UCLH Roof Mounted Solar PV Systems
Load Assessment Report

CNM Project: **11237**
Author: **John Matthews**
Date: **24 May 2022**
Revision: **P1**

1.0 Introduction

Clarke Nicholls Marcel (CNM) has been instructed by Mitie FM Ltd to complete a load assessment report the installation of multiple flat roof mounted solar PV systems at the University College London Hospital (UCLH) campus.

Initially PV systems were to be mounted on the Podium building roof, Tower building roof and EGA building roof.

However following a site visit CNM understand that it has been decided that the Tower roof will not be used due to concerns about wind loading.

Therefore this load assessment report only considers the Podium and EGA roof structure.

This report should be read in conjunction with all other Consultants drawings, reports and specifications.

2.0 Existing Structure

The Podium building was opened in 2005 at the same time as the Tower building.

The building structure is primarily constructed using a reinforced concrete frame with some structural steelwork on the southern elevation over the loading bays.

The main central roof slab is 250mm deep and laid to falls with a ridge line running east-west along the length of the building and hip lines into the corners.

This central roof area has no higher level structure or plant, which CNM understand is related to the original planning requirements.

The Podium roof level was therefore designed for a nominal roof imposed loading of 1.5kN/m^2 only.

FLOOR LOADINGS (kN/m^2)			
LOCATION	ROOF GENERALLY		
LIVE LOAD	1.5	FINISHES	2.2
		CEILING/ SERVICES	1.0
		PARTITIONS	
FIRE PERIOD	1.5 HRS. GENERALLY		

Figure 2.1 – Podium roof loading data from GA drawing

An 1850mm wide lower level roof runs around the northern, western, and southern perimeters of the building. The eastern perimeter abuts the steel framed Atrium sail roof structure.

The roof level general arrangement drawing 27/PGA/111 revision 17 and level 5 (roof) sections drawing 20/PGA/211 revision 11 are both contained in the appendix of this report.

The EGA building formed the second phase of the original UCLH PFI development and was opened in 2008.

The building structure is constructed using a reinforced concrete frame.

The main roof slab varies between a minimum of 300mm deep and a maximum of 400mm deep with the top level laid to falls, primarily from the central area and the corners to an internal valley line, and the soffit level constant.

This central roof area has an almost rectangular plantroom structure constructed using reinforced concrete to enclose the lift motor rooms and other plant above the central lift and stair core.

The main roof structure was future-proofed at design stage to allow for a roof garden.

The roof level was therefore designed for a nominal roof imposed loading of 5.0kN/m^2.

FLOOR LOADINGS (kN/m^2)			
LOCATION	ROOF		
LIVE LOAD	5.0	FINISHES	3.2
		CEILING/ SERVICES	1.0
		PARTITIONS	
FIRE RESIST	1.5 HOURS		

Figure 2.2 – EGA roof loading data from GA drawing

The EGA roof level general arrangement drawing 27/EGA/110 revision 09 and level 5 (roof) sections drawing 20/EGA/210 revision 08 are both contained in the appendix of this report.

3.0 Roof Mounted Solar PV System

CNM have received the Mitie Energy UCLH PV Solar Assessment and Design report dated 07/12/21 by email from Ross Holt of Mitie on 4 May 2022.

This report indicates that it is proposed to use the Podium, Tower and EGA roofs for roof mounted solar PV systems, as shown on the following figure.

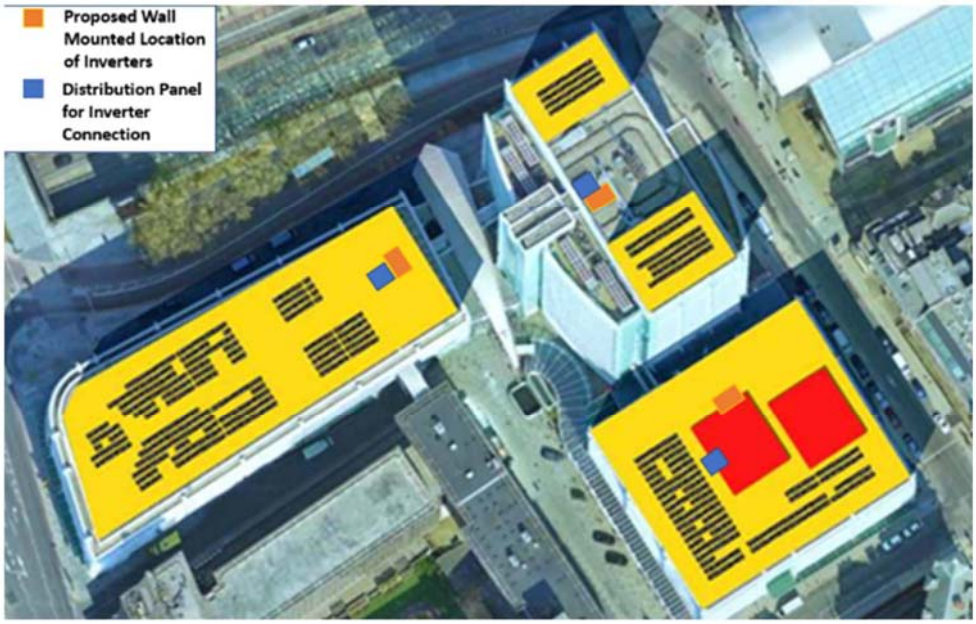

Figure 3.1 – Proposed solar PV system layout taken from Mitie report.

CNM received a further email from Ross Holt on Mitie on 19 May 2022 stating the following:

I met with Photon on Tuesday to survey the roofs. The plan is to not use the Tower now due to the potentially high winds, and so spread everything over Podium and EGA.

Therefore this report is only assessing the Podium and EGA roof loading capacity.

3.1 Solar PV System Loading

Section 15 of the Mitie Energy report states that a structural loading assessment is required, per the following figure.

