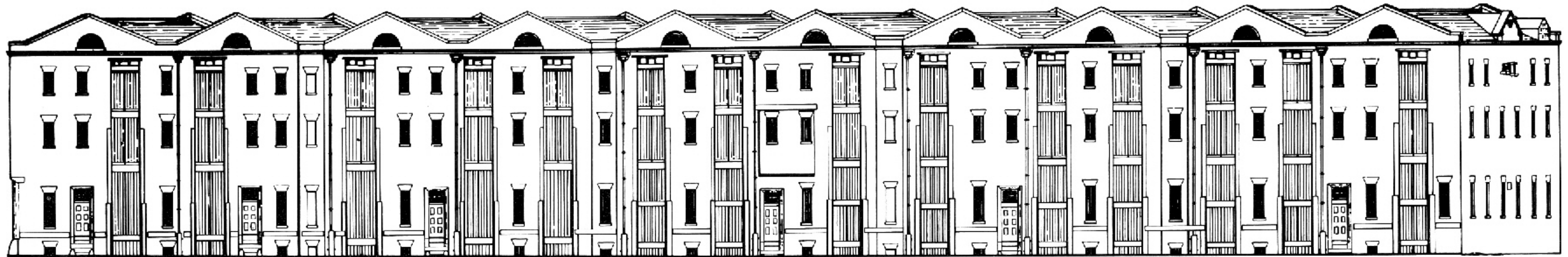


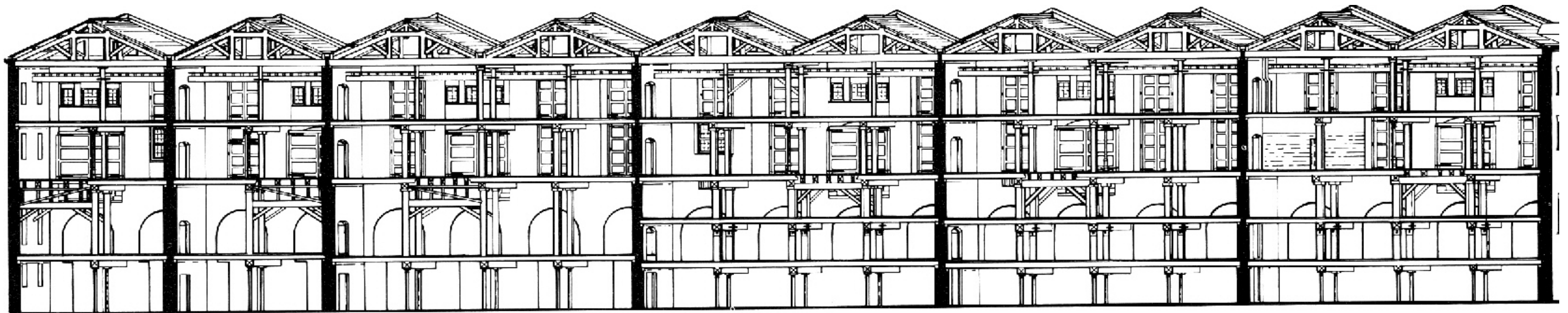
Proposals for Urgent Repair Works to the 1830 Warehouse, the Science and Industry Museum, Manchester

Listed Building Consent MCC Ref. 124068/LO/2019

Submission for discharge of Condition 6 (structural timber beams, lintels and joists), 1830 URW



NORTH ELEVATION



SECTION

3rd June 2021

Studio Downie Architects LLP

Contents

1: Introduction

2: Appraisal

3: Justification for the Option Proposed

4: Specification and Methodology

Appendix I

Appendix II

1: Introduction

We hereby submit an application for the approval of details reserved by Condition 6 attached to Listed Building Consent Ref. 124068/LO/2019, which approved the following scheme:

LISTED BUILDING CONSENT for urgent repair works to the 1830 Warehouse, required to prevent weather ingress and deterioration of the building fabric, including external facade works and internal works.

Manchester City Council granted planning permission on 18/05/2020 with the Condition 6 attached to the Listed Building Consent:

Condition 6

Notwithstanding the approved plans and documents as specified in condition 2, prior to the commencement of any repairs/works specifically relating to the clearly identified existing structural timber beams, lintels and joists on the approved plans specified in condition 2, final details of the repair method (as proposed on drawings DWGS 180426-CON-1830-XX-DR-S-4030 & 180426-CON-1830-XX-DR-S-4031) shall be submitted to and approved in writing by the City Council as local planning authority. These specific works shall then be carried out in full accordance with the submitted and approved final details.

For the avoidance of doubt the final details shall include a justification for the option of repair proposed.

Reason - In the interests of visual amenity, and because the proposed works affect a building which is included in the Statutory List of Buildings of Special Architectural or Historic Interest so careful attention to building work is required to protect the character and appearance of this building and appearance of the conservation area and the surrounding listed buildings in accordance with policies SP1, CC9, EN1, EN3 and DM1 of the Adopted Core Strategy for the City of Manchester, the Design and Principle of the Guide to Development in Manchester SPD and saved policies DC18.1 and DC19.1 of the Unitary Development Plan for the City of Manchester.

In accordance with Condition 6 details are provided within the respective documents attached to this application, prepared by Conisbee on behalf of the client.

As set out above, we therefore consider the submitted material is sufficient for the Council to discharge Condition 6 attached to the decision 124068/LO/2019.

2: Appraisal

1. Notes prepared by heritage consultant, Jody O'Reilly of HCUK Group

Heritage input

2. Condition 6 relates to the detailed design and methodology for the repair and replacement of structural timber work within the 1830 Warehouse, a grade I listed building as part of the consented urgent repair works. Detailed design drawings and methodology documentation has been drawn up by Conisbee in conjunction with the project architects. Reference throughout has been made to the application documentation including the conservation led approach advocated within the Design and Access Statement prepared by Studio Downie Architects (DAS) section 3.5 and specifically relating to timber repairs at section 4.3.5.

Significance

3. Structural timber makes up one material element of this highly graded listed building. Historic timberwork contributes directly to the evidential and illustrative architectural values of the listed building. They enable an understanding of structural traditions and solutions of that time and in particular the early 19th century solutions for construction of very large buildings that needed to accommodate considerable loads and forces. The major timber structural elements are situated within the roof structures, the floor structures and in timber framed wall elements. Secondary structural elements are around the tall cargo bay doors, and the joist pulley openings, though many of these involve later materials.
4. Differing phases of materials and works within the building, including timber, have a degree of archaeological interest as they illustrate, at sometimes fine detail, the specific changes wrought to the building's fabric over time.

Solutions

5. The timber repair approach for structural timberwork is detailed in the DAS at section 4.3.5. The approach has been governed by the following aims:
- maximise retention of the historic fabric where possible
 - retention where the majority of the section of wood is in good condition with localised repairs
 - remove and replace those elements of wood where major rotting and crumbling of the material has occurred.
6. Any structural intervention can be designed after considering a number of options:
- Doing nothing means that the building's timber work continues to decay, as a worst case scenario eventually leading to even greater loss and potentially to structural collapse.
 - Replacement of defective timbers with a new modern material that would not suffer from the inherent decay potential. This option was rejected as entirely counter to the principals of conservation and preservation of heritage values and significance.
 - Wholesale replacement of all defective timbers without quantitative assessment. This was rejected as although it might have preserved material integrity and broad characteristics it was deemed unnecessary in structural terms if historic timbers still perform their function adequately, and wholesale replacement would see substantial loss of historic fabric giving rise to harm to heritage values even if materials were matched.
 - Carefully assessed repair based on detailed survey of defective fabric and a minimum necessary approach to retain as much fabric as possible.
7. Initially a combination of resin repair and spliced new timber work was considered. Following consultation with the MCC Conservation Officer the spliced solution, with varying scales and forms of scarf joint was prioritised and no resin will be used as a solution for structural timbers.
8. All works will be executed carefully by appropriately qualified contractors and utilising carefully sourced, matched and appropriate hard or soft wood subject to location within the building. These details are set down by Conisbee and will be confirmed on site in each instance prior to commencing any specific repair.

Impact on Significance

9. The designed solution minimises loss of historic timbers, preserving the character and direct evidential and illustrative value embedded in the structural timbers within the building.
10. There are incidences where timbers have decayed so far that full replacement is justified. Materials and form will be closely matched, and the 'new' work clearly identified by date. These wholesale replacements have been identified already within the DAS. The further possibility for others to be identified during works is acknowledged.
11. In providing legible spliced and scarfed repairs, dated on the repair, not only is the loss of historic fabric minimised but there is a clear legibility and honesty to the phase of work enabling an understanding of the evolution of the building and its ongoing maintenance.
12. Though individual losses of historic fabric could be considered to cause harm to evidential values, in practice, where timbers are so damaged that they require wholesale replacement harm has already arisen. The reinstatement of a carefully matched structural timber will, in those instances, effect a restoration and thus enhancement of values (specifically architectural). Without these works ongoing decline would inevitably lead to further damage and erosion of architectural values.
13. Considered overall, the proposed timber repairs, including both localised and replacement works, do sustain and preserve the overall values of the highly graded listed building.
14. The appearance and aesthetic architectural values of the building as a whole will not be harmed and on closer inspection the honesty of repair will be clearly legible enabling an ongoing understanding of its history.

