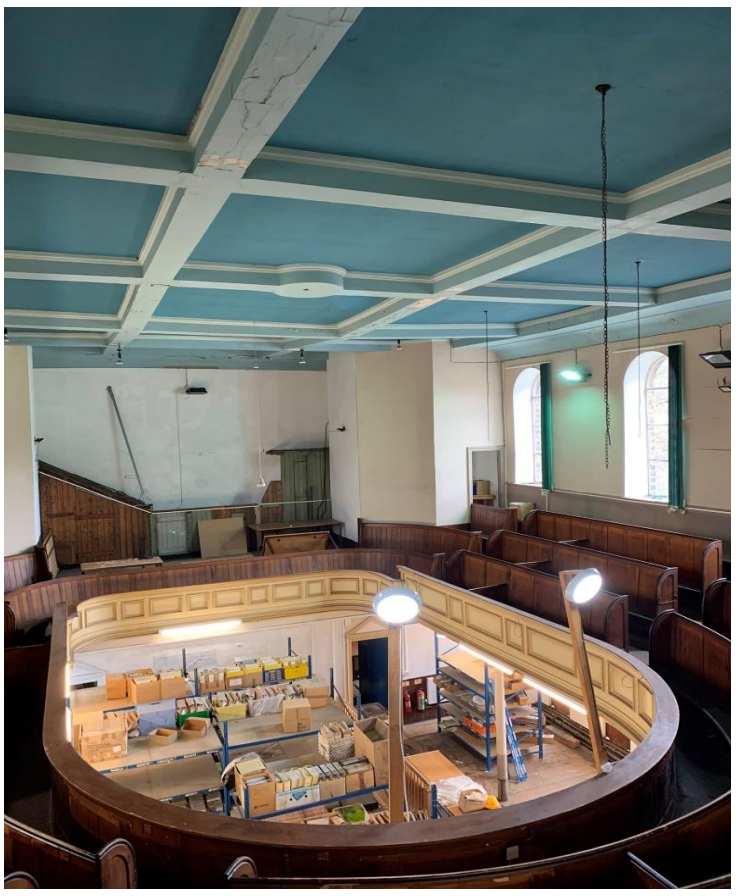

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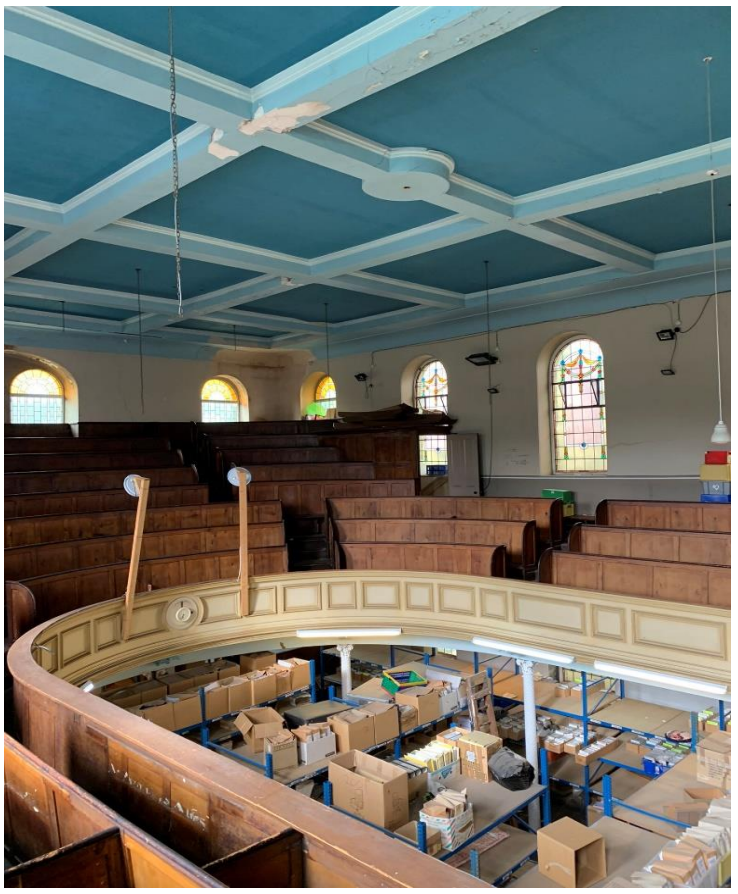

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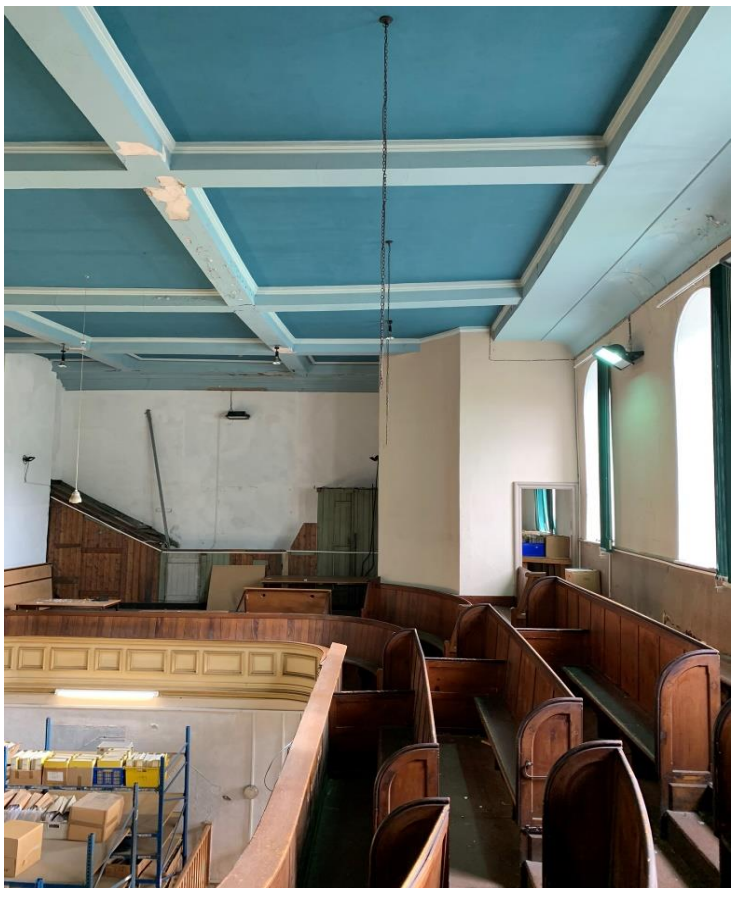

