Hydrock

Birkbeck Gordon Square

Stage 3 Report

For Birkbeck

Date: *3 November 2021*

Doc ref: *BBK-HYD-XX-XX-RP-ME-0002*

DOCUMENT CONTROL SHEET

Issued by	Hydrock Consultants Limited 5-7 Tanner Street London SE1 3LE United Kingdom T +44 (0)203 8468456 E london@hydrock.com www.hydrock.com	Client	Birkbeck
		Project name	Birkbeck Gordon Square
		Title	Stage 3 Report
		Doc ref	BBK-HYD-XX-XX-RP-ME-0002
		Project no.	C-14299
		Status	S2
		Date	03/11/2021

Document Production Record		
Issue Number	P04	Name
Prepared by		Andrew Bates & Zak French
Checked by		Michael Howarth
Approved by		Alan Rowell

Document Revision Record			
Issue Number	Status	Date	Revision Details
P01	S2	24/04/2020	Preliminary issue
P02	S2	07/05/2020	Stage 3 Issue
P03	S2	13/10/2021	Revised Stage 3 Issue
P04	S2	03/11/2021	Revised Stage 3 Issue

Hydrock Consultants Limited has prepared this report in accordance with the instructions of the above-named client for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk.

CONTENTS

Tables

Figures

1. INTRODUCTION

1.1 Project Introduction

Hydrock have been appointed by the client to undertake the MEP design of the refurbishment works on the Birkbeck buildings at 39-47 Gordon square. This report details the proposed Mechanical, Electrical and Public Health servicing strategies to service the renovation and provide the building occupiers with a rejuvenated servicing strategy to meet the client goal of a twenty to thirty-year lifetime on the new services installation.

1.1.1 Summary of existing Site

The site is comprised of nine Georgian townhouses on the eastern side of Gordon square in Bloomsbury, London. These are connected by a more modern extension at the rear, on the ground and basement floor levels. On the upper floors the houses are connected by a corridor at each level which has been formed through the centre, penetrating the party walls between each of the buildings.

Currently the site houses the school of Arts, however following the refurbishment, the site is to be shared between the school of arts and the school of law. The basement level of building 46 is a residential unit and is outside the scope of the scheme.

Usage of the building extends over the course of the day. The teaching spaces are rented to various University of London Colleges during the daytime and utilised by Birkbeck College in the evening until 9pm.

1.1.2 Existing Services

Currently the heating to the development is provided by a gas fired LTHW system, utilising radiators in each of the spaces. This is a decentralised system, with 3 boiler rooms located at the basement level within the lightwells, and a fourth boiler room located in the rear extension. The distribution from these rooms is thought to be relatively local, however due to the ad hoc nature of the servicing upgrades the zones fed from each boiler is not fully understood.

Generally teaching and office spaces within the building are naturally ventilated. A degree of refrigerant cooling is provided to serve a number of data rooms, as well as the office and café and performing arts space at the rear of the building. The external units for these are located within a louvred plant compound within an extension at the rear of building 43, with the café unit being exposed on the flat roof. Additionally, the existing split system serving the central Comms /Server room is currently located externally in the yard of one of the adjacent buildings in Tavistock square.

Two AHUs exist at the basement level. The first serves the lecture theatre, and intakes and exhaust air to wall mounted louvres facing into the garden of the building 46 flat. The Second AHU serves the visual arts teaching spaces as well as the cinema. This intakes and exhausts air through the rear into the yards between the Gordon square and Tavistock square buildings. These units are supplied with heating from the boiler room in the rear extension. The lecture theatre AHU is supplied with a DX cooling coil, whilst the cinema AHU has a chilled water coil, fed from a dedicated chiller within the rear plant compound.

1.1.3 Relevant Legislation

Various pieces of legislation will apply to the design, the points most likely to have an impact are discussed below.

1.1.3.1 Part L and Consequential improvements

As the project covers existing buildings which are not in use as dwellings, it will be governed by approved document L2B. This sets out minimum fabric performance values for any newly constructed or renovated thermal elements, or controlled fittings which work is done upon. Any services installed as part of the works will need to follow minimum efficiency and controllability requirements as set out in the Non-Domestic Building Services Compliance Guide.

As the floor area of the project is greater than 1,000m2 and new cooling is required to a number of classrooms, representing the initial provision of a fixed building service. The building regulations therefore require consequential improvements to be made. As a result of this, 10% of the project cost will need to be spent on energy efficiency improvements, provided these measures achieve a simple payback of 15 years or less. A list of typical improvement measures that should be considered is included below.

No.	Improvement measure
1	Upgrading heating systems more than 15 years old by the provision of new plant or improved controls
2	Upgrading cooling systems more than 15 years old by the provision of new plant or improved controls
3	Upgrading air-handling systems more than 15 years old by the provision of new plant or improved controls
4	Upgrading general lighting systems that have an average lamp efficacy of less than 40 lamp-lumens per circuit-watt and that serve areas greater than 100 m^2 by the provision of new luminaires or improved controls
5	Installing energy metering following the guidance given in CIBSE TM 39
6	Upgrading ***thermal elements*** which have U-values worse than those set out in column (a) of Table 5 following the guidance in paragraphs 5.12 and 5.13
7	Replacing existing windows, roof windows or rooflights (but excluding display windows) or doors (but excluding high-usage entrance doors) which have a U-value worse than 3.3 $W/m^2.K$ following the guidance in paragraphs 4.23 to 4.28
8	Increasing the on-site low and zero carbon (LZC) energy-generating systems if the existing on-site systems provide less than 10% of on-site energy demand, provided the increase would achieve a simple payback of 7 years or less
9	Measures specified in the Recommendations Report produced in parallel with a valid Energy Performance Certificate

Figure 1- Typical measures appropriate for consequential improvements

Given the majority of the heating, cooling and ventilation systems onsite were installed as part of the major renovation works in 2006, the majority of the service works, other than the provision of new cooling to the classrooms will be classed as consequential improvements. There should therefore be limited impact in achieving compliance with this aspect of the building regulations, however care will need to be paid that this forms at least 10% of the cost plan, and if not, fabric refurbishments may be required to make up any shortfall. Due to the Grade 2 listing of the 39-47 buildings, there may be limited scope to upgrade the building fabric, if this is required, an assessment of opportunities should be conducted in conjunction with the appointed heritage advisors.

1.1.3.2 Part F

Approved document F sets requirements both for areas where new ventilation is being provided, and for work on existing buildings using natural ventilation. In spaces which utilise natural ventilation, care must be taken if any renovation of the windows occurs that the new ventilation opening shall not be smaller that that originally provided. In areas where new ventilation systems are to be provided, these should meet the recommended ventilation rates given in CIBSE Guides A and B.

1.2 Lift Responsibility Matrix

As part of the scheme it is anticipated that the existing lifts will be refurbished or replaced. The below matrix has been produced to ensure alignment in scope between the vertical transportation specialist (to be appointed directly by the client) and the servicing provisions to be made by the MEP design team.

Table 1 - Lift Interface Matrix

Interface	Responsibility of Lift Specialist	Responsibility of others
Lift condition Survey	Specialist to review current installation and advise on if it requires refurbishment or replacement.	N/A
Lift Usage	Confirm operational requirements of lift, if it is life-safety / firefighting lift identify any specialist requirements that may exist e.g. secondary power supplies/ smoke seals	MEP- currently assumed no requirement for secondary power supply exists. If so, provision will need to be revisited.
Electrical supply	Identify size of supply required, and if it is three phase/ single phase. Design and install all wiring and small power downstream of isolator.	MEP- Provide rotary isolator to top of list shaft to meet supply characteristics identified by specialist.
Lighting	Design all lift lighting and lighting controls within car	N/A, No emergency lighting to be provided within lift shaft unless identified by specialist.