3: Justification for the Option Proposed

The following drawings were approved:

180426-CON-1830-XX-DR-S-4030 (**Joist end repairs**)

180426-CON-1830-XX-DR-S-4031 (**Removal of decayed pockets**)

The above drawings have now been finalised ‘for construction’ and are included with this submission. Without these works ongoing decline would inevitably lead to further damage and erosion of architectural values.

The designed solution minimises loss of historic timbers, preserving the character and direct evidential and illustrative value embedded in the structural timbers within the building.

The approach is the carefully assessed repair based on detailed survey of defective fabric and a minimum necessary approach to retain as much fabric as possible.

All works will be executed carefully by appropriately qualified contractors and utilising carefully sourced, matched and appropriate hard or soft wood subject to location within the building.

The loss of historic fabric is minimised and there is a clear legibility and honesty to the phase of work enabling an understanding of the evolution of the building and its ongoing maintenance

Joist end repairs:

The preferred approach for the joist repairs is the traditional splice, with varying scales and forms of scarf joint is proposed and no resin will be used as a solution for structural timbers.

This approach removes slightly more of the historic timber where the wood condition is decayed but is preferred to the resin dowel option (this latter option has been rejected because it would require invasive work to the ‘good’ part of the retained joist).

The splice in each case will be different in extent according to extent of decay in order to limit the extent of the repair to the minimum necessary. As noted on the drawing these can take several forms depending on size of the timber, extent of decay and loading but will generally be either half or splayed scarf joints. Generally, the greater the load on the timber, the longer the splice will need to be and this will be assessed with the contractor on site to confirm final details in each case. In each case, the splice design will be adapted to minimise loss of historic fabric. Refer to Appendix II for substitute detail for beam end in Bay 1 basement.

Where timber repairs/decay removal are necessary, a DPM will be installed between the timber and bearing

Removal of decayed pockets:

The pockets of decay within the beams are based on initial survey by Hutton & Rostron. The experienced contractor will use hand tools to carefully scrape out the decayed wood sufficiently to prevent further the damage to, and to preserve, the rest of the historic timber.

4: Specification and Methodology

The following information has been supplied by the Structural Engineer to explain their preferred approach and methodology.

Drawings are included as an Appendix as separate files

NOTES: 180426-CON-1830-XX-DR-S-4030

- 1. The contractor is responsible for the design and installation of temporary works. Their proposals must be submitted to the structural engineer sufficiently in advance of the works starting to permit comment. Under no circumstances should any structural alterations be carried out prior to the structural engineer commenting on the contractors temporary works proposals.
- 2. Loading for the design of all temporary works will provided to the contractor prior to the commencement of works on site.
- 3. Repair designs shown indicate prescriptive methodologies and materials to be used.
- 4. Final design for splices may vary according to size of member being repaired and the extent/location of decay and loading applied. In each case, the splice design will be adapted to minimise loss of historic fabric. Splice designs may therefore comprise vertical or horizontal splayed joints (as illustrated on the drawing) or face/edge half scarfs. Each to be confirmed and agreed on site between the structural engineer, architect and the contractor once full access is available.

Refer to Appendix II for substitute detail for beam end in Bay 1 basement.
Substitute Detail **180426-CON-1830-XX-DR-S-4033.**

- 5. New splicing timber to be of the same species as the parent timber, of matching dimensions and appropriately seasoned. Hardwood timber to be D30 grade. softwood timber to be minimum SS/C24 grade. Preservative treatment to be applied as per architect's specification.

Preservative treatment is generally not required but if preservative treatment is required in general the application will be selected to suit treatability of specific wood species in each case. Specialist to confirm type from copper-organic, waterbased-organic, boron.

- 6. Stainless steel bolt assemblies to be grade 316/1.4401 and A4I-80.
- 7. Lime mortar dry pack to be NHL 5/sharp sand in 1:2 ratio.

NOTES:180426-CON-1830-XX-DR-S-4031

- 1. Repair locations to be inspected by the structural engineer following removal of decayed material and before repair.
- 2. The contractor is to notify the structural engineer as soon as possible if decay is found to extend beyond 40 - 50mm depth in larger timber members (c350mm x 350mm) or to more than 10% of section size in smaller members (valley beams, rafters etc.)
- 3. New timber fillets required to be of matching species and appearance to the existing timber.
- 4. Fix new timber fillets with Rotafix structural adhesive (or equivalent and approved).

The following pages include the detailed extract from the NBS specification prepared by Conisbee.



C51

C51 Repairing/ Renovating/ Conserving timber

To be read with Preliminaries/ General conditions

GENERAL

- 110
- INSPECTION
- Purpose: To confirm nature and extent of repair/ renovation/ conservation work shown on drawings and described in survey reports and schedules of work.
 - Parties involved:
 - Contract administrator;
 - Contractor's representative; and
 - Structural engineer.
 - Timing: At least 5 days before starting each section of work.
 - Instructions issued during inspection: To be confirmed by Contract Administrator.

- 130
- OPENING UP
- Purpose: To reveal previously concealed areas of structure or fabric not recorded during initial surveys.
 - Extent: To be agreed at initial inspection.
 - Timing: Give notice before starting opening up.
 - Period of notice: At least five working days.
 - Retained building structure/ fabric: Do not damage or destabilize.

- 150
- TIMBER PROCUREMENT
- Timber (including timber for wood-based products): Obtained from well-managed forests and/ or plantations in accordance with:
 - The laws governing forest management in the producer country or countries.
 - International agreements such as the Convention on International Trade in Endangered Species of wild fauna and flora (CITES).
 - Documentation: Provide either:
 - Documentary evidence (that has been or can be independently verified) regarding the provenance of all timber supplied.
 - Evidence that suppliers have adopted and are implementing a formal environmental purchasing policy for timber and wood-based products.
 - Certification scheme: Forest Stewardship Council (FSA).
 - Other evidence: None.

- 160
- TIMBER SUPPLIER
- Supplier: Submit proposals.



C51

STRUCTURAL REPAIRS/ ALTERATIONS

- 220A
- TIMBER SECTION REPAIR - INTERNAL REINFORCEMENT
- Defective timber: Cut out.
 - Reinforcement:
 - Type: Stainless steel dowels.
 - Number/ size: As shown on drawing 180426-CON-1830-XX-DR-S-4030 .
 - Slots in existing members:
 - Location: Cut in side at one third and two thirds section depth.
 - Size: As shown on drawing 180426-CON-1830-XX-DR-S-4030.
 - Replacement timber: Softwood to match existing.
 - Sectional profiles of mating surfaces: To match cut ends of existing timber.
 - Holes/ slots for reinforcement:
 - Location: To suit slots in existing member.
 - Size: As shown on drawing 180426-CON-1830-XX-DR-S-4030.
 - Grout: Epoxy resin by Rotafix Ltd.

PRODUCTS

- 320
- STRUCTURAL SOFTWOOD (STRENGTH CLASS NOT SPECIFIED) FOR EXTERNAL STRUCTURAL USE GENERALLY
- Species: Pinus Sylvestris/Pseudotsuga menziesii - notify SE & CA if other species is required to match existing.
 - Grading standard: To the appropriate standard or rules for the specified grade and so marked.
 - Grade: SS to BS 4978/C24.
 - Treatment:
 - Preservative treatment: None required.
 - Design service life: Not applicable.
 - Fire retardant treatment: None required.
 - Moisture content (maximum) at time of installation: 16%.
 - Other requirements: Wane not permitted.
- 321
- STRUCTURAL SOFTWOOD (STRENGTH CLASS NOT SPECIFIED) FOR INTERNAL STRUCTURAL USE GENERALLY
- Species: Pinus Sylvestris/Pseudotsuga menziesii - notify SE & CA if other species is required to match existing.
 - Grading standard: To the appropriate standard or rules for the specified grade and so marked.
 - Grade: SS to BS 4978/C24.
 - Treatment:
 - Preservative treatment: None required.
 - Design service life: Not applicable.
 - Fire retardant treatment: None required.
 - Moisture content (maximum) at time of installation: 12%.
 - Other requirements: Wane not permitted.