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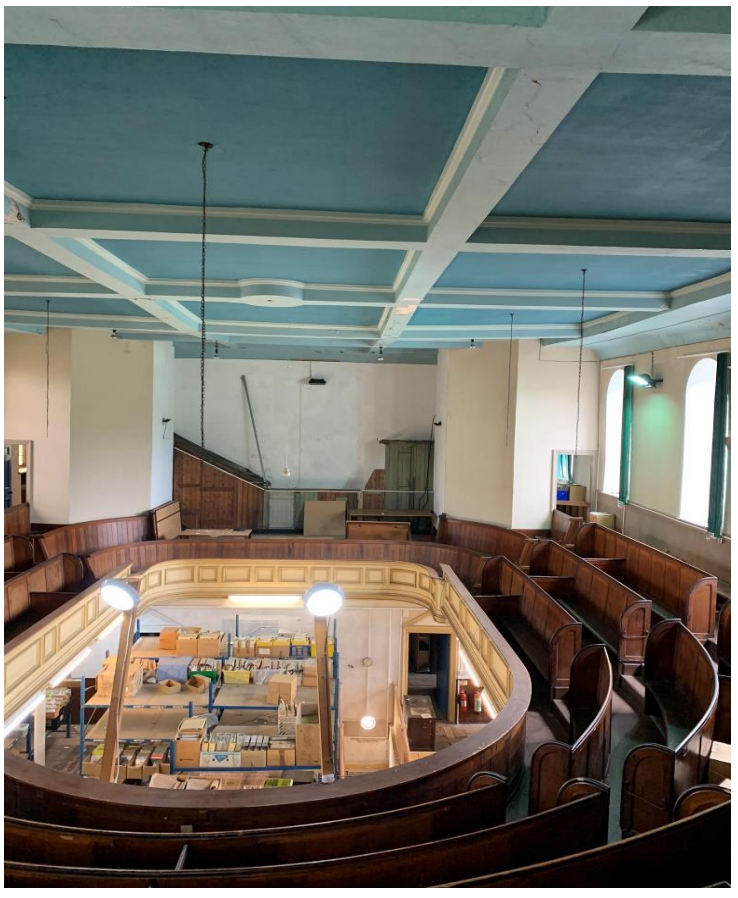

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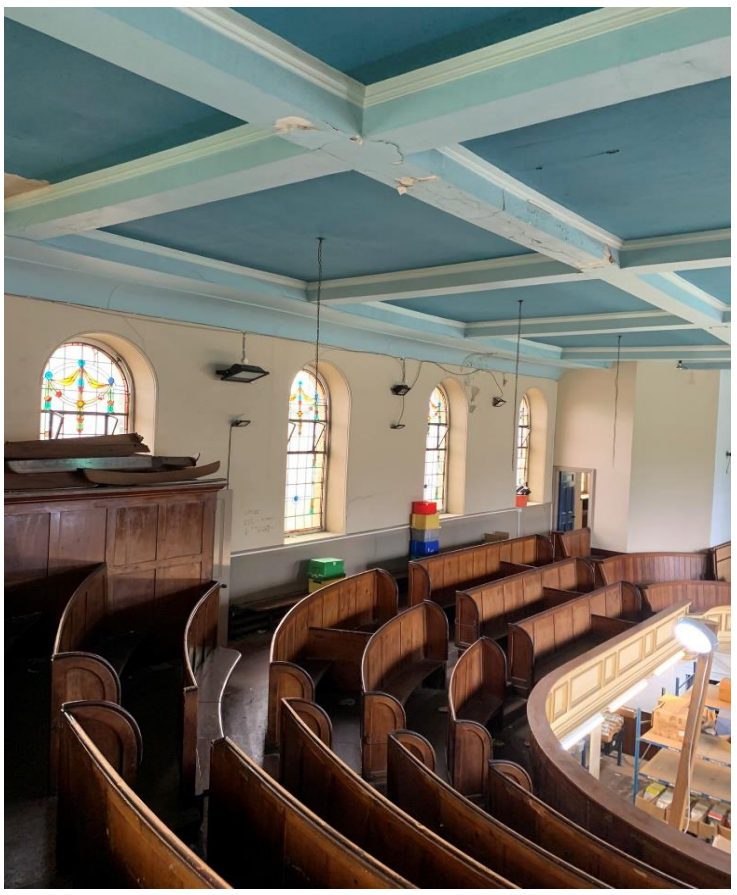

