HBL

HBL ASSOCIATES

PHASE 1 COMPLETION REPORT & RECOMMENDATIONS

For

STALLS BAR LIGHTWELL STEELWORK

MANCHESTER OPERA HOUSE

On Behalf Of

AMBASSADOR THEATRE GROUP

HBL Ref: 8283

Document Control

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Date	**8th September 2020**
Approved	
Signature	
Date	

Rev	Date	Details	Prepared By	Reviewed By
01	08/09/20	First Issue	ALS	

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1. Introduction

1.1. HBL Associates Ltd inspected the corroded lightwell steelwork within the Stalls Bar of the Manchester Opera House on several occasions during 2020 and provided a written report detailing the findings and recommendations. Reference should be made report reference 8283-HBL-XX-XX-RP-S-0001 for further details.

1.2. This report serves as a record of the implementation of the phase 1 works and provides further recommendations based on the observations during the phase 1 works.

2. Background

2.1. Concerns had been raised about the condition of the structure within an existing lightwell on the west elevation of the Opera House in Manchester. Initial investigations identified heavily corroded steelwork supporting the masonry over the opening to the lightwell. The phase 1 works recommended the removal of the existing stud wall and lightwell window and the installation of temporary props.

2.2. The props were installed in the short term to ensure the temporary stability of the structure whilst further investigations are completed and a more permanent solution designed and implemented.

2.3. The lightwell is located within the stalls bar within the building, at lower ground level, as shown on the figure below.

