

Hutton + Rostron Environmental Investigations Limited

Manchester Art Gallery, Mosley Street Entrance Foyer Lantern Timbers: Timber Condition Survey

Site note 1 for 21 & 23 November 2023, job no. 212-98

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1 INTRODUCTION

1.1 AUTHORITY AND REFERENCES

Hutton + Rostron Environmental Investigations Limited carried out a site visit to Manchester Art Gallery on 21 and 23 November 2023 in accordance with instructions received from Greg Hurst through acceptance of H+R Order Form reference '23.089 Rev3' signed on behalf of Robertson Construction. Drawings provided by Buttress, Ref 'MAG-BUT-17-RL-DR-A-27-0001 P02' were used for the identification of structures. For the purpose of orientation in this report, the building was taken as facing west onto Mosley Street

1.2 AIM

The aim of this survey was to identify decayed, partially decayed, and vulnerable timber elements of the structure and to give recommendations on any remedial works required to correct such problems and prevent decay problems in the future using environmental means. The aim of the survey was also to collect paint samples from the existing timber structure to test for lead/heavy metal content

1.3 LIMITATIONS

This survey was confined to the accessible structures. The condition of concealed timbers may be deduced from the general condition and moisture content of the adjacent structure. Only demolition or exposure work can enable the condition of timber to be determined with certainty, and this destroys what it is intended to preserve. Specialist investigative techniques are therefore employed as aids to the surveyor. No such technique can be 100 per cent reliable, but their use allows deductions to be made about the most probable condition of materials at the time of examination. Structures were not examined in detail except as described in this report, and no liability can be accepted for defects that may exist in other parts of the building. We have not inspected woodwork or other parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect or, in the event that such part of the property is not free from defect, that it will not contaminate and/or affect any other part of the property. The contents of this report do not imply the adoption of the role of Principal Designer by H+R for the purposes of the Construction Design and Management (CDM) Regulations 2015

2 STAFF ON SITE AND CONTACTS

2.1 H+R STAFF ON SITE

Peter Bannister
Ellen Wise
Catherine Knowles
Rhiannon Kelly

2.2 PERSONNEL CONTACTED

Nick Cook – Robertson Construction
Hannah Bellerby - Buttress

3 OBSERVATIONS

3.1 HISTORICAL CONTEXT

Manchester Art Gallery (formerly known as City Art Gallery) was built between 1824-1835 to designs by Sir Charles Barry. The building is grade I listed

The evidence of this investigation indicates that the timber lantern structure over the Mosley Street entrance foyer dates from the latter half of the 20th century. This view is based on;

- a) the lantern timber sections, their profiles and the construction techniques
- b) on the examination of the timber species which shows Brazilian mahogany and Malaysian eucalyptus species which have been used. Large volumes of these species' groups were imported into the UK for joinery products from the 1960's

Based on these material facts, H+R's opinion is that the lantern construction dates from 1970 -1990 (+/-5yrs)

3.2 CONSTRUCTION

The lantern walls comprised of a lightweight timber frame constructed from a variety of tropical hardwoods. A ratchet strap had been previously installed around the lantern walls, presumably to prevent the walls spreading outwards. There were 2no. locations where temporary self-adhesive flashing had been installed between corner posts and studs where joints had opened up as a result of movement within the timber frame. Wired glass glazing had been installed behind the louvres. Dimensions for the timber frame are as follows:

Timber element	Dimension
Corner post	~90x90mm
Sill	~115x90mm
Stud	~100x45mm
Louvre	~95x20mm
Upper plate	~100x25mm
Baton	~20mm (height)

The lantern had a hipped pyramid roof structure formed from 4no. timber hip rafters supporting a lightweight proprietary metal glazing system with wired glass panels. The timber hip rafters were not accessible from the external scaffold so could not be inspected. The joint at the apex of the pyramid roof structure was not accessible from the external scaffold so could not be inspected. The hips were covered with lead. There were 2no. locations where a temporary self-adhesive flashing had been installed over the proprietary metal glazing bars. Dimensions for the glazing panels are as follows:

Glass element	Dimension
Wired glazing panel	~645mm (width) ~8mm (thickness)

3.3 TIMBER SPECIES IDENTIFICATION

3no. timber samples (1no. from the corner post and 2no. from the sills) were taken from the timber frame on the east elevation. 1no. sample taken from the corner post was identified as Mahogany (*Swietenia spp.*), likely of Brazilian origin. The heartwood of Mahogany is classed as being naturally durable against wood-rotting fungi (durability class 2 according to BS EN 350:2016) and durable against wood-boring beetles. 2no. samples taken from the sill were typical of Eucalyptus spp. and were thought to be of Malaysian origin due to distinctive white lines of deposits within the sample. Eucalyptus is

classed as moderately-slightly durable against wood-rotting fungi (durability class 3-4 according to BS EN 350:2016) and durable against wood-boring beetles

