

1. Introduction

This report outlines findings from recent investigations into the Koko front piers and consequences on the structural form. The following two sections describe the findings and a solution proposed in response. Sections four and five compare the proposed solution to both the currently agreed solution and to an alternative solution conceived during discussions with the design team. Section six outlines the benefits of the proposed solution and summarises the details of this report.

2. Findings

On local exposure of the masonry piers to the front of Koko depicted in figure 1 it was found that these piers did not contain supporting steel columns. This despite their slender construction and despite steel columns having been identified elsewhere within the masonry construction.



Figure 1 - Koko front facade

The London Building Act of 1894 which was in force at the time of construction provided guidance on the thickness of masonry walls as depicted in figure 2, but did not detail specific requirements for narrow piers, large point loads or unusual arrangements. Consequently, there are instances where masonry structures constructed prior to the 20th century cannot be suitably justified to contemporary regulatory frameworks and guidance documents. In these instances, an assessment of condition and proven performance can often suffice to justify the suitability of the construction.

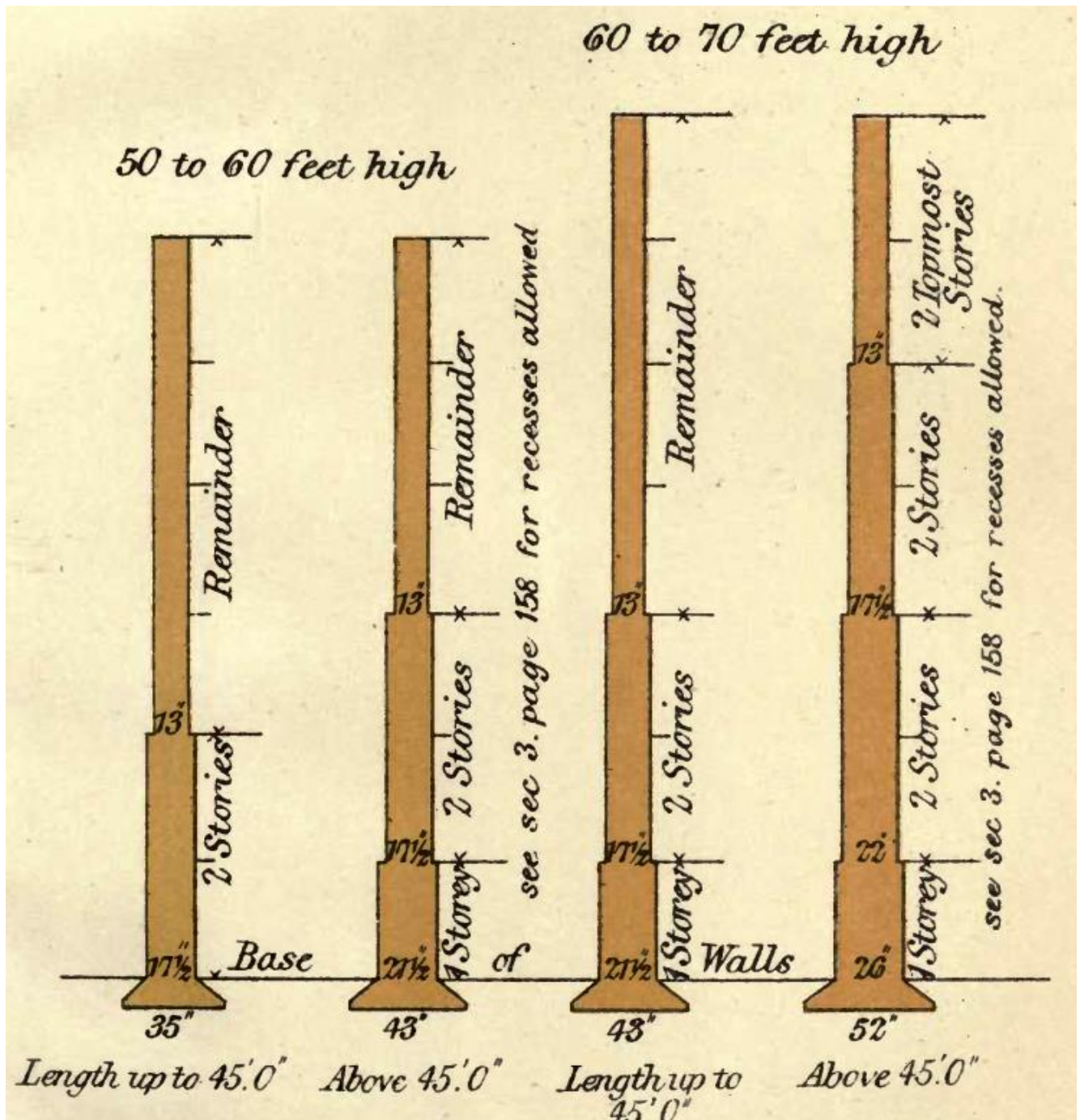


Figure 2 - Extract from the 1894 London Building Act

In this instance however, as we are proposing to increase the imposed loading on the roof structure by introducing a bar, this type of justification is no longer suitable. An analysis of the current condition of the piers suggests that they see a load 20% larger than what they can be justified to carry. With the bar loading this is further increased to 30%.

The aim of the proposed solution is therefore to devise a new alternative load path and ensuring that this carries the additional load imposed on the structure.

3. Proposed Solution

The proposed solution presented in Appendix A consists of introducing steel posts to the inside face of the piers between first floor and roof level. These posts are 200 x 90mm channel sections pushed close to the piers in section and central to the piers in elevation. The additional load is to be jacked into these posts to ensure that they carry their proportion of the applied load.

A transfer beam below the roof level soffit transfers loads from the new dome floor beams and distributes the load into the four posts as can be seen in figure 4. The dome floor beams and the transfer beam are all shown in the currently agreed solution.

We propose no physical fixing to the piers, and the solution is envisaged to be reversible without significant permanent visual impact on the listed fabric.

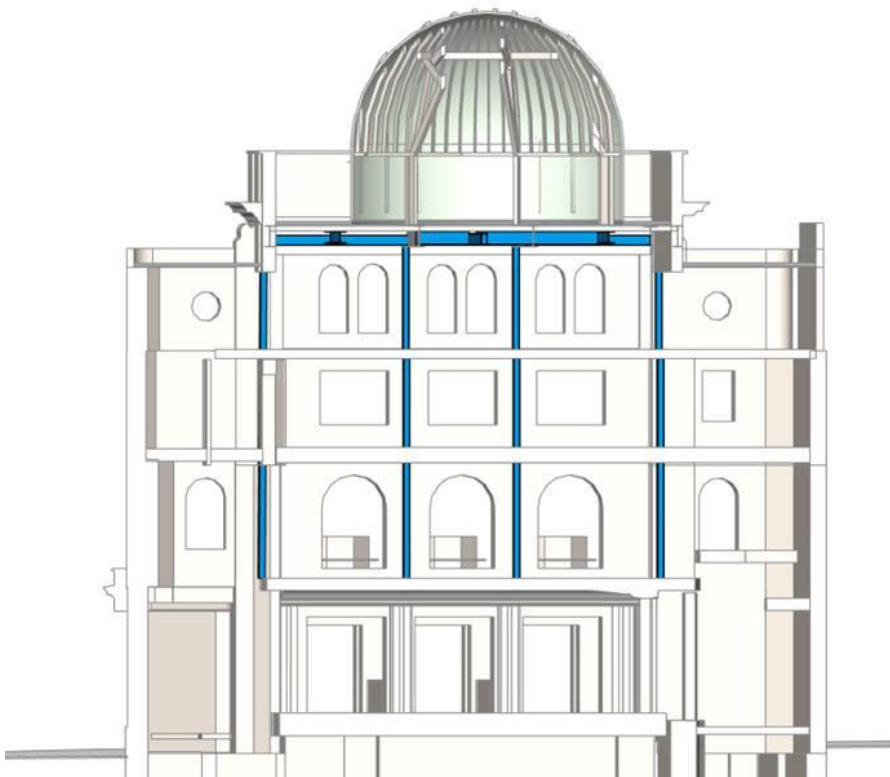


Figure 4 - Elevation of proposed posts from inside Koko

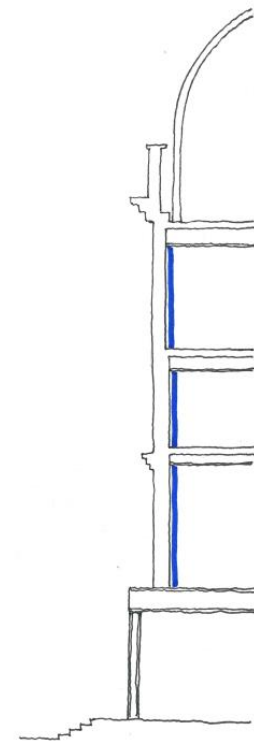


Figure 3 - Section through Koko front facade, proposed posts in blue

4. Currently Agreed Solution

The currently agreed solution is presented in Appendix B. This solution contains steel beams to the underside of the dome floor in the same locations as does our proposed solution. The only significant material difference is the four piers introduced between first floor and roof level. As is shown in figure 5, the currently agreed solution contains a steel frame (in orange) which is no longer required.