- 340 STRUCTURAL HARDWOOD (STRENGTH CLASS NOT SPECIFIED) FOR NEW FLITCH BEAMS AND ANY EXTERNAL STRUCTURAL REPAIRS TO EXISTING HARDWOOD TIMBER
- Species: European oak generally. Notify SE & CA if other species is required to match existing.
 - Grading standard: To the appropriate standard or rules for the specified grade and so marked.
 - Grade: THB/TH1 to BS 5756 (equivalent to D30).
 - Surface finish: Regularized.
 - Treatment:
 - Preservative treatment: None required.
 - Design service life: Not applicable.
 - Fire retardant treatment: None required.
 - Moisture content (maximum) at time of installation: 20%.
 - Other requirements: Heart to be boxed.

- 450 STAINLESS STEEL BOLT ASSEMBLIES FOR BEAM END AND SPLICE REPAIRS
- Bolts: To BS EN ISO 3506-1.
 - Designation: A4L-80.
 - Nuts and washers: To suit grade of bolt.
 - Washer size:
 - In contact with timber: Diameter: 2 times bolt diameter; thickness: 0.2 times bolt diameter.
 - In contact with steel section/ plate (required when surface finish may be damaged by nut or bolt head rotating): To BS 4320.

EXECUTION

- 600 WORKMANSHIP
- Skill and experience of site operatives: Appropriate for types of work on which they are employed.
 - Documentary evidence: Submit on request.
- 610 TEMPORARY SUPPORTS/ PROPPING
- General: Provide adequate temporary support at each stage of repair work to prevent damage, overstressing or uncontrolled collapse of any part of the structure.
 - Bearings for temporary supports/ propping: Suitable to carry loads throughout repair operations.
- 620 PROTECTION OF TIMBER AND WOOD COMPONENTS BEFORE AND DURING INSTALLATION
- Storage: Keep dry, under cover, clear of the ground and with good ventilation. Support sections/ components on regularly spaced, level bearers on a dry, firm base.
 - Handling: Do not overstress, distort or disfigure sections or components during transit, storage, lifting, erection or fixing.
- 630 MATERIAL SAMPLES
- Representative samples of designated materials: Submit before placing orders.
 - Designated materials: Hardwood and softwood structural timber.
- 650 DIMENSIONS GENERALLY
- Site dimensions: Take as necessary before starting fabrication.
 - Discrepancies with drawings: Report without delay and obtain instructions before proceeding.

- 660 CROSS SECTION DIMENSIONS OF STRUCTURAL SOFTWOOD AND HARDWOOD
- Dimensions: Dimensions in this specification and shown on drawings are target sizes as defined in BS EN 336.
 - Tolerances: The tolerance indicators (T1) and (T2) specify the maximum permitted deviations from target sizes as stated in BS EN 336, clause 4.3:
 - Tolerance class 1 (T1) for sawn surfaces.
 - Tolerance class 2 (T2) for further processed surfaces.
- 680 WARPING OF TIMBER
- Bow, spring, twist and cup: Not greater than the limits set down in BS 4978 or BS EN 14081-1 for softwood, or BS 5756 for hardwood.
- 720 TEMPORARY REMOVAL AND REINSTATEMENT OF FITTINGS/ FIXTURES
- Items to be removed, and reinstated on completion of repair work:
 - Identification: Attach labels or otherwise mark items using durable, non-permanent means, to identify location and refixing instructions, where applicable.
 - Treatment following removal: As schedule.
 - Storage: Protect against damage, and store until required.
 - Storage location: On site.
 - Reinstatement: Refit in original locations using original installation methods.
 - Items unsuitable or not required for reuse: Obtain instructions regarding disposal.
- 760 REPAIR OF MEMBERS - CUTTING OUT MEMBERS
- Extent of timber removal: Cut out full cross section of member where wood is defective or decayed, plus maximum shown on relevant drawing of sound wood.
 - Distance from face of support to cut end of existing timber: Obtain instructions if dimension exceeds maximum shown on relevant drawing.
 - Joint profile: As relevant drawing.
- 780 REPAIR OF DISTORTED TIMBER MEMBERS
- Generally: Repair to shape that member has assumed.
- 800 CONDITION OF DOWELS TO BE BONDED INTO TIMBER
- Condition at time of installation:
 - Dowels generally: Free from corrosive pitting, loose mill scale, loose rust and contaminants that may adversely affect dowels, adhesive, or bond between the two.
 - Carbon steel dowels: As above, and free from corrosive pitting, loose mill scale and loose rust.
- 810 BOLTED JOINTS WITH CONNECTORS
- Connectors: To BS EN 912.
 - Types and sizes: As shown on drawings.
 - Bolt hole: Where appropriate, size to suit bolt diameter.
 - Manufacturer: Contractor proposal.
 - Product reference: N/A.
 - Finish: Stainless steel.
 - Bolts and washers: To BS EN 1995-1-1.
 - Connector location: Where not otherwise shown, spacings, end and edge distances are to be not less than Standard values to BS EN 1995-1-1, section 8.9 for split ring and shear plate connectors, and BS EN 1995-1-1, section 8.10 for toothed plate connectors.
 - Centres of bolt holes: Not more than 2 mm from positions shown on drawings.
 - Assembly: Do not crush timber, deform washers or overstress bolts.
- 830 CRITICAL DIMENSIONS FOR FASTENERS
- Critical dimensions: As indicated on relevant drawings.

C51

850 GLUED JOINTS

- Adhesive: To BS EN 204, Type D4.
 - Compatibility: Where relevant, obtain manufacturer's confirmation that adhesive is compatible with preservative/ fire retardant treatment.
- Glued structural components: Fabricated to BS 6446 in clean, controlled workshop conditions.
- Anticipated equilibrium moisture content of timber in service: According to location/service class.

860 MOISTURE CONTENT CHECKING

- Procedure: When instructed, check moisture content of timber sections with an approved electrical moisture meter.
- Test results: Keep records of all tests. If moisture content falls outside specified range, obtain instructions.

870 MOISTURE CONTENT TESTING

- Procedure: When instructed, test timber sections with an electrical moisture meter with deep probes, that has been carefully calibrated against oven drying tests or otherwise guaranteed by an independent testing authority.
- Test sample: Test 5% but not less than 10 lengths of each cross-section in the centre of the length.
- Test results: 90% of values obtained to be within the specified range. Provide records of all tests.

COMPLETION

910 MECHANICALLY FASTENED JOINTS

- General: Inspect accessible bolted, coach screwed and timber pegged joints and tighten fasteners if necessary.
 - Timing: On Completion and at end of Defects Liability Period or Rectification Period.