The timber species groups and their probable provenance accords well with the period of construction of the lantern. Based on the timber section profiles and the construction methods, this is thought to be around 1975 +/- 15years

3.4 TIMBER CONDITION

Areas of timber decay have been 'marked up' on the Drawings in Attachment A for ease of interpretation

- 1 North elevation: There was 1no. area of decay to the sill in the north-west corner. Both corner posts were leaning outwards causing the joints between the corner posts and studs to open. In the north-west corner this joint had been covered with self-adhesive flashing tape. The decorative finish to the timber frame was largely intact with some localised areas of missing/flaking paint. Timber moisture contents were measured at 8-12 per cent w/w which is below the threshold for structurally significant decay to occur
- 2 East elevation: There were 2no. areas of decay to the sill in the north-east and south-east corners, and 1no. area of decay to the base of the stud in the south-east corner. 1no. louvre in the south-east corner was pulling out of its mortise. The decorative finish to the timber frame was in poor condition with areas of missing/flaking paint. Timber moisture contents were measured at 11-16 per cent w/w which is below the threshold for structurally significant decay to occur
- 3 South elevation: There were 3no. areas of decay to the sill and decay to the base of 2no studs. The south-west corner post was leaning outwards, likely as a result of decay in the sill beneath. The joint between the corner post and stud in the south-west corner had been previously covered with a temporary self-adhesive flashing tape. The decorative finish to the timber frame was in poor condition with areas of missing/flaking paint. Timber moisture contents were measured at 11-17 per cent, likely due to the increased exposure of the elevation to prevailing weather. There was superficial decay to the sill across the whole elevation
- 4 West elevation: There were 2no. areas of decay to the sill in the north-west and south-west corners, and 1no. area of decay to the base of the stud in the south-west corner. The decorative finish to the timber frame was largely intact with some localised areas of missing/flaking paint. Timber moisture contents were measured at <6-12 per cent w/w which is below the threshold for structurally significant decay to occur

3.5 PAINT ANALYSIS

3.5.1 Sample selection

5no. samples were taken from representative locations from across the lantern structure on the roof over the Gallery entrance. Samples were taken from structural members where paint could be easily removed and timber was weathered. Paint finishes were in relatively good condition across the north elevation and were flaking across the south, east, and west elevations in localised zones. The locations of samples are shown on the Plans at Attachment A

3.5.2 Methodology

Representative paint samples were taken in a total of 5no. locations indicated at Attachment A. Samples were collected by hand with the aid of a sharp tool to remove intact paint flakes. Samples were sealed on site and sent to an external reference laboratory for analysis of heavy metal content using inductively coupled plasma optical

emission spectroscopy (ICP-OES). Paint was tested for the following heavy metals: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc

The ICP-OES method allows for mass/mass quantification of the target elements within the limits of detection specified in the table below

3.5.3 Result summary

Results are shown in the table below. Generally, samples had very high lead content, and high levels of zinc and copper. These elements are hazardous to health if high quantities are ingested

Date Sampled: 22-Nov-23

Sample Reference	1	2	3	4	5	Units	Limit of detection
Arsenic	9	9	10	6	140	mg/kg	1
Cadmium	<2.0	<2.0	2.2	<2.0	2.7	mg/kg	0.5
Chromium	17	14	26	14	168	mg/kg	1
Copper	328	222	447	177	151	mg/kg	1
Lead	2290	3050	6710	2580	31700	mg/kg	1
Mercury	1.73	1.86	1.22	2.16	1.76	mg/kg	0.17
Nickel	8	6	15	7	83	mg/kg	1
Selenium	<4	<4	<4	<4	<5	mg/kg	1
Zinc	658	442	417	329	157	mg/kg	5

4 RECOMMENDATIONS

4.1 REPLACEMENT OPTION

Whilst repairs to address timber decay and structural deformation of the lantern are possible, consideration should be given to replacing the post-World War II structure with a lantern of improved design, which should be capable of providing greater service life and requiring of less frequent maintenance than the existing

4.2 RETENTION OPTION

If retention is opted for, the following measures are recommended

- 1 Further investigation is required to determine the works needed to address the apparent 'roof spread' and to determine the condition of the hip rafters
- 2 The lantern will need to be fully enclosed by a protective scaffold and then dismantled
- 3 Preference should be given to renewing the lantern sill members in full, using Accoya. As far as is practicable, the slope on the upper face of the new sill should be increased to improve drainage. To effectively undertaken permanent repairs, disassembly of the lantern would be necessary
- 4 An alternative to full renewal of the sill members would be splice repair of the existing timber (using suitably matched new timber) and to clad the entire sill with a sheet metal flashing such as lead or copper etc.
- 5 As part of the repair and refurbishment the lantern frame timber should be stripped of existing paint and repainted using a moisture vapour permeable or 'microporous' paint finish. Linseed oil paints, although demanding in application, will provide a reliable service life and are easily refurbished. Allowance should be made for servicing the paint finishes quinquennially
- 6 Access for future inspection and maintenance and works should be considered at this time. Consideration should be given to the provision of a permanent gantry for access above the slated roof finishes