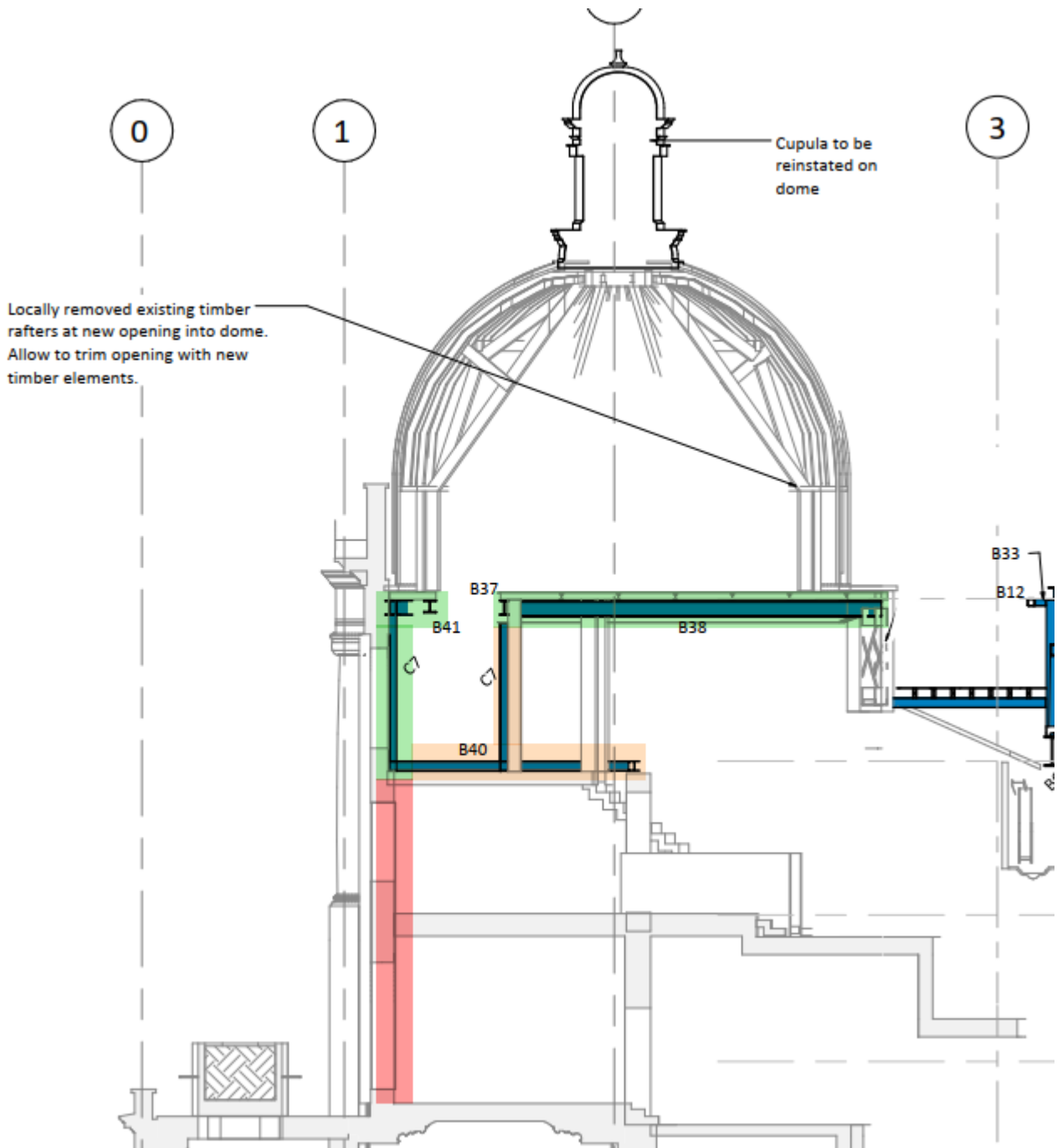


Figure 5 - Currently agreed solution, green elements are retained in the proposed solution, red elements are added in the proposed solution, orange elements are removed in the proposed solution

5. Alternative Solution

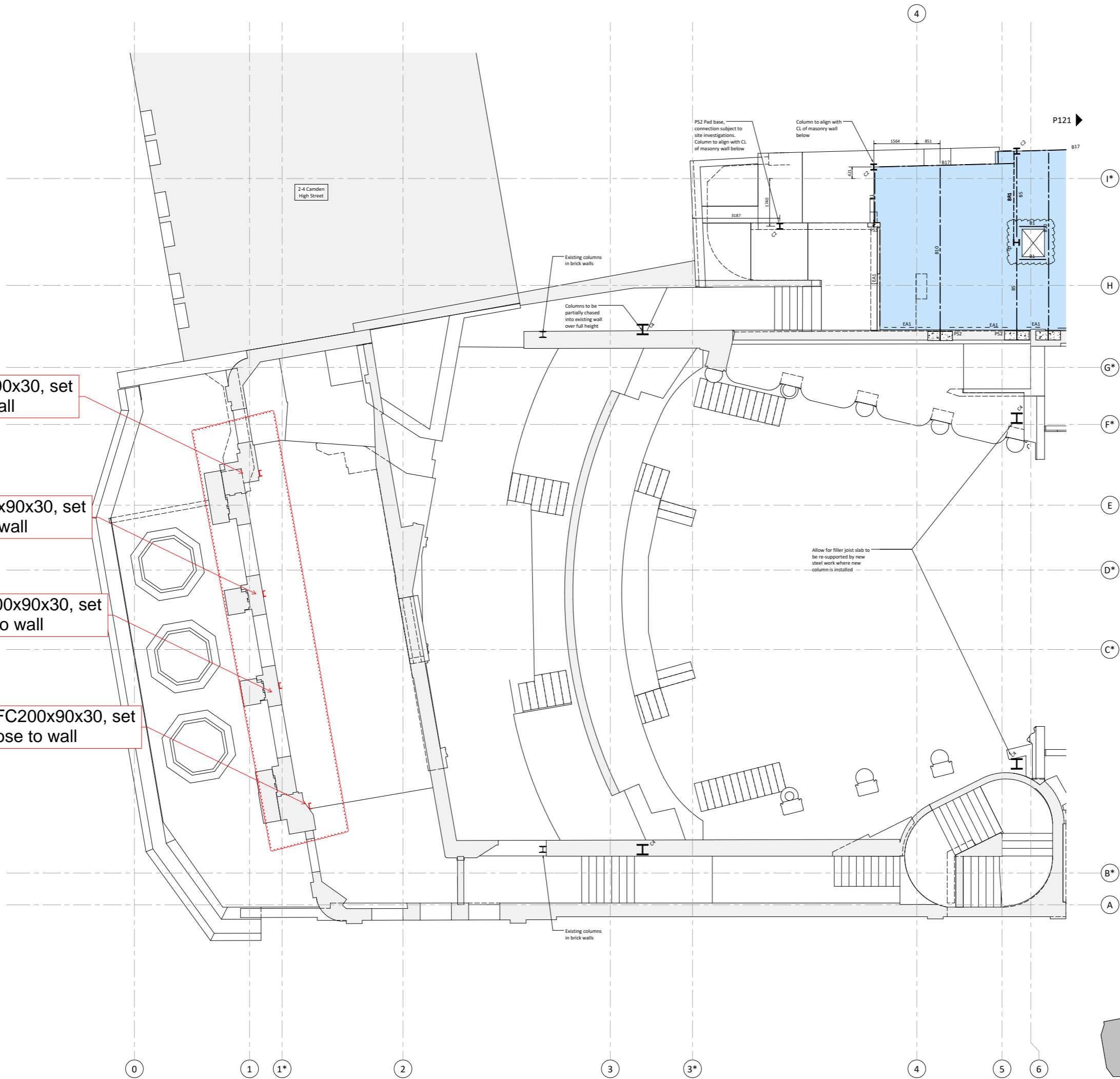
An alternative proposal is to chase the channel sections into the masonry piers to reduce the visual impact of the introduced channels. We have investigated this option, but do not recommend that it is pursued further for the following reasons:

- Chasing the posts into the piers will have a permanent irreversible effect on the listed fabric.
- The steel beams on all floor levels will need to be temporarily propped to install the posts, which will require new connections, local removal of finishes and installation of temporary foundations. All listed consequences will adversely impact the historic fabric.
- Cutting into the piers will result in a loss of capacity, and so the full load will need to be carried by the new posts which will need to be UC columns approximately 230 x 230mm; too wide to be fully hidden in the wall construction.
- The transfer of load from the piers to the temporary works and then from the temporary works to the new posts may result in some movement and cracking to finishes and concrete floors.

6. Conclusion

The masonry piers to the front of Koko cannot be shown to carry either the existing or proposed loading. To remedy this, we propose to introduce channel sections face fixed to the inside of the piers (without a physical connection between the two). This proposal is not dissimilar to the currently agreed solution but does introduce four posts to the front façade between first floor and roof with a visual impact to the inside of Koko. We note however that some of the previously agreed steel structure is omitted from this scheme thus reducing the impact on the existing building. We have investigated whether these posts can be chased into the existing masonry piers but have found that this would yield limited benefit while causing significant buildability issues and impacting the listed fabrics.

Appendix A – Proposed Solution



PFC200x90x30, set close to wall

PFC200x90x30, set close to wall

PFC200x90x30, set close to wall

PFC200x90x30, set close to wall

Beam Schedule

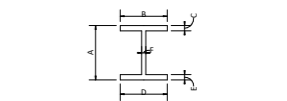
B1	203x203x46 UC + 200x100x10 UA
B2	203x203x60 UC + 150x90x10 UA
B4	203x203x86 UC + 150x90x10 UA
B5	254x254x89 UC + 200x100x10 UA
B6	610x305x238 UB
B7	203x203x46 UC
B8	356x171x57 UB + 150x90x10 UA
B9	254x254x107 UC + 200x100x10 UA
B10	305x305x97 UC + 200x100x10 UA
B11	250x150x10 RHS
B12	150x150x10 SHS
B14	305x305x137 UC + 200x100x10 UA
B15	250x150x14.2 RHS
B17	457x191x89 UB + 150x90x10 UA
B18	533x210x92 UB + 150x90x10 UA
B19	533x210x109 UB + 150x90x10 UA
B20	406x140x53 UB
B23	356x171x57 UB
B25	305x102x28 UB
B26	254x102x25 UB
B27	254x102x25 UB + 150x90x10 UA
B28	254x146x37 UB + 150x90x10 UA
B30	356x171x57 UB + 150x90x10 UA
B31	305x102x28 UB + 150x90x10 UA
B33	152x152x30 UC
B34	203x102x3 UB
B35	254x254x89 UC
B43	305x305x97 UC
B44	200x150x12.5 RHS laid flat
B45	150x100x8 RHS laid flat
B46	200x100x10 RHS
B47	100x50x10 PFC
B48	457x191x131 UB + 150x90x10 UA
B49	254x254x132 UC + 200x100x10 UA
B50	305x305x283 UC + 200x100x10 UA
B51	300x200x12.5 RHS + 100x100x10 EA
B52	150x150x16 SHS
B56	305 UC240 + 200x100x10 UA
B57	203x203x100 UC + 150x90x10 UA 2
B58	686x254 UB125 + 200x100x10 UA
B59	254x254x167 UC + 200x100x10 UA
B59	254x254x167 UC + 200x100x10 UA
B61	305x305x198 UC + 200x100x10 UA
B62	200x90x30 PFC
B63	457x152x80 UB + 150x90x10 UA
B64	203x102x3 UB + 150x90x10 UA
B65	356x368x177 UC
B66	686x254 UB152 + 200x100x15 UA
BR1	100 x 10 MS plate cross-brace
BR3	30mm macalloy bar
EA1	100x100x10 EA fixed to perimeter
EA2	150x150x12 EA
RCB1	700d x 230w RC

Column Schedule

C1	203x203x46 UC
C2	203x203x86 UC
C3	254x254x89 UC
C4	356x406x235 UC
C5	250x150x14.2 RHS
C6	152x152x30 UC
C7	203x203x46 UC cranked column
C8	203x203x46 UC cranked column
C-one	305x305x137 UC

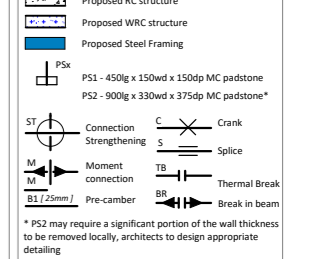
Fabricated beam Schedule

Beam Ref.	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	Weight (kg/m)
F802	550	400	160	400	50	20	145.00
F802	480	340	25	340	25	10	168.00



- This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
- Do not scale from this drawing in either paper or digital form. Use written dimensions only. To check drawing has been printed to the intended scale the above bar should be 100mm
- Existing foundation information based on limited site investigations. Materials, construction and sizes to be verified during construction.
- Allow for cast in weld plates to connect all beams to RC core walls, WRC liner wall & WRC capping beams
- Waterproofing to architects information and manufacturers of proprietary products
- Temporary works and sequencing to contractor design shall ensure a stable and safe structure throughout all stages of construction and shall not undermine preserved and proposed structures
- Facade design and connections to the superstructure to specialist design
- Allow intumescent paint to steel work & proprietary fire protection to timber by others to HTS specification.
- Refer to architects information for locations of openings to existing walls. Refer to HTS sketch SK142 for lintel intent. Design by Contractor
- Refer to overall plans for section markers

Detail Key



Floor Legend

RC Slab	Profiled metal deck	Timber floor
1	130 thk profiled NWC slab on TATA Comflor 60 1.0 mm gauge deck with A193 mesh top and 1 no. H16 bar per trough	
2	200 thk profiled NWC slab on TATA Comflor 60 1.0 mm gauge deck with A193 mesh top and 1 no. H16 bar per trough	
3	200 d x 75 w C24 joists at 400 crs with 18 thk plywood screwed to top face	
4	200 d x 50 w C24 joists at 400 crs with 18 thk plywood screwed to top face	
5	200 thk RC slab	
6	300 thk RC slab	
7	250 thk RC slab	
8	150 thk profiled NWC slab on TATA Comflor 60 1.0 mm gauge deck with A193 mesh top and 1 no. H16 bar per trough	
9	100 d x 50 w C24 joists at 400 crs with 18 thk plywood screwed to top face	
10	8mm steel checker plate	

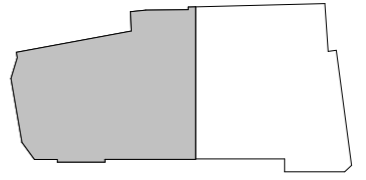
Rev	Date	By	Eng	Amendments
C4	27.02.19	JH	GG	Revised Construction Issue
C3	01.02.19	JH	GG	Revised Construction Issue
C2	24.12.18	AA	GG	CONSTRUCTION ISSUE
C1	23.11.18	AA	GG	DRAFT CONSTRUCTION ISSUE
T1	12.09.18	JH	GG	Revised Tender Issue

