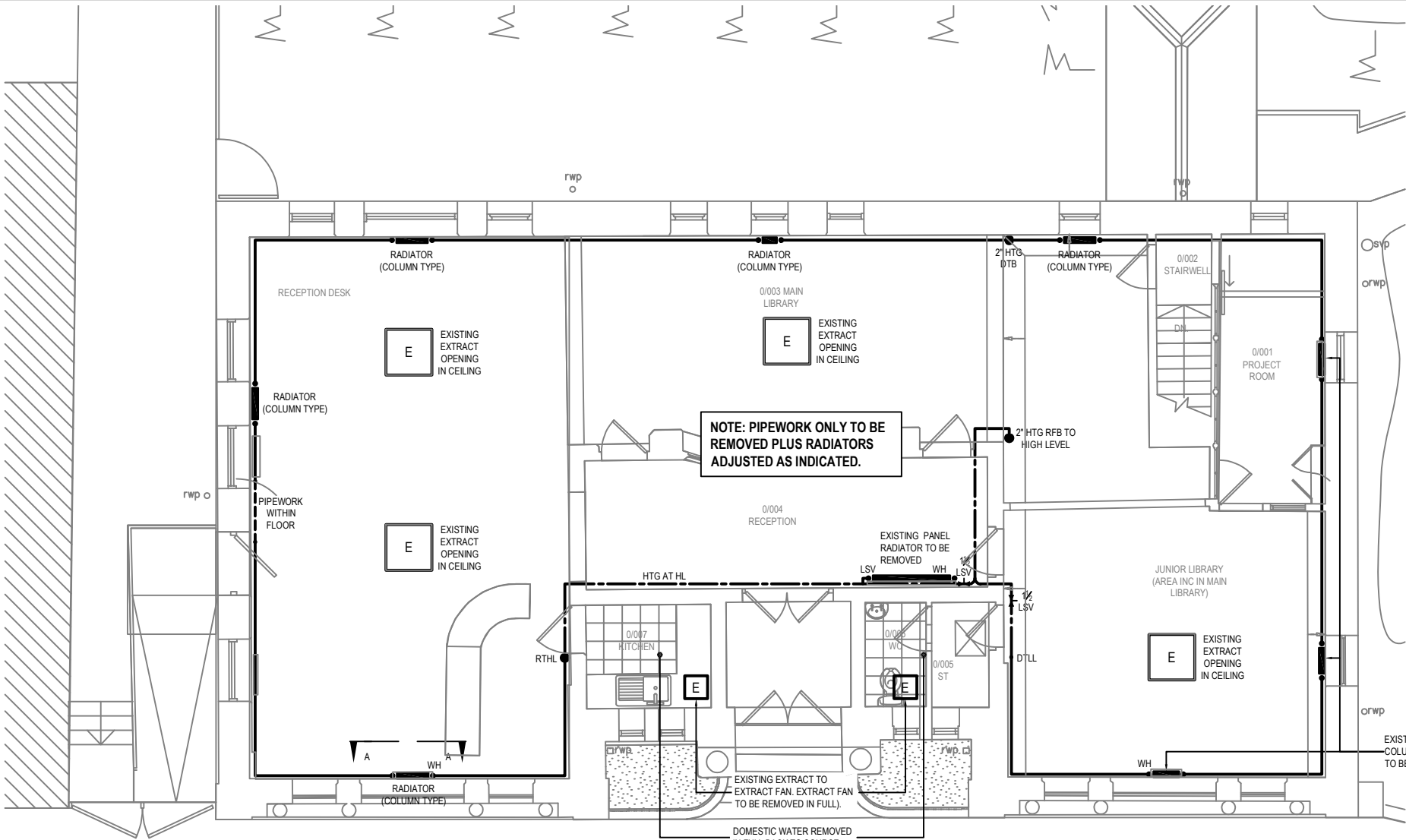
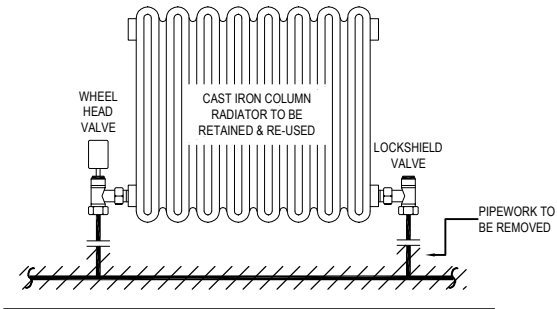


FILENAME : E:\PROJECTS\DR-1302 TREHARRIS LIBRARY AND CAEDRAW EXTENSION\02 CAD\MEP\MECHANICAL\NEW\DR-1302-M-01 (T1).EXISTING LGE & GF HEATING & VENTILATION LAYOUT.DWG | PLOTTED BY : MOHAMMAD GHASEMDOLU | PLOTTED DATE : 02 May 2023 12:03:14

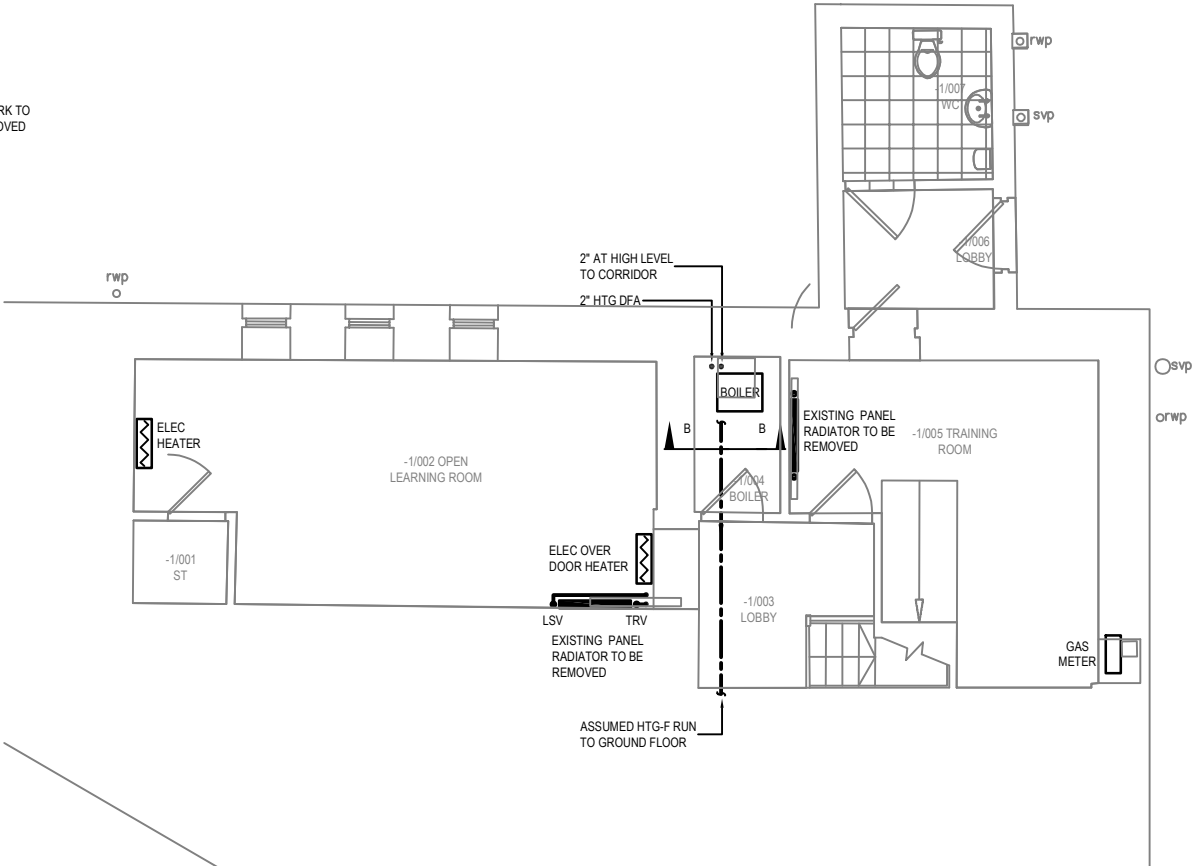
- NOTES :
- DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS
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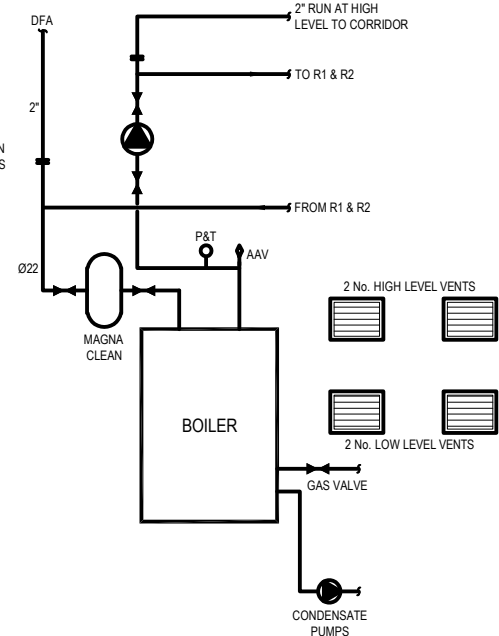
GROUND FLOOR
SCALE 1:50



ELEVATION A-A
NOT TO SCALE



LOWER GROUND FLOOR



ELEVATION B-B
NOT TO SCALE
(TO BE REMOVED IN FULL BACK TO METER)

TENDER ISSUE

T1	TENDER ISSUE	KS	RW	02.05.23
T0	TENDER ISSUE	KS	RW	28.04.23
REV	DESCRIPTION	CHK	APP	DATE

Client:

MERTHYR TYDFIL COUNTY
BOROUGH COUNCIL
CIVIC CENTRE, CASTLE STREET,
MERTHYR TYDFIL, CF47 8AN



4 Ty Nant Court,
Morganstown,
Cardiff,
CF15 8LW

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F: 02920 814459
W: www.dracconsulting.com



Project:

TREHARRIS LIBRARY

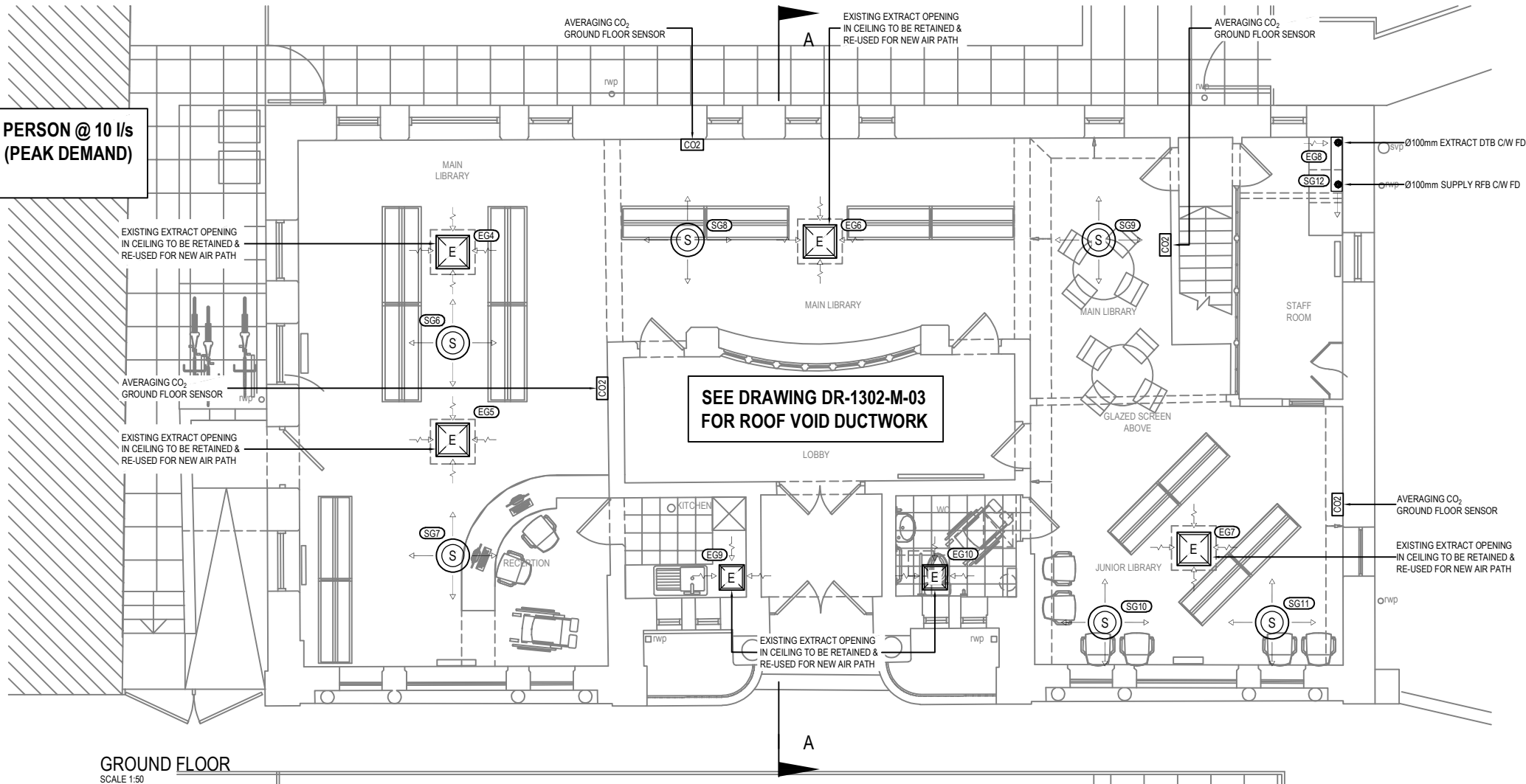
Drawing Title:

EXISTING
LOWER GROUND FLOOR & GROUND FLOOR
HEATING & VENTILATION LAYOUT

Scale @ 1:50	Drawn M.P.	Checked K.S.	Approved R.W.	Date 28.04.23
Drawing No. DR-1302-M-01				Revision T1

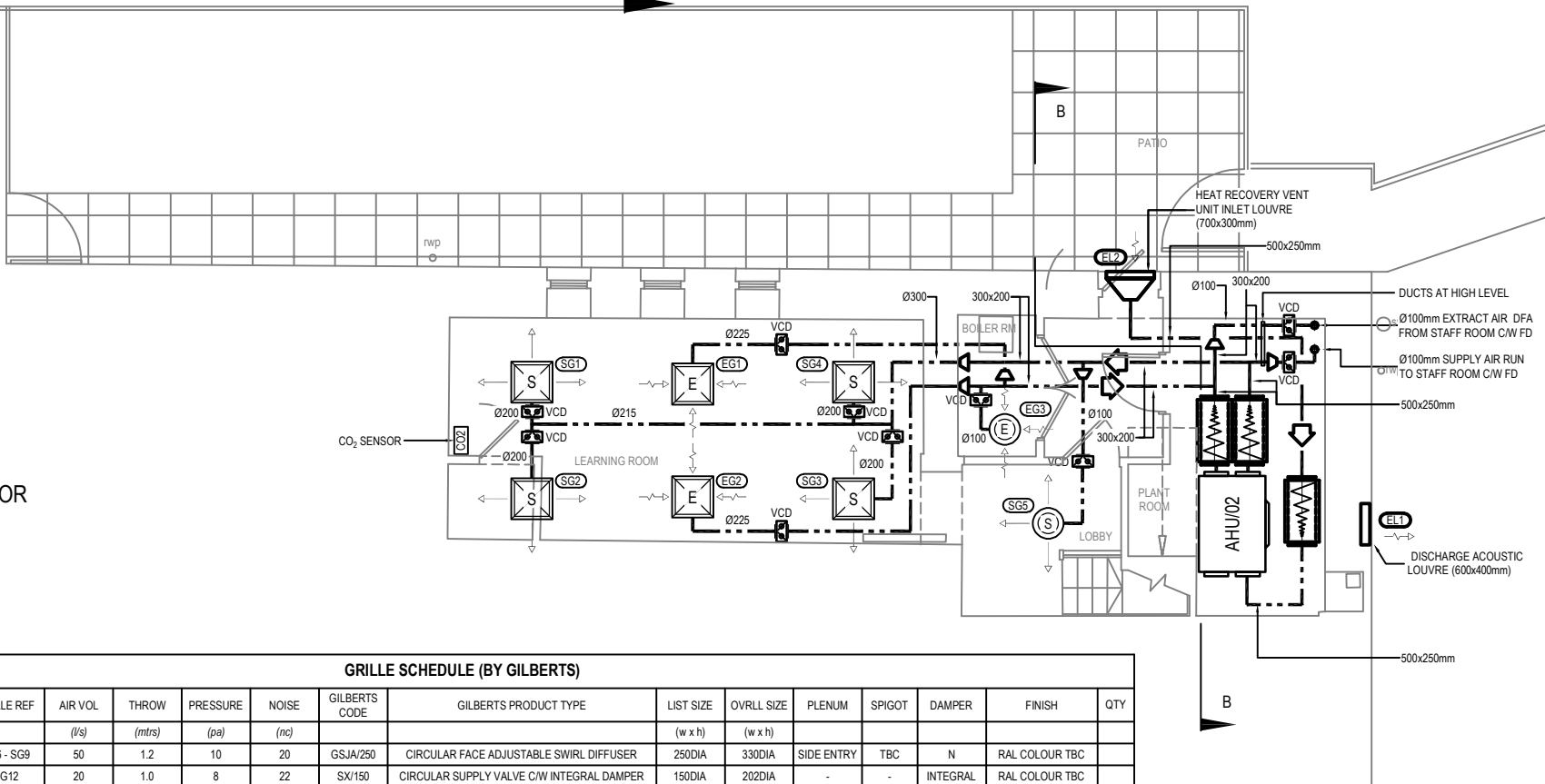
- NOTES :
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BASED ON 30 PERSON @ 10 l/s
OCCUPATION (PEAK DEMAND)
AHU/01



GROUND FLOOR
SCALE 1:50

BASED ON 20 PERSON @ 10 l/s
OCCUPATION (PEAK DEMAND)
AHU/02



LOWER GROUND FLOOR
SCALE 1:50

GRILLE SCHEDULE (BY GILBERTS)

ROOM No.	GRILLE REF	AIR VOL	THROW	PRESSURE	NOISE	GILBERTS CODE	GILBERTS PRODUCT TYPE	LIST SIZE	OVRLL SIZE	PLENUM	SPIGOT	DAMPER	FINISH	QTY
		(l/s)	(mtrs)	(pa)	(nc)			(w x h)	(w x h)					
MAIN LIBRARY SUPPLY	SG6 - SG9	50	1.2	10	20	GSJA/250	CIRCULAR FACE ADJUSTABLE SWIRL DIFFUSER	250DIA	330DIA	SIDE ENTRY	TBC	N	RAL COLOUR TBC	
STAFF ROOM SUPPLY	SG12	20	1.0	8	22	SX/150	CIRCULAR SUPPLY VALVE C/W INTEGRAL DAMPER	150DIA	202DIA	-	-	INTEGRAL	RAL COLOUR TBC	
STAFF ROOM EXTRACT	EG8	20		8	22	GX/150	CIRCULAR EXTRACT VALVE C/W INTEGRAL DAMPER	150DIA	202DIA	-	-	INTEGRAL	RAL COLOUR TBC	
LEARNING ROOM SUPPLY	SG1 - SG4	50	1.1	9	20	GSFA/250	CIRCULAR FACE FIX BLADE SWIRL DIFFUSER	250DIA	330DIA	SIDE ENTRY	TBC	Y	RAL COLOUR TBC	
LEARNING ROOM EXTRACT	EG1 - EG2	100		8	20	GSFA/315	CIRCULAR FACE FIX BLADE SWIRL DIFFUSER	315DIA	425DIA	SIDE ENTRY	TBC	Y	RAL COLOUR TBC	
LOBBY SUPPLY	SG5	10		12	25	SX/100	CIRCULAR SUPPLY VALVE C/W INTEGRAL DAMPER	100DIA	137DIA	-	-	INTEGRAL	RAL COLOUR TBC	
BOILER ROOM EXTRACT	EG3	10		12	25	GX/100	CIRCULAR EXTRACT VALVE C/W INTEGRAL DAMPER	100DIA	137DIA	-	-	INTEGRAL	RAL COLOUR TBC	
MAIN LIBRARY EXTRACT	EG4 - EG5	37				-	EXISTING GRILLE UTILISED	-	-	-	-	-	-	
	EG6	90				-	EXISTING GRILLE UTILISED	-	-	-	-	-	-	
	EG7	73				-	EXISTING GRILLE UTILISED	-	-	-	-	-	-	
KITCHEN EXTRACT	EG9	17				-	EXISTING GRILLE UTILISED	-	-	-	-	-	-	
WC EXTRACT	EG10	20				-	EXISTING GRILLE UTILISED	-	-	-	-	-	-	

TENDER ISSUE

T1	TENDER ISSUE	KS	RW	02.05.23
T0	TENDER ISSUE	KS	RW	28.04.23
REV	DESCRIPTION	CHK	APP	DATE

Client:

MERTHYR TYDFIL COUNTY
BOROUGH COUNCIL
CIVIC CENTRE, CASTLE STREET,
MERTHYR TYDFIL, CF47 8AN



4 Ty Nant Court,
Morganstown,
Cardiff,
CF15 8LW



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F: 02920 814459
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Project:

TREHARRIS LIBRARY

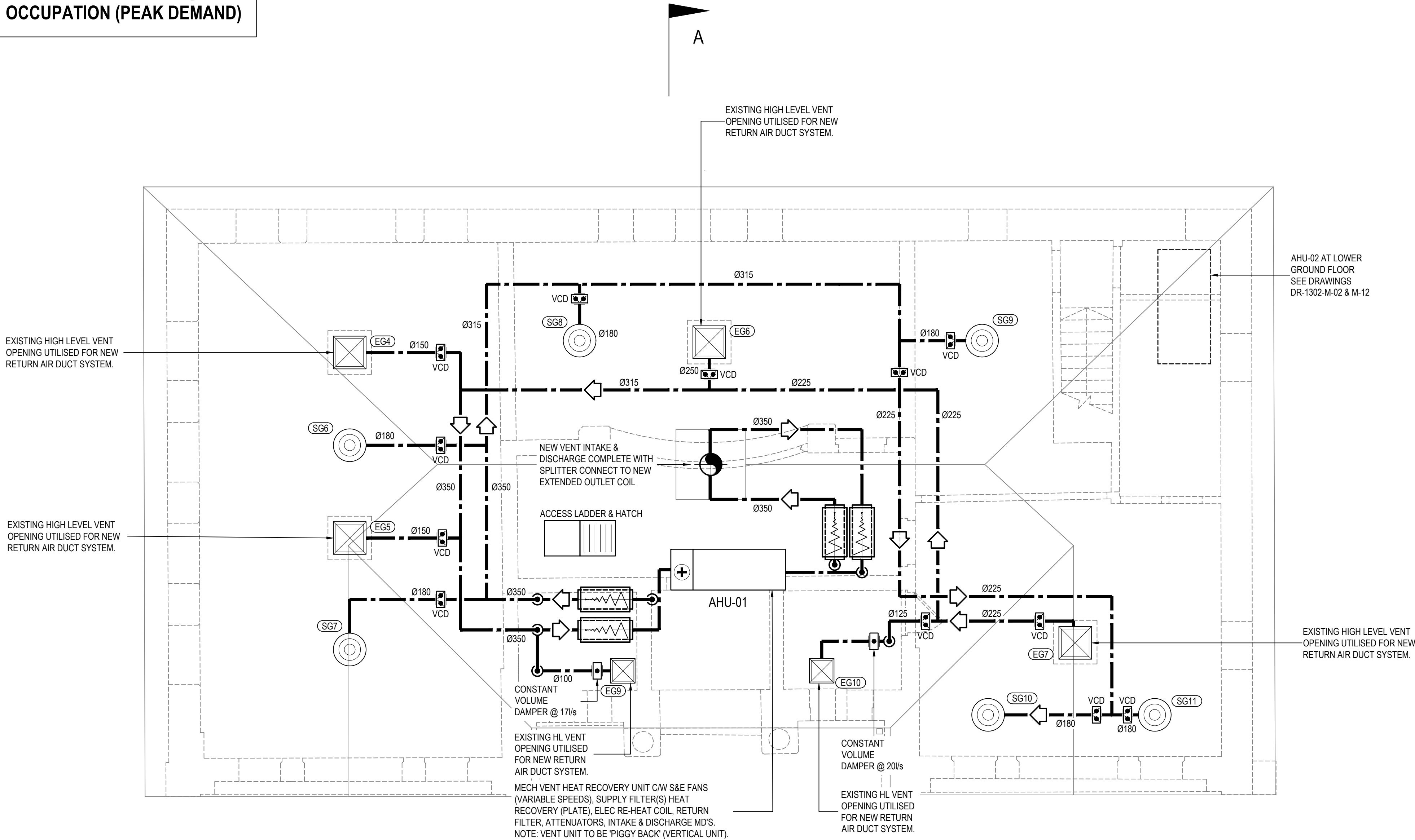
Drawing Title:

PROPOSED LOWER GROUND FLOOR
& GROUND FLOOR
VENTILATION LAYOUT

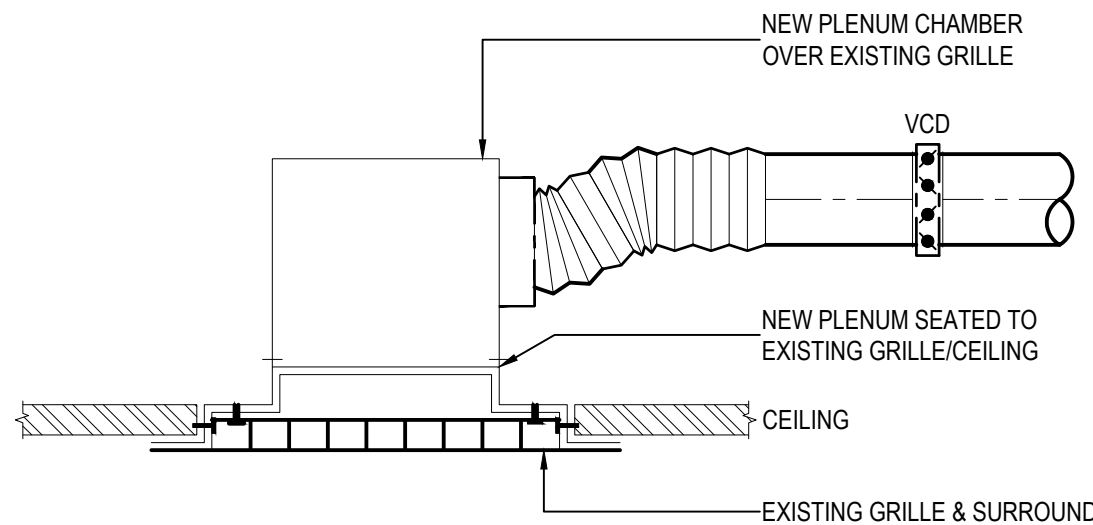
Scale @ 1:50	Drawn M.P.	Checked K.S.	Approved R.W.	Date 28.04.23
Drawing No.	DR-1302-M-02			Revision T1

FILENAME : E:\PROJECTS\DR-1302 TREHARRIS LIBRARY AND CAEDRAW EXTENSION\02 CAD\MEP\MECHANICAL\NEW\DR-1302-M-03 (T1) PROPOSED ROOF LEVEL VENTILATION LAYOUT.DWG | PLOTTED BY : MATT PHILLIPS | PLOTTED DATE : 02 May 2023 12:38:49

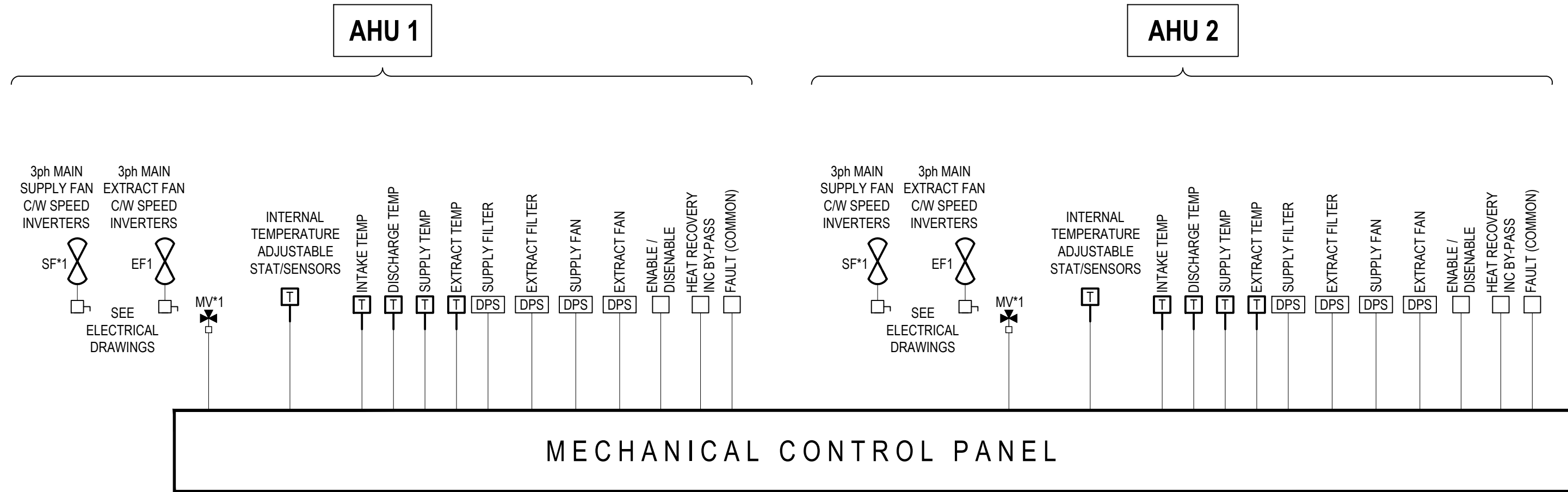
BASED ON 30 PERSON @ 10 l/s
OCCUPATION (PEAK DEMAND)



ROOF LEVEL
SCALE 1:50



TYPICAL EXISTING EXTRACT SECTION
NOT TO SCALE



- NOTES :
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SEE DRAWING DR-1302-M-02
FOR GRILLE SCHEDULES
WITH AIR VOLUMES

TENDER ISSUE

T1	TENDER ISSUE	KS	RW	02.05.23
T0	TENDER ISSUE	KS	RW	28.04.23
REV	DESCRIPTION	CHK	APP	DATE

Client:

MERTHYR TYDFIL COUNTY
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Project:

TREHARRIS LIBRARY

Drawing Title:

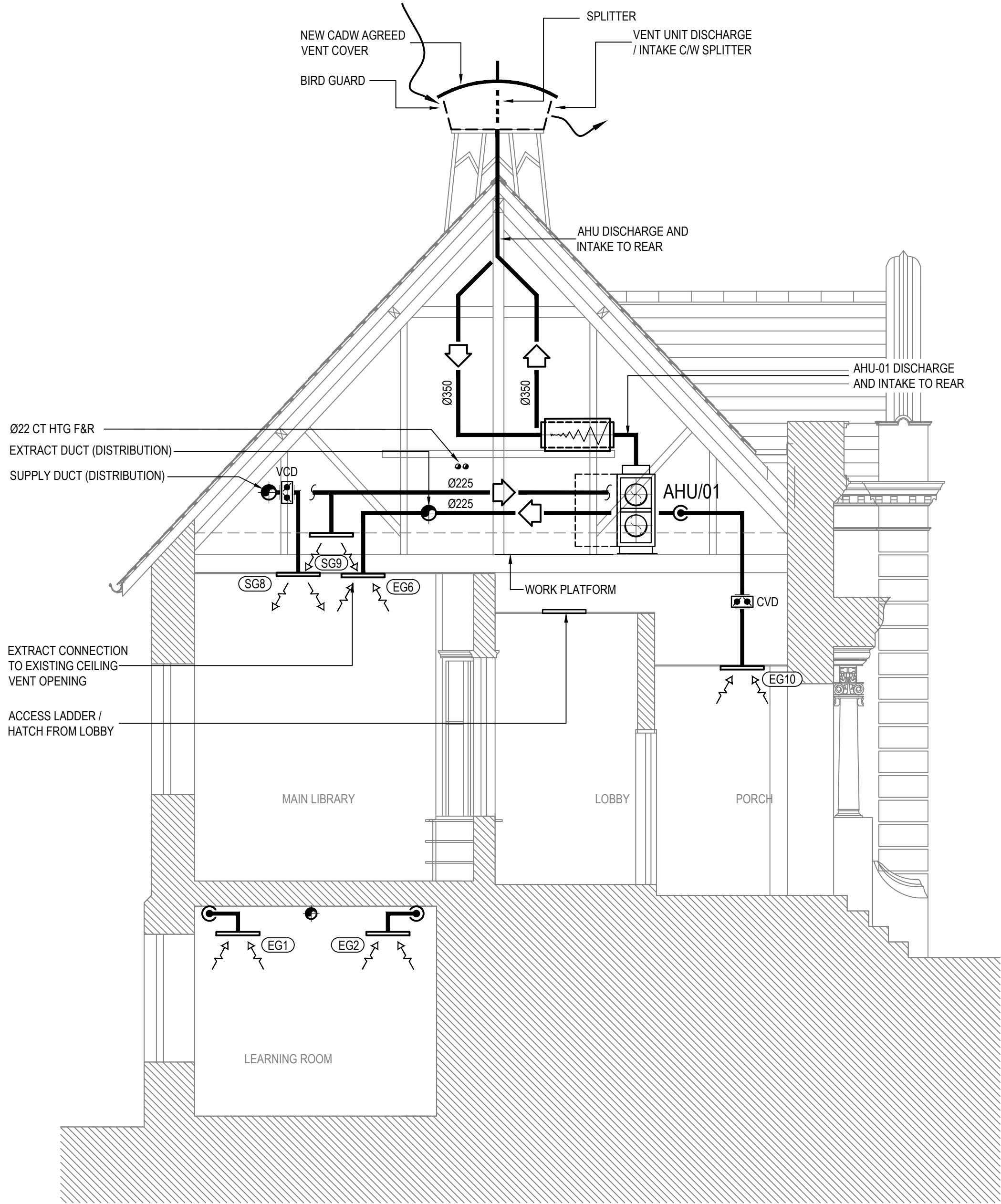
PROPOSED ROOF LEVEL
VENTILATION LAYOUT

Scale @	A1	Drawn	M.P.	Checked	K.S.	Approved	R.W.	Date	28.04.23
Drawing No.								Revision	T1

DR-1302-M-03

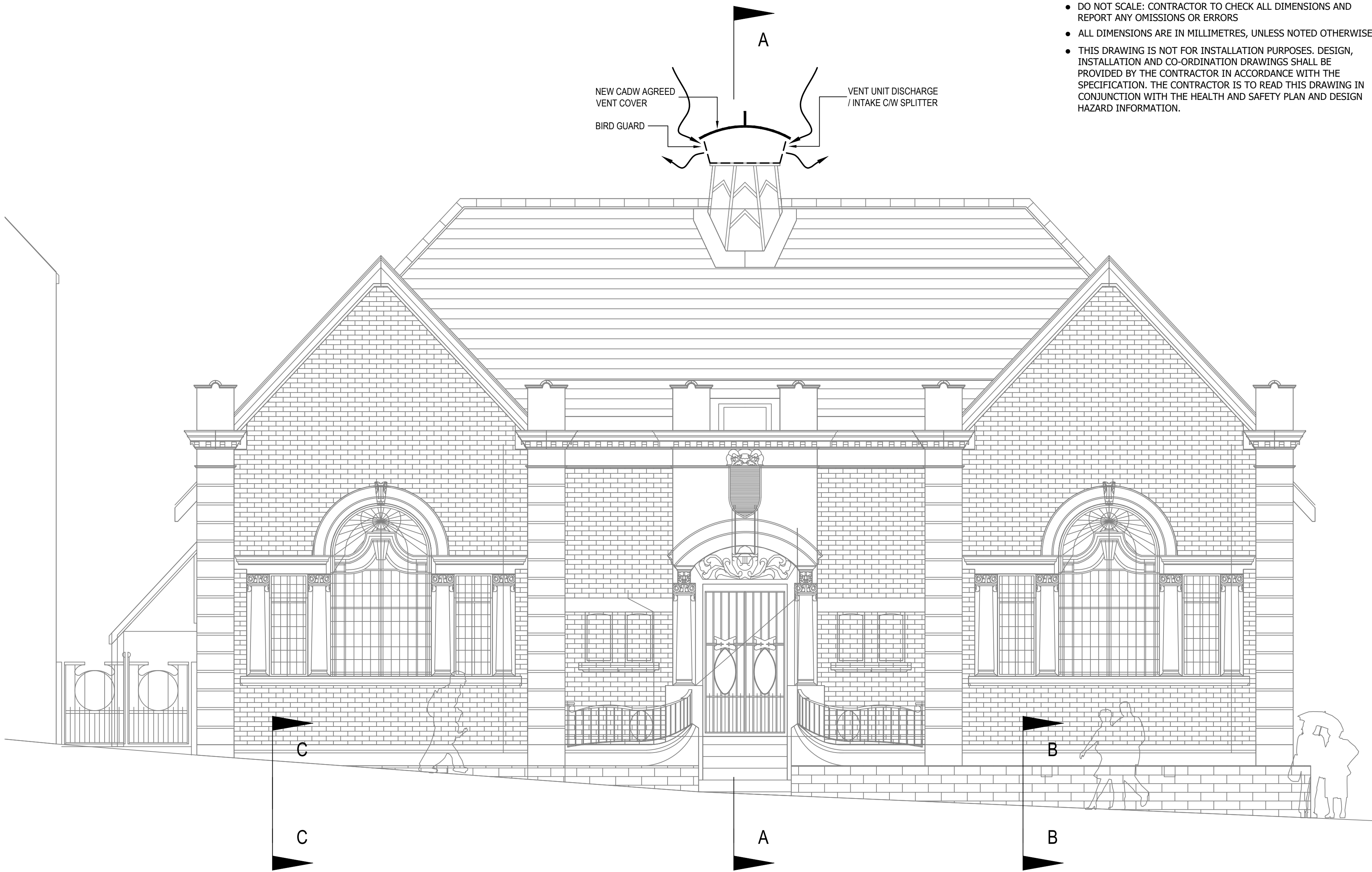
FILENAME : E:\PROJECTS\DR-1302 TREHARRIS LIBRARY AND CAEDRAW EXTENSION\02 CAD\MEP\MECHANICAL\NEW\DR-1302-M-04 (T1) PROPOSED VENTILATION ELEVATIONS & SECTIONS (SHT 1 OF 2).DWG | PLOTTED BY : MATT PHILLIPS | PLOTTED DATE : 02 May 2023 13:12:03

SECTION A-A
SCALE 1:50

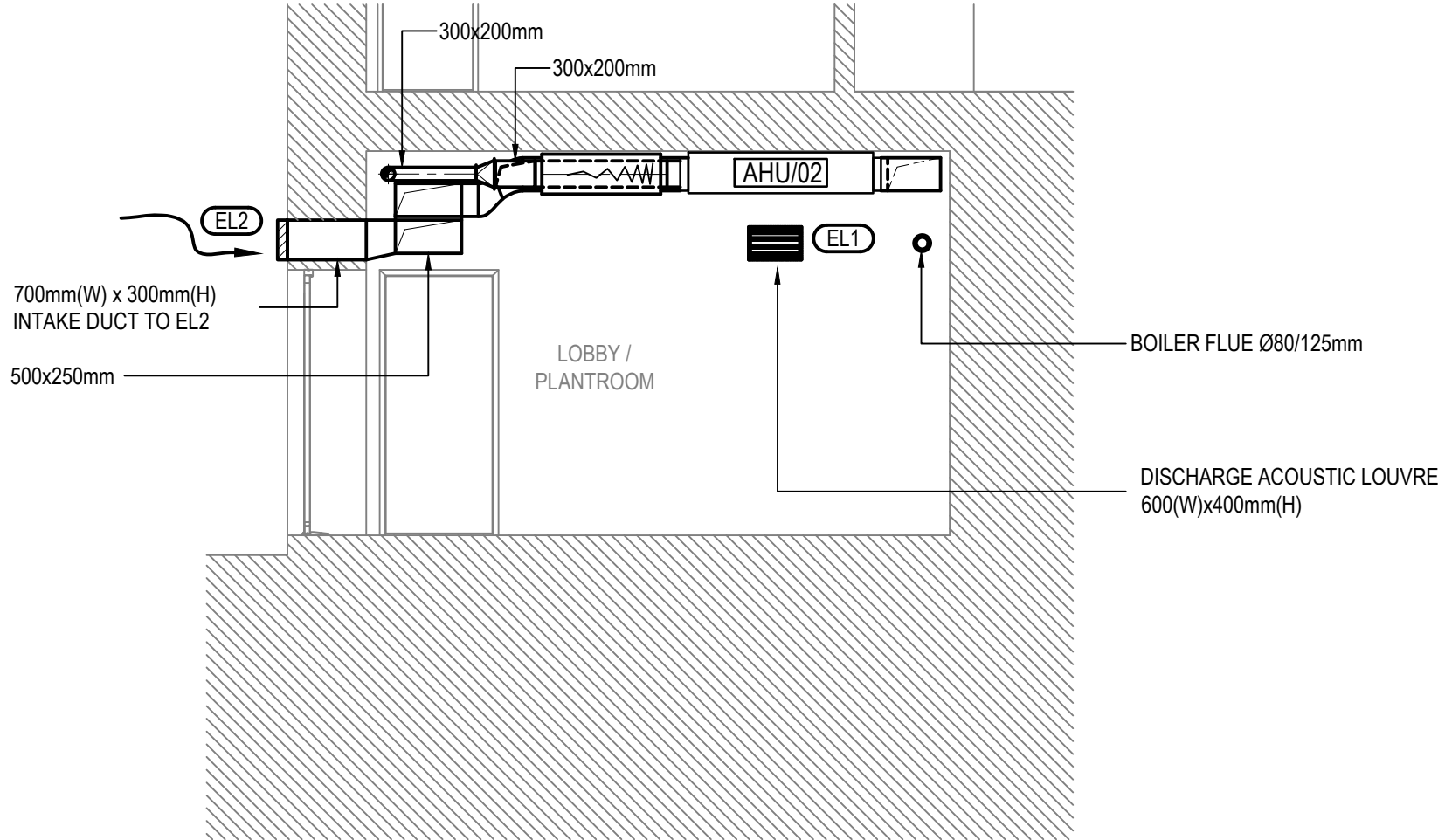


SECTION C-C
(PART ONLY - LGF ASHP EXTERNAL)
SCALE 1:50

FRONT ELEVATION
SCALE 1:50



SECTION B-B
(PART ONLY - LGF LOBBY/PLANTROOM)
SCALE 1:50



NOTES :

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TENDER ISSUE

T1	TENDER ISSUE	KS	RW	02.05.23
T0	TENDER ISSUE	KS	RW	28.04.23
REV	DESCRIPTION	CHK	APP	DATE

Client:

MERTHYR TYDFIL COUNTY
BOROUGH COUNCIL
CIVIC CENTRE, CASTLE STREET,
MERTHYR TYDFIL, CF47 8AN



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Project:

TREHARRIS LIBRARY

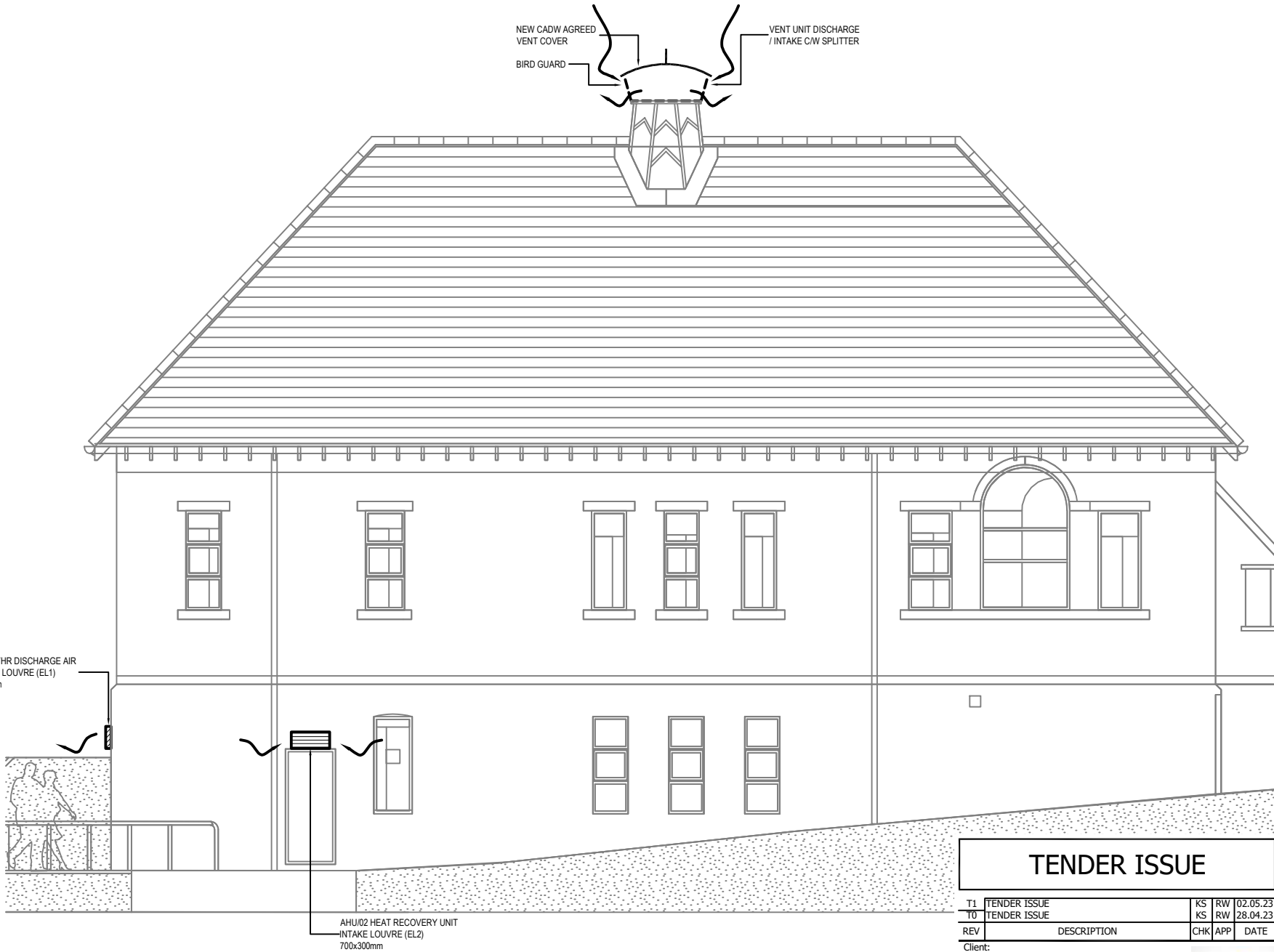
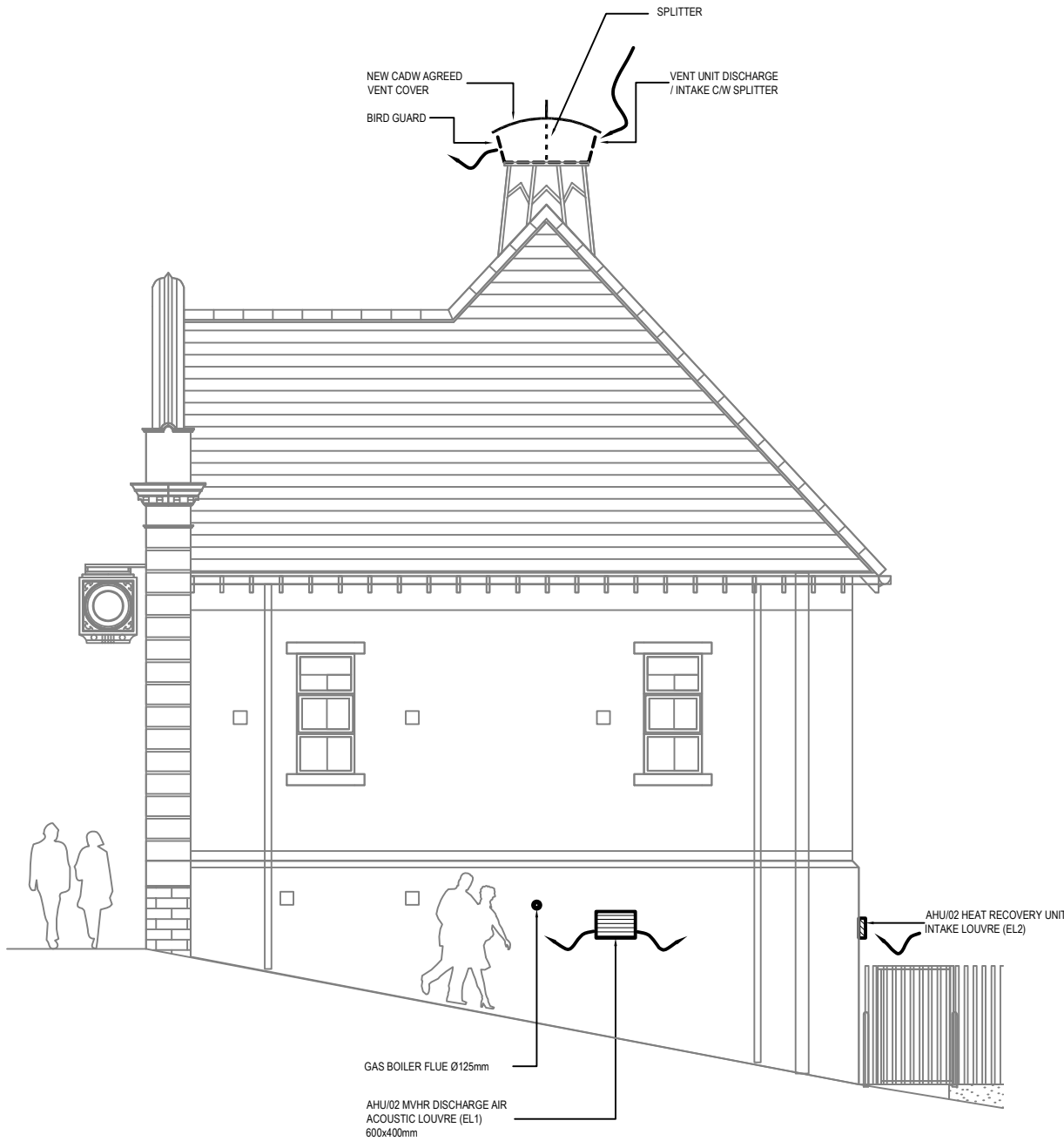
Drawing Title:

PROPOSED VENTILATION
ELEVATIONS & SECTIONS
(SHEET 1 OF 2)

Scale @	A1	Drawn	M.P.	Checked	K.S.	Approved	R.W.	Date	28.04.23
Drawing No.								Revision	T1

DR-1302-M-04

- NOTES :
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TENDER ISSUE

T1	TENDER ISSUE	KS	RW	02.05.23
T0	TENDER ISSUE	KS	RW	28.04.23
REV	DESCRIPTION	CHK	APP	DATE

Client:

MERTHYR TYDFIL COUNTY
BOROUGH COUNCIL
CIVIC CENTRE, CASTLE STREET,
MERTHYR TYDFIL, CF47 8AN



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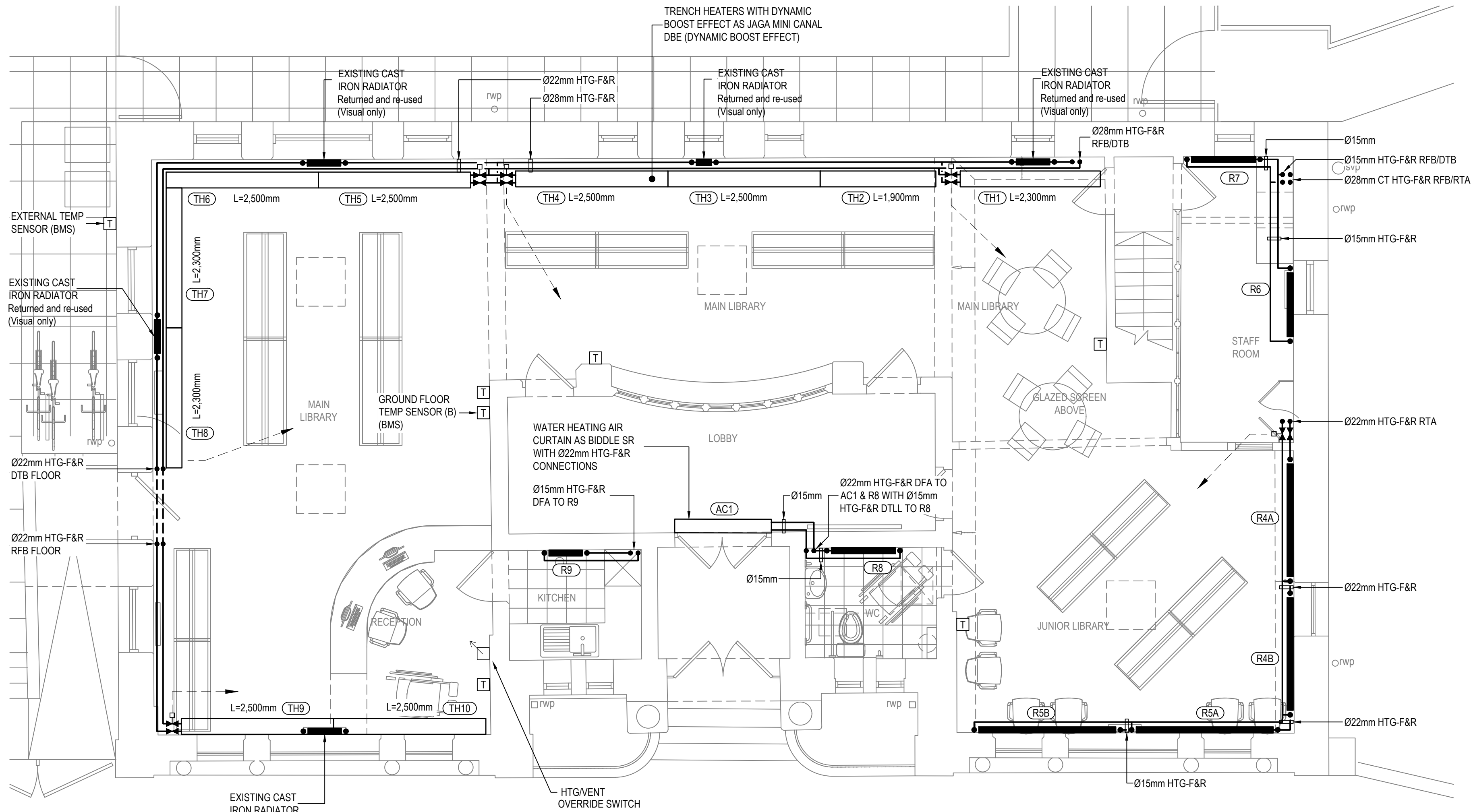
Project:

TREHARRIS LIBRARY

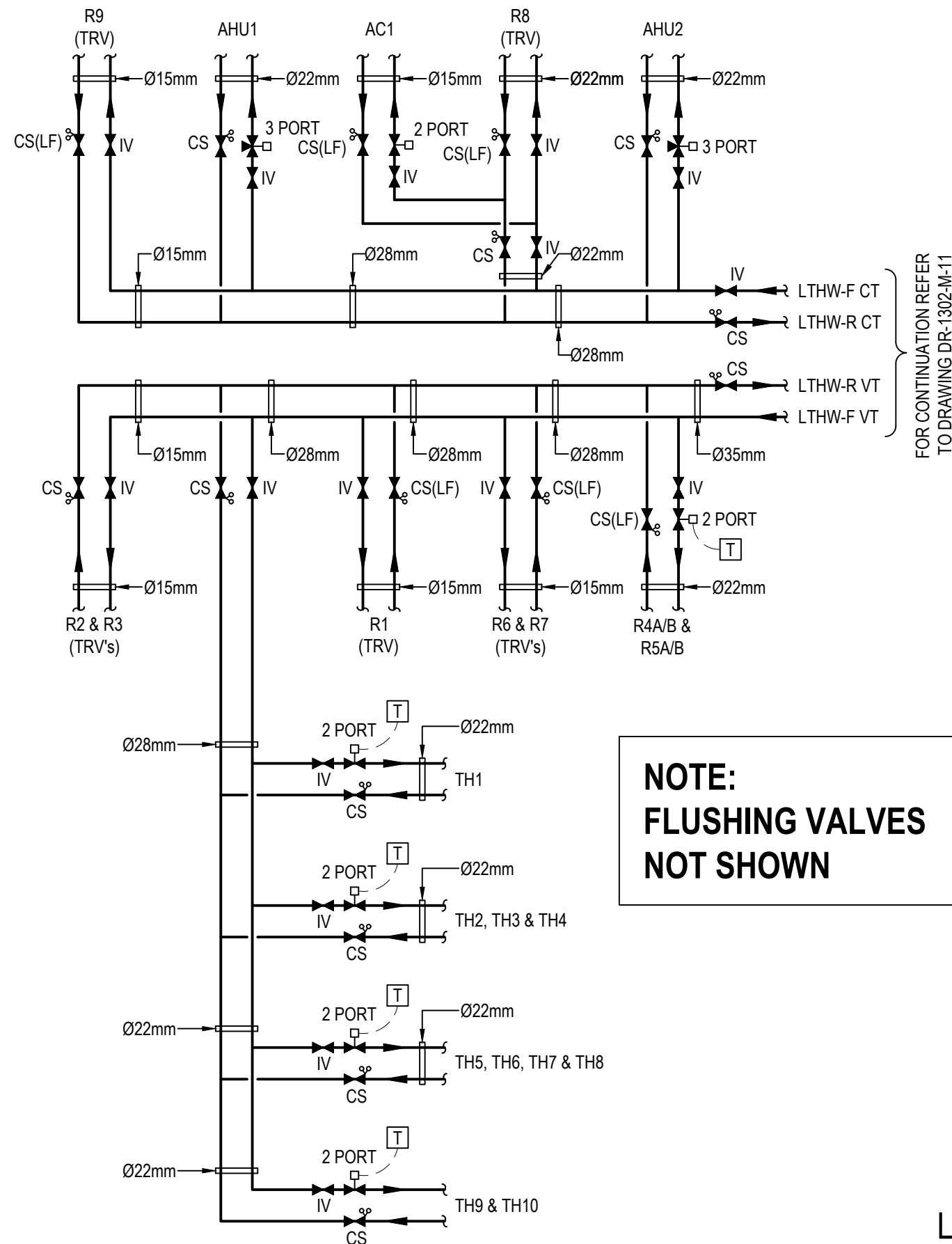
Drawing Title:

PROPOSED VENTILATION
ELEVATIONS & SECTIONS
(SHEET 2 OF 2)

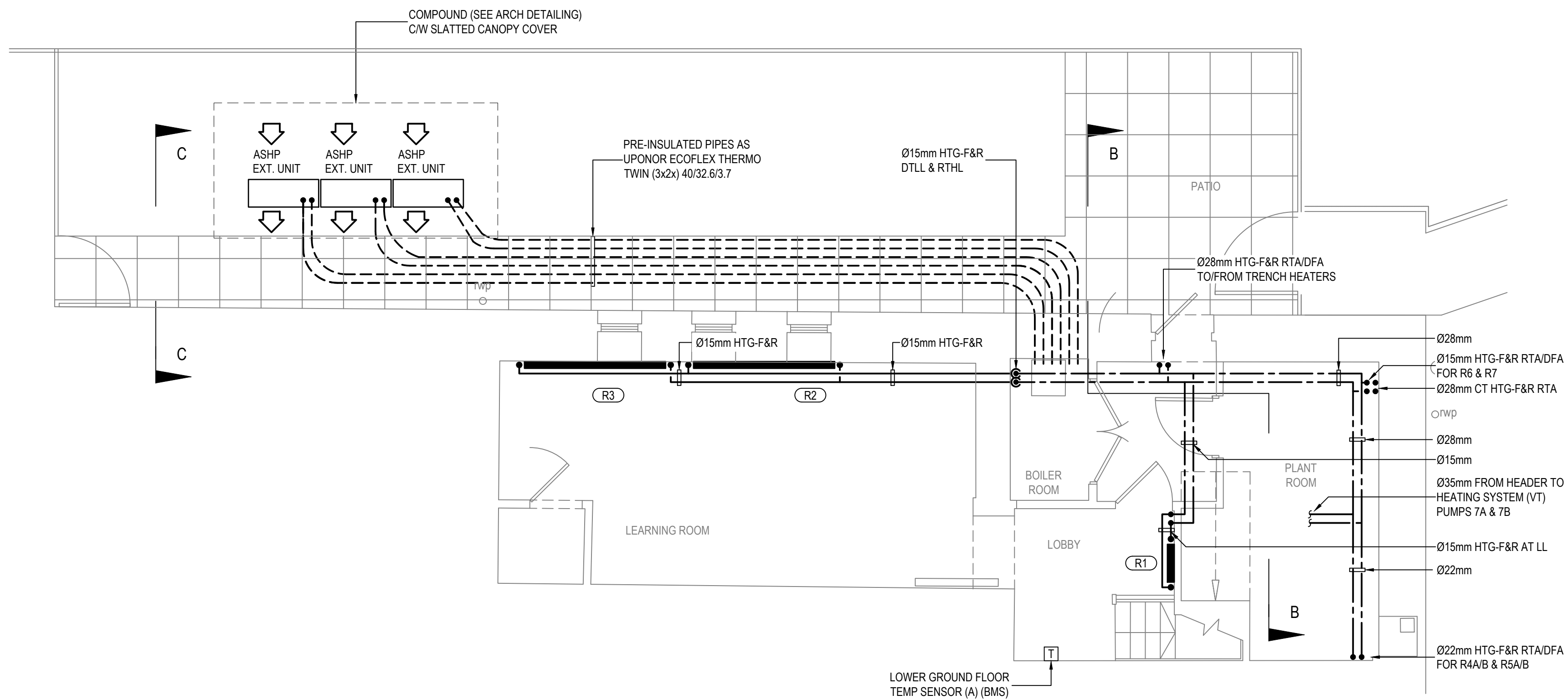
Scale @ 1:50	A1	Drawn M.P.	Checked K.S.	Approved R.W.	Date 28.04.23
Drawing No.	DR-1302-M-05				Revision T1



GROUND FLOOR
SCALE 1:50

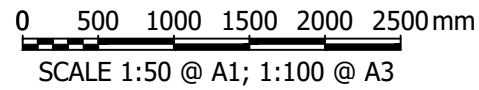


**NOTE:
FLUSHING VALVES
NOT SHOWN**



LOWER GROUND FLOOR

SCALE 1:50



TENDER ISSUE

T1	TENDER ISSUE	KS	RW	02.05.23
T0	TENDER ISSUE	KS	RW	28.04.23
REV	DESCRIPTION	CHK	APP	DATE

Client:

MERTHYR TYDFIL COUNTY
BOROUGH COUNCIL
CIVIC CENTRE, CASTLE STREET,
MERTHYR TYDFIL, CF47 8AN



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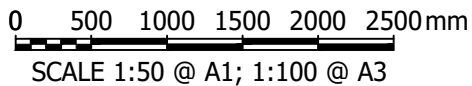
Project

TREHARRIS LIBRARY

Drawing Title:

PROPOSED LOWER GROUND FLOOR & GROUND FLOOR HEATING LAYOUT

Scale @ A1 1:50	Drawn M.P.	Checked K.S.	Approved R.W.	Date 28.04.23
Drawing No. DR-1302-M-06				Revision T1



T2	ASHP COMPOUND OMITTED	RW	KS	09.10.23
T1	TENDER ISSUE	KS	RW	02.05.23
T0	TENDER ISSUE	KS	RW	28.04.23
REV	DESCRIPTION	CHK	APP	DATE



MERTHYR TYDFIL
County Borough Council
Cyngor Bwrdeistref Sirol
MERTHYR TUDFUL

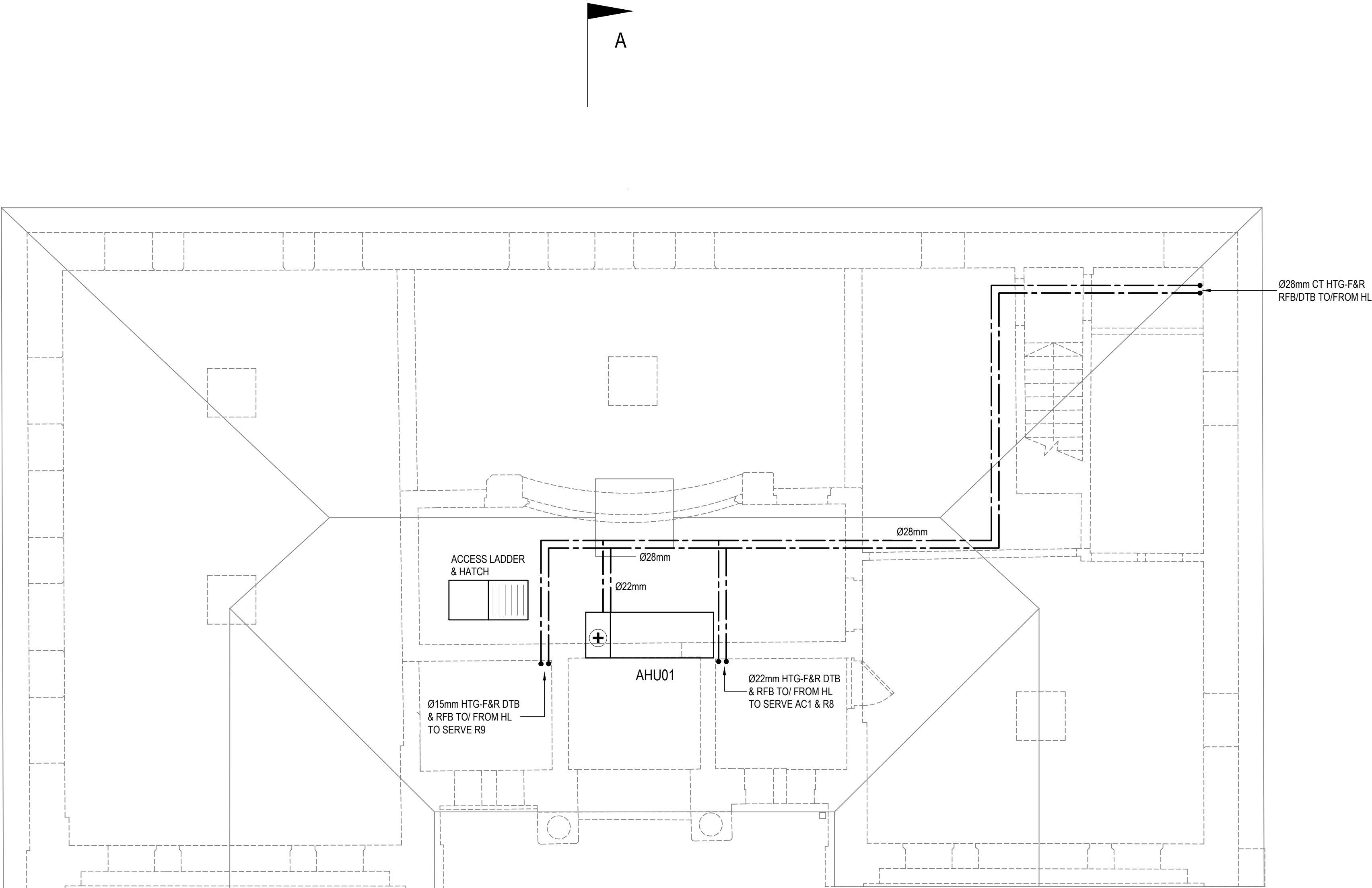


Project:
TREHARRIS LIBRARY

Scale @ A1 1:50	Drawn M.P.	Checked K.S.	Approved R.W.	Date 28.04.23
Drawing No. DR-1302-M-06				Revision T2

FILENAME : E:\PROJECTS\DR-1302 TREHARRIS LIBRARY AND CAEDRAW EXTENSION\02 CAD\MEP\MECHANICAL\NEW\DR-1302-M-07 (T1) PROPOSED ROOF LEVEL HEATING LAYOUT.DWG | PLOTTED BY : MATT PHILLIPS | PLOTTED DATE : 02 May 2023 12:29:47

- NOTES :
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ROOF LEVEL
SCALE 1:50

0 500 1000 1500 2000 2500mm
SCALE 1:50 @ A1; 1:100 @ A3

TENDER ISSUE

T1	TENDER ISSUE	KS	RW	02.05.23
T0	TENDER ISSUE	KS	RW	28.04.23
REV	DESCRIPTION	CHK	APP	DATE

Client:

MERTHYR TYDFIL COUNTY
BOROUGH COUNCIL
CIVIC CENTRE, CASTLE STREET,
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Project:

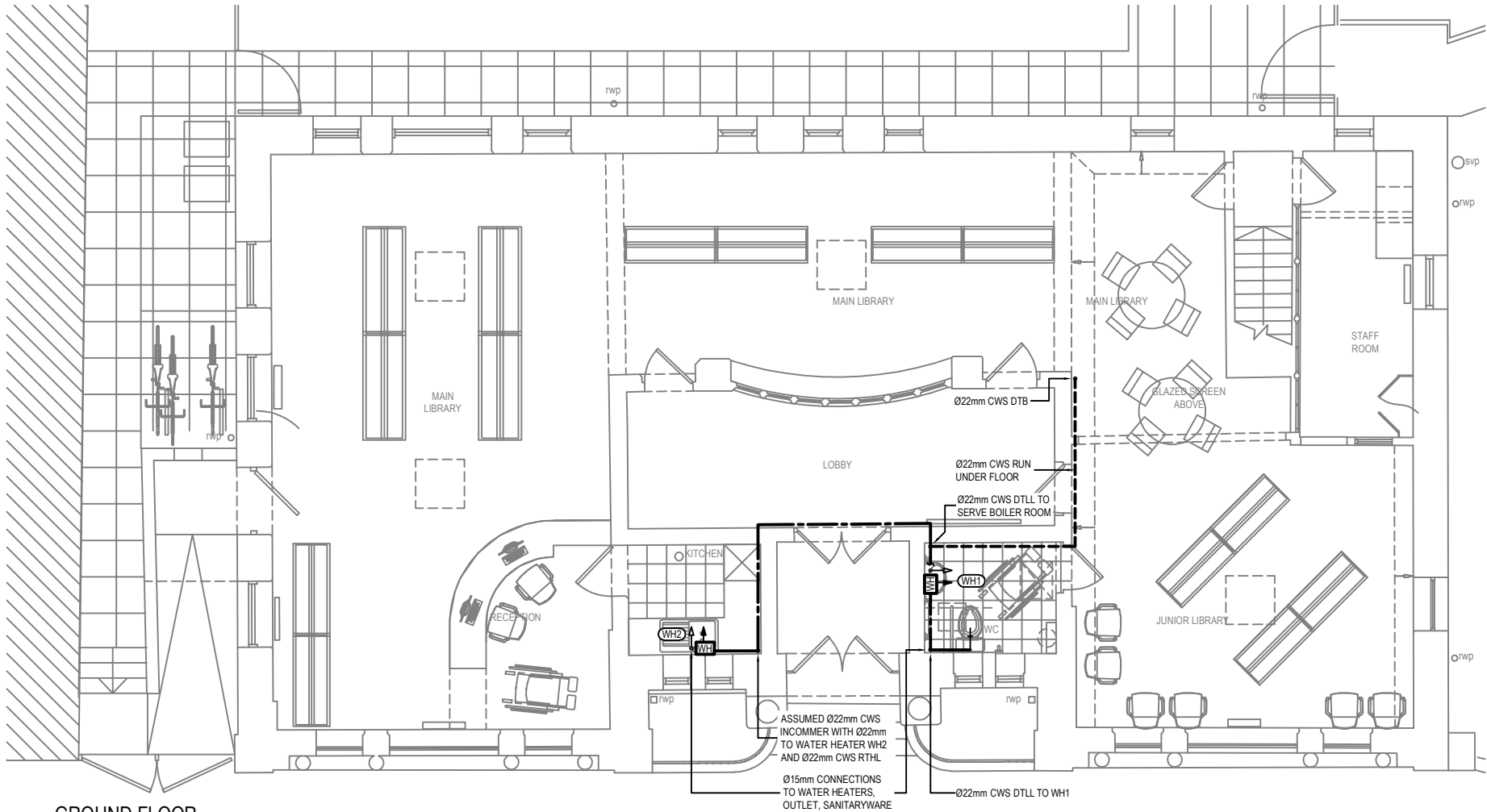
TREHARRIS LIBRARY

Drawing Title:

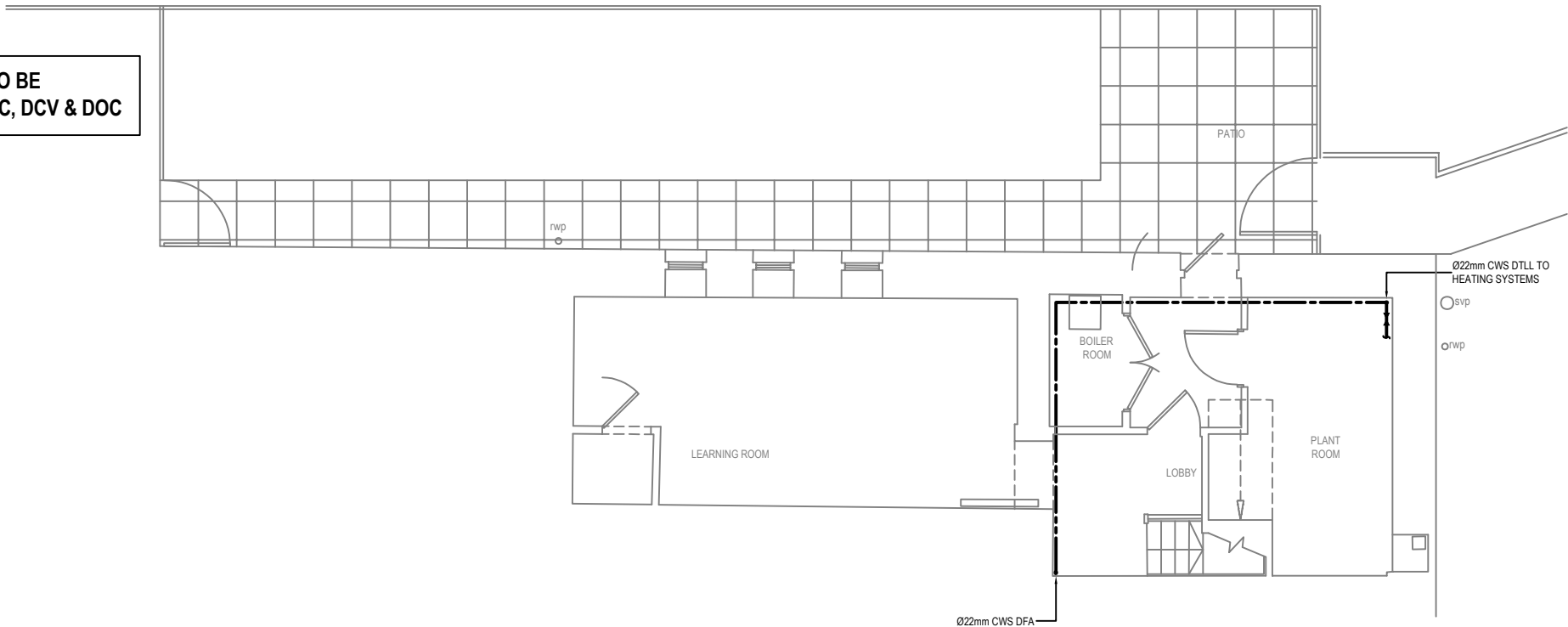
PROPOSED ROOF LEVEL
HEATING LAYOUT

Scale @ A1 1:50	Drawn M.P.	Checked K.S.	Approved R.W.	Date 28.04.23
Drawing No.	DR-1302-M-07			Revision T1

FILENAME : E:\PROJECTS\DR-1302 TREHARRIS LIBRARY AND CAEDRAW EXTENSIONS\02 CAD\MEP\MECHANICAL\NEW\DR-1302-M-08 (T1).PROPOSED LGF & GF DWS.DWG | PLOTTED BY : MOHAMMAD GHASEMIDOU | PLOTTED DATE : 02 May 2023 12:35:45

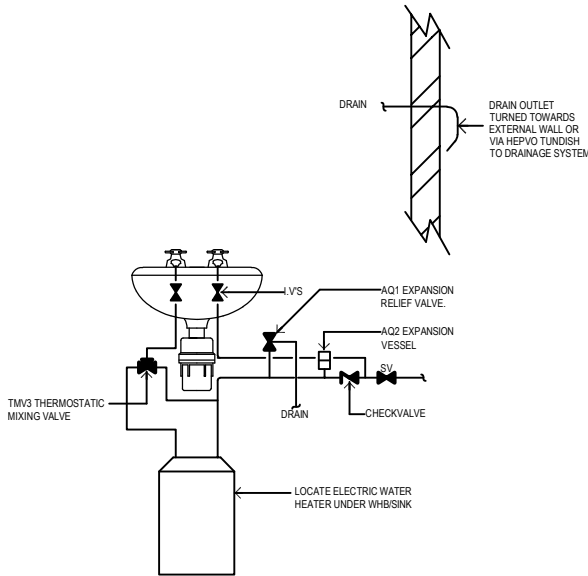


GROUND FLOOR
SCALE 1:50



LOWER GROUND FLOOR
SCALE 1:50

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DETAIL OF WATER HEATERS
SERVICING WHB'S IN WC
NOT TO SCALE

WATER HEATER SCHEDULE	
WH1	SANTON (15 LITRE-2.2KW)
WH2	SANTON (15 LITRE-2.2KW)

TENDER ISSUE

T1	TENDER ISSUE	KS	RW	02.05.23
T0	TENDER ISSUE	KS	RW	28.04.23
REV	DESCRIPTION	CHK	APP	DATE

Client:

MERTHYR TYDFIL COUNTY
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CIVIC CENTRE, CASTLE STREET,
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Project:

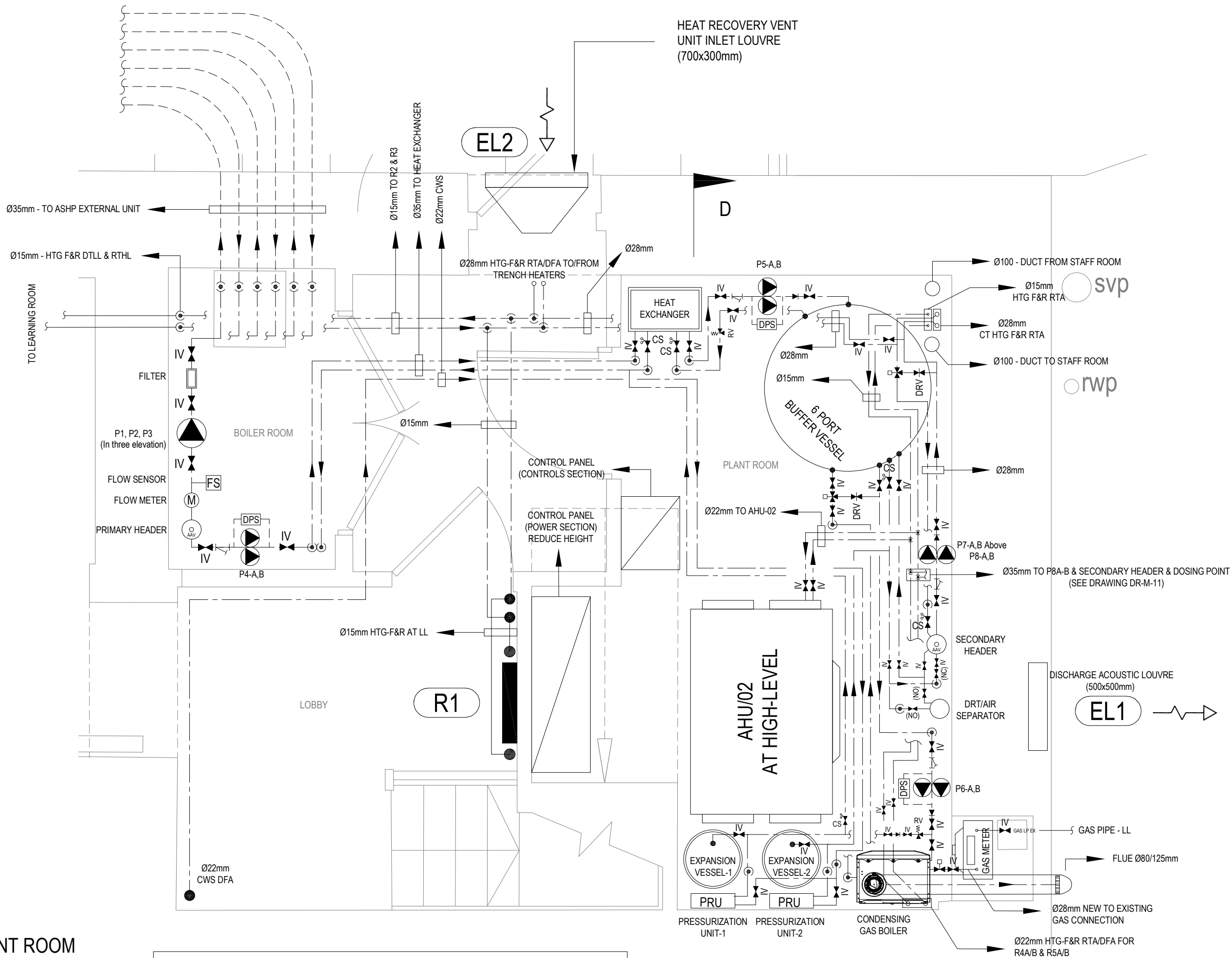
TREHARRIS LIBRARY

Drawing Title:

PROPOSED LOWER GROUND FLOOR
& GROUND FLOOR
DOMESTIC WATER SERVICES

Scale @ 1:50	Drawn M.P.	Checked K.S.	Approved R.W.	Date 28.04.23
Drawing No. DR-1302-M-08				Revision T1

- NOTES :
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PLANT ROOM
SCALE 1:20

0 200 400 600 800 1000mm
SCALE 1:20 @ A1; 1:40 @ A3

NOTICE: TO COORDINATE PAPERWORK & DUCTWORK
UNDER CEILING, SEE DRAWING DR-M-12

TENDER ISSUE

TO	TENDER ISSUE	KS	RW	28.04.23
REV	DESCRIPTION	CHK	APP	DATE

Client:

MERTHYR TYDFIL COUNTY
BOROUGH COUNCIL
CIVIC CENTRE, CASTLE STREET,
MERTHYR TYDFIL, CF47 8AN



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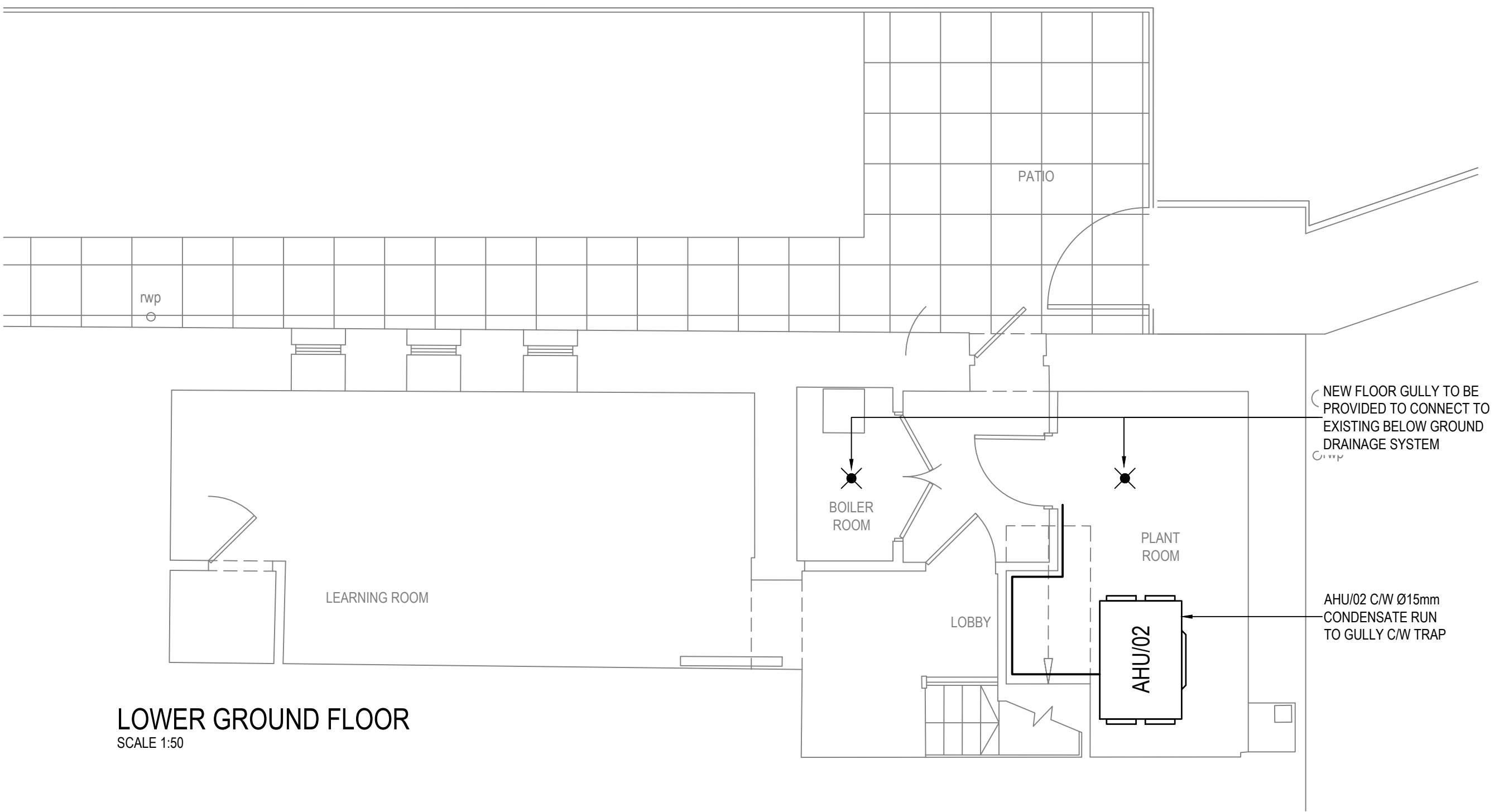
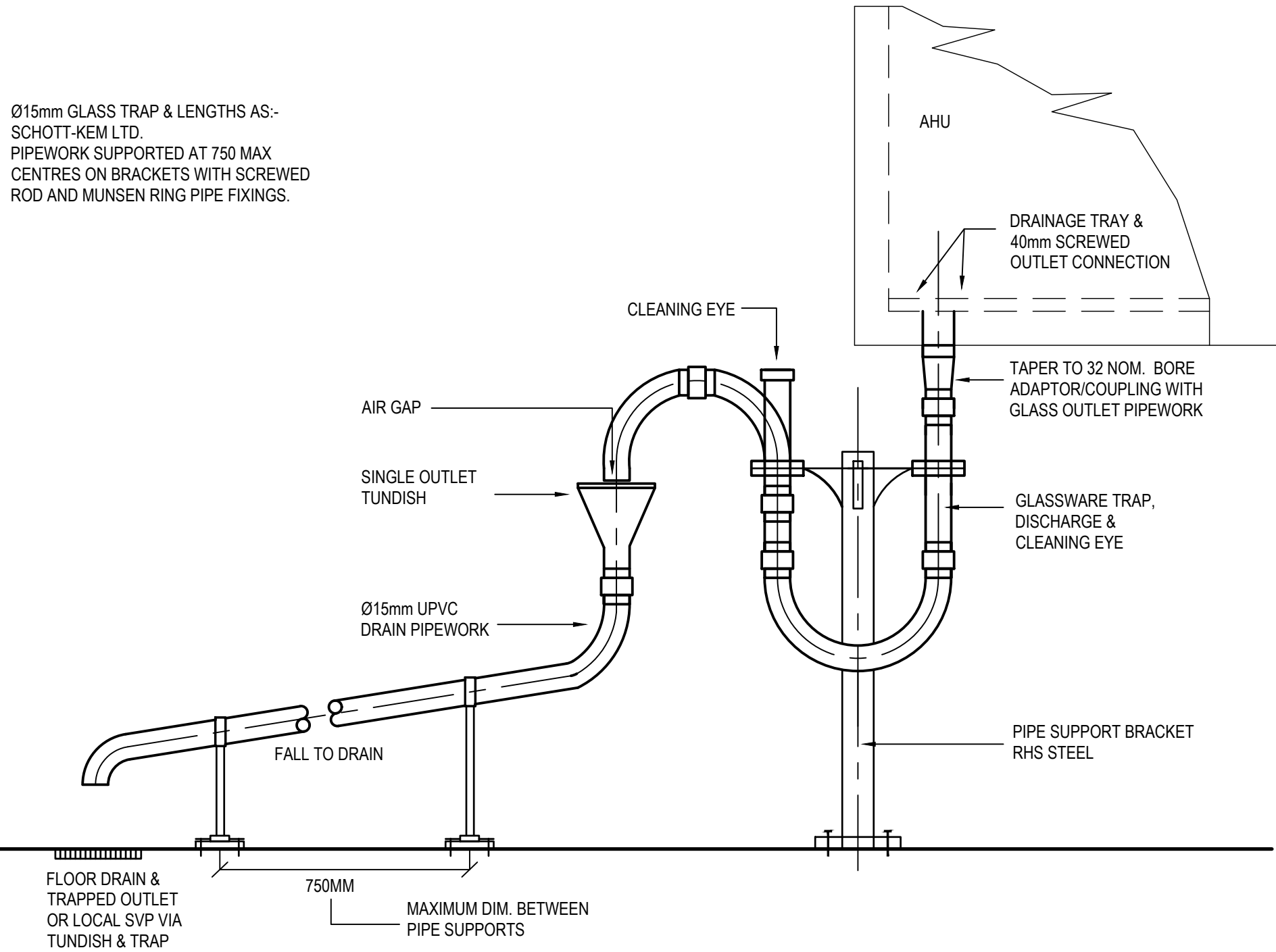
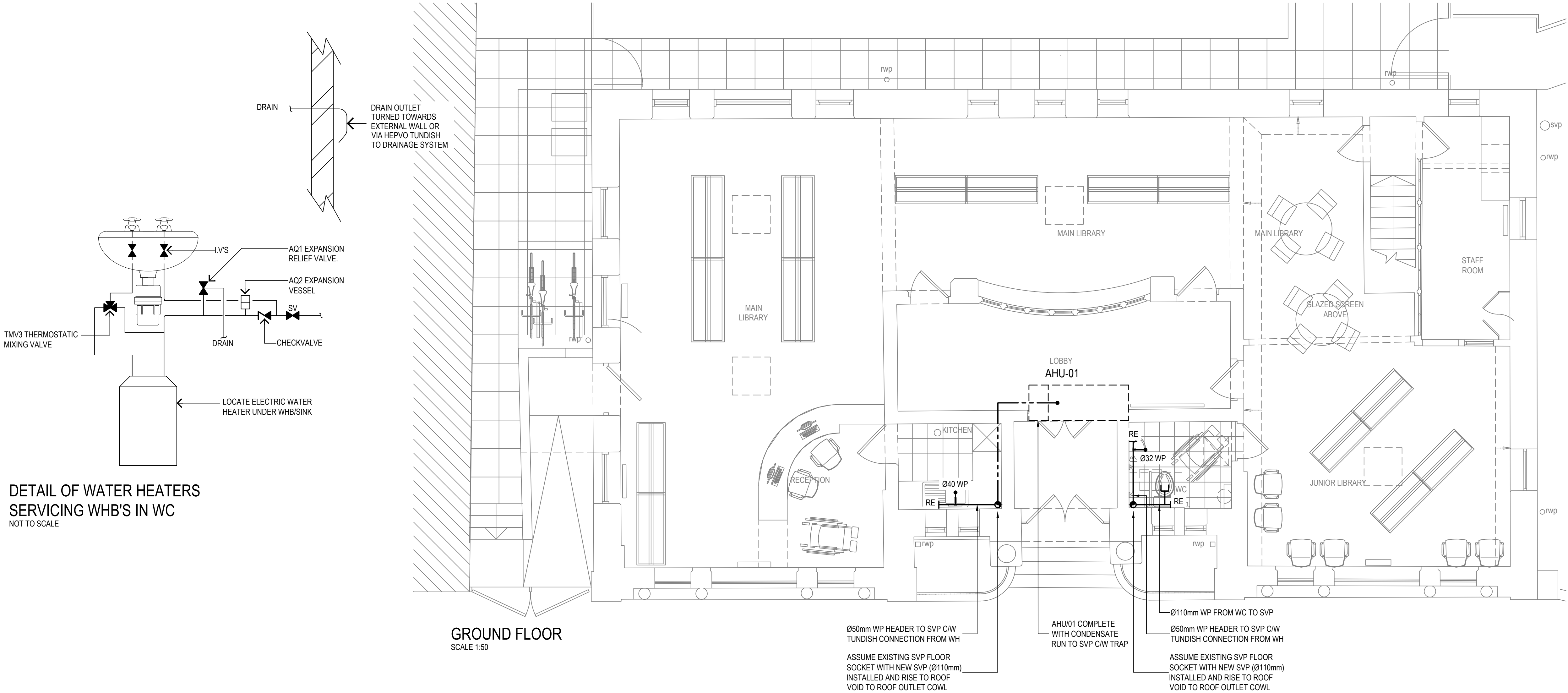
Project:

TREHARRIS LIBRARY

Drawing Title:
PROPOSED PLANT ROOM LAYOUT

Scale @ A1 1:20	Drawn M.G.	Checked K.S.	Approved R.W.	Date 28.04.23
Drawing No. DR-1302-M-09				Revision T1

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TENDER ISSUE

T1	TENDER ISSUE	KS	RW	02.05.23
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REV	DESCRIPTION	CHK	APP	DATE

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Project:

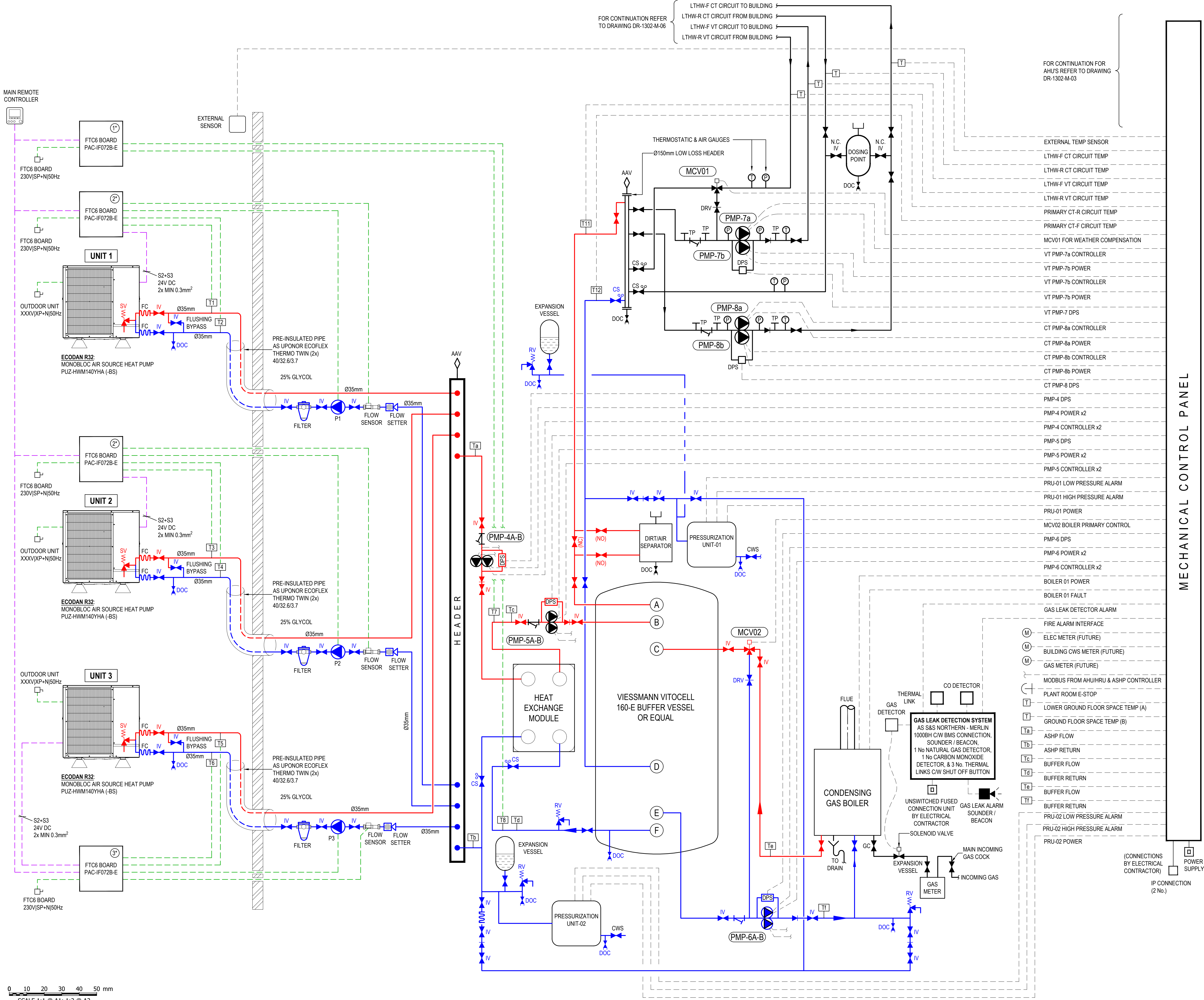
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Drawing Title:

PROPOSED LOWER GROUND FLOOR
& GROUND FLOOR
ABOVE GROUND DRAINAGE

Scale @	A1	Drawn	M.P.	Checked	K.S.	Approved	R.W.	Date	28.04.23
Drawing No.	DR-1302-M-10	Revision	T1						

FILENAME : E:\PROJECTS\DR-1302 TREHARRIS LIBRARY AND CAEDRAW EXTENSION\02 CAD\MEP\MECHANICAL\NEW\DR-1302-M-11 (T1) PROPOSED MECHANICAL SCHEMATIC.DWG | PLOTTED DATE : 02 May 2023 12:29:17



NOTES :

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- ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS NOTED OTHERWISE
- THIS DRAWING IS NOT FOR INSTALLATION PURPOSES. DESIGN, INSTALLATION AND CO-ORDINATION DRAWINGS SHALL BE PROVIDED BY THE CONTRACTOR IN ACCORDANCE WITH THE SPECIFICATION. THE CONTRACTOR IS TO READ THIS DRAWING IN CONJUNCTION WITH THE HEALTH AND SAFETY PLAN AND DESIGN HAZARD INFORMATION.