> **15 Structural Assessment**
>
> A structural assessment will be required to ensure the building can accommodate additional roof loadings. Roof loadings vary depending on systems size on each building.
>
> For the Tower, given the height of the building, it is recommended that consoles are installed and directly affixed to the building. This will require a specific design and specification by the manufacturer, Van der Valk delivered free of charge.
>
> **Action:** Van der Valk will need details of the roof structure to facilitate this design.
>
> For the podium and the EGA roofs the system will be self-ballasted and has been calculated with loadings of 0.27 kN/m^2. The report for these lower roofs accompanies this document.

Figure 3.2 – Section 15 of the Mitie Energy report.

The Tower loading information in the text is now no longer required as this area is not being used.

The text states that for the Podium and EGA roofs the system will be self-ballasted and has been calculated with loadings of 0.27kN/m^2.

4.0 Load Assessment

The following sections summarise the load assessment for each of the building roofs.

4.1 Podium Block Roof Load Assessment

The existing roof slab was designed for an imposed load capacity of 1.5kN/m^2 and the proposed solar PV systems loading requirement is 0.27kN/m^2.

Therefore the existing roof slab can support the proposed solar PV system whilst also still retaining a sufficient redundancy for snow and loading.

4.2 EGA Block Roof Load Assessment

The existing roof slab was future-proof designed for an imposed load capacity of 5.0kN/m^2 to allow for an accessible roof garden space for Trust staff use.

The proposed solar PV systems loading requirement is 0.27kN/m^2.

Therefore the existing roof slab can support the proposed solar PV system whilst also still retaining a significant redundancy for snow loading.

5.0 Appendix A

5.1 Record Structural Drawings

The following CNM record structural general arrangement drawings are contained in this appendix.

- 8141/27/PGA/111 revision 17 Existing Podium Block Roof Plan
- 8141/20/PGA/211 revision 11 Existing Podium Block Level 5 (Roof) Sections
- 8141/27/EGA/110 revision 09 Existing EGA Block Roof Plan
- 8141/20/EGA/210 revision 08 Existing EGA Block Level 5 (Roof) Sections

NOTES
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CONCRETE DATA

MEMBER	MIX	AGG.	28 DAY CUBE	MIn.CEM/CONT	W/C RATIO
FOUNDATIONS					
COLUMNS	C40	20mm	40 N/mm ^{2}	300	0.50
WALLS	C40	20mm	40 N/mm ^{2}	300	0.50
SLABS	C40	20mm	40 N/mm ^{2}	300	0.50
BEAMS	C40	20mm	40 N/mm ^{2}	300	0.50

FLOOR LOADINGS (kN/m^2)

LOCATION	ROOF GENERALLY		
LIVE LOAD	1.5	FINISHES	2.2
		CEILING/ SERVICES	1.0
		PARTITIONS	
FIRE PERIOD	1.5 HRS. GENERALLY		
LOCATION			
LIVE LOAD		FINISHES	
		CEILING/ SERVICES	
		PARTITIONS	
FIRE PERIOD			

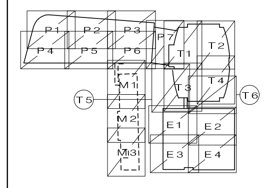
WINDOW CLEANING CRADLE REACTIONS

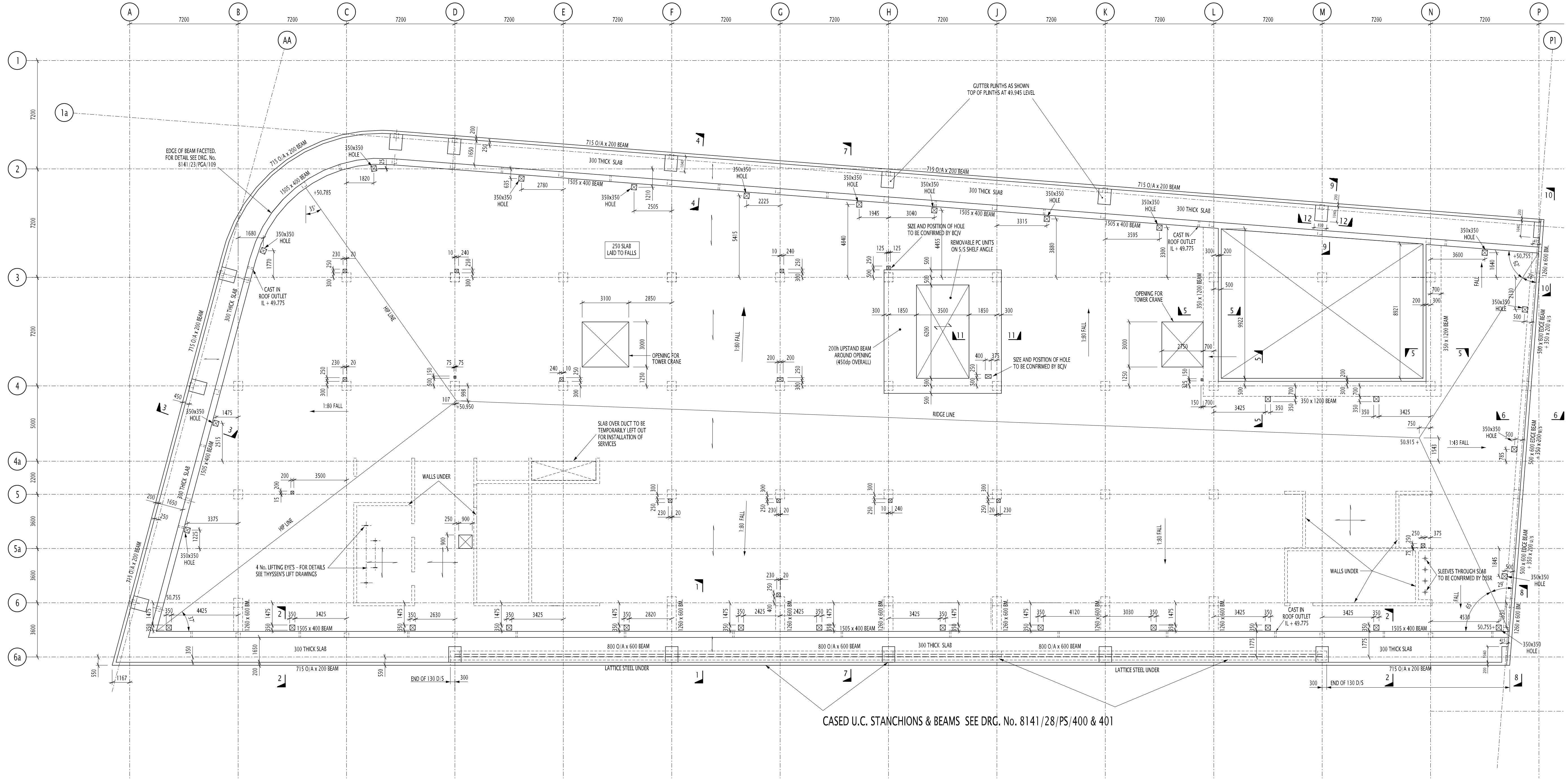
LIVE LOAD (TRAVELLING)	+40kN (REAR)	FRONT AND REAR LOADS REVERSE AT PARKING
	+60kN (FRONT)	
TOTAL MACHINE WEIGHT	+100kN	
FIRE PERIOD	ROOF SLAB OVER ELECTRICAL SUBSTATION 4 HOURS	

