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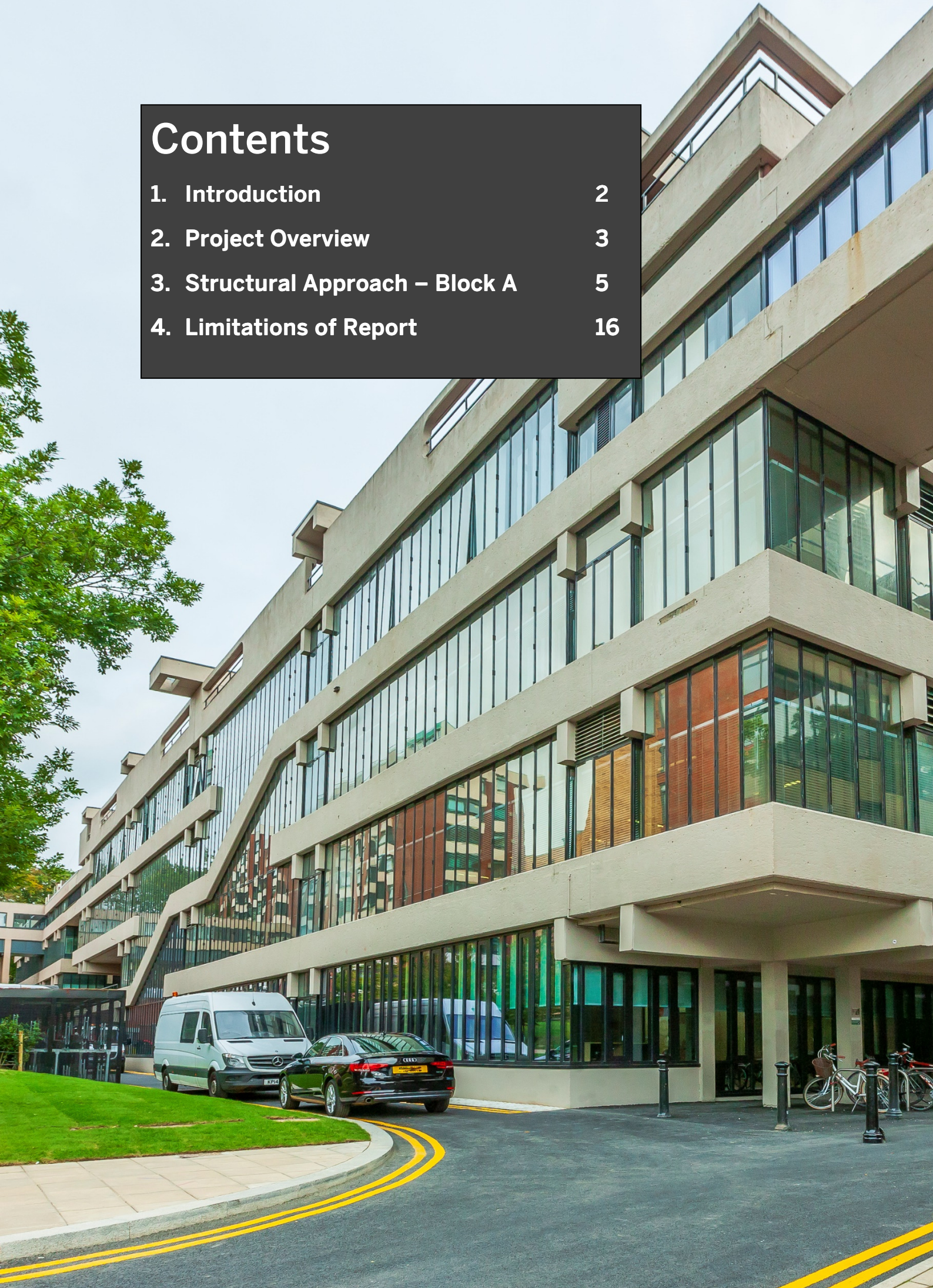
CIVIL AND STRUCTURAL CONSULTING ENGINEERS



STRUCTURAL DESIGN PHILOSOPHY The George Hotel, Huddersfield

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Report Author: James Hendry
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Leeds
Adept Consulting Engineers Ltd.
1912 Mill, Sunny Bank Mills
Leeds, LS28 5UJ
Tel: 0113 239 4518

Manchester
Adept Consulting Engineers Ltd.
4th Floor, 7 St James Square
Manchester, M2 6DN
Tel: 0161 974 0290

London
Adept Consulting Engineers Ltd.
25 Horsell Road, London, N5 1XL
Tel: 020 3007 7497

Sheffield
Adept Consulting Engineers Ltd.
Courtwood House, Silver Head Street
Sheffield, S1 2DD
Tel: 0114 279 2795



1. Introduction

1.1. Introduction

1.1.1. Adept Consulting Engineers has been appointed by GMI Construction as part of the design team to provide Civil and Structural engineering services for the redevelopment of the George Hotel, Huddersfield.