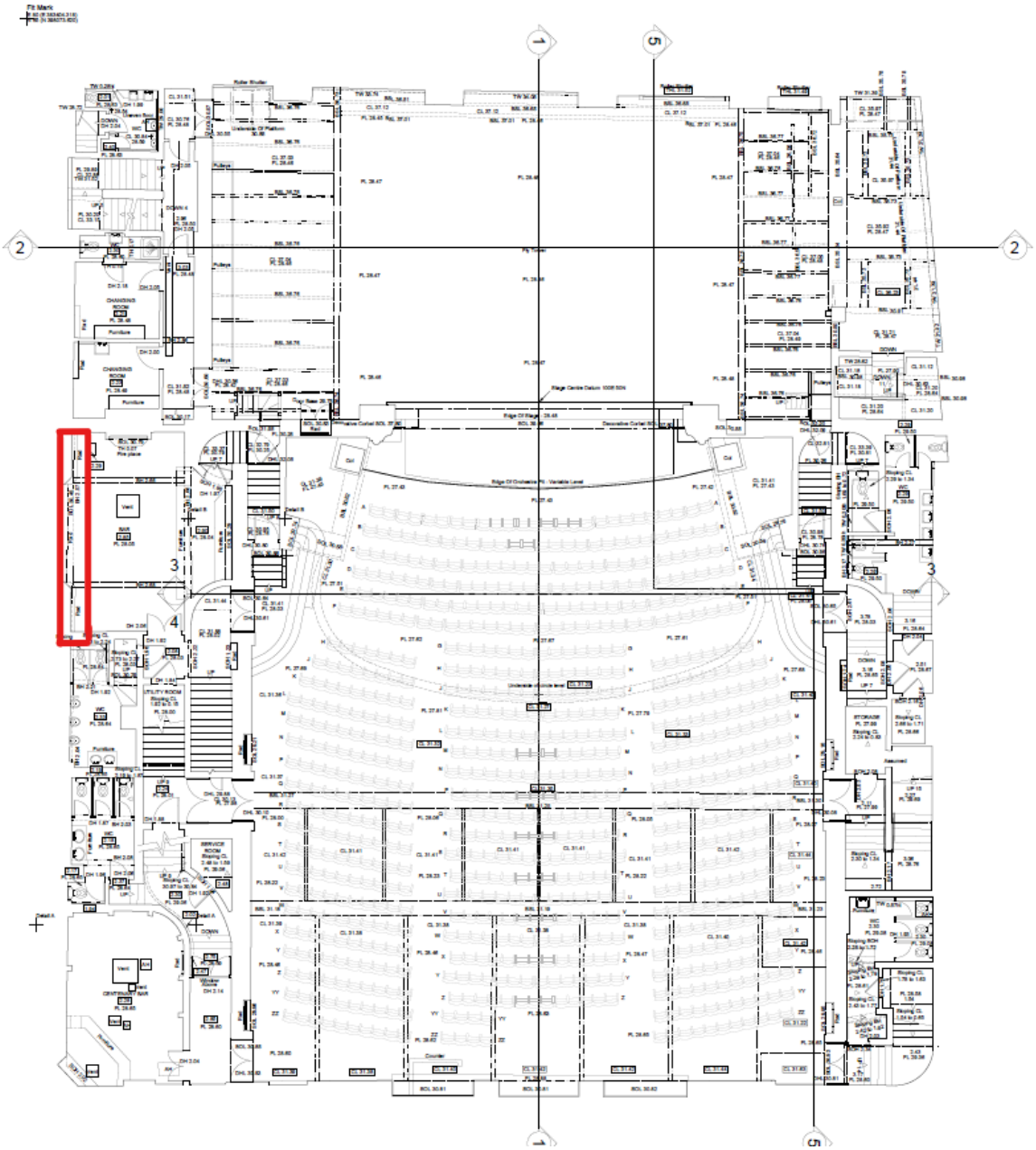


Figure 1 – Plan at stalls level showing location of lightwell within Stalls bar.

3. Phase 1 Works

3.1. Phase 1 works required the removal of the existing stud wall and glazing and the installation of temporary props beneath the corroded outer beam within the lightwell, as shown in figure 2.

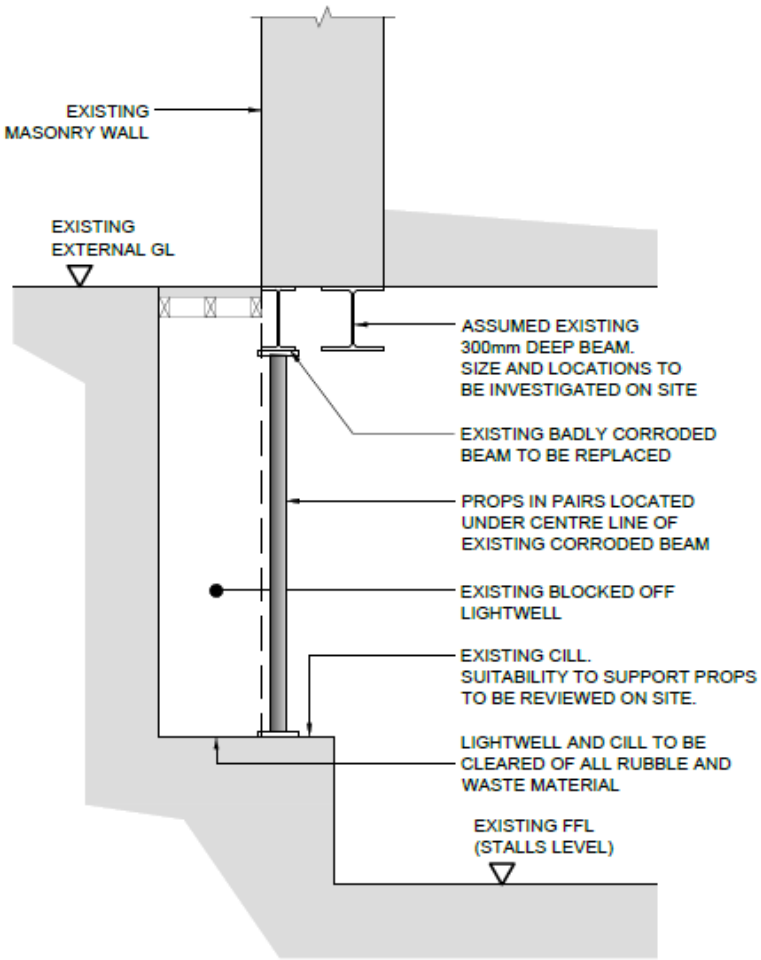


Figure 2 – Section through lightwell showing propping

3.2. The installation of the props was completed in early September 2020 as shown in the photograph below in figure 3. The temporary work design of the props was completed on behalf of the contractor, and the calculations are included within appendix B. The design loadings for the props was specified by HBL Associates.