4.3 PAINT FINISHES

If the intention is to retain the timber structure:

Paint finishes to the north elevation were serviceable and should not be removed. However, paint finishes were flaking in localised zones at the south, east, and west elevations, in areas that had been exposed to weather. Removal of loose material in these zones will require special precautionary measures

Where paint finishes are intact, they are unlikely to pose a significant health hazard provided they remain in good condition. However, as lead and other identified heavy metals can be hazardous to health, precautions are required during surface preparation and redecoration following Health and Safety (HSE) guidance available at:

<https://www.hse.gov.uk/construction/healthrisks/hazardous-substances/lead.htm>

For more information on Paint toxicity in historic buildings, please see Sheridan (2018):

https://www.buildingconservation.com/articles/_gsdata/_saved/_lead-paint/lead-paint.htm

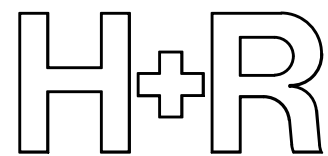
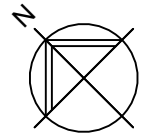
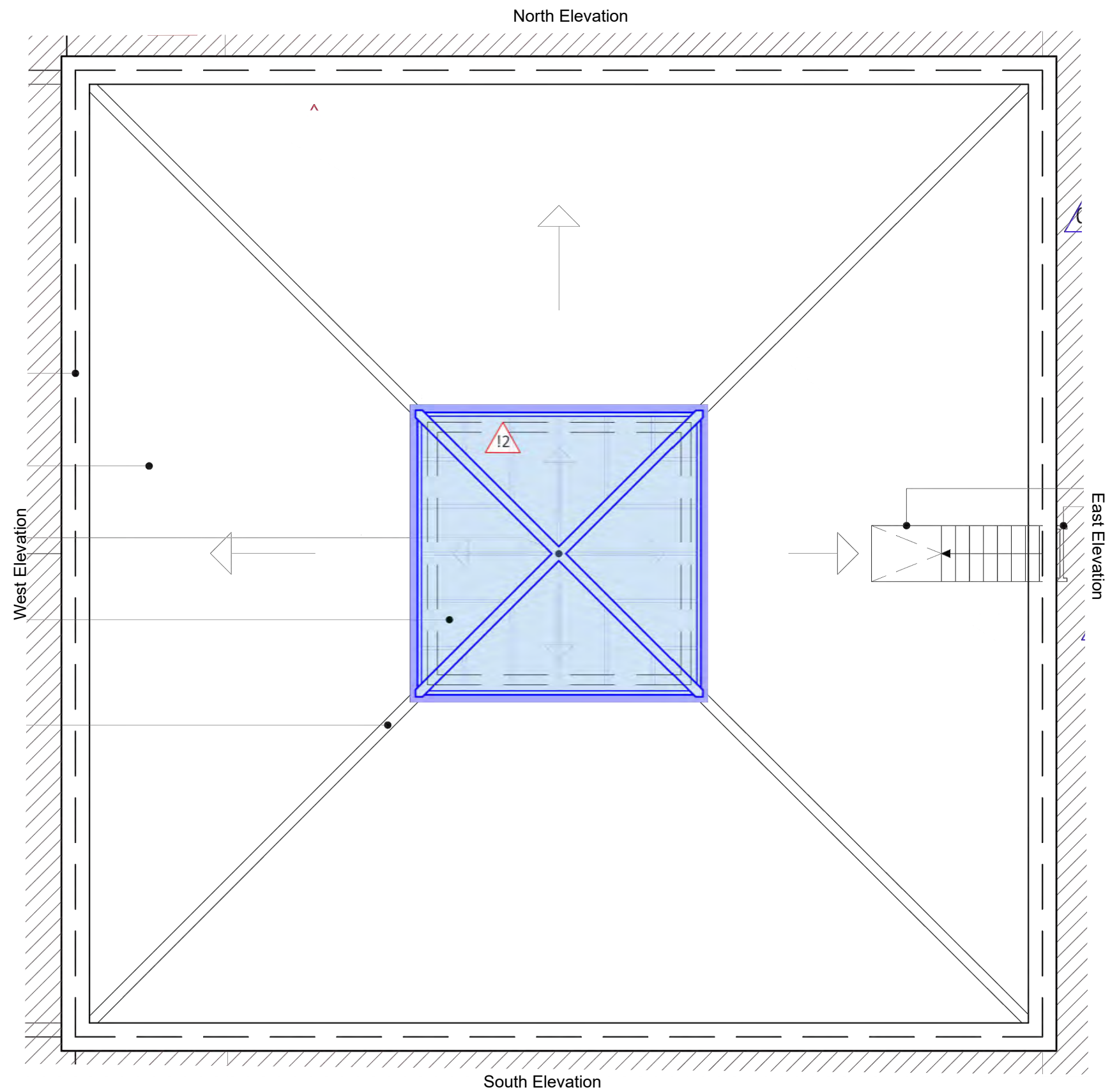
5 H+R WORK ON SITE