1.2. Purpose of this Document

1.2.1. The purpose of this document is to clearly define and document the parameters to be used in and relevant to the Structural Engineering Design of the heritage structure (Block A) at The George Hotel.

1.2.2. This is a live document and reflects the design at the point of writing (RIBA Stage 3). It will be the Contractor's responsibility to check the assumptions made and update and expand it during the design development to account for increased level of definition of the various issues and design revisions.

2. Project Overview

2.1. General

- 2.1.1. The project involves the retention and redevelopment of 'Block A' of the Grade II* listed George Hotel in Huddersfield, forming part of a wider new hotel development. The later additions, Blocks B and C, are to be demolished to make way for a new concrete frame structure.
- 2.1.2. Due to concerns regarding the condition of the historic John William Street façade, and the significant risks associated with retaining it in situ during construction, it is proposed that the façade will be carefully dismantled and reconstructed by a specialist historic stonework contractor, ensuring the heritage value is preserved.
- 2.1.3. Please refer to accompanying documentation by AHR, which outlines the design intent and the proposed interface between new interventions and retained heritage facades and features.

2.2. Site Location

- 2.2.1. The George Hotel is located in the heart of Huddersfield, directly fronting St George's Square and adjacent to Huddersfield Railway Station, a key landmark in the town.
- 2.2.2. The site is bounded by; John William Street to the east, St George's Square to the south, and the railway station car park to the west and north. The site exhibits varying topography, with basement level retaining structures present. The land generally slopes from west to east across the site.

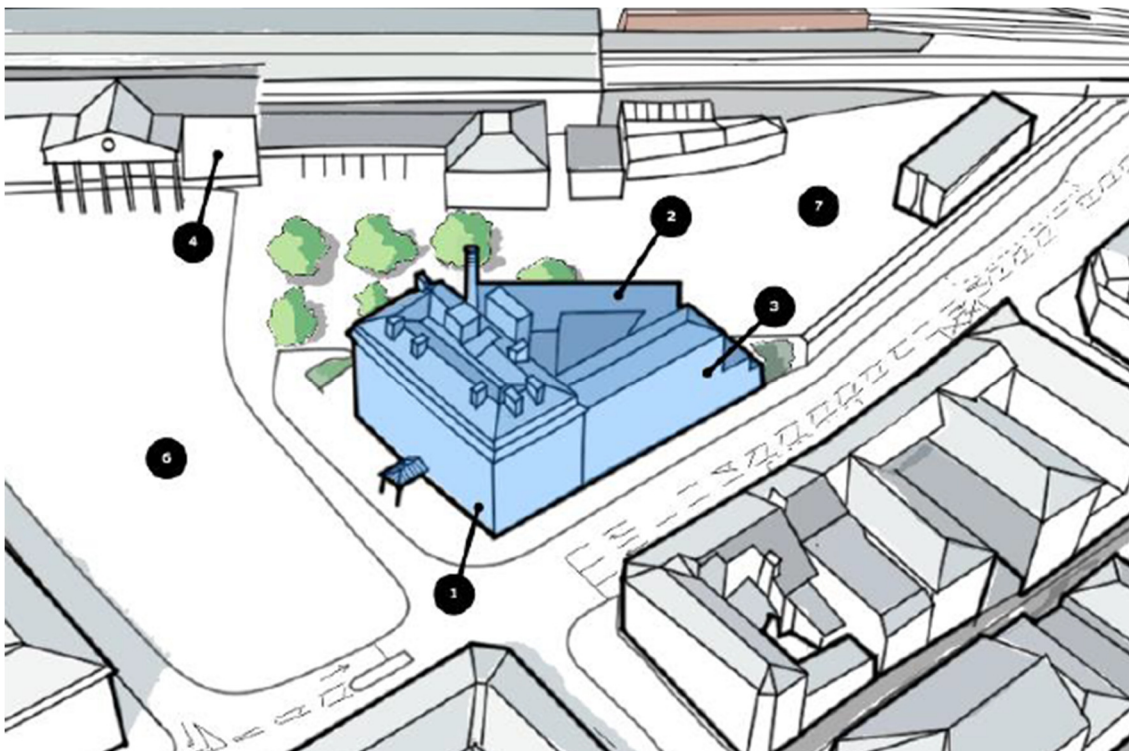


Figure 1 – Site Plan

- 1. Block A – The George Hotel
- 4. Huddersfield Railway Station
- 6. St George's Square

2.3. Building Description

2.3.1. Block A

2.3.2. Block A, the original 1850s structure, comprises timber joisted suspended floors supported by loadbearing masonry walls, with masonry basement retaining walls. The timber joists are typically (300mm) at close centres and are pocketed into the masonry walls at bearing ends.

2.3.3. In the corridor areas, sections of the floor construction are formed using stone slabs spanning between loadbearing masonry corridor walls, while in other locations, the corridor floors are formed using timber joists.