Figure 3 – Figure showing the installation of temporary props

4. Observations

4.1. Further investigations were undertaken once the props were in place and the area more accessible. Removal of the spalled concrete revealed that the opening to the lightwell is formed using 2No steel beams with concrete fill between the webs and surrounding the beams. Figure 4 shows the pair of beams with concrete web infill at the bearing location.

Figure 4 – Image showing the 2No beams forming the light well opening. The outer beam (L) was heavily corroded.

4.2. There was evidence of steel strapping or plate reinforcement within the spalled concrete that had heavily corroded and was no longer serving any structural purpose.

Figure 5 – Images showing corroded outer beam

4.3. It was also noted that the pipework within the lightwell was open and there were uncovered drains and was likely one source of water causing the corrosion of the steelwork, see figure 6 below.

Figure 6 – Image showing open pipework

5. Recommendations

5.1. In our opinion the corroded outer beam is no longer adequate and should be replaced. The inner beam and the concrete infill is likely forming a steel and concrete composite section, and removal of the outer beam will compromise this system. As such, we recommend allowance is made to replace the inner beam and infill structure also.

5.2. We also recommend further investigations are carried out to identify the source of any water entering the lightwell and attempt to reduce or eliminate the flow. Pipework should be reviewed to determine whether it is still functional or is now redundant and can be removed or capped off.

5.3. In the short term, the temporary props should be inspected regularly (weekly) to ensure that they have not moved or shifted and that they are still tightened. The lightwell should be monitored for any new signs of spalled concrete or debris from the structure over. Should it be found that the props have moved or become looser, or debris is present then HBL Associates should be notified immediately.

5.4. The actions are summarised below:

Immediate Term Works :

1. Monitor props for movement – ongoing for the duration of the props being in place.
2. Monitor lightwell for debris or newly spalled concrete – weekly, during the prop inspection
3. Identify sources of water ingress and determine whether pipework is redundant

Phase 2 – Medium Term Works

1. Design of replacement steelwork
2. Replacement of lightwell steelwork with 3No steel beams (galvanised). Steelwork sizes are to be determined following structural calculation.
3. Reinstatement of pavement light (if desired/required)

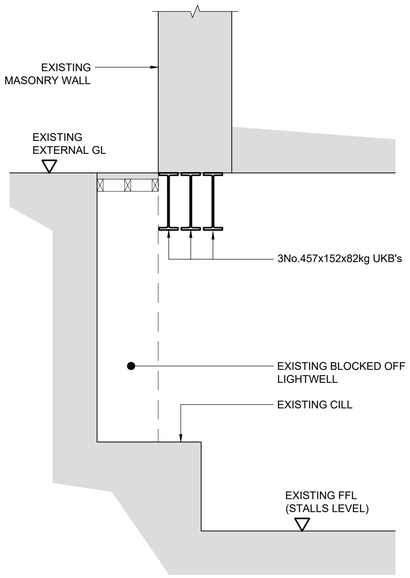
Phase 2 works to be complete by end of March 2021

5.5. Careful attention will have to be paid to the sequencing of the works to ensure temporary stability of the opening.

5.6. Appendix A includes a preliminary drawing showing the structural intent for the replacement of the steel beams for discussions with contractors and statutory bodies.