LEGEND:

O/P	ORIFICE PLATE
ISOLATION VALVE	ISOLATION VALVE
TEMPERATURE SENSOR	TEMPERATURE SENSOR
TEMPERATURE GAUGE	TEMPERATURE GAUGE
PRESSURE GAUGE	PRESSURE GAUGE
ISOLATION VALVE (NORMALLY CLOSED)	ISOLATION VALVE (NORMALLY CLOSED)
PRESSURE INDEPENDENT CONTROL VALVE	PRESSURE INDEPENDENT CONTROL VALVE
AAV	AUTOMATIC AIR VENT (AAV)
LOCKSHIELD VALVE	LOCKSHIELD VALVE
GAS COCK	GAS COCK
STOP COCK	STOP COCK
METER	METER
SAFETY VALVE	SAFETY VALVE
STRAINER	STRAINER
THREE PORT CONTROL VALVE	THREE PORT CONTROL VALVE
DOUBLE REGULATING VALVE	DOUBLE REGULATING VALVE
HEAT METER	HEAT METER
DRAIN OFF COCK	DRAIN OFF COCK
DOOR AIR CURTAIN CONTROLLER	DOOR AIR CURTAIN CONTROLLER

MECHANICAL CONTROL PANEL

TENDER ISSUE

T1	TENDER ISSUE	KS	RW	02.05.23
T0	TENDER ISSUE	KS	RW	28.04.23
REV	DESCRIPTION	CHK	APP	DATE

Client:

MERTHYR TYDFIL COUNTY BOROUGH COUNCIL
CIVIC CENTRE, CASTLE STREET,
MERTHYR TYDFIL, CF47 8AN

4 Ty Nant Court,
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Project:
TREHARRIS LIBRARY

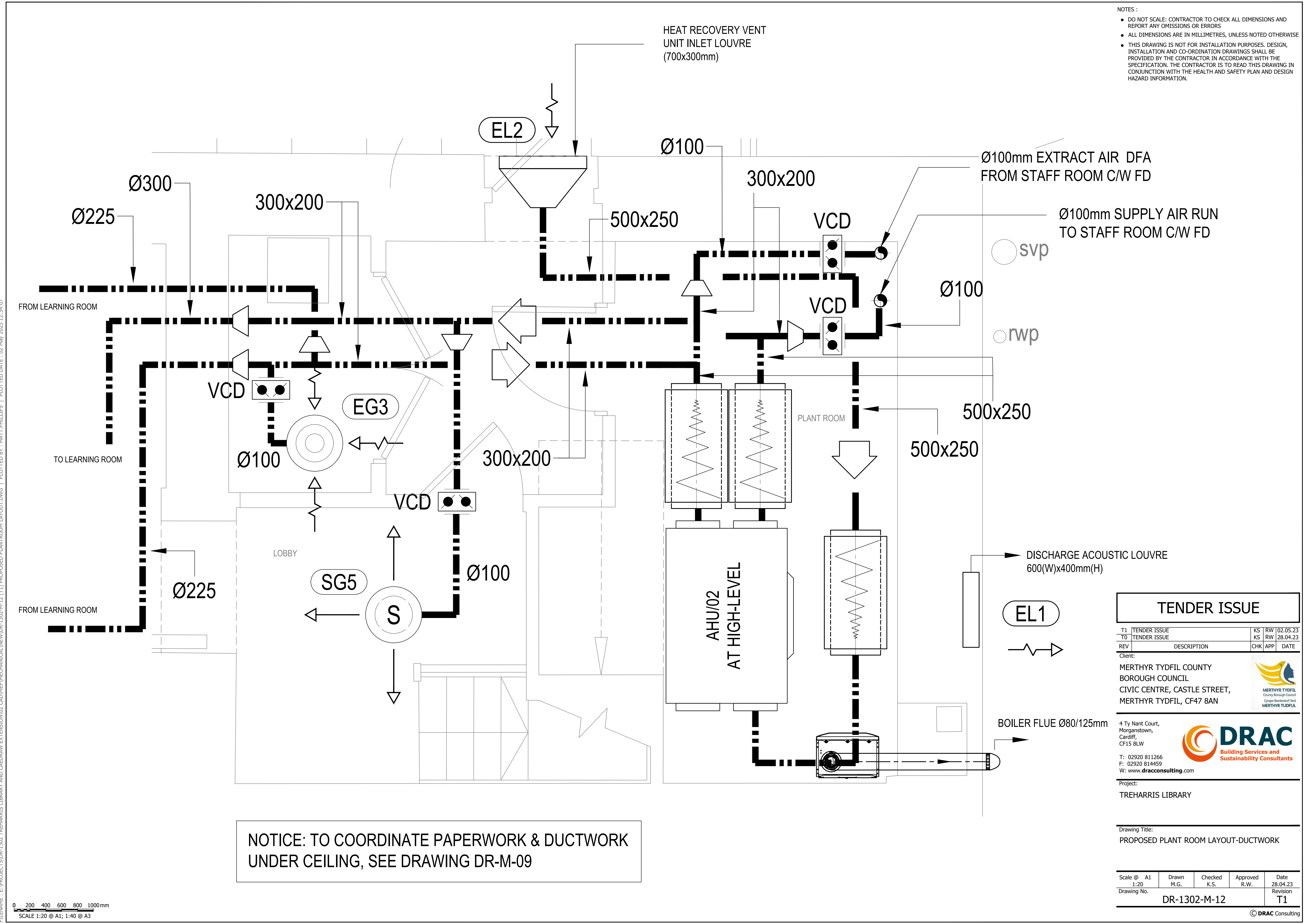
Drawing Title:
PROPOSED MECHANICAL SCHEMATIC

Scale @ A1	Drawn M.P.	Checked K.S.	Approved R.W.	Date 28.04.23
NOT TO SCALE				Revision
Drawing No.	DR-1302-M-11			T1

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NOTICE: TO COORDINATE PAPERWORK & DUCTWORK UNDER CEILING, SEE DRAWING DR-M-09

TENDER ISSUE

T1	TENDER ISSUE	KS	RW	02.05.23
T0	TENDER ISSUE	KS	RW	28.04.23
REV	DESCRIPTION	CHK	APP	DATE

Client:

MERTHYR TYDFIL COUNTY BOROUGH COUNCIL
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Project:

TREHARRIS LIBRARY

Drawing Title:

PROPOSED PLANT ROOM LAYOUT-DUCTWORK

Scale @ A1 1:20	Drawn M.G.	Checked K.S.	Approved R.W.	Date 28.04.23
Drawing No. DR-1302-M-12				Revision T1

MERTHYR TYDFIL
County Borough Council
Cynghor Bwrdeistref Saniol
MERTHYR TYDFIL

DRAC
Building Services and
Sustainability Consultants

MEP Stage 4

Technical Specification



Treharris Library Refurbishment

MEP Stage 4

Technical Specification

Project Number: DR 1302
Date: 23rd April 2023
Client: Merthyr Tydfil CBC

Specification information

Project:	Treharris Library Refurbishment
Client:	Merthyr Tydfil CBC
Job Number:	DR 1302
File Origin:	1302/Report

Document checking

Primary Author:	Daymon Brocklebank Kate Suszynska	Initialled: DB KS
Reviewed by:	Carl Bassett Russell Williams	Initialled:

Issue:	Date:	Status:	Checked for issue:
Rev T0	2 nd May 2023	Tender Issue	RW

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A64 INTRODUCTION

This specification outlines the proposed engineering services for the Mechanical, Electrical, and Public Health (MEP) building services connected with the refurbishment of the proposed library at Treharris Library, Perrott Street, Treharris, CF46 5ET.

The building is Grade II listed by CADW which was built 1908 and opened in 1909. The building comprises of a ground floor main library, office, kitchen, and toilet areas, and a lower ground floor with Learning Room and Training Room plus boiler room containing gas fire boiler.

General Overview of the Scope of Works.

The works involve the removal of the existing and the installation on new MEP services within the building and around the immediate external area.

MECHANICAL and PUBLIC HEALTH

The following items generally form the scope of works and shall be included in the contract:

- Heating via Natural Gas Boiler to serve space heating and AHU's with interface to ASHP,
- Heating via Air Source Heat Pumps and buffer vessel etc
- Space heating via trench heaters and radiators etc.
- Domestic Hot and cold water services,
- Toilet / kitchen extract ventilation linked to main AHU(s),
- Fresh air input/extract AHU(s) to ground and lower ground floor,
- Waste Plumbing (above Ground drainage),
- BMS Controls,
- Testing & Commissioning,
- Provision of As Installed drawings and O+M Manuals

ELECTRICAL

The following items generally form the scope of works and shall be included in the contract:

- Disconnection and removal of existing services
- Provision of a new TP+N electrical supply from NGED
- Low Voltage Distribution,
- Lighting Installation,
- Small Power Installation,
- Small Power for Mechanical Services,
- ICT Structured Wiring,
- Fire alarm Installation,
- Disabled WC Alarm
- Security and Access Control Installation,
- CCTV Cameras Installation,
- Lightning Surge Protection Installation,
- External building mounted lighting,
- Testing & Commissioning,
- Provision of As Installed drawings and O+M Manuals

A64 GENERAL CONDITIONS

100.000 PROJECT PARTICULARS

100.010 PROJECT PARTICULARS

For full details and particulars of the project refer to the Main Contract Preliminaries.

This specification is directed at the Main Contractor responsible for the Works. This specification must be read in conjunction the Main Contract specifications and documentation produced by Employer's professional design team including Architect, Structural Engineers,

The decision to sub-let any of the works, rests with the Main Contractor and any references herein to Contractor, Principal Contractor, Mechanical Contractor, Mechanical Sub-Contractor, Electrical Contractor, Electrical Sub-Contractor, Specialist Contractor, Specialist Installer, Tenderer or Installer are all deemed to refer to the Main Contractor for the project.

All conditions of appointment, terms of payment, welfare facilities, storage facilities, scaffolding and ancillary attendances shall be agreed by direct communication between the Principal Contractor and their "domestic" sub-contractors.

The Contractors selection of their Domestic Mechanical and Electrical sub-contractors may be subject to Employer/Consultant approval. The names of the Domestic Mechanical and/or Electrical Sub Mechanical and Electrical Contractors and Specialists shall be members of an approved trade organisation namely Gas Safe and B&ES for Mechanical Contractors and the ECA or NICEIC for Electrical Contractors.

Other Specialists shall be members of trade organisations such as the CIBSE, Refcom Elite (Register of Companies Competent to Manage Refrigerants), BAFE (British Approvals for Fire Equipment) and similar approved organisations.

The M&E specification may in some cases set out activities for mechanical sub-contractor/electrical sub-contractor and main contractor, an example being builders work. The division of such activities shall be the responsibility of the main contractor and any of the chosen domestic sub-contractors. All builders work shall be included within the Contract and the Principal/Main Contractor shall co-ordinate and agree the extent of responsibilities with their appointed domestic sub-contractors.

NOTE!

THE DRAWINGS PROVIDED BY DRAC CONSULTING TO ACCOMPANY THIS PARTICULAR M&E SPECIFICATION ARE FOR TENDER ACTION ONLY AND DO NOT CONSTITUTE INSTALLATION DRAWINGS.

THEY MUST NOT BE USED BY THE CONTRACTOR FOR INSTALLATION PURPOSES.

The **INSTALLATION / WORKING DRAWINGS** of the MEP Services shall be the responsibility of the Contractor.

The design of the MEP Services shall require the provision by the Main Contractor of a Design Warranty coupled with Professional Indemnity Insurance cover, further details of which may be found in the Main Contract documentation.

The Contractor shall prepare the Installation Drawings to comply with the parameters described within this specification and on any associated drawings and with due regard to compliance with the required British Standards and Building Regulations.

Design and Installation Drawings shall be issued to the Employers Representative(s) for review prior to commencing the site works. The drawings shall be fully co-ordinated and shall include dimensional checks of major service elements (such as service ducts routes, major plant items etc) to verify that the services can be

satisfactorily installed and maintained in accordance with the requirements of this specification.

The Contractor shall also provide, as necessary, formal documentation to Building Control and/or the Employer such as Part L compliance, EPC documentation and commissioning certification.

Any queries in understanding and/or determining the specific requirements or scope of works for this project should be submitted, in the first instance, in writing (e-mail acceptable) to the Project Manager and copied to the MEP Design Engineering team at DRAC Consulting Ltd.

BUILDERS WORK

The Contractor shall include for the provision of all builder's work associated with the MEP Services.

LIAISON WITH EMPLOYER or EMPLOYERS REPRESENTATIVE

As part of this scheme the Main Contractor shall hold regular meetings with the Employer and/or the Employers representatives.

BUILDING REGULATIONS including PART L and EPC documentation.

The Main Contractor shall be responsible for all aspects of Building Regulation approval, including but not limited to the demonstration of compliance, where required, with respect to the Part B, Part F, Part L and Part M etc. Building Regulation Approved Documents.

In discharging this duty, the Main Contractor shall liaise with the relevant Building Inspectors office and demonstrate compliance through methods identified in the Building Regulations Approved Documents such as the demonstration of consequential improvements, simplified building energy method (SBEM), thermal modelling or other acceptable methods that are approved by the relevant Building Control Authority.

The Main Contractor shall select operating systems, controls, materials and components that minimise the consumption of energy and reduce CO2 emissions for compliance with Building Regulations Approved Documents Part L of the current Building Regulations and also the recommendations contained within the "Non-Domestic Building Services Compliance Guide".

Design Parameters

All works shall comply with the requirements of the appropriate British Standards, European Standards, Building Regulations, CIBSE design guides, Codes of Practice, Firefighting Authority, Clean Air Act, Energy Conservation Act, Disability Discrimination Act (DDA). HSE ACoP L8 Legionnaires' disease and the control of legionella bacteria in water systems as HSG274 Legionella technical guidance.

100.020 THE PROJECT:

Particulars of the project as a whole are: Provided in Main Contract Tender documentation.

100.180 STATUTORY AUTHORITIES:

New services are to be connected into statutory authority utility networks with the exception of natural gas which will be extended from the existing gas supply for the main block, subject to detailed calculations by the main contractor.

The following table provides details of the main contacts related for this project.

100.020 THE EMPLOYER:	100.030 CONTRACT ADMINISTRATOR (CA):
Merthyr Tydfil CBC Civic Centre, Castle Street, Merthyr Tydfil, CF47 8AN Tel 01685 725000	Merthyr Tydfil CBC Civic Centre, Castle Street, Merthyr Tydfil, CF47 8AN Tel 01685 725000
100.040 THE ARCHITECT:	100.050 PROJECT MANAGER:
CFW Architects Ltd The Hawthorns, 6 North Road, Cardiff CF10 3DU Tel: 029 2034 0491	Not Applicable
100.060 BUILDING SERVICES (MEP) CONSULTANT:	100.070 STRUCTURAL ENGINEER:
DRAC Consulting Ltd 4 Ty Nant Court, Morganstown, Cardiff CF15 8LW Tel: 02920 811266	Vale Consultancy 29 Bocam Park, Old Field Rd, Pencoed, Bridgend CF35 5LJ Tel: 01656 863794
100.080 PRINCIPAL DESIGNER:	100.090 LANDSCAPE ARCHITECT:
To Be Confirmed	Not Applicable
100.100 MAIN CONTRACTOR:	100.110 MEP CONTRACTOR:
To be appointed	To be appointed

200.000 DEFINITIONS

200.010 GENERAL:

Where used in the documentation the following definitions shall apply and shall be interpreted as such:

- Works: The design, supply, installation, setting to work, testing and commissioning of the Mechanical, Electrical and Public Health (MEP) services, as generally outlined in the tender documentation.

All services shown on the drawings and described in the specification shall be deemed to be included in the contract.

- Drawings: The Tender drawings.
- Elsewhere: Detailed or specified elsewhere in other clauses, sections, shown on the drawings or contained in the specification or conditions of contract.
- MEP: Mechanical, Electrical and Public Health
- Services: Services means the inclusion of one or more system.
- System: All equipment, accessories, controls, supports and ancillary items, including supply, installation, connection, testing, commissioning and setting to work necessary for that section of the Works to function.
- Design process: All the activities necessary to convert design input into design output
- Review: Give notice and submit details to the CA for his comment and review, which shall be granted in writing only. In the event of the CA not accepting that submitted, resubmit alternative details for review or modify that submitted in accordance with the CA comments. Review of any submittal by the CA shall not mean that the CA is responsible for the correctness of the submittal or its suitability for purpose and does not relieve any contract responsibilities.
- Competent person: A person, by reason of theoretical and practical training or actual experience or both, is competent to perform the task or function or assume the responsibility in question and is authorised to perform such a task or function.
- Duct: An enclosed space specifically intended for the distribution of services, with direct access for personnel.
- Trench: A covered horizontal service space in the floor or ground with access from above.
- Cavity: A space enclosed within the elements of a building within which services are installed, e.g. the space between ceiling and floor above. See Building Regulations.
- Service Areas: Includes areas within a building with limited finishes such as loading bays, car parks etc.
- Concealed Services: Includes installations within ducts, trenches or cavities.
- Exposed Services: Includes installations outdoors or unprotected within service or occupied areas.
- Terminal Units: Terminal units such as radiators, convectors, fan coil units, induction units, variable or constant volume air boxes and other like equipment.
- Ancillaries: All specified fittings, accessories, inserts, test points, bracketing, terminal equipment connected to and installed in the engineering services system.
- CIBSE: The Chartered Institution of Building Services Engineers
- BSRIA: The Building Services Research and Information Association
- IET: The Institution of Engineering and Technology
- IOP: Institute of Plumbing
- FRS: Fire Research Station
- HSE: Health and Safety Executive

200.020 DEFINITIONS OF TECHNICAL TERMS

The definitions of technical terms associated with the engineering services installations are those included the latest edition of:

- CIBSE - Guides; Commissioning Codes; Technical Memoranda; Building Energy Codes; Lighting Guides; and Application Manuals

- IPHE - Plumbing Engineering Services Design Guide
- BSRIA - Technical Publications
- Loss Prevention Council - Rules for Automatic Sprinkler Installations
- BS 7671 Requirements for Electrical Installations (IET Wiring Regulations)
- British Standards, including Codes of Practice.
- Statutory Acts.
- Recommendations regarding the Disability Discrimination Act and The Equality Act 2010.
- HSE ACoP L8 Legionnaires' disease. The control of legionella bacteria in water systems.
- HSG274 Legionella technical guidance

200.030 DEFINITIONS: "SHOULD", "SHALL" AND "MUST"

This specification makes use of terms "should", "shall" and "must" when prescribing procedures:

- The term "must" identifies a requirement by law at the time of publication.
- The term "shall" prescribes a procedure which it is intended to be complied with, in full and without deviation.
- The term "should" prescribes a procedure which it is intended to be complied with unless, after prior consideration, deviation is considered to be equivalent or better.

300.000 TENDERING INSTRUCTIONS

300.010 GENERAL:

This section outlines the tendering procedures and requirements.

300.020 SCOPE:

These conditions are supplementary to those stated in the Main Contract Invitation to Tender.

300.030 TENDER DOCUMENTS

The Tender documents (in relation to the Mechanical, Electrical of the works) generally consist of the following:

- MEP Detailed Specification for the Works.
- Set of Mechanical and Electrical Detailed Tender drawings for the Works. - See Drawing Issue Sheet
- Summary of Tenders (Mechanical and Electrical) for the Works.

Additional information particularly in relation to the specific locations of equipment and fixtures may be found by reference to associated Architectural and/or Civil and Structural Engineers drawings/documentation.

It should be noted that the positions of sockets, light fittings, heat emitters and other components shown on the Tender Drawings are indicative only. The final accurate locations of all components shall be agreed and confirmed prior to installation with full details included on the Contractors Installation drawings.

300.040 PRIVACY OF INFORMATION:

The information contained in the tender documentation shall be treated as private and confidential.

300.050 CHECKING DOCUMENTS:

Check the Tender documentation for obvious errors and omissions. Should any such errors or omissions be discovered inform the office issuing the documents immediately in writing in order that a correction may be issued before the date for submission of the tender.

300.060 TENDER ACKNOWLEDGEMENT:

Acknowledge receipt of the Tender documentation and confirm submission of a tender in accordance with the instructions to tender.

300.070 PERIOD OF VALIDITY:

Tenders must remain open for consideration (unless previously withdrawn) for a period from the date fixed for submission of Tenders of not less than that referred to in the Main Contract information.

The date for possession/commencement is referred to in the Main Contract information.

300.080 TENDER PROCEDURE:

Tendering procedure is in accordance with the principles referred to in the Main Contract information.

300.120 INSPECTION OF SUPPLEMENTARY DOCUMENTS:

- Architectural documents may be inspected: Refer to Main Contract information.
- Structural documents may be inspected: Refer to Main Contract information.
- Building services documents may be inspected at - DRAC CONSULTING.

300.130 SITE VISIT:

Before tendering, ascertain the nature of the site, access thereto and all local conditions and restrictions likely to affect the execution of the Contract Works.

Inspect existing installations relevant to the works and study any relevant existing records.

Inspect the existing installations and all systems to remain operational during each phase of the works.

Inspect existing installations to determine the total extent of services to be modified and/or removed.

No claims shall be allowed after submission of a Tender for lack of information or other reasons which could have been resolved by such a visit to the site during the Tender period.

Arrangements for visiting the site must be made with prior agreement through: Refer to Main Contract Tender Information.

300.170 UNQUALIFIED TENDERS:

Other than as part of an alternative offer as described elsewhere, no account shall be taken of any qualification or special conditions that a Tenderer may impose on their Tender.

Any Tender containing such additional conditions may be rejected.

300.180 ALTERNATIVES:

Alternative equipment, specialists or methods of carrying out the works in addition to those described in the Tender documents may be submitted. Alternative offers shall be indicated on the appropriate document and include:

- Details of the alternative equipment, specialist or method proposed.
- Full technical data for each such alternative together with details of any consequential amendments to the design and/or other parts of the works. Demonstrate compliance with any stated British (or other equivalent recognised International) Standards.
- A detailed breakdown of any omissions or additions to the basic Tender sum indicated on the appropriate document.

- The impact of all proposed alternative equipment or materials on Part L compliance including:
- The CO₂ Target Emissions Rate.
- The final 'as constructed' CO₂ Buildings Emissions Rate.
- Confirm equivalence in quality, operation and space requirements to those items which have been specified by name. Demonstrate the proposed alternative is fully equivalent to the specified item and identify any constructional, cost, programme, maintenance, or other differences.
- Include for all necessary measures to ensure alternative manufacturer's equipment and the total installation is equivalent to that specified.
- The Tenderer shall include the costs necessary for re-sizing and re-selection of associated equipment (including pipework, ductwork and cable sizes) resulting from the proposed alternative together with all resulting design and coordination.

Alternative offers shall only be considered if accompanied by a compliant Tender.

Final approval of any alternative equipment/proposals remains solely with the Client/Employer and/or their appointed representative.

For the avoidance of doubt: – Where specific manufacturers / particular reference is specified (either on the drawing or within the specification) with the associated note "or equal approved" or similar notation, the Tenderer shall include for the provision of the specific manufacturer / reference number.

Note: Alternative offers shall only be considered if accompanied by a fully compliant Tender received by the return Tender date.

300.190 EXCLUSIONS:

If any part(s) of the Works cannot be tendered as defined in the Tender documents, the CA must be informed as soon as possible, defining the relevant part(s) and stating the reasons for the inability to tender.

300.195 INTERPRETATION OF THE TENDER DOCUMENTATION:

Should there be any doubt about the precise meaning of any item for any reason whatsoever, the tenderer must inform the office of issue of the Tender documents in writing in order that the correct meaning may be given.

Any clarification of the meaning or intent shall be issued in writing only and no other means of communication shall be valid. All Tenderers shall be notified of any such explanation.

No liability shall be admitted, nor claim allowed, in respect of errors in a tender due to mistakes that should have been rectified in the manner described above.

300.200 PROCUREMENT OF MATERIALS:

Allow for the procurement of materials and equipment from suppliers at such a time, and in such a manner as may be necessary to allow for the completion of the Works in accordance with the contract programme.

Clearly state in the Tender submission any foreseen difficulties with delivery periods for selected equipment or proposed alternatives.

No additional costs resulting from non-compliance shall be accepted.

300.201 A LIST OF PROPOSED MANUFACTURERS/SUPPLIERS:

A list of proposed manufacturers/suppliers of products, equipment, and plant, including all items for which the choice of manufacturer/supplier is at the discretion of the Contractor, must be submitted - Within 5 days of a formal request from the CA or Building Services Consultant.

300.202 SELECTION OF MANUFACTURERS/SUPPLIERS:

Where manufacturers, suppliers or installers of products are not identified by name select products that comply in all respects with the specification and demonstrate such compliance by the submission of relevant supporting data within 5 days of a formal request from the CA or Building Services Consultant.

Where manufacturers, suppliers or installers of products are identified by name, or names, but no reference is made to "or approved" equivalent use these exclusively.

Where manufacturers, suppliers or installers of products are identified by name, or names, but reference is made to "or approved equivalent" the submitted Tender must include the named or one of the named suppliers.

Alternatives may be permitted, subject to Employer agreement, but alternative proposals shall be submitted to the CA for formal approval.

300.210 SUBLETTING:

Where it is proposed to sublet any portion(s) of the Works a schedule must be submitted with the tender.

The schedule should define such portion(s) and give for each the details of the proposed company.

310.000 TENDER SUBMISSION

310.010 GENERAL:

This section details the particular Tender submission requirements.

310.030 TENDER SUBMISSION DELIVERABLES:

To be compliant the Tender submission must include the following deliverables:

- Fully completed Summary of Tender Form for the Mechanical Services
- Fully completed Summary of Tender Form for the Electrical Services

Summary of Tender Forms are located in the rear of this Specification.

320.000 PRICING AND COSTS

320.010 GENERAL:

This section details particular requirements for the pricing of the Tender documentation and cost procedures during the contract.

320.020 BASIS OF CONTRACT:

The contract shall be: Refer to Main contract documentation.

320.030 TENDER PRICING DOCUMENT:

Alterations and qualifications to the specification must not be made without the written consent of the CA. Tenders containing such alterations or qualifications may be rejected.

Costs relating to items in the specification that are not priced shall be deemed to have been included elsewhere in the Tender.

The Tenderer shall complete all sections of the tender pricing document in full including the Tender Summaries located in the rear of this specification.

Items described in the pricing document are abbreviated for the purpose of the schedule. The Tenderer is to make full allowance for all works associated with the installation of a particular element.

Items entered in the pricing document shall be deemed to include all costs involved in carrying out the Works.

Note: The priced Summary of Tenders as detailed in the Appendix must be submitted with the Main Contract Tender documentation.

320.040 SCHEDULE OF RATES:

A schedule of rates must be submitted:

Within two weeks of request from the CA.

A **fully quantified** schedule of rates must be submitted billed back to match the summary of Tender items.

All schedules of rates are to include installation, fixing, sundry items and setting to work of each item of equipment.

Include all items and materials included in the Tender, together with their rates, extended and totalled. Price preliminaries separately. Such totals shall agree with the contract sum subtotals detailed on the priced Summary of Tender Form(s).

Correction of errors in the quantification shall not lead to adjustment of the Subcontract Sum.

A quantified schedule of rates accepted by the CA shall only constitute part of the contract in the following respects:

- a) The descriptions of the works and the rates and prices contained therein shall be used for the purpose of adjusting variations.
- b) The quantities contained therein shall be used to facilitate the preparation and the checking of interim applications for payment.

The schedule of rates must include rates for all significant items of work.

- Rates to include Contractor's cash discount.
- Any provisional and prime cost sums contained therein shall be subject to adjustment in accordance with the rules and procedures contained in the contract conditions.

320.080 OVERTIME AND ALLOWANCES:

Include for all necessary overtime and other expenses in the contract price that may be necessary in order to complete the Works in compliance with the contract programme.

Payment shall be made for the extra cost of overtime only if a prior written CA instruction to work such overtime has been issued together with agreement to accept the costs involved.

400.000 CONTRACT CONDITIONS

400.010 CONDITIONS OF CONTRACT:

The conditions of the Main Contract are:

- Refer to Main Contractors Documentation

400.040 INSURANCES:

Under the terms and conditions of the Main Contract, the Contractor is required to secure certain policies of insurance, the benefits of which extend to their selected Domestic Sub-Contractor(s), either partly or in whole. Examine these policies and obtain such supplementary cover as shall be necessary.

400.060 WARRANTIES:

Refer to Main Contractors Documentation.

400.070 SUB-CONTRACT GUARANTEE BOND:

Refer to Main Contractors Documentation.

410.000 PARTICULAR CONDITIONS

410.010 GENERAL:

This section details particular conditions and requirements for the project.

410.020 INFORMATION PROVIDED BY OTHERS:

Instructions, drawings, or other information required to be provided by the CA shall be provided in due time upon written request provided always that such information is not requested unreasonably distant from nor unreasonably close to the date upon which it is necessary.

Provide written request to the CA in good time for any information required.

410.030 PROVIDE EVERYTHING NECESSARY:

Provide everything necessary for the proper execution and completion of the contract works to the true intent and meaning of the contract documents.

Details of construction or materials which have not been referred to in the contract documents but are a necessity for which may reasonably be implied or inferred from the said documents, or which are usually or essential to the completion of the Works, shall be installed with no additional cost.

410.042 CO-OPERATION WITH OTHERS:

Ensure that the contract works integrates with that of others and that full co-operation is maintained during the execution of the Works with that of others.

Co-operate with the Employer, Suppliers, Local Authorities and any other statutory undertakings in the execution of the Works.

In the event of any extra costs being caused by failure to programme and arrange the execution of the Works so that it fully integrates with that of others, the installer of the Works may be liable for any additional costs thereby incurred.

In particular, the following works carried out shall require close and careful liaison and co-operation.

Primary combined service routes for Mechanical and Electrical installations

Alterations to existing services.

Installation of any "free issue" equipment provided by the Employer.

410.060 NOISE AND NUISANCE:

Ensure that the contract works are undertaken with as little noise as possible.

Ensure no nuisance by noisy working is caused to:

- The Employer
- Occupants of existing premises
- Occupants of buildings in close proximity of the site
- Members of the public in the vicinity of the site

Take all necessary precautions to prevent nuisance from smoke, rubbish and other causes.

Fit all compressors, percussion tools and vehicles with effective silencers of a type recommended by the manufacturers of the equipment.

410.070 SUPPRESSORS:

Ensure all internal combustion engines used in the execution of the contract works are fitted with efficient suppressors in the ignition system in accordance with the recommendations of British Standards so as to prevent electrical interference to radio or television receiving equipment in the vicinity.

All temporary electrical installations, such as motors or the like, shall be prevented from creating such interference and shall be fitted with suppressor equipment in accordance with British Standards and to the satisfaction of the CA.

410.120 DRYING OUT:

Make due allowance in the sequence of the work to provide heat for drying out. This activity shall not relieve any responsibilities to hand over the installation in good order.

The interim period from the time of commencement of use for drying out to the handover shall not be considered as constituting any part of the defect liability period.

410.130 WORKING HOURS:

Working hours shall be: Refer to the Main Contract Documentation

410.140 ACCESS TO THE SITE:

Access to the site shall be as referred to in the Main Contract Documentation

410.150 METHOD AND SEQUENCE OF WORK:

Refer to Main Contractors Documentation

410.160 USE OF THE SITE:

Refer to Main Contractors Documentation

410.170 WORKING AREA:

Refer to Main Contractors Documentation

410.190 USE OR DISPOSAL OF MATERIALS:

Remove from the site any rubbish and debris arising out of the execution of the contract works on a daily basis.

Do not discharge any oil, noxious liquids or gases and all water discharged shall be reasonably free from impurities.

Refer also to Main Contractors Documentation

410.200 STORAGE:

Weatherproof, safe and secure storage shall be provided for all materials and equipment.

All materials, equipment and materials shall be offloaded, stored and transported in accordance with manufacturer's recommendations.

All electrical equipment and components shall be kept dry and free from dust.

Plug, cap or seal open ends on all ductwork, tubes, conduit, trunking and associated equipment whilst in storage and during transportation to site.

Provide racks to prevent distortion of pipes, conduit and similar materials.

410.210 PROTECTION AND PACKAGING:

All plant, equipment, materials and prefabricated elements of the Works shall be properly packaged and protected against damage during delivery, storage and until fully, finally and properly installed and set to work.

Protection shall also include adverse effects of environmental conditions prevalent in the stored and installed location.

Any plant or equipment subject to incorrect storage or inadequate protection shall be deemed unacceptable for incorporation into the works and new plant or equipment shall be required as a replacement.

Damaged plant, equipment and materials or that suffering from deterioration shall be replaced prior to handover.

All plant, equipment and materials shall be protected against ingress of water and dust, formation of condensation, extremes and rapid changes of temperature, building works and operations of others.

All open ends of pipes, ducts, conduit, and trunking etc. shall be capped except when being worked upon.

After removal of any temporary protection paint parts liable to corrosion.

Filter media shall only be installed when the plant items concerned are commissioned and tested.

Install items such as grilles, diffusers, light fittings, switches, electrical accessories etc. as near to practical completion as practicable.

410.220 CONFIDENTIALITY:

No information related to the contract works shall be given to the press or other media without the written permission of the CA or Employer.

410.240 MATERIALS USED:

No acoustic insulation or thermal insulation or sound attenuation materials shall be manufactured with any form of animal hair.

All materials supplied shall be a type that shall not support bacteria.

Substances publicised by the Health and Safety Executive, Building Research Establishment, British Standards Institution or other authorities or professional bodies as being deleterious to Health and Safety shall not be incorporated into any part of the Works.

Deleterious materials shall not be utilised on any part of the Works. Deleterious materials include but not limited to:

- halon/CFC's
- asbestos or products containing asbestos.
- urea formaldehyde or materials which may release formaldehyde.
- materials comprised in whole or part of man-made and/or naturally occurring mineral fibres which have a diameter of 3 microns or less and a length of 200 microns or less or which contain fibres not sealed or otherwise not stabilised to ensure that fibre migration is prevented.
- lead where the metal or its corrosion products may be directly ingested, inhaled or absorbed.
- polyurethane or polyisocyanate foam.
- polychlorinated biphenyls (PCBs) or similar compounds.
- pentachlorophenol, lindane or tributyltin (TBT) oxide.
- extruded polystyrene other than low ozone depletion materials.
- any other substances generally known to be deleterious at the time of installation.

All jointing materials shall be of a type approved by the respective authority.

Warrant that deleterious materials are not incorporated in the Works.

Notify the CA, in writing, as soon as reasonably practicable of any material designated by the Building Research Establishment, British Standards or codes of practice as deleterious at any time during the contract.

410.250 ADVERTISING:

No form of advertising shall be allowed on any part of the site or the Works without written CA approval.

410.270 BENEFICIAL USE OF INSTALLATIONS:

Systems shall not be used before practical completion without prior approval of the CA (with the exception of the Phased works on their completion).

Systems used before practical completion not for the benefit of the Employer must have all defective consumable elements replaced by new including:

- lamps and tubes
- filters

Replacement of consumable elements shall be not more than 2 days prior to practical completion.

If instructed by the CA, operate the installations or any part of them prior to practical completion, provided that such operation is practicable and does not prejudice the responsibilities and obligations under the contract.

All costs arising from the use of such installations shall be reimbursed at rates or where no such rates are applicable at reasonable rates agreed with the CA before commencing operation of the installations.

410.280 DEFECTS LIABILITY:

Liability for making good defects in respect of the Mechanical and Electrical Works shall be for a period of not less than 12 months from the date of issue of the certificate of practical completion for the installations (or longer if stated in the Main Contract Documentation).

If it is necessary to replace or renew any portion of the contract works as part of liability for defects, the defects liability period in respect of that portion of the contract Works shall be deemed to commence from the date of such replacement or renewal.

The CA may require that new tests be carried out to demonstrate that the plant is continuing to work satisfactorily if the replacement or renewal may affect the efficiency of the Works or any portions thereof.

In the remedying of defects in the contract Works take all necessary precautions to minimise the risk of damage to the buildings, the decorations, the fittings and the equipment.

- In the event of such damage occurring bear the cost of replacement or making good, subject to the proviso of being granted the benefit of any settlement in respect of such damage accepted by the insurers under the insurance policies taken out in accordance with the requirements of the contract.
- Agree with the CA a programme for the carrying out and the completion of any work not finally finished at the time of the contract Works being offered for acceptance and which does not prejudice the issue of a practical completion certificate. This work may be requested to be executed out of normal hours and no additional costs shall be accepted for this action.
- Prior to practical completion submit a method statement for the approval of the CA outlining how the defects which arise during the defect's liability period shall be rectified to ensure that disruption to the use of the building is kept to a practical minimum.
- No additional costs shall be accepted for undertaking works executed out of normal hours.
- Prepare and submit records of failures or malfunctions of any part of the contract Works during the defects liability period, together with details of remedial action taken, subsequent re-testing and the results.
- Notify the CA of damage, failures or malfunctions to the contract Works demonstrably caused by incorrect operation of the installations, vandalism or other actions by a third party.
- Inform the CA in writing when all defects are finally rectified so that an inspection may be carried out prior to the issue of a Final Certificate.
- No additional costs shall be accepted for undertaking works executed out of normal hours.

410.290 RIGHT OF ACCESS DURING DEFECTS LIABILITY PERIOD:

- Right of access shall not be unreasonably withheld, at all reasonable working hours and at own risk and expense, to any part of the contract works for the purpose of inspecting the working of the installations or to the records of the working and the performance thereof.
- Subject to CA approval, that shall not be unreasonably withheld, undertake any tests considered necessary at own risk and expense.
- During the defect's liability period and all necessary remedial works and/or rectification of defective materials and equipment liaise closely with the Employer's staff. All such work shall be carried out in such a manner as to avoid or minimise shut-down time and inconvenience to the Employer.

410.300 RATIONALISATION OF COMPONENTS:

Similar items of apparatus and equipment shall be made and provided by the same manufacturer where practicable and corresponding parts of all apparatus and equipment shall be interchangeable to reduce the need for different attention and spares.

410.310 SUPPLY OF COMPUTER HARDWARE AND SOFTWARE:

Obtain on behalf of the end user all appropriate licences, permissions, copyright waivers, rights of use and the like from the owners of the software rights. Ensure that the end user is properly registered with the software supplier for support and appropriate updating. Ensure that application software is written in compliance with BS 7649.

410.320 FIRE PRECAUTIONS:

Take all reasonable fire precautions in respect of stores, workshops and other installations. Where it is necessary to use any naked flame or welding equipment in executing the contract works and where combustible materials are in use, adequate protection shall be given to other adjacent materials and personnel. Suitable fire extinguishers shall be readily available at the position where such work is proceeding.

410.321 INTERFERENCE WITH TRAFFIC:

Maximum facilities for access and transit shall be provided in all works that may interfere with the traffic on the roads, paths and footways. Should any part of the Works be executed in such a way as to cause unnecessary obstruction to traffic with neglect to remove or remedy the same forthwith when called upon to do so, then any obstruction shall be removed and the costs recovered.

410.330 DAMAGE TO STRUCTURE:

Exercise due care and attention in carrying out the contract works and be fully responsible for any damage caused to the structure or building finishes.

Obtain permission from the CA before any holes are cut in floors, walls or steelwork, etc.

410.335 METHOD STATEMENTS:

Submit method statements to the CA prior to commencement of the contract works for the various main work activities detailed on the Summary of Tender.

410.340 INSPECTION BEFORE CONCEALMENT:

Whenever work requiring inspection or testing is subsequently to be concealed give the following the notice to the CA so that inspections may be made, or tests witnessed before concealment.

- 7 days' notice

410.350 EQUIPMENT GUARANTEES:

All plant and equipment guarantees shall commence at the date of practical completion and run for a minimum of 12 months after this date.

Any costs associated with this requirement shall be included in the contract price.

410.360 SITE MODIFICATIONS:

Site modifications to assemblies shall not be made without written approval of the CA.

Where site modifications to assemblies are authorised undertake in accordance with manufacturer's certified drawings and instructions.

Ensure that all modifications undertaken comply with the relevant standards and all test certification obtained.

410.370 DIMENSIONS:

Where installations are dependent upon site dimensions ensure that these are available before proceeding with the Works.

Dimensions should not be scaled from drawings.

Where dimensions are indicated on drawings check these on site, as appropriate, to ensure building construction tolerances and manufacturing tolerances can be accommodated.

Equipment should not be ordered or manufactured using dimensions indicated on the drawings.

430.000 QUALITY

430.010 QUALITY CONTROL:

Prepare and submit to the CA a method statement to indicate fully the quality control programme for the contract works.

430.020 WORKMANSHIP AND MATERIALS:

All materials, articles and workmanship shall be of the best quality and execution as detailed in the specification and drawings.

All equipment and materials to be installed shall be new unless otherwise indicated.

All equipment shall be installed in accordance with the manufacturer's written instructions and recommendations.

All materials considered by the CA to be unsound or not in accordance with the specification shall immediately be removed and properly replaced to the satisfaction of the CA at no additional cost. All work carried out imperfectly or with faulty materials must be immediately removed and properly replaced to the satisfaction of the CA at no additional cost.

The manufactured articles specified shall serve as a quality standard.

Where manufactured items are not specified by name submit with the tender all necessary details of proposed articles. The CA shall approve these articles before their use is permitted.

430.030 DEFECTS:

Agree with the CA a system of recording defects that should include:

- A reference to identify the defect.
- Description of the defect.
- Remedial works proposed.
- Agreement to remedial works proposed.
- Confirmation of defect clearance.
- Refer to Main Contractors Documentation.

500.000 ORGANISATION AND DESIGN MANAGEMENT

500.010 SITE STAFF:

Refer to the Main Contract preliminaries.

Employ a competent full-time site based project manager/engineer and supporting team dedicated full time to the project and not involved in the installation of the Works who shall have full authority to act in connection with the contract works.

Staff of sufficient number and competence in the opinion of the CA, shall be provided as necessary for design, drawing and technical information production, programming and administration to ensure efficient and satisfactory execution of the contract works.

Provide all necessary superintendence during the execution of the contract works. The said staff shall be in attendance on site during the whole time that work is in progress.

Employ on the site suitable qualified engineering staff to be in charge of the contract works from commencement to completion. The said staff shall be in attendance on site during the whole time that work is in progress.

Responsibility for all drawings and technical information production shall be undertaken by a nominated engineer.

Any change made to the appointment of staff during the contract works shall be agreed with the CA with maximum notice being provided.

If the CA is of the opinion that any member of the site staff has been guilty of a serious breach of his duties, he may by notice require that person to be replaced within one weeks of the notification.

510.000 SUBMITTALS AND APPROVALS

510.010 GENERAL:

This section outlines the requirements and procedures for submittals to the CA.

510.020 SUBMITTALS:

Prior to any orders being placed the CA shall review all drawings and manufacturer's details.

Submittals shall be in a clear, definable and easily read format with the specified technical details, notes, performance data and calculations where applicable all in the English language.

Where drawings are to be examined, the manufacturer's details shown on the drawings must have been previously approved.

Include all costs for attending meetings associated with the submittal review procedure. Meetings shall be held as referred to in the Main Contract information.

Agree with the CA where samples of materials offered for review are to be sent.

Issue progressively drawings, calculations and submittals as agreed in advance with the CA for review.

All correspondence related to the examination and review procedure shall be directed through the office of the CA - Refer to Main Contract Documentation.

The timescale for review or comment or otherwise on all submittals shall be as referred to in the Main Contract information.

510.030 SCHEDULE OF DRAWINGS AND SUBMITTALS:

Provide a schedule of all proposed drawings and submittals required for comment. The schedule shall be provided 2 weeks from contract appointment.

Indicate as a minimum the following information on the schedule:

- Drawing number and revision number
- Drawing title and service
- Scale
- Latest date required on site and/or for manufacturing purposes.
- Date required for final comment.
- Date for submission for comment
- Date of commencement of drawing production

The schedule shall be updated as necessary on a regular basis at intervals agreed with the CA during the contract period.

The programme for production of drawings and other submittals should include the necessary time for:

- Submission
- Examination
- Alterations and re-submission in the event of the initial submission not being accepted.
- Final issue

Allow adequate time in the programme in order not to cause delays.

The full extent of all submittals shall be indicated in the schedule.

Group submittals for a particular part of the building or building engineering service as agreed with the CA.

510.040 CALCULATIONS:

All calculations must be presented in a logical format and prepared to a recognised and agreed format and be suitably indexed.

All software programs used in the preparation of designs shall be agreed with the CA prior to commencement of design activities. The use of unverified software must be declared and the initial outputs justified by full and complete hand calculations.

Software used in calculating the energy performance of buildings, as required under Part L of the Building Regulations, shall be as approved and agreed with CA prior to commencement of use.

Calculations that are preliminary in nature, i.e. do not form part of the final submittal, are to be referenced independently and clearly indicated 'Preliminary'.

State the methodology, formulae, design criteria, assumptions and all design margins used in the calculations.

Where necessary calculation sheets shall be accompanied by an annotated layout drawing identifying terminals, fittings and the particular sections of ductwork or pipework.

Each calculation sheet, drawing or schedule shall clearly identify the originator, date of production, checker (who signs or initials) and date of check.

The timescale for review or comment or otherwise on all submittals shall be as referred to in the Main Contract information.

510.050 EQUIPMENT PERFORMANCE DETAILS:

Details of the equipment selected for inclusion into the Works shall include the following information:

- Plant item description, reference identification and serial number.
- Electrical input rating - kVA, Volts, Phase.
- Operating mode - duty, standby, generator etc.
- Starting characteristics - starter type, current, starts/hour and starting time.
- Performance characteristics - (full load current and power factor).
- Noise level.
- Weight.