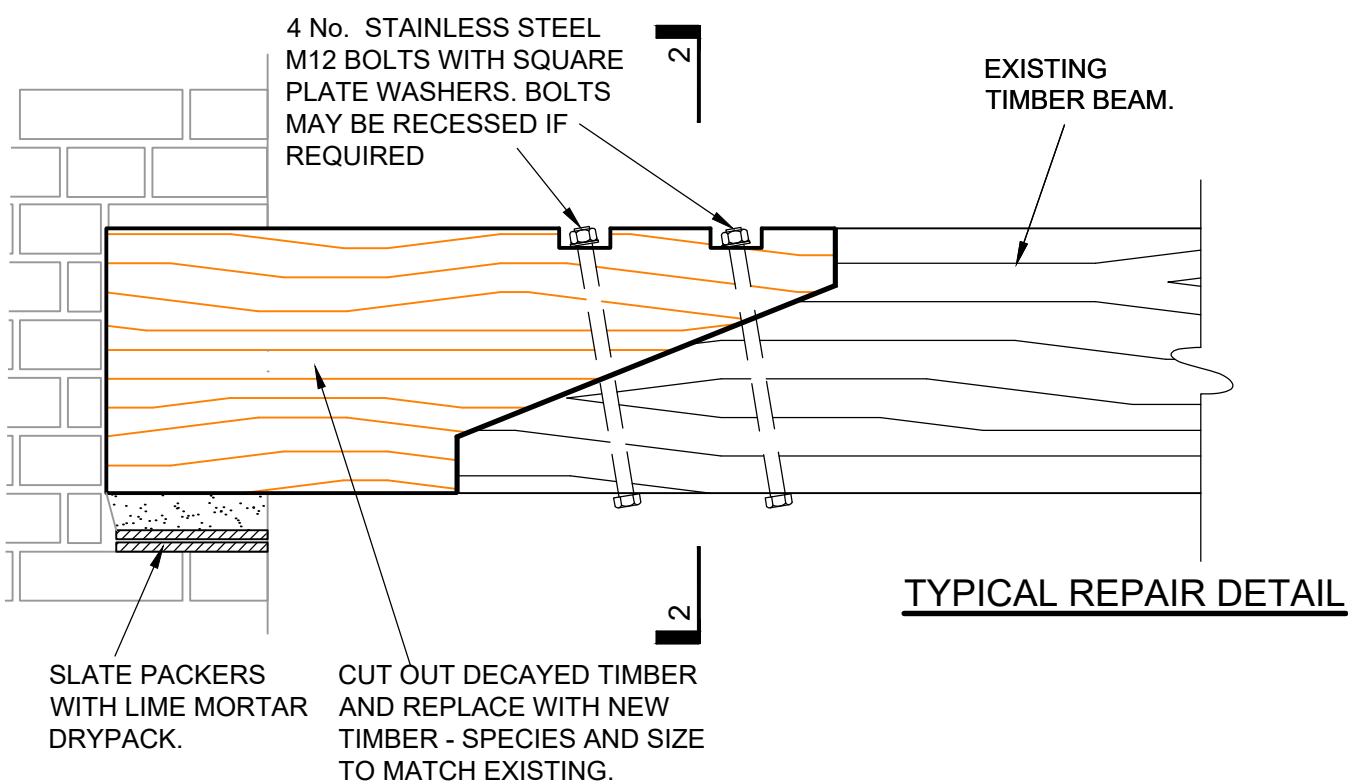
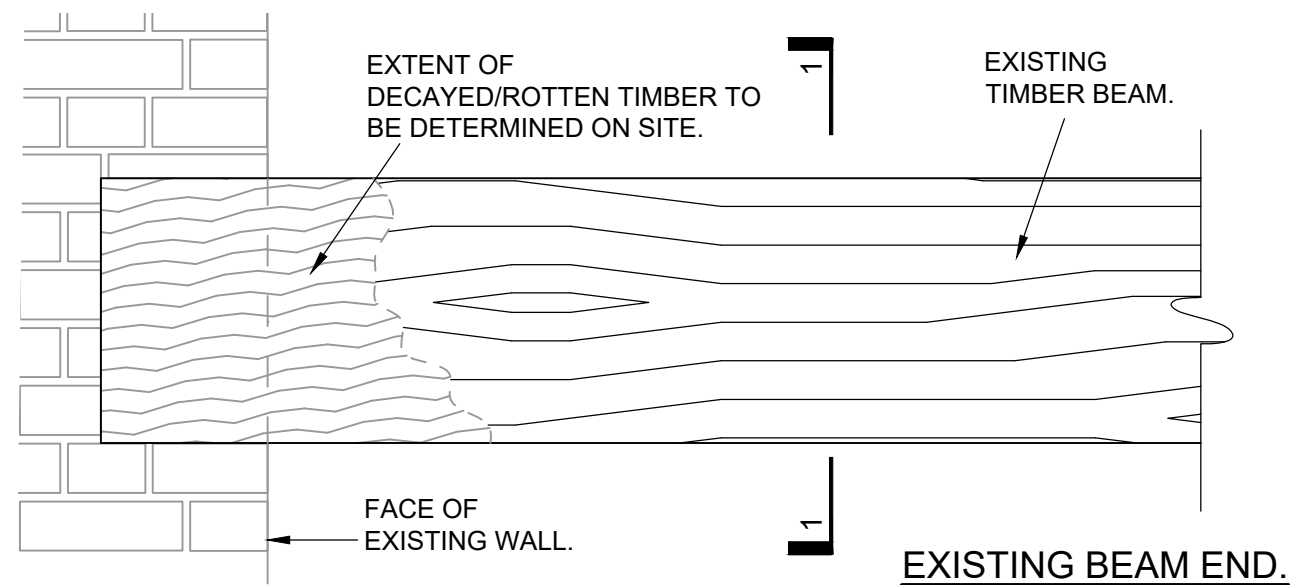
920 DATING TIMBERS USED IN STRUCTURAL REPAIRS

- Principal replacement members: Mark by carving or branding with date of repair and, when appropriate, initials of carpenter, in characters 20-25 mm high.
- Location of marks: To be agreed.

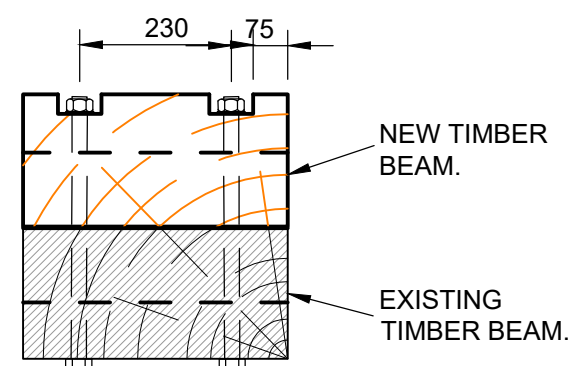
APPENDIX I

APPENDIX I - detailed drawings

- 180426-CON-1830-XX-DR-S-4030
- 180426-CON-1830-XX-DR-S-4031



SECTION 1-1.



SECTION 2-2

STRUCTURAL REPAIR NOTES

1. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND INSTALLATION OF TEMPORARY WORKS. THEIR PROPOSALS MUST BE SUBMITTED TO THE STRUCTURAL ENGINEER SUFFICIENTLY IN ADVANCE OF THE WORKS STARTING TO PERMIT COMMENT. UNDER NO CIRCUMSTANCES SHOULD ANY STRUCTURAL ALTERATIONS BE CARRIED OUT PRIOR TO THE STRUCTURAL ENGINEER COMMENTING ON THE CONTRACTORS TEMPORARY WORKS PROPOSALS.
2. LOADING FOR THE DESIGN OF ALL TEMPORARY WORKS WILL PROVIDED TO THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF WORKS ON SITE.
3. REPAIR DESIGNS SHOWN INDICATE PRESCRIPTIVE METHODOLOGIES AND MATERIALS TO BE USED.
4. FINAL DESIGN FOR SPLICES MAY VARY ACCORDING TO SIZE OF MEMBER BEING REPAIRED AND THE EXTENT/LOCATION OF DECAY AND LOADING APPLIED. IN EACH CASE, THE SPLICE DESIGN WILL BE ADAPTED TO MINIMISE LOSS OF HISTORIC FABRIC. SPLICE DESIGNS MAY THEREFORE COMPRISE VERTICAL OR HORIZONTAL SPLAYED JOINTS (AS SHOWN HERE) OR FACE/EDGE HALF SCARFS. EACH TO BE CONFIRMED AND AGREED ON SITE BETWEEN THE SE,CA AND THE CONTRACTOR ONCE FULL ACCESS IS AVAILABLE.
5. NEW SPLICING TIMBER TO BE OF THE SAME SPECIES AS THE PARENT TIMBER, OF MATCHING DIMENSIONS AND APPROPRIATELY SEASONED. HARDWOOD TIMBER TO BE D30 GRADE. SOFTWOOD TIMBER TO BE MINIMUM SS/C24 GRADE. PRESERVATIVE TREATMENT TO BE APPLIED AS PER ARCHITECT'S SPECIFICATION.
6. STAINLESS STEEL BOLT ASSEMBLIES TO BE GRADE 316/1.4401 and A4L-80.
7. LIME MORTAR DRY PACK TO BE NHL 5/SHARP SAND IN 1:2 RATIO.
8. REFER ALSO TO CONISBEE STRUCTURAL SPECIFICATION.

C2 07.01.21 CONSTRUCTION ISSUE

Rev	Date	Description		
Scale	Drawn	Engineer	Date	
1:10	PM	SW	June 2019	
Drawing Status		Project No	Revision	
CONSTRUCTION		180426	C2	