Telephone Line	Confirm number and location of data outlets required for lift and if separate redcare lines are required.	MEP- Provide direct analogue phone line for lift to terminate in shaft
Fire alarm	Identify fire alarm signal required and preferred location of interface unit.	MEP- Install fire detector at top of lift shaft, either local smoke head, or remote air sampling system Provide interface unit from fire alarm panel
Temperature control	Confirm the allowable temperature range within the lift shaft, as well as background thermal loading of the lift in operation (i.e. heat rejection and standard operating profile) Assist in finding a clear location for any required temperature control equipment within the lift shaft.	MEP - Assess if shaft temperature is likely to stray outside of allowable design conditions and provide supplementary heating/ ventilation if required.
Ventilation	Confirm what if any ventilation requirements exist to the lift and to any associated equipment	MEP- Provide ventilation/ ducting/ transfers up to the lift shaft as required to meet ventilation requirements

1.3 Budget Advice

A separate and fuller costing plan will be prepared by Fulkers Bailey Russell, and this should take precedence, however for information Hydrock have produced a high-level estimate of the possible cost that could apply to services. This is based on case studies for refurbishment of office buildings from industry publications, and should only be relied on as indicative. Hydrock have assessed the level of intervention proposed on a scale of minimal alteration through to full replacement, and applied set rates for services based on this.

Table 2 - Budget Cost

	Level of replacement	Cost	
		(Cost/m2 GIFA)	(£)
Sanitary Installations	Full	£13.00	£67,715.70
Disposal Installations	Full	£9.10	£47,400.99
Mechanical Installations	Medium	£179.00	£932,393.10
Hot and Cold Water Installations	Full	£2.60	£13,543.14
Space Heating and Ventilation	Medium	£62.00	£322,951.80
Electric Installations	Full	£195.00	£1,015,735.50
Protective Installations	Full	£45.50	£237,004.95
Communications Installations	Full	£156.00	£812,588.40
Specialist Installations	Full	£36.40	£189,603.96
Lift and Conveyor Installations	Medium	£30.00	£156,267.00
Total		£728.60	£3,795,204.54

As the original budget for MEP given within the stage 2 cost plan was £3.2 million, this represents an increase and attention must be paid that the project is still on budget. Further this is likely to be an underestimate as it is based around more modern buildings, and so an extra factor should be applied to take into account the heritage complications of a project.

As the cost of the scheme has been over budget, the below value engineering savings have been implemented.

- The low temperature hot water (LTHW) heating system has been simplified with heating provided simply by a consolidated boiler. The air source heat pump preheat to this system has been omitted.
- Cooling to the classroom spaces has been omitted. Whilst an acceptable temperature can be maintained for the summer months, there is risk of overheating during the summer months. This is explored in more detail in Appendix A- Overheating assessment, which outlines the risks of this strategy.

1.4 Survey information.

Whilst what record information is available has been made available to the design team, this is very limited. The understanding of the existing services is therefore based largely on visual surveys carried out during site visits. It will be key therefore that the contractor make provision for carrying out of surveys to beginning works on site. In particular, although the works are to be undertaken in a single phase, the existing comms room supports university properties outside of the project site. It will therefore be key that the contractor traces back the existing power, data and services connections supplying this space back to their points of entry to the site, so that these can be protected during the works.

Additionally it is understood that the existing heating and electrical systems have had additional services added on to them on an ad-hoc basis, and so boundary tests should be undertaken to ensure the extent of the area served from each system is understood, and the systems are fully isolated before any work upon these systems is commended.

1.1 Upgrades to the existing Comms/ Server Rooms

The existing comms/ server room is to be largely untouched during the works, save for connections to support the new infrastructure. There will however be some limited interventions to improve resilience.

- The existing FCUs will be added onto the central building management system.
- External drip trays with leak detection are to be installed below each of the FCU units.
- Any wet services running through the room, if unavoidable, will be sealed pipe-in-pipe, with the external pipe being welded to minimise the opportunity for leaks.

Additionally, as wet services are being installed on the floor directly over the server room, additional leak detection within this space is to be provided. This shall be provided at high level and low level at each data rack, and shall be connected to the BMS, and capable of raising an alarm in the event of moisture being detected.

1.5 Removal of Existing Services and Void Closures.

There are believed to be a large number of existing mechanical and electrical services within the existing floor voids. In order that the new installation can be clearly understood by all who may need to work on it in future, and old and redundant services are to be removed. The contractor shall be responsible for removing all redundant services within the floor voids. It is anticipated void closure inspections relating to 100% of floor voids shall be undertaken and witnessed by the facilities team.

2. MECHANICAL

2.1 Load Assessment

In order to size the heating and cooling plant an area-based load had been used. This has been based upon the age of the building and the construction of the thermal envelope and the use of the space. The assumed values for heating and cooling are shown in the table below.

Table 3 - Heating and cooling load assumptions

Room Type	Heating Provision	Cooling Provision
	W/m2	W/m2
Classroom	80	0
Store	50	0
Plant	50	0
Office	80	0
Toilet	50	0
Kitchen	80	0
Circulation	50	0
Meeting Room	80	0
Comms Room	50	400
Communal	80	0

These values have been used to provide sizes for the in-space emitters (radiators and fan coil units) and the central/external plant associated with them (boilers and condensers).

The total loads for the building are summarised in the table below.

Table 4 - Heating and cooling loads

Building Number	Heating Load	Cooling Load
	(kW)	(kW)
39	31.94	0
40	43.93	0
41	32.08	3.00
42	32.41	0
43	42.35	0
44	38.26	0
45	37.01	0
46	25.25	0
47	36.10	3.00
Total Loads	319.32	6.00

During stage 4, it is recommended that a thermal model of the building is produced and a dynamic simulation be carried out to confirm the assumptions that have been made at stage 3. Load analysis of existing systems should also be carried out if practical. This would include monitoring of boiler output for heating systems and the output of cooling systems to provide a check to verify the thermal modelling.

2.2 Overheating Assessment

Based on the brief provided by the College and the layouts provided by the Architect, an overheating study was carried out on a number of spaces. The aim of the investigation was to assess the risk of overheating. The following spaces were modelled.

- Classrooms
  - Three classrooms with varying occupancies (33,31 and 26 desks)
- Meeting Rooms
  - Two meeting rooms representing smaller and larger spaces
- Offices
  - One person office (north and south facing)
  - Two person office (north and south facing)
  - Tutorial room (North and south facing)

The results of the study have found that even with a reduced occupancy in the classrooms, the majority of spaces still do not pass the overheating assessment. It has further been confirmed in review meetings that there is no flexibility in the occupancy levels to be provided to these spaces. On this basis, we have concluded that for the classrooms to fulfil the function assigned in the brief, active cooling to these spaces is required, or there should be an acceptance that the teaching spaces will be at risk of overheating and a derogation be agreed.

The small meeting room passes the overheating assessment; however, the large meeting room fails. The large meeting room passes if the occupancy is reduced from 14 to 12 persons. It is advised that this is reflected in the design occupancy.

A full version of the overheating technical note has been included in the appendices of this report. This report discusses in more depth the extent to which the spaces fail the overheating criteria, and the times of year that these spaces are most at risk. Due to the budgetary constraints of the scheme, it is understood a strategy of natural ventilation is to be utilised with the acceptance that there will be points across the year when the classrooms will be at risk of overheating.

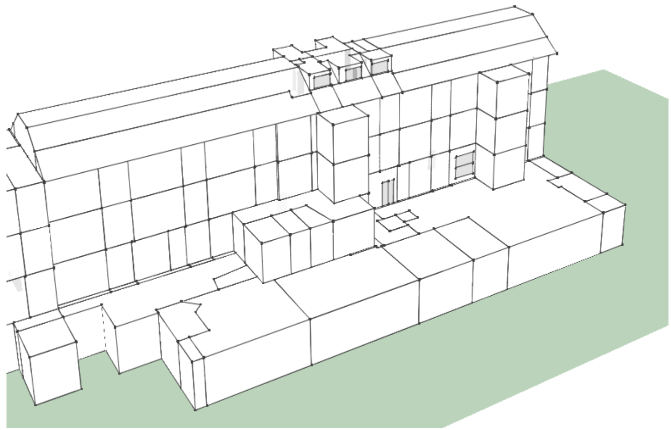


Figure 2 - IES Model

2.3 Cooling Strategy

Split cooling units shall be provided to the basement comms rooms to protect active equipment from overheating. The internal units shall be wall mounted with a local thermostat. The external units shall be located in the vaults at the front of the building. The refrigerant pipework shall be routed on tray at high level, in the ceiling void to the comms rooms.

The doors to the vaults will be used to provide air circulation for the external condensers. These shall be of the caged variety to maximise the free area. This is largely the current situation, however, if these are not present on the proposed locations then they would need to be provided. It is not currently anticipated that any widening works will be required to any of the openings, however this is subject to final confirmation of equipment and detailed survey of existing openings, to be carried out as part of the stage 4 works.