The format of the information shall be as agreed with the CA.

510.051 PREPARATION OF DRAWINGS:

Agree with the CA a document numbering system prior to preparing any documents.

All drawings shall be prepared using a computer aided draughting system and the software used to produce drawings shall be approved prior to commencement of drawing production.

Each service shall be represented by a separate layer/overlay, for subsequent easy modification.

Prior to commencement of drawing production agree the sequence of layers, pen colours and sizes.

The medium for transfer of information shall be:

- Email transfer with paper copies as back up

AutoCAD drawing files shall be:

- DWG

Drawing plots shall be "A" size to British Standard, with an agreed logo/title block.

The standard drawing size is to be:

- A0 or A1

Scales used on drawings shall be:

- selected to clearly convey the proposals.

510.060 REVIEW OF SUBMITTALS:

Submittals shall be examined for compliance in principle with the design intent.

Such examination shall not relieve any responsibilities and obligations under the contract.

Examination of any submittal by the CA shall not mean that the CA is responsible for the correctness of the drawing or submittal or its suitability for purpose. These responsibilities shall remain as defined elsewhere and as the contract.

Allow adequate time in the programme for submittals with due allowance for incorporation of comments and resubmission in order not to cause delays.

Each package shall contain all drawings, design calculations, support information, manufacturer's literature, etc. necessary to facilitate examination by the CA.

Where drawings are revised and updated during the construction stage these shall be issued to the CA for examination of the revision only, the revision being clearly marked.

Builder's work information and installation drawings shall not be examined in detail but shall be examined by the CA for general suitability.

Record drawings are to be prepared as the contract works progress and shall be examined in the same manner as for other submittals.

The timescale for review or comment or otherwise of record drawings shall be 10 normal working days.

510.070 MISTAKES IN SUBMITTALS:

Examination and/or issue on a CA instruction of submittals shall not be deemed to remove any duties, obligations and responsibilities under the contract.

Be responsible for any error, discrepancy or omission in any submittal, presentation or drawing prepared or where others have prepared these for submittal.

The said indemnity shall be subject to the proviso that such error, discrepancy or omission is not due to any inaccurate data, drawing or information provided by the employer or by the CA on his behalf.

510.080 SAMPLES:

Provide free of charge samples of material and workmanship proposed to be used in the Works.

Samples shall include all alternative finishes available if required.

The samples submitted and approved, shall remain the property of the Employer until the completion of the contract.

Approval of the CA shall be obtained before equipment is placed on order.

The CA shall endeavour to approve samples within five normal working days from receipt.

510.081 FORM AND NUMBER OF SUBMITTALS TO BE PROVIDED:

All submittals shall be issued to the CA or the CA's appointed representative.

Drawings shall be produced in CAD format to:

- comply with BS EN ISO 13567-1
- comply with BS EN ISO 13567-2

Provide drawn information in the following forms:

- Initial copies for comment by electronic transfer.
- Final copies of for distribution by both electronic transfer and in print form in normal paper scale.

Provide copies of drawn information as follows:

- Co-ordinated working drawings
- Installation drawings
- Manufacturer's drawings
- Builder's work information

Provide, in addition to the electronic transfer of drawings, the following paper copies:

- Provide 4No. copies of drawings for issue to the CA for distribution.

Record drawings

Retain a site copy of all installation drawings in print form and regularly mark-up drawings to indicate the progress of the works and to record any changes to the installation.

510.090 REVISIONS TO DRAWINGS:

Where revisions take place either under the authority of a CA instruction, or by written agreement with the CA or when revised architectural, structural or services information is issued, all drawings shall be modified accordingly and shall be re-issued for construction purposes subject to examination by the CA.

The issue of revised drawings shall be in accordance with and with regard to the agreed programme for construction and where time is available re-issues shall be grouped together, as agreed with the CA.

520.000 OBLIGATIONS AND RESPONSIBILITIES

520.010 GENERAL:

Undertake the responsibility for resolving final spatial co-ordination.

Undertake the co-ordination of the engineering services, with each other and with the building structure and fabric.

Undertake all on-site co-ordination with all trades, disciplines, manufacturers and suppliers.

Undertake the role of lead co-ordinator and agree principles of co-ordination with all parties concerned.

Carry out final detailed location and dimensioning of all second fix equipment.

Notify the necessary Statutory Authorities (Building Control, Fire Officer, Environmental Health etc.) in respect of any formally tests and demonstrations required.

Arrange all necessary attendance, documentation to ensure full approval.

Seek full statutory approval of the Works and arrange all necessary attendance, documentation to ensure full approval.

Demonstrate that all plant and equipment incorporated into the works can be safely and easily maintained in compliance with current legislation.

520.015 BUILDER'S WORK OBLIGATIONS AND RESPONSIBILITIES:

Check the provisions for, and adequacy of any builder's work information previously issued prior to the award of the contract.

Check the spatial requirements and adequacy of any builders' work information previously issued by others for utilities works.

Provide final builders work details based on the installation drawings to facilitate the installation of the works. Provide fully dimensioned drawings showing both size and position of builder's work making reference to the structural engineering and architectural final dimensioned detailed drawings.

Detail all access requirements including access to false ceilings and ducts for maintenance.

Provide fully dimensioned and annotated drawings.

Undertake the redesign of the associated builder's work for approved alternative equipment or materials which subsequently varies the works in any way whatsoever.

Detailed design and locations of brackets and supports.

- Submit details of all types of brackets and supports including fixing details.
- Submit load and thrust calculations.

Design, supply and installation of support for plant and services.

- Steelwork.
- Brackets.
- Hangers and clips etc.
- Plinths.
- Inertia bases.

Detail and supply sleeves, inserts, frames, fixing anchors etc., and any other items required to be cast or built into the structures by others, including coordination of positions to such extent and accuracy to allow structural construction to proceed.

Detail design, supply, installation and co-ordination of all access platforms, access covers, gratings, ladders, stairs, rails and protecting elements required for future maintenance and operation of plant/equipment.

Provide fully dimensioned and annotated drawings.

Undertake and detail all fire stopping and sleeving systems for the Works where they pass through fire compartments.

Detail and install fire barriers where a fire rated partition is penetrated.

Undertake and detail the weatherproofing of all services passing through external elements of the building.

Undertake and detail all acoustic stopping associated with the Works.

Detail the final requirements for access to ceiling voids and builder's work ducts for maintenance and operation.

520.020 MECHANICAL SERVICES OBLIGATIONS AND RESPONSIBILITIES:

The contractor shall provide the detailed final location of drain and vent points and pipework gradients.

Design of adequate provision for movement of services and systems due to thermal expansion and contraction, hydraulic pressures and building movement.

- Include cold draw calculations.

Detailed design and location of expansion anchors and guide locations including:

- Fixing details.
- Load and thrust calculations.

Design and install all necessary temporary facilities for flushing, commissioning, etc.

Final selection and location of control dampers, control valves, etc. to achieve the specified function and to suit the characteristics of items served and final system configurations based on the final equipment selection, co-ordinated working and installation drawings. To include required access requirements.

Detail design of

- Fire rated ductwork systems.
- Ductwork fire protection systems.
- Obtain all necessary statutory approvals.

Final detailing and confirmation of the location and sizes of duct connections to external louvres, grilles / air bricks etc.

Design and selection of sound attenuation equipment to satisfy the particular performance requirements of the specification and the spatial allowances based on final equipment selection and final co-ordinated working and installation drawings.

Final selection of all anti-vibration mountings to suit the particular application of the mounts.

Undertake the redesign of the final acoustic requirements associated with approved alternative equipment or materials which subsequently varies the Works in any way whatsoever.

Provide a report confirming that the results of the leakage tests comply with the specified ductwork leakage requirements.

520.025 ELECTRICAL SERVICES:

The contractor shall provide the design of cable or cable containment terminations on to electrical equipment.

Dimensioning and final installation details of electrical switchgear including.

- Provision of safe operating and maintenance clearances.
- Acceptable cable entries for the final location.

Detailed design of earthing and bonding requirements for:

- Electrical engineering services.
- Mechanical engineering services.
- Architectural elements.
- Structural elements.

Check that cable size selections as specified are not invalidated by the selection of alternative routes during installation or selection of alternative manufacturers.

Detailed sizing, location, routes and design of electrical containment systems, including:

- Trunking.
- Tray.
- Supporting structures, brackets, fixings etc.

Design of electrical conduit systems including capacity, location, routes and fixing.

Verify cable sizes, voltage drops, discrimination and fault handling of cables based on the installation drawings, selected equipment and actual installed cable lengths for, where applicable,

- Access control.
- Fire Alarm
- Telephone and Data system(s)
- Mechanical services power and control wiring
- Specialist systems (e.g. PA System, Induction Loop system, Access Control, Telecare etc.)

Final detailed design of the fire alarm system including component and cabling requirements to meet with particular manufacturer's recommendations, the engineering specification and requirements of statutory bodies, standards and codes.

Verify spatial requirements, routes and anchor points for cable pulling.

520.030 PUBLIC HEALTH SERVICES OBLIGATIONS AND RESPONSIBILITIES:

Carry out final detailed co-ordination of above and below ground drainage with superstructure and substructure.

Modify distribution systems and equipment capacities as may be required as a result of final detailed spatial co-ordination.

520.040 EXISTING SERVICES OBLIGATIONS AND RESPONSIBILITIES:

Remove the following existing services:

- All existing MEP services within the building and on the external walls.

Maintain the following existing services during the duration of the contract including the provision of any additional work and materials necessary:

- Water main serving the building for use of the contractor for the project.
- Existing Cast iron radiators to be retained and re-utilised (for appearance only).
- Existing ventilation grilles in ceiling void to be retained and re-utilised (for extract ventilation air path).
- Electrical service to the building for use of the contractor for the project.
- Services as detailed elsewhere in this specification or as detailed on the associated drawings

Determine and define any physical site restrictions, constraints and hazards which may affect the undertaking of visual inspections, including health and safety matters, prior to commencement of the Works.

Assess the general condition of existing mechanical, electrical and public health services that are to be retained within the contract work areas, based on a visual inspection, report any noted defects and recommended where further specialist investigation is required.

Where detailed in this specification or on the associated Drawings undertake specific testing or detailed examination of services and prepare a report on the condition of the existing retained services. The report shall include:

- Schedule of equipment and location.
- Size/rating.
- Condition.
- Safety.
- Maintainability.

- Any Hazardous substances/materials.
- Compliance with current statutory regulations, codes of practice or normal good practice.

Determine the presence of deleterious materials relating to the services. Submit a report to the CA.

Undertake an assessment relating to the prevention and control of legionella.

Advise on the requirement for any urgent works or required action as a result of non-compliance and any parts of the services installation found to be potentially hazardous.

Identify special training and other requirements that should be satisfied before commencement of the Works.

Produce record drawings for the installations incorporating details of both new and existing services.

520.045 COMMISSIONING:

Undertake the testing, commissioning, regulation and setting to work of the Works including partial commissioning at the end of works.

Design all necessary facilities required for setting to work commissioning and testing of the completed installations.

Appoint an independent specialist responsible for the testing and commissioning.

Ensure that the commissioning requirements are compatible with any project restraints concerning sectional handover/ phasing.

Review all designs to ensure that systems are commissionable and highlight for review by the CA any considerations in respect of commissioning.

Provide a report signed, by a competent person confirming, prior to installation that all system designs can be commissioned.

Incorporate into the systems design the essential components and features necessary to enable the proper preparation and commissioning of the building services.

Prepare comprehensive commissioning method statements including procedures, logic diagrams and risk assessments for:

- Pre-commissioning checks.
- Setting to work.
- Commissioning and testing.
- System proving.
- Environmental testing of the Works.

Prepare flushing, chemical cleaning and water treatment method statements, logic diagrams and programme:

- Prior to commencement of Works.

Produce a detailed commissioning programme:

- When requested by the CA
- And/or Prior to commencement of Works.

Establish procedures with all parties to allow the demonstration of normal, emergency, shutdown and standby mode operation of plant and systems.

- Prepare method statements

Provision of all necessary facilities to enable tests to be witnessed and inspections carried out including all necessary instruments and recorders to monitor systems during the commissioning and environmental proving period.

Produce record pro-forma documentation for review by the CA relating to the commissioning and testing of plant and systems:

- Prior to commencement of the Works.

Ensure all certification is attained and witnessed as necessary for inclusion in the record documentation.

Maintain a log of all significant activities during the testing, commissioning and system proving process.

Record all plant and system settings.

Provide and submit a report for every test, demonstration, balance or commissioning activity witnessed, together with an engineering appraisal on the performance, either on or off-site.

Provide a final commissioning report, signed by a competent person, detailing the results of the commissioning and commenting on the performance of systems. The report to confirm that each installation is correctly tested and commissioned, achieves the specified performance and in accordance with CIBSE Code M.

Demonstrate that equipment is capable of the performance and method of operation specified.

Demonstrate that the overall and complete systems perform correctly in the required manner and as intended by the specification.

520.050 HANDOVER:

Prepare logbook(s) in accordance with the requirements of the specification and Building Regulations

Prepare operation and maintenance manuals in accordance with the specified requirements.

Ensure that information needed for inclusion in the operating and maintenance manuals is obtained as the works progress. Identify individual sources of information.

Produce record drawings.

Modify the record drawings as the works progress so that all alterations from the installation drawings are recorded as the work proceeds.

Modify and update operating details to reflect commissioning results.

Prepare planned preventative maintenance schedules for

- 12 months from practical completion.

Instruct the Employer's staff in the use, operation and maintenance of the installations.

Fully operate and maintain the installations in accordance with the Employer's normal occupational requirements prior to practical completion.

Prepare a schedule of all spare parts require for the works including recommendations of any others not stated in the specification.

Prepare a schedule of all tools require for the works including recommendations of any others not stated in the specification.

520.51 PREPARATION of THE LOGBOOK and SUPPORTING DOCUMENTATION

Use CIBSE TM:31 template.

The Contractor shall employ the services of an independent specialist to produce this document.

The Contractor shall employ the services of a qualified Approved Assessor to produce and register EPC, DEC and/or Part L compliance checks as applicable for the project.

It is strongly recommended that the same specialist be employed to produce and/or assist in the production of the MEP Record Documentation and Logbook.

The Contractor (in conjunction with their Domestic Mechanical and Electrical Sub Contractors) shall agree the responsibility for the production of the Record Documentation.

520.055 DURING THE 12 MONTHS AFTER PRACTICAL COMPLETION:

Record all plant and system settings following any fine-tuning activities.

Fine tuning activities include, but not be limited to:

- Assess the need for fine tuning of the Works and prepare statement.
- Prepare programme in advance and agree with CA.
- Arrange for the relevant parties to be retained and appointed to provide input to fine tuning activities.
- Planned with regard to the health and safety of occupants and such that any disturbance to them is minimised.
- Carry out visits to undertake fine tuning of the Works.
- Provide a mechanism by which the Employer can provide feedback on the performance of the building both before and after fine tuning.

530.000 LOCAL AUTHORITY REQUIREMENTS

530.010 GENERAL:

This section details the requirements for compliance with Local Authority By-laws.

530.020 STATUTORY AUTHORITY APPROVALS:

Make full and formal submissions to Building Control/District Surveyor at the earliest opportunity to ensure the approval of the Statutory Authorities for the proposed installation works.

Notify the District Surveyor, Building Control Officer and Fire Officer directly in respect of all tests and demonstrations relevant to life safety installations, and include for all necessary attendance, documentation, etc., to ensure full Statutory Authority approval of the installation.

530.040 BYE-LAWS, NOTICES, ETC:

Observe and comply with the requirements of all Statutes and Bye-Laws.

Serve notices on the Authorities having control of the road surfaces before the same are broken up and likewise serve notices on the owners of sewers, drains, water, gas or other mains, electric cables, tramways and other services which may in any way be affected by the execution of the Works.

Inform all necessary parties when work necessitates such notices to be given.

540.000 HEALTH AND SAFETY

540.010 GENERAL:

Refer to the Main Contract Preliminaries for the requirements of safety, health and welfare.

Conform to all safety rules, regulations and codes of practice.

Check that facilities provided by others fulfil the obligations and advise accordingly.

Provide all necessary first aid facilities.

Appoint a "competent person" on the site to manage health and safety during construction.

Ensure, so far as is reasonably practicable, that all persons employed on, or visiting, the site are adequately informed, instructed, trained, supervised and equipped such that they are able to carry out their duties safely.

540.040 COSHH REGULATIONS:

Comply with The Control of Substances Hazardous to Health Regulations and The Control of Substances Hazardous to Health (Amendment) Regulations 2003.

Provide with the tender an assessment of the risks in undertaking the contract works.

Provide with the tender a method statement on the steps proposed to meet the requirements of the Regulations.

Undertake COSHH assessments for all activities and substances provided or used on site to assess their potential health hazards.

Copies of all relevant COSHH assessments must be issued to the operatives concerned and strictly monitored. Particular attention must be given to the use of glues and sealant.

Where the use of substances falling within the scope of the Regulations forms part of the contract works notify the CA in writing, together with the additional costs, if any, of use of non-hazardous alternative.

Ensure during the course of the contract works, and under all circumstances, that all substances falling within the scope of the Regulations are positively so identified at all times and that they are transported, handled, stored, used and disposed of in strict accordance with their manufacturer's/supplier's recommendations.

Where use of substances falling within the scope of the Regulations are required for the operation and maintenance of the completed contract works, ensure that:

- Suitable facilities are available for the on-site storage of such substances and that all necessary warning/instruction notices are provided at the point of their storage and use.
- Provision of any special protective clothing, eye protection and similar safety equipment for the operation and maintenance of the Works and in sufficient quantity for 1 year of operation.
- Employer's staff have been fully trained in the use, handling, storage, transport and disposal of the substances concerned prior to handover.
- The type and the use and control of the substances have been fully and correctly identified in the operating and maintenance manuals/health and safety file.

540.050 ASBESTOS:

No material or goods containing asbestos shall be incorporated in the contract works.

Be responsible for certifying at practical completion of any section of the contract works that no asbestos or asbestos related materials have been incorporated or by any sub-contractor employed.

Refer to the Asbestos information available via the Main Contract Documentation

540.060 RISKS TO HEALTH AND SAFETY:

Submit a statement with the tender describing any significant and unavoidable risks which may arise as a result of carrying out the contract works and the measures proposed to safeguard the health and safety of operatives and of any person who may be affected by the contract works.

550.000 BUILDING REGULATIONS REQUIREMENTS

550.010 GENERAL:

This section details the requirements for compliance with the Building Regulations.

550.020 BUILDING REGULATIONS APPROVALS:

Make full and formal submissions to Building Control/District Surveyor/Approved Inspector at the earliest opportunity to ensure the approval of the relevant Authorities for the proposed installation works.

Notify the District Surveyor, Building Control Officer and Fire Officer directly in respect of all tests and demonstrations relevant to life safety installations, and include for all necessary attendance, documentation, etc., to ensure full relevant Authority approval of the installation.

Include for all fees and charges legally required under the Building Regulations in respect of the Works.

600.000 THE SITE

600.010 GENERAL:

This section outlines information on the site.

600.020 SITE LOCATION:

The site is located at:

Treharris Library,
Perrott Street,
Treharris,
CF46 5ET

600.030 DESCRIPTION OF THE SITE:

The site is an existing library having a Grade II Listed Building status.

The building is currently not in use and is basically only used for archive storage.

It should be noted that the building will be closed during the duration of the Contract.

600.040 THE BUILDING:

The building was constructed in 1908 and opened in 1909.

The Contractor shall visit site to view the premises to fully appreciate the construction details and limitations in respect of the Listed Building consent.

Refer to architectural drawings and specifications for further details on the restrictions to changing the building structure and installation of fixings for new services and plant, and openings.

The building comprises of a ground floor for the main library and small reading room, with toilet and staff kitchen. There is a small basement area accessible via an internal stairs and an external door with two multi-purpose rooms and a boiler room all accessed off a common hall.

610.000 EXISTING SERVICES

610.010 GENERAL:

This section provides information on existing services.

610.020 EXISTING INCOMING SERVICES:

Mains water, gas and electrical services (including telecoms and ICT) are provided via the service providers and their infrastructure.

Existing services are in a poor condition and replacement will be required as described within and on the drawings.

It should be noted that Record Drawings of the existing Mechanical and Electrical services are not available.

The accurate location of existing services shall be determined by the Contractor by site investigation.

610.070 SURVEY:

Ascertain the nature of the site and all local conditions and restrictions likely to affect the execution of the Works.

Before commencing work, carry out a detailed survey and examination of the engineering services.

Examine all available drawings of the engineering services and report any discrepancies to the CA.

700.000 DESCRIPTION OF THE WORKS

700.010 GENERAL:

This section outlines the extent of the works and provides a description in a brief manner of the scope of each of the building services installations.

700.020 SCOPE OF WORKS:

The engineering services included in the Works and covered by this specification comprise the provision of the removal and new installations of:

- Mechanical services
- Electrical services
- Public Health Services,

For details of the associated Architectural and Structural works refer to the associated tender documentation.

700.030 EXTENT OF THE WORKS:

The extent of the Works is generally as indicated on the associated performance drawings and as detailed within this specification.

710.000 GENERAL DESIGN CRITERIA AND STANDARDS

710.010 GENERAL:

This section outlines the general design criteria and definitions applicable to the engineering services forming the contract Works.

710.020 GENERAL DESIGN CRITERIA:

The criteria listed in the following clauses apply to all work sections included in the contract unless specified otherwise.

The design of the engineering services is based on the criteria and design data stated in the following clauses

710.030 DESIGN CONDITIONS:

Ambient conditions for the design of all thermal loads and selection of equipment:

Period	External Condition
Winter	-5°C d.b. -5°C w.b.
Summer	28°C d.b. 20°C w.b.

The following table outlines the internal design conditions.

Space	Winter Temperature	Summer Temperature	Average Illumination
Unconditioned Rooms			
Stairs	Uncontrolled	Uncontrolled	100 lux Day / 20 lux Night
Entrance (GF)	Uncontrolled	Uncontrolled	100 lux / 200 lux in front of door
Meter Room (LGF)	Uncontrolled	Uncontrolled	100 lux
Heat only Rooms			
Lobbies (LGF & GF)	20°C (±2)	Uncontrolled	100 lux
Main & Junior Library	21°C (±2)	Uncontrolled	400 lux
Reception	21°C (±2)	Uncontrolled	350 lux
Staff Room	21°C (±2)	Uncontrolled	250 lux
Kitchen	21°C (±2)	Uncontrolled	200 lux
WC	21°C (±2)	Uncontrolled	150 lux
Open Learning Room	21°C (±2)	Uncontrolled	200 - 350 lux
Training Room	21°C (±2)	Uncontrolled	200 - 350 lux

Where areas are not specifically detailed, design conditions shall be generally as the CIBSE recommendations.

Supply Fresh air rate - 10 litres/sec/person in compliance with Building Regulations

Extract rate – Balanced and matched to supply.

Occupancy levels – Where not shown on the Architect's plans, allow 1 person / 10m² floor area (or part thereof)

Internal Noise Levels:

Type of Accommodation	Sound Level Range (NR)
Library	35
Teaching Room	35
Meeting Rooms	35
Toilets	35 – 45
From Plant	55 dBA at 10 m

710.090 ELECTRICAL WIRING:

Where systems are specified as being maintained under fire conditions ensure wiring selected is suitable for the temperatures to be encountered.

710.110 STANDARDS AND REGULATIONS:

Unless stated otherwise the Works shall comply with the appropriate British Standard (BS) or Code of Practice (CP) and where no BS or CP is applicable comply with:

The Agreement Certificate for the particular item.

- CIBSE recommendations and guides to current practice.
- BS 7671 Requirements for Electrical Installations

Guidance published by IET.

- To comply with Employer's Energy Management System, BS EN ISO 50001

Statutory Obligations

- Health and Safety at Work etc. Act 1974
- HSE L8 Legionnaires' Disease. The Control of Legionella Bacteria in Water Systems. ACOP and all parts of HSG274 (for technical guidance).
- HSE L5 Control of Substances Hazardous to Health. ACOP and guidance (sixth edition, 2013).
- Building Regulations and current amendments, and relevant Approved Documents in England and Wales.
- England and Wales - The Water Supply (Water Fittings) Regulations 1999 as amended, the Water Act 2014 and The Construction Products Regulations 2013.

In the absence of specific design, performance or installation standards being stated seek the instructions of the CA prior to commencement of the Works and with adequate time so as not to cause delay.

When new editions, versions and amendments are published during the construction, seek the instructions of the CA with respect to any modifications or changes necessary.

References to BSI documents shall be to the versions and amendments listed in the British Standards Catalogue and in subsequent issues of BSI Update Standards up to

- One month prior to the tender issue date.

The tender shall be based on the standards and regulations current to

- One month prior to the issue date of the tender.

710.130 ELECTROMAGNETIC COMPATIBILITY:

Ensure all equipment and installations meet the requirements of relevant legislation:

- The Electromagnetic Compatibility Regulations 2016.
- The Radio and Telecommunications Terminal Equipment Regulations 2000 as amended.
- The Medical Devices Regulations 2002 as amended.
- The Supply of Machinery (Safety) Regulations 2008 as amended.

Ensure all equipment and systems are installed to provide electromagnetic compatibility within the system and with any other systems installed in the same area.

Ensure all apparatus covered by the Wireless Telegraphy Act meets regulations issued by Ofcom.

Ensure all equipment and systems meet the requirements of BS 6701 and BS EN 41003.

Ensure that all cable installations meet the minimum separation in BS 7671 and BS EN 50174.

710.140 PRESSURE DIRECTIVE:

All pressure equipment and assemblies with a maximum allowable pressure greater than 0.5 bar shall comply with the European Community (EU) Pressure Equipment Directive (PED) 97/23/EC. Pressure equipment shall include vessels, piping, safety accessories and pressure accessories. Assemblies shall mean several pieces of pressure equipment assembled to form an integrated, functional whole.

Pressure equipment shall be marked as a minimum with:

- a) Unique identification of the manufacturer
- b) Unique identification of model and serial number
- c) The year of manufacture
- d) Maximum/minimum allowable pressure limits
- e) CE marking

Provide a declaration of conformity for all pressure equipment.

- Submit copies to the CA prior to installation into the Works.
- Provide copies as part of the record documentation.

Equipment must be:

- a) Designed for adequate strength taking into account internal/external pressure, ambient and operational temperatures, static pressure and mass of contents in operating and test conditions, corrosion and erosion, fatigue, etc.
- b) Provided with means to ensure safe handling and operation and of examination, draining and venting.
- c) Provided with protection against exceeding the allowable limits of pressure.
- d) Where necessary, pressure equipment must be designed and fitted with suitable accessories to meet damage-limitation requirements in the event of external fire.

Ensure all components or sub-assemblies in their finished assembly are used within their safe operating range and correctly installed and tested.

Ensure that adequate instructions are provided by the manufacture for the safe installation, testing and operation.

Instructions shall be provided to ensure for the safe maintenance and operation of the equipment when in operation.

Pressure equipment and assemblies below the specified pressure / volume thresholds must:

- a) Be safe.
- b) Be designed and manufactured according to sound engineering practice.

710.150 EXPLOSIVE ATMOSPHERES:

Ensure that all aspects of the Works comply with relevant legislation including:

- The Control of Major Accident Hazards Regulations 2015 (COMAH).
- Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002.
- The equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations 1996.

Employ relevant standards and guidance in the design, selection, construction and erection of the Works:

- BS EN 60079-series
- BS EN 13463-2
- BS EN 13463-3
- BS EN 80079-series
- HSE L138 Dangerous substances and explosive atmospheres. Dangerous Substances and Explosive
- Ensure equipment and other products conform to relevant parts of BS EN 60079 and BS EN 13463 for the zone(s) in which they are to be installed and used.

Ensure electrostatic hazards are controlled in accordance with PD CLC/TR 60079-32-1.

Provide evidence of conformity to the relevant legislation for the completed Works:

Provide evidence of product conformity to relevant legislation and standards for explosive atmospheres, and suitability of the equipment for the zones(s) in which it is to be installed and used.

710.160 FACILITIES FOR REMOVAL OF EQUIPMENT:

De-coupling facilities shall be provided for all services connections to equipment and plant and be located adjacent to the equipment such that any removable section, cover or the complete unit can be readily removed or withdrawn without the removal or disturbance to large sections of adjacent services.

Ensure isolation and drain down of any item of equipment without isolating large sections of the remaining system.

710.170 SOFTWARE:

Obtain on behalf of the end user all appropriate licences, permissions, copyright waivers, rights of use and the like from the owners of the software rights. Ensure that the end user is properly registered with the software supplier for support and appropriate updating. Ensure that application software is written in compliance with BS 7649.

720.000 BUILDERS WORK

720.010 BUILDERS WORK PROVIDED:

Where structural and/or architectural facilities or provisions, for engineering services are already indicated check that these are correct, satisfactory and adequate for the purpose and confirm same in writing to the CA.

Timescale:

- Within weeks of the award of contract (no) 2

Where the preliminary builder's work facilities issued prior to the award of contract are not correct or insufficient advice the CA immediately and obtain further instructions.

Where alternative equipment or materials has been offered that the CA has accepted and which subsequently varies the works in any way whatsoever, then undertake the redesign of the associated builder's work.

720.020 BUILDER'S WORK RESPONSIBILITIES:

The requirements for and responsibilities with regard to builder's work items are in addition to that normally provided as is normal custom and practice in the building industry.

Confirm and amplify any information provided by the CA.

Provide builder's work information, appropriate to the stage of design development. Revise, supplement and/or issue final information, drawings/details for the actual requirements of the contract works.

Provide fully dimensioned drawings showing both size and position of builder's work making due reference to the structural engineering and architectural final dimensioned detailed drawings.

As approved by the CA Mark out on site, all cut holes and chases required, any pockets cast in concrete, any inserts, any built in sleeves or similar items.

All builders work information shall be provided to comply with the programme and include sufficient time for the necessary approvals.

All materials provided for fixing by others are to be included in the contract works cost and supplied in accordance with the programme.

720.030 SCOPE OF BUILDER'S WORK:

- Builder's work is to be Included in the contract works.

All builder's work to be carried out by the Main Contractor or his selected domestic MEP Sub Contractor(s).

720.040 MARKING OUT OF BUILDER'S WORK HOLES ON SITE:

If approved by the CA, mark on site actual locations of minor non-structural holes through walls, partitions, floors etc. and also chases in non, fair-faced walls, etc. for conduits, pipes and the like in preference to providing drawings of such builder's work requirements. The CA is to be given the opportunity to inspect prior to work being carried out.

Establish a method of working with the CA to ensure the works may proceed without hindrance.

The maximum size for a non-structural hole for marking on site shall be Refer to Structural Engineers for approval of all holes through walls and floor slabs.

720.050 BUILDER'S WORK INFORMATION TO BE PROVIDED:

All builder's work drawings shall be fully dimensioned.

Builder's work drawings to be provided shall be as follows:

Details of all attendant builders' work, holes, chases, etc. for pipework, ductwork, trunking and similar etc. and any item where access for a function of the installation is required.

- to a scale of not less than 1:100 or as applicable to fully convey the specific requirements.

720.060 STRUCTURAL STEELWORK:

No steelwork shall be cut, drilled or welded without written approval from the CA.

The cutting and drilling of structural steelwork shall be agreed with the CA prior to the commencement of the work and shall require application in writing with all necessary drawings/details.

Fixings to steelwork shall be

- the approved clamp type

All fixings shall be of the correct size and type for the fixing load applied and the type shall be approved prior to commencement of the works.

720.070 PRE-CAST CONCRETE:

Holes may not be cut in precast concrete without written approval from the CA.

Under no circumstances shall holes be cut in pre-stressed concrete.

Agree with the Structural Engineers the details of any hole through the structure.

740.000 COMMISSIONING AND TESTING

740.010 DEFINITIONS:

Where used in the documentation the following definitions shall apply and shall be interpreted as such:

Commissioning: The advancement of an installation from the stage of static completion to working order to the specified requirements

Testing: The measurement and recording of specified quantifiable characteristics of an installation or parts thereof and includes witness site testing.

Setting to work: The process of setting a static system in motion

Regulation: The process of adjusting the rates of fluid flow in a distribution system to achieve specified values

Environmental testing: The measurement and recording of internal environmental conditions.

System proving: the measuring, recording, evaluating and reporting on the seasonal performance of the systems against their design values.

System demonstration: Demonstrating the capability of the installation to achieve and maintain the specified performance criteria.

Fine-tuning: The adjustment of the system where usage and system proving has shown such a need and includes the re-assessment of design values and control set points to achieve the required system performance.

740.020 PROGRAMME:

Prepare comprehensive programmes for the pre-commissioning checks, setting to work, testing, commissioning, system proving and environmental testing of the contract works.

Timescale:

- Within weeks of contract appointment **2No.**

Review and update the commissioning programme at agreed intervals and if necessary, revise and amend the programme to suit the progress of the contract works.

Due account shall be taken of any phasing requirements.

740.030 COMMISSIONING SPECIALIST:

Employ an independent company who specialises in testing and commissioning of building services to undertake the following:

- All commissioning and testing activities associated with the contract works.

Submit with the tender details of the independent company to be employed.

The commissioning specialist shall be a member of The Commissioning Specialists Association (CSA).

740.040 COMMISSIONING AND TESTING:

When the contract works or parts thereof are ready for testing and commissioning notify the CA in writing.

All necessary facilities shall be provided to enable tests to be witnessed and inspections carried out including all necessary instruments and recorders to monitor systems during commissioning system proving and environmental testing.

Provide information where access is required into ceiling voids, service risers etc. and ensure these points are not closed up until the commissioning and testing is complete.

Where commissioning, testing, balancing, adjustment, is undertaken in an area of the building taken over and occupied by the Employer, then take all necessary precautions against and be responsible for any damage caused whilst working in such areas for that purpose.

Prior to witnessing and inspection by the CA the contract works shall be fully tested, commissioned and be fully operational.

Where portions of the work are required to be commissioned and tested separately, then upon final completion, demonstrate to the CA that all the several portions are capable of proper simultaneous operation in accordance with the requirements of the specification.

If testing demonstrates that the plant and equipment is not properly installed and/or not functioning correctly carry out such remedial measures and adjustments as may be necessary and repeat the commissioning and testing procedure to the satisfaction of the CA.

Complete all tests before any paint, cladding or similar materials are applied or before services are concealed.

Ensure all requirements such as cleanliness, protection from harmful external and internal elements are provided prior to commencement of commissioning.

Undertake to:

Commission, test, regulate and set to work the installations that form the contract works.

Prepare comprehensive programmes, commissioning plans, schedules and method statements and procedures supported by risk assessments for the pre-commissioning checks, setting to work, commissioning, system proving and environmental testing of the contract works.

Comply with the requirements of the Building Regulations (Approved Document Part L2) for the inspection and commissioning of the building services systems. Prepare all necessary submittals including commissioning plans and reports. Obtain all compliance approvals from the building control bodies.

Provide all specialist personnel including manufacturer's representatives and coordinate their activities, together with providing any attendance required.

Prior to commencement of the works submit to the CA for approval sample pro-forma for the various commissioning record and certification documentation.

Provide reports detailing progress of testing and commissioning activities at intervals agreed with CA.

Maintain a diary/log of significant commissioning and testing activities.

Measure and reconcile noise levels at agreed locations to verify compliance with design criteria.

Submit to the CA all certification documents prior to any system being offered for final acceptance.

Confirm in writing to the CA that each installation has been correctly tested and commissioned and that the performance requirements can be achieved.

Ensure all certification is attained and witnessed as necessary for inclusion in the record documentation.

Submit a report for every test, demonstration, balance or commissioning activity witnessed, together with an engineering appraisal on the performance, either on or off-site.

Co-ordinate and liaise with the Employer's representative.

Maintain on site full records of all testing, commissioning and performance testing.

The extent and proportion of results to be witnessed by the CA shall be at the discretion of the CA.

The CA shall determine if the specified requirements have been satisfied.

740.050 STATIC TESTING:

Progressive static testing shall include the following tests, but other tests may be required and witnessed:

- Insulation resistance
- Earth fault loop impedance
- Earth continuity
- Pressure testing of hydraulic systems
- Air leakage testing of ductwork systems

The CA shall be given the opportunity to witness all static tests.

Advance notice of the tests shall be given to the CA.

Timescale: days prior to test **5No.**

740.060 PRE-COMMISSIONING CHECKS:

Ensure all pre-commissioning examinations and tests have been undertaken and that each system, including components, or item of equipment is complete and in a safe condition prior to start-up.

All necessary notices shall be displayed.

740.080 SYSTEM DEMONSTRATION:

After the completion of all testing and commissioning to the satisfaction of the CA and when directed operate the plant and demonstrate that the overall systems function correctly in accordance with the requirements of the specification.

Carry out the demonstration for every phase of the project as completion approaches.

Fully run and operate the following systems to demonstrate correct function in accordance with the requirements of the specification:

- All systems

The period of operation shall be:

- weeks (no) – **1No.** minimum
- carried out during normal working hours.
- allowed in the programme.

During this period, be responsible for the recording of results and the operation and maintenance of the plant.

Provide the following.

- An operational report of the demonstration

740.100 INSPECTIONS AND TESTS:

Submit schedules indicating those parts of the contract works for which inspections and tests are required to substantiate conformity with the specification.

Should any alternative item be proposed that does not carry appropriate certification, ensure independent testing is carried out at no expense to the contract works to confirm compliance.

Provide method statements supported by risk assessments detailing the procedures for carrying out on site tests.

Agree in advance with all parties' procedures for inspections and tests including periods of notice.

Where a test indicates non-compliance with the specification submit immediately details of the non-compliance and details for corrective action.

Maintain records of all specified inspections and tests performed including third party and works testing.

Maintain all records on site for inspection.

740.110 TEST CERTIFICATES AND RECORDS:

Ensure that test certificates include:

- project title
- details and date of test
- instruments used, serial numbers, calibration dates.
- signature of those witnessing test
- installers name
- specific location of the item in the contract works.

The number of copies of each test certificate to be issued to the CA

- **2No.**
- Time scale - within **5No.** working days of the test

740.140 BMS WITNESSING REQUIREMENTS:

The CA or nominated representative shall implement the following witnessing requirements.

Ensure that on-site commissioning staff facilitate the following witnessing process.

The BMS hardware is installed in accordance with the requirements as stated elsewhere.

Verify any operator software and associated graphics.

Witness completely the control of any main and/or critical items of plant along with a random sample of other points

Points witnessing -

- Where less than 300 points, witness all points.
- Between 300 and 1000 points witness 50% (minimum of 300 to be witnessed).
- Where more than 1000 points witness 20% (with a minimum of 500 points witnessed).
- Reserve the right to witness 100% of the points if the failure rate is greater than 5%.
- Witness a sample of specific functions, e.g. 10% of alarms and 10% of data logging.
- Witness one of several identical items of plant in detail with the others witnessed on a random basis.
- Verify the system security access.
- Verify that all safety-related functions perform to that specified, e.g. plant shutdown on fire condition.
- Verify all plant restarts according to that specified after building power failure and local power failure.
- Verify the handover of all operating manuals and system documentation.

740.150 BMS - POST HANDOVER CHECKS:

Ensure that the following post-handover checks are performed on the new or adjusted portions of the BMS:

- Global level checks
- Internal air temperature
- Relative humidity
- Ventilation
- Energy consumption (ensure that the pulse-input counters match the meters)
- Check that each of the above meets the specified requirements.
- System level checks
- Control strategies. Check that any suspect control strategies are appropriate for the intended application. Check that the suspect control strategy has been implemented and commissioned correctly. Check that the control strategy is still appropriate for the intended use.
- Network communications. Check that all relevant field controllers communicate properly. Check for correct sharing between controllers of relevant data and correct inter-controller operation.
- Control set-points. Check that the set-points in question are correct and appropriate.
- Control loop settings. Check that the control loop settings result in accurate and stable control.
- Check that all self-learned characteristics are valid.
- Control zones. Check that the control zones are appropriate.
- Occupant controls. Check that occupant controls work correctly.
- Sub-system/component level
- Sensors. Check the accuracy and location of any suspect sensors.
- Actuators. Check that any suspect actuators operate correctly.

- Dampers and valves. Check that any suspect dampers and valves are not jammed and that they operate as intended.

740.160 ROTATING EQUIPMENT:

- Immediately prior to practical completion adjust, ease, and lubricate moving parts as necessary to ensure easy and efficient operation.
- Ensure that temporary electrical supplies are provided to enable rotating plant items delivered and/or installed to be run at regular intervals to avoid damage or deterioration.
- If temporary electrical supplies are not available ensure that rotating plant is hand-turned.

800.000 DRAWING DEFINITIONS

800.010 GENERAL:

This section defines each of the main drawing types and outlines the extent and content of drawn information.

800.020 THE TENDER DRAWINGS:

Drawings produced to enable those tendering to interpret the design and to submit a tender for executing all or any part of the Works as defined elsewhere.

The tender drawings are as referred to in the Schedule and/or Document Register and Issue Sheet(s).

The Contractor shall develop the tender drawings and prepare detailed design, co-ordination, installation, builders work and record drawings as detailed elsewhere.

800.030 SKETCH DRAWINGS:

Line diagrams and layouts indicating basic proposals, location of main items of plant, routes of main pipes, air ducts and cable runs in such detail as to illustrate the incorporation of the engineering services within the project as a whole and with respect to any zoning.

800.035 SKETCH SCHEMATICS:

Line diagrams indicating main items of plant and their interrelationship in such detail as to illustrate the incorporation of the engineering services within the project as a whole.

800.040 DETAILED SCHEMATICS:

Line diagrams describing the interconnection of components in a system and showing the engineering principles. The main features of a schematic drawing are as follows:

- The drawings include all the functional components that make the system work, such as ducts, pipes, cables, busbars, plant items, pumps, fans, valves, dampers, control devices, strainers, terminals, electrical switchgear and components, security and fire sensors and control equipment.
- Symbols and line conventions in accordance either with a recognised standard, such as ISO or BS, or a supplied legend.
- Drawings labelled with appropriate pipe, duct, busbar and cable sizes, pressures and flow rates.
- The drawings indicate components which have a sensing, control or measurement function.
- Identify major components on the schematic drawing for cross-referencing purposes.
- All data essential to testing and commissioning including:
 - volumetric flow rates.
 - design total pressure losses at equipment.
 - location of dampers.
 - location of valves and flow measuring stations.
 - electrical fault levels.

- current ratings.
- short circuit capacities and tripping times.

800.050 DEVELOPED DESIGN DRAWING:

A drawing showing the extent of the services installations. The main features of developed design drawings should be as follows:

- Plan layouts to a scale of at least 1:100.
- Show the extent and types of the services terminals visible within the occupied space.
- Show approximate locations of horizontal and vertical service runs.
- Show plant and distribution system sizes, particularly those affecting spatial allocation, while acknowledging that these may need some adjustment and refinement in the operation of the detailed (technical) design drawings and equipment schedules.
- Pipework and electrical containment represented by single line layouts. Ductwork represented by either double line or single line layouts as required to demonstrate that the routes indicated are feasible. Symbols and lines conventions in accordance with either a recognised standard (ISO or BS), or a supplied legend.

800.055 TECHNICAL DESIGN DRAWING:

A drawing showing the intended locations of plant items and service routes in such detail as to indicate the design intent. The main features of detailed design drawings should be as follows:

- Plan layouts to a scale of at least 1:100.
- Plant areas to a scale of at least 1:50 and accompanied by cross-sections.
- The drawing shall not indicate the precise position of services, but it should nevertheless be feasible to install the services within the general routes indicated. It should be possible to produce co-ordinated working drawings or installation drawings without major re-routing of the services.
- Pipework and cable containment represented by single line layouts.
- Ductwork represented by either double line or single line layouts as required to demonstrate that the routes are feasible.
- Symbols and line conventions in accordance with either a recognised standard, such as ISO or BS, or supplied legend.
- The drawing should indicate the space available for major routing in both horizontal and vertical planes.

The Contractor shall use the tender drawings to prepare drawings for co-ordination, installation, builders work etc. and final record drawings as outlined elsewhere.

800.056 BUILDER'S WORK INFORMATION:

A drawing to show the provisions required to accommodate the services which significantly affect the design of the building structure, fabric and external works.

Drawings (or schedules) of work to be carried out by building trade and required to be costed at the design state e.g. plant bases.

800.060 CO-ORDINATED WORKING DRAWINGS:

Drawings showing the inter-relationship of two or more engineering services and their relation to the structure and building fabric. The main features of co-ordinated working drawings are:

- Plan layouts to a scale of at least 1:50, accompanied by cross-sections to a scale of at least 1:20 for all congested areas.
- The drawings should make allowance for installation working space and space to facilitate commissioning and maintenance.
- The drawings should be spatially co-ordinated and there should be no physical clashes between components when installed. Critical dimensions, datum levels and invert levels should be provided.
- The spaces between pipe and duct runs down on the drawing should make allowance for the service at the widest point. Insulation, standard fittings dimensions and joint widths should therefore have been allowed for on the drawing.
- The drawing should indicate positions of main fixing points and supports where they have significance to the structural design of spatial constraints.

800.070 INSTALLATION DRAWING:

A drawing based on the detailed drawing or co-ordination drawing with the primary purpose of defining that information needed by the tradesman on site to install the works. The main features of installation drawings should be as per co-ordinated working drawings plus:

- Allowances should be made for inclusion of all supports and fixings necessary to install the works.
- The drawing should make allowances for installation details provided from manufacturer's drawings.
- Allowances should be made for plant and equipment. This includes any alternatives to the designers original specified option that have been chosen.

800.100 MANUFACTURER'S DRAWING:

Drawing prepared by a manufacturer, fabricator or supplier for a particular project, and which is unique to that project. Examples include drawings for ductwork, pre-fabricated pipework, sprinkler systems, control and switchgear panels and associated internal wiring, pre-fabricated plant, customised plant and equipment.

800.120 RECORD DRAWING:

Drawing showing the building and services installations as installed at the date of practical completion. The main features of the record drawings should be as follows:

- The drawings should be to a scale not less than that of the installation drawings.
- Locations of all mechanical, electrical and public health systems and components installed including ducts, pipes, cables, busbars, plant items, pumps, fans, valves, dampers, control devices, strainers, terminals, electrical switchgear and components, security and fire sensors and control equipment.
- The drawing should be labelled with appropriate pipe, duct and cable sizes, pressures and flow rates.
- The drawings should have marked on them positions of access points for operating and maintenance purposes.
- The drawings should not be dimensioned unless the inclusion of a dimension(s) is considered necessary for accurate location such as in the case of buried services.

800.130 BUILDER'S WORK DETAILS:

Drawing to show requirements for building works necessary to facilitate the installation of the engineering services.

Unless stated or agreed with the CA the following builder's work details can be marked out on site:

- Holes less than the threshold dimension stated elsewhere.
- Electrical socket and switch boxes.
- Openings that are best cut into blockwork and partitions.

Builder's work drawn information to be provided shall include:

- Details of all bases for plant formed in concrete, brickwork or blockwork to a scale of not less than 1:20
- Details of all attendant builders' work, holes, chases, etc. for conduits, cables and trunking etc. and any item where access for a function of the installation is required to a scale of not less than 1:100
- Details of all-purpose made brackets for supporting service or plant/equipment to a scale of not less than 1:50
- Details of all accesses into ceilings, ducts, etc. at a scale of not less than 1:50
- Details of all special fixings, inserts, brackets, anchors, suspensions, supports etc. at a scale of not less than 1:20

800.170 PLANTROOM SCHEDULES AND SCHEMATICS:

Provide good quality plant and switch room drawings, schedules, schematics and instructions and hang in the respective plant room or any other appropriate location or where directed by the CA.

Protect surfaces of such information by:

- Pressure lamination, or
- Framing under glass or other rigid, transparent, cleanable and protective surface.
- Hang using suitable fixings and provide backboards if necessary.
- A sample shall be submitted for approval to the CA prior to commencing production.
- Schematic drawings of circuit layouts showing:
 - Location, identification and duties of equipment.
 - Location of controls devices.
 - Circuit layout.
- Valve schedules in the form of printed sheets showing the number, type, location, application/service and symbol, and normal operating position of each valve.
- Control schematics.
- Location of mechanical and electrical plant and equipment items.
- First aid instructions for treatment of persons after electric shock.
- Location of isolating switch for electricity supply.
- Location of main incoming gas valve serving gas meter and isolation point.
- Location of main incoming water main and isolation point.
- Location of sprinkler fire main control valve.
- Emergency operating procedures and telephone numbers for emergency call out service applicable to any system or item of plant and equipment.
- All other items required under Statutory or other regulations.