2.3.4. Additionally, steel or cast iron beams and columns are present at First Floor Level, enabling larger spans and open plan arrangements at Ground Floor.

2.3.5. The roof to Block A consists of two adjacent duo-pitched roofs, supported on perimeter masonry walls at eaves level, with an internal valley beam and ridge beams supporting the structure longitudinally. Horizontal timber ties are provided between principal rafters to restrain roof spread.

2.3.6. During a structural condition survey undertaken by others in 2021, the roof was identified as a key source of water ingress into Block A. However, since that time, repairs have been completed, and the roof is now considered to be in a satisfactory, watertight condition. As such, any works to the roof structure are limited to the interaction with the new build concrete frame which is to replace Blocks B & C.



Figure 2 - Photo of Block A from St George's Square

3. Structural Approach – Block A

3.1. Design Principles

3.1.1. The approach taken by Adept on the George Hotel Project, recognises the key principles of good conservation, which include:

1. **Understanding Historic Significance** – Working closely with GMI / AHR, it has been established what is significant before any structural solutions are developed.
2. **Understanding structural form and actions** – The structural actions presented within the building structure have been fully understood to enable sympathetic and complimentary repair and alterations to be undertaken.
3. **Diagnose the cause of any defects correctly** – Allowing the correct repair / solution to be provided, reducing the risk of damage to historic fabric from inappropriate action.
4. **Minimum intervention** - A conservative approach of minimum intervention and disturbance of fabric is key.
5. **Intervention must be honest and distinguishable from the original fabric** - Repairs or alterations are, where possible, wholly apparent from the original fabric.
6. **Adopt materials and techniques on a 'like for like' basis** – This approach enables the structure to be retained and function as it always has. New technologies and modern materials are to be used with caution and good reason.
7. **Alterations should be reversible where possible** – This is to enable original fabric to be identified and reestablished if necessary.
8. **New work is of complementary quality** – The proposals are to compliment the original fabric, not compete or conceal it.
9. **Keep accurate records** - What cannot be retained has been accurately recorded to inform future generations what was present before these works.
10. **Encourage routine maintenance and good housekeeping** - True conservation can be achieved with a relatively modest regime of routine maintenance and good housekeeping.

3.2. Suspended Timber Floors

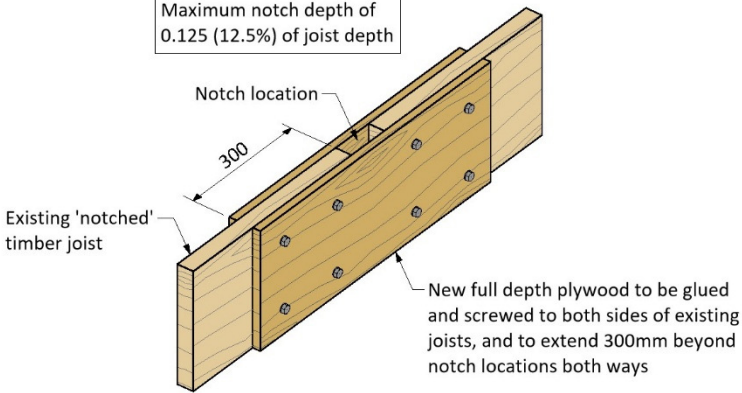
- 3.2.1. A timber survey was undertaken, with a subsequent report produced by Floyd Consulting dated 04/02/2025. The report examined the condition and arrangement of timber elements at all previously exposed points across every floor level.
- 3.2.2. In addition to documenting the condition and geometry of the existing floor joists, the report highlighted a significant number of post-construction service installations (notching of joists). This has inevitably weakened the overall structure, and there are also areas where further investigation is required to confirm sufficient end bearing condition.
- 3.2.3. Refer to Figure 3 below for examples of heavily notched joists.