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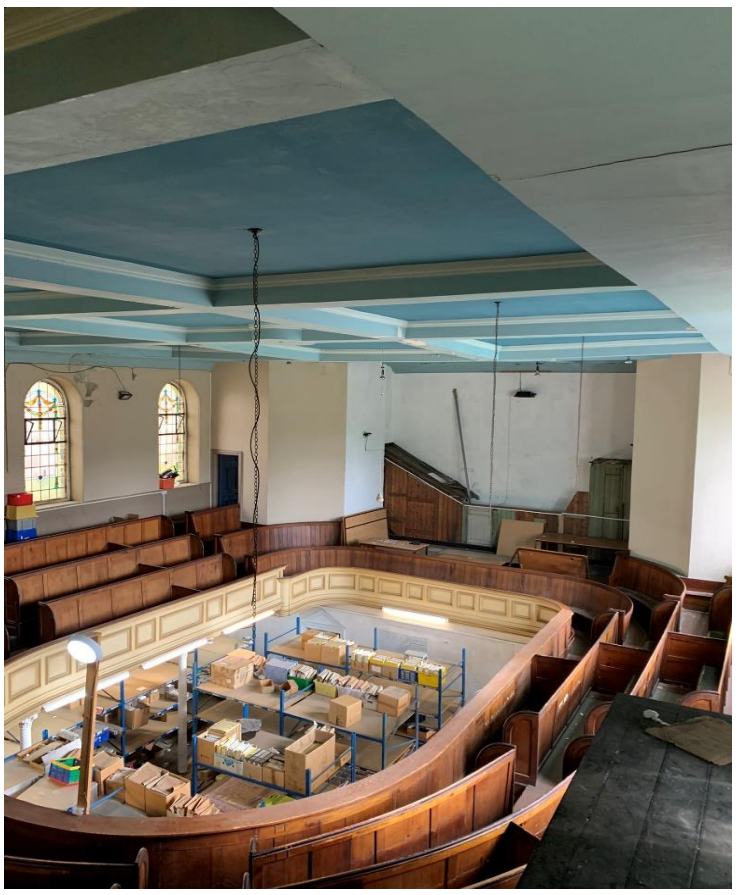

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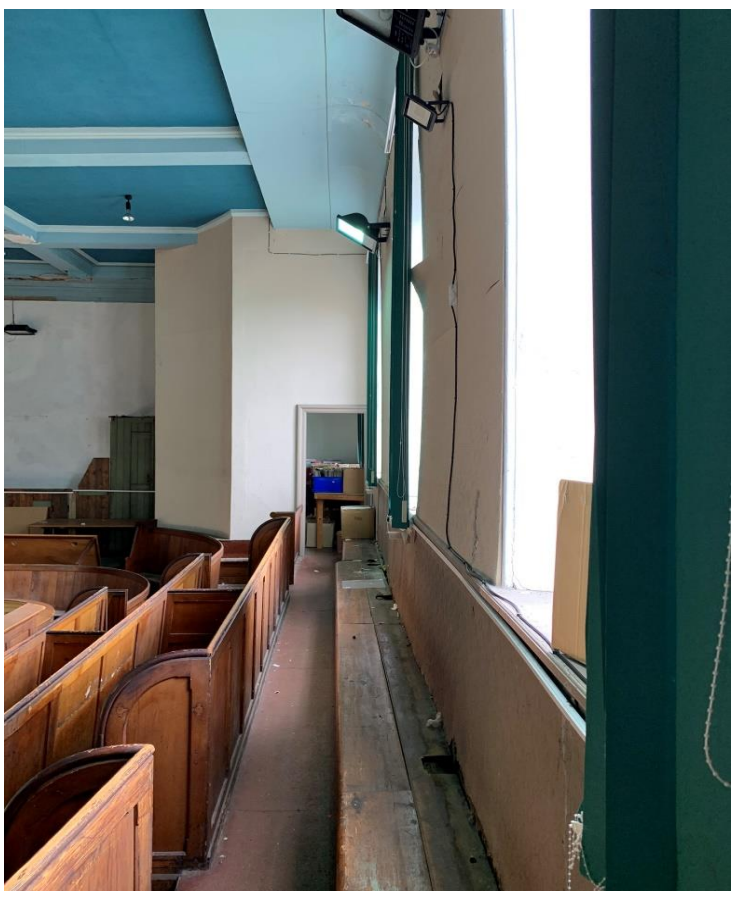

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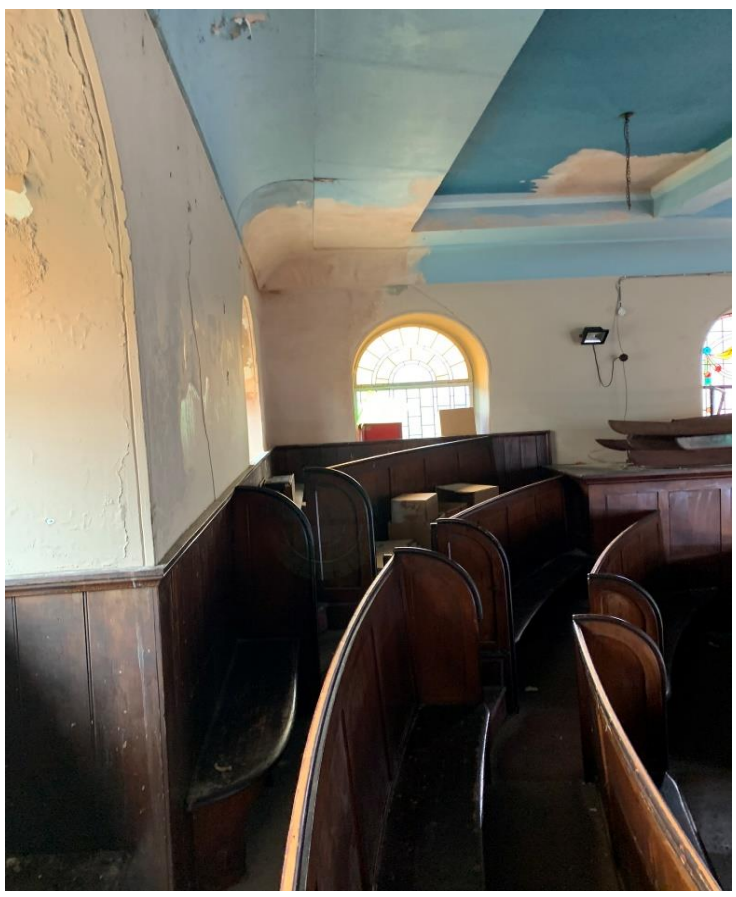