6. Appendix A

8283-HBL-XX-XX-DR-S-0002 - EXISTING LIGHTWELL PHASE 2 – PROPOSED PERMANENT WORKS



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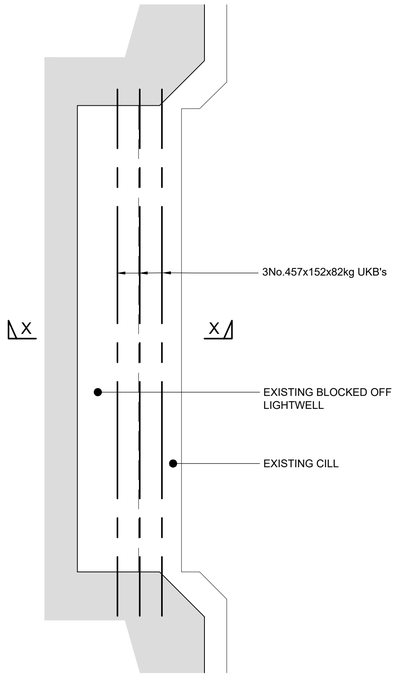
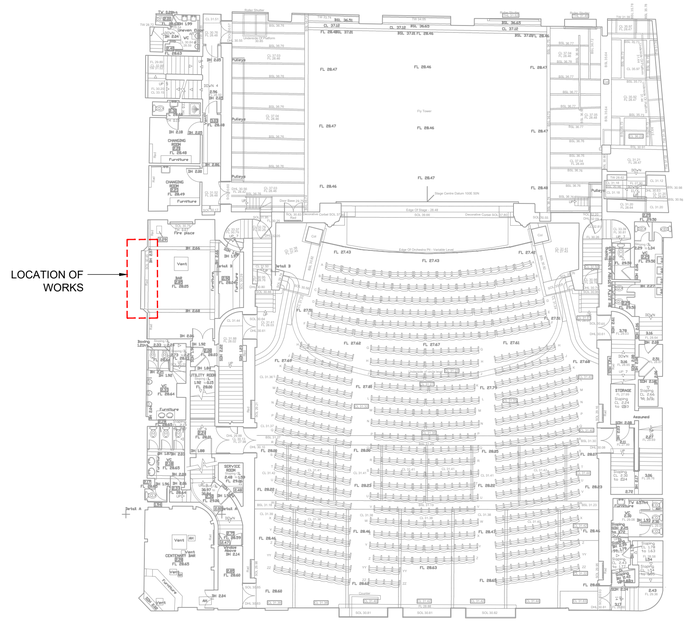


PLAN

PHASE 2 - PERMANENT WORKS

SCALE 1:25

NOTE:
ALLOW FOR 3No.457x152x82kg UKB's WITH 2No. SPLICE CONNECTIONS PER BEAM
CONTRACTOR TO ALLOW FOR DEVELOPMENT OF PROPPING SOLUTION TO INSTALL BEAM.
ALL STEELWORK TO BE GALVANISED



KEY PLAN

SCALE 1:200

DO NOT SCALE FROM THIS DRAWING

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH
ALL OTHER HBL DRAWINGS ISSUED FOR THIS PROJECT

GENERAL NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES.
3. ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IMMEDIATELY.
4. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS', ENGINEERS' AND SPECIALISTS' DRAWINGS TOGETHER WITH THEIR SPECIFICATIONS.

REV.	DATE	DRAWN	DESCRIPTION	CHKD	APPRD
P02	SEP'20	JKW	REPLACEMENT BEAM SIZES UPDATED	ALS	ALS
P01	JUL'20	HM	ISSUED FOR INFORMATION	ALS	ALS

STATUS DESCRIPTION: FOR INFORMATION
STATUS: S2

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PROJECT
MANCHESTER OPERA HOUSE

DRAWING TITLE
EXISTING LIGHTWELL
PHASE 2 - PROPOSED PERMANENT WORKS

CLIENT
AMBASSADOR THEATRE GROUP

HBL REF.	DATE	SCALE(S)	
8283	JULY 2020	AS SHOWN	A1

DRAWN	CHECKED	APPROVED
H.MAMAGANI	A.SMITH	A.SMITH

DRAWING No.	REV.
8283-HBL-XX-XX-DR-S-0002	P02

7. Appendix B

PROPPING CALCULATIONS

Marston & Grundy LLP
Consulting Engineers

Priory House, Ellesmere Avenue
Marple, Stockport SK6 7AN
Tel 0161 427 7231 Fax 0161 426 0136
Email mail@marstonandgrundy.com

Project	Job Ref.
Manchester Opera House	12179
Section: Temporary Propping to lightwell	Sheet no./rev.: 1

Calc. by	Date	Checked by	Date	Approved by	Date
DAG	12/08/20				

Temporary Propping to Beam

Existing steel beam over lightwell is badly corroded and requires to be propped. Lightwell is 3.8m long x 1.5m high.