5.1 H+R inspected all accessible timbers by deep drilling and probing, as necessary, so as to determine their decay state and deep moisture content

5.2 H+R took 3no. timber samples from the timber frame for timber species identification

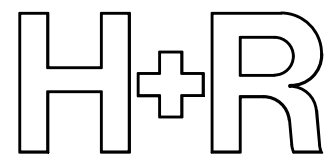
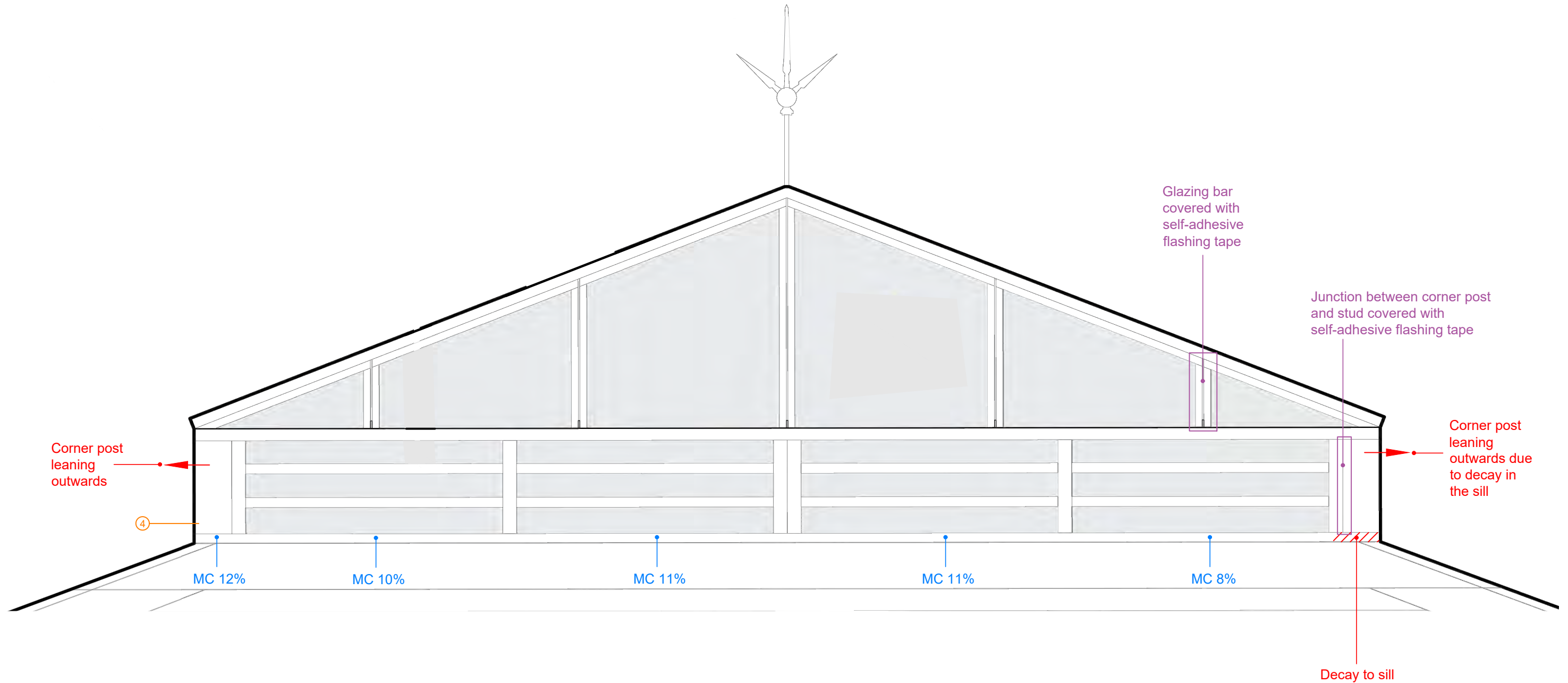
5.3 H+R took 5no. paint samples from representative structural members, to determine their heavy metals content via an external laboratory

Attachment A



Manchester Art Gallery, Mosley Street Entrance Foyer - Roof Layout
 Timber Condition Survey
 21&23 November 2023