Drawing No
180426-CON-1830-XX-DR-S-4030

conisbee Consulting Structural Engineers
Consulting Civil Engineers

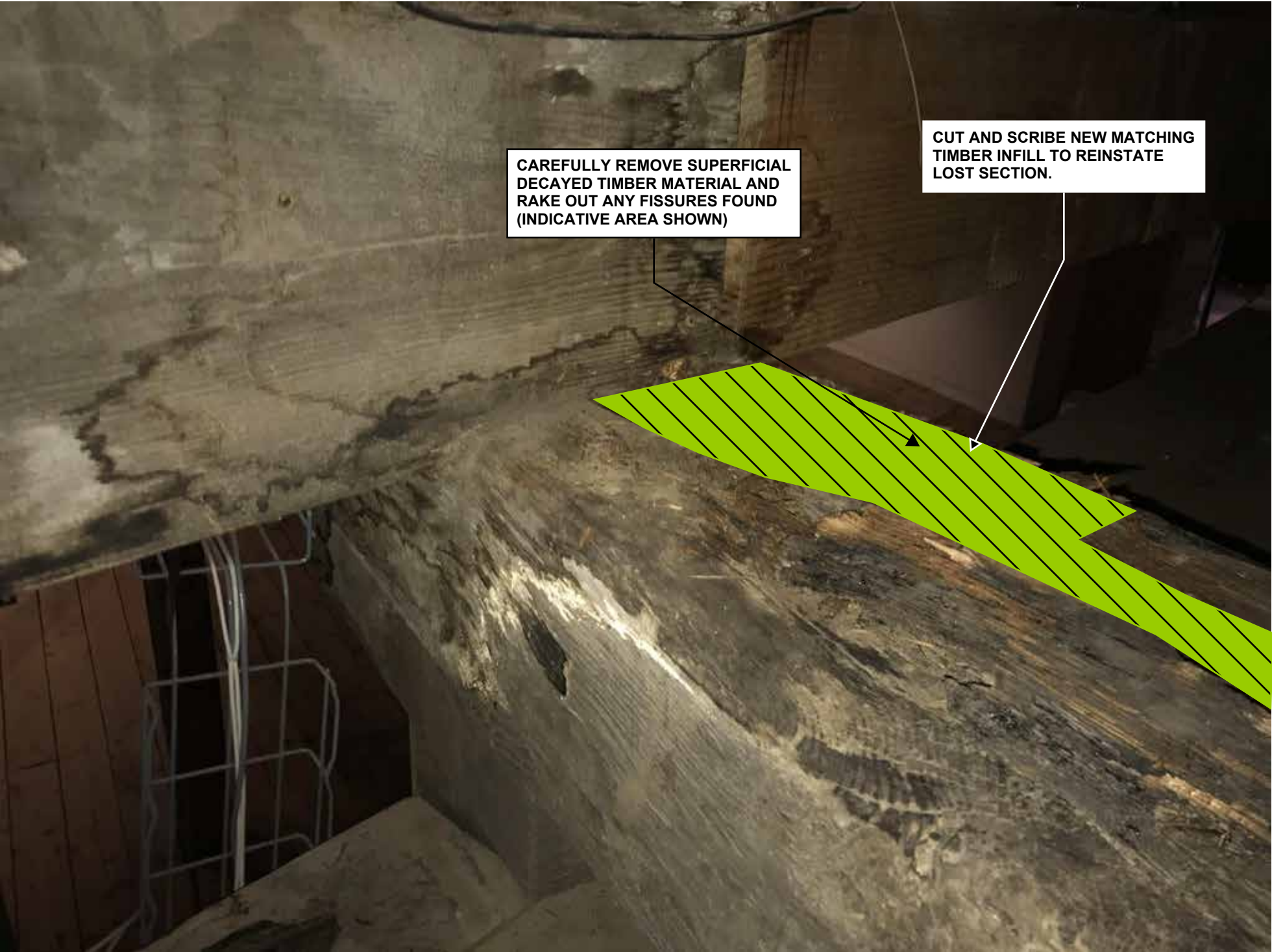
1-5 Offord St London N1 1DH
Telephone 020 7700 6666
www.conisbee.co.uk

Project

Science & Industry Museum,
1830 Warehouse URW

Title

Timber Beam/Joist /Rafter Bearing
Typical Repair Details.



- NOTES:**
- 1. REPAIR LOCATIONS TO BE INSPECTED BY THE STRUCTURAL ENGINEER FOLLOWING REMOVAL OF DECAYED MATERIAL AND BEFORE REPAIR.
 - 2. NOTIFY THE STRUCTURAL ENGINEER AS SOON AS POSSIBLE IF DECAY IS FOUND TO EXTEND BEYOND 40 - 50MM DEPTH IN LARGER TIMBER MEMBERS (c350mm X 350mm) OR TO MORE THAN 10% OF SECTION SIZE IN SMALLER MEMBERS (VALLEY BEAMS, RAFTERS ETC.)
 - 3. NEW TIMBER FILLETS REQUIRED TO BE OF MATCHING SPECIES AND APPEARANCE TO THE EXISTING TIMBER.
 - 4. FIX NEW TIMBER FILLETS WITH ROTAFIX STRUCTURAL ADHESIVE (OR EQUIVALENT AND APPROVED).

TYPICAL REPAIR FOR SUPERFICIAL TIMBER DECAY

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Project
SCIENCE & INDUSTRY MUSEUM
1830 WAREHOUSE URW
Title
TYPICAL TIMBER SURFACE REPAIRS

C1	02.12.20	CONSTRUCTION ISSUE	SW	KC
Rev	Date	Description	Drawn	Check
Drawing Status CONSTRUCTION			Project No 180426	
Date JUNE 2019	Drawn SW		Drawing No S-4031	
Scale NTS	Engineer SW		Revision C1	

APPENDIX II

APPENDIX II - detailed drawings

- 180426-CON-1830-XX-DR-S-4033

Amendment of a discharged condition – Condition 6

CDN/21/0017 Discharge of condition 6 (Timber Beam Repairs) attached to listed building consent reference 124068/LO/2019

Reason for amendment:

Appraisal -

Please refer to the following pages drawings, the new amended plan location drawing shows the location of the detail to change and the change to the detail cross reference to a new drawing; and see also the photograph of the beam to the right of this page. This beam is historic, Baltic pine, and is approximately 3-metres in length. The beam has approximately 200mm of inactive decay at the bearing end which represents a substantial extent of decay which significantly weakens the bearing capacity. A notch created some time in the past to provide headroom to the doorway has reduced the structural capacity of the beam which therefore means that the traditional repair approach would substantially alter the existing beam. Following further investigation and careful assessment by the contractor, structural engineer, architect and heritage consultant in discussion with the client, a proposed repair has been amended based on a detailed survey of the defective fabric and a minimum necessary approach to retain as much fabric as possible.

Justification -

The consented scheme includes indicative details for traditional half or splayed scarf joints repairs. As noted in Condition 6 report under ‘Justification’ that generally, the greater the load on the timber, the longer the splice will need to be and this will be assessed with the contractor on site to confirm final details in each case. In this instance it has been calculated that a substantial proportion of the original beam would need to be cut into, altered or removed to resolve both the decayed zone of 200mm at the bearing end and the loss of loadbearing capacity due to the existing notch. The drawing 180426-CON-1830-XX-DR-S-4033 illustrates the full extent of beam and the extent of beam replacement using the consented repair method (see sketches at top of sheet). An alternative approach is therefore proposed to the consented detail to this particular primary beam in the basement of Bay 1.

Specification -

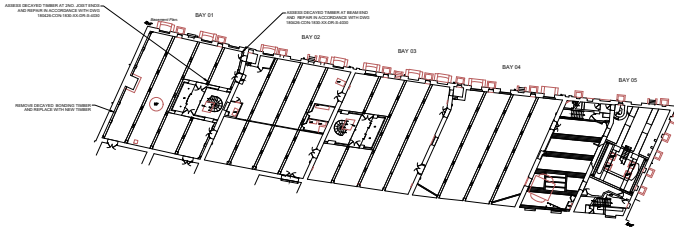
The drawing 180426-CON-1830-XX-DR-S-4033 illustrates two repair options. Repair Option 1 could require further lifting of floor boards to gain adequate access. Repair Option 2 is preferred as it provides a permanent solution with two minimal steel posts either side of the doorway which will bolt into the existing beam, two small footings below the cobble and only a small number of existing cobbles to be set aside.

Repair Option 2 was discussed on site and agreed in principle on 27/05/21 with Paul Mason.

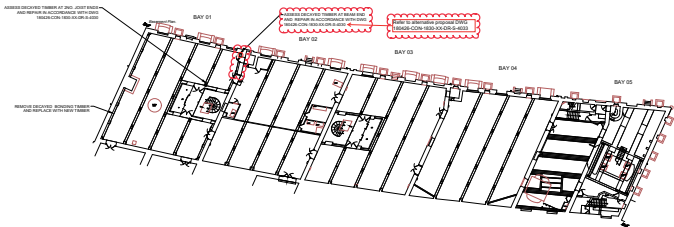
Amended approved plans (and addendum):

For avoidance of doubt, the proposed changes to the approved drawings are identified below:

Original Drawing Reference	Revised Drawing Reference	Drawing Title
180426-CON-1830-B-DR-S-1099 T1 BASEMENT PLAN	Plan S-1099_T1 location of alternative detail-250521	Basement Plan
180426-CON-1830-XX-DR-S-4030	(no change to this drawing as it applicable for other instances)	Timber Beam/Joist /Rafter Bearing Typical Repair Details.
	180426-CON-1830-XX-DR-S-4033 (this is a new drawing)	1830 Warehouse (Basement) Primary Beam Repair



Approved Drawing



New Drawing - marked-up with location of amended detail for beam end in Bay 1 Basement.

Decayed beam end

Existing joint



Photograph of existing beam in Bay 1 Basement. The decayed beam end is visible to the left hand side, the existing joint showing the extent of the existing beam is visible to the right hand side.