There is the potential for the use of obscuring greenery to minimise the visual impact of the plant areas, providing there is minimal reduction to the free area of the opening.

The cooling systems located in the Café shall be replaced with a new system to suit the revised layout. The external units shall be located within the cooling tower at the rear of the building. The unit shall be linked to the BMS system for control and fault monitoring.

The cooling systems in the main computer room will be replaced with new split systems and provided with a connection the new BMS system for fault monitoring. The external units are currently located in the garden of number 39. The replacement units shall be relocated to the cooling tower, at the rear of the building. The units shall each be provided with a dedicated external unit to provide improved resilience.

Spaces served by AHU's shall be cooled via the supply air. This is discussed in section 1.5.

2.4 Heating Strategy

A number of options were explored for the heating requirements for the Gordon Square, refurbishment. They were assessed on a number of criteria covering performance, cost and compatibility with the building and its heritage features. The options that were investigated are as follows:

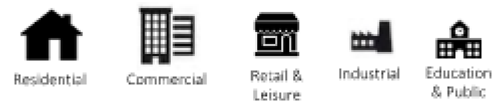
- Decentralised Boilers
- Central Boilers
- Central Boilers with ASHP

The following pages provide a brief overview of each system and how it operates. This is followed by a summary table comparing each option. Based on this analysis it is recommended that a central boiler option is utilised to serve the demands of the site. All plant can be located within existing plant areas, minimising impact on the available floor area of the building and any heritage features.

An ASHP p pre-heat could be considered to increase the efficiency of the system, however given the budgetary constraints of the system, this is not proposed and the centralised gas boiler is to form the baseline.

De-Centralised Boiler Systems

Applicable Sectors



Abbreviations

LTHW – Low Temperature Hot Water
F&R – Flow and Return
TRV – Thermostatic Radiator Valve
BMS – Building Management System

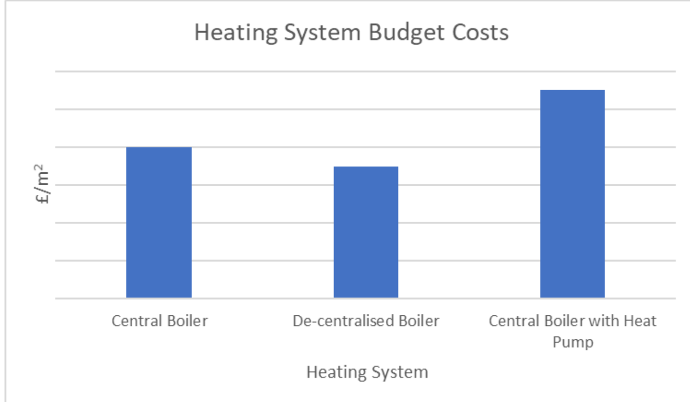
A de-centralised boiler system uses multiple boilers spread throughout the building to provide heating and/or hot water. A number of piped LTHW distribution networks circulate through the building serving discrete zones.

Key Points

- Low to medium system capacity 30kW+
- No distribution limits
- Moderate degree of adaptability
- Multiple, small plant spaces required

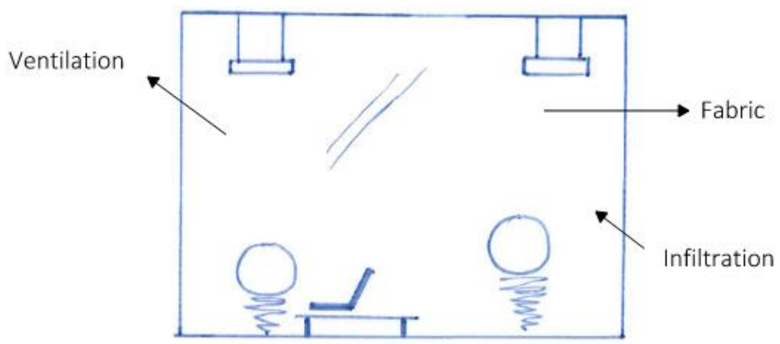
System Cost

Indicative cost estimates based on figures detailed in SPONS

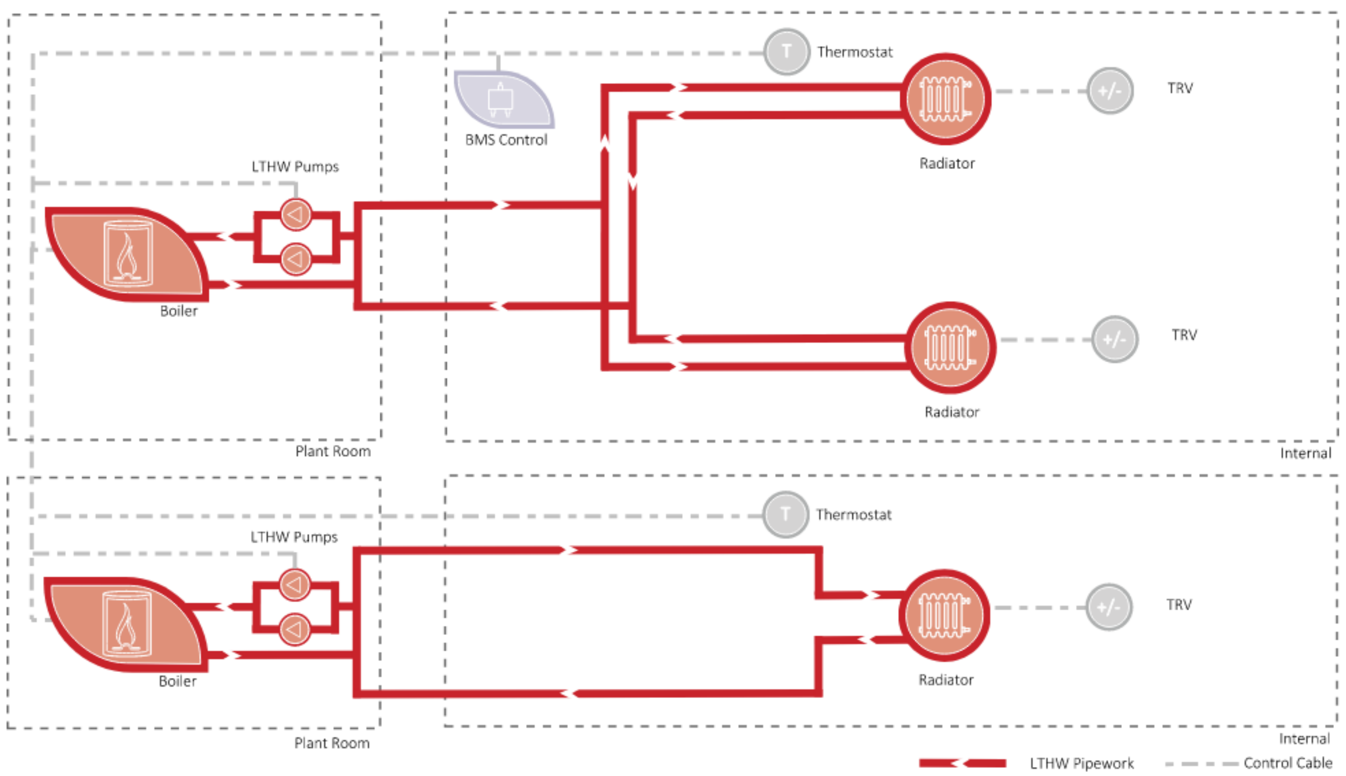


System Sizing

Heat losses determine the size and number of heat emitters required.



System Schematic

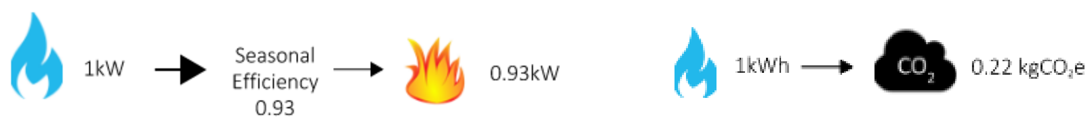


Operation

The system burns natural gas to release heat. This heat is used to warm water within an LTHW loop. The LTHW is pumped around the building by a set of pumps. Depending on the size and complexity of the building, a number of separate circuits can be provided, each controlled by a motorised valve.