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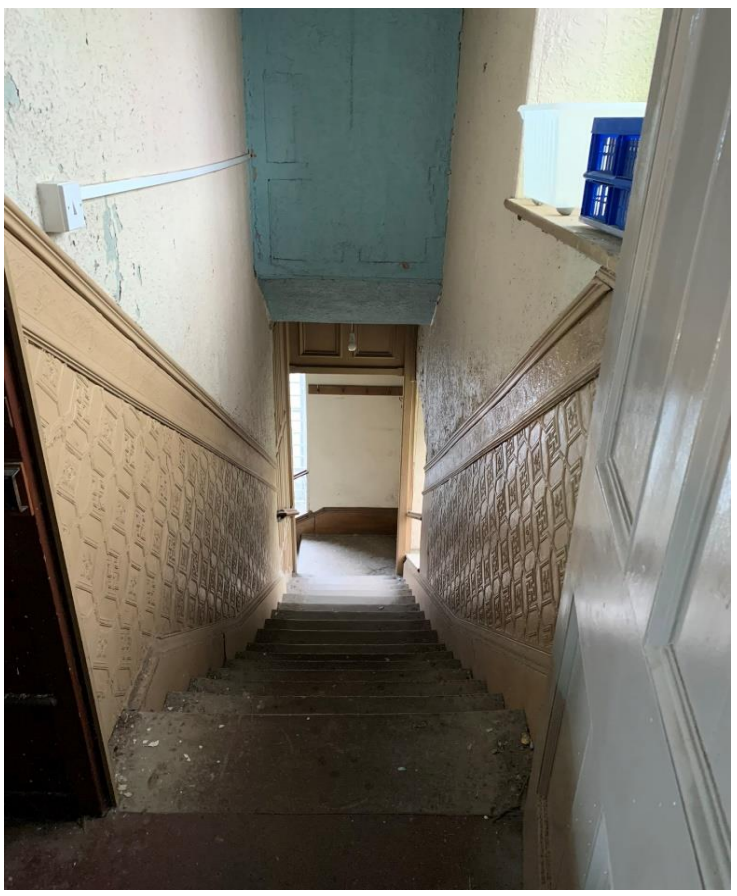

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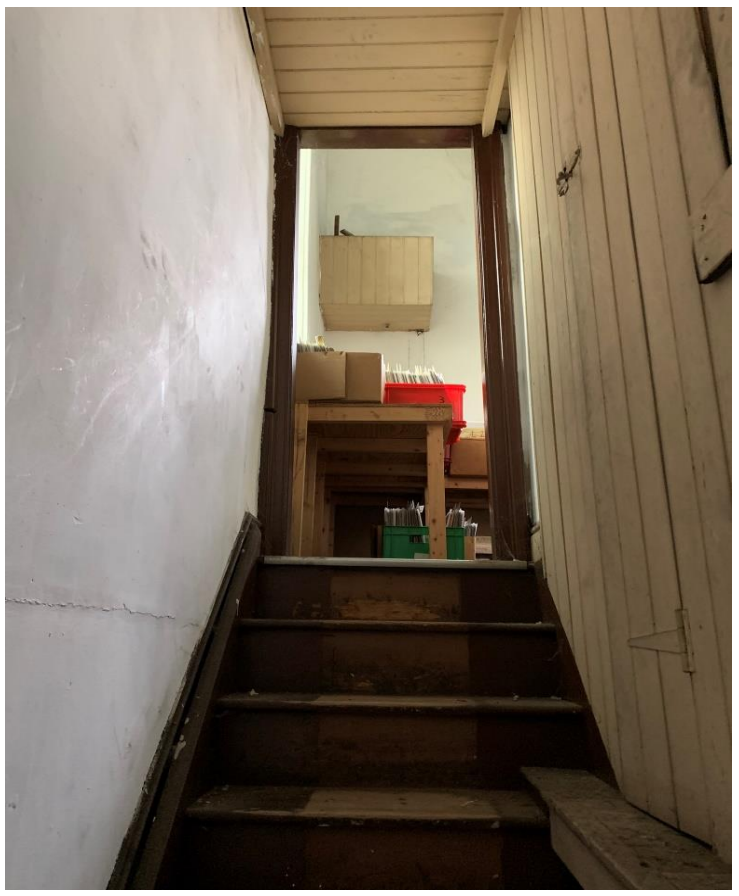