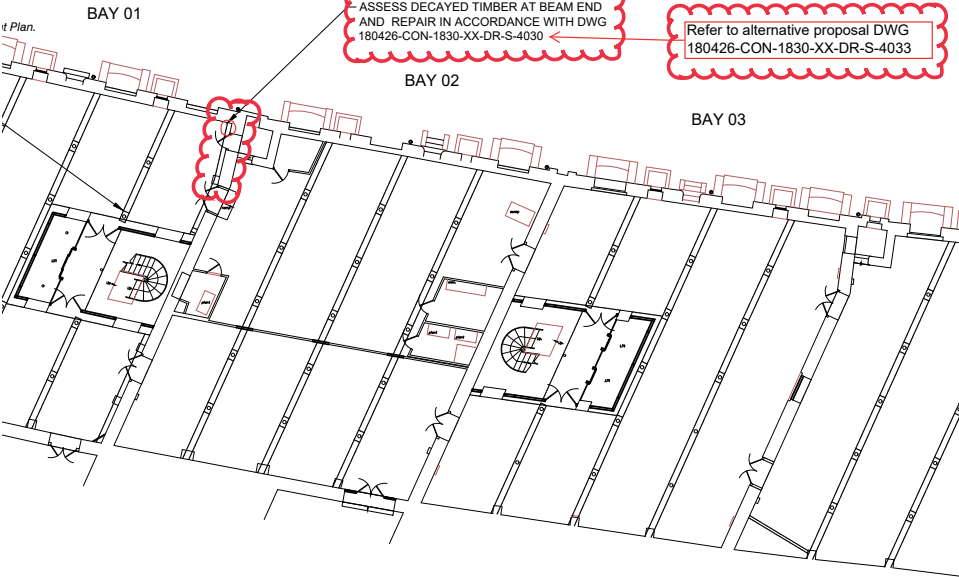
Existing notch in beam for existing door

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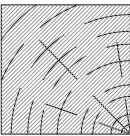
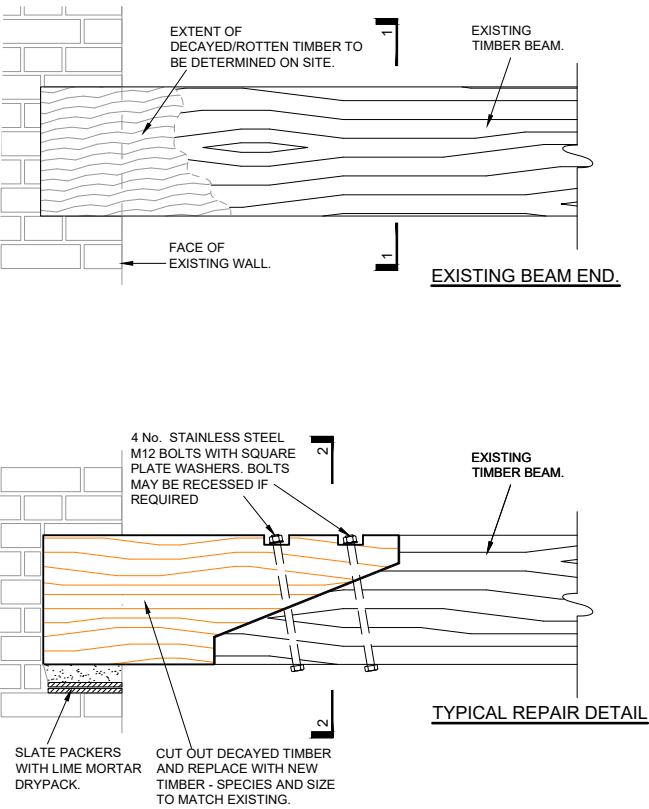
NOT FOR CONSTRUCTION

NOT FOR CONSTRUCTION

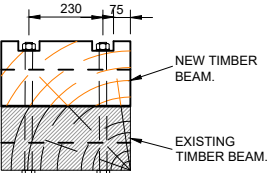
NOT FOR CONSTRUCTION



Detail location plan



SECTION 1-1.



SECTION 2-2

STRUCTURAL REPAIR NOTES

1. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND INSTALLATION OF TEMPORARY WORKS. THEIR PROPOSALS MUST BE SUBMITTED TO THE STRUCTURAL ENGINEER SUFFICIENTLY IN ADVANCE OF THE WORKS STARTING TO PERMIT COMMENT. UNDER NO CIRCUMSTANCES SHOULD ANY STRUCTURAL ALTERATIONS BE CARRIED OUT PRIOR TO THE STRUCTURAL ENGINEER COMMENTING ON THE CONTRACTORS TEMPORARY WORKS PROPOSALS.

2. LOADING FOR THE DESIGN OF ALL TEMPORARY WORKS WILL PROVIDED TO THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF WORKS ON SITE.

3. REPAIR DESIGNS SHOWN INDICATE PRESCRIPTIVE METHODOLOGIES AND MATERIALS TO BE USED.

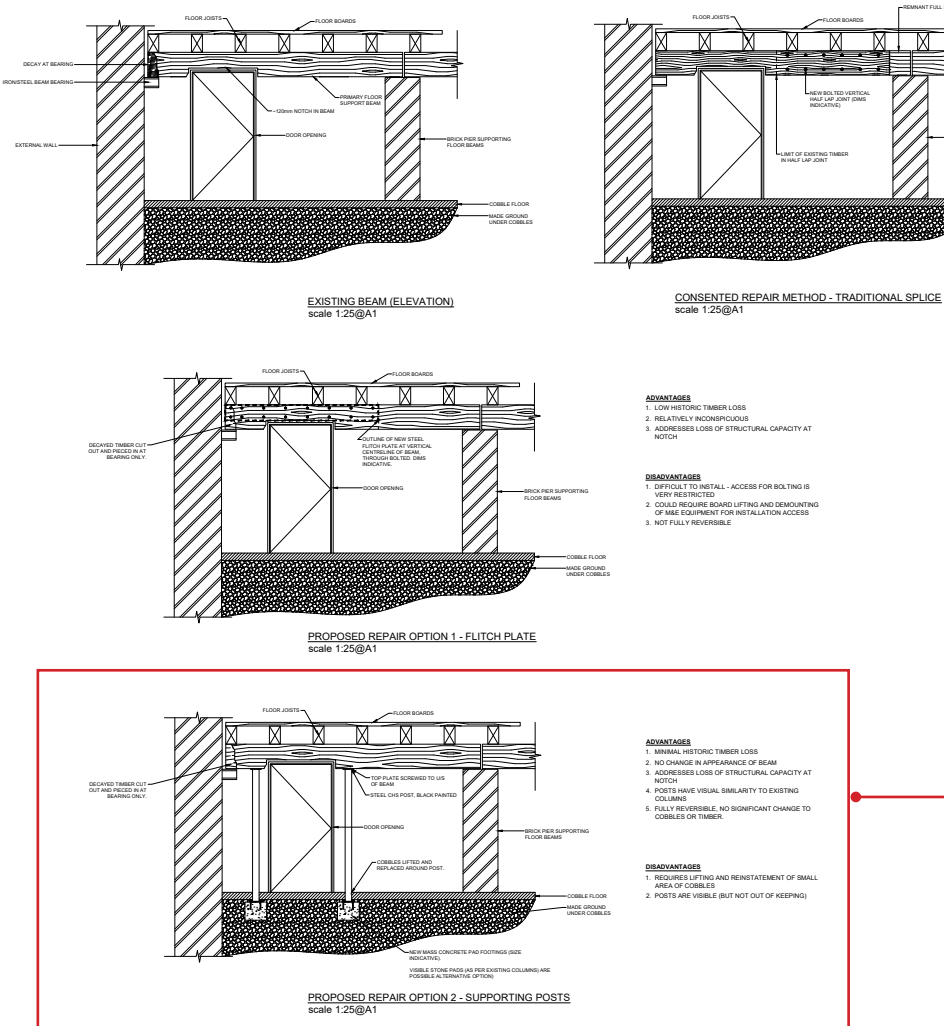
4. FINAL DESIGN FOR SPLICES MAY VARY ACCORDING TO SIZE OF MEMBER BEING REPAIRED AND THE EXTENT/LOCATION OF DECAY AND LOADING APPLIED. IN EACH CASE, THE SPLICE DESIGN WILL BE ADAPTED TO MINIMISE LOSS OF HISTORIC FABRIC. SPLICE DESIGNS MAY THEREFORE COMPRISE VERTICAL OR HORIZONTAL SPLAYED JOINTS (AS SHOWN HERE) OR FACE/EDGE HALF SCARS. EACH TO BE CONFIRMED AND AGREED ON SITE BETWEEN THE SE, CA AND THE CONTRACTOR ONCE FULL ACCESS IS AVAILABLE.