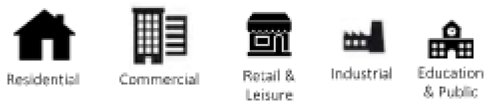
As the system is based upon combustion of gas a flue is required to be provided from the location of the boilers to external atmosphere. Combustion air should also be provided, this can be via external louvres or a concentric flue (two part flue, expels combustion gases and draws in fresh air).

Seasonal efficiency figures represent the seasonal operating conditions of a boiler, by combining the 30% and 100% load efficiencies in a ratio that represents typical usage. Due to inefficiencies within the combustion process boiler efficiencies are limited to circa 90%.



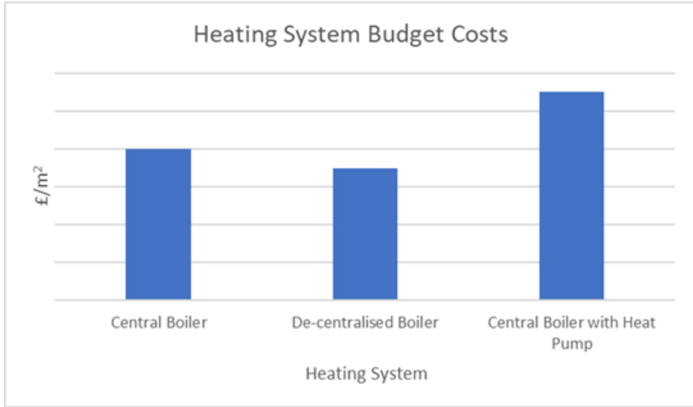
Central Boiler Systems

Applicable Sectors



System Cost

Indicative cost estimates based on figures detailed in SPONS



Abbreviations

LTHW – Low Temperature Hot Water
F&R – Flow and Return
TRV – Thermostatic Radiator Valve
BMS – Building Management System

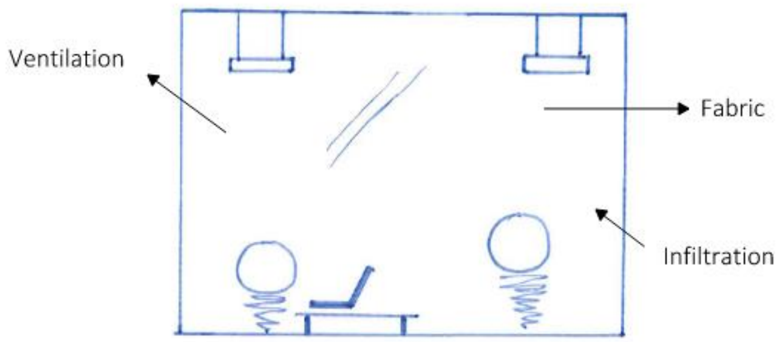
A central boiler uses a single boiler or a system of linked modular boilers as a single source of heat within a building to provide heating and/or hot water. A piped LTHW distribution network circulates through the building.

Key Points

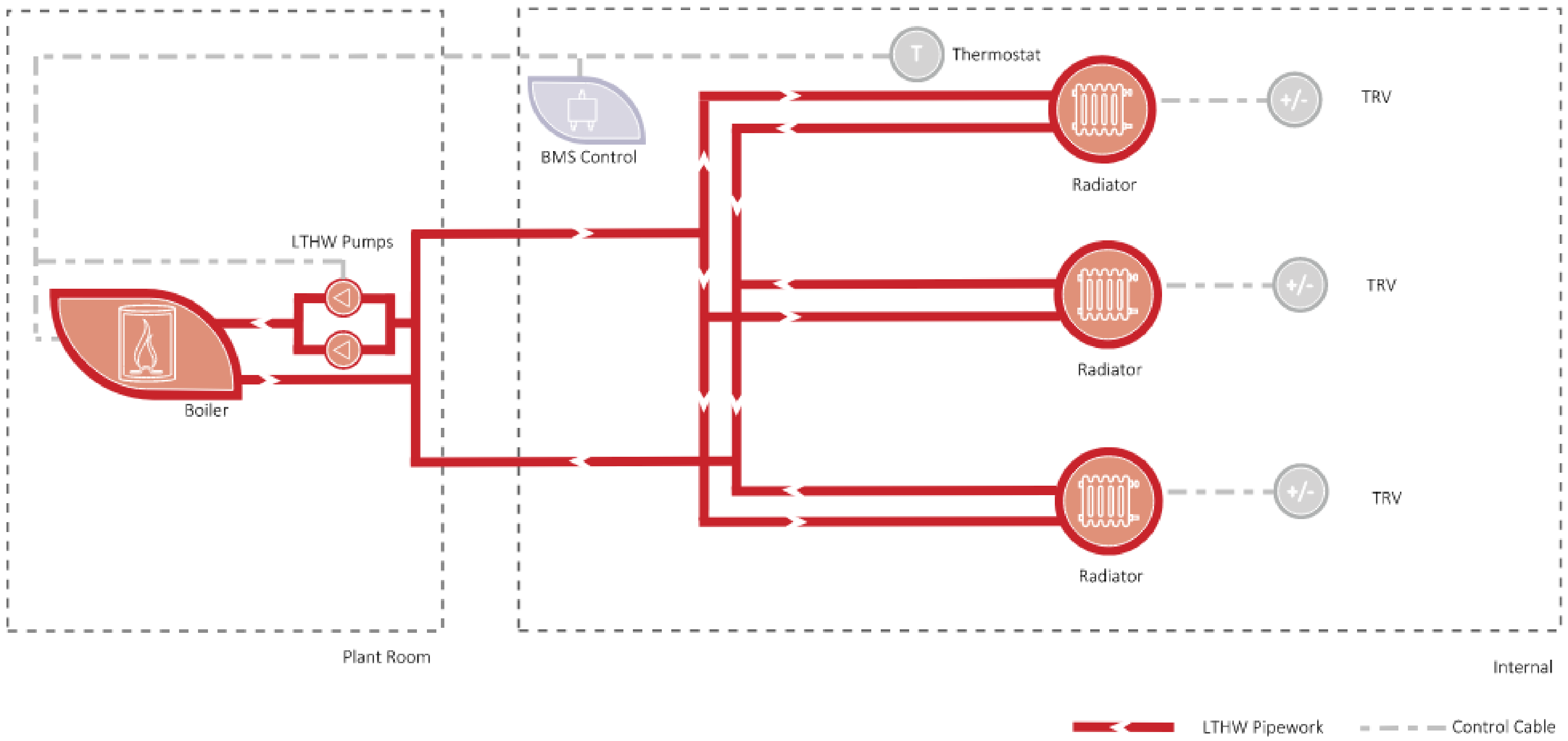
- Low to high system capacity 30kW+
- No distribution limits
- High degree of adaptability
- Moderate plant space requirement

System Sizing

Heat losses determine the size and number of heat emitters required.



System Schematic

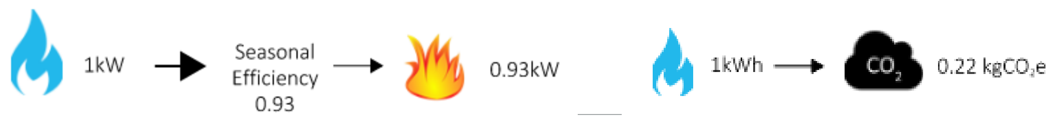


Operation

The system burns natural gas to release heat. This heat is used to warm water within an LTHW loop. The LTHW is pumped around the building by a set of pumps. Depending on the size and complexity of the building, a number of separate circuits can be provided, each controlled by a motorised valve.

As the system is based upon combustion of gas a flue is required to be provided from the location of the boilers to external atmosphere. Combustion air should also be provided via an external louvre to the plant room.

Seasonal efficiency figures represent the seasonal operating conditions of a boiler, by combining the 30% and 100% load efficiencies in a ratio that represents typical usage. Due to inefficiencies within the combustion process boiler efficiencies are limited to circa 90%.