810.000 RECORD DOCUMENTATION

810.010 STANDARDS:

Provide operating and maintenance manuals, system records and full documentation in accordance with the following standards

- BS EN 50131-1 - Intruder alarm systems.
- BS 5839 - Fire detection and alarms in buildings.
- BS 6701 - Telecommunications equipment and telecommunications cabling.
- BS 7671 - Requirements for electrical installations. (IET Wiring regulations)
- BS EN 12171 - Heating Systems not requiring a trained operator
- BS EN 62305 - Protection against lightning.
- Building Regulations

Engage the use of an Approved Low Carbon Energy Assessor to undertake the required calculations for the production and lodgement of the EPC certificate(s).

Comply with the requirements of the CDM Regulations in providing the appropriate input to the Construction Phase Plan and health and safety file for the contract works.

810.020 RECORD DOCUMENTS:

Provide:

- Record drawings and schedules.
- Plant room and switch room drawings, schedules and schematics.
- Operating and maintenance manuals.
- Blank maintenance logs.
- Logbooks
- In compliance with the Building Regulations and
- In accordance with CIBSE TM 31.

Ensure record documents clearly record the arrangements of the various sections of the Works as actually installed and identify and locate all component parts.

Ensure record documents make it possible to comprehend the extent and purpose of the Works and the method of operation thereof.

Ensure record documents set out the extent to which maintenance and servicing is required and how, in detail, it should be executed.

Ensure record documents provide sufficient, readily accessible and proper information to enable spares and replacements to be ordered.

Correlate record documents so that the terminology and the references used are consistent with those used in the physical identification of the component parts of the installations.

Demonstrate as required throughout the execution of the contract works that complete and accurate records are being maintained and that the record documents are being progressively compiled as the work on site proceeds.

Ensure that building logbooks contain all the information necessary to comply with the relevant Building Regulations Approved Document.

810.030 RECORD DRAWINGS AND SCHEDULES:

Prepare record drawings and schedules based on the As Installed Drawings maintained on site during the progress of the contract works.

- The scale of the drawings shall be not less than 1:100.

Each record drawing shall show the following information:

- The name of the contract and, where appropriate, the zone or floor designation.
- Description of drawing, drawing reference and scale.
- Name and address of the installer and the consultant.

Endorse all such documents:

- 'Record Drawing'

Where agreed with the CA certain detailed information may be provided in schedule form.

Where portions of the work are to be concealed, draft copies of record drawings shall be supplied to the CA before the work is concealed in order to facilitate checking and examination.

Prepare electrical drawings in accordance with BS EN 61082-1.

Issue at practical completion the complete approved package of record drawings in the following numbers and format:

2No copies of the O&M Manual in paper format plus a further copy in electronic format. Provide **2No** reduced scale copies of all drawings on A3 for inclusion into each of the operating and maintenance manuals as stated elsewhere.

2No sets of complete record drawings / schedules in print format minimum size A1. Contain drawings in **2No** separate suitably labelled ring binders.

Provide **2No** reduced scale copies of all drawings on A3 for inclusion into each of the operating and maintenance manuals as stated elsewhere.

Ensure that the record information is accurately recorded on site and developed as the project progresses into a complete set of documents for inclusion into the health and safety file.

Provide a Logbook and User Guide for the building in accordance with Building Regulations Part L and in accordance with the recommendations and standards of the CIBSE TM 31.

- Provide both paper copies and electronic copies of record drawings (in both dwg CAD format and pdf format) on compact disc(s). Each compact disc (CD) shall be labelled and the enclosed in a CD jewel cases also labelled with the identifying project title, issue date and index of contents.
- Number of sets of complete working drawings **2No**
- 'White' prints.
- Number of sets of complete record drawings **2No**

Provide reduced scale copies for inclusion in the operating and maintenance manuals as stated elsewhere.

Record drawings and schedules must include, but are not limited to:

- Location, including level if buried, of utility service connections, including those provided by the appropriate Authority, indicating points of origin and termination, size and material of service, emergency shut-off isolation locations, pressure and/or other relevant information.
- Disposition and depth of all underground systems.
- Schematic drawings of each system indicating principal items of plant, equipment, zoning, means of isolation, etc. in sufficient detail to make it possible to comprehend the system operation and the inter-connections between various systems.
- Details of the principles of application of automatic controls and instrumentation.
- Diagrammatic dimensioned plans and sections of each system or service showing sizes and locations of all ancillaries, plant, equipment controls, test points, and means of isolation etc. including any items forming an integral part of the engineering systems provided by others (such as plenum ceilings, builders' work shafts, chimneys etc.).
- Identification of all terminals/cables etc. by size/type and duty/rating as recorded from the approved commissioning results.
- Detailed wiring drawings/diagrams/schedules for all systems, including controls, showing origin, route, cable/conduit size, type, number of conductors, length, termination size and identification, and measured conductor and earth continuity resistance of each circuit. Ensure routes indicate if cable/conduit is surface mounted, concealed in wall chase, in floor screed, cast in-situ, above false ceiling etc.
- Details of co-ordination of wiring and connections with cable core identification, notation of fire alarm, security, control and instrumentation and similar systems provided as part of the Works.
- Details to show inter-connections between the Works and equipment or systems provided by others to which wiring and connections are carried out as part of the Works.
- Location and identity of each room or space housing plant, machinery or apparatus.
- Dimensioned plans and sections of plantrooms, service subways, trenches, ducts and other congested areas where in the opinion of the CA smaller scale drawings cannot provide an adequate record. Indicate the location, identity, size and details of each piece of apparatus.

- The scale of drawings to be 1:50
- Manufacturer's drawings of equipment indicating.
- General arrangement and assembly of component parts which may require servicing.
- Internal wiring diagrams together with sufficient physical arrangement details to locate and identify component parts.
- Schedules as required to locate, reference and provide details of ratings and duty of all items incorporated into the Works together with all fixed and variable equipment settings established during commissioning.
- For each programmable control item.
- schedules indicating for each input and output point connected.
- full data in respect of that point including reference.
- type of input/output.
- connected equipment reference.
- set values of temperature or pressure etc.
- set values of start/stop/speed change times etc.
- alarm priority
- control specification reference.
- any other such applicable parameters.
- Each spare input and output point including reference, type of input/output and space for future entry of appropriate parameters as listed above.
- Logic flow diagrams for each individual control or monitoring specification and for each building services engineering system to illustrate the logical basis of the software design.
- Schedules setting out details of all initial values of user-defined variables, text statements for alarm messages etc.

810.040 PLANT ROOM AND SWITCH ROOM DRAWINGS, SCHEDULES AND SCHEMATICS:

Provide good quality plant and switch room drawings, schedules, schematics and instructions and hang in the respective plant room or any other appropriate location or where directed by the CA.

Protect surfaces of such information by:

- Pressure lamination or
- Framing under glass or other rigid, transparent, cleanable and protective surface

Hang using suitable fixings and provide backboards if necessary

A sample shall be submitted for approval to the CA prior to commencing production.

Schematic drawings of circuit layouts showing:

- Location, identification and duties of equipment
- Location of controls devices
- Circuit layout

Valve schedules in the form of printed sheets showing the number, type, location, application/service and symbol, and normal operating position of each valve.

Control schematics.

Location of mechanical and electrical plant and equipment items.

First aid instructions for treatment of persons after electric shock.

Location of isolating switch for electricity supply.

Location of main incoming gas valve serving gas meter and isolation point.

Location of main incoming water main and isolation point.

Emergency operating procedures and telephone numbers for emergency call out service applicable to any system or item of plant and equipment.

Location of metering facilities.

All other items required under Statutory or other regulations.

Prepare electrical drawings in accordance with BS EN 61082-1.

810.050 OPERATING AND MAINTENANCE MANUAL SPECIALIST:

Employ a specialist to prepare the operating and maintenance manuals.

The same Specialist may also be employed to prepare the EPC documentation (or use an Approved Energy Assessor employed to prepare the EPC(s)).

Include all costs for the engagement of a Specialist(s) within the tender.

810.060 PRESENTATION OF THE OPERATING AND MAINTENANCE MANUALS:

Agree format and contents with the CA.

Provide the operating and maintenance manuals in the following form:

- Encase the manuals in A4 size, plastic-covered, loose leaf, four ring binders with hard covers, each indexed, divided and appropriately cover- titled. Fold drawings larger than A4 and include in the binder so that they may be unfolded without being detached from the rings.
- Electronic format stored on CD
- Draft copies for comment: **1No.** copy
- Final copies for Client use:
- **2No.** paper copies of the O&M manuals (including all certification) for inclusion within the H&S file
- **2No.** paper copies of all Record Drawings on minimum A1 sheets plus **2No.** sets reduced to A3 size for inclusion in the H&S files.
- **2No.** Electronic copies of all O&M manuals and Drawings on CD with all information copied in pdf format.

The draft copy of the manual shall conform to the final format required by the specification to enable all relevant comments to be made by the CA.

810.070 OPERATING AND MAINTENANCE MANUALS:

The operating and maintenance manuals must include:

- A full description of each of the systems installed, written to ensure that the Employer's staff fully understand the scope and facilities provided.
- A description of the mode of operation of all systems including services capacity and restrictions.
- Diagrammatic drawings of each system indicating principal items of plant, equipment, valves etc.
- Legend of all colour-coded services.
- Schedules (system by system) of plant, equipment, valves, including any existing equipment retained and re-used, etc., stating their locations, duties and performance figures. Each item must have a unique number cross-referenced to the record and diagrammatic drawings and schedules.
- The name, address and telephone number of the manufacturer of every item of plant and equipment together with catalogue list numbers.
- Manufacturer's technical literature for all items of plant and equipment, assembled specifically for the project, excluding irrelevant matter and including detailed drawings, electrical circuit details and operating and maintenance instructions.

- A copy of all test certificates, inspection and test Records, commissioning and performance test records including, but not limited to, electrical circuit tests, corrosion tests, type tests, start and commissioning tests, for the installations and plant, equipment, valves, etc., used in the installations.
- A copy of all manufacturer's guarantees or warranties, together with maintenance agreements offered by subcontractors and manufacturers.
- Copies of insurance and inspecting Authority certificates and reports.
- Starting up, operating and shutting down instructions for all equipment and systems installed.
- Control sequences for all systems installed.
- Schedules of all fixed and variable equipment settings established during commissioning.
- Procedures for seasonal change-overs and/or precautions necessary for the care of apparatus subject to seasonal disuse.
- Detailed recommendations for the preventative maintenance frequency and procedures which should be adopted by the Employer to ensure the most efficient operation of the systems.
- Details of lubrication for lubricated items including schedules of lubricant type, frequency, etc.
- Details of regular tests to be carried out (e.g. water analysis, fire alarm, emergency lighting etc.)
- Details of procedures to maintain plant in safe working conditions.
- Details of the disposal requirements for all items in the works.
- A list of normal consumable items.
- A list of recommended spares to be kept in stock by the Employer, being those items subject to wear or deterioration and which may involve the Employer in extended deliveries when replacements are required at some future date.
- A list of any special tools needed for maintenance cross-referenced to the particular item for which required.
- Procedures for fault finding.
- Emergency procedures, including telephone numbers for emergency services.
- Back-up copies of any system software.
- Documentation of the procedures for updating and/or modifying software operating systems and control programmes.
- Instructions for the creation of control procedure routines and graphic diagrams.
- Details of the software revision for all programs provided.
- Two back-up copies of all software items, as commissioned.
- Copies of relevant HSE/CIBSE/IET Guidance notes etc.
- Contractual and legal information including but not limited to
- Details of local and public authority consents
- Details of design team, consultants, installation contractors and associated subcontractors
- Start date for installation, date of practical completion and expiry date for the defect's liability period
- Details of warranties for plant and systems including expiry dates, addresses and telephone numbers.
- A provision for update and modification.
- The O&M Manuals are intended to act as advisory and informative documents to enable the Employer to undertake the normal operation, user adjustment, periodic inspections and checks on the systems.
- The documents shall also be used by suitably trained and qualified Service Engineers to undertake more detailed examinations, tests, inspections and the "general maintenance" of the systems and/or components and as such the documentation shall be in sufficient detail to enable suitably trained and qualified engineers to carry out these functions safely and with sufficient knowledge of the components forming the systems.
- The documents are not intended to fully detail how "major repairs" and "major replacement" of intrinsic components are to be undertaken as it is expected that this work would be undertaken as necessary by more Specialist Contractors.

900.000 COMPLETION AND HANDOVER

900.010 GENERAL:

This section details the requirements and procedures for completion and handover.

900.020 HANDOVER REQUIREMENTS:

As a pre-requisite to Practical Completion in respect of the contract works or part thereof, demonstrate to the satisfaction of the CA that:

All the contract works are complete.

- With the exception of minor snags or limited defects as agreed with the CA that could be reasonably completed within an agreed programme without causing disruption to the Employer's use of the building or part thereof.

All spares, keys, tools and other consumables as stated elsewhere have been supplied and handed over to the Employer.

The instruction of the Employer's staff in the use and correct operation of the installation has been completed satisfactorily. In particular, safety devices and controls demonstration.

All commissioning and testing completed including the issue of a final commissioning report signed by an approved competent person.

A complete demonstration of the contract works with fully functional operational controls tested has been undertaken in the presence and to the satisfaction of the CA.

All necessary certification by the Employer's insurers has been completed.

All approved record documentation including record drawings, operation and maintenance manuals, etc. is issued.

All information required for the health and safety file is issued to the satisfaction of the Principal Designer

The information shall include:

- A written description of plant operation.
- Control strategy/logic diagrams recording the final version of configuration software installed at handover.
- Details of system application software configuration.
- A points list including hard and soft-points (all points should have a unique mnemonic).
- A description of user adjustable points.
- Commissioning record details.
- Detailed data sheets for all control components and equipment.
- Wiring circuit details including origin, route and destination of each cable.
- Basic security access to the system.
- Comprehensive instructions for switching on, operation, switching off, isolation, fault finding and procedures for dealing with emergency conditions.
- Instructions for any precautionary measures necessary.
- Instructions for the routine operation of the control system including simple day-to-day guidance for those with limited technical skill.
- Instructions for servicing and system upkeep.
- A provision for update and modification.

All necessary Statutory Authority approvals have been undertaken and written confirmation established.

Completion and issue of logbooks in accordance with Building Regulations and in accordance with CIBSE TM31 Building Logbook Toolkit (standard templates)

Air permeability test certificate in accordance with Building Regulations where required.

Should adequately record documentation not be available Practical Completion shall not be granted.

900.030 READING OF METERS:

Record where necessary readings of all water, gas, and electricity meters immediately on site start and again at the completion of the work (or at each phase of the Works) and forward to the CA.

900.040 RECOMMENDED SPARE PARTS:

Before Practical Completion submit to the CA a schedule of spare parts as stated elsewhere and recommend any that should be obtained and kept in stock by the Employer for maintenance of the installations included in the Works.

Time scale

- Two Weeks before **2No**

State against each item the manufacturer's current price, including packaging and delivery to site. Identify those items that are additional to those specified for inclusion as stated elsewhere.

900.090 TRAINING OF EMPLOYER'S STAFF:

Prior to Practical Completion explain and demonstrate the purpose, function and operation of the installations including all items and procedures listed in the operation and maintenance manual:

- To the Employer's maintenance staff.
- And/or to the Employers operational staff.

Submit to the CA for approval a detailed programme for the training of the Employer's staff.

Time scale

- Two Weeks before commencement of training

Employ the services of relevant specialists and suppliers as necessary for the purpose of training and instruction.

Provide each person being trained with a comprehensive set of teaching notes and diagrams.

Be responsible for the correct operation and maintenance of the installation during such periods of instruction.

Provide training for the operation of the automatic controls, monitoring or BMS installations as follows.

- Include instruction on the procedures for testing and routine inspection of sensors and actuators to enable the operator to assess the nature of faults and extent of remedial action required.
- Include instruction on the procedures to be undertaken to alter the initial defined operating parameters. (e.g. time, temperature etc.)

Number of persons to be included for training - **4No.**

Include for not less than indicated number of operating days for this purpose and demonstrate the safe day to day running and maintenance of all systems, plant and equipment.

Allow for the Mechanical Contractor, together with their supporting specialists to attend site for 3 hours to fully demonstrate and advise on the: -

- safe operation of all systems,
- general day to day inspections and testing of systems
- general maintenance procedures
- emergency shut down procedures
- Health and Safety matters
- requirements for periodic maintenance
- adjustment of end user controls

Allow for the Electrical Contractor, together with their supporting specialists to attend site for **3-hours** to fully demonstrate and advise on the: -

- safe operation of all systems
- general day to day inspections and testing of systems
- general maintenance procedures
- emergency shut down procedures

Within a period of 6 months from practical completion and occupation be available for a further 3-hour period on site period to assist and refresh the Employer's personnel in the correct operation and maintenance of the various systems.

All costs associated with the initial instruction of the Employer's personnel and the follow up instruction and attendance following practical completion shall be included in the contract price.

900.100 OPERATION OF SYSTEMS BEFORE THE PRODUCTION OF DRAWINGS AND/OR OPERATING AND MAINTENANCE MANUALS:

Provide attendance, at no expense to the Employer, to put into service, operate **24-hours** a day and maintain the systems to the Employer's requirements, including the provision of suitable competent labour, in the event that the Record Drawings and/or Maintenance Manuals are not available when the Works would, in the opinion of the CA, otherwise qualify for Practical Completion.

In the event of the Contractor failing to provide this service satisfactorily the Employer shall be entitled to make his own arrangements and recover the full cost through the contract.

910.030 PROVISION FOR 12 MONTHS MAINTENANCE:

GENERAL MAINTENANCE

Allow for a visit at 12 months following Practical Completion (e.g. End of 12 months Defects)

To:

- Review the operation of the system with the CA's representative.
- Undertake a visual examination of readily accessible components.
- Check and adjust controls as necessary to maintain optimum seasonal efficiency and operating conditions.
- Rectify any apparent defects such as leaking joints, faulty switches, lamp replacement etc.

NOTE: Daily and weekly checking and testing of the systems, including periodic testing of the Fire Alarm and Emergency lighting systems shall be undertaken by the Employer.

Filter replacement within AHU's and the like shall be undertaken by the Employer.

EMERGENCY ATTENDANCE TO FAULTS

The Contractor shall attend to faults within the following time periods depending on the severity of the fault:-

Emergency Call Out to attend such items as major water leaks causing damage to the structure or loss of water supply, gas leaks, heating or hot water failure - Within **4 hours** of reported fault.

Emergency Call Out to attend to major electricity failure causing loss of lighting and power to the building or large areas of the building - Within **4 hours** of reported fault.

Emergency Call Out to attend to failure of the fire alarm system, security alarm, call assistance alarms or panic alarm systems - Within **4 hours** of reported fault.

Emergency Call out for Lift Failure - Within **4 hours** of reported fault.

General Fault Conditions such as local circuit failure, minor leaks and similar non-critical items - Within **48 hours** of reported fault.

The Building Occupier/Employer must notify the Contractor by telephone and/or by e-mail and/or fax of reported faults.

The Contractor must advise the Building Occupier/Employer of all 24-hour telephone numbers for Emergency Assistance.

All faults must be logged by the Building Occupier/Employer and Contractor with details of fault, action taken to report fault, contractors response to repair fault, and fault cleared or problems still occurring.

NOTE: IF THE CONTRACTOR FAILS TO COMPLETE REPAIR WORK WITHIN THE SPECIFIED PERIOD THE EMPLOYER RESERVES THE RIGHT TO HAVE THE WORKS UNDERTAKEN BY A THIRD PARTY AND ANY COSTS INCURRED SHALL BE DEDUCTED FROM THE FINAL ACCOUNT.

C14 BUILDING SERVICES SURVEY

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

Undertake a site survey of the existing MEP services and adjacent grounds prior to commencing any works in order to determine the particular requirements for the works, making temporary connections, sectional removal, full removal etc. generally as the list below:

- Obtain and verify accuracy of existing survey information.
- Determine the location, nature, and condition of existing services.
- Determine suitable points for connection of new services onto existing incoming services.
- What temporary services or "out of hours" working may be necessary to avoid disruption to the building for construction.
- See specific existing electrical services clauses in Section V90.
- To understand and determine methods for the safe removal of existing Mechanical and Electrical services and the provision of temporary services where required.

Collate and record information as necessary to document the location and provision of temporary / retained services during the course of the works.

Visit site prior to submitting a tender to fully appreciate the scope and scale of the works required.

100.30 SYSTEM DESCRIPTION

Services that exist within the building to be retained and re-used include but are not limited to: -

- Natural Gas incomer
- Water incomer
- Below ground drainage connection points.
- Existing Cast iron radiators to be retained and re-used for visual impact only.
- Existing ceiling void vent openings to be retained for re-use.
- Electrical incomer until upgraded service installed.

The Contractor shall survey all items to be adapted.

PART 3 SPECIFICATION CLAUSES SPECIFIC TO C14

300.010 CONTENT AND PRESENTATION OF SURVEY:

There is no requirement to prepare detailed drawings of existing services where such services are to be removed as part of the contract.

However, where temporary services are installed there should be a site record indicating the scope and location of any temporary works.

In addition, the Contractor shall update, on a regular basis, draft copies of site record drawings indicating the extent of any new works installed so that the periodic progress of the installations is fully documented.

Record details of the existing services that are to be retained, modified and/or re-used and incorporate details of such services and components within the Installation Drawings and subsequent Record Documentation.

R19 FOUL DRAINAGE ABOVE GROUND

100.000 SYSTEM DETAILS

Provide new above ground drainage systems to remove foul waste-water.

The above ground drainage will connect into the existing below ground drainage system with all existing above ground drainage removed in full.

100.010 SYSTEM DESCRIPTION

Provide gravity above ground drainage systems to efficiently transfer above ground waste-water to the underground drainage system as generally indicated on the drawings.

The drainage system will be used to collect and dispose of water discharged:

- Water that may be discharged from safety devices fitted to water heaters and the like.
- From sanitary ware and kitchen equipment such as sinks, WCs, etc
- Condensate from AHU(s) vent heat recovery units, etc.
- New boiler / plant room floor gullies to be provided.

The work includes the supply, delivery, off-loading, storage, installation, connection, inspection, testing, commissioning and finishing of all materials, equipment and labour necessary to form a complete and satisfactory above ground waste disposal system(s).

Provide all necessary adaptors, reducing connectors etc. as required to form an effective seal at connection points.

Solvent welded pipework shall be utilised where possible with due allowance for compression or push fit fittings to permit easy removal and inspection of traps and cleaning points.

Provide traps to all new sanitary ware, sinks, washing machines and similar appliances.

Falls on soil, waste and vent pipes shall accord with the minimum stated in BS EN 12056-2

Sanitary pipework installation shall be undertaken in compliance with BS EN 12056-2.

Provide access / rodding points at all changes of direction and directly above (i.e. within 900mm) of the Connection point to the below ground drainage in accordance with good practice and standards.

Where plastic pipework passes through fire compartment floors and walls, intumescent fire sleeves to BS 476 'Fire tests on building materials and structures' shall be fitted. The fire sleeves shall be securely fixed to the structure to retain the integrity of the structure under a fire condition.

Allow for thermal expansion on PVC and polypropylene soil waste and vent pipework systems.

Wherever practicable obtain all soil and waste pipework from one manufacturer.

Note: Trapped floor gullies are to be provided within the plantroom as indicated on the drawings. These are to be connected into the nearest below ground drainage system provided as part of the below ground drainage works as part of the Civil Engineer's package

100.020 DESIGN PARAMETERS

Refer to BS EN 12056-2 - Gravity drainage systems inside buildings.

Refer to Building Regulations, Approved Document H Drainage and Waste disposal, as well as the Local Authority.

Note: The use of any form of pumped waste system shall be avoided wherever possible.

Soil stacks shall be treated, to minimise noise transmission, by means of wrapping in acoustic material, installing within suitable separation enclosures in compliance with Building Regulations and to comply with the acoustic requirements of the structure.

100.040 SYSTEM DRAWINGS:

Refer to indicative drawings but the Contractor is to prepare installation drawings.

200.000 DRAINAGE PIPELINES AND FITTINGS

200.010 PIPES AND FITTINGS - UNPLASTICIZED PVC TO BS 4514:

- Application - Main Vertical Soil & Vent stacks
- Manufacturer – Marley or Polypipe Terrain or equal and approved
- Kitemark certified
- Material - UPVC to BS 4514
- Finish - Grey where pipework is concealed and White finish where normally exposed to view.
- Jointing
- Solvent welded. Provide disconnection points near sanitary fittings and where pipework passes through floors to facilitate disconnection. Solvent welded pipework shall be utilised wherever practicable on horizontal runs of soil pipework or where soil pipes are located on or near electrical equipment or similar essential equipment.

200.020 PIPES AND FITTINGS - PLASTICS TO BS 5255:

- Application – Internal wastes from sinks, basins, urinals.
- Manufacturer - Marley or Polypipe Terrain or equal and approved
- Kitemark certified
- Material - Plastics to BS 5255
- Finish - White
- Jointing
- Solvent welded
- or
- Compression at traps and to facilitate removal for maintenance and inspection.

200.050 PIPEWORK ACCESSORIES:

- Application - All soil and waste pipework
- Pipe rings and clips - Select type according to the application and material compatibility.
- Where the soil and vent pipes terminate through the roof to atmosphere provide suitable weathering collar and vent cowl.
- Where soil and vent pipes are not terminated to atmosphere fit air admittance valves (AAV's). Where practicable AAV's shall be located in false ceiling voids and/or roof voids.

200.060 FIRE COLLARS:

- Application Where plastic pipes penetrate fire compartments.
- Manufacturer: PFC Corofil Intumescent Firestop Collars

- Or approved equivalent.
- Supply intumescent sleeves where pipes pass through fire walls or floors for fire separation. Fix strictly in accordance with manufacturers recommendations to provide a minimum of one-hour fire resistance.

300.000 DRAINAGE ACCESSORIES

300.040 PLASTIC TUBULAR TRAPS:

- Application - Sinks and/or baths
- Manufacturer and reference : Marley, Key Terrain
- Or approved equivalent.
- Standard - BS EN 274-1, BS EN 274-2, BS EN 274-3.
- Material - Polypropylene.
- Pattern - P. or S.
- Seal depth (mm) – to comply with Building Regulations

300.060 PLASTICS BOTTLE TRAPS:

- Application - Sinks , wash basins , urinals
- Manufacturer and reference Marley, Key Terrain, or approved equivalent.
- Standard - BS EN 274-1, BS EN 274-2, BS EN 274-3 - for sanitary appliances excluding baths.
- Material - Polypropylene.

300.061 ANTI VACUUM TRAPS:

- Application - Sinks and wash basins
- Manufacturer and reference Marley, Key Terrain, McAlpine, or approved equivalent.
- Standard - BS EN 274-1, BS EN 274-2, BS EN 274-3 - for sanitary appliances excluding baths.
- Material - Polypropylene.
- Provide anti vacuum traps on appliances where the length of the branch discharge pipe exceeds the relevant dimensions as listed in the Building Regulations and/or British Standards in order to retain the correct water seal.

300.062 IN LINE SELF SEALING WASTE VALVES:

- Application – Sinks, wash basins, showers, urinals and baths, where there is insufficient space to accommodate space for a traditional bottle, P or S trap.
- Application - Fit on condensate drain lines and on safety discharge lines that connect into the foul water system.
- Standard - ASME A112.18.8
- Manufacturer and reference:
- Wavin HepVo or approved equivalent for cold discharges
and
- RA Teck UK Ltd Hotun dry trap or approved equivalent for hot discharges.

300.160 AIR ADMITTANCE VALVES (AAV'S):

- Type – Full bore valves compliant with BS EN 12056.
- Application- For the ventilation of drainage pipework under conditions of reduced pressure when ventilating pipes are terminated inside buildings.
- Manufacturer - Marley, Key Terrain or approved equivalent.

- Standard - BS EN 12380
- Ensure that there is a change of gradient at stack connections. Use swept branches on small diameter pipes. Use swept inlet or 45° branch connections for pipe 75mm diameter or over.
- Details – Locate valve above the flood level of the respective appliance(s). Where practicable locate valves within roof voids or in false ceiling voids.
- Ensure that AAV's are accessible for inspection and maintenance. Where AAV's are enclosed in decorative boxings/enclosures ensure that the enclosures are adequately ventilated.

300.190 SAFETY DISCHARGE PIPES:

Safety discharge pipes shall be connected to discharge:

- into local trapped floor gullies (In Plant Rooms only)
- into the local sink/basin waste via a tundish in accordance with the manufacturer's recommendations
- externally terminating in a safe location all in strict accordance with Building Regulations Approved Document G.

Where safety discharge pipes connect into an internal waste system an in-line self-sealing waste valve shall be installed to prevent odours emanating from the foul waste system.

See R19 clause 300.062.

400.000 DRAINAGE WORKMANSHIP

400.010 PERFORMANCE CRITERIA:

Install pipework fittings and accessories to ensure that

- appliances drain quickly, quietly and completely at all times without nuisance or risk to health.
- discharge is conveyed without crossflow, backfall, leakage or blockage.
- air from drainage system does not enter building.
- pressure fluctuations in pipework do not vary by more than plus or minus 38mm water gauge and traps retain a water seal of not less than 25mm.
- system can be adequately tested, cleaned and maintained.

400.020 PIPE ROUTES:

Ensure pipe routes are shortest practicable, with as few bends as possible and no bends in wet portion of soil stacks, unless indicated otherwise on drawings.

400.030 COATED PIPES:

Make good damaged coatings and cut ends, or recoat, as recommended by manufacturer.

400.040 INSTALLATION GENERALLY:

Install pipes, fittings and accessories in accordance with BS EN 12056-2 and manufacturer's recommendations. Obtain all components for each type of pipework from the same manufacturer, unless otherwise indicated.

Inspect components carefully before fixing and reject any which are defective.

Ensure cut ends of pipes to be clean and square with burrs removed.

Allow for thermal and building movement when jointing and fixing.

Form junctions using fittings intended for the purpose, ensuring that jointing material does not project into bore of pipes, fittings and appliances.

Fix pipes at centres not greater than those specified in BS 8000-13. Provide additional supports as necessary at junctions and changes in direction. Fix every length of soil vent pipe at, or close below the socket collar.

Use plated, sheradized, galvanized or nonferrous fastenings, suitable for the purpose and background, and compatible with the material being fixed or fixed to.

Avoid contact between dissimilar metals and other materials which would result in electrolytic corrosion.

In convenient locations, provide access covers and cleaning eyes as necessary and in accordance with Local Authority requirements to permit adequate testing and cleaning of pipework.

Prevent entry of foreign matter into any part of system by sealing openings during construction. Fit all access covers and cleaning eyes as work proceeds.

400.050 CONNECTIONS BETWEEN PIPES OF DIFFERENT MATERIALS:

Plastic

- Connect plastics pipework to pipework of other materials using approved connectors and methods in accordance with plastics pipework manufacturer's recommendations, to form a watertight joint.

400.060 WASTES:

Bed in waterproof jointing compound and fix with resilient washer between appliance and back nut.

400.070 WASTE CONNECTORS:

Join to traps as manufacturer's recommendations.

400.080 WC PANS:

Plastic

- Connect to soil pipe spigots with plastic connectors in accordance with connector manufacturer's recommendations.

400.090 ACCESS POINTS:

Provide rodding and access points at all changes of direction to enable whole system to be maintained.

Provide square door type access points as indicated on drawings at foot of all soil and ventilation pipes.

Where practicable, locate access points and horizontal anti-syphon pipes above fitment flood level.

In general, make WC connections to drain points and soil pipes via flexible connectors.

400.100 PRESSURE TESTING - SOIL, WASTE, VENTILATION, AND ANTI- SYPHON PIPEWORK:

Test section by section as the work proceeds and subsequently on completion with all sanitary fittings fixed and working. Submit systems to two separate tests, Air test and Hydraulic Performance test in accordance with BS EN 12056.

500.000 SANITARY EQUIPMENT

There is no allowance within this specification for the supply and installation of sanitary equipment, kitchen and cleaners sinks and associated taps, waste outlets and accessories.

Refer to the Architects drawings / specification for details of this equipment.

Make due allowance for undertaking the final waste connections (and water connections) to all sanitary ware, sinks, washing machines, and similar components.

S12 HOT AND COLD-WATER SERVICES

100.000 SYSTEM DETAILS:

100.010 SYSTEM DESCRIPTION:

The existing building cold-water service (CWS) entry shall be retained and utilised for the new services and new services shall run from the existing incomer as indicated on the drawings. The existing cold and hot water services shall be removed in full from building entry point.

Facilities only shall be allowed for future installation of a new internal Welsh Water meter complete with pulsed output.

The new CWS on enter to the building shall be complete with all necessary valving etc as indicated on the mechanical drawings with new services run to all outlets.

New electric point of use water heater shall be installed within the kitchenette and toilet facility as indicated on the drawings to provide hot water to the sink / WHB etc.

Hot and cold-water service distribution shall be installed to serve sinks, basins, WC's, and appliances as necessary to form complete and fully functional systems.

Type TMV 3 thermostatic mixing valve to be provide on the hot water connection to the Assisted WC WHB unless integral to tap.

Cold water service to run to the lower ground floor plantroom.

All cold-water services shall be complete with branch isolation valves and lever-type isolation valves to individual appliances/ outlets.

100.020 DESIGN PARAMETERS:

BS EN 806-2, BS EN 806-3, and complimentary guidance in BS 8558, CIBSE Guide G: Public Health & Plumbing Engineering, CIBSE TM13, HSE Approved Code of Practice L8 and associated guidance HSG274 Part 2 (The control of legionella bacteria in hot and cold-water systems).

Comply with appropriate WRAS guidance.

100.040 SYSTEM DRAWINGS:

Refer to indicative drawings but the Contractor is to prepare installation drawings.

200.000 PLANT AND EQUIPMENT:

200.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:

All equipment and assemblies which fall within the scope of The Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through The Pressure Equipment Regulations 1999, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.

Only relevant equipment and assemblies certified as compliant shall be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

200.106 THERMOSTATIC BLENDING VALVES (IF REQUIRED):

Type: TMV3 approved

Application: Blending Valves to limit the discharge temperature of hot water from wash hand basins.

Manufacturer and reference: Reliance Heatguard® Dual TMV2-3 or approved equivalent.

Location: Conceal valves within IPS panel systems wherever possible.

Valves to be complete with:

- Tamperproof cover
- Integrated check valves and strainers
- Line mounted isolation valves to be provided.

Install thermostatic mixing valves in accordance with manufacturer's recommendations.

Outlet temperature from wash hand basins shall be restricted to 43°C

NOTE: Blending valves shall not be installed to sinks. In these areas fit "Danger Hot Water" notices.

200.135 APPROVALS:

Ensure all water fittings and materials are listed in the Water Fittings and Materials Directory published by WRAS.

200.174 FLOW LIMITERS

Type: In line flow regulation devices

Manufacturer: Robert Pearson and Co, Altenic Ltd, Aquaflo Regulators Ltd, or equal and approved.

Application: Provide automatic water flow regulator devices to wash basins and showers to restrict maximum water usage irrespective of pressure fluctuations.

Unless specifically stated flow restrictors shall be fitted to all wash basin taps, kitchen sink taps etc. to reduce water consumption and where necessary to meet other specific design standards (such as BREEAM).

The flow restrictors shall deliver the following maximum flow rates:

Basins	-	2.0 litres/minute
Kitchen Sinks	-	6.0 litres/minute

Generally, the device shall be fitted at or near the outlet and after the local means of isolation (or integrated within the local servicing valve).

Final details of flow restrictor sizes shall be confirmed before ordering and installation.

200.176 ELECTRIC WATER HEATER(S):

Supply and install water heating units and accessories in locations as generally indicated on the drawings.

Kitchen Sink & Assisted WC WHB

Type: Refer to Mechanical Drawings

Manufacturer and Model: Santon Hotflo 15 (15 litre, 2.2 kW heating element), or equal and approved.

To be complete with Hotflo expansion kit pack U5 with Pressure (expansion) relief valve, expansion vessel, check valve etc and to be complete with separate temperature / Pressure relief valve, local isolation valves etc.

Provide a connection to the mains water supply with servicing valve and all associated mains water kits and expansion and safety devices.

Connect to the electrical supply via the mechanical control panel with heat resistant flexible cable.

Connect safety discharge pipes to the local trapped floor gulley via a tundish such as HotTun or similar.

Install all equipment in accordance with the manufacturer's recommendations.

Accessories:

- Manufacturers Expansion Vessel

NOTE: Final details and model type to be confirmed and agreed with the Employer and Architect before ordering the equipment.

600.000 PIPELINES AND ANCILLARIES - MATERIALS:

600.015 PIPES - COPPER TO BS EN 1057:

Type: General purpose drawn seamless half hard tube. Minimum size 15mm diameter

Application: for the distribution of potable cold water and hot water

Manufacturer: Contractors selection

Kitemark certified

Material: Copper to BS EN 1057.

R250 half hard.

Finish: Uncoated.

Jointing:

- Capillary fittings as clause 600.040.
- Compression fittings for connections to equipment - as clause 600.050.
- Compression fittings as clause 600.050.

600.040 COPPER FITTINGS - CAPILLARY, FOR COPPER TUBING:

Type: Fittings with ends for capillary soldering or capillary brazing to copper tubes

Application: for the distribution of potable cold water and hot water

Manufacturer: Contractors selection

Kitemark certified.

Material

Copper (dezincifiable resistant).

Copper alloy (dezincifiable resistant).

Copper/copper alloy (lead- and cadmium-free).

Standard: BS EN 1254-1.

Joining materials: capillary joints.

Solder - BS EN ISO 9453.

600.050 COPPER FITTINGS - COMPRESSION, FOR COPPER TUBING:

Type: Fittings with compression ends for jointing and use with copper tubes

Application: Hot and cold-water services

Manufacturer: Contractors selection

Kitemark certified.

Material:

Copper (dezincifiable resistant).

Copper alloy (dezincifiable resistant).

Copper/copper alloy (lead- and cadmium-free).

Standard: BS EN 1254-2.

Type

Type A - non-manipulative.

Type B - manipulative.

Ends - Socket.

Finish - Cast.

600.070 STOP VALVES TO BS 1010-2:

Type: Screw-down pattern with crutch head

Application - For isolation of water services. Install a main stop valve, and drain cock, on the water main where it enters the property to enable total isolation of the water supply from within the building

Manufacturer and reference: Peglers or approved equivalent

Kitemark certified.

Material: Bronze or DZR copper alloy body.

Ends:

Threaded to BS 21 and BS EN 10226-1.

With connections for capillary fittings to BS EN 1254-1.

600.083 DOUBLE CHECK VALVES:

Application: for backflow prevention

Manufacturer and reference: Contractors selection

Kitemark certified.

Size: To suit pipeline

Bronze or DZR copper alloy body assembly.

Water Research Centre approval.

Ends: to BS EN ISO 228-1.

Pattern: In-line pattern.

Location: As generally indicated on the schematics and where required to prevent backflow of contaminated water into the potable water system.

600.085 STOP VALVES - BALL TYPE:

Type - Chromium plated full bore quarter turn servicing valve with red (hot) or blue(cold) lever

Application - Install on all final hot and cold-water connections to fixed components such as sanitary equipment, taps, appliances and the like to enable local isolation of the component to facilitate inspection and maintenance.

Manufacturer and reference - Peglers PB300T range or approved equivalent

Bronze or DZR copper alloy body; chrome or nickel-plated sphere.

Ends:

Threaded to BS 21 and BS EN 10226-1.

Capillary to BS EN 1254-1.

Compression to BS EN 1254-2.

Compression to BS EN 1254-3

Operation - Lever operated with colour coded handles

600.095 PRESSURE REGULATING VALVES - INTEGRAL SENSOR TYPE:

Type: Integral cartridge spring type with easy adjustment of discharge pressure

Application: To limit water pressure to a pre - set maximum discharge pressure (circa 2.5 bar)

Location: Install near the main entry points into the building downstream from main isolating stopcock or on sections of the installation to maintain balanced pressures across the installation as deemed necessary.

Manufacturer and reference: Reliance Water Controls model; 315i or approved equivalent

Material: Bronze or DZR copper alloy body threaded to BS 21 and BS EN 10226-1.

Components: Control spring and handwheel; integral sensor with an alpha/numeric pressure set-point indicator and locking facility.

600.100 DRAIN COCKS - SCREWDOWN COCK TYPE TO BS 2879, TYPE 1:

Type: Type A Drain cock with hose union connection

Application: Fit at all low points of systems to enable drain down of water services

Manufacturer and reference: Peglers type 833 or approved equivalent

Bronze body threaded male to BS 21 and BS EN 10226-1.

Screw down plug with square shank for loose lever.

Serrated outlet to accept hose pipe, fixed or union pattern.

600.120 WALL, FLOOR AND CEILING MASKING PLATES:

Type: white plastic one-piece snap fix

Application: for use on pipework passing through walls, floors and partitions to conceal pipe penetration opening

Manufacturer: Talon Plastics, Tel: 08450 952 828 or approved equivalent

600.130 VALVE LABELS:

Supply and fit engraved plastic labels to all valves (except isolating and regulating valves on heat emitters).

Valve labels shall clearly to identify the water service and function of the valve (e.g. mains water stopcock).

Securely fix tag to valve with a nylon zip tie.

Where multiple valves are installed in Plant Rooms or service rooms fit valve labels with a unique reference to each valve and provide within the room a valve chart and/or valve drawing to clearly identify the function of each valve. Provide a copy of any charts and/or drawings within the O&M manual.

600.140 PIPEWORK IDENTIFICATION:

Type: Self-adhesive wrap around identification to pipelines

Application - Apply to all insulated hot and cold-water services to clearly identify the service content and direction of flow.

Colour code and label to BS 1710.

Apply: 100mm wide colour bands and superimpose a legend identifying circuit and direction of flow at intervals not exceeding 6.0 metres. Apply legends to colour bands by transfers of an approved type.

700.000 PIPELINE WORKMANSHIP:

700.010 INSTALLATION AND COMMISSIONING GENERALLY:

Install, test and commission systems to comply with BS EN 806-4 and complimentary guidance in BS 8558, Water Supply (Water Fittings) Regulations 1999 and equipment manufacturer's recommendations.

Construct the system to ensure it is safe and without risks to health and where applicable incorporate in the final design/installation recommendations given in HSG274 Part 2.

Install thermoplastics pipework in accordance with BS 5955-8.

700.020 APPEARANCE:

Arrange all exposed pipe runs to present neat appearance, parallel with other pipe or service runs and building structure, subject to gradients for draining or venting.

Ensure all vertical pipes are plumb or follow building line.

700.030 SPACING:

Space pipe runs in relation to one another, other services runs and building structure, allow for thermal insulation and ensure adequate space for access to pipe joints, etc.

Minimum clearances to pipe or pipe insulation: -

From	Minimum Clearance (mm)
Wall	25
Ceiling	50
Floor	150
Other pipes	25
Electrical cables, conduit, switchgear, etc	150

700.040 GRADIENTS:

Install pipework with gradients to allow drainage and air release.

700.050 EXPANSION AND CONTRACTION:

Arrange supports and fixings to accommodate pipe movement caused by the thermal changes. Isolate pipes from structure to prevent noise or abrasion due to thermal movement / changes in direction.

700.060 BENDS, SPRINGS AND OFFSETS:

Machine bend and ensure that machine guides and formers are smooth and clean, free from any scores, or other damage. Deformed bends shall not be accepted.

700.070 PIPES THROUGH WALLS AND FLOORS:

Enclose pipes passing through building elements, (walls, floors, partitions, etc.) concentrically within purpose made sleeves.

700.080 PIPE SLEEVES:

Cut sleeves from material same as pipe one or two sizes larger than pipe. Do not use sleeves as pipe supports. Install sleeves flush with building finish.

700.090 TEMPORARY PLUGS AND CAPS:

Seal all open ends as installation proceeds by metal, plastic or wooden plugs or caps, to prevent ingress of foreign matter.

700.100 CAPILLARY JOINTS, COPPER/STAINLESS STEEL PIPES:

Preparation: Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size. Clean plain ends with fine steel wool.

Making and sealing: Use specified flux ensuring no excess material used. Make joint in accordance with manufacturer's instructions. Clean off traces of flux when joint is completed. Protect building fabric from heat when forming joints.

Polyethylene sheathed pipe - Follow manufacturer's recommendations to avoid damage to plastic coating. Make good with PVC tape of matching colour.

700.110 COMPRESSION JOINTS, COPPER/STAINLESS STEEL/POLYETHYLENE PIPES:

Preparation: Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size. Clean plain ends with fine steel wool or fine sandpaper. Then if using:

Type 'A' fitting - no further preparation.

Type 'B' fitting - in accordance with fitting manufacturer's instructions.

Making and Sealing: In accordance with fitting manufacturer's instructions.

700.120 SCREWED JOINTS TO BS 21:

Preparation: Ensure that plain ends are cut square. Reamer out bore at plain ends. Screw plain ends, taper thread.

Making and Sealing: Coat male pipe threads with PTFE tape, connect with female end of socket or fitting, and tighten ensuring that coating does not intrude into pipe. Leave joint clean.

700.130 PIPE RINGS AND CLIPS:

Select type according to the application and material compatibility.

700.140 PIPE SUPPORTS:

Arrange supports and accessories for equipment, appliances or ancillary fittings in pipe runs, so that no undue strain is imposed upon pipes.

Ensure that materials used for supports are compatible with pipeline materials.

Provide all ancillary steel supports utilizing Flamco, Unistrut or similar channel support systems to span between steelwork or joists as required to securely fix the services to the main structural frame of the building.

700.150 PIPE SUPPORT SPACING COPPER/STAINLESS STEEL PIPE:

PIPE BORE (mm)	MAXIMUM SUPPORT SPACING (mm)	
	Horizontal	Vertical
Nominal		
Up to 15	1200	1800
22	1400	2100
28	1800	2400
35	2400	3000
42	2400	3000
54	2700	3000

NOTE: Proximity of hot and cold pipework. Cold water distribution services to be segregated from heating and hot water pipelines where practicable to reduce the risk of the water temperature exceeding nominally 20°C. Where pipes are installed in vertical banks locate cold water pipes at the lowest level where practicable. Where hot water and cold-water pipes are in close proximity insulate pipelines to limit heat transfer.

700.170 MAINTENANCE AND RENEWAL:

Arrange pipework, valves, drains, air vents etc., for convenient routine maintenance and renewals.

700.190 CLEANING:

Remove cement and clean off all pipework and brackets.

800.000 THERMAL INSULATION:

800.010 THERMAL INSULATION TO PIPELINES:

Type - Mineral Fibre

All insulation shall have Zero Ozone Depletion Potential

Application - For the conservation of energy, frost protection, and condensation control.

Apply to all pipework located in:

Roof Voids and False Ceiling voids

Service ducts/risers including decorative boxed enclosures and IPS sanitary enclosures

Floor voids

Non heated spaces (such as basements, storerooms, outbuildings and garages)

Plant Rooms.

Thermal Insulation - Employ the services of a competent trades person to supply and fix all insulation in accordance with the insulation manufacturers recommendations.

Standards and regulations

Comply in general with BS 5422, BS 5970, BS EN ISO 12241 and either BS EN 14303, BS EN 14304 or BS EN 14314 product standards. Use the description of terms as BS 3533. All insulation products must have a Declaration of Performance (DoP) certificate and be CE marked in accordance with the Construction Products Regulations (CPR).

Supply insulating materials classified in accordance with BS EN 13501-1 Fire Classification of Construction Materials. Classes acceptable are A1/A1L, A2/A2L or B/BL having smoke emission classification of s1 and production of flaming droplets/particles classification of d0.

Test methods BS EN ISO 1182, BS EN ISO 1716, BS EN ISO 11925-2 or BS EN 13823 as appropriate

Thermal conductivity - All thermal conductivity figures are typical values at the mean temperature stated, as declared in manufacturer's Declaration of Performance (DoP) certificates in accordance with CPR.