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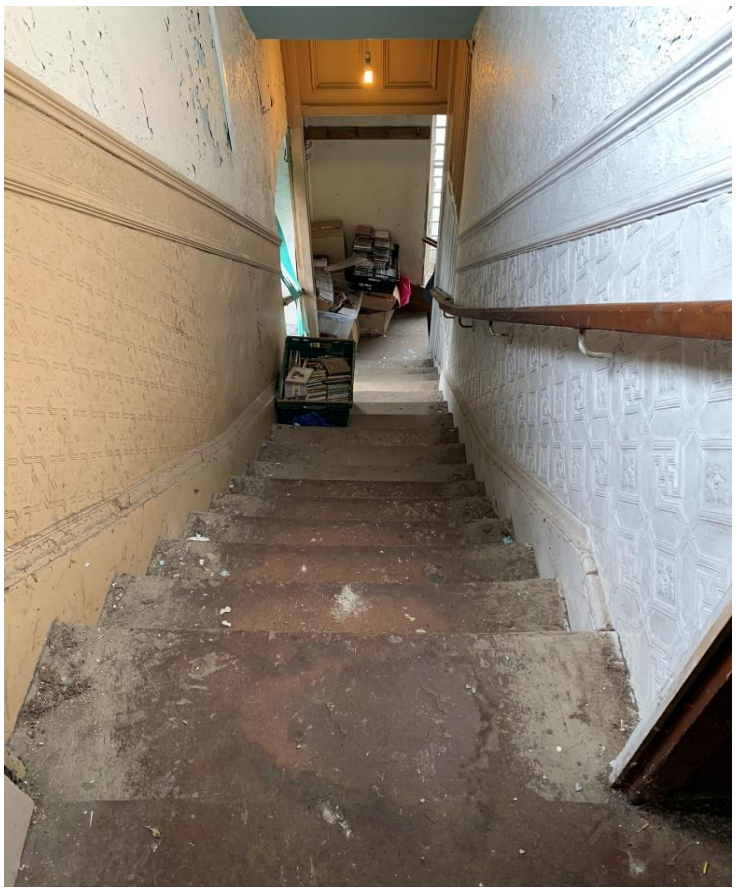

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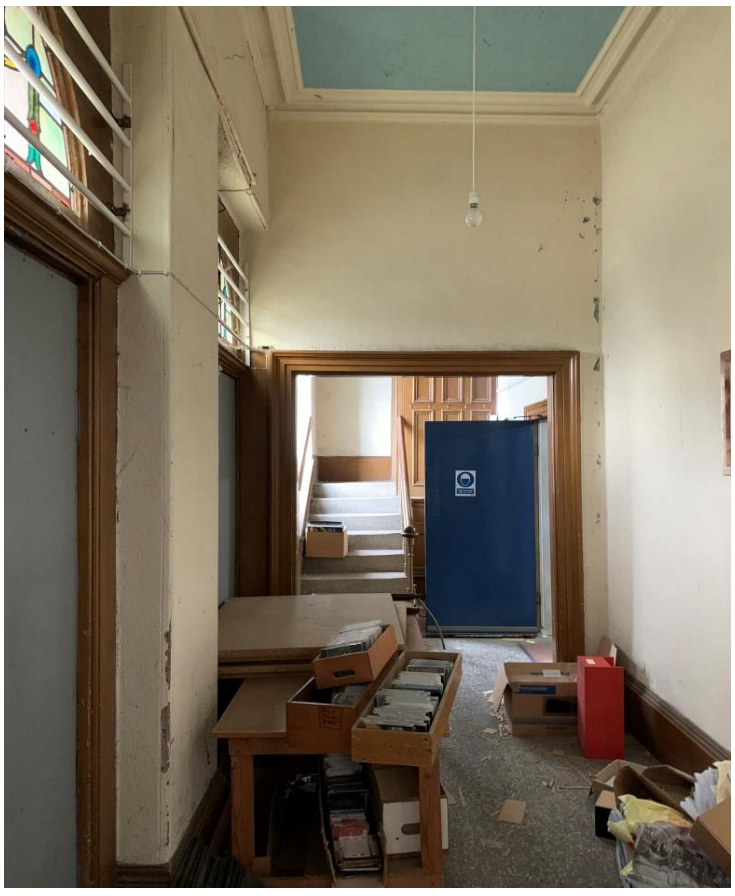

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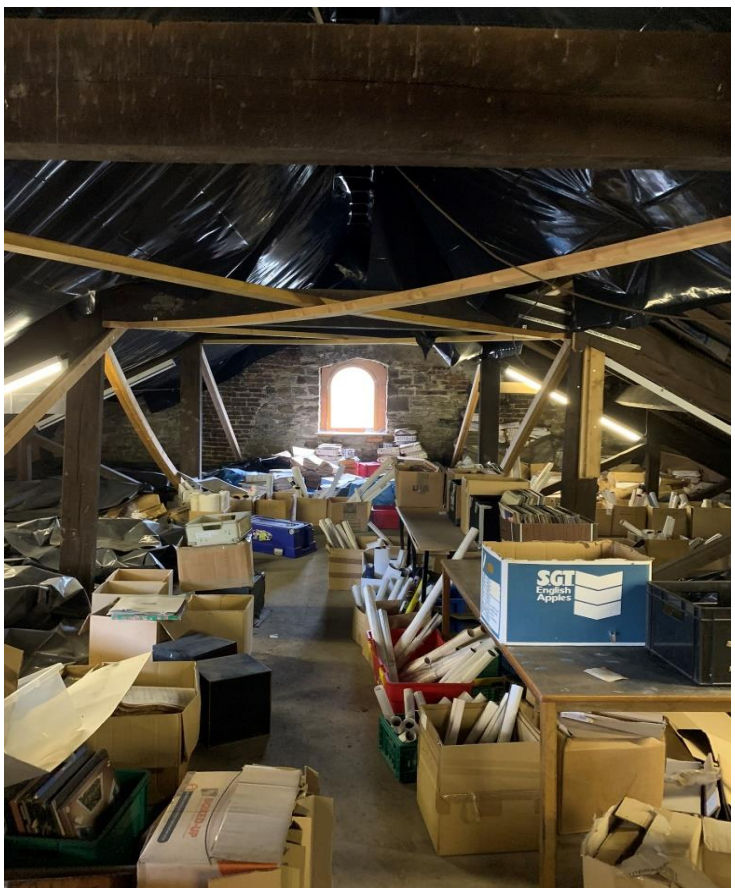