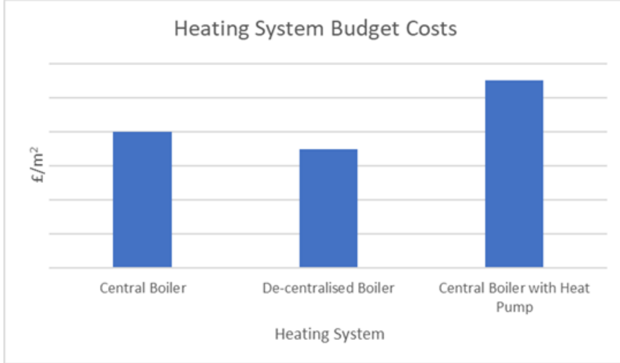


Central Boiler with Heat Pump

Applicable Sectors

System Cost

Indicative cost estimates based on figures detailed in SPONS



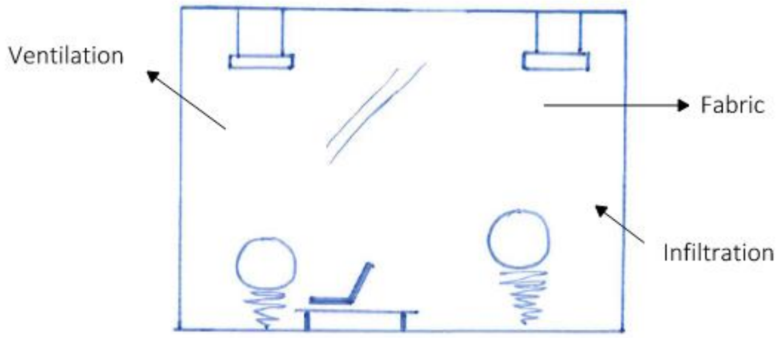
Abbreviations

LTHW – Low Temperature Hot Water
F&R – Flow and Return
TRV – Thermostatic Radiator Valve
BMS – Building Management System
ASHP – Air Source Heat Pump

A central boiler uses a single boiler or a system of linked modular boilers as a single source of heat within a building to provide heating and/or hot water. A piped LTHW distribution network circulates through the building. An air source heat pump is used to provide a base level of heating to lower temperatures to maximise efficiency.

System Sizing

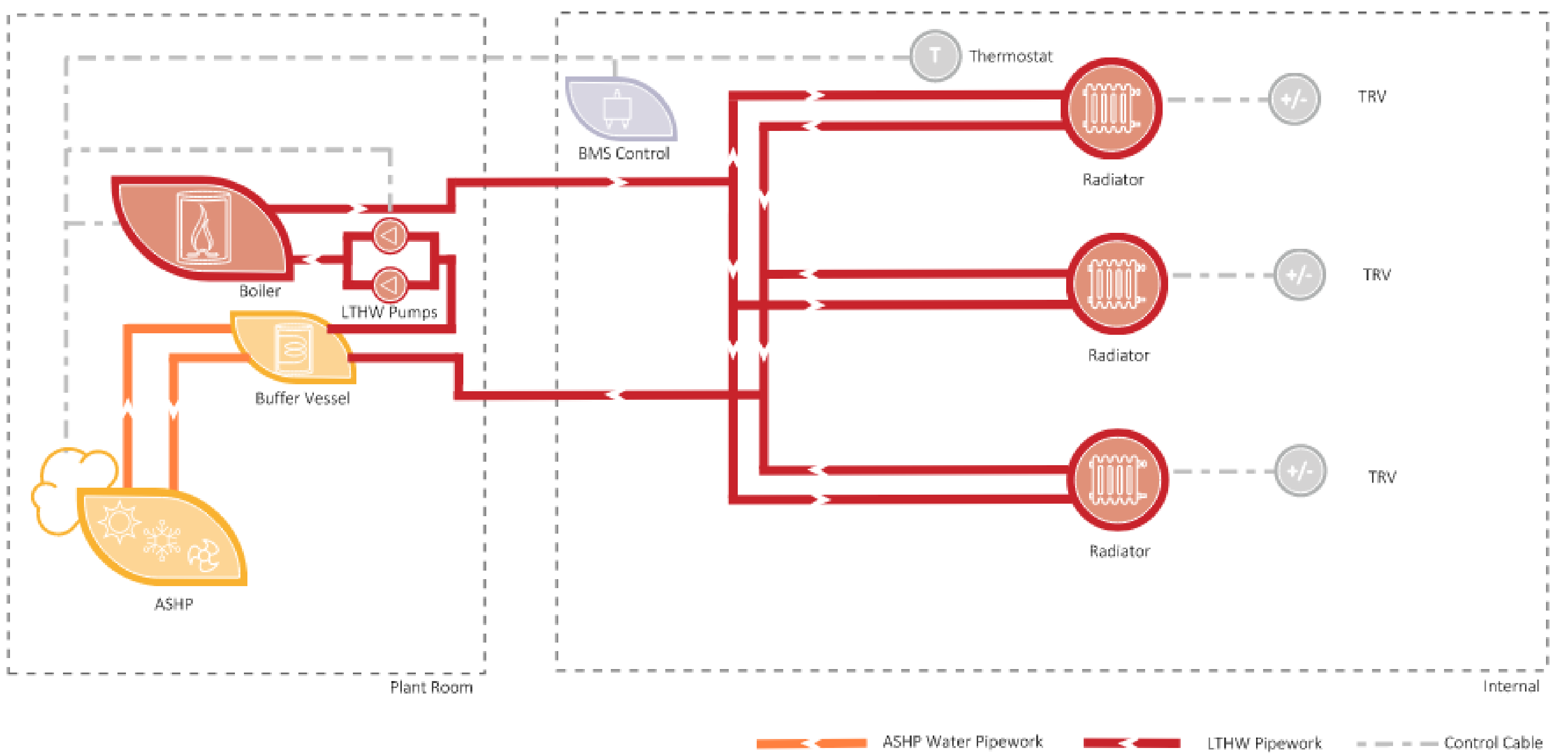
Heat losses determine the size and number of heat emitters required.



Key Points

- Low to high system capacity 30kW+
- No distribution limits
- Increased long term sustainability
- High degree of adaptability
- Large plant space requirement
- High efficiencies due to ASHP
- Reduction of gas usage

System Schematic



Operation

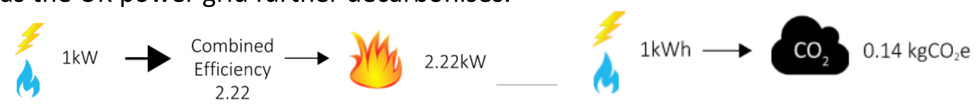
An ASHP is used to provide low quality heat (up to 55°C) to an LTHW system. This is paired with gas boilers to top up the heat to the operating temperature (70°C). The boilers burn natural gas to release high grade heat (55°C +). The LTHW loop is used to provide heat to a radiator in each room.

The ASHP uses a direct expansion refrigerant cycle to transfer heat from the atmosphere into the system. The ASHP will operate on a heat only basis in this application. Buffer vessels are required to maximise effectiveness of the system

Seasonal efficiency figures represent the seasonal operating conditions of a boiler, by combining the 30% and 100% load efficiencies in a ratio that represents typical usage. Due to inefficiencies within the combustion process boiler efficiencies are limited to circa 90%.

Due to the mechanics of the refrigeration cycle, the useful output of the system, is greater than that of the input. This is described by the SCOP of the system (circa 3.5).

Combining an ASHP and boiler system provide significant carbon reductions (circa 30% with a 50/50 load split). The carbon savings will increase over the life of the equipment as the UK power grid further decarbonises.