Use mineral wool pipe insulation to BS EN 14303, nominal density of 80 kg/m³ to 120 kg/m³ and thermal conductivity typical value of 0.033 - 0.034 W/mK at a mean temperature of 10°C.

Finish:

Reinforced aluminium foil with at least 25mm overlap.

Protection:

Ensure that where protection is applied to insulation, the joints fall blind side and that all joints are made to shed water and sealed with waterproof tape, adhesive or joint sealant where appropriate.

800.015 THERMAL INSULATION TO VALVES AND FLANGES

Apply flexible insulated valve jackets to all valves and flanges in excess of 25mm pipeline size on both heating and hot water pipelines.

Applies to all valves and flanges exceeding 25mm nominal pipeline diameter located within:

- boiler house / plant rooms
- ceiling voids
- roof voids
- Main Service Ducts/ Service Voids
- Unheated Areas

The jackets shall be manufactured from aluminium coated glass cloth and secured to the valve/flange with nylon draw strings or industrial grade Velcro hook and loop attachments to completely encase the fitting but to allow for easy removal and replacement for inspection and repair of valves/flanges.

The jacket shall be filled with a flexible mineral fibre insulation complying with BS 5422 1990.

800.025 EXTERNAL INSULATION PROTECTIVE COVERING

Where insulation is exposed to the weather it shall be protected with a weather resistant covering such as: -

- Polyisobutylene having a minimum thickness 0.8mm. Seams, overlaps and end laps shall be solvent welded with a suitable PIP Welding Agent

800.030 THERMAL INSULATION WORKMANSHIP

Do not apply thermal insulation until installation has been fully tested and all joints proved sound.

Ensure that all materials are kept dry.

Ensure clearance between insulated pipes.

Apply insulants, facings, coatings and protection strictly in accordance with manufacturer's instructions.

Neatly finish joints and corners, and ensure continuity over fittings and supports, with longitudinal split concealed.

Arrange insulation of feed and expansion cistern to allow removal of access covers.

In locations where insulation cannot be installed adequately after pipeline or ductline installation, pre-insulated sections shall be installed. Insulation to such sections shall be equivalent in thermal and physical properties to that specified for the remainder of the system including vapour barriers.

Before phenolic foam sectional insulation is applied, ensure that all pipework is clean, dry and free of any debris or corrosive substances such as excess soldering flux, building materials.

Installation shall be by a contractor approved by the manufacturers strictly in accordance with the manufacturer's installation instructions.

All exposed edges of phenolic foam insulation shall be sealed to the surface being insulated with a suitable vapour sealing mastic.

800.035 CALCULATION OF INSULATION THICKNESS - BUILDING REGULATIONS:

Provide insulation of thickness conforming with the requirements of the Building Regulations (England and Wales) Part L Approved Documents or the Scottish Technical Handbooks, and the calculation methods given in BS EN ISO 12241 using the standardised assumptions within BS 5422.

800.036 NON-DOMESTIC HOT WATER SUPPLY SERVICES, ECA ENHANCED:

The insulation manufacturer selected for a particular project should calculate the minimum required thicknesses of pipework insulation based on the actual conductivity of the product at the relevant temperature and the criteria on the ECA web site for an eligible installation using the methodology set out in BS EN ISO

12241 and the assumptions set out in Table C1 of BS 5422: 2009. The table below defines the maximum permissible heat losses to be used in the calculations.

Non-Domestic Hot Water Supply Maximum Permitted Heat Loss (W/m)	
Temperature	60°C
Outside Pipe Diameter (mm)	
17.2	6.04
21.3	6.45
26.9	7.00
33.7	7.71
42.4	8.46
48.3	9.01
60.3	9.94
76.1	11.25
88.9	12.17
114.3	14.29

800.037 INSULATION THICKNESS TABLES:

Unless stated otherwise the thicknesses given in the tables in this specification are the nearest commercially available material thickness to meet the minimum calculated thickness to BS ISO 12241 and the product declared performance data for CE marking. Thicknesses have been calculated by manufacturers for each product and use thermal conductivity values calculated from the mean insulation temperature based on the fluid and air temperatures listed in the relevant tables.

Should alternative products be offered that may have different performance data the Contractor shall ensure the manufacturer undertakes calculations and submits appropriate thickness tables.

800.045 NON-DOMESTIC HOT WATER SERVICE AREAS - BUILDING REGULATIONS ROCK MINERAL WOOL:

Insulation thickness to achieve the maximum permissible heat loss stated in the Building Regulations Part L Non-Domestic Building Services Compliance Guide, Northern Ireland Technical Booklet F2 and Section 6 of the Scottish Non-Domestic Technical Handbook.

Outside diameter of steel pipe (mm)	Thickness of rock mineral wool (mm)	
Surface emissivity	0.05	0.9
17	25	30
21	25	30
27	30	35
34	30	35
42	30	35
48	35	40

60	40	40
76	35	45
89	35	45
114	40	45

Basis: Horizontal pipe at 60°C in still air at 15°C, thermal conductivity values calculated from the mean insulation temperature based on the fluid and air temperatures.

Use this table for insulation thickness of copper pipework of the nearest equivalent outside diameter.

Use this table for insulation thickness of plastic pipework of the nearest equivalent outside diameter.

800.086 PROTECTION AGAINST FREEZING - ROCK MINERAL WOOL:

Outside diameter of	Indoor condition where	Outdoor condition where
	Thickness of mineral wool insulation (mm)	
Copper		
15	-	-
22	20	50
28	20	25
35	20	20
42	20	20
54	20	20
76	25	25
108	25	25
Steel		
21	40	-
27	20	45
34	20	25
42	20	20
48	20	20
60	20	20
76	25	25
89	25	25

900.000 COMMISSIONING AND TESTING:

900.010 PRESSURE TESTING:

Advise appropriate personnel, at least 3 days in advance, of the time that pressure tests may be witnessed.

Test concealed or buried pipework before any permanent covering is applied.

Complete pressure testing before applying thermal insulation.

Thoroughly flush out the whole system, fill system, vent all air from system and check for leaks, repair any leaks and re-check.

Pressure test the system for a period of one hour and check for and repair any leaks. Repeat pressure test if leaks have been found.

Test at twice the working pressure.

Disconnect incoming service pipe from mains, fill with potable water, pressure test for a period of one hour, and check for and repair any leaks. Repeat pressure test if leaks have been found.

Test at twice the working pressure.

900.020 STERILIZATION - GENERAL:

After flushing process, carry out sterilization in accordance with BS EN 806-4 and complimentary guidance in BS EN 8558.

Prior to sterilization ensure each system is flushed, cleaned and drained.

Provide temporary connections to system terminal points suitable for introduction of sterilization chemicals and fluids and 22mm minimum valved drain connection on incoming main immediately downstream of mains isolating valve.

Fill system with clean, fresh water.

900.030 STERILIZATION - MAINS WATER SYSTEM:

Carry out the following operations in accordance with BS EN 806-4 and complimentary guidance in BS EN 8558.

Flush system and introduce sterilisation chemical, take samples to ensure correct chlorine concentration.

Repeatedly flush system with clean water until all traces of chlorine have been removed - leave system filled.

Submit samples to a registered laboratory for microbiological analysis and report.

900.040 STERILIZATION - WATER STORAGE SYSTEMS:

Carry out the following operations in accordance with BS EN 806-4 and complimentary guidance in BS EN 8558 and HSE L8 Approved Code of Practice and Guidance - Legionnaires' disease - control of legionella bacteria in water systems.

Carry out procedures as for mains water systems on potable water storage tanks and cisterns, cold and hot.

Certificate of conformity

Immediately prior to handover, retake samples and submit for analysis and report.

Where necessary repeat sterilisation of potable water systems immediately prior to handover.

S32 NATURAL GAS

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

To provide a natural gas supply to the new boiler plant to serve the 1Nº natural-gas fired boilers.

100.020 DESIGN PARAMETERS

Natural gas operating at low pressure.

Comply with the Gas Safe recommendations and the Institution of Gas Engineers Standards.

100.030 SYSTEM DESCRIPTION

The Contractor shall extend the existing gas supply from the site meter within the lower ground floor plantroom, and onto the gas boilers.

100.040 CONTROL REQUIREMENTS

The gas supply shall be equipped with:

- A local gas cock adjacent each boiler.
- A manually operated gas cock adjacent to each gas meter.
- Gas detection panel fitted in the plantroom.

100.040 SYSTEM DRAWINGS:

Refer to indicative drawings but the Contractor is to prepare installation drawings.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

200.0 PIPELINES

200.110 STEEL GAS PIPE

Gas services shall be carried out utilising an approved steel pipework system suitable for above ground gas installations installed strictly in accordance with the manufacturers recommendations.

Identification

Provide paint, sleeving or tape identification to all gas pipelines.

PART 3 SPECIFICATION CLAUSES SPECIFIC TO S32

300.000 GENERAL

300.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:

All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through the Pressure Equipment Regulations 1999, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.

Only relevant equipment and assemblies (i.e., those with a maximum allowable) certified as compliant will be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

300.010 REGULATIONS:

Supply and install equipment in accordance with

HSE L56 - Safety in the Installation and Use of Gas Systems and Appliances. Approved Code of Practice and Guidance. Gas Safety (Installation and Use) Regulations 1998. 4th Edition.

HSE L81 - Design, construction, and installation of gas services pipes. Approved Code of Practice and Guidance. Pipelines Safety Regulations 1996.

The Gas (Meters) Regulations 1983, SI 684 (as amended)

The Measuring Instruments (Gas Meters) Regulations 2006, SI 2647

300.020 STANDARDS:

Install in accordance with the following as appropriate to the application:

- Install gas pipework in buildings in accordance with BS EN 1775
- Gas supply pipelines for maximum operating pressure up to and including 16 bar to BS EN 12007
- Installation of gas fired catering appliances for use in all types of catering establishments to BS 6173
- Safety and control devices for gas-burners and gas-burning appliances - general requirements to BS EN 13611
- HSE L56 Safety in the Installation and Use of Gas Systems and Appliances: Gas Safety (Installation and Use) Regulations 1998. 4th Edition
- Pipelines Safety Regulations 1996 - Design, construction, and installation of gas service pipes, L81
- IGE/TD/3 Steel and PE pipelines for gas distribution
- IGE/TD/4 PE and steel gas services and service pipework
- IGE/UP/1 Strength testing, tightness testing and purging of industrial and commercial gas installations.
- IGE/UP/2 Installation pipework on industrial and commercial premises
- IGE/UP/4 Commissioning of gas fired plant on industrial and commercial premises.
- IGE/UP/10 Installation of flued gas appliances in industrial and commercial premises
- Building and Engineering Services Association (B&ES) TR 20/9 Natural Gas

310.000 PRODUCTS/MATERIALS

310.005 SECONDARY METER INSTALLATION:

Application - Installation of gas sub-meter(s) for metering purposes.

Supply and installation responsibility:

Contractor – Complete pipework and entry into LGF plantroom and connection onto boilers complete with

valves,, meter regulator, flexible connection, interconnecting pipework/fittings and supports.

Standard

IGEM/GM/6 (Standard installations 6m³/h up to 1076m³/h up to 100mbar)

Where a meter is used to measure the amount of energy supplied for billing purposes, the meter must be approved and stamped by NMO (National Measurement Office) or approved under the European Measuring Instruments Directive (MID 2004/22/EC).

310.006 GAS DETECTION PANEL

Application – For the detection and isolation of gas supply

Manufacturer & Reference: S&S Northern – Merlin 1000BH or equal and approved.

Accessories:

- BMS Connection
- External Sounder/Beacon
- 1Nº Natural Gas Detectors
- 1Nº CO Detector
- 1Nº Thermal Links
- EM Stop button fitted to panel.

320.010 INSTALLATION:

Comply with Building and Engineering Services Association (B&ES) TR 20/9 Natural Gas.

320.020 TESTING AND PURGING:

Comply with IGE/UP/1 Strength and tightness testing and direct purging of industrial and commercial gas installations.

Comply with IGE/UP/1A Strength and tightness testing and direct purging of small low pressure industrial and commercial Natural Gas installations.

Carry out pressure testing in accordance with BS EN 12327.

Upon completion of works provide Gas Safe approved certification to demonstrate that:

- All pipework has been tested.
- All appliances have been tested.

T32 LOW TEMPERATURE HOT WATER HEATING

100.000 SYSTEM DETAILS

To provide a full heating system to the building via a Low Temperature Hot Water (LTHW) system as generally indicated on the drawings. The system is a hybrid design consisting of Air Source Heat Pumps (ASHP) and interface to gas fire boiler plant and to be complete with

vessel, heat exchanger, headers, pumps and BMS / control panel etc.

Mechanical Services shall be provided in line with current applicable standards, Chartered Institution of Building Services Engineers (CIBSE) Guide Books and Building Regulations.

100.010 SYSTEM DESCRIPTION

1 No wall mounted gas fired high efficiency condensing boilers shall provide Low Temperature Hot Water (LTHW) heating water alongside 3 No external mounted Air Source Heat Pumps (ASHP), with space heating via 1 variable temperature circuit (VT) circuit serving radiators, trench heating etc and ventilation heating via 1 constant temperature circuit (CT) circuit including air and the radiators located with Assisted WC and kitchen.

The heating system shall be pressurised via wall mounted pressurisation unit and an expansion vessel.

The ASHP shall operate down to an external air temperature of between 2 to 4 degC, at lower external air temperatures the gas fired boiler shall act as the primary energy source.

The building is served via hybrid system consisting of a gas boiler (secondary side) and external ASHP arrangement (as the Primary side). The systems shall interface to a plate heat exchanger complete with low loss headers on both sides. The secondary side shall also include a buffer vessel to assist with load levelling. The secondary side low loss header also connects to the building CT and VT heating systems.

The ASHP system (primary side) shall be stand alone with interface to the BMS control panel, the secondary side shall be controlled from the Main control panel.

The heating system (primary and secondary side) shall be pressurised via wall mounted pressurisation unit and an expansion vessel, dosing pots etc.

The ventilation systems shall be stand alone with interface to the main BMS control panel.

100.020 DESIGN PARAMETERS:

ASHP Flow and Return Temperatures:

Nominally 55°C Flow

Nominally 45°C Return

Boilers Flow and Return Temperatures:

Nominally 80°C Flow

Nominally 60°C Return

Plant Sizing:

1 No boilers sized at 120% peak load (55 kW).

LTHW System Design:

See Sections A64 - 710.030 for OUTSIDE CONDITIONS and for A64 - 710.040 for INSIDE DESIGN CONDITIONS

100.0130 CONTROL REQUIREMENTS:

Refer to Section W69 CENTRAL CONTROL/BUILDING MANAGEMENT

100.040 SYSTEM DRAWINGS:

Refer to indicative drawings but the Contractor is to prepare installation drawings.

200.000 PLANT AND EQUIPMENT

200.001 STANDARDS:

200.002 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:

All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 2014/68/EU, implemented in the UK through the Pressure Equipment (Amendment) Regulations 2015 and The Pressure Equipment (Safety) Regulations 2016, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.

Only relevant equipment and assemblies certified as compliant shall be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

200.003 SAFETY OF WATER BASED HEATING SYSTEMS:

For water-based heating systems in buildings with a maximum operating temperature of up to 105°C, ensure safety arrangements in the system comply with Section 4.6 in BS EN 12828

Comply with Annexe E in BS EN 12828 for safety valves in heating systems in addition to the relevant product standards

200.040 BOILERS:

Type: 1 No Wall Mounted high efficiency condensing gas fired boiler complete with safety devices, pump set, none return valve, flue, and ancillary components to form a complete working system.

- Manufacturer/type – Remeha Quinta ACE 65 wall mounted (61.5 kW at 80/60 degC and 65 kW at 50/30 degC) boiler (or equal and approved) (to be confirmed prior to order).
- Electrical supply to BS 7697 – Single Phase (Manufacturer recommended fuse rating: 4.0 A)
- Provide boiler suitable for firing with natural gas.
- Casing: ensure casing allows easy access for maintenance.
- Boiler mountings - Fit boiler mountings in accordance with manufacturer's recommendations.
- Fit safety valves in accordance with BS 6759-1.

Electrical supply and control wiring for the boiler and ancillary components shall be run from the main mechanical control panel within the plantroom.

Installation:

- Comply with the manufacturer's installation instructions.
- Provide condensate drains and run to discharge into a local floor gulley.
- Provide a safety discharge and discharge to a safe location.
- If the safety discharge is to connect to the above ground drainage, then it is to be connected via a suitably rated Tundish (Hotun Dry Trap tundish or equal and approved).

The contractor shall employ the services of the manufacturer to fully test and commission the boiler and ASHP (including interface) and issue a formal commissioning certificate.

The system shall be commissioned to run at flow and return temperatures nominally ASHP 55°C & 45°C and the boiler 80°C & 60°C flow & return.

Note: Heat emitters are sized at the ASHP flow / return temperatures as this results in the largest heat emitter sizes (compared to the boiler flow and return temperatures).

Provide the necessary water treatment including inhibitor as recommended by the boiler / ASHP manufacturer, and record dosage and date of dosing in the Health and Safety file.

Ensure that the systems are thoroughly flushed out prior to treatment and / or use.

200.070 LOW LOSS HEADER AND BUFFER VESSEL:

Provide new low loss header to connect 3 N^o primary ASHP circuits and 1 N^o secondary ASHP circuit to plate heat exchanger as generally indicated on the drawings and schematics.

Provide new buffer vessel to interface to secondary side of heat exchanger and gas fired boiler plant as generally indicated on the drawings and schematics.

Provide new secondary side low loss header to connect 1 N^o buffer circuit and 2 N^o secondary heating circuits (1 for VT space heating and a CT for AHUs etc.) as generally indicated on the drawings and schematics.

Primary and secondary connections to the low loss header shall be complete with temperature and pressure gauges as generally indicated on the drawings.

200.075 PRESSURISATION PLANT

Type: 2 number Wall-mounted pressurisation units

Application: For the initial fill and re-pressurisation of LTHW (1 for boiler side (assume 600 litre capacity but to be confirmed prior to order) and 1 for ASHP system side (assume 400 litre capacity but to be confirmed prior to order) complete with suitable backflow prevention for commercial type systems.

Manufacturer: Mikrofill

Model: Mikrofill 3 or equal and approved

(to be confirmed prior to order).

200.076 PLATE HEAT EXCHANGER

Type: 1 number Floor-mounted Plate Heat Exchanger with AISI 316 stainless steel plates on skid base plate

Application: For the heat transfer between Primary ASHP and secondary side heating side.

To be sized on 60kW input (heating flow at 55 degC and 45 degC return from ASHP) and 60 kW output 55 degC and 45 degC.

NOTE: Primary side contains 25% glycol mix.

(Size to be confirmed prior to order).

Manufacturer: UK exchangers ltd or equal and approved

200.080 CIRCULATING PUMPS:

3 Number ASHP primary side PUMP(s) – P1, P2 & P3

Single Head Pump for ASHP Primary side Heating

(to be confirmed prior to order).

Material: Cast Iron

Manufacturer: Grundfos or equal and approved

Type: Magna 3 Range (40.1 l/min @ 20 kPa to 80 l/min @ 100 kPa) – Single Head Pump or equal and approved

Voltage: 240/1/50

Isolation Valves: Fit isolation valves on the suction and delivery sides of the pump set

Electrical supply and control wiring for the boiler and pump set shall be run from the main mechanical control panel within the plantroom.

1 Number ASHP secondary side PUMP to heat exchanger – P4A & P4B

Twin Head Pump for ASHP secondary side Heating

(to be confirmed prior to order).

Material: Cast Iron

Manufacturer: Grundfos or equal and approved

Type: Magna 3 Range (130 l/min @ 40 kPa to 250 l/min @ 100 kPa) – Twin Head Pump or equal and approved

Voltage: 240/1/50

Isolation Valves: Fit isolation valves on the suction and delivery sides of the pump set

Electrical supply and control wiring for the boiler and pump set shall be run from the main mechanical control panel within the plantroom.

1 Number heat exchanger to buffer vessel secondary side PUMP – P5A & P5B

Twin Head Pump for heat exchanger to buffer vessel side Heating

(to be confirmed prior to order).

Material: Cast Iron

Manufacturer: Grundfos or equal and approved

Type: Magna 3 Range (140 l/min @ 40 kPa to 270 l/min @ 100 kPa) – Twin Head Pump or equal and approved

Voltage: 240/1/50

Isolation Valves: Fit isolation valves on the suction and delivery sides of the pump set

Electrical supply and control wiring for the boiler and pump set shall be run from the main mechanical control panel within the plantroom.

1 Number Boiler side PUMP – P6A & P6B

Twin Head Pump for boiler side Heating

(to be confirmed prior to order).

Material: Cast Iron

Manufacturer: Grundfos or equal and approved

Type: Magna 3 Range (0.8 l/s @ 60 kPa) – Twin Head Pump or equal and approved

Voltage: 240/1/50

Isolation Valves: Fit isolation valves on the suction and delivery sides of the pump set

CT SYSTEM PUMP – P8A & P8B

Twin Head CT Pump for; Door Air Curtains and AHU 1 & 2 and 2 number radiators

Material: Cast Iron

Manufacturer: Grundfos or equal and approved

Type: Magna 3 Range (0.3 l/s @ 60 kPa) - Twin Head Pump or equal and approved

Voltage: 240/1/50

Isolation Valves: Fit isolation valves on the suction and delivery sides of the pump set

Electrical supply and control wiring for the boiler and pump set shall be run from the main mechanical control panel within the plantroom.

VT SYSTEM PUMP – P7A & P7B

Twin Head VT Pump for; Trench heaters, radiators etc.

Material: Cast Iron

Manufacturer: Grundfos or equal and approved

Type: Magna 3 Range (0.5 l/s @ 60 kPa) - Twin Head Pump or equal and approved

Voltage: 240/1/50

Isolation Valves: Fit isolation valves on the suction and delivery sides of the pump set

Electrical supply and control wiring for the boiler and pump set shall be run from the main mechanical control panel within the plantroom.

200.081 ALTITUDE GAUGES

100mm diameter dial altitude gauges with flanged back and gunmetal gauges cocks and handle shall be connected in copper to the main on each side of the pump sets.

The gauges shall be mounted side-by-side on appropriate varnished hardwood mounting board securely fixed to the wall.

CONTROLS

See Section W69 – Central Control/Building Management

ELECTRICAL SUPPLY AND CONTROL WIRING FOR THE BOILER AND PUMP SET SHALL BE RUN FROM THE MAIN MECHANICAL CONTROL PANEL WITHIN THE PLANTROOM.

200.120 AIR DIRT SEPARATOR:

Provide and fit an air/dirt separator as generally indicated on the drawings.

Type: Combined Deaerator and Dirt Separator

Manufacturer and model: Spirotech | SpiroCombi (or equal and approved) with 35 mm dia connections

Duty: Contractors Design

Material: Steel

200.130 DOSING POT:

Provide and fit a dosing pot (as generally indicated on the drawings (13 litres).

200.180 ELECTRICAL SUPPLY:

As Work Section V90 Electrical Installation.

300.000 HEAT EMITTERS

RADIATORS SCHEDULE							
ROOM	EMITTER NUMBER	MANUFACTURER	MODEL	DIMENSION	No OF ELEMENTS	ROOM HEAT LOSS @ te=+4°C	HEAT EMITTING @ 55°C/45°C AND ROOM ti=20°C
LOBBY (LGF)	R1	MHS	KOMPAKT PLAN	HxLxD 900x1200x160 TYPE 22	1	1,220 W	1,286 W
LEARNING ROOM	R2	JAGA	LINEA PLUS FREE STANDING	HxLxD 350x2200x230 TYPE 20	1	3,480 W	1,872 W
	R3	JAGA	LINEA PLUS FREE STANDING	HxLxD 350x2200x230 TYPE 20	1		1,872 W
JUNIOR LIBRARY	R4A	MHS	AMBIGUARD STYLE T WITH FINNED ELEMENT EMITTER FLOOR MOUNTED & CASING WITH SOLID TOP AND BOTTOM/FRONT FACING INLET GRILLES	HxLxD 815x2000x161 TYPE E22	1	5,380 W	1,298 W
	R4B	MHS	AMBIGUARD STYLE T WITH FINNED ELEMENT EMITTER FLOOR MOUNTED & CASING WITH SOLID TOP AND BOTTOM/FRONT FACING INLET GRILLES	HxLxD 815x2000x161 TYPE E22	1		1,298 W
	R5A	MHS	AMBIGUARD STYLE T WITH FINNED ELEMENT EMITTER FLOOR MOUNTED & CASING WITH SOLID TOP AND BOTTOM/FRONT FACING INLET GRILLES	HxLxD 815x2400x161 TYPE E22	1		1,604 W

	R5B	MHS	AMBIGUARD STYLE T WITH FINNED ELEMENT EMITTER FLOOR MOUNTED & CASING WITH SOLID TOP AND BOTTOM/FRONT FACING INLET GRILLES	HxLxD 815x2400x161 TYPE E22	1		1,604 W
STAFF ROOM	R6	MHS	KOMPAKT PLAN	HxLxD 700x1200x160 TYPE 22	1	1,910 W	1,030 W
	R7	MHS	KOMPAKT PLAN	HxLxD 700x1200x160 TYPE 22	1		1,030 W
WC	R8	MHS	AMBIGUARD STYLE D WITH FINNED ELEMENT EMITTER FLOOR MOUNTED & CASING WITH SOLID TOP AND BOTTOM/FRONT FACING INLET GRILLES	HxLxD 2400x1200x260 TYPE E22	1	1,450 W	1,464 W
KITCHEN	R9	MHS	KOMPAKT VERTICAL PLAN	HxLxD 2000x700x140 TYPE 22	1	1,276 W	1,320 W
MAIN LIBRARY	TH1	JAGA	MINI CANAL DBE (DYNAMIC BOOST EFFECT)	HxLxD 140x2300x260 (Speed 1)	1	11,973 W	1,165 W
	TH2	JAGA	MINI CANAL DBE (DYNAMIC BOOST EFFECT)	HxLxD 140x1900x260 (Speed 1)	1		1,031 W
	TH3	JAGA	MINI CANAL DBE (DYNAMIC BOOST EFFECT)	HxLxD 140x2500x260 (Speed 1)	1		1,301 W
	TH4	JAGA	MINI CANAL DBE (DYNAMIC BOOST EFFECT)	HxLxD 140x2500x260 (Speed 1)	1		1,301 W
	TH5	JAGA	MINI CANAL DBE (DYNAMIC BOOST EFFECT)	HxLxD 140x2500x260 (Speed 1)	1		1,301 W
	TH6	JAGA	MINI CANAL DBE (DYNAMIC BOOST EFFECT)	HxLxD 140x2500x260 (Speed 1)	1		1,301 W
	TH7	JAGA	MINI CANAL DBE (DYNAMIC BOOST EFFECT)	HxLxD 140x2300x260 (Speed 1)	1		1,165 W
	TH8	JAGA	MINI CANAL DBE (DYNAMIC BOOST EFFECT)	HxLxD 140x2300x260 (Speed 1)	1		1,165 W
	TH9	JAGA	MINI CANAL DBE (DYNAMIC BOOST EFFECT)	HxLxD 140x2500x260 (Speed 1)	1		1,301 W

	TH10	JAGA	MINI CANAL DBE (DYNAMIC BOOST EFFECT)	HxLxD 140x2500x260 (Speed 1)	1		1,301 W
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Note Dummy trench heater covers to be provided as indicated on drawings.

Provide heating to the buildings to maintain the room temperatures as detailed in Section A64.

300.025 AIR CURTAINS:

Type - RAL 9010 (pure white) Steel and ABS construction with LPHW (CT heating) with low & high heat selection

Application - Above entrance

Manufacturer and reference – SR S-150-H3 surface mounted range by Biddle (or approved equivalent)

Finish - Stove enamelled, colour manufacturers standard white stove enamelled finish.

Accessories: - Wall brackets

- Provide Electronic controller (I-Sense complete with CHIPS) control over fan speed, heat level and door sensor complete with 7 day time controller all in line with manufacturers recommendations.

500.000 PIPELINE AND ANCILLARIES - MATERIALS

500.015 PIPES - COPPER TO BS EN 1057:

Application – Heating Distribution

Kitemark certified

Material: Copper to BS EN 1057.

R220 annealed.

R250 half hard.

Finish - uncoated.

500.020 COPPER FITTINGS, CAPILLARY FOR COPPER TUBES:

Application - Heating as described above

Kitemark certified

Material

Copper (dezincifiable resistant).

Standard

BS EN 1254-1.

Ends

Socket - pre-soldered.

Plain.

Finish - natural, cast.

Jointing materials - capillary joints

Solder BS EN ISO 9453.

Flux - copper pipe - classification, labelling and packaging to BS EN ISO 9454-1 and performance requirements to BS EN ISO 9454-2

500.030 COPPER FITTINGS, COMPRESSION FOR COPPER FITTINGS:

Application Heating (final connections only)

Kitemark certified

Material

Copper (non-dezincifiable).

Standard

BS EN 1254-2.

Type

Type A - non-manipulative.

Type B - manipulative.

Ends - Socket.

Finish - cast.

500.040 PIPES - STEEL TO BS 1387 - SCREWED:

Application – Heating Distribution

All pipelines up to and including 50mm nominal diameter.

Pipes to BS 1387 grade

Heavy.

Finish - Varnished.

Fittings

Malleable cast iron to BS 143 and 1256 or BS EN 10242.

Finish - Black.

Jointing: Threaded to BS 21

Use hemp and jointing compound to BS 6956-5 or BS EN 751-2.

Use union connections with spherical seating

bronze to bronze, navy pattern.

500.050 PIPES - CARBON STEEL - WELDED AND FLANGED:

Application All pipelines from 65mm nominal diameter up to and including 200mm.

Pipes to BS EN 10255

- Medium series.
- Heavy series.
- Finish - varnished.
- Size - nominal diameter (DN) 65mm to 150mm.

Pipes to BS EN 10217-1

- Grade - P235TR1.
- Size - nominal diameter (DN) 200mm and above.

- Size - nominal diameter (DN)
- Wall thicknesses - to be suitable for the application duty / testing requirements.

Fittings

- Carbon steel, butt welded to BS EN 10253-1, for general use without specific inspection requirements, grade as pipes.
- Carbon steel butt welded to BS EN 10253-2 with specific inspection requirements for use on applications covered by the Pressure Equipment Regulations, grade as pipes.
- Finish - Varnished.

Jointing: Welded and flanged.

Welding to class 2.

Use welding rods

Gas welding, BS EN 12536.

Class I electric arc welding BS 2633.

Class II electric arc welding BS 2971.

Flanges

- Provide flat faced hubbed slip-on flanges for welding with PN to suit system working pressure.
- Material
- BS EN 1092-1, ferritic steel

Bolting

- In accordance with BS EN 1092-1.
- Jointing rings, use
- Corrugated copper nickel alloy to BS 6956-1.
- Non-metallic flat gaskets to BS EN 1514-1.

500.060 STOP VALVES – SCREWED ENDS:

Manufacturer and reference - Pegler 1070 or Crane D151 or approved equivalent

To BS 5154 series B, straight pattern.

Materials - Manufacturer's standard.

Ends - Threaded to BS 21.

500.070 STOP VALVES - FLANGED ENDS:

Manufacturer and reference - Pegler or Crane

- Or approved equivalent

To BS EN 1171 materials - Manufacturer's standard.

Ends flanged to BS EN 1092-2, PN to suit working pressure.

500.090 DOUBLE REGULATING VALVES - GLOBE TYPE TO BS 7350:

Manufacturer and reference - Pegler Crane D931, DR 933 Or approved equivalent

To BS EN 12288 and BS 5154 series B, oblique or Y pattern.

Materials - Manufacturer's standard.

Ends

- Threaded to relevant parts of BS EN 10226.
- Compression fittings to BS EN 1254-2.
- Flanged to BS EN 1092-3, PN to suit working pressure.

Commissioning stations are to be complete with integral orifice plate

500.100 RADIATOR VALVES:

Fit thermostatic radiator valves on the flow connections. Fit lockshield valves on return connections.

Type - Angle or straight pattern radiator valve on the flow connection shall be provided to match the existing installation.

Application – For independent room temperature control

Ends

Female, threaded to BS 21 and BS EN 10226-1.

Compression joints to BS EN 1254-2.

Valves to be as the standard units supplied by manufacturer.

500.110 CHECK VALVES - SWING CHECK TYPE TO BS 5154:

Manufacturer - Pegler or Crane

Or approved equivalent.

Standard

- Copper alloy to BS 5154
- Steel and cast iron to BS EN 16767
- Series B, straight pattern.
- Materials - manufacturer's standard to suit fluid and operating conditions.

Ends

- Threaded to relevant parts of BS EN 10226.
- Flanged to relevant parts of BS EN 1092.

500.115 DIRECT ACTING SAFETY VALVES TO BS EN ISO 4126-1:

Manufacturer and reference: Pegler or Crane

Or approved equivalent

Material

Cast iron body.

Cast steel body.

Bronze or DZR copper alloy body.

Ends

Flanged to BS EN 1092-1 PN

Flanged to BS EN 1092-2 PN
 Flanged to BS EN 1092-3 PN
 Flanged to BS EN 1092-4 PN
 Threaded to relevant parts of BS EN 10226.

Spring Type

Single spring loaded high lift type.
 Double spring loaded high lift type.

Protection from unauthorised adjustment

Fit a ferrule under adjusting screw.
 Fit compression ring under adjusting screw.
 Lock adjusting screw.

500.120 DRAIN COCKS:

Application

All low points, in accordance with Water Regulations and BS 6700

Manufacturer and reference

Pegler or Crane

Or approved equivalent

Throughway gland cock type incorporating

Bronze or DZR copper alloy body threaded male to BS 21 and BS EN 10226-1. Tapered plug with square shank for loose lever. Bolted gland. Chain and blank cap screwed on hand tight. Outlet to accept loose hose union. Hose union.

Screw down cock type to BS 2879 Type 1, incorporating

Bronze or DZR copper alloy body threaded male to BS 21 and BS EN 10226-1. Screw down plug with square shank for loose lever. Serrated outlet to accept hose pipe, fixed or union pattern.

500.135 TEMPERATURE GAUGES:

Use temperature gauges with pocket, and gland attachment on thermometer stem.

Type

Vapour pressure to BS 5235, mounted direct in pocket with horizontal or vertical stem as appropriate.

Use separable type pockets, threaded 15/19mm BSP and manufactured from stainless steel.

Screw pockets into tapped bosses or stools set in pipelines or vessels. Fill pockets with oil to BS 7207 to ensure contact with thermometer bulb.

Provide gauges with dial graduation in degrees Celsius marked on a logarithmic scale. Ensure pointer movement is clockwise for increase in temperature.

500.136 PRESSURE AND ALTITUDE GAUGES:

Use vapour pressure type gauges to BS EN 837-1. Connect to pipeline systems via matched gauge cocks and cock connectors.

Ensure dial graduation is from zero to between 1.5 and 3.0 times normal working pressure. Graduate in bar (gauge) on gauges reading head or working pressure, or in Pascals where pressure differences across plant

items are to be established. Where fitted on boilers and pressure vessels, clearly mark with operating and maximum permissible working heads in accordance BS 759-1. Elsewhere provide gauges with normal working pressure. Ensure dial movement is clockwise for an increasing in head.

Provide flexible piping where gauge is subject to noticeable vibration.

Fit gauge cocks preceding all connections to altitude and pressure gauges. Copper alloy, tapered ground plug, with ebonite lever. Unless flanged joints are required, screw inlet ends female and Fit-outlet ends with union connections allowing removal of gauges.

500.140 WALL, FLOOR AND CEILING MASKING PLATES:

Application - Fit on all exposed visible pipework passing through walls, floors, partitions, boxed enclosures and ceilings

Manufacturer - Talon

Material – White Plastic

500.150 VALVE LABELS:

Supply and fit engraved plastic labels to all valves (except isolating and regulating valves on heat emitters). Engrave with a description of its function or reference number with associated reference schedule

500.160 PIPEWORK IDENTIFICATION:

Colour code and label to BS 1710.

Apply 300mm wide colour bands to each pipe at intervals of 15 metres maximum.

Apply 50mm wide colour bands and superimpose a legend identifying circuit and direction of flow.

Apply legends to colour bands by transfers of an approved type.

600.000 PIPELINE WORKMANSHIP

600.010 APPEARANCE:

Arrange all exposed pipe runs to present neat appearance, parallel with other pipe or service runs and building structure, subject to gradients for draining or venting.

Ensure all vertical pipes are plumb or follow building line.

600.020 ISOLATION AND REGULATION:

Provide valves, cocks and stop taps for isolation and/or regulation

- where shown on drawings.
- at points of pipe connection of all items of apparatus and equipment except where the item could conveniently be isolated or regulated by valves provided for other adjacent items.

600.030 SPACING:

Space pipe runs in relation to one another, other services runs and building structure, allow for thermal insulation and ensure adequate space for access to pipe joints, etc.

Minimum clearances to pipe or pipe insulation:

From	Minimum Clearance (mm)
Wall	25

Ceiling	50
Floor	150
Other pipes	25
Electrical cables, conduit, switchgear, etc	150

600.040 GRADIENTS:

Install pipework with gradients to allow drainage and air release.

Provide a means of venting the pipe system at all high points.

Grade pipework to allow system to be drained. Provide a means of draining the system at all low points.

600.040 GRADIENTS:

Install pipework with gradients to allow drainage and air release.

Provide a means of venting the pipe system at all high points.

Grade pipework to allow system to be drained. Provide a means of draining the system at all low points.

600.050 EXPANSION AND CONTRACTION:

Arrange supports and fixings to accommodate pipe movement caused by the thermal changes. Isolate pipes from structure to prevent noise or abrasion due to thermal movement.

600.060 BENDS, SPRINGS, AND OFFSETS:

Machine bend and ensure that machine guides and formers are smooth and clean, free from any scores, or other damage. Deformed bends shall not be accepted.

600.070 PIPES THROUGH WALLS AND FLOORS:

Enclose pipes passing through building elements, (walls, floors, partitions, etc.) concentrically within purpose made sleeves.

Each service penetration of laboratory walls and floors shall be fully sealed to ensure the individual room air leakage test detailed in the Main Contract Documentation is satisfied.

600.080 PIPE SLEEVES:

Cut sleeves from material same as pipe one or two sizes larger than pipe. Do not use sleeves as pipe supports. Install sleeves flush with building finish.

Each service penetration of laboratory walls and floors shall be fully sealed to ensure the individual room air leakage test detailed in the Main Contract Documentation is satisfied.

600.090 TEMPORARY PLUGS AND CAPS:

Seal all open ends as installation proceeds by metal, plastic or wooden plugs or caps, to prevent ingress of foreign matter.

600.100 CAPILLARY JOINTS, COPPER PIPES:

Preparation

Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size. Clean plain ends with fine steel wool.

Making and sealing

Use specified flux ensuring no excess material used. Make joint in accordance with manufacturer's instructions. Clean off traces of flux when joint is completed. Protect building fabric from heat when forming joints.

a) Polyethylene sheathed pipe

Follow manufacturer's recommendations to avoid damage to plastic coating. Make good with PVC tape of matching colour.

600.110 COMPRESSION JOINTS, COPPER PIPES:

Preparation

Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size. Clean plain ends with fine steel wool or fine sandpaper. Then if using

- a) Type 'A' fitting - no further preparation.
- b) Type 'B' fitting - in accordance with fitting manufacturer's instructions.

Making and Sealing

In accordance with fitting manufacturer's instructions.

600.120 SCREWED JOINTS - STEEL PIPES:

Preparation

Ensure that plain ends of pipe are cut square, reamer out bore and cut taper thread.

Making and Sealing

Coat male pipe threads with jointing compound and hemp, or PTFE tape on small sizes. Immediately after applying coating, connect with female end of socket or fitting, and tighten ensuring that coating does not intrude into pipe. Leave joint clean.

600.130 WELDED JOINTS - STEEL PIPES:

Use skilled craftsman in possession of a current Certificate of Competence appropriate to type and class of work, issued by an approved authority.

Mark each weld to identify operative. Submit specimen welds, representative of joints and conditions of site welding for each craftsman.

Welded Joints Class 2 - Weld pipeline joints to BS 2640 and BS 2971 and to HVCA Code of Practice TR/5, Welding of Carbon Steel Pipework, as appropriate.

Preparation, making and sealing.

Oxy-acetylene welding, conforming to BS 1821 or BS 2640 appropriate to system temperature and pressure.

Arc welding, conforming to BS 2633 or BS 2971 appropriate to system temperature and pressure. Use arc welding process on piping greater than 100mm.

Unless pipework is being prepared for galvanizing after manufacture, wire brush and paint all welds with red oxide paint when welds are complete.

600.140 FLANGED JOINTS - STEEL PIPES:

Use number and diameters of bolts to standard specified. Fit bolts of length to give not less than one thread, or more than 3mm protrusion beyond nut when joint is pulled up. Fit washers under each nut.

Weld neck and bore of "slip on" flange.

- Preparation
- Ensure that flange mating faces are parallel; flange peripheries are flush with each other; and bolt holes are correctly aligned.
- Making and sealing
- Insert jointing between flange mating faces. Pull up joint equally all round.

600.150 PIPE RINGS AND CLIPS:

Select type according to the application and material compatibility.

NOTE: Plastic pipe supports/clips will not be permitted.

600.160 PIPE SUPPORTS:

Arrange supports and accessories for equipment, appliances or ancillary fittings in pipe runs, so that no undue strain is imposed upon pipes.

Ensure that materials used for supports are compatible with pipeline materials.

- Support spacing

Comply with tables in appropriate parts of BESA (formerly HVCA) TR/20 Installation and Testing of Pipework Systems.

- Comply with the manufacturers' installation recommendations for proprietary pipe systems.

600.170 PIPE SUPPORT SPACING - COPPER PIPES:

PIPE BORE (mm)	MAXIMUM SUPPORT SPACING (mm)	
	Horizontal	Vertical
Nominal		
15	1200	1800
22	1400	2100
28	1800	2400
35	2400	3000
42	2400	3000
54	2700	3000

600.180 PIPE SUPPORT SPACING - STEEL PIPES:

PIPE BORE (mm)	MAXIMUM SUPPORT SPACING (mm)	
	Horizontal	Vertical
Nominal		
15	1800	2400
20	2400	3000
25	2400	3000
32	2700	3000
40	3000	3600
50	3000	4600
65	3700	4600

600.190 MAINTENANCE AND RENEWAL:

Arrange pipework, valves, drains, air vents etc., for convenient routine maintenance and renewals.

600.210 CLEANING:

Remove cement and clean off all pipework and brackets.

600.230 SYSTEM FLUSHING AND CHEMICAL CLEANING:

Carry out flushing of water systems in accordance with BSRIA Guide BG 29/2012 - Pre-commission Cleaning of Pipework Systems.

- System filling
- Temporary connection from mains in compliance with
- England and Wales - The Water Supply (Water Fittings) Regulations 1999 as amended, the Water Act 2014 and the Construction Products Regulations 2013.
- By installation of temporary tank and pump arrangement.
- Carry out chemical cleaning procedure in accordance with BSRIA Guide BG 29/2012 - Pre-commission Cleaning of Pipework Systems.

700.000 THERMAL INSULATION

700.010 THERMAL INSULATION TO PIPELINES:

Application - All pipework except where exposed to view in occupied areas.

Use aluminium foil faced mineral fibre pipe insulation, to BS 3958-4, with nominal density 80 kg/m³ to 120 kg/m³. Thermal conductivity not exceeding 0.038 W/mK at a mean temperature of 50°C.

Finish aluminium foil faced

Plantroom and External services to be covered in a laminar foil/film protection such as Venture Clad (tel 01327 876555), Product code 1579 CW – "Natural Aluminium" or equal and approved. Final type to be agreed before order.

Protection

Ensure that where protection is applied to insulation, the joints fall blind side and that all joints are made to shed water and sealed with waterproof tape, adhesive or joint sealant where appropriate.

• Standards and regulations

- Comply in general with BS 5422, BS 5970, BS EN ISO 12241 and either BS EN 14303, BS EN 14304 or BS EN 14314 product standards. Use the description of terms as BS 3533. All insulation products must have a Declaration of Performance (DoP) certificate and be CE marked in accordance with the Construction Products Regulations (CPR).
- Supply insulating materials classified in accordance with BS EN 13501-1 Fire Classification of Construction Materials. Classes acceptable are A1/A1L, A2/A2L or B/BL having smoke emission classification of s1 and production of flaming droplets/particles classification of d0.
- Test methods BS EN ISO 1182, BS EN ISO 1716, BS EN ISO 11925-2 or BS EN 13823 as appropriate

• Thermal conductivity

- All thermal conductivity figures are typical values at the mean temperature stated, as declared in manufacturer's Declaration of Performance (DoP) certificates in accordance with CPR.
- Use mineral wool pipe insulation to BS EN 14303 nominal density of 120 kg/m³ and thermal conductivity typical value of 0.033 to 0.034 W/mK at a mean temperature of 10°C.
 - Finish
 - Reinforced aluminium foil with at least 25mm overlap.

• Protection

- Ensure that where protection is applied to insulation, the joints fall blind side and that all joints are made to shed water and sealed with waterproof tape, adhesive or joint sealant where appropriate.

700.030 THERMAL INSULATION WORKMANSHIP:

Do not apply thermal insulation until installation has been fully tested and all joints proved sound.

Ensure that all materials are kept dry.

Insulate each unit separately. Ensure clearance between insulated pipes.

Apply insulants, facings, coatings and protection strictly in accordance with manufacturer's instructions.

Neatly finish joints, corners, edges and overlaps, where possible arrange overlaps to fall on blind side.

Ensure overlaps are neat and even and parallel to circumferential and longitudinal joints.

Arrange insulation of feed and expansion cistern to allow removal of access covers.

In locations where insulation cannot be installed adequately after pipeline or ductline installation, pre-insulated sections shall be installed. Insulation to such sections shall be equivalent in thermal and physical properties to that specified for the remainder of the system including vapour barriers.

700.040 INSTALLATION OF INSULATION ON PIPEWORK:

Ensure joints are close butted together. Secure overlaps with adhesive or matching class "O" tape, a minimum of 50mm wide, on both longitudinal and circumferential butt joints. Insulate fittings to same standard as adjacent pipework and use mitred segments where necessary, taped as above.

Before phenolic foam sectional insulation is applied, ensure that all pipework is clean, dry and free of any debris or corrosive substances such as excess soldering flux, building materials.

Installation shall be by a contractor approved by the manufacturers strictly in accordance with the manufacturer's installation instructions.

All exposed edges of phenolic foam insulation shall be sealed to the surface being insulated with a suitable vapour sealing mastic.

Where fibre containment is required tape exposed insulation membrane and return to pipe surface.

Insulation with canvas finish

Apply two coats of class "O" polymer solution

700.045 CALCULATION OF INSULATION THICKNESS - BUILDING REGULATIONS (ENGLAND AND WALES):

Provide insulation of thickness conforming with the values given in the tables below. These figures are derived from the requirements of the Building Regulations (England and Wales) Part L Approved Documents, and the calculation methods given in BS EN ISO 12241.

700.046 NON-DOMESTIC HEATING INSTALLATIONS, ECA ENHANCED:

The insulation manufacturer selected for a particular project should calculate the minimum required thicknesses of pipework insulation based on the actual conductivity of the product at the relevant temperature and the criteria on the ECA web site for an eligible installation using the methodology set out in BS EN ISO 12241 and the assumptions set out in Table C1 of BS 5422. The table below defines the maximum permissible heat losses to be used in the calculations.

Non-Domestic Heating Installations Maximum Permitted Heat Loss (W/m)	
Temperature	< 95°C
Outside Pipe Diameter (mm)	
17.2	7.78
21.3	8.42
26.9	9.05
33.7	9.86
42.4	10.83
48.3	11.42
60.3	12.61

700 INSULATION THICKNESS TABLES:

Unless stated otherwise the thicknesses given in the tables in this specification are the nearest commercially available material thickness to meet the minimum calculated thickness to BS EN ISO 12241 and the product declared performance data for CE marking. Thicknesses have been calculated by manufacturers for each product and use thermal conductivity values calculated from the mean insulation temperature based on the fluid and air temperatures listed in the relevant tables.

Should alternative products be offered that may have different performance data the Contractor shall ensure the manufacturer undertakes calculations and submits appropriate thickness tables.