TO BE ADVISED BY CRADLE SPECIALIST

	Revisions	Date	By
00	STATUS REVISED TO CONSTRUCTION.	01.06.00	CY
01	MINOR REVISIONS FOLLOWING SQUAD CHECK.	10.08.00	CY
02	STATUS REVISED TO TENDER.	06.10.00	CY
03	WINDOW CRADLE LOADS REVISED.	30.11.00	CY
04	ISSUED FOR CONSTRUCTION.	22.10.01	CY
05	TOWER CRANE OPENINGS ADDED. HOLE THROUGH SLAB AND TRIMMING BEAMS ADDED AT GRIDS D-E/3-4. WINDOW CLEANING TRACK, PLINTHS etc OMITTED. PLINTHS ADDED AT LOW LEVEL SLAB AROUND PERIMETER. UPSTANDS ADDED GRIDS L-N/2-4. CONFIRMATION NOTES ADDED TO BEAMS. LEVELS ADDED/REQUESTED. UPSTAND REVISED ADJACENT GRID P1.	26.02.02	JA/CY
06	NORTH WEST EDGE REVISED TO BUG DRG HS229_CL REV 01C. PERIMETER PLINTHS REVISED/DELETED. UPSTAND REVISED ADJACENT GRID L-N/1a-3. SECTION 12 ADDED.	11.04.02	CY
07	GUTTER PLINTHS REVISED AT ARCHITECT'S REQUEST.	10.07.02	JA
08	SLAB LEVEL GRID M/4 REVISED.	03.09.02	JPC
09	UPSTAND POSITION & WIDTH REVISED GRID L/1a-4, L-N/1a & N/1a-4. BUILDERSWORK HOLES & CAST IN ROOF OUTLETS ADDED. TEMPORARY HOLES IN SLAB ADDED GRID E/4a & N/5-6. ROOF RIDGE SETTING OUT ADDED.	10.10.02	JPC
10	BUILDERSWORK HOLES REVISED. DOWNSTAND BEAM ADDED GRID N/5-5a. BEAM AROUND HOLE GRID L-N/1a-4 REVISED TO 1200 WIDE.	30.10.02	JPC
11	B/W HOLE REVISED GRID H-J/6-6a. NOTE OF LIFTING EYE'S ADDED.	06.11.02	JPC
12	UPSTANDS ON GRID P1 DECREASED TO 350 HIGH. BEAMS ABOVE SL1 & SL2 LMR (C-D/5a) OMITTED.	27.11.02	DJB
13	HOLES REVISED/ADDED TO BCJV REQUIREMENTS. PLANT ACCESS OPENING RELOCATED TO BCJV REQUIREMENTS.	19.12.02	JA
14	CORE 2 HOLE ADDED TO ARCHITECT'S REQUIREMENTS. TRIMMER BEAMS REMOVED AROUND ORIGINAL PLANT ACCESS OPENING (GRIDS D-E/3-4).	06.01.03	JA
15	CORE 2 HOLE REVISED TO ARCHITECT'S REQUIREMENTS.	19.02.03	JRM
16	TEMPORARY SLAB OPENINGS IN CORE 3 REMOVED AS NOT REQUIRED BY BCJV. TRIMMER BEAM N/5-5a OMITTED.	28.02.03	JRM
17	AS BUILT ISSUE.	01.12.04	JA

Key





FOR SECTIONS REFER TO DRG. No. 8141/20/PGA/211

FOR CAST- IN INSERTS SEE ARCHITECTS/SPECIALISTS DRAWINGS

NOTE
1. FOR BUILDERS WORK OVER PLANTROOMS SEE DOC. REF. No. 01219/10.003/SCH001. FINAL BUILDERS WORK REQUIREMENTS TO BE AGREED WITH STRUCTURAL ENGINEER.

2. FOR ROOF DRAINAGE HOLES SEE DOC. REF. No. 01219/10.003/SCH001.

User Client
University College London Hospitals NHS
NHS Trust

Project Co.
HMU
HEALTH MANAGEMENT (UCLH) plc

Contractor
BCJV
AMEC CAPITAL PROJECTS
BALFOUR BEATTY - HADEN YOUNG
Project Office, 301-305 Euston Road, London. NW1 3AD