Wall supported off 2No° beams (TBC on site). Propping required to external beam only. Assume floor supported off internal beam, so propping required to support wall only.

DL - 0.215 x 20 x 3.8 = 16.3 kN/m (conservative)

With 3No° props at 1.0m c/c,

N = 16.3 x 1 = 16.3kN per prop.

Ref sht. 2
Use

No° Acrow prop. SWL = 32 kN for concentric loading (17kN with 25mm eccentricity)

12179 12

Acrow Prop Data Sheet – Scaffolding Supplies Limited

Safe Working Load (kN) for Props loaded 25mm Max. Eccentric and 1.5° Max. Out-of-Plumb.

Recommended safe working loads for Props where concentric loading cannot be guaranteed. When supporting timber bearers prop load may be limited by allowable stress in timber.

Height (m)	1.25	1.5	1.75	2.0	2.25	2.5	2.75	3.0	3.25	3.5	3.75	4.0	4.25	4.5	4.75	5	5.25	5.5	5.75	6.0
Prop Size																				
0,1,2,3	17	17	17	17	17	17	17	15	13	11	10	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	17	14	11	10	9	8	7	7	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	13	11	9	8.5	7.5	6	5	4.5	4

Source: Based on CIRIA Technical Note 79 (1977), (Except for size '0' props).

Safe Working Load (kN) for props loaded Concentrically and 1.5° Max. Out-of-Plumb.

Recommended safe working loads for props supporting Metriform or similar formwork systems ensuring concentric loading. Also for timber bearers where fork heads are used to ensure concentric loading, but load on prop may be limited by allowable stress in timber.

Height (m)	1.25	1.5	1.75	2.0	2.25	2.5	2.75	3.0	3.25	3.5	3.75	4.0	4.25	4.5	4.75	5	5.25	5.5	5.75	6.0
Prop Size																				
0	32	32	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3	-	-	32	32	32	26	23	19	17	15	13	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	24	19	15	12	11	10	9	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	18	15	12	11	9	8	7	6	6

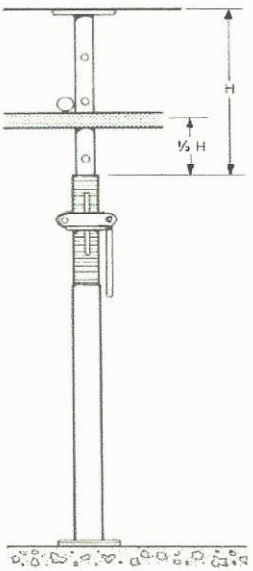
Source: Based on CIRIA Technical Note 79 (1977), (Except for size '0' props).

Safe Working Load (kN) for props loaded Concentrically and Suitably Laced with Tube and Fittings.

Recommended safe working loads for props laced in two directions, at right angles, at a level ⅓ of the height of the extended inner tube (see sketch). The lacing and the formwork deck must be restrained against horizontal movement by tying to the building or by diagonal bracing.
When using the loading tables, the height of any drop head or similar attachment should be included in the prop height.

Height (m)	2.0	2.25	2.5	2.75	3.0	3.25	3.5	3.75	4.0	4.25	4.5	4.75
Prop Size												
1,2,3	-	-	32	32	32	32	28	24	20	-	-	-
4	-	-	-	-	-	32	32	30	26	22	19	16

Source: calculated in accordance with BS449: Part 2: 1969, but using a load factor of 2.