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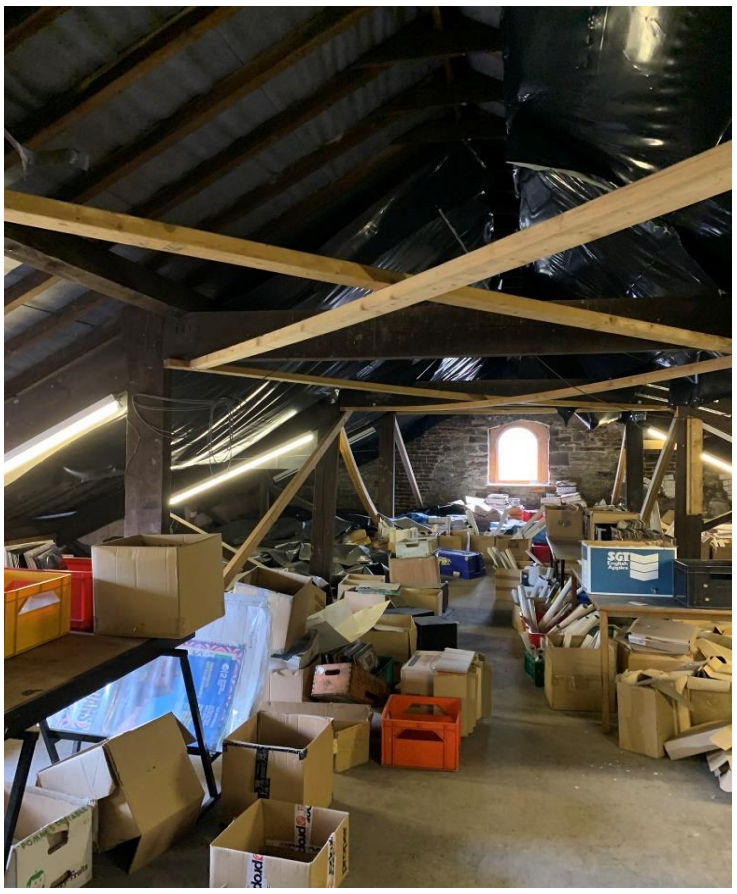

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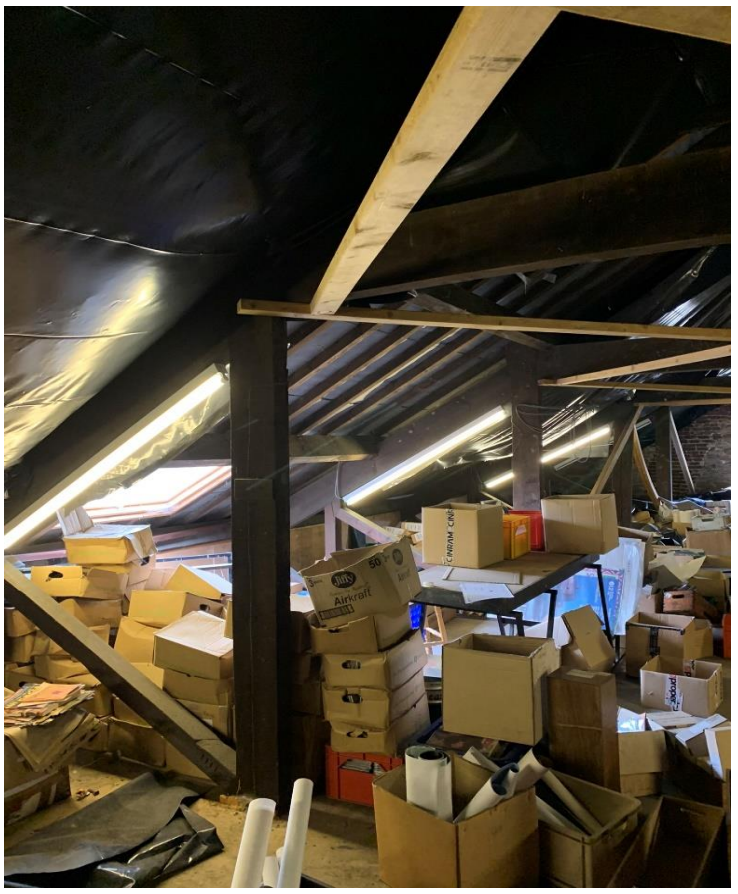

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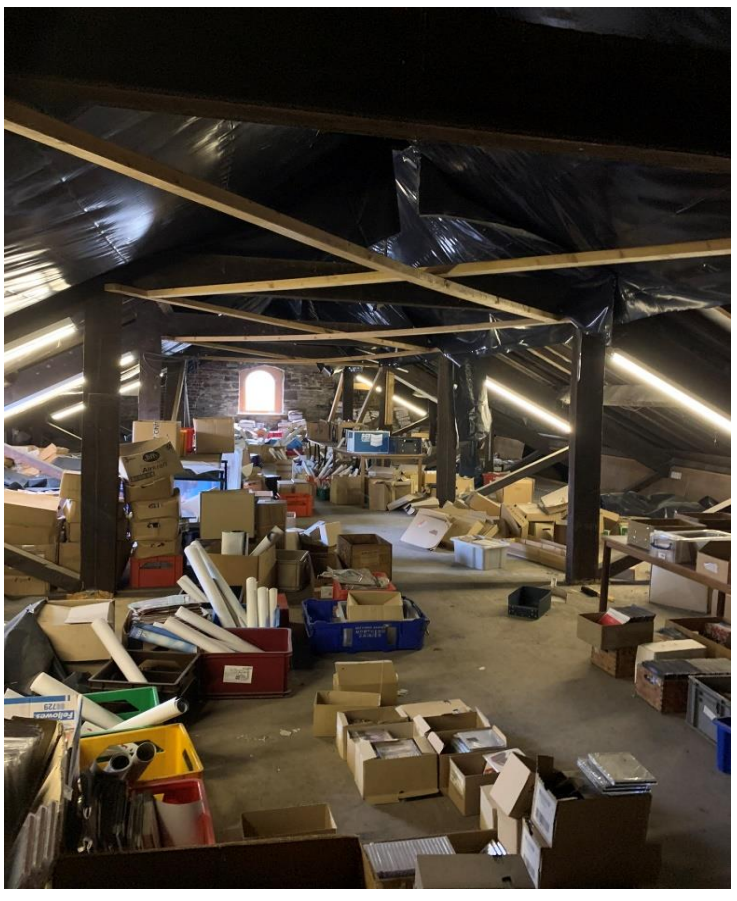