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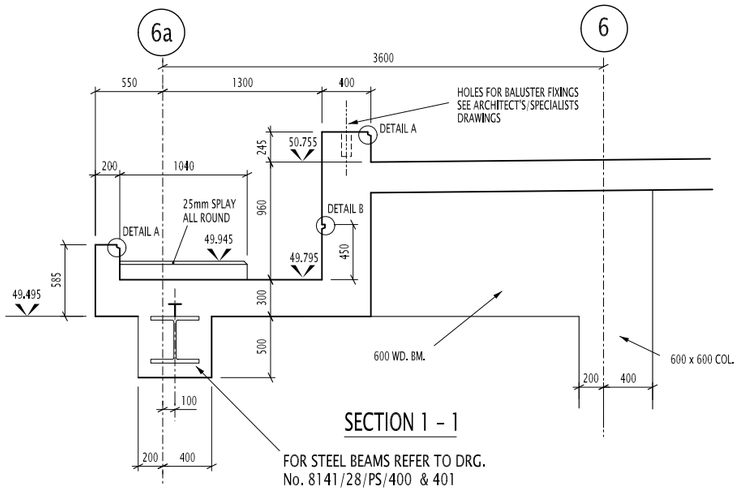
The Redevelopment of
University College London Hospitals
Euston Road Proposal

Drawing Title
Podium Block Roof Level

North	Drawing Status: AS BUILT	
Scale 1:100 @ A0		
Date 10.09.99	Drawn TRD	Checked JS
Job Number 8141	Drawing Number 27/PGA/111	Revision 17



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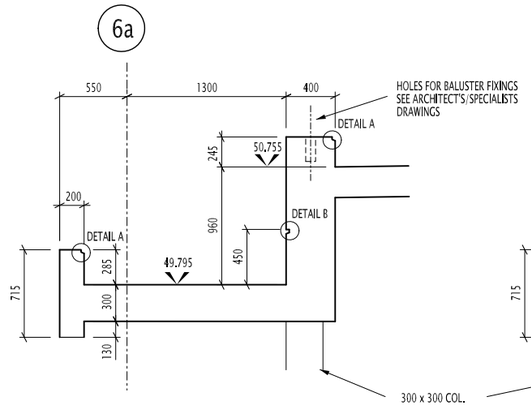

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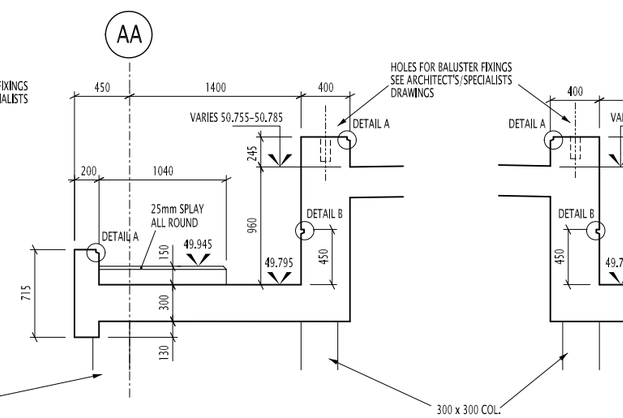

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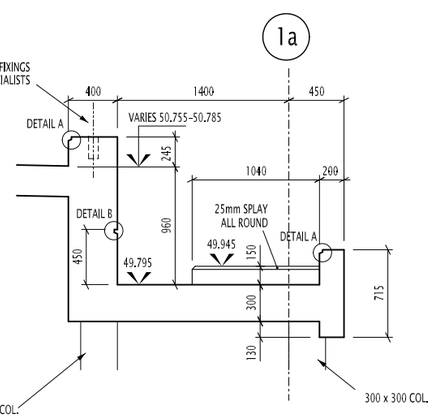

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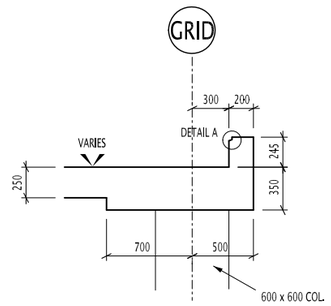

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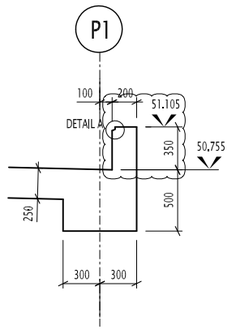

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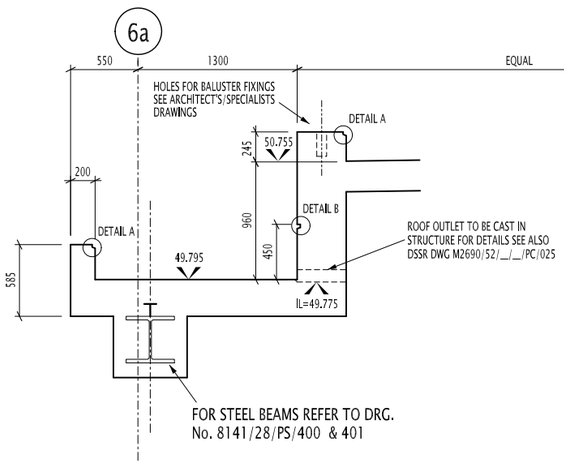

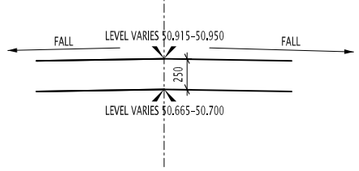

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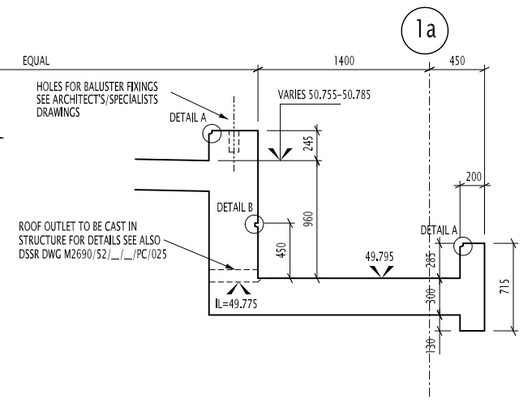
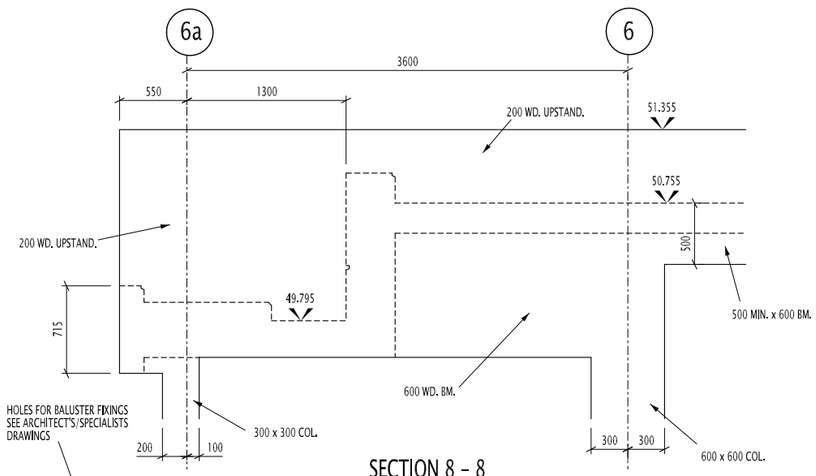
TYPICAL CROSS SECTION