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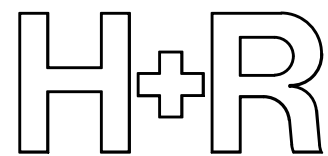
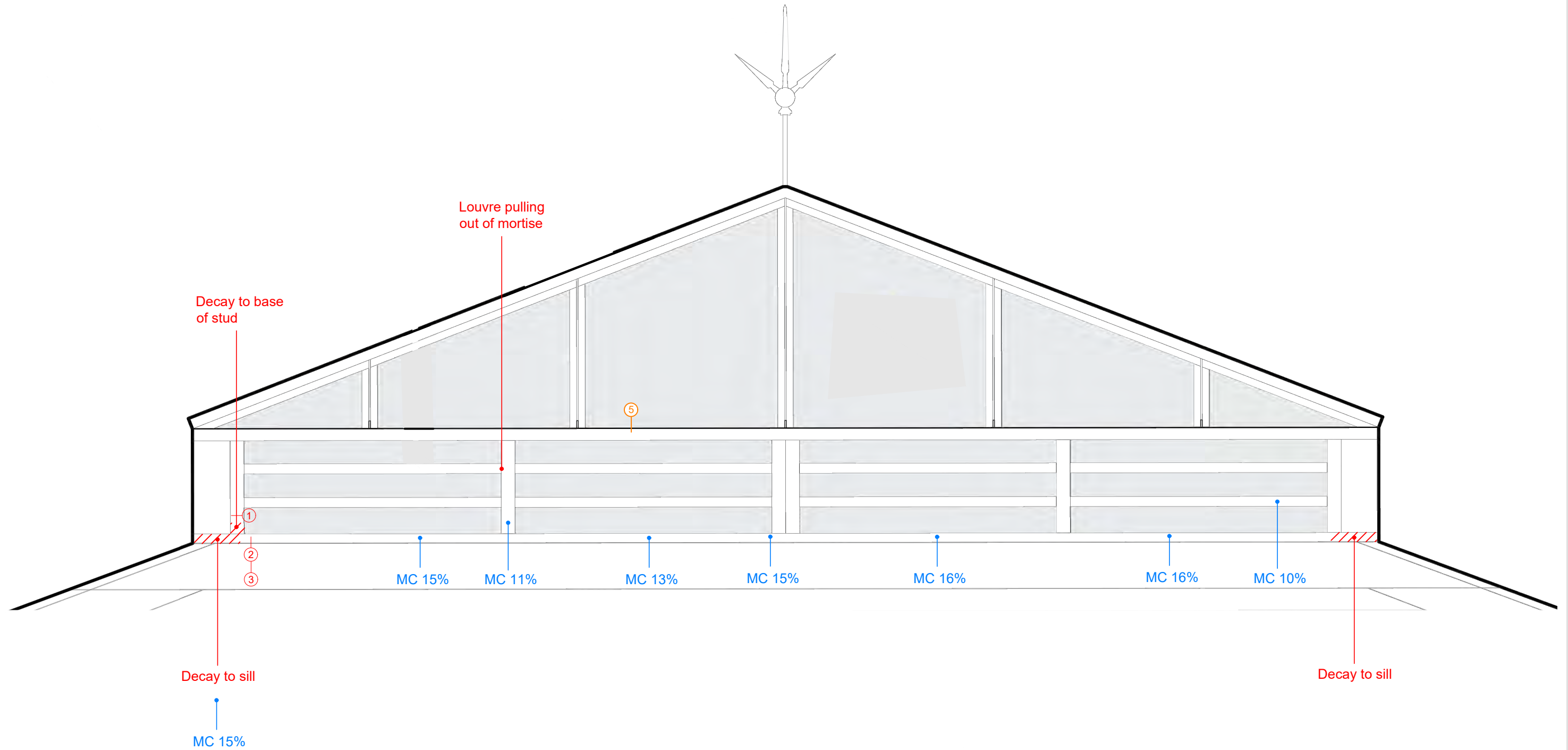


Manchester Art Gallery, Mosley Street Entrance Foyer Lantern - North Elevation
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Key:

-  Area subject to timber decay
-  Indication of movement of timber element
-  Area with temporary self-adhesive flashing tape
-  w/w% of moisture content of timber element
-  Paint sample location