5. NEW SPLICING TIMBER TO BE OF THE SAME SPECIES AS THE PARENT TIMBER, OF MATCHING DIMENSIONS AND APPROPRIATELY SEASONED. HARDWOOD TIMBER TO BE D30 GRADE. SOFTWOOD TIMBER TO BE MINIMUM SS/C24 GRADE. PRESERVATIVE TREATMENT TO BE APPLIED AS PER ARCHITECT'S SPECIFICATION.

6. STAINLESS STEEL BOLT ASSEMBLIES TO BE GRADE 316/1.4401 and A4L-80.

7. LIME MORTAR DRY PACK TO BE NHL 5/SHARP SAND IN 1:2 RATIO.

8. REFER ALSO TO CONISBEE STRUCTURAL SPECIFICATION.



GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS

2. DO NOT SCALE FROM THIS DRAWING IN EITHER PAPER OR DIGITAL FORM. USE WRITTEN DIMENSIONS ONLY.

ADVANTAGES

1. TRADITIONAL REPAIR METHOD

DISADVANTAGES

1. HIGHLY INVASIVE - MOST OF HISTORIC BALTO PINE BEAM IS LOST

2. DOES NOT ADDRESS LOSS OF STRUCTURAL CAPACITY AT NOTCH

3. COULD REQUIRE BOARD LIFTING AND DEMOUNTING OF MME EQUIPMENT FOR INSTALLATION ACCESS

4. NOT REVERSIBLE

STRUCTURAL REPAIR NOTES

1. TIMBER AT THE BEAM BEARING IS HEAVILY DECAYED. THE DECAY DOES NOT EXTEND BEYOND THE BEARING AREA (APPROX 200MM LENGTH).

2. THE BEAM HAS BEEN DEEPLY NOTCHED CLOSE TO THE BEARING FOR INSTALLATION OF A DOOR OPENING. THIS HAS REDUCED STRUCTURAL CAPACITY BELOW THAT EXPECTED FOR UNUSUAL/UNIFORM LOADING.

3. THE CONSENTED REPAIR APPROACH AS PER DRAWING IS TO UNDERTAKE TRADITIONAL BOLTED SPLICE/LAP/Joint REPAIRS.

4. IN THIS CASE THE PRESENCE OF THE NOTCH REQUIRES THE GENERIC CONSENTED REPAIR TYPE TO BE LOCATED IN THE FULL DEPTH BEAM SECTION BEYOND.

5. THE FLOOR LOADING NECESSITATES A LONG LAP IN THE REPAIR AND WOULD RESULT IN LOSS OF THE MID-SPAN OF THE EXISTING HISTORIC BEAM AND NOT ADDRESS THE LOSS OF CAPACITY CREATED BY THE NOTCH.

6. FROM A CONSERVATION/ENGINEERING PERSPECTIVE, AN ALTERNATIVE, LESS INVASIVE APPROACH IS MUCH PREFERRED.

7. OUR PREFERENCE WOULD BE OPTION 1 TO INSTALL SUPPORT POSTS AS THIS HAS MINIMAL IMPACT ON EXISTING HISTORIC FABRIC. IN THE SUPERFICIAL AND PERMANENT CONDITIONS, AND IS FULLY REVERSIBLE SHOULD THE NEED EVER ARISE.

BASEMENT PART PLAN - REPAIR LOCATION
scale 1:200@A1

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Rev Date Description Drawn Check

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Drawing Title
PRELIMINARY

Project
SCIENCE & INDUSTRY MUSEUM
1830 WAREHOUSE URW

Date
MAY 2021

Scale
SW

Drawn
SW

Engineer

Project No
1830 WAREHOUSE (BASEMENT)
PRIMARY BEAM REPAIR

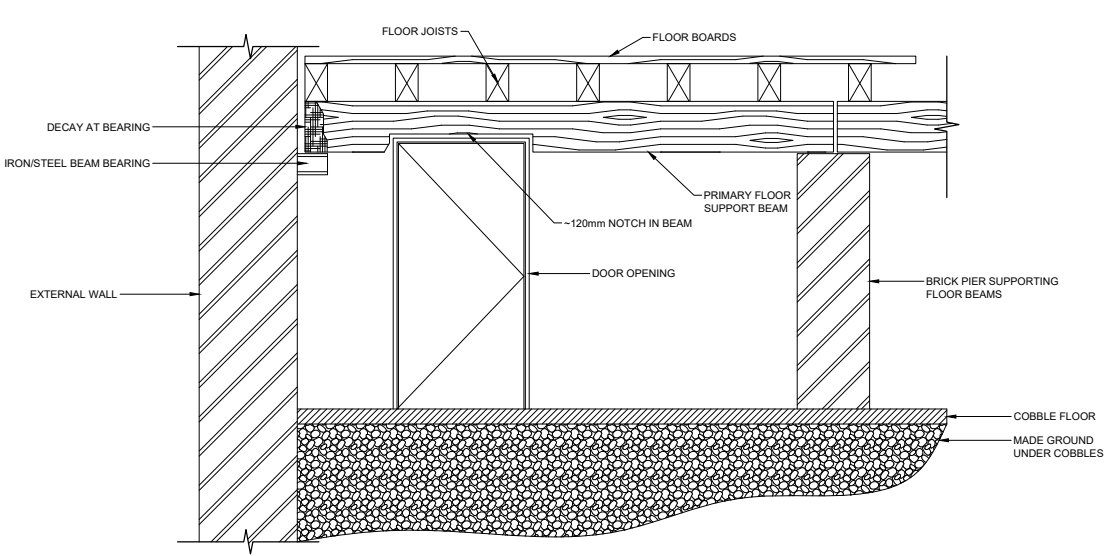
Drawing No
180426-CON-1830-XX-DR-S-4633

Revision
P1

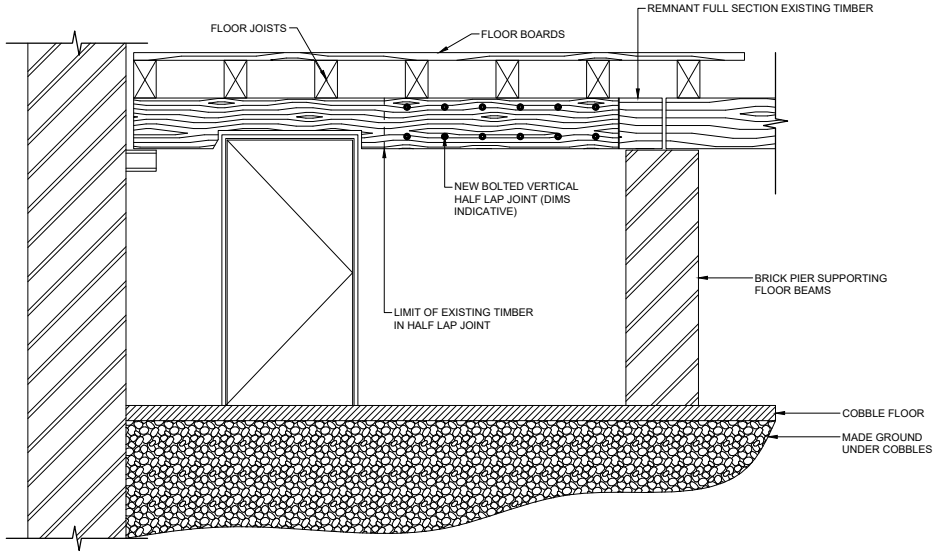
THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE SPECIFICATION AND ALL OTHER RELEVANT DRAWINGS. DO NOT SCALE FROM THIS DRAWING

Approved Drawing - still relevant for repairs in other locations.

New Additional Drawing - showing options appraisal & preferred option 2.