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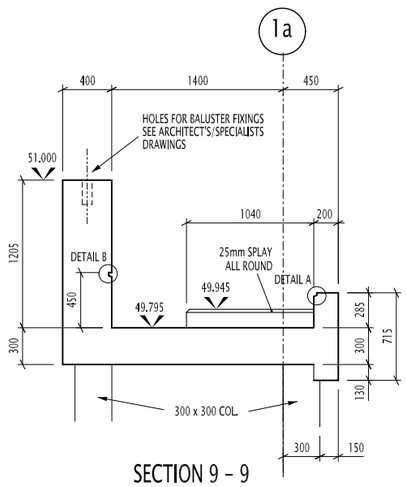

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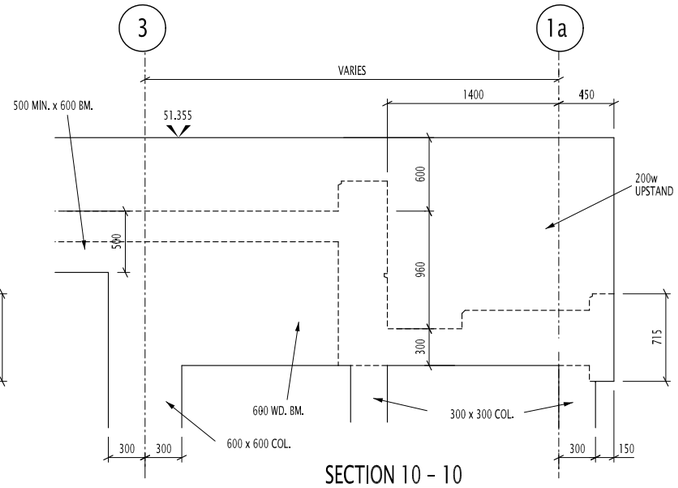

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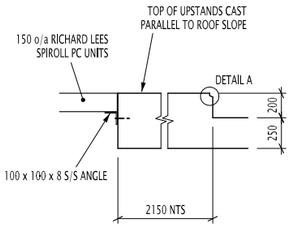
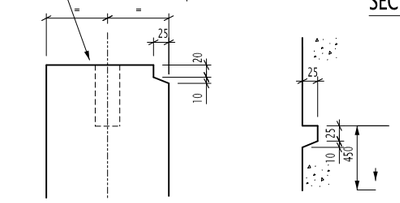
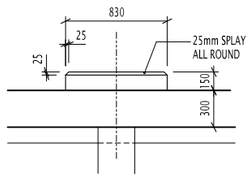


SECTION 11-11



DETAIL A (1:10)

DETAIL B (1:10)



SECTION 12 - 12

FOR LOCATION OF SECTIONS
REFER TO DRG. No.8141/27/PGA/111

FOR CAST- IN INSERTS SEE
ARCHITECTS/SPECIALISTS DRAWINGS

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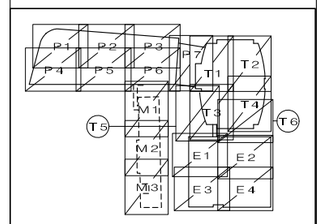
CONCRETE DATA

MEMBER	MIX	AGG.	28 DAY CUBE	Min.CEM/CONT	W/C RATIO
FOUNDATIONS					
COLUMNS	C40	20mm	40 N/mm²	300	
WALLS	C40	20mm	40 N/mm²	300	
SLABS	C40	20mm	40 N/mm	300	
BEAMS	C40	20mm	40 N/mm	300	

	Revisions	Date	By
A	ISSUED FOR COMMENTS.	22.11.99	WJS
B	ISSUED FOR COMMENTS.	17.12.99	WJS
C	ISSUED FOR INCLUSION IN PFI CONTRACTORS TENDER DOCUMENTATION.	27.01.00	WJS
00	STATUS REVISED TO CONSTRUCTION.	01.06.00	CY
01	STOOLING BOLT SIZES ADDED.	10.08.00	CY
02	STATUS REVISED TO TENDER.	06.10.00	CY
03	HANGING CRADLE FIXINGS ADDED. WINDOW CLEANING TRACK, PLINTHS,	26.02.02	PT/JA
	HOLDING DOWN DETAIL etc ALL OMITTED. PLINTHS ADDED AT LOW LEVEL		
	SLABS AROUND PERIMETER. 400w BEAMS DEPTH INCREASED. SECTIONS		
	REVISED TO SUIT AND DETAIL A ADDED. SECTION 11-11 ADDED.		
	DETAIL B ADDED, ARCHITECT CONFIRMATION NOTES ADDED,LEVELS		
	REVISED SECTION 7,UPSTAND ADDED SECTION 5. UPSTAND HEIGHT		
	REVISED SECTION 6. STATUS REVISED TO CONSTRUCTION.		
04	SECTION 12 ADDED. PLINTHS REVISED/DELETED SECTIONS 1,2,3,4,7,8.	11.04.02	CY
	BEAM LEVEL REVISED SECTIONS 8 & 10. UPSTAND PROFILE REVISED		
	SECTION 9.		
05	GUTTER PLINTHS REVISED AT ARCHITECT'S REQUEST.	10.07.02	JA
06	LEVELS REVISED SECTION 7-7.	03.09.02	JPC
07	UPSTAND WIDTH REVISED SECTION 5-5. ROOF OUTLET ADDED TO SECTION 7.	02.10.02	JPC
08	SECTIONS 1-1 & 7-7 REVISED. HOLES FOR BALUSTRADE FIXINGS INDICATED.	06.11.02	WJS
09	SECTION 6-6 REVISED.	27.11.02	DJB
10	SECTION 11-11 REVISED.	19.12.02	JA
11	AS BUILT ISSUE.	01.12.04	JA