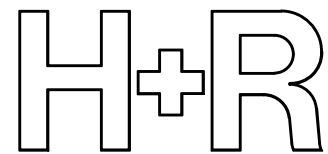
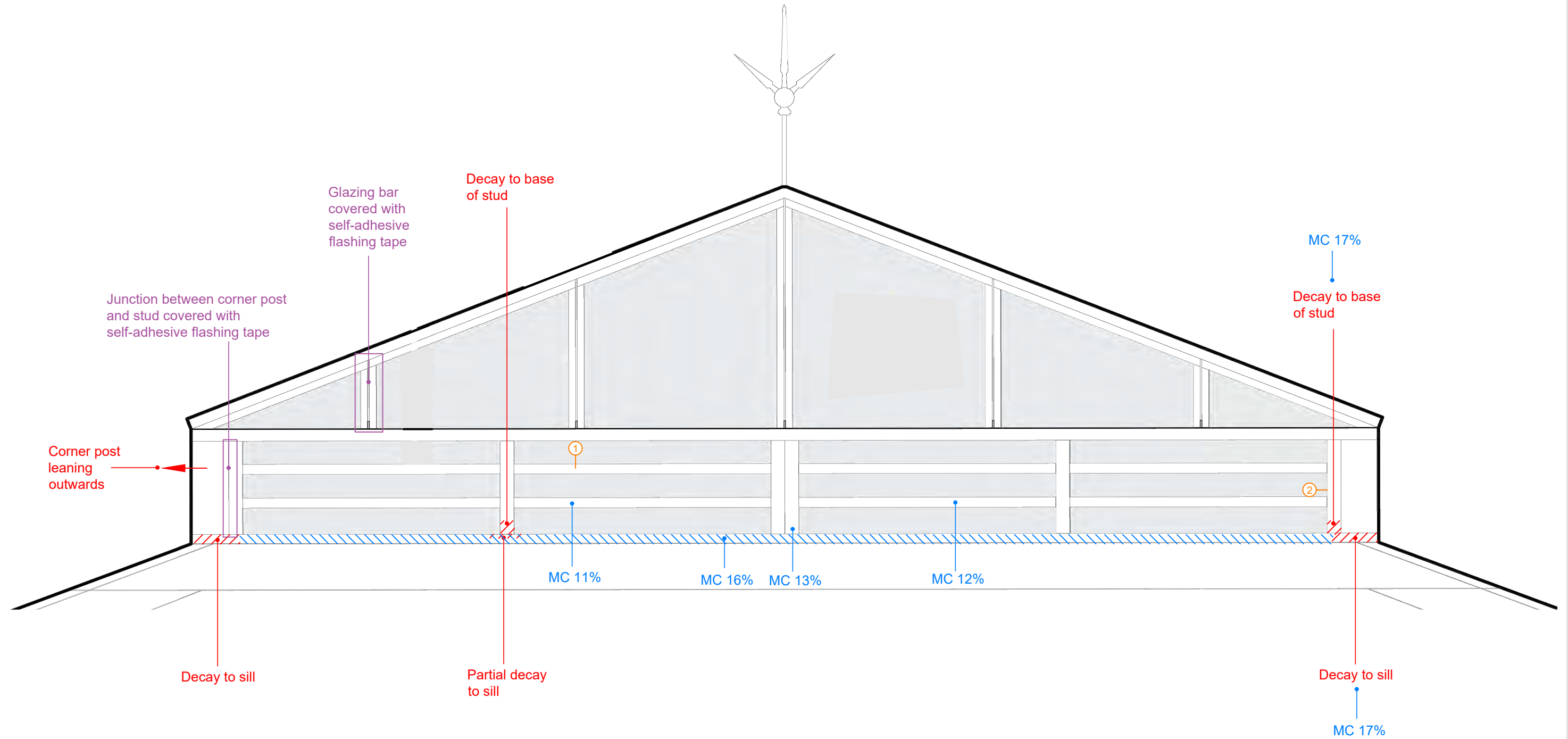


Manchester Art Gallery, Mosley Street Entrance Foyer Lantern - East Elevation
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Key:

- Area subject to timber decay
- MC 11% w/w% of moisture content of timber element
- Timber sample location
- Paint sample location