700.055 NON-DOMESTIC HEATING INSTALLATIONS, BUILDING REGULATIONS - ROCK MINERAL WOOL:

Insulation thickness to achieve the maximum permissible heat loss stated in the Building Regulations Part L Non Domestic Building Services Compliance Guide, Northern Ireland Technical Booklet F2, and section 6 of the Scottish Non Domestic Technical Handbook.

Outside diameter of steel pipe (mm)	Thickness of rock mineral wool insulation (mm)					
	Temperature of contents °C		≤95		96-120	
Surface emissivity	0.05	0.9	0.05	0.9	0.05	0.9
17	25	30	25	30	25	30
21	30	35	30	35	30	35
27	35	40	40	45	40	45
34	35	40	45	55	55	55
42	35	40	55	60	65	70
48	40	45	55	60	70	75
60	40	45	60	65	75	80

Basis of calculation: Horizontal pipe at 75°C (LTHW), in still air at 15°C, Thermal conductivity calculated from the mean insulation temperature based on the fluid and air temperatures.

Use this table for insulation thickness of copper or plastic pipework of the nearest equivalent outside diameter.

700.075 CENTRAL HEATING SYSTEMS, BUILDING REGULATIONS - MINERAL WOOL:

Environmental insulation thickness for central heating installations in potentially unheated areas to control heat loss, in accordance with the requirements of the Building Regulations (England and Wales) Part L Approved Documents.

Outside diameter of copper pipe (mm)	Thickness of mineral wool insulation for water at 60°C for central heating in still air at 15°C
10	20
12	20
15	20
22	20
28	20
35	20
42	20
54	25

800.000 COMMISSIONING AND TESTING

800.010 PRESSURE TESTING:

Advise appropriate personnel, at least 3 days in advance, of the time that pressure tests may be witnessed.

Test concealed or buried pipework before any permanent covering is applied.

Complete pressure testing before applying thermal insulation.

Isolate or remove pump and thoroughly flush out the whole system.

Replace pump, fill system, vent all air from system and check for leaks, repair any leaks and re-check.

Pressure test the system for a period of one hour and check for and repair any leaks. Repeat pressure test if leaks have been found.

Pressure test to twice the working pressure.

800.020 COMMISSIONING:

Carry out commissioning of installations in accordance with the procedures, checks and tolerances given in the CIBSE Commissioning Codes and BSRIA Application Guides.-

U19 VENTILATION

100.000 SYSTEM DETAILS

100.010 SYSTEM DESCRIPTION

Air Handling Units (AHU) with Heat recovery units shall be provided as generally indicated on the drawings.

100.020 DESIGN PARAMETERS

Refer to Section A64 Clause 710.020 for details.

FIRE DAMPERS

Fire damper's (FD) are to be installed where ductwork passes through fire rated walls/compartmentation.

100.030 CONTROL REQUIREMENTS:

Refer to Controls Section W69

100.040 SYSTEM DRAWINGS:

Refer to indicative drawings but the Contractor is to prepare installation drawings.

200.000 PLANT AND EQUIPMENT

200.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:

All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through the Pressure Equipment Regulations 1999, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.

Only relevant equipment and assemblies certified as compliant shall be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

200.006 ELECTRIC MOTORS:

Comply with EC Regulation 640/2009 and amendment EU Regulation 4/2014 with regard to ecodesign requirements for electric motors.

Comply with BS EN 60034-30-1 and BS EN 50347 as applicable to 3-phase cage-induction motors.
Minimum efficiency to be IE2 and be equipped with a variable speed drive.
Minimum efficiency to be IE3

200.007 EXTERNAL WEATHER LOUVRE (AHU 02 - INTAKE)

Application: Fresh air Supply for outdoor air intakes to air handling unit.

Type: Weather louvre with angled fixed blades 38mm

Size: To be site measured before order.

Manufacturer: Gilberts type WG or approved equivalent

Accessories: All louvres to be provided with bird screen and insect mesh

Finish: Louvres to be polyester colour coated to an agreed RAL colour (Colour to be agreed with architect/client)

Fixing: Louvres to be equipped with flanged border for screw fixing to a supporting frame.

Location: Ensure that the outdoor supply air louvre(s) is sufficiently separated from the exhaust air to avoid

cross contamination.

200.008 EXTERNAL WEATHER LOUVRE (AHU 02 - DISCHARGE)

Application: Discharge of contaminated air to atmosphere from air handling unit.

Type: Acoustic Weather louvre with angled fixed blades 75mm (Double banked 304mm deep)

Size: To be site measured before order.

Manufacturer: Gilberts type ALD/60 or approved equivalent

Accessories: All louvres to be provided with bird screen and insect mesh

Finish: Louvres to be polyester colour coated to an agreed RAL colour (Colour to be agreed with architect/client)

Fixing: Louvres to be equipped with flanged border for screw fixing to a supporting frame.

Location: Ensure that the outdoor supply air louvre(s) is sufficiently separated from the exhaust air to avoid cross contamination.

200.009 EXTERNAL WEATHER "COWL" (AHU 01)

Application: Fresh Air Supply and Discharge of contaminated air to atmosphere and for outdoor air intakes to air handling unit.

Type: Existing Roof outlet Vent to be adjusted as part of the building works to allow fresh air intake and exhaust air discharge, the fresh air and discharge duct shall connect to a purpose built plenum chamber complete with splitter to separate the air streams.

Manufacturer: N/A

Accessories: Plenum and opening to be provided with bird screen

Fixing: Plenum to be equipped with flanged border for screw fixing to a supporting frame.

NOTE: Final configuration, colour and locations of the external louvres and cowl shall be confirmed with the Architect and the Client before ordering.

200.010 HEAT RECOVERY UNIT:

Type: New heat recovery units to serve classrooms

Application: Supply and extract ventilation incorporating a heat exchanger

Duty: AHU 01,

Manufacturer: Systemair TOPVEX FR03, or equal and approved

Supply 0.3 m³/s and 150 Pa (external)

Extract 0.3 m³/s and 150 Pa (external)

"Piggy backed" / vertical arrangement

Complete with:

- Insulated double skin casing (50mm)
- Rotary wheel heat recovery c/w by-pass damper and condensate drainage
- Fresh intake filter (grade F7)
- Extract return filter (grade M5)
- EC Supply & Extract fans with speed control, linked to averaging air quality sensors
- LPHW heating coil (sized for 55 / 45 DegC F&R at +2 external temperature) to raised air from 10 degC to 25 degC.
- Max face velocity 1.6 m/s
- Integral controls linked to main control panel via Modbus.
- Manufacturers provided attenuators (900mm long, 450mm by 450mm, 315mm Dia connections)
- Location: Within roof void as generally indicated on the drawings

Duty: AHU 02,

Manufacturer: Systemair VSC 1500 Compact AHU, or equal and approved

Supply 0.23 m³/s and 120 Pa (external)
Extract 0.23 m³/s and 120 Pa (external)

Horizontal arrangement

Complete with:

- Insulated double skin casing (30mm)
- Plate heat recovery c/w by-pass damper and condensate drainage
- Fresh intake filter (grade F7)
- Extract return filter (grade M5)
- EC Supply & Extract fans with speed control, linked to averaging air quality sensors
- LPHW heating coil (sized for 55 / 45 DegC F&R at +2 external temperature) to raised air from 10 degC to 25 degC.
- Max face velocity 1.6 m/s
- Integral controls linked to main control panel via Modbus / BacNet.
- Manufacturers provided attenuators (900mm long, 300mm by 400mm with 225mm by 325mm connections)
- Location: Within plantroom at high level as generally indicated on the drawings

The equipment shall be complete Heat recovery Unit (HRU). The system(s) shall utilize a total heat exchanger with fresh air and heat recovery ventilation.

Each unit shall have 2 fans running simultaneously supplying and extracting air at the same rate.

The unit shall be capable of unbalanced airflow to suit the project requirements such as external static pressures etc.

The temperature recovery efficiency shall be a minimum of 73% at winter conditions to comply with ERP Regulations. The element shall have filters at both the supply and exhaust sides with an access cover to allow easy maintenance.

Outdoor and return air thermistors shall control the damper whilst interlocked with a remote controller.

Control

The control shall be interlocked with the indoor units via a control cable. The following functionality shall be possible:

- On/Off
- Fan Speed
- Bypass operation
- Time-clock
- CO₂ sensing control to vary the rate of air flow to suit the room occupancy requirements.

200.080 GRILLES AND DIFFUSERS:

Type - Provide all grilles as necessary to form a complete installation as indicated on the drawings and schedules.

Application – Internal Supply and Extract air

Manufacturer and reference – Gilberts Blackpool, or equal and approved

Provide plenum boxes to all supply and extract grilles.

Provide all transformations from duct size to spigot size of grilles, louvres, air valves and plenum boxes.

200.082 FIRE DAMPERS

- Supply and install fire dampers in accordance with BESA DW/144, Part 7; DW/145 and BS EN 15650.
- Location: to be located in fire compartment walls / floors.
- Application: To maintain the fire rating integrity of the fire compartment
- Type: fire damper via thermal switch (72 degC) - Rectangular or circular to match adjacent ductwork
- fire dampers to be complete with an installation frame to match wall / floor construction.
- Manufacturer: Actionair or similar equal and approved
- Installation: Install strictly in accordance with manufacturers recommendations.
- Minimum Size: The minimum size of fire damper to be installed shall be a minimum of 100 x 100mm or 100mm diameter (as internal access to smaller dampers is too restrictive).
- Accessories:
 - Damper Test switch,
 - Access door

200.090 PLANT AND EQUIPMENT WORKMANSHIP:

Install all plant and equipment in accordance with manufacturer's instructions.

200.100 ELECTRICAL SUPPLY:

Electrical installation - Refer to Section V90

Requirements - As Work Section V90 Electrical installation.

Carry out electrical installation in accordance with BS 7671.

Provide a local means of isolation adjacent each item of plant / equipment.

300.000 DUCTLINES AND ANCILLARIES

300.010 DUCTWORK FABRICATION:

Prepare fabrication drawings and carry out fabrication of ductwork in accordance with DW/144 and DW/154 as appropriate

300.020 DUCTWORK DIMENSIONS:

Sizes of ductwork are internal dimensions. Where applicable make allowance for any internal lining.

300.030 INSTALLER SELECTION:

Use a member of the BESA specialising in the trade of manufacturing and installing ductwork.

Appoint a specialist ductwork cleaning contractor to undertake the work in accordance with BESA TR/19 to ensure the internal ductwork cleanliness quality satisfies Table 1 (A.1) and Table 2 (A.4) for Medium systems and supply and install any additional cleaning openings to suit their selected specific methods of cleaning and to suit the practical site conditions relative to the fabric of the building and position of other services.

300.040 DUCTWORK AND FITTINGS:

Application Supply and extract ventilation utilizing low velocity spirally wound rigid ductwork, rectangular ductwork and fittings

Supply ductwork in accordance with classification in DW/144 Table 1.

Ductwork classification and air leakage limits.

- Low pressure - Class A - positive.
- Low pressure - Class A - negative.

System cleanliness quality class to BS EN 15780 / BESA TR/19

- Low.

Protection Delivery and Installation (PDI) level to BS EN 15780 and BESA (formerly HVCA) TR/19

- Basic.

Ductwork air leakage testing

- For compliance with Building Regulations.

Testing plant items as DW/144.

- Cleaning access
- Medium level of PDI - provide access for cleaning in accordance with BESA documents DW/144 and TR/19.

Testing plant items, DW/144.

- Plant connections
- Make connection between air handling assembly and ductwork system in accordance with DW/144.
- Flanged connections
- Provide bolted flanged joints for connecting ductwork to flanged items of plant, builder's work frames and where removable sections of ductwork are required.

300.050 DUCTWORK TO DW 144:

Material, DW/144

Zinc-coated steel. Hot-dip galvanised steel to BS EN 10346.

Protective finishes - DW/144

Galvanizing after manufacture.

Construction

Rectangular ductwork - DW/144.

Circular ductwork - DW/144

Spirally wound.

300.060 FLEXIBLE DUCTS:

Application; For use in making the final connections only at fans, fresh air units and at grilles, diffusers and louvres.

- Supply and fasten flexible duct connections as DW/144. Use flexible duct connections in applications listed in DW/144.

Maximum length of flexible duct nominally 600mm.

300.070 FIRE RATED DUCTWORK

Application: to ensure continuity of fire rating through protected areas such as plantrooms

Where indicated on the drawings, ductwork is to be fire-rated (Nominally 2 hours TBC with fire engineer) via suitable fire protection insulation or intumescent paint (Method to be agreed with client).

300.080 ACCESSORIES - METAL DUCTWORK:

Application

Flexible Joints

Supply and install flexible joints as detailed in BESA DW/144, Part 7.

All flexible joint connections shall comply with current Building Regulations regarding the spread of fire and smoke.

Position

- Use flexible joints, as shown on drawings.
- On fan inlet/outlets.
- To make connections to air conditioning units
- To make connections to air diffusers, grilles and air registers.

Access openings

- Provide access openings in accordance with BESA DW/144, Part 7.
- Provide access for cleaning in accordance with BESA DW/144, Part 7 and Appendix H.
- Provide hangers and supports throughout in accordance with BESA DW/144, Part 6.
- Use proprietary system of ductwork support

Regulating dampers

Standards

- Aerodynamic testing - BS EN 1751.
- Acoustic testing - BS EN ISO 5135.
- Provide regulating dampers in accordance with DW/144, Part 7.

Function

- Balancing damper.
- Control damper.

Fire Dampers.

- Supply and install fire dampers in accordance with BESA DW/144, Part 7; DW/145 and BS EN 15650.
- Location: At all fire wall /floor penetrations.
- Application: To maintain the integrity of the fire compartments
- Type: Fusible link - Circular or rectangular fire dampers with an installation frame
- Manufacturer: Actionair or similar equal and approved
- Installation: Install strictly in accordance with manufacturers recommendations.
- Minimum Size: The minimum size of fire damper to be installed shall be 100 x 100mm or 100mm diameter (as internal access to smaller dampers is too restrictive).

Standards

- Classification - BS EN 13501-3.
- Fire resistance tests - BS EN 1366-2.

- Test of thermal release mechanism - BS ISO 10294-4.
-

300.100 DUCTWORK WORKMANSHIP:

Install ductwork in accordance with BESA DW/144, and DW/154 as appropriate. Ensure that there are no sharp edges or corners on cut edges on ductwork, flanges and supports. Arrange ductwork to drain any entrained moisture and ensure the lapping of joints minimises moisture leakage.

Connection to building openings. Comply with BESA DW/144, Appendix K or DW/154, Part 6, Section 20 as appropriate.

Space supports in accordance with BESA DW/144, Part 6 or DW/154, Part 5 as appropriate.

Internal cleanliness

- Where post installation cleaning is specified, appoint a specialist cleaning contractor to undertake the work in accordance with BESA TR/19 and supply and install any additional cleaning openings to suit their selected specific methods of cleaning and to suit the practical conditions relative to the fabric of the building and position of other services,

Weatherproofing

- Fit ductwork with trimming angle and weather cravat, skirt, flashing plate and cowl where ductwork passes through or terminates in roof, to ensure a weatherproof seal to building structure.
- Enclose ducts passing through building elements, (walls, floors, partitions, etc.) within purpose made sleeves. Cut sleeves of the same material as the duct and pack with mineral fibre or similar non-flammable and fire-resistant material to form a fire/smoke stop of adequate rating and to prevent air movement and noise transmission between duct and sleeve.

Provide test holes in ductwork system to allow complete testing and balancing of system in accordance with CIBSE Commissioning Code A.

Site drill test holes on-site in accordance with BESA DW/144.

Provide holes in metal ductwork, in accordance with BESA DW/144, Part 7 to accommodate thermostats, humidistats and other control sensors in positions and sizes indicated on drawings.

Install sensors and test points in plastics ductwork to suit specialist control and sensing equipment in positions and fixing configurations shown on drawings.

Fit sensors, damper motors and other control equipment as indicated on drawings.

Provide instrument connections where indicated on drawings.

500.000 THERMAL INSULATION

500.010 THERMAL INSULATION - MATERIALS:

Standards

Supply and extract ducts to/from the AHU's shall be insulated to the following standards.

Comply in general with BS 5422 and the British Standards publications referred to therein. Also comply with BS 5970. Description of terms as BS 3533.

Thermal conductivity:

Ensure values are in accordance with BS 874 and BS 2972.

Fire rating:

Employ materials that comply with BS 476-4, non-combustibility test, or obtain a Class 'O' fire rating to Building Regulations.

When finished, comply with BS 476-7.

Class 1 spread of flame

Temperature of fluid in ducts (°C) -3 to 25

Material: Mineral fibre rigid duct insulation with foil faced finish

- Adhesives.

Comply with the recommendations of clause 8.2 of BS 5970, section 2 for insulation bonding adhesives, lagging adhesives, facing and film attachment adhesives.

The external ducts shall be covered in a laminar foil/film protection such as Venture Clad (tel 01327 876555), Product code 1579 CW – “Natural Aluminium” or equal and approved. (Final type to be confirmed before order).

500.015 ENVIRONMENTAL THICKNESS ON WARM AIR DUCTWORK:

Temperature difference between air inside ductwork and ambient still air (K)	10	25	50
Heat loss (W/m ²)	7.2	15.3	26
Environmental thickness of mineral wool insulation (mm)	40	50	60

500.020 CONDENSATION CONTROL ON CHILLED AND FRESH AIR INTAKE AIR DUCTWORK - MINERAL WOOL:

Minimum insulation thickness for condensation control on ductwork carrying chilled air in ambient conditions: indoor still air temperature 25C, relative humidity 80%, dew point temperature 21.30C.

Minimum air temperature inside duct. Degrees C	Thermal conductivity of 0.035 W/mK at a mean temperature of 100C		
	Surface coefficients		
	Low (0.05)	Medium (0.44)	High (0.90)
	Thickness of mineral wool insulation (mm)		
15°C	25	25	25
10°C	50	25	25
5°C	65	40	25
0°C	90	50	30

To be fully insulated and fully vapour sealed

500.020 DUCTWORK THERMAL INSULATION WORKMANSHIP:

Carry out thermal insulation work using one of the scheduled firms employing skilled craftsmen conversant with class of work.

Do not apply thermal insulation until installation has been fully tested and all joints proved sound.

Ensure all materials are kept dry.

Insulate each unit separately. Do not enclose adjacent units together.

Apply insulants, facings, coatings and protection strictly in accordance with manufacturer's instructions.

Neatly finish joints, corners, edges and overlaps and, where possible, arrange overlaps to fall on blind side.

Ensure overlaps are neat and even and parallel to circumferential and longitudinal joints.

Provide identification bands and arrows on all ductwork (insulated or non-insulated).

500.030 INSTALLATION OF FOIL FACED INSULATION ON DUCTWORK:

Secure the insulation with adhesive in accordance with manufacturer's recommendations.

Use insulation hangers spaced at maximum 300mm centres on the underside of ducts.

Seal joints and pin penetrations using 100mm wide class 'O' aluminium foil tape. Where cut outs for test holes, etc occur tape over insulation membrane and return to the duct surface.

Foil faced semi-rigid slab

Cut slabs so that the top and bottom pieces overlap the sides.

Where insulation abuts duct support inserts that have integral vapour barriers seal using class 'O' foil tape to continue vapour barrier.

500.040 INSTALLATION OF PROTECTION:

Ensure that where protection is applied to insulation, the joints fall blind side and that all joints are made to shed water and sealed with waterproof tape, adhesive or joint sealant where appropriate.

Plantroom and External services to be covered in a laminar foil/film protection such as Venture Clad (tel 01327 876555), Product code 1577 – "Aluminium" embossed or equal and approved. Final type to be agreed before order.

500.060 DUCT AND ANCILLARIES

500.070 APPEARANCE:

Arrange all exposed duct runs to present neat appearance, parallel with other service runs and building structure.

Ensure all vertical ducts are plumb or follow building line.

500.140 SPACING:

Space duct runs in relation to one another, other services runs and building structure, allow for thermal insulation and ensure adequate space for access to duct joints, etc.

Minimum clearances to duct insulation: -

From	Minimum Clearance (mm)
Wall	25
Ceiling	25
Floor	150
Other services	25
Electrical cables, conduit, switchgear, etc	150

600.000 COMMISSIONING REQUIREMENTS:

Clean ductwork before plant is first run, using access openings in ductwork.

Put system to work and demonstrate that specified duties are attained plus or minus 10%

Carry out commissioning of installations in accordance with the procedures, checks and tolerances given in the BSRIA Application Guide for air systems to achieve the standards set in the CIBSE Commissioning Codes.

Carry out checks and procedures as detailed in CIBSE Commissioning Code A, Section A1.

Set to work and regulate air distribution systems in accordance with CIBSE Commissioning Code A, Section A2.

Ensure that the control system functions in accordance with the requirements specified in clause 100.030.

Keep a systematic record of commissioning results.

700.000 CONTROLS

700.010 CONTROL COMPONENTS:

- As shown in Controls Section W69

V90 ELECTRICAL INSTALLATION

100.010 SYSTEM DESCRIPTION

The project information is designed to RIBA Stage 4 Technical Design standard. The Contractor shall provide the RIBA Stage 5 coordinated design, and supply, install, test and commission all electrical systems for the building as described herein.

Summary of the Electrical Works

Electrical services shall be provided to the building in line with current applicable standards, CIBSE Guidance, Building Regulations and the 18th Edition IET Wiring Regulations.

The works shall generally comprise of the following new services:

- Incoming Supplies
- Small Power Installation
- Internal Lighting
- External Lighting
- Emergency Lighting
- Fire Alarm System
- Toilet Alarms
- Lightning Protection and Surge Protection
- Electrical Works Associated with Mechanical Services
- Earthing and Bonding
- Telecoms / Data Installation
- Security/Intruder Alarm
- Access Control
- Electrical Containment (Trunking, Conduit and Basket)

The internal wiring systems within the building shall be hidden within the building fabric wherever possible.

Lighting and power wiring shall utilise twin insulated Low Smoke Zero Halogen (LSZH) cable installed on cable basket in ceiling voids and surface mounted trunking drops to low level, or uPVC conduit within the cavity walls.

ICT Cat 6 cables shall be installed on cable basket in ceiling voids and surface mounted trunking drops to low level, or uPVC conduit within the cavity walls.

The fire alarm system shall be run in an approved fire rated cable with red sheathing. Drops to call points to be installed in mini trunking.

ELV cable for security and access control systems shall be installed in trunking in ceiling voids and surface mounted mini trunking to the equipment, or uPVC conduit within the cavity walls.

V90-1 Low Voltage (LV) Main Switchboard and Local Distribution Boards

A new 100A 10-way TP+N MCB distribution board shall be installed and connected to the new incoming service meter to serve the proposed electrical services for the building.

The distribution board shall be wall mounted, metal cased, complete with integral isolator, lockable doors, and MCB's, RCBO's, installed as indicated in the distribution board schedules.

The distribution board shall be equipped with facilities for separately monitoring lighting and power energy consumption, with the metering units located within the distribution board.

The distribution board shall be equipped with a minimum of 25% spare ways to accommodate future expansion. Associated sub mains shall also be sized to accommodate a potential 25% load increase without alteration to the distribution network.

V90-2 Small Power Installation

General small power shall be provided to the Library, Offices, Teaching and meeting rooms and ancillary areas, incorporating twin 13A switched socket outlets wired via ring or radial circuits. Sockets shall be logically spaced to maximise coverage in each area.

Socket outlets shall be twin outlets switched pattern with outboard rockers, dual earth and shall be colour contrasted (final colour to be agreed with Architect/Employer) in compliance with DDA recommendations.

Power supplies will be provided for auxiliary services such as those listed below. These will have a dedicated radial circuit from the distribution board.

- Fire Alarm panel
- Intruder Alarm panel
- ICT Cabinet
- Memorial Clock
- Kitchen services
- Mechanical services
- Cardiac Resus Unit
- Air Source Heat Pumps and Manifolds

Fixed appliances within kitchen areas such as the refrigerator and dishwasher shall be connected via switched fused connection units and double pole switches with neon indicators. These will have the same finish as the socket outlets and include labels indicating their use.

Where appliances are located below worktops, they shall generally be connected via a switched fused connection unit above the worktop wired to a flush un-switched socket outlet below the worktop. Careful coordination of the final equipment positions will be required.

Provide power supplies for the installation of a hand dryer, water heater and disabled alarm call point within the toilet facilities. The Hand Dryer and Water Heater shall be wired via ring circuit to local high level switched fused connection units (FCU) with indicator lamp. From the FCU a flush 20mm conduit and heat resistant flexible cable shall run to the hand dryer and water heater positions terminating within flush outlet box and blank plate to permit the final installation of the dryer and heater.

Electrical supplies shall be provided in the kitchen for a point of use water heater and water boiler. The supply shall be from the local ring main circuit. The water boiler shall be fed from a 13A 7-day 24Hr time switch supplied from the fused connection unit so that the boiler is not operating when the building is closed.

Accessories shall generally be as MK Logic Plus. Socket outlets shall be of the plug socket type.

V90-3 Information & Communications Technology (ICT)

The existing 15U 800mm x 1000mm wall mounted data cabinet and head end equipment located in the kitchen area will be carefully removed and stored and re-installed when the wall has been repaired.

The electrical contractor shall provide a new 32-port outgoing patch panel for the ICT cabinet. The electrical contractor shall allow for all CAT 6 wiring from the outgoing patch panel to the RJ45 outlets.

The building will be provided with twin data outlets to networked items (Access Control, Intruder Alarms, etc) utilising RJ45 outlets and Cat6A F/FTP cabling. With no cable lengths to exceed 90m.

The existing connection to Merthyr Tydfil CBC main hub will be retained, and the Main Contractor shall make arrangements with MTCBC ICT officers to provide and connect the head end equipment within the building and the connectivity to the main hub.

WIFI is to be provided within the building via strategically positioned wireless access points and RJ45 outlets provided by the electrical contractor (contractors specialist to provide heat map to confirm coverage).

The ICT Cat 6 cables shall be installed on cable basket in ceiling voids and within surface mounted trunking drops to low level, or uPVC conduit within the cavity walls. Where the ICT outlets are grouped, a section of multi compartment dado or skirting trunking will be used to contain the cables and outlets.

A dedicated electrical supply will be provided to the ICT cabinet from the distribution board as indicated in the DB schedule.

V90-4 Internal Lighting Installation

Lighting will comprise of a combination of recessed, suspended and surface mounted luminaires all equipped with LED lamps to provide illumination levels in accordance with CIBSE/SSL recommendations and performance guides.

Lighting in the main library areas and the junior library will be provided by 350mm diameter globes suspended from the plaster ceiling on white flex with a brass metal ceiling rose. The suspension shall be 2m long, but the contractor shall allow for adjusting the suspensions to all fittings **twice** in accordance with the Architect and Engineers preference following the initial installation. The lighting will be controlled from a switchbank located at the reception desk.

The Lower Ground Floor Teaching Rooms shall have surface mounted modular fittings with dimmable LED lighting units. The fittings shall be locally controlled and switched to provided different switching scenarios as well as lighting levels.

The toilet and kitchen will be lit using recessed LED downlight with IP54 rating. The fittings will be controlled by local PIR units occupancy sensors with time delay and integral on/off lighting control.

Lighting to Plantrooms will be provided by Linear IP65 Luminaires equipped with LED lamps. Lighting control will be by means of local manual switch.

Lighting to primary circulation routes, including undefined open area escape routes shall be equipped with PIR detection of a suitable type positioned to ensure rapid response to illuminate circulation routes for safe movement.

All LED fittings shall be LM80 verified and be provided with a minimum of 5-year manufacturer's warranty.

V90-5 Emergency Lighting

Emergency Lighting in general areas shall be provided by self-contained non-maintained emergency luminaires in compliance with Building Regulations and the recommendations of BS 5266.

Emergency lighting will be provided to all escape routes (internally and externally) and to high-risk areas utilising stand-alone non-maintained LED emergency luminaires.

In addition, self-contained maintained illuminated directional LED Exit lights will be provided in corridors and above all exit doors to assist in identifying the location of escape routes.

External emergency lighting shall also be installed to illuminate external escape routes to enable occupants to evacuate the building to a safe point of Assembly. The external emergency lighting may be incorporated within the general lighting fittings.

All emergency lighting will be provided with self-test facility.

V90-6 External Lighting

The contractor shall provide external lighting to the perimeter and access/egress routes. Lighting to be provided by building mounted luminaires, indicative luminaires and scope of works has been indicated on the lighting proposals drawing.

Control of the external lighting shall be via daylight sensing photocells and time switches with manual override switch located adjacent to the distribution board.

V90-7 Fire Detection and Alarm Installation

A fully automatic fire detection system shall be provided to the building in compliance with Building Regulations and BS 5839 Part 1: 2017 to a minimum of Category L2 standard. The Electrical Contractor shall engage the services of a qualified specialist contractor for the design, installation, testing and commissioning of the Fire Alarm Installation.

The system shall incorporate a new fire alarm panel at the main entrance complete with battery backup. The smoke and heat detectors, visual and audible devices and manual call points shall be provided as indicated on the layout drawings.

Smoke detectors shall be installed within ceiling/roof voids, although after tender this may be omitted subject to a formal Risk Assessment by a Competent Person and agreement with the CA.

The fire alarm panel shall be connected to a remote Alarm Receiving Centre (ARC) and a dedicated telephone line monitored by a BT REDCARE or similar secure connection provided at the new panel location. The fire alarm panel should have a **2-minute** delay in the activation of the connection to the ARC, and subsequent fire service, to allow staff to investigate the alarm and take appropriate action. The fire alarm sounders and beacons shall activate, and the occupants should evacuate the building, during this search period. In addition, the following interfaces shall operate.

Interface Units will be provided for Interface with (but not limited to):

- Gas shut off valve.
- Electrically Powered Automatic Door Opening Mechanisms.
- Access Control Magnetic Locks.
- Fire Dampers
- Mechanical Control Panel

V90-8 Toilet and WC Alarms

The Accessible WC shall be provided with an Assistance Call Facility comprising of:

- Power Supply Unit.
- Pull Cord with Integral Reassurance Indicator.
- Reset Facility.
- Overdoor Indicator/Buzzer unit external to the WC.

The electrical supply shall be provided from the local power circuit via a switched fused connection unit mounted at high level adjacent to the call system Power Unit.

V90-9 Intruder Alarm

An automatic Intruder Alarm System to NACOSS Standards is to be provided. The Electrical Contractor shall engage the services of a qualified specialist contractor for the design, installation, testing and commissioning of the Intruder Alarm Installation.

The System is to comprise of:

- Intruder Alarm Panel
- Exit Keypad.
- Door Contacts.
- PIR Movement Detection Sensors.

The intruder alarm system shall be designed to NACOSS standards, BS8220, BS7807 BS4737, BSEN 50131-1, BSRIA Handbook AH3/92 Part 1 and 2.

The Contractor shall be responsible for the provision of all 230V AC power supplies, wire ways etc as required by the specialist supplier.

V90-10 CCTV Installation and Recording

A new CCTV monitoring installation shall be installed to provide external and internal images of the spaces and surrounding area. The Electrical Contractor shall engage the services of a qualified specialist contractor for the design, installation, testing and commissioning of the complete CCTV Installation.

The areas shall be covered via static CCTV cameras to monitor persons entering and leaving the building, as well as the external building perimeter. The specification of the new CCTV cameras shall be determined by the specialist contractor, but shall typically incorporate IP 1.3 Mega pixel 720p discreet vandal resistant IR dome Unit, capable of Day / Night surveillance.

A 17" monitor split screen shall be provided in the reception to allow images of dedicated areas to be displayed.

The specialist contractor shall allow for all control equipment for the CCTV system to allow the connection of Digital Video Recorder (DVR), camera control switches (joystick) and provision of As Installed schematics and record information.

A hard-wired RJ45 data point shall be installed to the camera position and shall be linked into the new CCTV system within the main building.

The Installation shall comply with NACOSS NACP20 "Code of Practice for Planning, Installation and Maintenance of Closed-Circuit Television Systems".

V90-11 Access Control System

The Electrical Contractor shall engage the services of a qualified specialist contractor for the design, installation, testing and commissioning of the complete access/egress installation system.

The system shall include:

- External call/video station
- Reception receiver station with door release button
- Maglocks on the doors
- Exit Button
- Green Breakglass for Emergency Exit

In addition, the side entrance door shall be provided with automatic opening, controlled by a Push-to-Open switch externally and internally.

V90-12 Lightning Protection

A Lightning Protection Risk Assessment will be undertaken by the Contractor and the results from the assessment to determine if a lightning protection system is required.

In addition to the lightning protection system, an electronic surge protection system will be provided complying with BSEN 62305.

The contractor shall employ the services of a qualified specialist to design, install, test and commission a full lightning protection system (LPS) and surge protection units within the proposed building.

V90-13 Works Associated with Mechanical Plant and Equipment (Refer also to the Mechanical Sections of this Specification)

The Contractor shall make allowance for all power and control wiring associated with:

- Air Source Heat Pumps (ASHP)
- Gas Fired Boiler
- Heating circulation Pumps
- Air Handling Units (AHUs)
- Local Extract Fans
- BMS Controls
- Mechanical Control Panel
- Water Heaters and Boilers

Mechanical services internal wiring shall be carried out in LSZH/LSZH cabling with final connections to appliances generally undertaken in heat resistant flexible cabling. Local means of isolation shall be provided adjacent equipment suitably IP rated where necessary.

V90-14 Earthing and Bonding

Main and supplementary equipotential bonding conductors shall be provided in accordance with BS 7671 (IET Wiring Regulations 18th Edition).

All Extraneous Conductive Parts are to be equipotentially bonded and linked back to the local Distribution Board Earth Rail.

Such Extraneous Conductive Parts are, but not limited to:

- Heating Pipework,
- Domestic Water Services Pipework,

- Ventilation ducts,
- Metal Grid suspended ceilings.

V90-15 Method of Wiring

Lighting Circuits: shall generally be wired in LSZH/LSZH cables with copper conductors run on basket in ceiling voids, in surface mounted trunking and in conduit when flushed in the wall.

Small Power: circuits shall generally be wired in LSZH/LSZH single core cables with copper conductors run on basket in ceiling voids, in surface mounted trunking and in conduit when flushed in the wall.

External Services: circuits to external plant and lighting shall be wired in LSZH/SWA/LSZH cable in ducts surface mounted on the building.

Fire Alarm System: Wiring shall be carried out in standard Red sheathed fire alarm cable in compliance with BS 5839 Part1:2017. Cable to be run on basket in ceiling voids, in surface mounted trunking and in conduit where flushed in the wall.

All cabling Data/ELV to have a minimum CPR rating of CCA in accordance with BS 6701. Cables shall be run on basket in ceiling voids, in surface mounted trunking and in conduit when flushed in the wall.

V90-16 Wiring Accessories

Accessories shall generally be as MK Logic Plus, Crabtree or similar.

THE FOLLOWING CLAUSES ARE TAKEN FROM THE NATIONAL BUILDING SPECIFICATION AND SHALL BE ADHERED TOO WHERE APPLICABLE

100.030 CONTROL REQUIREMENTS

All electrical systems shall be complete with a means of main isolation together with local isolation adjacent to fixed apparatus. External isolators shall be to IP66 rating.

200.000 GENERAL LIGHTING AND POWER

200.010 REGULATIONS:

Comply with:

- Requirements for electrical installations (the IET Wiring Regulations) BS 7671
- Requirements of the electricity supply company.
- Requirements of the electricity metering company.

200.020 ELECTRICITY SUPPLY:

New 400V TP&N 50Hz electrical supplies from the local supply authority.

Contractor to confirm capacity of required supply and confirm existing system where power is to be derived from has sufficient capacity.

200.030 ARRANGEMENTS OF CIRCUITS:

Divide the installation into separately controlled circuits as accordance with the existing installation strategy, further subdividing where necessary to ensure compliance with BS 7671 (the IET Regulations).

Generally, socket outlets shall be wired on ring main circuits from the proposed distribution board. All socket outlets shall include dual earth facilities and wired to comply with IET Wiring Regulation (High Integrity Earthing).

Generally, radial circuits shall be provided to items of fixed equipment to suit each particular application in accordance with normal good practice.

All supplies to items of fixed equipment shall terminate in switched/unswitched fused connection units local to the item of equipment. Generally, final connections to items of fixed equipment shall be carried out using heat resistant flexible cables.

200.040 INSPECTION AND TEST PROCEDURE:

Comply with BS 7671 (IET Regulations). Provide completion certificates in accordance with BS 7671 (IET Regulations). Provide information to fulfil BS 7671 (IET Regulation)

Carry out site testing and inspection and provide test certificates for specialist installations. Record all results and readings. Provide copies of any test and inspection result.

Check correct operation of devices. Confirm interlocks and sequences operate correctly. Provide test equipment and consumables to complete tests and retest any failed installations following corrective measures. Check and confirm correct sequence in multiphase circuits.

200.050 TESTING FIRE ALARM SYSTEM:

Test the installation in accordance with BS 7671 (the IET Wiring Regulations), BS 5839 and appropriate standards. Record all tests.

200.060 IDENTIFICATION - GENERAL:

Apply identification notices in accordance with the BS 7671 (IET Wiring Regulations) and Appendix 7 to all electrical cables plant and equipment.

Phase colours - Brown, Black, Grey.

Fix using materials compatible with the notices and fixing surface.

- Obtain approval prior to manufacture of all notices.

Apply identification markers in accordance with the BS 7671 (IET Wiring Regulations), Clause 514 to all conductor termination points.

Phase marking - L1, L2, L3.

In alterations or additions to an existing installation, identify conductors and terminals as BS 7671 Appendix 7.

In single phase installations identify conductors and terminals as BS 7671 Appendix 7 and identify all phase conductors brown and all phase terminals L.

200.070 LABELS

Label all electrical plant and equipment using safety sign 8.A.0044 of BS 5499-5, where voltages above ELV exist.

Materials - Engraved thermosetting plastic laminate.

Colour - Background White Lettering Black

Fixing - Adhesive or screw fixed

Position safety signs in accordance with BS 5499-10.

200.080 ENGRAVED ACCESSORY PLATES:

Engrave accessory plates and specialist items to identify the function of the accessory

- Use 6mm high letters with engraving coloured

200.090 SCHEMATIC DIAGRAMS:

Provide a purpose made schematic diagram permanently fixed showing the connections of the equipment and plant.

200.100 DISTRIBUTION BOARDS IDENTIFICATION:

Identify every outgoing way with a renewable circuit chart in a transparent plastic envelope permanently fitted inside distribution board cover. Clearly indicate in typed script, circuit identification number, cable size, fuse or circuit breaker rating and a description of item supplied and area supplied by circuit.

200.110 CABLE IDENTIFICATION:

Provide all cables, other than final sub-circuit wiring with labels fixed at each end of cable, either side of wall and floor penetrations and at approximately 10m intervals. Ensure labels show reference number of cable.

200.140 FIXING TO BUILDING FABRIC - PREPARATION:

Mark-out using manufacturer's drawings and templates and fix all items.

Ensure structure and fixings are suitable for items to be fixed. Use largest size of fixing permitted by diameter of hole in item to be fixed.

Provide all assistance to enable any item to be built in by others.

200.150 PLUGS AND SCREWS:

Use plugs of material, size and length, in accordance with the manufacturer's instructions. Use screws to BS 1210. Generally, use sherardized steel screws. In damp or exposed situations use brass screws.

200.160 FIXING - WORKMANSHIP:

Drill holes squarely. Use drills of correct size and type. Do not flame-cut holes in metalwork. Comply with manufacturer's instructions for all fixings. Avoid fixing through reinforcement. Do not fix to unsound material.

200.170 FIXING TO THE STRUCTURE:

- Obtain approval to:-
 - Cut holes in the structure.
 - Weld to structural steelwork.
 - Use fixings suitable for the equipment being installed taking account of total weight and physical size.

200.180 OFF-SITE PAINTING AND ANTI-CORROSION TREATMENTS - GENERAL REQUIREMENTS:

Protect all equipment and ancillaries against corrosion. Protect ferrous metals with coatings at works. Provide all items for decorative finishing primed to suit base material and finish.

300.000 CONDUIT AND TRUNKING, LV CABLES AND WIRING - MATERIALS

300.010 STEEL CONDUIT AND FITTINGS:

- Type Heavy Gauge Galvanised
 - Application containment of lighting and small power circuit conductors.
 - Manufacturer and reference Contractors Choice
 - Or approved equivalent.
 - Standard
 - BS EN 61386-21.
 - Ends
 - Threaded.
 - Size in accordance with BS 7671 (IET regulations).
 - Fittings
 - Use adaptable boxes of 100mm x 100mm x 38 mm minimum size.
 - Use adaptable boxes of 100mm x 100mm x 50mm minimum size.
 - Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes.
 - Protection class/finish BS EN 61386-1, Table 10
 - Class 4 hot dipped galvanized.
 - Mounting/support Hospital Spacer Bar saddles where surface mounted, crampets where covered by render coating.
 - Installation
- Use maximum practical lengths to minimise number of joints. Form bends by machine and remove burrs from cut ends.

Use bends and/or junction boxes at changes of direction. Do not use elbows or tees of any sort without approval.

Fix securely with boxes fixed independently of conduit.

Tightly screw all joints to ensure electrical continuity, with no thread showing. Use expansion couplings where conduit crosses movement joints in structure.

300.020 PVC CONDUIT AND FITTINGS:

Application: for the protection of all cabling where flush fixed into the structure

Manufacturer and reference: Marshall Tufflex or approved equivalent.

Standard – BS EN 61386-21.

Strength

Heavy duty.

High impact.

Size in accordance with BS 7671 (The IET Wiring Regulations).

Shape

Round.

Oval

Colour

White.

Jointing

Push-fit and solvent welded.

Fittings

Provide boxes with earthing terminal.

Provide weatherproof boxes.

Installation

Use maximum practical straight lengths to minimise number of joints.

Use proprietary bends and/or junction boxes at changes of direction. Do not use elbows, tees or site formed bends without approval.

Fix securely with boxes fixed independently of conduit.

Form secure joints, using expansion couplings where recommended by the manufacturer, and connectors at equipment, terminal fittings, etc.

300.030 STEEL SURFACE TRUNKING:

Type Galvanised Steel and specialist medical trunking

Application generally for containment of lighting and small power circuit conductors -

Manufacturer and reference General trunking runs- Contractors choice

Type

Standard cable trunking.

Standard

BS 4678-1.

BS EN 50085

Size in accordance with BS 7671 (IET regulations).

Fittings

Hanger brackets.

Fire barriers.

Protection class

Class 3.

Finish

Zinc coated to BS EN 10326, BS EN 10327 or BS EN 10143.

Mounting/support - utilise proprietary support and mounting system secured to building fabric

Installation

Use proprietary units to form junctions and changes of direction wherever possible.

Use mechanical fastenings/fixings; do not weld.

Fit a copper link at each joint to ensure electrical continuity.

Fit grommets, bushes or liners to holes through which cables pass.

The contractor is responsible for the sizing of all cable trunking and each trunking should have 50% spare capacity.

300.050 DADO SURFACE TRUNKING:

Type trunking

Application dado trunking to contain - lighting, small power in PC Areas.

Manufacturer and reference - MARCO Cable Management or MK Electrical or Marshall Tufflex

Type -

PVC trunking 3 compartment.

Material - Extruded PVC (anti bacterial coating).

Size in accordance with BS 7671 (IET regulations).

Fittings

Socket outlet boxes.

Bends.

Stop ends.

Specialist outlets as detailed on tender drawings

Mounting/support surface mounted

Multi-compartmental trunking

Provide multi-compartmental trunking with separate compartments for wiring of:

Extra low voltage circuits.

Communications.

Installation

Use proprietary units to form junctions and changes of direction wherever possible.

300.090 FIRE STOPPING OF TRUNKING/DUCTING:

- Application - where trunking penetrates fire barriers/compartments
- Manufacturer and reference:
 - Environmental Seals Ltd,
 - Envirograf House,
 - Barfrestone,
 - DOVER, Kent,
 - CT15 7JG.
 - Telephone: +44 (0) 1 304 842 555
- Or approved equivalent.

Where trunking or ducting pass through fire resisting floors, ceilings, cavity barriers, etc., seal internally with:

 - proprietary intumescent material.

300.095 FIRE STOPPING WITHIN BACK BOXES:

- Application - where outlet back boxes are installed in fire barriers/compartments walls
- Manufacturer and reference:-
 - CP 617 Intumescent fire acoustic putty pad
 - Manufacturer:
 - Hilti (Gt. Britain) Limited
 - 1 Trafford Wharf Road
 - Trafford Park
 - Manchester M17 1BY
 - Telephone: 0800 886 100
- Or approved equivalent.

Where back boxes are installed in plaster board walls, blockwork walls etc., seal internally with: -

 - CP 617 Intumescent fire acoustic putty pad.

300.100 FLEXIBLE CORDS:

- Application. To provide final connections to between luminaires and ceiling roses, small items of fixed equipment and fused connection units, etc. utilising correctly rated heat resistant cables.
- Final connections to fixed equipment shall be carried out using flexible cable. Cables shall terminate "back-

entry" into the items of equipment which they serve. Where this is not possible, then cables may be installed surface, but must be kept to the minimum length and must be clipped (plug & screwed) to the highest standard.

- Manufacturer and reference BS6500 3 Core 1.5 mm sq LSHF
 - Or approved equivalent.
- BASEC certified.
- Standard
 - BS 6500 and VDE 0250

300.110 INSULATED CABLES:

Type - Multi-core copper LSZH in conduit/trunking,

Application - Multi-core - Lighting and small power circuits

Manufacturer and reference- Contractor's choice

ASEC certified.

Type - Copper conductors.

Multi-core.

Armoured.

Unarmoured.

Sheathed.

LSZH.

- Unsheathed.
- Standard
 - General purpose 450/750V to BS 6004.
 - 600/1000V to BS 6724.
 - Control 300/500 to BS 7629-1.
- Fire performance to BS 5839-1
 - Enhanced.

300.150 CABLE JOINTING SUNDRIES:

- Use terminations conforming to BS EN 61238-1. Use tapes to BS 3924 or BS EN 60454.
- Use twist on connection devices to BS EN 60998-2-4

300.180 PERFORATED CABLE TRAY:

Support all cables throughout their length using cable tray or baskets, firmly fixed to building fabric.

Ensure cable tray allows for spacing in accordance with BS 7671 for the design current of the cable.

- Standard BS EN 61537
 - Classification Heavy duty galvanised

Type

- Return flanged.
- Basket.

Perforations and thickness

- Manufacturer's standard pattern and thickness.
- Cable tray as indicated on tender drawings to accommodate all sub-main cables. Cable basket to

accommodate I.C.T. cables.

The contractor is responsible for the sizing of all cable trays and cable baskets.

NOTE! Contractor to determine exact routes and layout of cable tray required. Any routes indicated on tender drawings are for general guidance only but it is the tenderers responsibility to assess the full extent of all requirements to form a complete installation

Fittings

Use factory made fittings throughout of same material, type, pattern, finish and thickness as cable tray.

300.180A STEEL WIRE CABLE TRAY:

Support all cables throughout their length using cable tray, firmly fixed to building fabric.

Ensure cable tray allows for spacing in accordance with BS 7671 for the design current of the cable.

THE CONTRACTOR MUST ENSURE A SEPARATION DISTANCE OF 300MM BETWEEN STEEL WIRE CABLE TRAY USED FOR LOW VOLTAGE AND THE STEEL WIRE CABLE TRAY USED FOR EXTRA LOW VOLTAGE CABLING.

- Standard BS EN 61537
- Classification Heavy Duty Wire Tray - MK Matrix
- Type
- Flanged.
- Basket.
- Perforations and thickness
- Manufacturer's standard pattern and thickness.
- Fittings
- Use factory made fittings throughout of same material, type, pattern, finish and thickness as cable tray.

300.190 CABLE CLIPS AND CLEATS:

- Standard BS EN 50368
- Material - Contractors Choice

400.000 CONDUIT AND TRUNKING, LV CABLES AND WIRING - WORKMANSHIP

400.020 INSTALLING TRUNKING:

Remove burrs from cut trunking and conduit ends.

400.030 DRAINAGE OF CONDUIT:

Provide drainage outlets at lowest points in conduit installed externally and in locations where condensation may occur.

400.040 APPEARANCE:

Arrange conduit and trunking, plumb where vertical, neatly parallel with other service runs and the structure.