User Client
University College London Hospitals NHS
NHS Trust

Project Co.
HEALTH MANAGEMENT (UCLH) plc

Contractor
BCJV
Project Office, 301-305 Euston Road, London. NW1 3AD

CN&M
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CONSULTING CIVIL & STRUCTURAL ENGINEERS
Galena House • Galena Road • Hammersmith • London • W6 0LT
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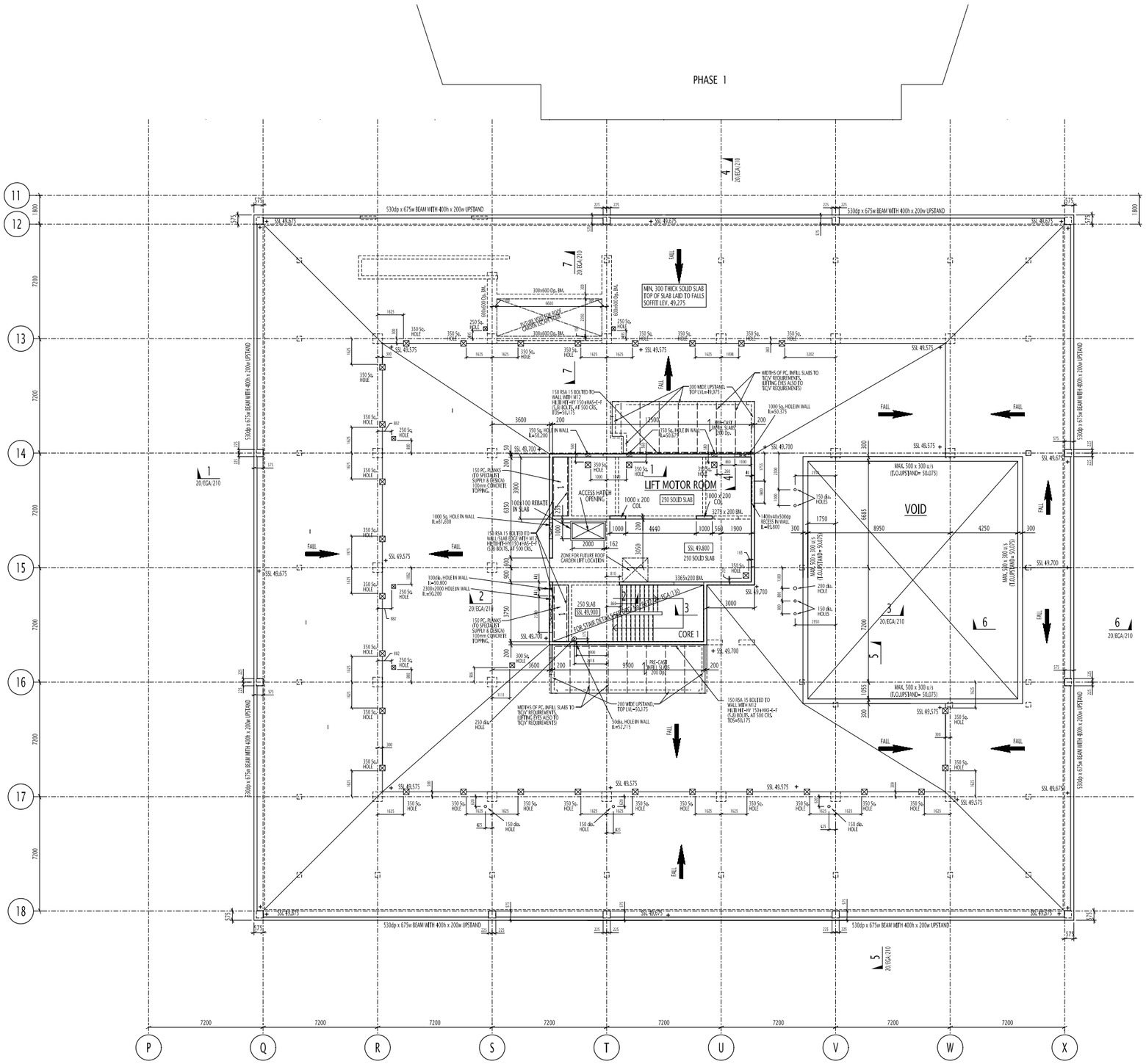
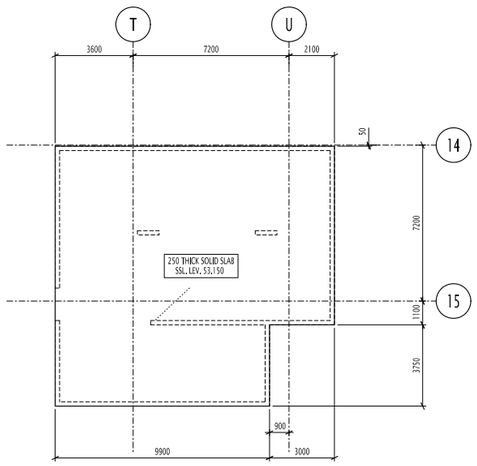
The Redevelopment of
University College London Hospitals
Euston Road Proposal

Drawing Title
Podium Block Level 5 Sections

North
Drawing Status: AS BUILT
Scale 1:25
Date 10.10.99
Drawn WJS
Checked JS
Job Number 8141
Drawing Number 20/PGA/211
Revision 11





ROOF PLAN TO LIFT MOTOR ROOM AND STAIRS

NOTES:

1) ALL WALLS 200th UNO.