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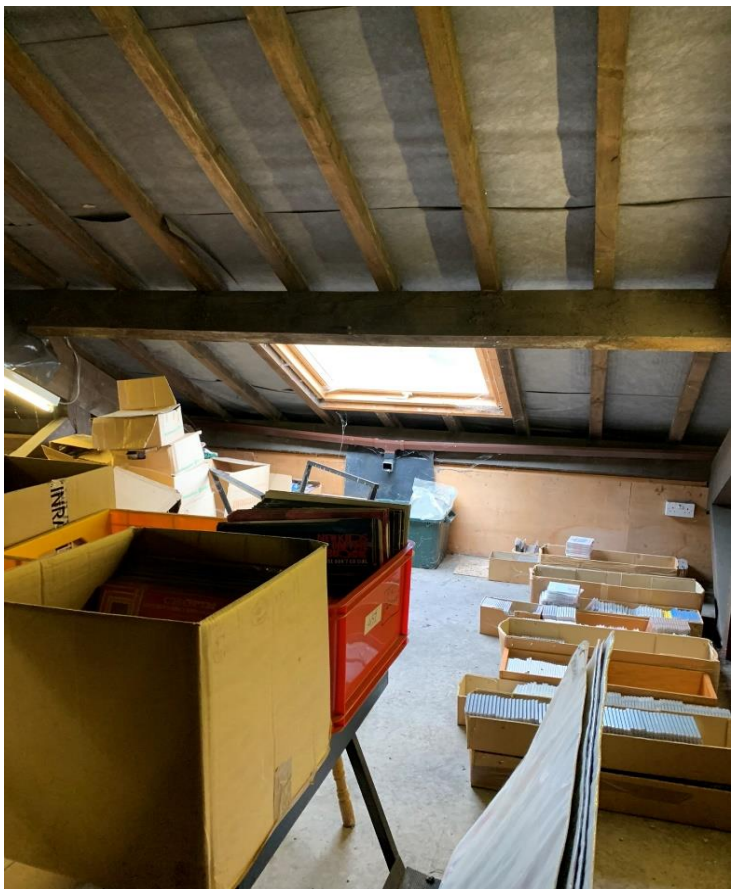

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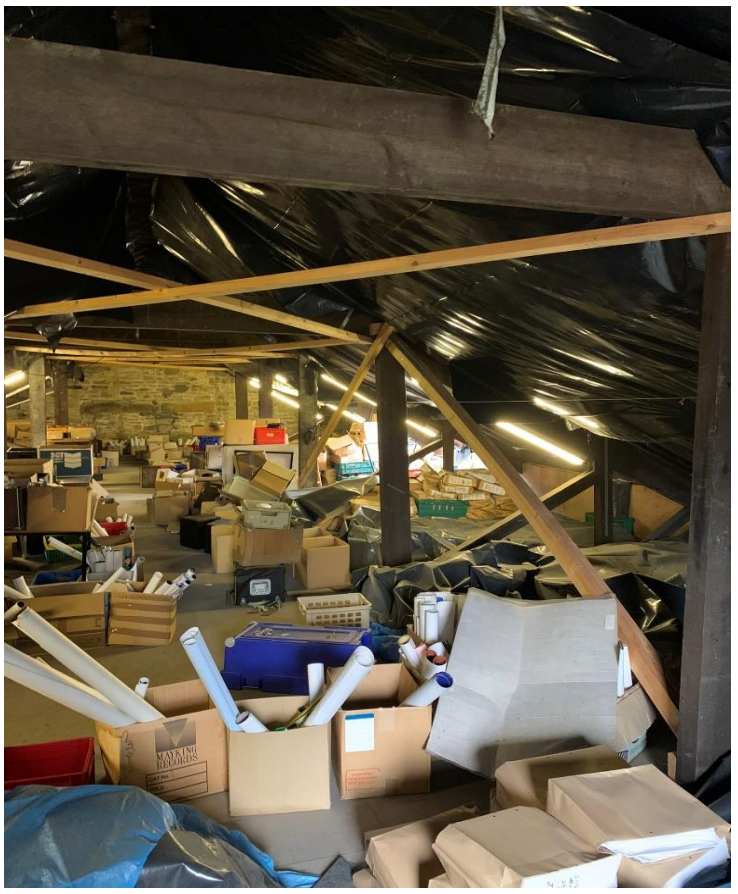