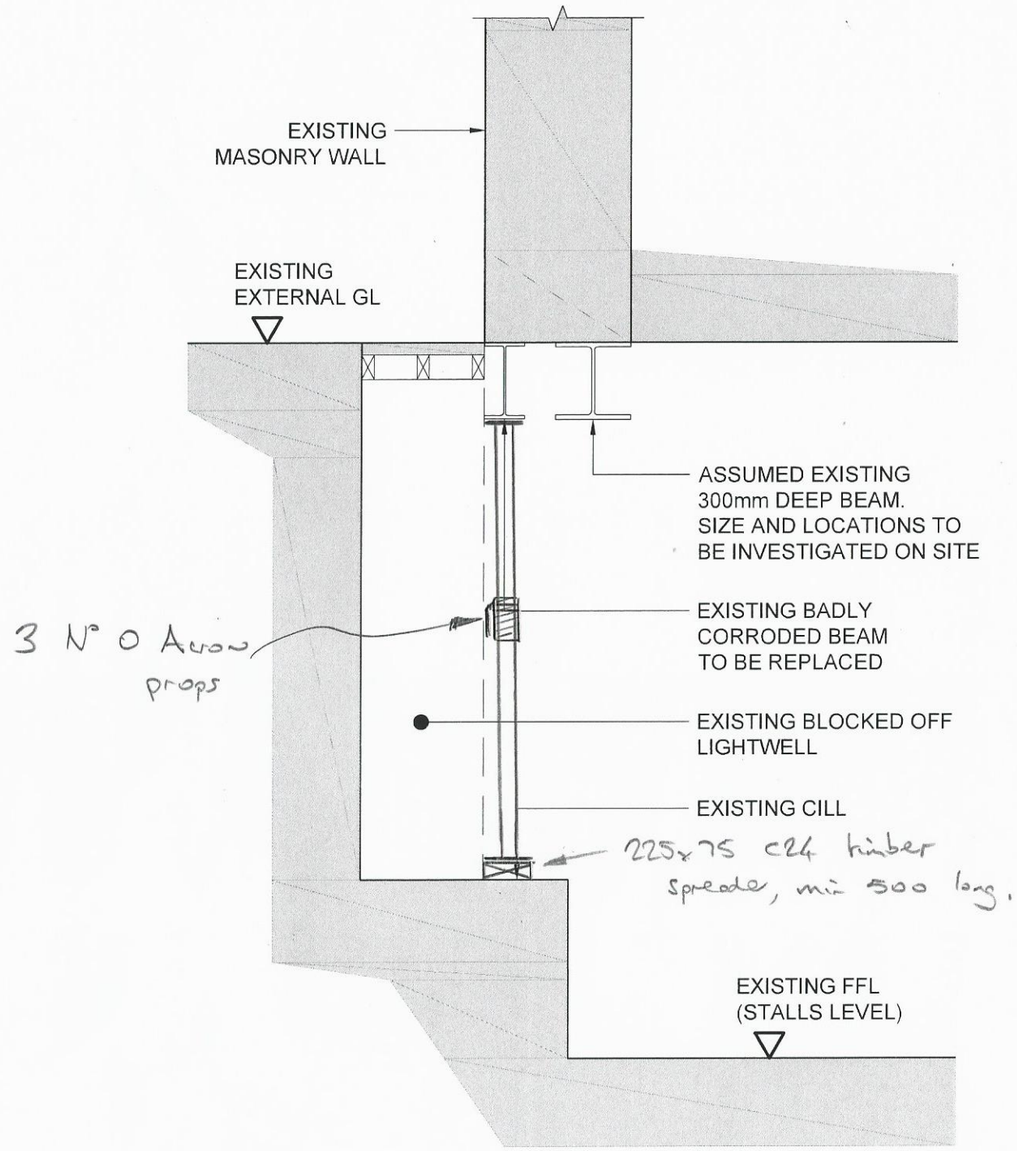


N.B For all practical purposes, to convert KN to tons or metric tones divide by 10.