2) FOR SECTIONS SEE DWG. 8832/20/EGA/210.

3) FOR CAST-IN INSERTS SEE ARCHITECT/SPECIALIST DRAWINGS.

4) FOR ROOF DRAINAGE SEE ALSO DSSR DRAWINGS.

5) FOR WINDOW CLEANING CRADLE TRACK PLINTH SETTING OUT SEE CENTO ENGINEERING CO. Ltd. DRAWING No. 12.027/E-14310

6) FOR HOLES THROUGH LIFT MOTOR ROOM SLAB REFER TO SPECIALIST'S DRAWINGS

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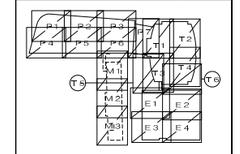
CONCRETE DATA (DESIGNATED CONCRETE)					
MEMBER	MIX	AGG.	STRENGTH CLASS	EXPOSURE CLASS	CONSTRUENCE
FOUNDATIONS					
COLUMNS	RC40	20	C32/40	XC1	S3
WALLS	RC40	20	C32/40	XC1	S3
SLABS	RC40	20	C32/40	XC1	S3
BEAMS	RC40	20	C32/40	XC1	S3

FLOOR LOADINGS (kN/m²)			
LOCATION	ROOF		
LIVE LOAD	5.0	FINISHES	3.2
		CEILING/ SERVICES	1.0
		PARTITIONS	
FIRE PERIOD	1.5 HOURS		
LOCATION			
LIVE LOAD		FINISHES	
		CEILING/ SERVICES	
		PARTITIONS	
FIRE PERIOD			

Revisions		Date	By
P1	UPDATED TO LATEST ARCHITECTS DRAWINGS.	30.11.04	FP
P2	LIFT MOTOR ROOM ADDED, ROOF RO LIFT MOTOR ROOM	20.01.05	FP
	AND STAIRS ADDED.		
P3	DIMENSIONS ADDED , LEVELS AND FALLS OF SLAB SHOWN.	13.04.05	WS
	EDGE BEAM ALONG PERIMETER ADDED.		
P4	TOWER CRANE OPENING DIMENSIONED.	19.07.05	WS
P5	LIFT MOTOR ROOM LEVELS REVISED, WALL OPENING REMOVED,	19.08.05	JC
	UPSTAND HEIGHT ADDED.		
00	LIFT MOTOR ROOM ROOF REVISED	07.10.05	WS
	ISSUED FOR CONSTRUCTION		
01	BUILDING PERIMETER REPOSITIONED.	16.12.05	JA
	HEIGHT OF UPSTANDS AROUND VOID REVISED.		
02	BUILDING PERIMETER REPOSITIONED-EO-CLADDING	09.06.06	JA
	SUB-CONTRACTOR'S REQUIREMENTS AND EDGE BEAMS REVISED.		
	SECTION MARK 6-6 ADDED, VOID ABOVE CHILLER ENCLOSURE		
	RELOCATED.		
03	UPSTAND TO LIFT MOTOR ROOM REMOVED. DRAWING UPDATED TO	25.09.06	JGH
	'NON FIRST /CHILLER COMPONENTS INCREASED & 'NON FIRST' ROOF		
	GARDEN FUTURE-PROOFING REQUIREMENTS.		
04	BEAM SHOWN GRIDS 16-6-1, ZONES FOR FUTURE ROOF GARDEN	16.10.06	WS
	LIFT & ESC. STAIRS SHOWN.		
05	AREAS SHOWN AS PRE-CASTEN CORE, AREA 13.5=E REVTD.,	07.12.06	JGH
	DOOR OPENINGS LAN CORE 1 AREA ADDED, DOOR OPENING		
	IN CORE 1 WALL // TO 16 REMOVED.		
06	350 Sq. HOLE IN LIFT MOTOR-ROOM SLAB AND	19.12.06	JGH
	WALL // TO N ADDED.		
07	3No. HOLES IN CORE 1 WALLS ADDED ADJ. GRIDS 8/14, 5a/17-	03.01.07	JGH
	8/14-15A, FARMENROOF PLINTHS ADDED.		
08	WALL EXTENT REDUCED & SLAB EXTENDED ADJ. GRIDS 15/E	29.07.07	WS
09	MINOR BUILDERSWORK HOLES THROUGH SLAB ADDED, HOLES	12.02.08	WS
	ADDED THROUGH CORE 1 WALLS ADJ. GRIDS 5a/15= & 8=16=.		
	RECESS FORMED IN SAB WALL ADJ. GRID 16/14=.		
	AS BUILT ISSUE.		