	De-Centralised Boilers	Centralised Boilers	Centralised Boilers with ASHP
Cost	1-Low	2-Medium	3-High
Energy Efficiency	2-Average	2-Average	1-Best
Flexibility	3-Worst, smaller capacity allows for only minor modification	2-Good, additional capacity can be added centrally	1-Best, Additional capacity can be added centrally, via boilers or additional ASHP/increased buffer vessel provision
Distribution	2-Average, internal distribution is required to all areas that require heating, additional gas and flue routes required for plant areas	1- Best, internal distribution is required to all areas that require heating, single flue and gas supplied required	3- Worst, internal distribution is required to all areas that require heating, single flue and gas supplied required. Additional distribution from ASHP to internal plant room. Space required for large buffer vessel.
Phasing	1-Best, Boilers can be provided to serve each phase of the development	2-Good, once centralised plant and distribution is installed branches can be capped pending connection to rooms	2-Good, once centralised plant and distribution is installed branches can be capped pending connection to rooms
Resilience	3-Worst, Whole sections of the building loose heating if a boiler were to develop a fault	2-Good, Single point of failure. Modular boilers can be used to provide some redundancy to the system	1-Best, Single point of failure. Modular boilers can be used to provide some redundancy to the system. ASHP not able to provide water to high enough temperature to operate system without boilers, however can carry some load
Maintenance requirements	2- Average, System must be maintained by Gas Safe registered operatives. Separate systems increase number of maintenance tasks.	1- Best, System must be maintained by Gas Safe registered operative. Single Plant Location	3-Worst, System must be maintained by Gas Safe registered operative, ASHP required F-gas certified personnel. Multiple Plant Locations
Heritage Considerations	Risers required from basement plant areas to fourth floor. Pipework can be distributed horizontally at basement/ground and then rise vertically. Plant areas require flues discharging to atmosphere, there are existing flues in this location but may make opening windows in basement areas less appealing to occupants.	Risers required from basement plant areas to fourth floor. Pipework can be distributed horizontally at basement/ground and then rise vertically. Existing plant area could be utilised. Existing gas main to plant room and flue routes to external. Some re-configuration may be required if gas supply needs increasing. Additional/modifications to builders work for larger pipework distributed from plant room.	Risers required from basement plant areas to fourth floor. Pipework can be distributed horizontally at basement/ground and then rise vertically. Existing plant area could be utilised. Existing gas main to plant room and flue routes to external. Some re-configuration may be required if gas supply needs increasing. Additional/modifications to builders work for larger pipework distributed from plant room. Additional riser required for link to ASHP, possible location in cooling tower at rear of building.

The boilers shall be located within the basement mechanical plant room The boiler shall be of a floor standing modular variety and supplied with the manufacturers pipe kit. Twin headed LTHW circulation pumps will supply each zone from within the mechanical plantroom.

The plantroom has an existing gas supply. The size and available flow through it should be confirmed as part of the stage 4 design and confirmed against the boiler's supply requirements. The installation of the gas supply should be checked to ensure that it meets current standards and is suitably protected and or ventilated.

Where possible, heating plant shall be supplied to achieve an N+1 level of redundancy to allow for maintenance to be carried out on boilers and pumps without affecting the operability of the system.

2.5 Ventilation Strategy

In order to cause minimum disruption to the heritage aspects of the building the ventilation strategy was developed to revolve around a central principal of natural ventilation. This ensures that there is minimum disruption to the existing façade and historically significant internal features. All occupied areas will be naturally ventilated via openable windows, where possible. This will allow full user control of the ventilation to each space. This strategy is suitable for a majority of spaces due to their geometry. The depth of the rooms falls within the recommendations for natural ventilation. To assist in operation of the space, a wall mounted CO_2 sensor with a traffic light type indicator shall be installed within the classroom, close to the teaching wall.

Two AHU's (Air Handling Units) currently serve the large, high occupancy spaces that have no provision for openable windows, in the form of the cinema and the lecture theatre. These are both approaching the end of their economical lifetime and should be considered for replacement in the near future, however sit outside the scope of these works.

Three small MVHR (Mechanical Ventilation with Heat Recovery) systems have been provided in rooms that have no access to openable windows. These systems will operate continuously during building occupied hours, via a timeclock controller provided by the BMS (Building Management System). Each systems will provide a balanced supply and extract, sized based on the occupancy of the spaces they serve. The rooms ventilated with MVHR systems are Admin Office's B.01 and B.05, classroom B.06, Research office B.07 and Meeting Room G.02

Extract fans will be provided to serve all wet areas. Twin fans will serve the larger WC blocks, located within the ceiling void and discharging via local exhaust louvres at the rear of the building. Small WC's and cleaners' stores shall be provided by local, through the wall fans, discharging direct to outside via small local louvres.

The Café shall have a dedicated extract fan located over the servery. It shall be sized based on the kitchen equipment or the occupancy, which ever results in a larger flow rate. A supply fan will provide make up air to the café and the adjoining WC.

All fans will have a link to the BMS to provide time clock functionality and run/fault indication as a minimum.

All ventilation systems shall be provided with fire dampers when crossing fire resistant elements and smoke fire dampers when crossing fire resistant elements into escape corridors.

2.6 Hot and Cold-Water Strategy

Main water shall be provided via two separate systems. These have been located locally to existing, incoming water supplies. This will reduce the amount of alterations required as part of the works. The incoming water supply capacity should be verified as part of the stage 4 design works. If the incoming supplies are of a suitable size, or can be cost effectively increased, then there is the potential for a reduction in the volume of stored water required for the scheme.

A supply located in building 47 shall supply all outlets located within that building only. A combined cold water booster set and tank shall provide BCWS (Boosted Cold Water Service) to all outlets. Hot water in this building will be provided by a combination of instantaneous electric water heaters (located in WC's) and an electric hot water cylinder (located in the cleaners cupboard).

The second system shall be located in the front mechanical plant room of building 43. A cold water storage tank shall be located in the vaults with a booster set located in the adjoining mechanical plant area. This system will distribute water through the remainder of the building. Capped connections shall be left at the boundary of the phase one works, for connection to the phase two pipework.

Hot water shall be provided via a LTHW backed hot water cylinders located in the mechanical plant room. This will be a high capacity cylinder with a fast recharge rate to ensure that the system can meet any high demand periods. The system shall be provided with additional resilience through an N+1 provision of hot water cylinders. These shall be provided with the capability for one cylinder to be isolated from the system for maintenance while the other supplies the buildings full hot water load.

A provision shall be made to supply a boiling and chilled water tap to each kitchenette (located in basement and second floors).

2.7 Distribution principles

In order to minimise the impact of services distribution on the heritage features of the building the following distribution strategy was developed, in conjunction with the systems selected.

All major horizontal distribution from central services shall be carried out on the basement and ground floors. Above the ground floor, each building shall be served via a series of vertical risers at the rear of each building. This avoids the need to run risers along the front elevation, where the rooms are of extremely high heritage value. On each floor, the services shall distribute within the floor void, to serve the rooms at the front of the building. This will be carried out in such a way that the modifications required to existing floor joists are minimised. Wall hung column radiators have selected to match the strategy of floor void distribution to avoid disruption to ceilings and cornice detail and other significant heritage features.

Services within the basement and ground floor areas are to be run at high level within corridor areas and shall be hidden by a ceiling or similar Architectural covering.

No services will be chased into existing masonry walls. All services on such walls will be surface mounted to minimise the impact on any heritage features and the fabric of the building.

Exposed services shall be minimised in all areas and finished to a high level, in suitable materials, subject to Architectural approval.

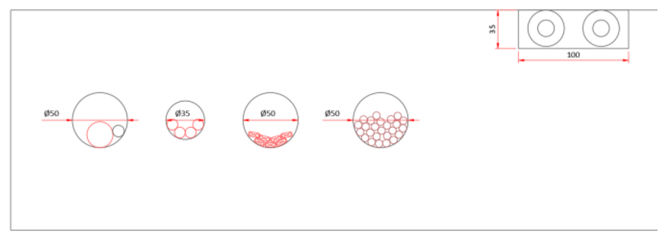


Figure 3 - Holes require through joists at 1st floor and above

2.8 BEMS System

A Trend building energy management system shall be supplied to control the building services systems. This shall link back to a virtual head end allowing web-based monitoring and control of all systems by staff based of site, e.g. in the University estates office.

The system shall make use of open protocols, e.g. BAC Net to allow for connection of third-party devices where required. Additional gateways allowing connectivity with other protocols e.g. MOD Bus shall be provided where required to allow for connection of meter devices.

2.8.1 Metering & Datalogging.

The system shall be capable of logging energy consumption and storing it centrally to allow for interrogation for site staff. Further the system shall be capable of monitoring meter values and raising and alarm upon the detection of out of range values.

A metering strategy is to be developed in line with the requirements of Part L and the SKA rating system.

Aa a minimum this should allow for:

Electrical

Separate electricity metering to each of the below end uses:

- Lighting
- Small power
- HVAC loads
- Cinema
- Comms Room

The BEMS shall also be capable of displaying the total electricity demand of each end use for:

- Each individual building
- The School of Arts
- The School of Law
- All shared spaces.

Heating

LTHW demand to each of the following end uses:

- Domestic hot water
- Space heating

The BEMS shall also be capable of displaying the total space heating demand for:

- Each individual building
- The School of Arts
- The School of Law
- All shared spaces.
- The lecture theatre
- The cinema

Cooling

The BEMS shall be capable of displaying the total cooling demand for:

- The lecture theatre
- The cinema

Domestic water services

The BEMS shall log the bulk domestic water demand or both separate systems.