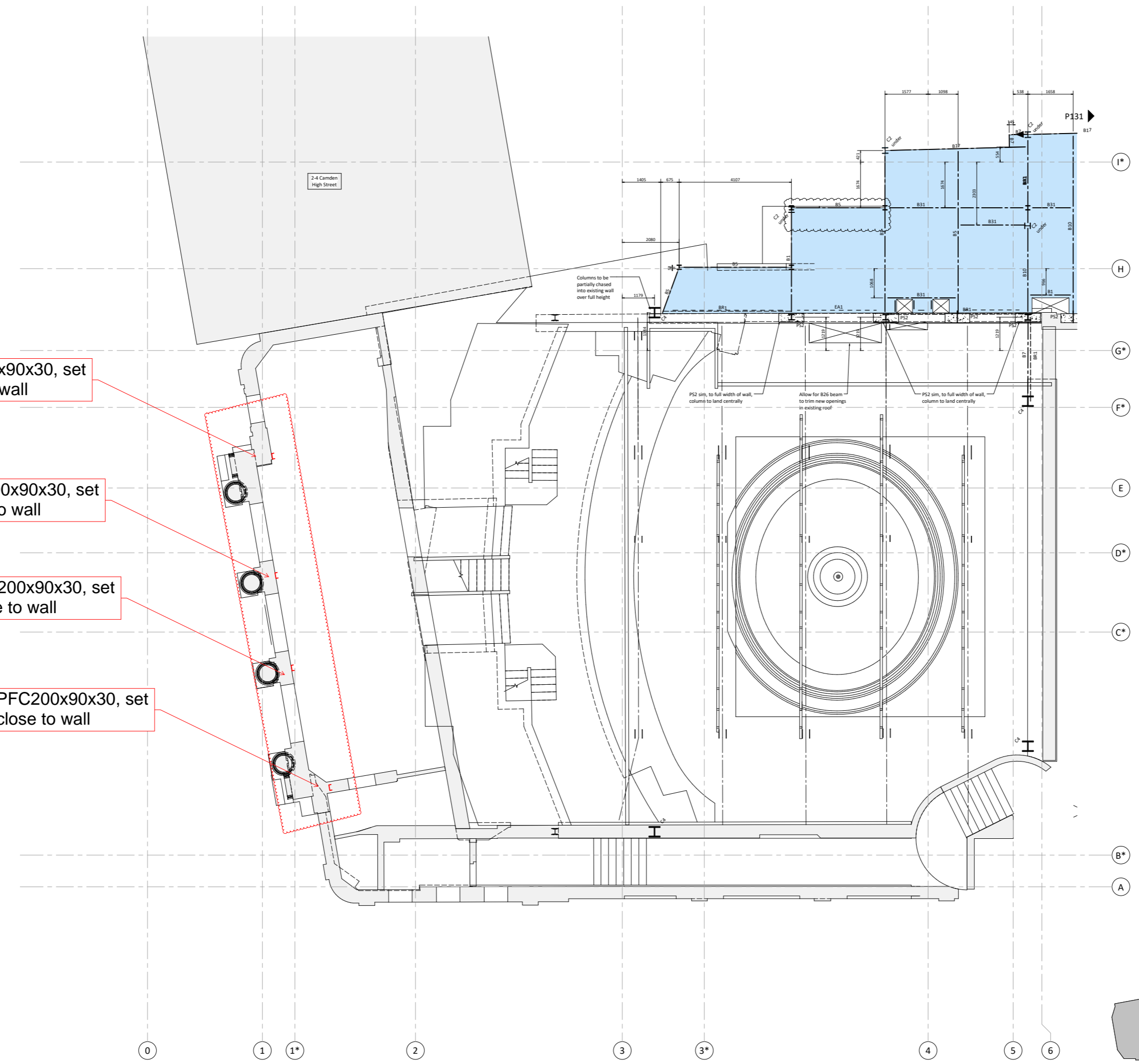


Job Name
The Hope Project

Drawing Title
Proposed Second Floor Plan 2

Purpose of Issue **Construction** Scale at A0 **1:50**
Drg No **1444/P122** Rev **C4**





PFC200x90x30, set close to wall

PFC200x90x30, set close to wall

PFC200x90x30, set close to wall

PFC200x90x30, set close to wall

Beam Schedule

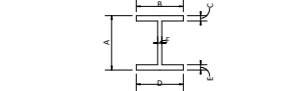
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B2	203x203x60 UC + 150x90x10 UA
B4	203x203x86 UC + 150x90x10 UA
B5	254x254x89 UC + 200x100x10 UA
B6	610x305x238 UB
B7	203x203x46 UC
B7	203x203x46 UC
B8	356x171x57 UB + 150x90x10 UA
B9	254x254x107 UC + 200x100x10 UA
B10	305x305x97 UC + 200x100x10 UA
B11	250x150x10 RHS
B12	150x150x10 SHS
B14	305x305x137 UC + 200x100x10 UA
B15	250x150x14.2 RHS
B17	457x191x89 UB + 150x90x10 UA
B18	533x210x92 UB + 150x90x10 UA
B19	533x210x109 UB + 150x90x10 UA
B20	406x140x53 UB
B23	356x171x45 UB
B25	305x102x28 UB
B26	254x102x25 UB
B27	254x102x25 UB + 150x90x10 UA
B28	254x146x37 UB + 150x90x10 UA
B30	356x171x51 UB + 150x90x10 UA
B31	305x102x28 UB + 150x90x10 UA
B33	152x152x3 UC
B34	203x102x3 UB
B35	254x254x89 UC
B43	305x305x97 UC
B44	200x150x12.5 RHS laid flat
B45	150x100x8 RHS laid flat
B46	200x100x10 RHS
B47	100x50x10 PFC
B48	457x191x131 UB + 150x90x10 UA
B49	254x254x132 UC + 200x100x10 UA
B50	305x305x283 UC + 200x100x10 UA
B51	300x200x12.5 RHS + 100x100x10 EA
B52	150x150x16 SHS
B56	305 UC240 + 200x100x10 UA
B57	203x203x100 UC + 150x90x10 UA 2
B58	686x254 UB125 + 200x100x10 UA
B59	254x254x167 UC + 200x100x10 UA
B59	254x254x167 UC + 200x100x10 UA
B61	305x305x198 UC + 200x100x10 UA
B62	200x90x30 PFC
B63	457x152x83 UB + 150x90x10 UA
B64	203x102x23 UB + 150x90x10 UA
B65	356x368x177 UC
B66	686x254 UB152 + 200x100x15 UA
BR1	100 x 10 MS plate cross-brace
BR3	30mm macalloy bar
EA1	100x100x10 EA fixed to perimeter
EA2	150x150x12 EA
RCB1	700d x 230w RC

Column Schedule

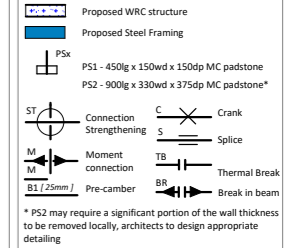
C1	203x203x46 UC
C2	203x203x86 UC
C3	254x254x89 UC
C4	356x406x235 UC
C5	250x150x14.2 RHS
C6	152x152x30 UC
C7	203x203x46 UC cranked column
C8	203x203x46 UC cranked column
C-one	305x305x137 UC

Fabricated beam Schedule

Beam Ref.	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	Weight (kg/m)
F802	150	400	60	400	60	20	145.00
F802	480	340	25	340	25	10	148.00



Detail Key



Floor Legend

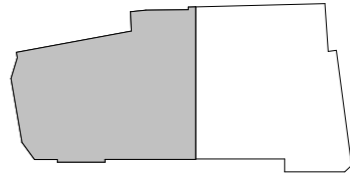
	RC Slab	Profiled metal deck	Timber floor
1	130 thk profiled NWC slab on TATA Comflor 60 1.0 mm gauge deck with A193 mesh top and 1 no. H16 bar per trough		
2	200 thk profiled NWC slab on TATA Comflor 60 1.0 mm gauge deck with A193 mesh top and 1 no. H16 bar per trough		
3	200 d x 75 w C24 joists at 400 crs with 18 thk plywood screwed to top face		
4	200 d x 50 w C24 joists at 400 crs with 18 thk plywood screwed to top face		
5	200 thk RC slab		
6	300 thk RC slab		
7	250 thk RC slab		
8	150 thk profiled NWC slab on TATA Comflor 60 1.0 mm gauge deck with A193 mesh top and 1 no. H16 bar per trough		
9	100 d x 50 w C24 joists at 400 crs with 18 thk plywood screwed to top face		
10	8mm steel checker plate		