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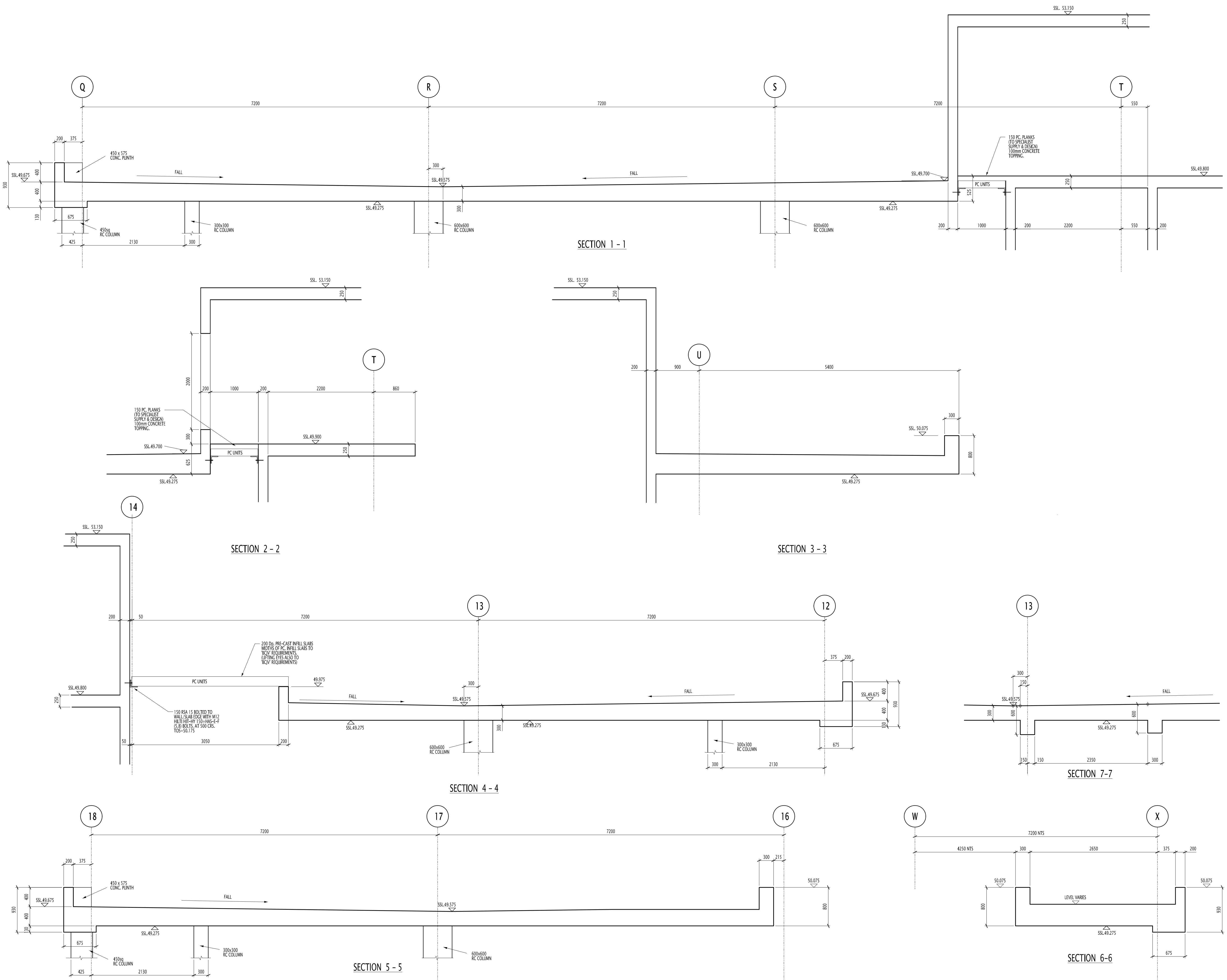
The Redevelopment of
University College London Hospitals
Euston Road Proposal

Drawing Title
EGA Block Roof

North	Drawing Status: AS BUILT		
Scale: 1:100 @ A0			
Date: 28.02.05	Drawn: JA	Checked: JRM	
Job Number: 8832	Drawing Number: 27/EGA/110	Revision: 09	



NOTES

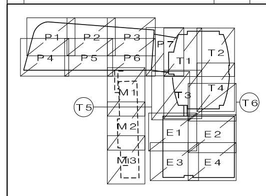
DO NOT SCALE. WORK TO FIGURED DIMENSIONS ONLY. ALL DIMENSIONS ARE QUOTED IN MILLIMETRES. THE CONTRACTOR IS TO CHECK ALL DIMENSIONS AND ANY ERRORS OR OMISSIONS ARE TO BE REPORTED TO THE ENGINEERS. ALL SIZES AND POSITIONS OF HOLES SHOWN ON THIS DRAWING SHOULD BE IN ACCORDANCE WITH THE LATEST REVISION OF THE RELEVANT SERVICES ENGINEERS DRAWINGS AT THE TIME OF ISSUE.

HOLES HAVE BEEN DIMENSIONED AND/OR POSITIONED ON R.C. DRAWINGS IN CERTAIN CASES WHERE THEY ARE PARTICULARLY IMPORTANT TO THE STRUCTURE. FINAL POSITION OF HOLES SHOULD BE TAKEN FROM SERVICES DRAWINGS ONLY AND ANY DISCREPANCIES BETWEEN THE LATTER AND THE R.C. DRAWINGS MUST BE REPORTED TO THE ENGINEERS.

NOTE:

1. FOR LOCATION OF SECTIONS SEE DRG. 8832/23/EGA/110.

Revisions		Date	By
P1	ISSUED FOR COMMENTS / APPROVAL.	13.04.05	WJS
P2	SECTIONS UPDATED.	19.08.05	JG
00	SECTIONS 1-1,2-2,3-3 & 4-4 UPDATED.	07.10.05	WJS
	ISSUED FOR CONSTRUCTION.		
01	300sq COLUMNS UNDER SLAB REPOSITIONED; UPSTANDS AROUND	16.12.05	JA
	VOID REVISED; BUILDING PERIMETER REPOSITIONED. SECTIONS		
	REVISED TO SUIT.		
02	BUILDING PERIMETER REPOSITIONED TO CLADDING	05.06.06	JA
	SUB-CONTRACTOR'S REQUIREMENTS, EDGE BEAMS		
	REVISED AND VOID RELOCATED: SECTIONS REVISED TO		
	SUIT AND SECTION 6-6 ADDED.		
03	SECTIONS 1, 2, 3 & 4 UPSTAND TO LIFT MOTOR ROOM REMOVED,	25.09.06	JGW
	DRAWING UPDATED TO 'NoV E460' (CHILLER COMPOUND INCREASE)		
	& 'NoV E461' (ROOF GARDEN FUTURE-PROOFING) REQUIREMENTS.		
04	SECTION 7 ADDED.	16.10.06	JGW
05	SECTIONS 1, 2, 4 & 7 REVISED.	07.12.06	JGW
06	SECTION 1,2 & 5 REVISED.	03.01.07	JGW
07	SECTION 2-2 REVISED.	20.02.07	WJS
08	AS BUILT ISSUE.	12.02.08	JRM



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The Redevelopment of
University College London Hospitals
Euston Road Proposal

Drawing Title

EGA Block Sections Level 5

North

Drawing Status: AS BUILT

Scale: 1:25 @ A0

Date	Drawn	Checked
MAR.05	WJS	JRM

Job Number	Drawing Number	Revision
8832	20/EGA/210	08