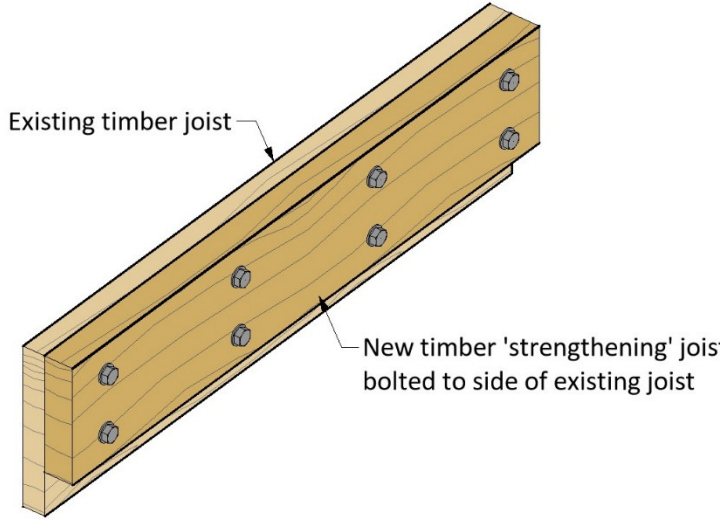
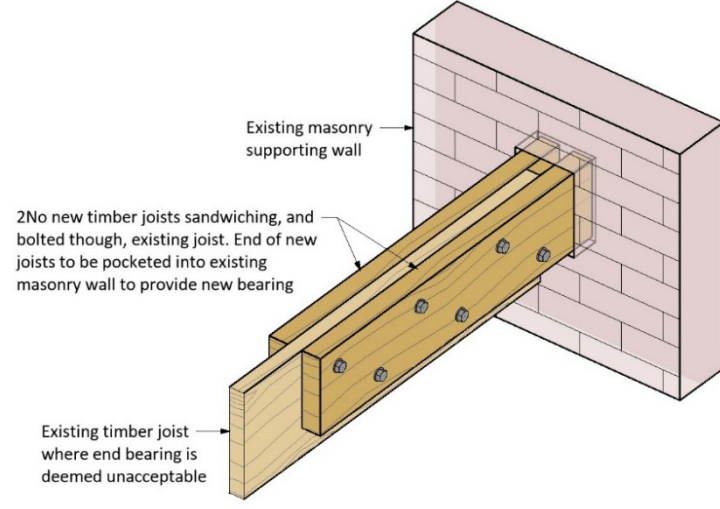


Figure 3 – Heavily Notched Joists (30-40%)

- 3.2.4. Generally, the timber was found to be dry (unless otherwise noted) and in reasonable condition, notwithstanding the issues identified above. Timber samples were tested and identified as either Red Pine or, more likely, Baltic Pine. The timber was generally slow-grown and, in accordance with BS EN 1912:2024, would achieve a strength grading of C24.

- 3.2.5. Given the proposed increase in dead load, necessary to satisfy updated acoustic and fire performance requirements and in order to preserve the integrity of the existing floor structures, some level of repair and strengthening will be required in specific areas. End bearing conditions, as noted in 3.2.2, will also need to be verified.
- 3.2.6. In order for a full assessment and any required remedial works to be carried out, the existing floor joists will need to be fully exposed.
- 3.2.7. Following discussions with AHR's conservation lead, it has been agreed that in most areas, this will result in the full loss of existing ceilings and cornices, to allow for safe and effective access to the structure from below.
- 3.2.8. In areas where important ceilings are to be preserved and repaired, any remedial work will instead be undertaken from above, via the careful removal and reinstatement of the existing floorboards.
- 3.2.9. At the time of writing, it is understood that the following areas are to be preserved and accessed from above:
- Ground Floor Conference Room
 - First Floor Signing Room
 - First Floor Bedrooms Facing the Station
- 3.2.10. Refer to the table below for an indicative range of repair details anticipated to be employed, subject to a detailed assessment following opening-up works.

Notes	Isometric View
<p><u>Localised Repair Detail at Notch Locations:</u></p> <p>Maximum permitted notch depth is 0.125 x joist depth.</p> <p>Where notching is identified (following removal of ceilings or floorboards), a full depth plywood plate shall be glued and screwed to both sides of the affected joist. The plywood plates should extend a minimum of 300mm beyond the notched area in both directions.</p> <p>Fixings to be staggered and installed in accordance with best practice for timber strengthening.</p>	 <p>Maximum notch depth of 0.125 (12.5%) of joist depth</p> <p>Notch location</p> <p>300</p> <p>Existing 'notched' timber joist</p> <p>New full depth plywood to be glued and screwed to both sides of existing joists, and to extend 300mm beyond notch locations both ways</p>

Notes	Isometric View
<p><u>Strengthening of Timber Joists:</u></p> <p>Where additional capacity is required, a wider and shorter C24 timber member shall be bolted to the side of the existing joist. Fixings to be M12 bolts at 600mm centres, ensuring good alignment and avoiding clash with existing notches or defects.</p> <p>This approach enhances structural strength while allowing retention of existing joists.</p>	 <p>Existing timber joist</p> <p>New timber 'strengthening' joist bolted to side of existing joist</p>
<p><u>End Bearing Replacement Detail:</u></p> <p>Where the existing end bearing is found to be insufficient, the affected area shall be locally propped to ensure safety.</p> <p>The original joist will be cut back, and a pair of new C24 timber joists introduced on either side. These shall be bolted to the original joist and pocketed into the existing masonry wall to ensure adequate bearing and shear transfer.</p> <p>All new timber introduced to be treated and verified for compatibility with existing fabric.</p>	 <p>Existing masonry supporting wall</p> <p>2 No new timber joists sandwiching, and bolted though, existing joist. End of new joists to be pocketed into existing masonry wall to provide new bearing</p> <p>Existing timber joist where end bearing is deemed unacceptable</p>

3.3. Suspended Stone Slabs

- 3.3.1. During the condition survey carried out on 27/03/25, stone slabs were observed at both ground and first floor levels, spanning between loadbearing masonry walls.
- 3.3.2. The soffit of the Level 0 stone slabs was visible from the basement. Hairline cracking was noted across several areas, with more pronounced shear cracking evident toward the edges of some units.