C3	01.02.19	JH	GG	Revised Construction Issue
C2	24.12.18	AA	GG	CONSTRUCTION ISSUE
C1	23.11.18	AA	GG	DRAFT CONSTRUCTION ISSUE
T1	12.09.18	JH	GG	Revised Tender Issue
Rev	Date	By	Eng	Amendments

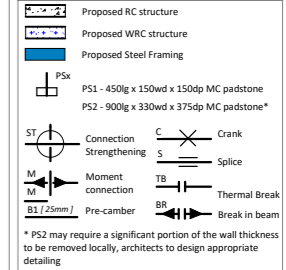


Job Name
The Hope Project

Drawing Title
Proposed Third Floor Plan 2



Detail Key



Floor Legend

RC Slab	Profiled metal deck	Timber floor
1	130 thk profiled NWC slab on TATA Comform 60 1.0 mm gauge deck with A193 mesh top and 1 no. H16 bar per trough	
2	200 thk profiled NWC slab on TATA Comform 60 1.0 mm gauge deck with A193 mesh top and 1 no. H16 bar per trough	
3	200 d x 75 w C24 joists at 400 crs with 18 thk plywood screwed to top face	
4	200 d x 50 w C24 joists at 400 crs with 18 thk plywood screwed to top face	
5	200 thk RC slab	
6	300 thk RC slab	
7	250 thk RC slab	
8	150 thk profiled NWC slab on TATA Comform 60 1.0 mm gauge deck with A193 mesh top and 1 no. H16 bar per trough	
9	100 d x 50 w C24 joists at 400 crs with 18 thk plywood screwed to top face	
10	8mm steel checker plate	

Indicates 19mm dia x 100 long shear studs. 1No per rib
For details of support angle locations to Comform deck refer to drawings P400 to P406

Beam Schedule

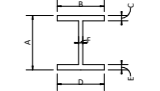
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B2	203x203x46 UC + 150x90x10 UA
B4	203x203x46 UC + 150x90x10 UA
B5	254x254x89 UC + 200x100x10 UA
B6	610x305x238 UB
B7	203x203x46 UC
B8	356x171x57 UB + 150x90x10 UA
B9	254x254x107 UC + 200x100x10 UA
B10	305x305x97 UC + 200x100x10 UA
B11	250x150x10 RHS
B12	150x150x10 SHS
B14	305x305x137 UC + 200x100x10 UA
B15	250x150x14.2 RHS
B17	457x191x89 UB + 150x90x10 UA
B18	533x210x92 UB + 150x90x10 UA
B19	533x210x109 UB + 150x90x10 UA
B20	406x140x53 UB
B21	356x171x45 UB
B22	305x102x28 UB
B23	254x102x25 UB
B24	254x102x25 UB + 150x90x10 UA
B25	254x146x17 UC + 150x90x10 UA
B26	356x171x51 UB + 150x90x10 UA
B27	305x102x28 UB + 150x90x10 UA
B28	152x152x23 UC
B29	203x102x23 UB
B30	254x254x89 UC
B31	305x305x97 UC
B32	200x90x30 PFC
B33	200x100x10 UA
B34	200x100x10 UA
B35	254x254x89 UC
B36	305x305x97 UC
B37	200x90x30 PFC
B38	457x191x131 UB + 150x90x10 UA
B39	254x254x132 UC + 200x100x10 UA
B40	305x305x283 UC + 200x100x10 UA
B41	300x200x12.5 RHS + 100x100x10 EA
B42	150x150x15 SHS
B43	305 UC240 + 200x100x10 UA
B44	203x203x100 UC + 150x90x10 UA 2
B45	686x254 UB125 + 200x100x10 UA
B46	254x254x167 UC + 200x100x10 UA
B47	254x254x167 UC + 200x100x10 UA
B48	305x305x198 UC + 200x100x10 UA
B49	200x90x30 PFC
B50	457x152x89 UB + 150x90x10 UA
B51	203x102x23 UB + 150x90x10 UA
B52	356x171x77 UC
B53	686x254 UB152 + 200x100x15 UA
B54	100 x 10 MS plate cross-brace
B55	30mm macalloy bar
B56	100x100x10 EA fixed to perimeter
B57	150x150x12 EA
B58	700d x 230w RC

Column Schedule

C1	203x203x46 UC
C2	203x203x46 UC
C3	254x254x89 UC
C4	356x406x235 UC
C5	250x150x14.2 RHS
C6	152x152x30 UC
C7	203x203x46 UC cranked column
C8	203x203x46 UC cranked column
C-one	305x305x137 UC

Fabricated beam Schedule

Beam Ref	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	Weight (kg/m)
F801	550	400	60	400	60	20	145.00
F802	480	340	25	340	25	10	168.00



C4	27.02.19	JH	GG	Revised Construction Issue
C3	01.02.19	JH	GG	Revised Construction Issue
C2	24.12.18	AA	GG	CONSTRUCTION ISSUE
C1	23.11.18	AA	GG	DRAFT CONSTRUCTION ISSUE
T1	12.09.18	JH	GG	Revised Tender Issue
Rev	Date	By	Eng	Amendments



STRUCTURAL ENGINEERS

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Job Name
The Hope Project

Drawing Title
Proposed Fourth Floor Plan 2

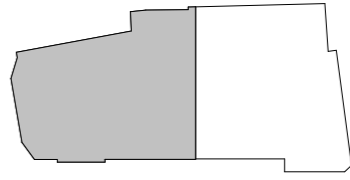
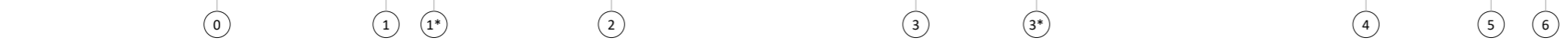
Purpose of Issue **Construction** Scale at A0 **1:50**
Drg No **1444/P142** Rev **C4**