EXISTING BEAM (ELEVATION)
scale 1:25@A1



CONSENTED REPAIR METHOD - TRADITIONAL SPLICE
scale 1:25@A1

ADVANTAGES

1. TRADITIONAL REPAIR METHOD

DISADVANTAGES

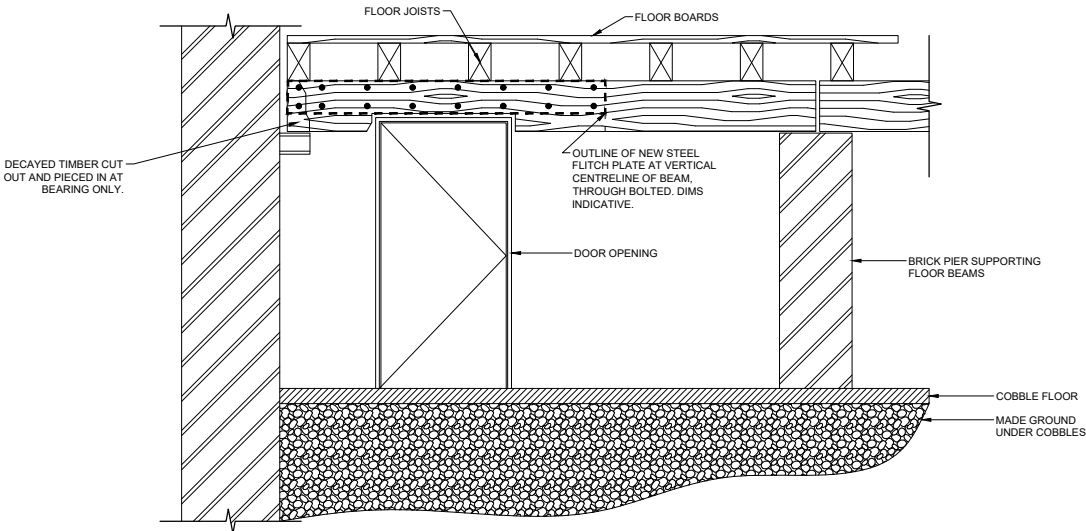
1. HIGHLY INVASIVE - MOST OF HISTORIC BALTIC PINE BEAM IS LOST.
2. DOES NOT ADDRESS LOSS OF STRUCTURAL CAPACITY AT NOTCH
3. COULD REQUIRE BOARD LIFTING AND DEMOUNTING OF M&E EQUIPMENT FOR INSTALLATION ACCESS
4. NOT REVERSIBLE

GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS
2. DO NOT SCALE FROM THIS DRAWING IN EITHER PAPER OR DIGITAL FORM. USE WRITTEN DIMENSIONS ONLY.

STRUCTURAL REPAIR NOTES

1. TIMBER AT THE BEAM BEARING IS HEAVILY DECAYED. THE DECAY DOES NOT EXTEND BEYOND THE BEARING AREA (APPROX 200mm LENGTH).
2. THE BEAM HAS BEEN DEEPLY NOTCHED CLOSE TO THE BEARING FOR INSTALLATION OF A DOOR OPENING. THIS HAS REDUCED STRUCTURAL CAPACITY BELOW THAT EXPECTED FOR MUSEUM/GALLERY LOADING.
3. THE CONSENTED REPAIR APPROACH AS PER DR-S-4030 IS TO UNDERTAKE TRADITIONAL BOLTED SPLICE/LAP/SCARF JOINT REPAIRS.
4. IN THIS CASE THE PRESENCE OF THE NOTCH REQUIRES THE GENERIC CONSENTED REPAIR TYPE TO BE LOCATED IN THE FULL DEPTH BEAM SECTION BEYOND.
5. THE FLOOR LOADING NECESSITATES A LONG LAP IN THE REPAIR AND WOULD RESULT IN LOSS OF THE MAJORITY OF THE EXISTING HISTORIC BEAM AND NOT ADDRESS THE LOSS OF CAPACITY CREATED BY THE NOTCH.
6. FROM A CONSERVATION ENGINEERING PERSPECTIVE, AN ALTERNATIVE, LESS INVASIVE APPROACH IS MUCH PREFERRED.
7. ADVANTAGES AND DISADVANTAGES OF THE VARIOUS OPTIONS ARE SET OUT TO THE LEFT ADJACENT TO THE SKETCHES.
8. OUR PREFERENCE WOULD BE OPTION 2 TO INSTALL SUPPORT POSTS AS THIS HAS MINIMAL IMPACT ON EXISTING HISTORIC FABRIC IN THE TEMPORARY AND PERMANENT CONDITIONS, AND IS FULLY REVERSIBLE SHOULD THE NEED EVER ARISE.



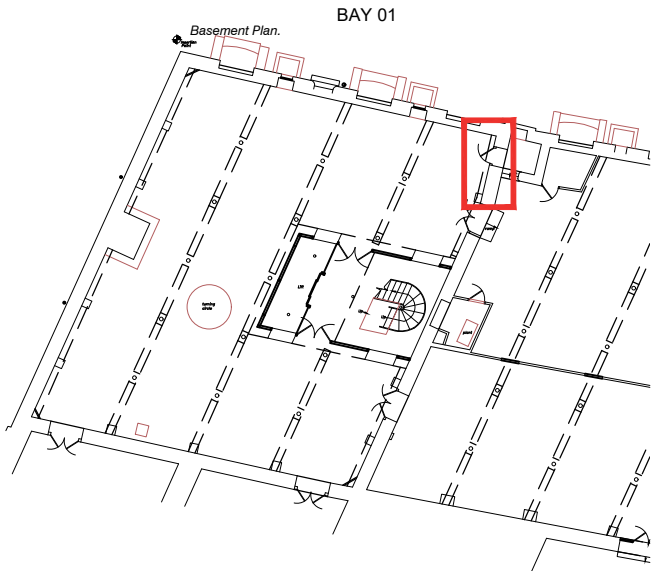
PROPOSED REPAIR OPTION 1 - FLITCH PLATE
scale 1:25@A1

ADVANTAGES

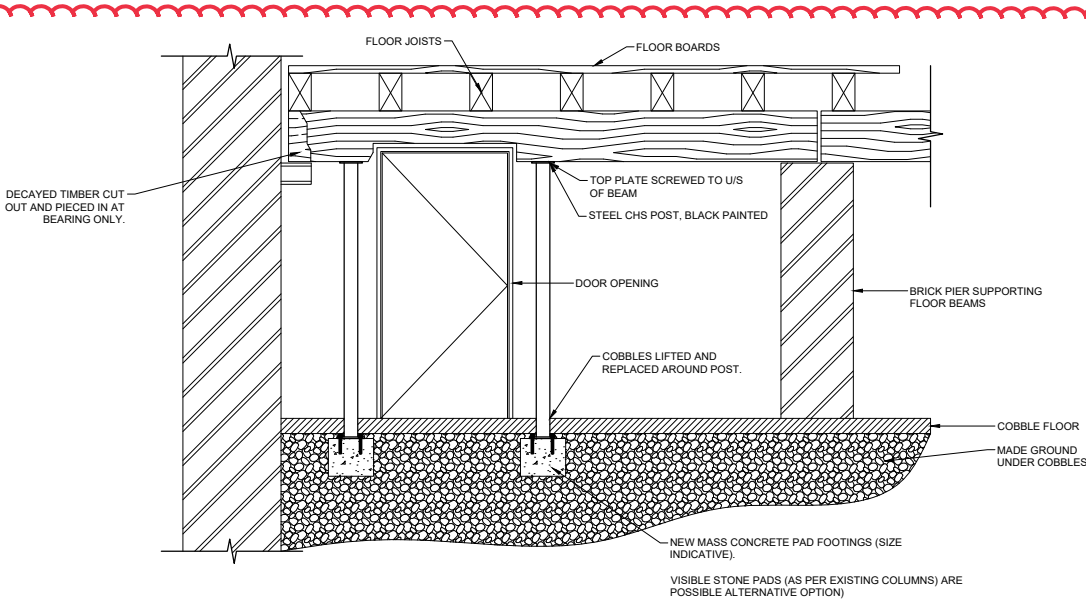
1. LOW HISTORIC TIMBER LOSS
2. RELATIVELY INCONSPICUOUS
3. ADDRESSES LOSS OF STRUCTURAL CAPACITY AT NOTCH

DISADVANTAGES

1. DIFFICULT TO INSTALL - ACCESS FOR BOLTING IS VERY RESTRICTED
2. COULD REQUIRE BOARD LIFTING AND DEMOUNTING OF M&E EQUIPMENT FOR INSTALLATION ACCESS
3. NOT FULLY REVERSIBLE



BASEMENT PART PLAN - REPAIR LOCATION
scale 1:200@A1



PROPOSED REPAIR OPTION 2 - SUPPORTING POSTS
scale 1:25@A1

ADVANTAGES

1. MINIMAL HISTORIC TIMBER LOSS
2. NO CHANGE IN APPEARANCE OF BEAM
3. ADDRESSES LOSS OF STRUCTURAL CAPACITY AT NOTCH
4. POSTS HAVE VISUAL SIMILARITY TO EXISTING COLUMNS
5. FULLY REVERSIBLE, NO SIGNIFICANT CHANGE TO COBBLES OR TIMBER.

DISADVANTAGES

1. REQUIRES LIFTING AND REINSTATEMENT OF SMALL AREA OF COBBLES
2. POSTS ARE VISIBLE (BUT NOT OUT OF KEEPING)

Preferred Approach

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Drawing Status	PRELIMINARY
Project	SCIENCE & INDUSTRY MUSEUM 1830 WAREHOUSE URW
Title	1830 WAREHOUSE (BASEMENT) PRIMARY BEAM REPAIR
Drawing No	180426-CON-1830-XX-DR-S-4033
Date	MAY 2021
Scale	SW
Drawn	SW
Engineer	
Project No	180426
Revision	P1