Figure 4 - Photos of Stone Slabs

- 3.3.3. It is believed that the slabs are formed from sandstone, a material known for variability in quality and strength. Due to this inconsistency, in-situ testing is considered both time consuming and likely ineffective, making it nearly impossible to verify structural capacity through traditional calculation methods.
- 3.3.4. In addition, available literature suggests that sandstone performs poorly under fire conditions and cannot be relied upon to meet modern fire performance standards.
- 3.3.5. Accordingly, we propose installing a grillage of steel beams, likely UC sections or back-to-back equal angles, pocketed into the existing loadbearing walls on padstones at either end. This will provide reliable structural support to the existing stone slabs.
- 3.3.6. The new steelwork will also serve as a suitable fixing point for underdrawn gypsum linings, effectively encapsulating the stone to provide the necessary fire protection.

3.3.7. Refer to Figure 5 below for the proposed steel grillage arrangement at Level 0.

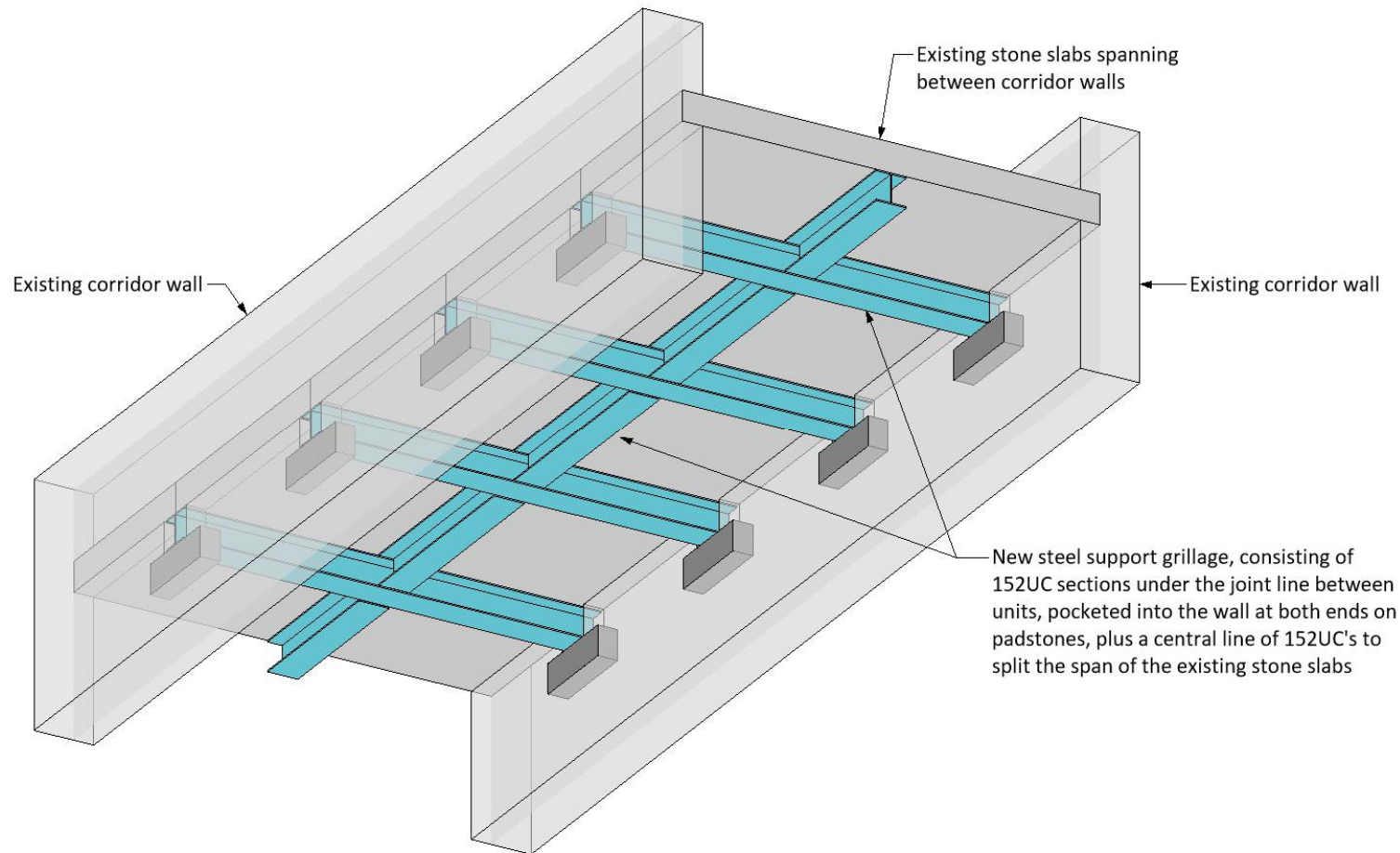


Figure 5 – Typical Steel Grillage Arrangement

3.3.8. A similar solution could be adopted at first floor level where required, however it would be more practical to install timber joists at say 400mm centres to support the slabs at this level due to the existing suspended timber floor structure.