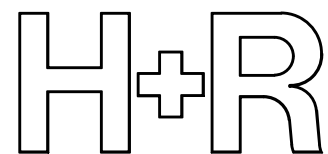
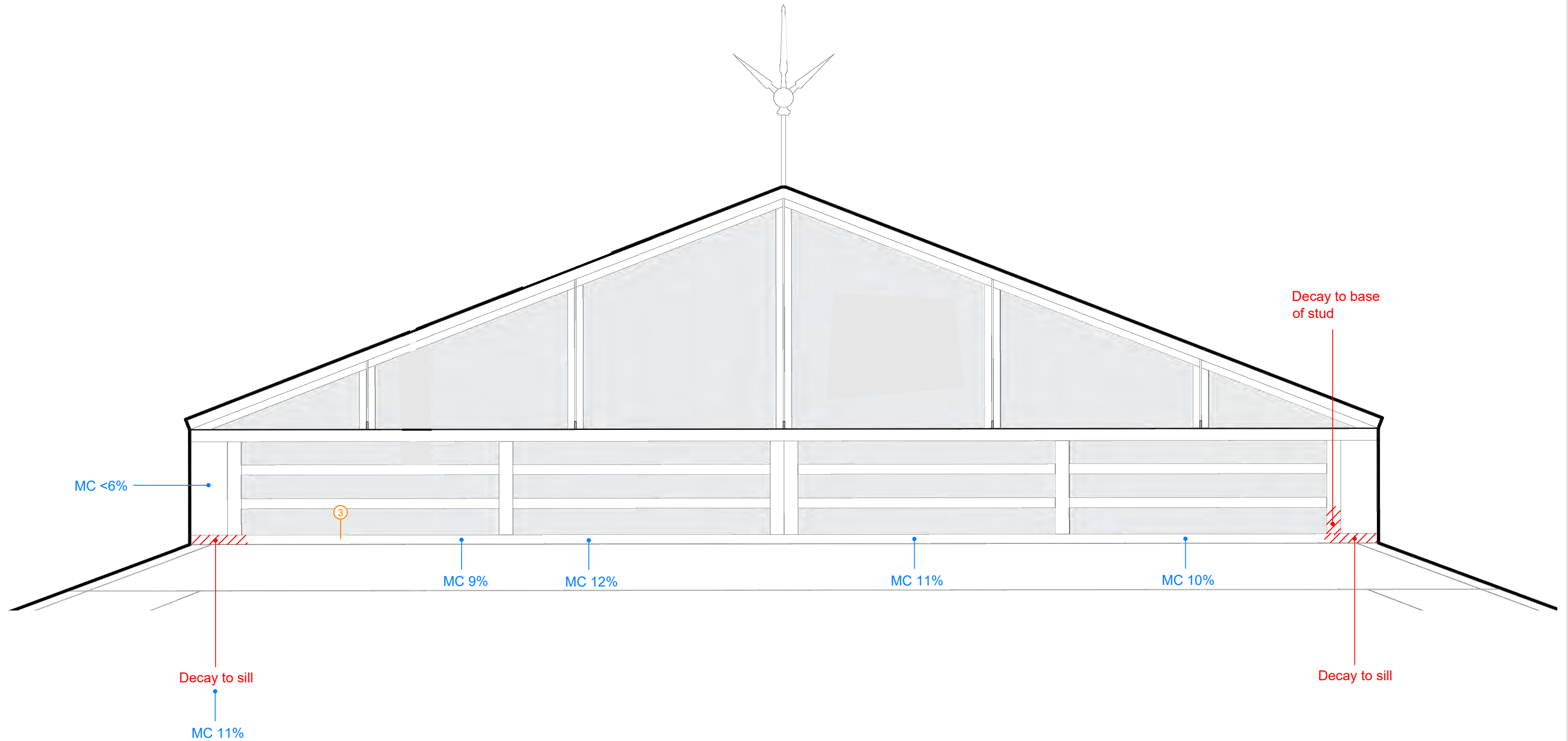


Manchester Art Gallery, Mosley Street Entrance Foyer Lantern - South Elevation
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Key:

- Area subject to timber decay
- Indication of movement of timber element
- Area with temporary self-adhesive flashing tape
- w/w% of moisture content of timber element
- Area subject to water penetration
- Paint sample location



Manchester Art Gallery, Mosley Street Entrance Foyer Lantern - West Elevation
Timber Condition Survey
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Key:

- Area subject to timber decay
- w/w% of moisture content of timber element
- Paint sample location

Attachment B



Fig 1:

North elevation; showing general view



Fig 2:

North elevation; showing close-up view of north-west corner post. Decay to sill in this location. Note also temporary self-adhesive flashing (arrowed) covering joint between corner post and stud



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Fig 3:

North elevation; showing close-up view of temporary self-adhesive flashing, covering open joint between north-west corner post and stud



Fig 4:

North elevation; showing close-up view of decorative finish. Note wired glass panes installed behind louvres



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Fig 5:

North elevation; showing self-adhesive flashing tape over metal glazing bar in north-west corner. Note wired glass panes



Fig 6:

East elevation; showing general view



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Fig 7:

East elevation; showing close-up view of north-east corner post. Note decay to sill in this location (arrowed)



Fig 8:

East elevation; showing close-up view of open joint between north-east corner post and stud (arrowed)



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Fig 9:

East elevation; showing close-up view of poor condition decorative finish



Fig 10:

East elevation; showing example of glazing bar from proprietary metal glazing system