Scaffolding Supplies Limited

Tel: 01472 501011

www.scaffoldingsupplies.co.uk



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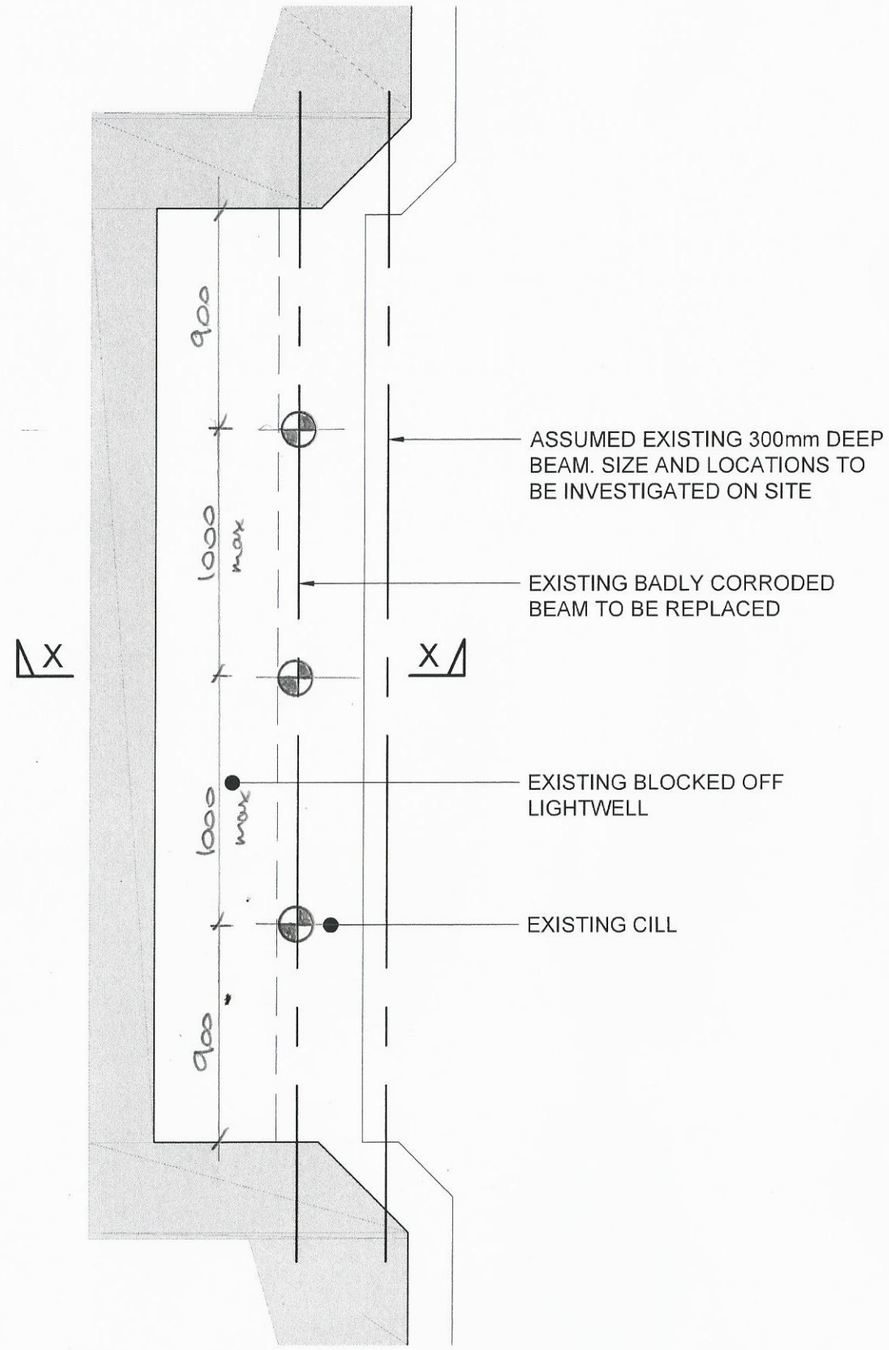

PLAN

EXISTING

SCALE 1:25

MANCHESTER OPERA HOUSE - TEMPORARY PROPPING

12179/SK1