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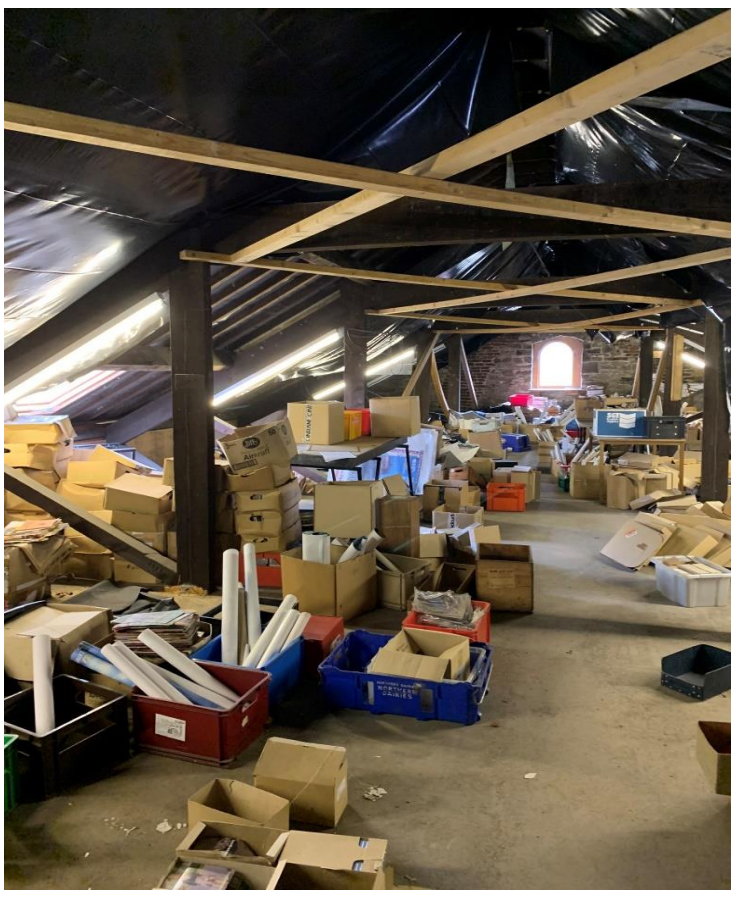

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Photographic Reference -

External Areas

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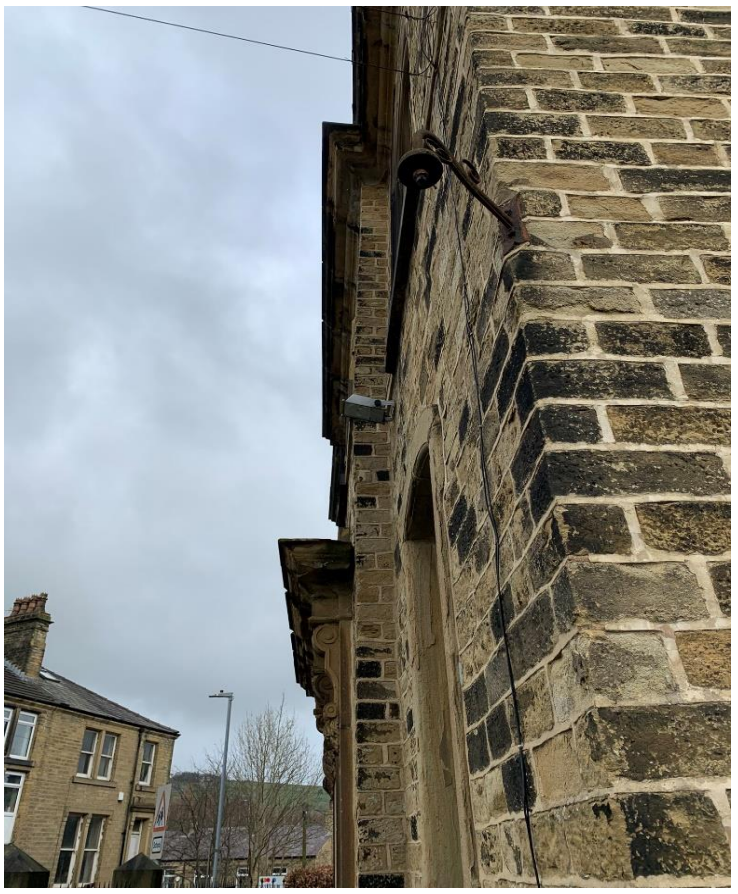

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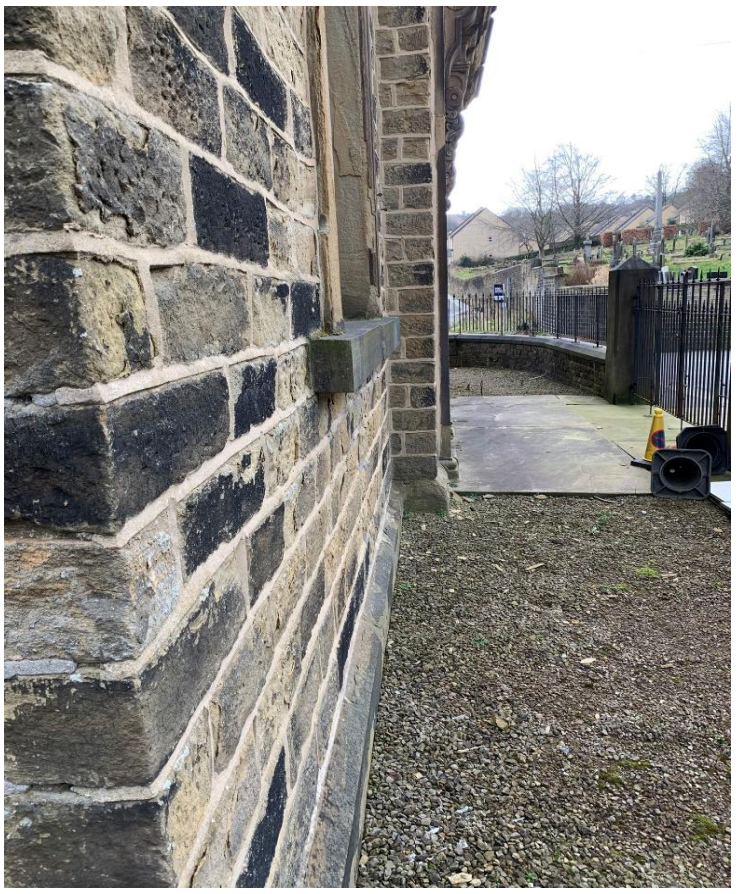

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