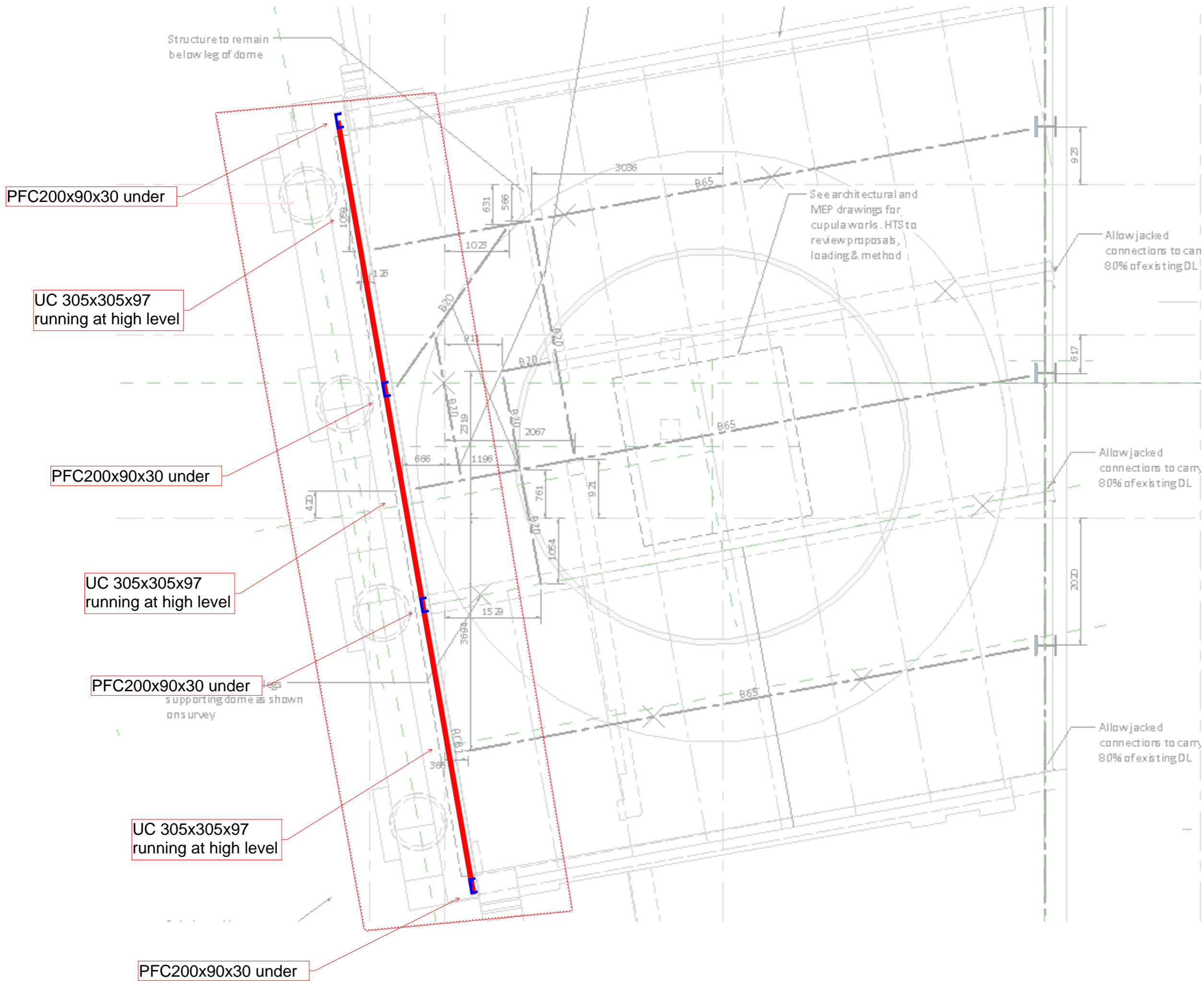
PFC200x90x30,
110mm from face of wall

PFC200x90x30,
110mm from face of wall

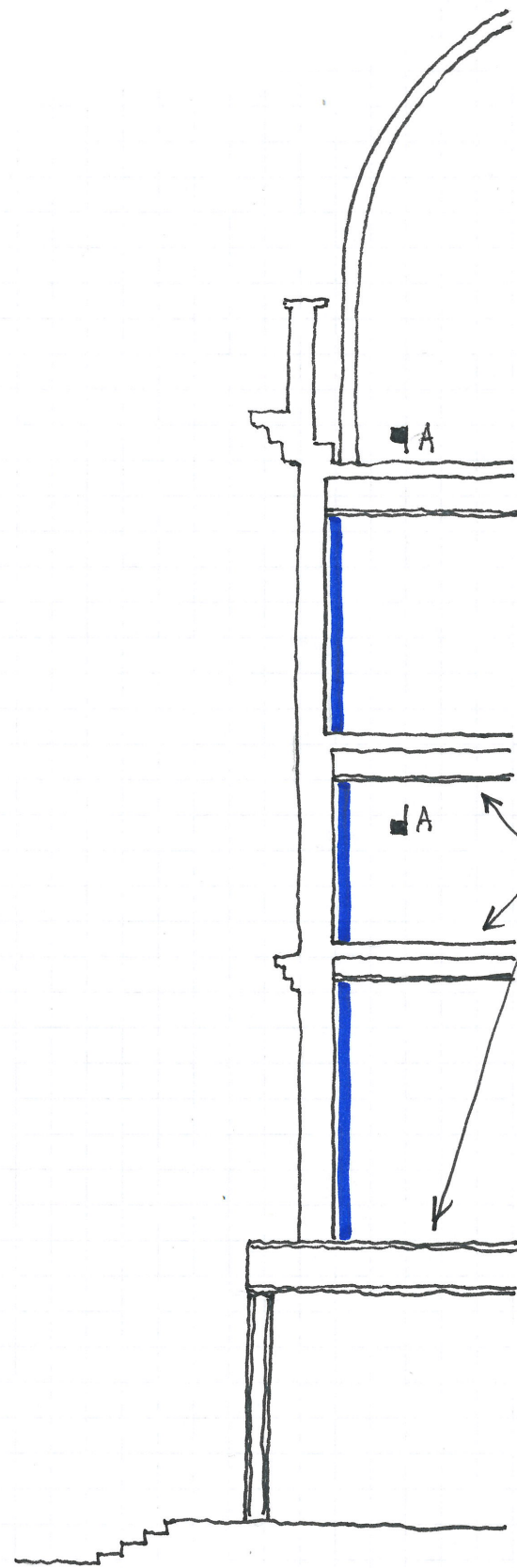
PFC200x90x30,
110mm from face of wall

PFC200x90x30,
110mm from face of wall



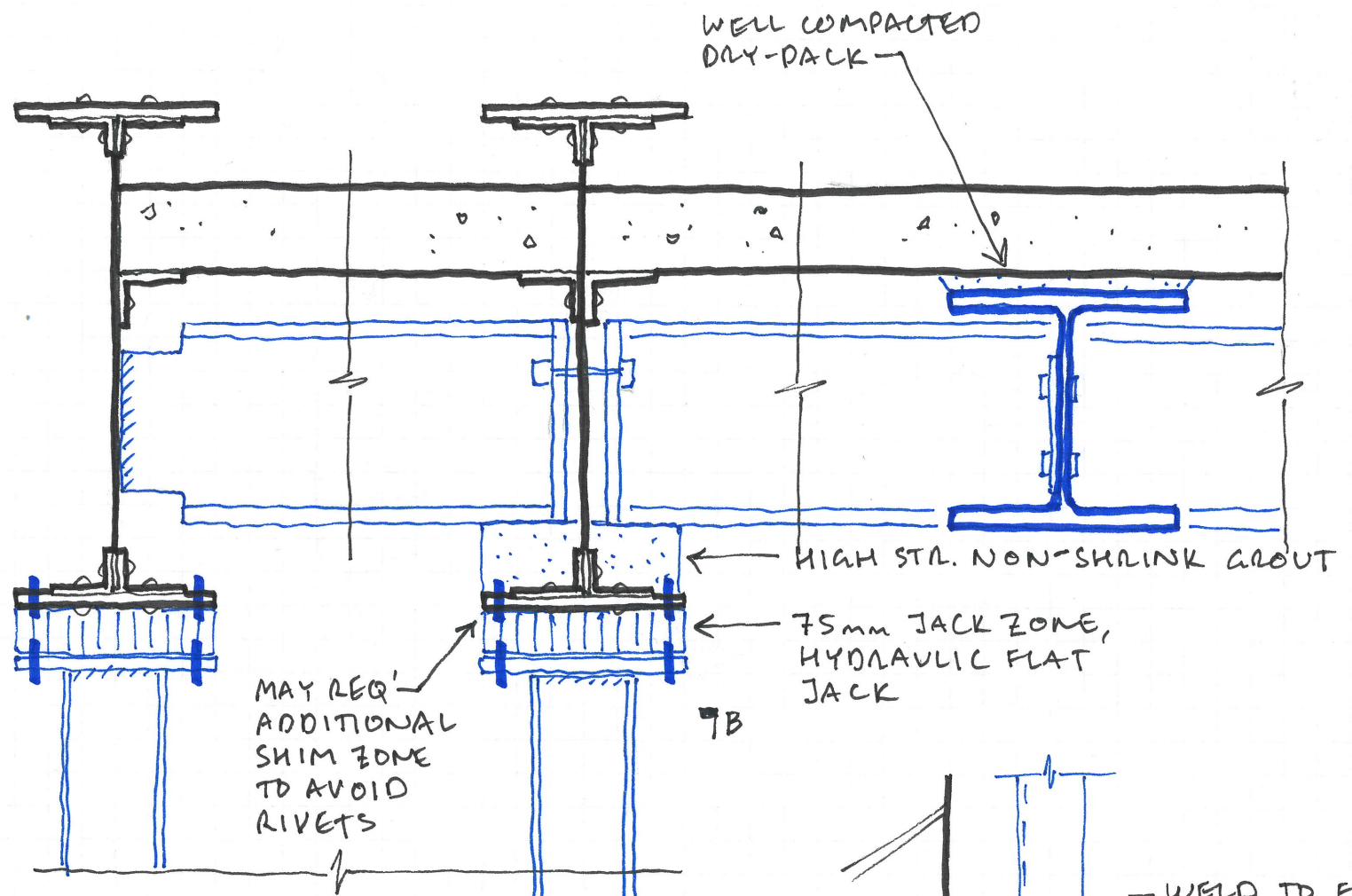


**HIGH LEVEL
4TH FLOOR**



SECTION
1:100@A3

BEAM SIZES TO BE CONFIRMED DURING WORKS FOR HTS REVIEW

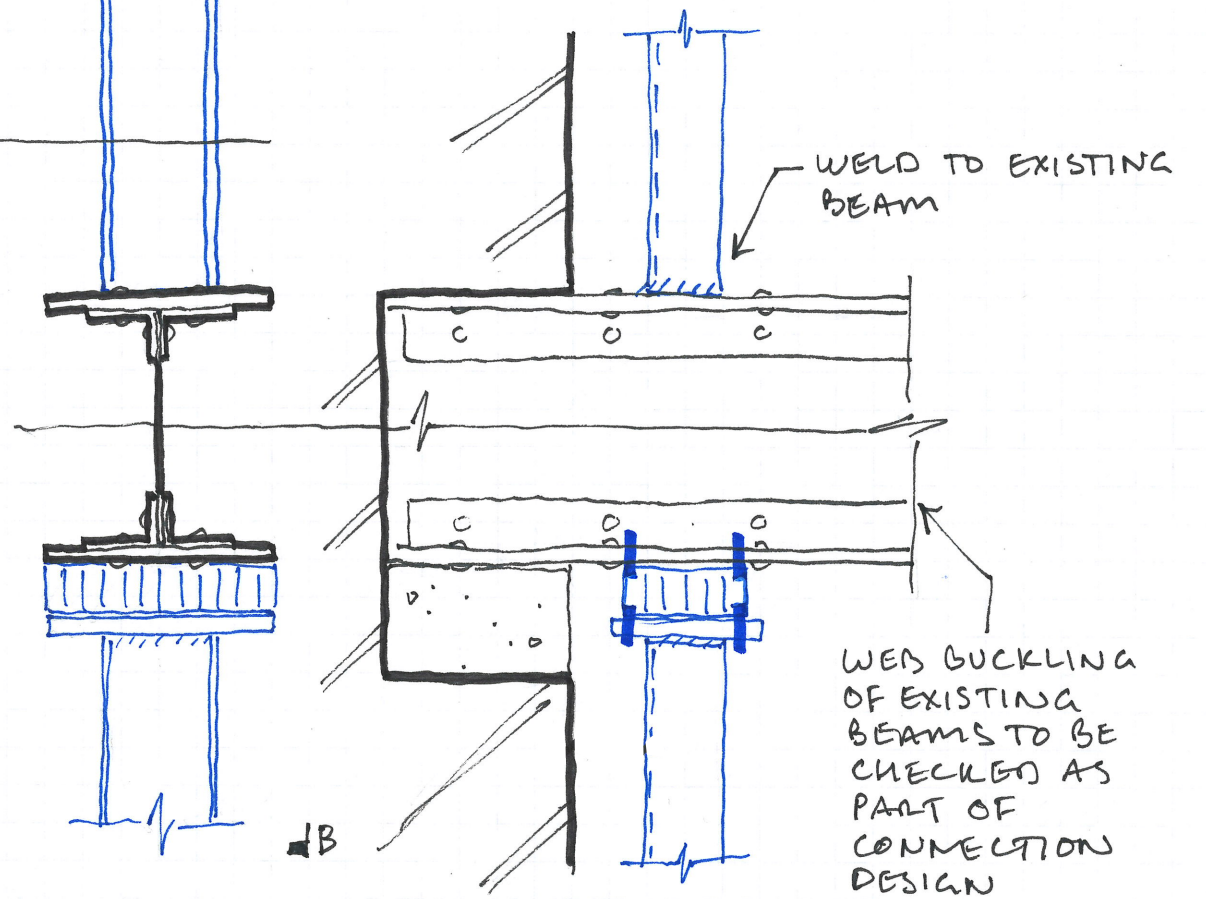