3.4. Historic Car Park Wall Intervention

- 3.4.1. During the condition survey carried out on 27/03/25, the existing masonry car park retaining wall, running parallel to Block A and St George's Square, was observed to be leaning significantly towards Block A. It appears that brickwork buttresses have been installed at some point in an attempt to address this issue, however, it is unclear what these are founded on or how effective they have been.
- 3.4.2. The existing iron railings and stone coping are also in poor condition and appear to be detaching from the wall below. The presence of stone lintels and infill brickwork suggests that a historic opening has been bricked up. Further investigation is required to confirm whether any voids exist beneath the adjacent ramp, or if the area has been fully backfilled.



Figure 6 – Photos of Wall

- 3.4.3. Given the deteriorated condition of the retaining structure and its proximity to the listed building, it is recommended that the wall be carefully demolished and replaced with a reinforced concrete retaining wall, designed in accordance with current standards. It is understood that an AIP will be required for this element of the works.
- 3.4.4. To maintain the existing aesthetic, the new wall could be clad in the salvaged stone facing, with the stone coping and iron railings reinstated.
- 3.4.5. Refer to figure 7 below for existing and proposed sections through the Block A external wall.

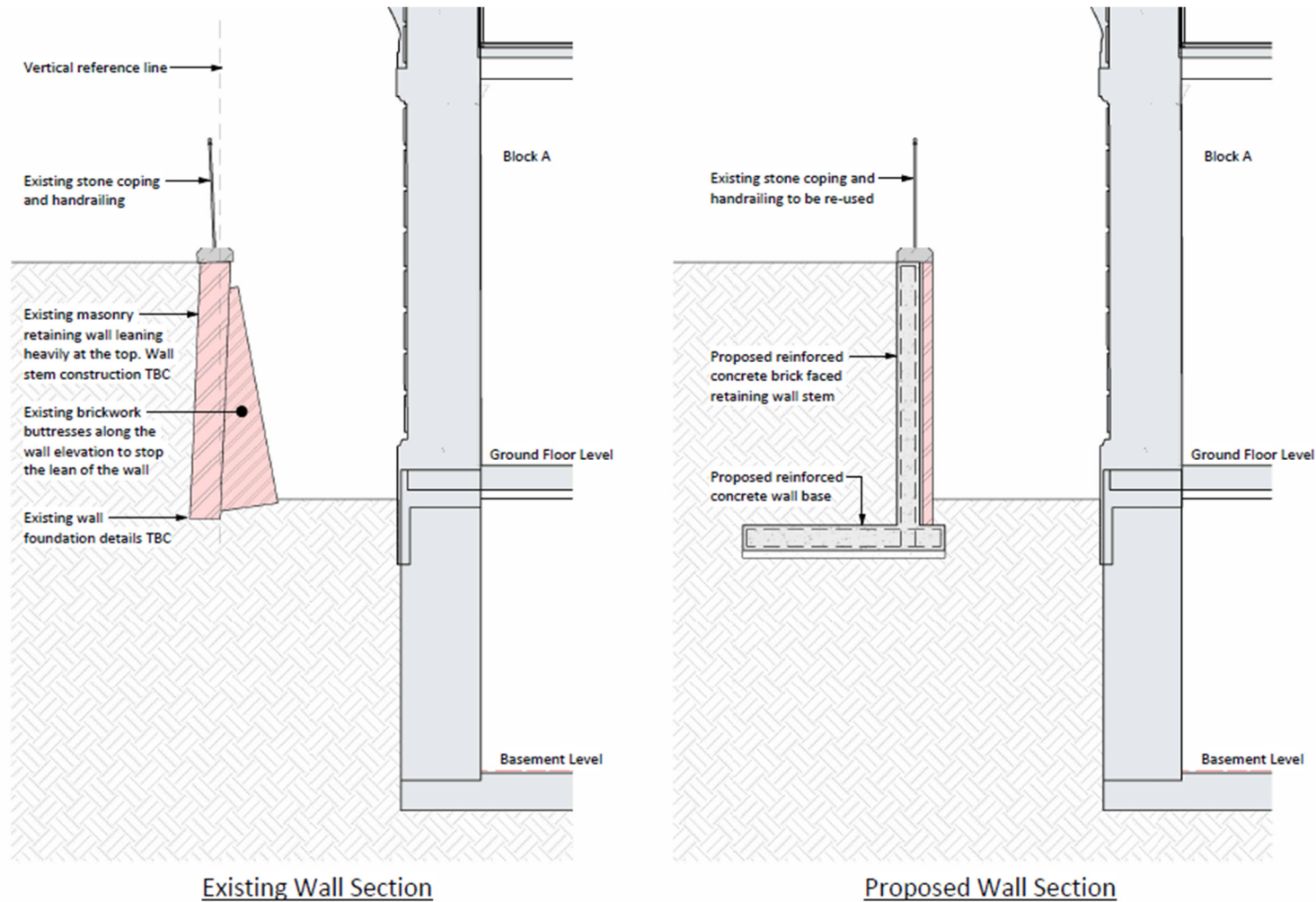
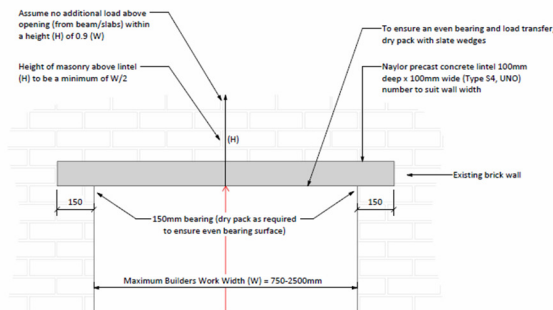