2.8.2 Graphics

The BEMS shall include graphic displays of plant operation in the form of diagrams of the plant with live point values displayed, giving on-screen displays of temperatures, flows etc. plus the operating state of items of plant.

Set points may be adjusted directly and plant items switched on and off within the graphical display.

2.8.3 Alarms

Certain points, or error messages, shall be capable of raising an alarm. When an alarm event occurs, the BEMS shall take appropriate action relative to the severity of the alarm, in the form of one of the following:

- displaying an alarm message on screen
- sending an alarm message to another network
- relaying an alarm message via e-mail or SMS
- updating the alarm log, which includes acknowledgement and action taken.

3. ELECTRICAL

3.1 Electrical Load Assessment

A desktop load assessment was carried out and the total electrical load for all the houses 39 to 47 and the figure arrived at was approximately 500A TPN supply. Allowing a 20% margin for future capacity increases, this load comes to 600A. This requires a 630A main supply for the whole site. The below table outlines the basis of design for each space and the applied diversity.

	Electrical Basis of design	
Space Type	Electrical Load W/m2	Diversity
Circulation	15	0.9
Classroom	55	0.9
Comms Room	1500	1
Communal	20	0.6
Meeting room	87	0.8
Office	87	0.7
Plant	22	0.8
Store	10	0.5
Toilet	15	0.8
Kitchen	500	0.7

Figure 4- Electrical basis of design

The highest loaded house from the load calculation was house 47 with a total of 35-40KW of TPN electrical load.

The least electrical loaded house from the load calculation was house 46 with a total of 15-20KW of TPN electrical load.

A review of the client's electrical record drawings (produced by Guardian) and of the equipment schedules provided within the Stage 2 report, suggest that the combined size of the existing incomers is 760A (excluding the Comms /Server room which will remain untouched). The existing supplies therefore seem sufficient to supply this building without future reinforcement of supply required from UKPN, although some reconfiguration of the supplies will be required to suit the centralised distribution strategy. Existing supply will be reconfirmed with UKPN as this is progressed.

3.2 LV Distribution and containment strategy

The building electrical system will require a full strip out of the existing systems from the incoming electrical supply points all the way to the final circuits Including distribution boards. This is to achieve the designed life time of 20 - 30 years aspired to by the university. Currently there are 5 electrical supplies on site.

- 200A TPN for houses 39,40 & 41.
- 400A TPN for houses 42, 43, 44 & 45.
- 200A TPN Comms /Server room supply.
- 60A SPN on house 46.
- 100A TPN on house 47.

The final 3 incomers will not be amended.

Its proposed that the two separate supplies serving houses 39 -45 are consolidated into a new single incomer. This simplifies metering arrangement but also improves maintainability throughout the lifetime. It also consolidates centralised plant areas into a single location which is directly accessible from the outside.

The main 400A TPN supply under house 42 will need to be upgraded to 630A supply. This will be the main electrical supply & panel for houses 39 up to 45.

The contractor will be responsible for provision of all cable containment systems, ducting trenches and any builders work necessary to support the LV infrastructure installation.

All cabling routes will be co-ordinated with the utilities both for installation and future maintenance access.

3.2.1 LV Distribution

Buildings 39 to 45 will be provided with one Main LV switchboard (LVMP-42). Sub main distribution shall run horizontally at high level B1 on Ladder/ HD tray to feed each house. From there cables (tray/clipped direct) rise vertically to supply each house's main distribution board located on level 2. These distribution boards supply 2 floors up and 2 floors down. Refer to LV schematic for more detail.

The contractor shall allow for TPN split metered distribution boards specific to the areas including but not limited to: Cinema, Reception, Café, Kitchen, Comms Rooms, Server Room. Two mechanical control panels (MCP B1-40/41 Plant & MCP B1-45 Plant) have been allowed to supply the basement main mechanical equipment. Refer to the electrical schematic and schedule of equipment for overview of the electrical distribution system strategy and equipment details.

A MCCB type main distribution switchboard "LVMP-42" will be located in B1 floor electrical plantroom. The switchboard will supply 16 distribution boards and 2 Mechanical Control Panel (MCP) located within basement, ground and 2nd floor areas of the building plantroom and riser locations.

Distribution boards will be wall mounted on Unistrut support frame. Allowance will be made for integral meters. Panel boards will supply submain distribution to the riser distributed distribution boards, fire alarm systems and lifts.

Transient Voltage Surge Suppressor (TVSS) equipment will be installed integral or adjacent to main distribution panel to meet building requirements.

Power factor correction equipment will be installed post completion of all works based upon measured readings. Correction will be up to 0.96 lag.

New metal clad final distribution boards complete with all required MCBs, blanking strips, integral isolators, integral Part L/CIBSE TM39 compliant metering suitable for connection to the central control/BMS system for the building, barrel locks, labels and completed distribution charts, installed in secure locations as per the contract documentation. Distribution boards to be as manufactured by Schneider Electric or equal and approved. Distribution boards shall generally be TPN split metered for lighting and power type B distribution boards with BMS connection capability.

Submain distribution comprising generally of XLPE/SWA/LSF type cable installed on galvanised steel cable ladder/tray within ceiling voids, plant rooms and services routes. Contractor shall allow a minimum 20% spare capacity on submains cable trays in terms of weight and physical space for future cabling and shall provide electrical supply to emergency systems with switch coloured red and labelling to indicate item served and that it must not be switched off, i.e., “Fire Alarm – Do Not Switch Off”.

All out going ways to be labelled on main distribution panel with screw fixed traffolyte labels.

The new distribution system to have spare capacity for future expansion of minimum 20%, in terms of electrical capacity and spare ways.

3.2.2 Earthing

Earthing and bonding will be installed and tested in accordance with the requirements of the latest IET Wiring Regulations, 18th Edition including all amendments.

Dedicated earth bars within the main LV switch room comprising hard drawn copper bars with removable links, mounted on insulated supports. Equipotential bonding will be provided throughout the building in accordance with the IET Wiring Regulations via LSF insulated green/yellow copper conductor cabling with connections made to the respective earth bar via bolted ring connectors.

Separate earth bars will be provided to the server room and hub rooms, linked to the main earthing system via dedicated earth cable.

All final circuits shall be provided with separate CPC, with circuits serving computers provided with high integrity earth cabling

3.2.3 Metering

Digital metering will be installed in accordance with Part L2B Building Regulations and the recommendation of CIBSE TM guides. All meters will be linked to the new site BMS system for collection and storage of the building energy usage data.

3.2.4 Containment

All new Cable Management Systems (CMS) shall be provided throughout the building plant rooms, voids, vertical risers and concealed with the building to support the Electrical Building Services installation.

The cable management systems shall be designed in accordance with the building structural compartmentation fire strategy and meet the requirements set out by Building Control and the local fire officer.

All containment shall be galvanised medium duty trunking, tray, basket or conduits as required. A minimum 25% spare capacity shall be provided within new containment systems throughout, including all junctions and bends.

Steel cable trays, baskets, and trunking should have a galvanised finish. Metallic cable containment is electrically continuous and fire barriers are provided wherever cable containment penetrates a fire compartment.

Wiring methods selected shall be compliant with BS 7671, robust, suitable for the environment, accessible, rewireable and where visible neat and tidy and in accord with the desired aesthetic.

Preferred wiring methods for all final circuits to all areas with cables running vertically are: BS 7211 624-B Twin & Earth LSZH run in galvanised steel trunking and conduit.

Within the typical teaching, meeting, office spaces environment the cabling shall run in 3 compartment u-PVC trunking mounted to wall. Any drops of cables down should ideally happen on corners of the room to minimise visual impact on the space and to help further cable continuation routes to the teaching wall or any presentation area of the room. Refer to equipment schedule for more details.

In developing the design for the LV distribution and finalising the cable routes, the contractor shall ensure that all necessary builders' works requirements and containment that impact on other work packages has been communicated to the project team and have correctly co-ordinated and integrated within the design.

All trunking, conduit and cable basket / tray shall be mechanically and electrically continuous throughout their lengths and effectively bonded, where this cannot be guaranteed earth links shall be connected at each junction.