SECTION A-A
1:10@A3

JACKING LOAD

LOCATION	VALUE*
A	0+
B	80 kN
C	0+
D	50 kN

* VALUES NOT TO BE EXCEEDED, APPLY ON ALL FLOOR LEVELS
+ NO JACK REQUIRED



SECTION B-B
1:10@A3

Job W010

Date 25/03/19

Title FRONT PIERS

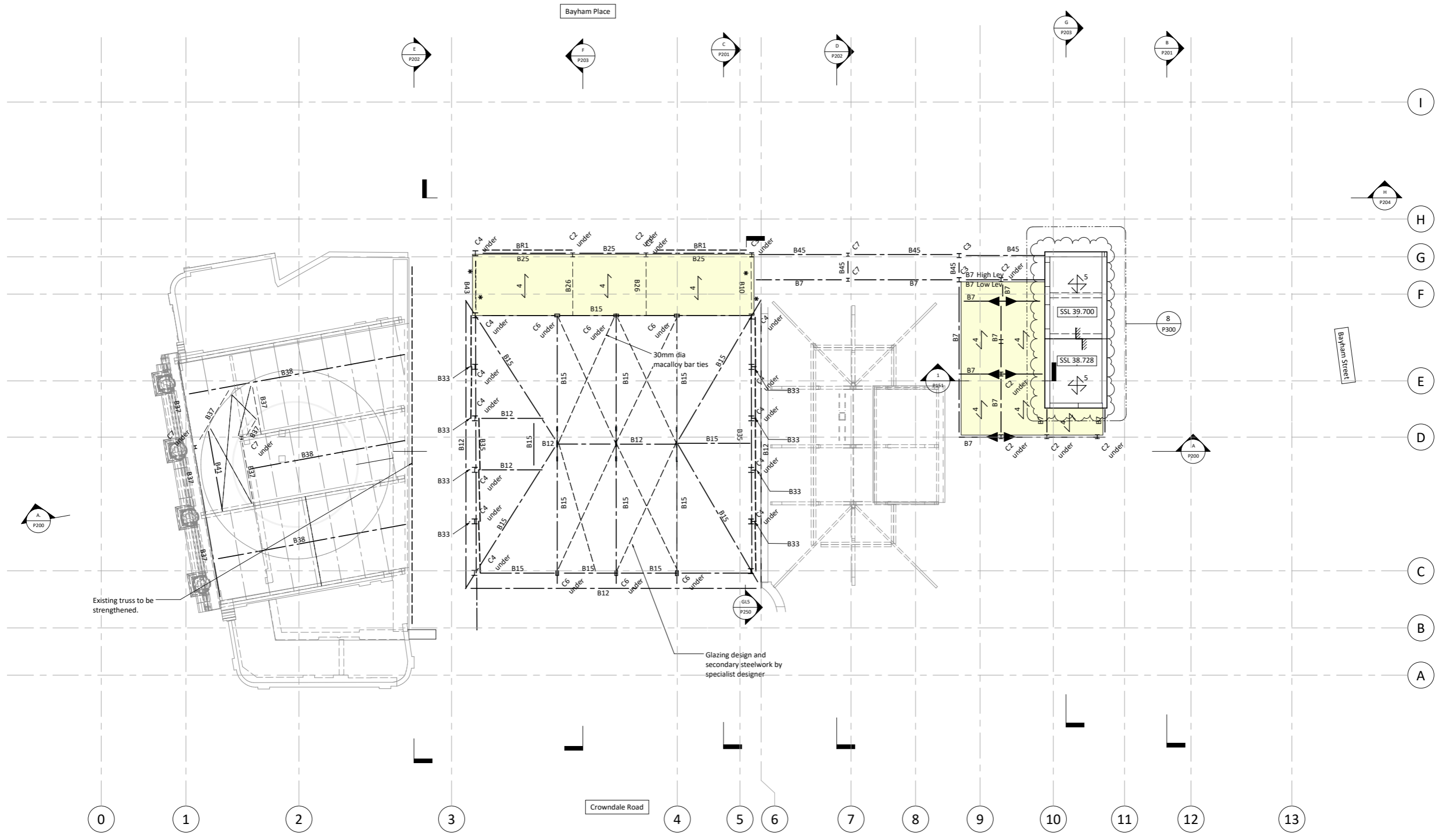
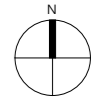
Eng. GA

Job No. 1444

Sheet SK-174

Rev. I 01

Appendix B – Currently Agreed Solution



Existing truss to be strengthened.