Figure 7 – Sections on Block A External Wall

3.5. Penetrations through Existing Building Fabric

- 3.5.1. All new doorway openings, up to double-door wide openings, are supported with proprietary pre-cast concrete lintels (number of lintels dependant on the wall thickness). At new opening locations, the walls are needled and propped (and back propped accordingly), openings made, and proprietary pre-cast lintels lifted into place.
- 3.5.2. Where openings are greater than a double-door width, or formed in exposed stonework, where the lintel edge is to be hidden, steel beams (proprietary and/or hot rolled) are to be used.
- 3.5.3. Builders work openings up to 750mm wide are to be supported with steel plates, (number of plates dependant on wall thickness). Any openings above 750mm wide, up to double door width are to be supported with proprietary pre-cast concrete lintels (number of lintels dependant on wall thickness).
- 3.5.4. For larger openings and significant sections of wall removal, the principles adopted will be as follows:
- Utilise pairs of beams: This is to accommodate the width of the load bearing wall and slab bearing detail above whilst minimising beam size/weight (for buildability in an enclosed space with the significance of a Grade II* listed building).
 - Minimise spans of beams: This is to minimise the beam depth/weight and the beam length to ensure that buildability/manoeuvrability of the steelwork in enclosed spaces of historic significance. This approach also minimises the beam end loads to reduce pad-stone sizes and maintains the loads as evenly distributed as possible, resulting in the least possible change to the load paths within the original structure.



**Type 2 - Typical Builderswork and Door Opening Through Existing Wall
(750-2500mm wide)**

1:10

Figure 8 - Typical Lintel Detail

3.6. Alterations to the Bar Area at Ground Floor Level

- 3.6.1. The Client's aspiration is to open up the main reception/bar area to make full use of the available space and to create a welcoming, spatially generous first impression for visitors.
- 3.6.2. The existing loadbearing masonry wall, visible in the photograph below, currently extends the full height of the building from the basement up to eaves level. It also supports timber floor structures at multiple levels. As a result, a significant amount of vertical load is being transferred down to the foundations via this wall.



Figure 9 - Photo of Area to be Opened Up

- 3.6.3. Subject to further intrusive investigation and in-situ testing, the current proposal is to introduce a new steel 'picture' frame structure. This will support both vertical loads from the masonry and floors above and provide necessary lateral stability. A prop column has been introduced within the opening to distribute loads more effectively into a bottom spreader beam, which in turn transfers the load into the existing basement walls, without significantly altering the load path.
- 3.6.4. Temporary works will be required to enable the safe removal of the existing structure and installation of the new frame. This will be developed in collaboration with the appointed Temporary Works Engineer at the next stage.
- 3.6.5. Refer to Figure 10 below for the current sketch proposal, which is considered the most pragmatic and buildable approach at this stage.