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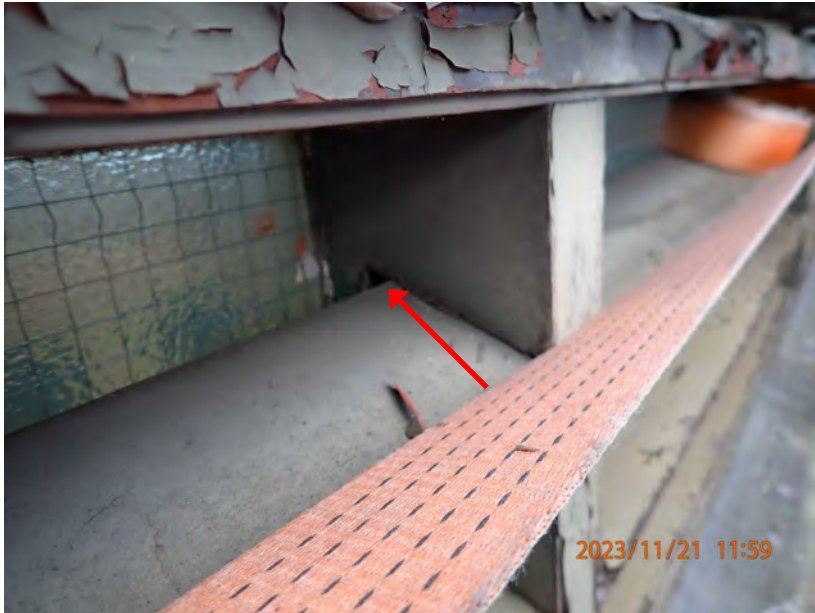


Fig 11:

East elevation; showing close-up view of louvre pulling out of its mortise (arrowed)



Fig 12:

East elevation; showing close-up view of south-east corner post. Note decay to sill and base of stud in this location (arrowed)



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Fig 13:

South elevation; showing general view



Fig 14:

South elevation; showing close-up view of decay to sill and base of stud in south-east corner



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Fig 15:

South elevation; showing close-up view of poor condition of decorative finish



Fig 16:

South elevation; showing decay to base of vertical stud (circled)



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Fig 17:

South elevation; showing close-up view of decay to sill in south-west corner (arrowed)



Fig 18:

South elevation; showing alternative view of decay to sill in south-west corner. Note self-adhesive flashing tape covering open joint between corner post and stud (arrowed)



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Fig 19:

South elevation; showing close-up view of self-adhesive flashing tape covering open joint between south-west corner post and stud



Fig 20:

South elevation; showing example of superficial decay to the sill along the elevation (arrowed)



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Fig 21:

West elevation; showing general view



Fig 22:

West elevation; showing close-up view of decay to sill and stud in south-west corner (arrowed)



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Fig 23:

West elevation; showing decay to base of stud in south-west corner (arrowed)



Fig 24:

West elevation; showing decay to sill in north-west corner (circled)



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Fig 25:

West elevation; showing example profile of proprietary metal glazing bars



Fig 26:

Mosley Street entrance foyer; showing internal view of lantern. Note movement visible at corner (arrowed)



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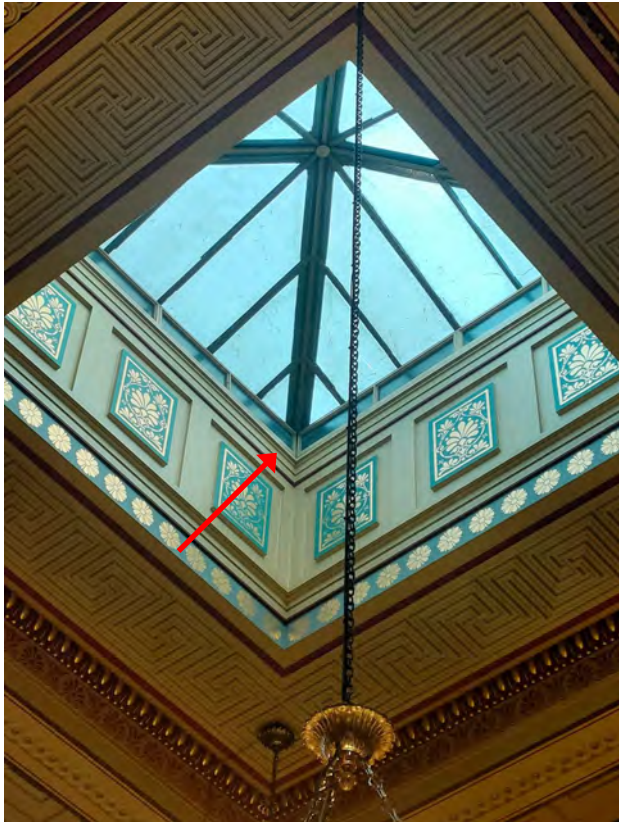


Fig 27:

Mosley Street entrance foyer; showing internal view of lantern. Note movement visible at corner (arrowed)



Fig 28:

Mosley Street entrance foyer; showing internal view of lantern. Note movement visible at corner (arrowed)



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Fig 29:

Mosley Street entrance foyer; showing internal view of lantern. Note movement visible at corner (arrowed)



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