Glazing design and secondary steelwork by specialist designer

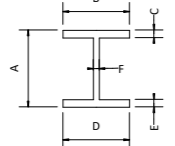
- 1 This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
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- 3 Existing foundation information based on limited site investigations. Materials, construction and sizes to be verified during construction.
- 4 Allow for cast in weld plates to connect all beams to RC core walls.

Column Schedule

C2	203x203x46 UC
C3	203x203x86 UC
C4	254x254x89 UC
C5	356x406x235 UC
C6	250x150x14.2 RHS
C7	152x152x30 UC
C9	203x203x46 UC cranked column

Fabricated beam Schedule

Beam Ref.	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	Weight (kg/m)
FB01	550	400	60	400	60	20	445.00
FB02	480	340	25	340	25	10	168.00



Beam Schedule

B1	203x203x46 UC + 200x100x10 UA
B2	203x203x60 UC + 150x90x10 UA
B4	203x203x86 UC + 150x90x10 UA
B5	254x254x89 UC + 200x100x10 UA
B6	610x305x238 UB
B7	203x203x46 UC
B10	305x305x97 UC + 200x100x10 UA
B12	150x150x10 SHS
B14	305x305x137 UC + 200x100x10 UA
B15	250x150x14.2 RHS
B17	457x191x89 UB + 150x90x10 UA
B18	533x210x92 UB + 150x90x10 UA
B19	533x210x109 UB + 150x90x10 UA
B23	356x171x45 UB
B25	305x102x28 UB
B26	254x102x25 UB
B27	254x102x25 UB + 150x90x10 UA
B30	356x171x51 UB + 150x90x10 UA
B31	305x102x28 UB + 150x90x10 UA
B33	152x152x23 UC
B34	203x102x23 UB
B35	254x254x89 UC
B37	305x165x46 UB
B38	305x305x240 UC
B40	203x203x113 UC
B41	254x254x73 UC
B42	356x368 UC153 + 200x100x10 UA
B43	305x305x97 UC
B44	200x150x12.5 RHS laid flat
B45	150x100x8 RHS laid flat
BR1	100 x 10 MS plate cross-brace
BR3	30mm macalloy bar
EA1	100x100x10 EA fixed to perimeter

Floor Legend

	1 130 thk profiled NWC slab on TATA Comflor 60 1.0 mm gauge deck with A193 mesh top and 1 no. H16 bar per trough
	2 200 thk profiled NWC slab on TATA Comflor 60 1.0 mm gauge deck with A193 mesh top and 1 no. H16 bar per trough
	3 200 d x 75 w C24 joists at 400 crs with 18 thk plywood screwed to top face
	4 200 d x 50 w C24 joists at 400 crs with 18 thk plywood screwed to top face
	5 200 thk RC slab
	6 300 thk RC slab
	7 250 thk RC slab
	8 150 thk profiled NWC slab on TATA Comflor 60 1.0 mm gauge deck with A193 mesh top and 1 no. H16 bar per trough
	9 100 d x 50 w C24 joists at 400 crs with 18 thk plywood screwed to top face

* Indicates angle welded to web of beam. Size indicated in table above

Indicates 19mm dia x 100 long shear studs. 1No per rib

Detail Key

	Proposed RC structure
	Proposed WRC structure
	Proposed Steel Framing
	PS1 - 450lg x 150wd x 150dp MC padstone
	Connection Strengthening
	Moment connection
	B1 [25mm] Pre-camber
	C Crank
	S Splice
	TB Thermal Break
	BR Break in beam

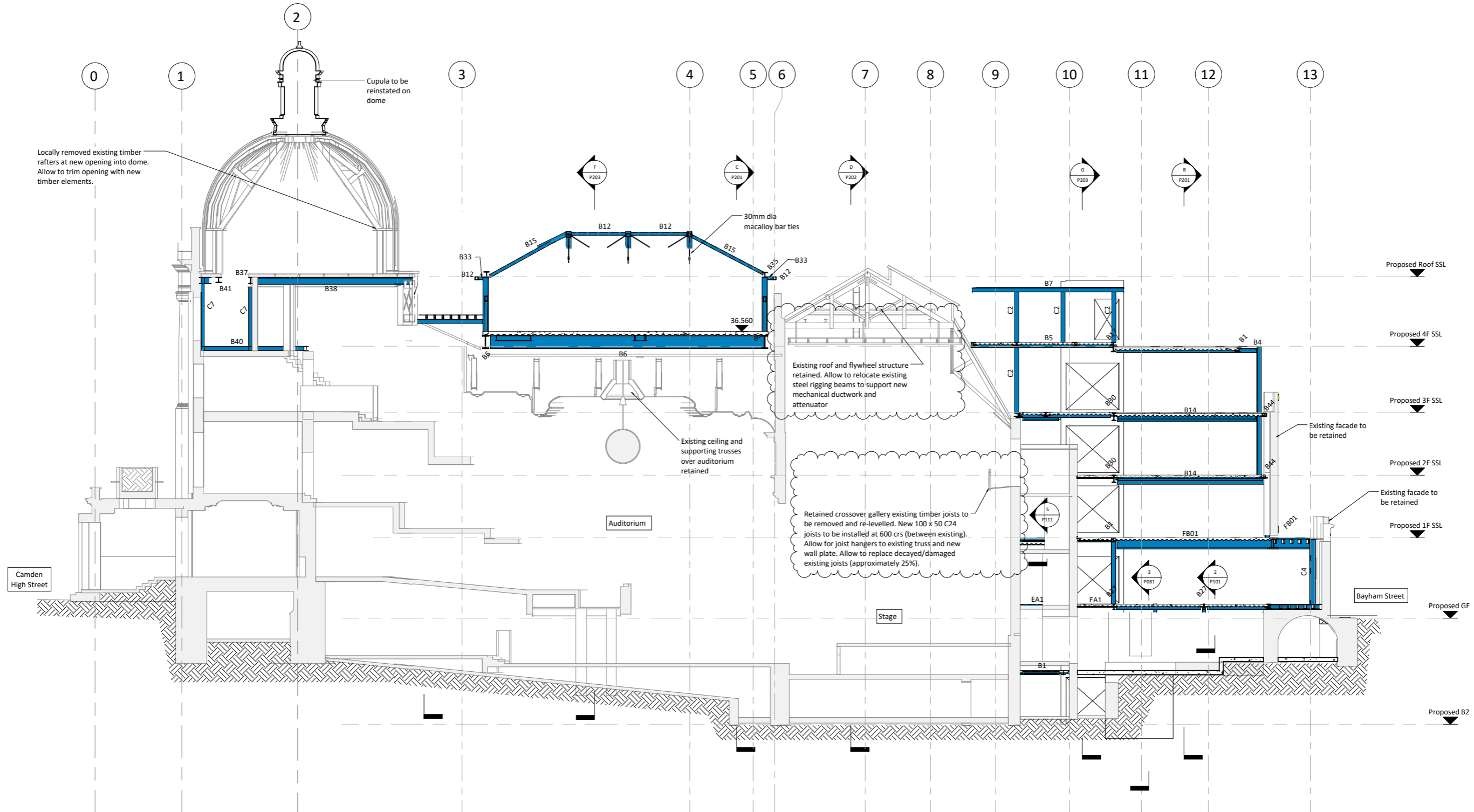
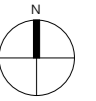
T2	20.03.18	AA	AC	Revised Tender Issue
T1	02.03.18	JH	AC	Tender Issue
Rev	Date	By	Eng	Amendments

HEYNE TILLET STEEL STRUCTURAL ENGINEERS
hts.uk.com

Job Name
The Hope Project

Drawing Title
Proposed Roof Plan

Purpose of Issue **Tender** Scale at A1 **1 : 100**
Drg No **1444 / P150** Rev **T2**



Section A-A
1 : 100

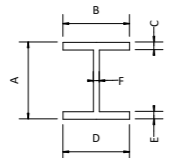
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