400.050 EXPANSION AND SETTLEMENT JOINTS:

Make provision at expansion and settlement joints for movement. Use manufactured expansion couplings.

400.060 SPACING:

Install conduit, trunking and equipment clear of other services with minimum spacings:-

- To other services - 150mm and above radiators - 1000mm.

Ensure trunking and conduit is independently supported from building fabric. Obtain approval for supports.

400.070 ACCESS:

Locate covers on top or sides of trunking to allow access to wiring.

400.080 CABLE ROUTES:

- Ensure cable routes are
 - Straight, vertical or horizontal and parallel to walls/floors.
 - In approved locations where exposed to view. Conceal cables wherever possible.
 - Positioned at least 150 mm clear of other services. Locate cables running parallel and adjacent to heating pipes below pipes.
- Install
 - Concealed horizontal runs in walls within 150 mm of ceiling or between 150 and 300 mm of floor.
 - Concealed vertical cable runs to wall switches and outlets in line with accessory.

400.090 CABLE INSTALLATION - GENERAL:

- Do not commence internal cabling until the building is enclosed and weatherproof.
- Install cables neatly and securely, adequately protected against accidental damage, adverse environmental conditions, mechanical stress and deleterious substances.
- Install cables without joints other than at equipment and terminal fittings. Do not use junction boxes without approval.
- Sleeve cables passing through masonry walls with conduit bushed at both ends.
- Do not run cables in spaces where they will be surrounded or covered by insulation.
- Install all data and telecommunications cable in accordance with BS 6701 or BS EN 50174-2.

400.100 PROTECTIVE CONDUCTORS:

Use cable conductors throughout; do not use conduit or trunking as protective conductors.

400.120 CABLE INSTALLATION – PVC LSZH SHEATHED CABLES:

Do not install cables when temperature is near or below freezing.

Do not install in cavities of external walls.

Fit insulating cable glands at entries to equipment.

Terminate cable sheaths within boxes.

400.170 CABLES IN VERTICAL TRUNKING/DUCTS:

Support with pin racks or cleats at each floor level or at 5m vertical centres, whichever is less.

Provide and fix heat barriers at not more than 5m centres where fire resisting barriers are not indicated.

500.000 LIGHTING AND POWER - PRODUCTS/MATERIALS

500.010 LIGHTING AND POWER SCHEDULES:

Supply lamps and luminaires as generally indicated on the tender drawings or in this specification.

Supply distribution boards as generally indicated on the tender drawings or in this specification.

Supply electrical accessories as generally indicated on the tender drawings or in this specification.

Note: It is the Contractors responsibility to fully assess and determine the final requirements to suit the specific needs of the premises and to ensure that luminaires achieve the required illumination standards.

All equipment shall be selected to suit the environmental conditions within the respective locations

500.030 DISTRIBUTION BOARDS:

Local Distribution Boards

Type : Wall mounted metal cased

Application: for lighting and small power supplies.

Manufacturer and reference – Eaton or equal and approved, all boards and main board from one manufacturer.

Main control – Main isolator/Switch disconnecter.

Number of ways - - Contractors design with 25% spare ways for future use

Permanently label each way to identify circuit and rating.

Circuit protection - Miniature circuit breakers to BS EN 60898-1

RCCBs additional protection for circuits for compliance with Regulations

Labelling: All distribution boards shall be equipped with a unique identification reference label with the notation matching the information on the record drawing(s). The identity, size and location of the protective device on the supply of the Clearly identify protective devices. Provide final circuit identification charts and locate in a clear protective cover adjacent or within the door of the respective board.

Provide "Treatment for Electric Shock" notices adjacent each distribution board.

500.050 ISOLATING SWITCHES:

Application - To provide local isolation adjacent to fixed electrical equipment

Manufacturer and reference - EATON, or approved equivalent.

Utilisation category and making capacity to BS EN 60669-1, with earth terminal in enclosure.

Rating – to suit maximum electrical capacity of equipment

All isolating devices shall have a rocker switch, rotary switch or handle to facilitate ease of operation.

Where switches serve small essential service appliances, such as the fire alarm panel, they shall be equipped with a local secret key operated double pole switch. Devices shall be equipped with a neon indicator to indicate that the supply is energised.

500.055 SWITCHGEAR ACCESSORIES:

Provide switchgear accessories:

Cylinder locks on hinged doors, with 2 keys for each lock.

Provide each switchboard with sets of padlocks.

Spare MCB's and RCBO's - 2no of each sized utilized on the project and a suitable plastic box to house the spare components.

500.060 LUMINAIRES:

500.070 LAMPHOLDERS:

- Application Ceiling pendant to flats and communal bathrooms
 - Manufacturer and reference MK
 - Or approved equivalent.
 - Standard
 - BS 7895.
 - BS EN 61184, B22.
 - BS EN 60400.
 - BS EN 60238, E27.
 - Fixing
 - Bracket
 - Suspension.
 - Finish
 - Material
 - Heat resistant moulded plastic.
 - Ancillaries
 - Cord grip.
 - Lampshade ring.
- Ensure lampholders in luminaires of similar type and rating are identical.

Installation

Securely mount lampholder in luminaire.

Ensure metal lampholders incorporate an earthing terminal.

Ensure phase conductor is connected to centre contact of Edison screw lampholders

500.110 SUPPORT SYSTEM:

- Type Steel wire / Steel Rod
- Application Provide a minimum of one connection per fitting.

Ensure all luminaires, cable trunkings, cable trays, cable baskets, trunkings, conduits, equipment, etc. and other items are securely fixed to the main building structure.

The contractor shall install a system of 'Unistrut' type steel channelling suspended from the main building structure and allow for all proprietary hangers and fixings.

Ensure all luminaires, cable trays, basket, trunking, conduits, equipment, etc. are securely supported.

Flexible cable shall NOT to be utilised for supporting any luminaires.

In areas where suspended ceilings are to be provided support fittings independently.

DO NOT RELY ON THE SUSPENDED CEILING SYSTEM AS A MEANS OF SUPPORT.

Luminaires comprising of linear lamps shall be supported by threaded rods to suit the luminaire.

Recessed downlighters of less than 250mm diameter cut-out and ancillary components (presence detectors, photocells, etc.) in areas where suspended ceilings are to be provided shall be fixed centrally about the grid and provided with plywood backing plates. Backing plates shall occupy the complete ceiling tile.

- Manufacturer and reference Unistrut / Gripple
 - Or approved equivalent.
- Steel wire 2.5mm for lighting / Steel Rod 10mm for tray / basket

500.140 ENCLOSURES FOR ELECTRICAL ACCESSORIES:

- Type: Type A Flush steel, Surface metal clad or Plastic Dry Lining Box
- Application For the installation of electrical accessories.

Where walls are lined with plasterboard or similar coverings and where new partitions are formed accessories shall be flush installed.

With exception of store/plant areas and dado trunking installed items, the contractor shall assume that all accessories/outlets etc. are to be flush mounted.

- Manufacturer and reference; - MK Limited
- Standard, BS 4662 or BS 5733
- Pattern
 - Flush.
 - 25mm deep back boxes for lighting and small power
 - 44mm deep back box for data outlets
- Mounting
 - Adjustable steel grid.
- Material and finish
 - Pressed steel.
- Cover plate finish
 - Flush moulded plastic colour white/red/blue finish.
 - Plant Room Areas : Surface metal clad finish

500.140A ENCLOSURES FOR ELECTRICAL ACCESSORIES:

- Type B.
- Application - Enclosure for surface mounting of accessories within store and plant areas.

Manufacturer and reference to be compatible with accessories from the same manufacturer.

Or approved equivalent.

- Standard, BS 4662 or BS 5733
- Pattern
 - Surface.
- Mounting
 - Direct to enclosure.
- Material and finish
 - Pressed steel.
- Cover plate finish
 - Metal in store and plantroom areas.
- Cover plate pattern
 - Surface type.

500.140B ENCLOSURES FOR ELECTRICAL ACCESSORIES:

500.150 LIGHTING SWITCHES:

- Type Grid mounted
- Application General manual lighting control
- Manufacturer and reference
MK Logic Plus
- Standard
 - BS EN 60669-1 with earth terminal in enclosure.
- Switch type
 - Gang as drawing
 - Rocker bar
- Rating
 - 20A.
- Switch mechanism
 - Snap action microgap.
 - Retractive type switch for dimming control.
- Pole configurations
 - Single pole.
 - 2 way.

500.158 ISOLATING SWITCHES:

- Provide single phase isolating switches for items of fixed equipment over 13 ampere rating.
- Standard
- BS EN 60947-3.
- Switch type
 - quick make and break
- Rating
 - As indicated on tender drawings
- Pole configuration
 - As indicated on tender drawings
- Ancillaries
 - Phase barrier
- Mechanical off indicator.

500.160 SWITCHED FUSE CONNECTION UNITS:

Type – General

Application; Final control of fixed equipment and appliances

Manufacturer and reference; MK Logic Plus (white finish)

Standard

BS 1363-4.

- Double pole switching where indicated.
- Unit type
 - Rocker bar
 - Red Rocker for Essential circuits
- Ancillaries
 - Red indicator lamp.
 - Fuses to BS 1362, sized in accordance with fixed load
 - Cord outlet and cord grip.

500.170 SOCKET OUTLETS:

- Type General
- Application
- Manufacturer and reference
Generally - MK Logic Plus
- Standard
 - BS 1363-2.
- Type
 - Socket outlet.
 - Switched.
 - DP switch.
 - 1 gang.
 - 2 gang.

500.180 CORD OUTLETS:

- Type 1 gang cable outlet
- Application: To provide final connection to low level items or items with limited access. Outlets for final connection to fixed electrical equipment and to provide a cable aperture to assist a neat earth installation to be installed.
- Manufacturer and reference MK Logic Plus
Or approved equivalent.
 - Standard - BS 5733.
 - Rating to suit application 20 or 45 amp
 - Pole configuration
 - DP.
 - TPN.
 - Ancillaries
 - Cord grip.

500.250 ACCESSORIES MOUNTING HEIGHTS:

Provide switches and socket outlets for lighting and other equipment in habitable rooms at appropriate heights between 450mm and 1200mm from finished floor level, in accordance with Building Regulations Approved Document M and BS 8300.

High level accessories mounted at 2000mm and low level accessories mounted at 450mm refer to drawing for final details.

600.000 LIGHTING AND POWER – WORKMANSHIP

600.010 LAMPS AND LUMINAIRES INSTALLATION:

Install luminaires in horizontal plane unless otherwise shown.

Ensure luminaires are clean.

Ensure classification of luminaires is appropriate.

- Install recessed and semi-recessed luminaires as manufacturer's details.
- Install wall mounted luminaires at height 1.8M nominally.
- Support and fixing
 - Where luminaire is supported from conduit, provide a conduit box forming an integral part of conduit system at each point of suspension. Where conduit enters luminaire, use backnuts and washers to secure luminaire to conduit.
 - Where luminaire is supported from trunking, use appropriate clamps or brackets.
 - Use washers, nut and lock-nut at top and bottom of rod for rod suspensions.
 - Use hook cover for suspension of chain from circular conduit box.
 - Use manufacturer's recommended chain hook for connection to luminaires.
 - Suspend flexible cord from ceiling rose.
 - Support luminaires directly from building fabric with steel wire rope or threaded bar

Do not support luminaires directly from any flammable non-metal or heat sensitive materials.

Ensure suspensions are vertical unless otherwise shown.

600.020 CONNECTIONS TO LUMINAIRES:

Connect circuit wiring to luminaires. Use grommet where cables enter luminaire body.

Connect the earthing terminal of Class 1 luminaires to the circuit protective conductor of the supply circuit.

Clip loose wiring within luminaire, at 300mm intervals.

- Conduit, rod or chain suspension.
 - Terminate in terminal block within supporting conduit box. Use flexible cord from terminal block to luminaire, installed within tube of conduit suspension. Secure cord to rod or chain without weaving cord through chain.
 - Terminate at supply terminals of luminaire.
- Recessed
 - Terminate at plug and socket to BS 546, located not more than 500mm from the access through the ceiling. Use flexible cord from plug to supply terminals of luminaire.
 - Terminate in terminal block within conduit box. Install flexible wiring to luminaire.
- Direct fixing

600.030 ELECTRICAL ACCESSORY INSTALLATION:

Provide CPC between earth lug on metal box and accessory except for plastic accessories.

Ensure there is no damage to accessories during installation.

Protect surface mounted accessories from painting. Install front plates of flush mounted accessories after painting.

Align accessories to building finishes. Mount grouped accessories in line, parallel and equidistant.

700.000 MISCELLANEOUS ELECTRICAL EQUIPMENT

700.010 HAND DRYERS

- Manufacturer - Dyson
- Type - Airblade dB AB14
- Colour - White FT5
- Installation - Install units in accordance with the manufactures recommendations
- Wiring - Wire units via a high level switched fused connection unit with a vertical flush conduit drop to permit concealed wiring to the rear of the dryer.

Note! The final selection of the dryers shall be confirmed with the Employer before ordering.

800.000 SPECIALIST SYSTEMS

800.010 EMERGENCY LIGHTING SYSTEM:

Application: Directional & General Escape Lighting in compliance with British Standards.

Manufacturer and reference: As per the general lighting luminaires.

Comply with the Manufacturer's instructions and recommendations.

Fittings may be:

- Non-Maintained and/or Maintained units
- Self-contained luminaires

Lamp Type - Incorporate LED technology.

Illumination of signs - Illuminate exit, emergency exit and escape route signs so that they are legible at all times.

All emergencies luminaires shall incorporate "self-test" facilities.

800.030 TELECOMMUNICATIONS SYSTEM:

Liaise with and attend upon the operation and maintenance organisation of the telecommunication system and ensure the installation meets all the requirements of that organisation.

800.045 DISABLED ALARM SYSTEM:

Ensure that all Disabled WC facilities are equipped with a local toilet alarm system.

800.150 FIRE ALARM SYSTEM:

Application - provide L2 protection in compliance with BS 5839-1.

Provide fire alarm system to - Enhance safety of occupants

Reduce loss of property

800.225 FIRE ALARM CONTROL PANEL:

Type:- Advanced MX Pro - Addressable Fire Alarm Control Panel located in Main Entrance.

800.230 FIRE ALARM SYSTEM - RECORD DRAWINGS AND OPERATING INSTRUCTIONS:

Provide instructions on use of installation to person responsible for use of premises. Supply the user with a logbook certificate of installation and commissioning and record drawings in accordance with BS 5839-1.

Circuit diagrams of fire alarm system.

Provide record drawings along with formal test and commissioning certificates.

300.090 CCTV SYSTEM:

Standard

- BS 7958.
- BS 8418.
- BS 8495.
- BS EN 50131-1.
- BS EN 50132-7.

Carry out survey of proposed CCTV coverage

- Design CCTV system.
- CCTV system coverage
- Ensure system provides effective and adequate viewing of areas indicated on the drawings at light levels
- bright sunlight down to
- 0.4 lux.
- 4.0 lux
- internal daylighting down to 100 lux.
- artificial illumination provided at indicated area.
- night viewing using camera mounted infrared projectors.
- night viewing down to 0.5 mlux if necessary with use of image intensifier.
- NSI approved
- System programming
- software
- System test specification
- Video transmission system
- BS EN 50132-5-1, BS EN 50132-5-2, BS EN 50132-5-3.

800.250 ELECTRICAL INSTALLATION METALWORK:

Bond together all exposed conducting parts with joints of negligible impedance. Carry out work in accordance with BS 7671 (IET Wiring Regulations 18th Edition), BS 7430, Electricity Safety Quality and Continuity Regulations and Local Electricity Supply Authority Requirements.

- Comply with the requirements of BS EN 50310.

800.260 EXTERNAL SOCKETS AND EQUIPMENT:

Provide each circuit serving external socket outlets and sockets for external use of equipment with high sensitivity residual current device, earth leakage tripping current not exceeding 30mA.

800.270 PROTECTIVE CONDUCTORS:

Provide protective and equipotential bonding conductors. Size in accordance with BS 7671 (IET Wiring Regulations 18th Edition).

- Material
 - Copper LSF to BS 7211.
 - Bare copper.
 - Copper tape insulated PVC.
 - Copper tape insulated
 - Metallic screwed conduits.
 - Metallic trunking.
 - Armouring or sheathing of cables.
 - Protective conductor of multi-core cable.

800.300 INSTALLATION OF EARTHING SYSTEM:

Carry out installation of earthing system in accordance with BS 7671 (IET Wiring Regulations 18th Edition) and BS 7430. Secure bare copper tape to structure with fixing devices which avoid piercing tape and ensure 3mm (minimum) clearance of tape from structure, at 450mm maximum centres.

Locate electrodes not less than 2m distant from structure and away from all cables and metallic fences.

Drive rods vertically. Locate electrode heads just below ground level. Install interconnecting tape 750mm below finished ground level, rising vertically at each electrode.

Ensure where electrodes are installed in a group, minimum distance between electrodes is twice depth of rods.

Provide earth bar at incoming electrical service position. Mount on insulated supports. Drill holes, one for each cable plus 30% spare holes (two minimum) at 50 mm minimum centres through bar for connection of cable lugs. Ensure holes are minimum size to maintain adequate contact.

Connect main earth conductors and main equipotential bonding conductors to earth bar.

Terminate protective conductors on switchboard earthing bar.

Extend protective conductor from incoming main cable gland direct to earth bar.

Extend separate protective conductor from earth bar to switchpanel served by incoming main cable.

Extend when main cable is provided by Electrical Supply Authority, separate protective conductor from main cable armouring gland (or direct earth terminals or PME earth installed by supply Authority) to earth bar.

W51 LV EARTHING AND BONDING

300.000 GENERAL

300.020 EARTHING AND BONDING SCHEDULE:

- Carry out earthing and bonding installation

300.030 EARTHING SYSTEM TYPE/PME INSTALLATIONS:

- Type
- Application
 - Provide protective conductors
- Material Copper
 - Protective bonding conductor(s)
- Material Copper
 - Supplementary bonding conductor(s)

300.032 COMMON BONDING NETWORK:

- Where appropriate, form a Common Bonding Network for information technology equipment by equipotential bonding of metalwork throughout the building. Carry out work to the Common Bonding Network in accordance with BS 7671, BS EN 50174-1, BS EN 50174-2 or BS EN 50174-3 and BS EN 50310. Include in the CBN but not limited to
 - Steel structural frames.
 - Ceiling grids.
- Services
- Water services.
- Air ductlines.
- AHU plant
- Gas services.
 - Power cable containment

300.050 SOIL TESTS:

- Carry out soil tests in accordance with BS 1377 to establish soil characteristics
 - pH.
 - Redox potential (V).
 - Moisture content (%).
 - Dissolved salts
- Chloride.
 - Organic acids.
- Apply one or more acceptable industry practice testing method to carry out soil resistivity tests in accordance with the requirements of BS 7430.

300.060 RISE IN POTENTIAL IN TELECOMMUNICATIONS:

- Ensure the potential rise in telecommunications circuits due to power system earth faults is limited as BS 6701

310.000 PRODUCTS/MATERIALS

310.030 MAIN EARTH TERMINAL CONNECTIONS:

- Connect main earth conductors and main equipotential bonding conductors to main earth terminals.
- Terminate circuit protective conductors on switchboard and control panels earthing bar.
- Terminate conductors with
- Compression type lugs suitable for bolting direct to bar.
- Bond all main equipment and plant to an earth terminal, connected to the bonding ring or radial conductor(s).
- Connect telecommunications and data equipment in accordance with BS 6701.
- Where appropriate, provide torque record of the bonding connections.

310.120 PORTABLE EARTH CONNECTIONS:

- Provide tape loops for the connection of portable earths

310.130 CEILING SUPPORTS:

- Type
- Application
- Bond main supports to exposed conductive parts of electrical installation where appropriate (based on risk assessment).
- Conductor
 - Use PVC insulated copper cable, sized
 - Use LSF insulated copper cable, sized 6mm²

320.040 EQUIPOTENTIAL BONDING:

Type

Application

Bond to main earth terminal all extraneous conductive parts of the installation in accordance with

- BS 7430.
- BS 7671.
- BS EN 50174.
- BS EN 50310.
- BS EN 62305.

Ensure the following services are bonded

- Structured steel
- Metallic ceiling grids.
- Main gas pipes.
- Air ductlines.
- Heating pipework.
- Chilled water pipework.
- Exposed metallic parts of building structure.
- Metallic cable sheaths of all cables except British Telecom.
- Lightning protection systems.
- Bond with supplementary equipotential bonds to protective conductor system, all simultaneous accessible conductive.
- Ensure the following areas are bonded to BS 7671, Section 701
 - Bathrooms and shower rooms.
- Bond to non-current carrying parts of electrical installation in associated spaces to BS 7430.
- Use clamps to BS 951 for bonding of pipes.

W52 LIGHTNING AND SURGE PROTECTION SYSTEMS (LSPS)

300.000 GENERAL

300.015 TYPE OF LIGHTNING AND SURGE PROTECTION SYSTEM (LSPS):

- Provide a Class IV LPS system
- External non-isolated LPS or exceeds the assessed lightning protection level (in accordance with the risk assessment results).

300.030 LIGHTNING AND SURGE PROTECTION SPECIALIST:

- Engage a OMEGA RED GROUP lightning protection specialist to carry out the following elements of the lightning and surge protection system (LSPS).
 - Design - provide independent peer review for lightning current distribution design and shielding calculations based on Electro-Geometric Model (EGM) for Lightning Protection Zones 1, 2 and 3; provide independent peer review for over-voltage surge protection schematic with proper energy coordination; provide independent peer review for overcurrent protection on surge protection devices.
 - Installation - provide independent peer review for the selection and positioning of lightning and surge protection device wiring installation drawings showing no detrimental influence to HV and LV installations.
 - Testing.
 - Commissioning.
- Specialist

300.070 PROTECTION OF ELECTRONIC EQUIPMENT:

- Protect electronic equipment against lightning induced EMC and over-voltage surges in accordance with BS 7671 and BS EN 62305 and CIBSE Guide K.
- Equipment transient design level (Volts)
- Transient Control level (Volts)

310.000 PRODUCTS/MATERIALS

310.020 BUILDING ELEMENTS:

- Use building elements as natural conductors in accordance with BS 7671 and BS EN 62305-3 using Annex E as a code of practice for design and construction and test.
- Ensure reinforcing bars are in good electrical contact by
 - Welding
- Multiple fortuitous contact by binding wire.

310.030 LIGHTNING PROTECTION SYSTEM BONDS:

- Type - Tape
- Application
- Manufacturer and reference. – Furse or Equal and Approved
- Rigid.
- Metal work clamp
- Rainwater down pipe bond
- Water main bond
- Bond material
- Material
 - Copper

- BS EN 60228.
- Connectors to down conductor or air terminal
 - Test and Junction
 - Bolted
 - Compression joint

310.050 SURGE PROTECTION DEVICES:

- Protect equipment against the risk of permanent failures or damage due to surges by considering the withstand voltage UW as defined by BS EN 60664-1 (see BS 7671 Table 44.3)
 - Application
 - Manufacturer and reference. – Furze or Equal and Approved
- Standard - PD IEC/PAS 60099-7, DD CLC/TS 50539-22 and BS EN 61643-11.

Selection method DD CLC/TS 50539-22, DD CLC/TS 61643-12.

Voltage sensitive electronic equipment LPZ3.

Highly voltage sensitive electronic equipment LPZ4, 5 etc.

320.040 EARTHED EQUIPOTENTIAL BONDING:

Bond building structural elements and metallic services as per BS EN 62305, BS 7671 and BS 7430 including, Steel structural frame.

Metallic roof coverings.

Services

Television and radio aerials and supports.

Metal flues and flue lining.

Water services.

AHU's

Gas services.

Roof level plant rooms.

Isolate building structural elements and metallic services as BS EN 62305 including

320.070 MAINTENANCE:

The Lightning and Surge Protection System (LSPS) shall be designed and installed with ease of carrying out maintenance - test points and access to lightning and earthing elements should be provided.

ELECTROMAGNETIC COMPATIBILITY (EMC)

330.010 REGULATIONS AND AGREEMENTS:

Comply with regulations of all concerned authorities for the installation and connection of public utility services to a common earth termination network, comply with agreements made with bodies concerned with adequate separation distance from other services connected to a common earth termination network.

Public utility services

Electricity

Information technology, data and telephone communication (refer to BS EN 50174)

W69 CENTRAL CONTROL/ BUILDING MANAGEMENT

100.000 SYSTEM DETAILS

100.010 PERFORMANCE OBJECTIVES:

Integrate all mechanical plant and sensors into a new BMS system located within a new mechanical control panel located within the building lower ground floor plantroom.

- Use a controls specialist to design, supply, install, test, and commission a complete building management system.
- Control Specialists to be from the MTCC approved installers lists:
BSC Swansea – 01792 561900
BBM Cardiff – 029 20451446
- The control panel to be split into 2 sections to assist installation within the plantroom including an area of lowered ceiling.

The BMS system shall be capable of integrating with WEB based software interface with access via an internet connection and future off site BMS system (based on TREND IQ4 type system but to be confirmed prior to order).

The building is served via hybrid system consisting of a gas boiler (secondary side) and external ASHP arrangement (as the Primary side). The systems shall interface to a plate heat exchanger complete with low loss headers on both sides. The secondary side shall also include a buffer vessel to assist with load levelling. The secondary side low loss header also connects to the building CT and VT heating systems.

The ASHP shall operate down to an external air temperature of between 2 to 4 degC, at lower external air temperatures the gas fired boiler shall act as the primary energy source.

1 N^o wall mounted gas fired high efficiency condensing boilers shall provide Low Temperature Hot Water (LTHW) heating water alongside 3 N^o external mounted Air Source Heat Pumps (ASHP), with space heating via 1 variable temperature circuit (VT) circuits serving radiators, trench heating etc and ventilation heating via 1 constant temperature circuit (CT) circuit including air and the radiators located with Assisted WC and kitchen.

The heating system (primary and secondary side) shall be pressurised via wall mounted pressurisation unit and an expansion vessel, dosing pots etc.

The building is served via hybrid system consisting of a gas boiler (secondary side) and external ASHP arrangement (as the Primary side). The systems shall interface to a plate heat exchanger complete with low loss headers on both sides. The secondary side shall also include a buffer vessel to assist with load levelling. The secondary side low loss header also connects to the building CT and VT heating systems.

The ASHP system (primary side) shall be stand alone with interface to the BMS control panel, the secondary side shall be controlled from the Main control panel.

The ventilation systems shall be complete with interface to the main BMS control panel.

The building heating and ventilation shall be time clock controlled via the control panel (set up day /time to be confirmed and to include holiday / weekend set back). An 1 hr, 2hr, 3 Hr override control switch shall be

provided at the reception desk to give extended run of the heating, vent plant located at the reception desk or mounted securely on a wall adjacent to the desk (position to be agreed).

100.020 DESIGN PARAMETERS:

General

The new centralised controls shall incorporate the new mechanical plant detailed in earlier Sections and generally as shown on the drawings including all sensors, switches, and temperature sensors.

The controls package shall comply with Building Regulations and shall enable the fully automatic operation and regulation of the primary mechanical services as indicated in the following clauses. The controls package should be complete with a web-based software interface, accessible via an internet connection.

The Control Panel components shall be enclosed in a wall or floor mounted lockable enclosure and incorporate all fuses, relays and devices as required to power and communicate with the remote equipment.

The control panel shall incorporate fascia mounted hand/auto/off switching as necessary and LED red/green fault and run indication and LED amber warning lights.

A fascia mounted back lit controller shall enable authorised users to adjust the main operating control parameters such as time operation, room temperature control etc.

The Controls Specialist shall provide all power and control wiring from/to the control panel(s) to items of fixed equipment as generally indicated on the mechanical schematic with local safety isolation in compliance with Regulations and to all items of control equipment (i.e. detectors, thermostats, differential switches etc.).

All wiring within the Plant Room(s) shall be enclosed in galvanised conduit and/or trunking. Provide local isolation adjacent all equipment. Provide all wiring to remote equipment in suitably sized and rated cabling screened where necessary to prevent interference from external influences.

Provide power supplies to air handling unit fans and similar large current consuming devices, in armoured cables securely fixed to the structure or to cable tray.

Where equipment is electrically supplied from the mechanical control panel, they shall be fitted with an electrical consumption meter to enable monitoring of ongoing power consumption.

Facilities to be provided for Water, Gas, elec and Heat meters shall be connected to the control panel in the future to enable remote readings.

Volt free contacts shall be provided to control the plant in a fire condition in the form of volt free contacts from a local fire alarm interface (FAI). Upon receipt of a signal all plant shall be shut down. An emergency stop push button shall be supplied near to the plantroom entrance to enable the shut-down of all plant from the entrance.

The following controls and control items will be provided, fitted, and wired by the control specialist:

Facilities for the future installation of incoming gas, water, elec and future heat meters (2 number) shall be allowed for

Each meter shall be monitored via a pulsed volt free contact which shall be installed on the meter in the future by a control specialist. Information with respect to the pulse frequency and duration shall be provided by the supplier of the meters. The BMS input shall be suitable for metering purposes and capable of recognising and counting a pulse with a high frequency and short duration.

Each item of meter data shall be displayed on a common metering services graphic at the BMS operator's station and recorded by the BMS.

Gas Leak Detection System

The gas leak detection system shall raise an alarm via a volt free contact should a condition occur where the gas leak detection system is in an alarm state.

Should an alarm be raised then all plant shall shut down as part of a safety circuit, and the gas flow proved before any gas consuming plant is enabled.

Natural Gas Boiler

The control panel shall control and provide power to the new condensing wall-mounted boiler via a signal from the central control panel. The boiler run signal shall be via a 0 – 10v signal from the main control panel within the plant room.

The sequencing /control of the boilers shall be automatically determined by the BMS controller on a regular basis to ensure “staged” control of boiler. The system shall monitor the individual boiler for run/fault conditions and hours of operation. In the event of a fault the boiler shall shut down. Provide run/fault indicator lamps and rotary switches for the boiler to be fitted to the fascia of the main control panel.

ASHP

The ASHP shall be complete with stand alone controls as indicated on drawings with interface to the main control panel to serve the Primary side with interface to the secondary side via plate heat exchanger.

The sequencing of the ASHPs shall be automatically determined by the their controller on a regular basis to ensure equal run periods for all ASHPs. The system shall monitor the individual ASHPs for run/fault conditions and hours of operation. In the event of a fault the respective ASHP shall shut down. Provide common run/fault indicator lamp on the fascia of the main control panel.

LTHW Sensors

The sensors generally indicated within the LTHW (primary and secondary) systems shall be monitored by the BMS and shall be used for control of the pumps, boiler etc.

The sensor values shall be logged to enable monitoring and logging to aid future investigation and fault finding.

Pumps (primary side from ASHP header to plate heat exchanger) – P4A & P4B

The 1 N^o twin-head LTHW secondary pump shall be integrated and powered from the main control panel via a suitable isolator. The BMS shall provide an enable signal to the pump via the digital start/stop input and monitor fault signals via the integrated relay, the BMS shall monitor/record the following:

- Run status.
- Fault Signal.

The pump set shall comprise of twin pumps operating as duty and standby and shall be provided with pressure differential switches for run/fault monitoring with visual indication. The Twin Head Pump shall be provided with automatic changeover facility and the lead pump shall be cycled by total hours run to ensure even wear on each pump. In addition, the controls shall manage the automatic changeover in the event of a pump failure.

A rotary switch shall be fitted to the fascia of the main control panel for Pumps On / Pumps Off / Pumps Auto control. After the shutdown of the heating ASHP, the pumps will run-on for a period of not less than 15 minutes Adjustable) to dissipate residual heat in the ASHP.

Pumps (secondary side to buffer from plate heat exchanger) – P5A & P5B

The 1 N^o twin-head LTHW secondary pump shall be integrated and powered from the main control panel via a suitable isolator. The BMS shall provide an enable signal to the pump via the digital start/stop input and monitor fault signals via the integrated relay, the BMS shall monitor/record the following:

- Run status.
- Fault Signal.

The pump set shall comprise of twin pumps operating as duty and standby and shall be provided with pressure differential switches for run/fault monitoring with visual indication. The Twin Head Pump shall be provided with automatic changeover facility and the lead pump shall be cycled by total hours run to ensure even wear on each pump. In addition, the controls shall manage the automatic changeover in the event of a pump failure.

A rotary switch shall be fitted to the fascia of the main control panel for Pumps On / Pumps Off / Pumps Auto control. After the shutdown of the heating ASHP / boiler, the pumps will run-on for a period of not less than 15 minutes Adjustable) to dissipate residual heat in the boilers/ASHP.

Pumps (secondary side to boiler side) – P6A & P6B

The 1 N^o twin-head LTHW secondary pump shall be integrated and powered from the main control panel via a suitable isolator. The BMS shall provide an enable signal to the pump via the digital start/stop input and monitor fault signals via the integrated relay, the BMS shall monitor/record the following:

- Run status.
- Fault Signal.

The pump set shall comprise of twin pumps operating as duty and standby and shall be provided with pressure differential switches for run/fault monitoring with visual indication. The Twin Head Pump shall be provided with automatic changeover facility and the lead pump shall be cycled by total hours run to ensure even wear on each pump. In addition, the controls shall manage the automatic changeover in the event of a pump failure.

A rotary switch shall be fitted to the fascia of the main control panel for Pumps On / Pumps Off / Pumps Auto control. After the shutdown of the heating boiler, the pumps will run-on for a period of not less than 15 minutes Adjustable) to dissipate residual heat in the boilers.

Pumps (VT) – P7A & P7B

The 1 N^o twin-head LTHW secondary VT pump shall be integrated and powered from the main control panel via a suitable isolator. The BMS shall provide an enable signal to the pump via the digital start/stop input and monitor fault signals via the integrated relay, the BMS shall monitor/record the following:

- Run status.
- Fault Signal.

The pump set shall comprise of twin pumps operating as duty and standby and shall be provided with pressure differential switches for run/fault monitoring with visual indication. The Twin Head Pump shall be provided with automatic changeover facility and the lead pump shall be cycled by total hours run to ensure even wear on each pump. In addition, the controls shall manage the automatic changeover in the event of a pump failure.

A rotary switch shall be fitted to the fascia of the main control panel within the plant room for Pumps On / Pumps Off / Pumps Auto control. After the shutdown of the heating boiler(s), the pumps will run-on for a period of not less than 15 minutes Adjustable) to dissipate residual heat in the boilers.

Pumps (CT) – P8A & P8B

The 1 N^o twin-head LTHW secondary CT pump shall be integrated and powered from the main control panel via a suitable isolator. The BMS shall provide an enable signal to the pump via the digital start/stop input and monitor fault signals via the integrated relay, the BMS shall monitor/record the following:

- Run status.
- Fault Signal.

The pump set shall comprise of twin pumps operating as duty and standby and shall be provided with pressure differential switches for run/fault monitoring with visual indication. The Twin Head Pump shall be provided with automatic changeover facility and the lead pump shall be cycled by total hours run to ensure even wear on each pump. In addition, the controls shall manage the automatic changeover in the event of a pump failure.

A rotary switch shall be fitted to the fascia of the main control panel for Pumps On / Pumps Off / Pumps Auto control. After the shutdown of the heating boiler(s), the pumps will run-on for a period of not less than 15 minutes (Adjustable) to dissipate residual heat in the boilers.

LTHW VT Circuit control

The space heating VT heating circuit shall include a mixing control valve (3 port) to allow the flow temperature to be blended to a suitable temperature linked to external air temperature and internal space temperatures. The three-port blending control valve (labelled MCV01) shall be under the control of the BMS. A control loop incorporating the LTHW flow and return temperature sensors shall modulate the position of the control valve.

Frost Protection System

A three-stage frost protection system shall be programmed and controlled via the BMS.

STAGE 1

The external air temperature sensor shall be initiated when the external air temperature falls to 2°C and remain on until 3°C is reached during which the twin head pumps are enabled, all diverting, and zone control valves should be in the open position, the ASHP / boilers are not required to operate, unless called for elsewhere.

The differential pressure sensors across the pump shall be monitored to prove the flow and if flow is not proved then a critical alarm should be generated on the BMS operator's station.

STAGE 2

The Primary and Secondary side LTHW temperature sensors shall be monitored and should either fall to 10°C or lower, the primary plant shall operate until the ASHP / boiler secondary side return temperature reaches 30°C, all control valves shall be in the open position.

The temperature sensors shall be monitored and if heat is not proved then a critical alarm should be generated on the BMS operator's station.

STAGE 3

The 2 No room temperature sensors shall be monitored and should any of the temperature sensors fall to 10°C or lower (set point temperature to be adjustable via the control panel), then ASHP / boiler(s) & primary plant shall be enabled. The primary plant should operate until the average space temperature sensor(s) reaches 14°C, all control valves should be in the open position.

The room side temperature sensors shall be monitored and if heat is not proved then a critical alarm should be generated on the BMS operator's station.

Air Curtain (DAC)

A rotary switch shall be fitted to the fascia of the main control panel within the plant room for DAC On / DAC Off control.

The door air curtain integral controller shall control the associated 3 port control valve.

Trench Heater

The trench heater shall be controlled via room mounted adjustable room temperatures sensors direct to the heating unit control valves within the trenching etc. This shall also operate the integral fans.

Heating demand shall be determined by the temperature sensors and the trench heater shall be controlled to match the individual zone.

A rotary switch shall be fitted to the fascia of the main control panel within the plant room for trench heating On / Off / Auto control.

AHU Recovery Units (AHUs)

The AHUs (01 & 02) shall be capable of varying fresh air supply in response to room CO₂ level to avoid over supplying fresh air and reduce energy consumption. The AHU's shall be complete with controls and connect to the central BMS.

Override control of the heat recovery units shall be possible via a touch screen controller located on the teacher's desk or mounted securely on a wall adjacent to the teacher's desk position as described in the next item.

The AHU's shall be monitored for fault conditions of the supply and extract fans, and filter condition. Indicator lights shall be added to the mechanical control panel to indicate run and fault status of each HRU. A rotary switch shall also be fitted to the control panel for fan Hand/Off/Auto control.

Override switch to Control Panel

The control panel shall incorporate a override switch for heating and ventilation.

After a period of time, (for example 1hr, 2 Hr or 3Hr), the local override shall default to the Full Auto option to prevent permanent override of the BMS control.

Air Handling Units (AHU's)

To be complete with integral controls with interface of Run, Fault etc at control panel:

- Main Plant Isolator,
- Fan Power Supplies
- Suitable AHU Controller,
- Modbus / BACnet IP (Or other suitable open protocol) Interface from Controller to control panel,
- Fresh Air temperature sensor,
- Filter Differential Pressure Sensor (DPS) (3 N^o),
- Heat Exchanger (HX) Bypass Damper Actuator,
- Heat exchanger room side supply air temperature sensor,
- Airflow differential pressure switch (DPS) (2 N^o),
- Heating Coil control three-port valve and actuator,
- Supply duct velocity sensor,
- Supply duct temperature sensor,
- Extract duct temperature sensor,
- Room mounted CO₂ sensor (averaging for AHU 01),
- Supply Duct High Pressure Sensor,
- Extract Duct Low Pressure Sensor,
- LTHW pipework frost thermostat.
- Supply air off control set point adjustable via BMS

Note: The Controls Specialist shall liaise with the AHU manufacturer for the selection of the appropriate control accessories and controller which are to be supplied and installed by the Controls Specialist.

The AHU set-points are to be controlled by their integral sensors and to be design to provide tempered air only (21 degC upto an external air temperature of +13 degC , 18 degC for external air temperature of between +13 degC and 18 degC and no heating when external air temperature is above 18 degC (control panel adjustable) and centralised BMS head end. The AHU controllers shall be connected to the central BMS

system via a Modbus / BACnet interface (Or other suitable open protocol) to allow the BMS to monitor, record, and adjust (where applicable) all control and set points alongside the following:

- Time Clock,
- Run status,
- Fault Signal and Description,
- Internal Room Temperature & set-point,
- Supply Air Temperature set-point.

The AHU controllers shall send a heat demand signal to the central BMS head end when LTHW is required, the BMS shall then energise the LTHW CT twin head pump and if required energise sufficient ASHP / boilers to suit the total LTHW demand.

Ancillary Components

The Contractor shall make due allowance for the provision of all controls for the integration of ancillary components such as :

Gas Leak detection

Plate heat exchanger

Pressurisation Units

External Weather Sensor

to maintain fully automatic control and safety shut down of the system(s).

100.050 SYSTEM SCHEMATICS:

Refer to schematic drawings for proposals but final detailed requirements to be developed by the Controls Specialist.

100.060 SYSTEM DRAWINGS:

To be provided by the Controls Specialist.

200.000 GENERAL

200.010 SYSTEM REQUIREMENTS:

- Select control components and equipment, suitable to meet system objective requirements. Ensure that system safety complies with:
 - BS EN 61508-series for control of systems where an assessed safety integrity level is required.
 - BS EN ISO 13849-1 and BS EN ISO 13849-2 for safety-related components of control systems.
 - BS EN 13850 for design of emergency stop functions.
 - BS EN 61511-1 for functional safety of programmable controllers.
- Comply with BS EN 15500-1 for control of heating, ventilation, and air conditioning for energy performance.
- Comply with the following standards for building automation and control systems (BACS) components:
 - BS EN ISO 16484-2 for hardware
 - BS EN ISO 16484-3 for functions
- Comply with the requirements of the relevant parts of BS EN 50491 appropriate to the project, for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS).

200.030 CONTROLS SPECIALIST:

- Use a controls specialist to design, supply, install, test, and commission the complete BMS system

210.040 ELECTRICAL SAFETY:

Ensure that the BMS complies with the following legislation:

The Electrical Equipment (Safety) Regulations 2016.

The Construction Products Regulations 2013.

The General Product Safety Regulations 2005.

Ensure that the BMS installation complies with BS 7671.

Ensure that control panels comply with:

- Relevant parts of BS EN 61439-series.
- BS EN 60204-1 where the control panel is classed as Machinery in accordance with the Supply of Machinery (Safety) Regulations 2008.
-

210.050 ELECTRICAL SUPPLY:

- Ensure that the BMS can operate when supplied with electricity conforming to:
- The Electricity Safety, Quality and Continuity Regulations 2002 (as amended)
- BS EN 50160 voltage characteristics of electricity supplied by public distribution systems
- Additional voltage drops within the consumer's electrical installation according to BS 7671 (IET Wiring Regulations)

210.060 EMC:

- Ensure all monitoring system equipment is compatible and does not adversely affect any other equipment installed in the same location.
- Ensure all systems are designed and installed with due consideration to good electromagnetic compatibility (EMC) practice, and in line with EMC requirements of relevant standards including:
- BS 7671 (IET Wiring Regulations)
- BS EN 50310 for earthing and bonding in relation to communications system components
- BS EN 50174-series for communications and control cabling
- BS EN 61000-6-7 and BS EN 61000-1-2 as relevant for EMC in relation to functional safety
- Ensure all equipment complies with the Electromagnetic Compatibility Regulations (2016), carries the CE Mark, and is suitable for the electromagnetic environment in which it is to be used, for the service to which it is to be put.
- Ensure fire alarm interface equipment complies with BS EN 50130-4 where relevant.

SCHEDULE OF MOUNTING HEIGHTS

The following mounting heights are given for guidance only. For construction purposes the Electrical Services Contractor shall confirm all heights with the Employer or the Employers representative.

Item	Height AFFL	Measured to
Distribution Boards	1800mm	Top of unit
Lighting Switches	1050mm	Underside of faceplate
Wall mounted luminaires	1900mm	Bottom of luminaire
Temperature Thermostat	1500mm (to be agreed for specific DDA and manufacturers requirements)	Underside of faceplate
Fan Isolator Switch	2150mm	Underside of faceplate
Socket Outlets	450mm	Underside of faceplate
Socket Outlets, above worktops	150mm above worktop to be co-ordinated with tiling.	Underside of faceplate
Fused connection units, above worktops	150mm above worktop to be co-ordinated with tiling.	Underside of faceplate
Off Peak Heaters	400mm	Underside of faceplate
Panel Heaters	400mm	Underside of faceplate
Fan Heaters – high level	As indicated on drawings	
Hand driers	2200mm	Underside of faceplate with low level outlet for hand dryer
Window/Wall Extract Fans	Underside of accessory to be in line with underside of fan	
Immersion Heaters	1350mm	Underside of faceplate
Cooker/Equipment Isolators	1350mm	Underside of faceplate
Cooker cable connection units	450mm	Underside of faceplate
Telephone Outlets\ Data Outlets	450mm	Underside of faceplate
Room sensors\ Thermostats	1400mm	Top of faceplate
Lighting switches (Assisted W.C.s)	1050mm	Underside of faceplate
Fire Alarm Panels	1650mm	Top of panel
Fire Alarm Break-Glass Contacts	1050mm	Underside of faceplate
Fire Alarm Remote Control Switch	1050mm	Underside of faceplate
Fire Alarm Sounders	2200mm	Underside of faceplate
AOV override and Manual call points	1050mm	Underside of faceplate
Door Access Fob/carder reader, green emergency manual call point and requests to exit button	1050mm	Underside of faceplate
Video Entry Unit	1050mm	Underside of unit
Fused connection unit for Intruder Alarm	300mm below ceiling in store cupboard. With lower level flex outlet to suit. TBC on site.	Underside of faceplate
Dado trunking	1000mm	Coordinate with location e.g. window cill, white boards etc.

APPENDIX A

SUMMARY OF TENDER

For

MECHANICAL SERVICES

The contractor must complete and price **ALL** items identified in the tender summaries in order to be a bona fide and complete tender return.

SUMMARY OF TENDER

MECHANICAL ENGINEERING SERVICES

The Contractor shall include for the **detailed design**, supply, delivery, installation, testing and commissioning of all items of equipment to form a complete installation.

No	Description	Cost
1.	Preliminaries including the drawing production	
2.	Removals	
3.	For the complete above-ground waste plumbing systems	
4.	For the complete Primary side heating system inc. ASHP Primary side Plant, pumps, header etc.	
5.	For the complete Secondary side heating system inc headers, pumps, plate heat exchanger, buffer vessel, boiler etc.	
6.	For the complete heating system inc. CT and VT side inc pumps and distribution and heat emitters	
7.	For the complete natural gas distribution and supply adjustments	
8.	For the complete cold-water system and distribution pipework	
9.	For the complete hot-water system including water heaters	
10.	For the complete Ventilation including distribution	
11.	For the complete BMS & automatic controls	
General		
12.	System Demonstration and Operator training	
13.	For the as-fitted drawings, certification and operating/maintenance manuals	
14.	Provisional Sum	£10,000
	Grand Total	

Ref: DR 1302/SP/mechanical tender

Signed

for

.....

Date

APPENDIX B

SUMMARY OF TENDER

For

ELECTRICAL SERVICES

The contractor must complete and price **ALL** items identified in the tender summaries in order to be a bona fide and complete tender return.

SUMMARY OF TENDER

ELECTRICAL ENGINEERING SERVICES

The Contractor shall include for the **detailed design**, supply, delivery, installation, testing and commissioning of all items of equipment to form a complete installation including all associated cable containment and ancillary components.

	Description	Cost
1.	Preliminaries including drawing production	
2.	For the complete Internal Lighting	
3.	For the complete External Lighting	
4.	For the complete Small Power	
5.	For the complete sub mains & switchgear	
6.	For the complete earthing and bonding	
7.	For the Mechanical Services Installations	
8.	For the Fire Alarm Installations	
9.	For the complete TV Distribution	
10.	For the complete Telephone / Data wiring	
11.	For the complete door access control / Intruder Alarm	
12.	For the Lightning Protection / Surge adjustment	
General		
13.	For the System Demonstrations and Operator training	
14.	For the As-Fitted Drawings, Certificates and Operating/Maintenance Manuals	
15.	Provisional Sum	£10,000
	Grand Total	

Ref: DR 1302/SP/electrical tender

Signed

for

.....

Date

APPENDIX C

SUMMARY OF TENDER

STATUTORY AUTHORITY SERVICES

SUMMARY OF TENDER: INCOMING SERVICES

item	Description	Cost
1.0	For the incoming Electrical Supply	
GRAND TOTAL		

file: DR 1302 / SP /stats tender

Signed..... for

Date

- Mechanical Building Services Design • Electrical Building Services Design • BREEAM Assessment & Certification
- Supervisor Services • Independent Certifiers • Thermal Modelling • Condition Surveys



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