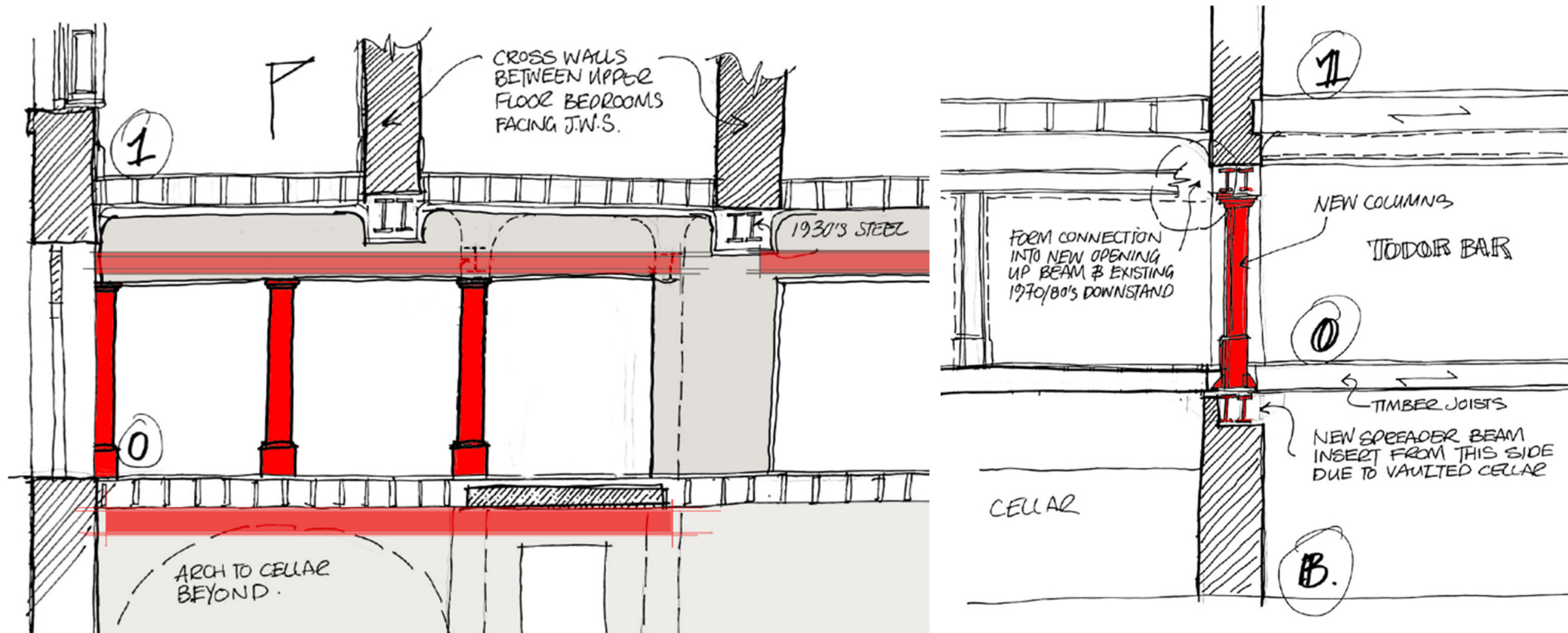


Figure 10 – Proposed Sections Through Bar Area

3.6.6. Note proposed steelwork is shown in Red for clarity.

4. Limitations of Report

4.1. Limitations of Report

- 4.1.1. The limitations of our structural inspection report are included in the text at the end of this report.

Report prepared by
James Hendry BSc (Hons) IEng MICE
For and on behalf of Adept Consulting Engineers Limited.
April 2025.

Limitations of Report

- a) Adept Consulting Engineers Ltd have prepared this report for the sole use and benefit of the client and/or his appointed agent only and no liability is accepted to any third party who may seek to rely on the whole or any part of this report. Should the client not act upon specific reasonable advice contained in the report, no responsibility is accepted for the consequences.
- b) Comments are restricted to those elements of the structure which are loadbearing and/or provide stability to the buildings, and to the external envelope. Non-structural items of interior or exterior fabric are excluded, except where deterioration or damage to such items may have caused or may in the future cause, damage to or loss of integrity of the structure.
- c) Comments are restricted to those elements of the structure which were readily available for visual inspection and exclude all items or elements which were covered in any way by, for example, fittings, fixtures, carpets, floor coverings, furniture, stored goods or plaster/finishes etc. or any items which are buried. No “opening up” of the structure or exposure of foundations took place and none of the above items were moved or disturbed.
- d) The external inspection of the roof, chimneys and rainwater goods, was made from ground floor level. It should be noted that the efficiency of rainwater goods, which may appear in good condition, can only be assessed if there is heavy rain falling during the inspection.
- e) Roof voids are only inspected from the access hatch, unless there are fully boarded walkways and adequate light available. Should it be felt necessary to make a more detailed inspection and walkways or light are not available, suitable access arrangements may need to be made, the costs of which would be the responsibility of the client.
- f) Similarly basements or under floor voids will only be inspected if adequate light and safe access are available.
- g) It is not practical to itemise every defect and minor defects which are obvious to the layman are not generally noted unless they are symptomatic of a more serious underlying structural fault.
- h) The inspection does not include any services in or to the building and the services of appropriate experts should be sought if deemed necessary.
- i) The detection and eradication of timber infestation and rising damp are specialist matters and as such are outside the scope of this report. We would, nevertheless, recommend that a firm of appropriate experts should be employed to carry out an independent survey and prepare a report.
- j) Although mention may be made in this report, we have not carried out an exhaustive survey as to whether hazardous or deleterious materials such as asbestos is used in the construction of the buildings, neither have we carried out any tests or other investigation to determine the presence or otherwise of methane gases or other noxious substances of any kind whatsoever on the site. Appropriate experts should be consulted if deemed necessary.
- k) It should be noted that further deterioration of existing defects, or the presence of any defects undetectable at the time of the inspection, cannot be ruled out.