Segregation of services will be in accordance with BS7671, designed to satisfy EMC best practice requirements, resulting in the use of several trunking systems and separate cable tray/trunking networks segregated dependent on their classification.

Fire stopping will be provided where services pass through a fire compartment in accordance with the building fire strategy drawings. Wiring systems in escape routes shall be supported such that they will not be liable to premature collapse in the event of fire. This shall include the use of metallic conduits, brackets and fixings throughout. The following types of containment shall be provided;

Figure 5 -Containment types to be provided

System	CMS Type
Main Distribution	Galvanised Steel Cable Tray
Fire Alarms	Galvanised Steel Trunking & Galvanised Steel Conduits
Security Alarm	Galvanised Steel Cable Tray & Galvanised Steel Conduits
Comms Cabling	Galvanised Steel Cable Tray & Galvanised Steel Conduits

3.3 Lighting Strategy

Lighting will be provided in accordance with CIBSE Lighting Guide LG5 and BS 12464-2, ensuring good uniformity and appropriate levels for each room/area.

Low energy LED lighting technology shall be used where practical to achieve the SKA target of 7W/m2 for areas of 300-500 design lux level and 4w/m2 for corridor areas of 100 lux level.

Typical lighting spaces include;

1. Admin Offices
2. Classrooms
3. Meeting rooms large and small
4. Corridor
5. Academic offices 2P &4P
6. Café
7. Reception

In admin offices the lighting is suspended LED luminaires. Lighting control shall be provided in a typical absence detection mode and daylight linking. Lighting levels in these areas are aimed at 300-500 lux level with the aim closer to the later value due to the administrative tasks that will be carried out here.

The Classroom strategy is similar to the offices. The design Lux level for classrooms is 500 lux. Typically lighting control shall be provided via absence detection. Daylight linking shall be provided where appropriate.

Meeting Room lighting focuses more on the space and is more feature orientated. Suspended circular LED lights with up and down lighting are proposed, with supplementary surface mounted downlights as required. Absence detection and scene setting and daylight link where applicable is proposed.

Corridor lighting is via suspended linear line of light LED luminaire with presence detection. Where a ceiling void is present and sufficient recessed LED downlighters shall be utilised. The luminaire produces diffuses light for a broader throw of light in the corridor. Corridor lighting control via PIRs, lights shall dim to maximum 50% of its output during any unoccupied hours after a set time (20 min typically) but never go fully off. The design lighting level is 150 lux.

Academic offices shall have suspended linear LED lighting with additional task lights for each person. The design lighting levels shall be 300-500 lux with Absence detection and daylight linking controls.

The 5A desk task lighting circuit shall have individual circuiting and be programmed to switch off via the Smartscan lighting control system at a set time of the day so it is switched off if task light is left on. Override push button adding a pre-set 45 min time at a push of a button shall also be provided should staff want to keep the desk light on out of hours. Optional connection of 5A task lighting to the absence detection shall be explored at the next stage of the design if the aim is just to switch off when room is unoccupied.

Café lighting levels are to be 200lux generally and 300lux over the counters. Lighting control shall be via manual switching. Automatic off signal via Smartscan lighting control system should switch off the lighting in this space at a set time if left on. Manual switch signal shall override the automatic signal. Luminaires in this space are a mixture of downlights and suspended warm coloured lights for a more relaxed and warm social type of space.

Reception lighting shall be a mixture of surface lights, suspended lighting and track lighting. 300 lux design level with presence detection lighting control. Similar to the corridors, the lighting in reception shall dim to 50% output but will never switch off. Additional track lighting is proposed for specific displays which may be installed in this area.

Toilet lighting shall be recessed type of LED lighting designed to achieve 200 lux and controlled via PIR.

Plantroom lighting shall be surface or suspended type LED luminaire capable to achieve 200 lux on the floor. All plantroom lighting shall be manually switched.

Refer to the lighting strategy drawings for more details on controls and efficiencies of the design.

3.4 Emergency Lighting Strategy

Emergency lighting will be provided in accordance of BS 5266 Emergency Lighting Systems. The system will be a standalone microdot fittings c/w auto self-test LED's. Testing of all emergency lighting shall be via Thorlux's Smartscan system.

Illuminated emergency exit signage will be installed in accordance with the building fire strategy.

3.5 Small Power Strategy

The installation generally will be installed within floor boxes where the floor make up allows. Where this is not possible outlets shall be installed in uPVC 3 trunking mounted on wall.

Accessories generally to be as MK Logic Plus range or equal and approved, plastic finish with contrasting faceplate (white/grey) and rocker switch to meet DDA requirements.

Socket outlets are on 32A ring or 20A radial circuits as defined by BS 7671.

Small power accessories comply with BS 1363.

Fused connection units and socket outlets have an Ingress Protection (IP) rating suitable for the environment.

Fused connection units are provided for tea points, hand driers, fridges, freezers, and other similar equipment.

Socket outlet circuits are protected against overload by miniature circuit breakers (MCBs) and are protected against earth leakage currents by RCDs and RCBO's.

Typically, the number of socket outlets provided is as shown in the per small power strategy drawings and includes corridors and classrooms areas & high-level projectors.

USB type of socket outlets shall be provided in the group meeting rooms and Café.

All fixed equipment to be provided with means of local isolation.

Power within classrooms and offices generally to be provided via floor boxes.

Where outlets are not within the floor boxes, they will be served via concealed conduits/trunking within stud walls.

All conduit pathways shall be suitable for Category 6A data cabling.

Circuits incorporating socket outlets to include RCBO's (combined miniature circuit breaker and RCD). Circuitry serving computer equipment to be provided with high integrity earth in accordance with the 18th edition of BS7671 (IET Wiring Regulations).

All electrical socket outlets shall be labelled to identify the associated distribution board and circuit reference.

External sockets shall be RCD protected in accordance with BS 7671. External sockets shall have a secondary isolator within the school building.

3.6 Fire Alarm Strategy

The new fire alarm systems will be open protocol such that the systems can be maintained by any suitably qualified fire alarm company in the future.

The fire alarm and detection systems will be designed and installed in accordance with all relevant standards and Building Bulletins, including BS 5839,

A complete and functional digital analogue addressable type fire control system covering all areas of the building to the requirements of current BS 5839, Category L1. Refer to the Fire Strategy.

The fire alarm system shall comprise of the following:

- Smoke/heat detection throughout the building – L1 coverage, including coverage within ceiling voids greater than 800mm;
- Break glass units at final exits, Changes in Level, and to suit the designated maximum travel distances;
- Sounders, generally provided to the bases of detectors;
- Flashing beacons, generally provided to the bases of detectors within main circulation routes and WC's/changing rooms;
- Main analogue addressable fire control panel located at the main entrance and repeater panels at an alternative location.
- Door hold open devices as required by Building Control/Fire Strategy;
- Interface units to suit fire strategy including; kitchen power and gas supplies.

Provide fire alarm system interfaced with the following as minimum:

- Ventilation systems;
- Main gas supply to building/s via interface to boiler control panel;
- Smoke/fire damper control units;
- Controlled doors via interfaces to access control system door controllers;
- Automatic doors, to power open and remain open (where applicable);
- Door hold open devices, doors to release/close;

Flashing beacons shall be provided to rooms which are to be used by the community:

- Lecture theatre
- Cinema
- Cafe
- Classrooms
- Reception
- Circulations spaces local to hall and leading to WC facilities
- Locations where deaf occupants could be alone. All rooms subject to higher than average background noise shall also be provided with flashing beacons.

A Main fire control panel within the secure lobby area with standby battery back-up to enable sounders to be operated up to 72 hours after loss of mains power.

A fire condition on the school site will send a signal via a signalling unit and Redcare line/Dualcom GPRS or analogue telecoms line to the ARC (Alarm Responding Centre).

The system shall be zoned according to the requirements of BS5839 and shall make full allowance for all loop isolation devices, to be located in easily accessible locations

3.6.1 PA/VA

A new PA/VA system shall be installed to comply with BS 5839-8, BS EN 54 and BS 7827.

The system shall provide a means of broadcasting either pre-defined or live messages from the site security room in the event of a fire. The final evacuation strategy for the building is to be determined, once this has been confirmed the final selection of system can be selected.

PA/VA fibre optic cable type of system is proposed with individual control rack panels located in the basement of each house. The fibre optic network is connected to each rack for any communication. Each control rack panel has also capability to connect to graphical management system or configuration system laptop or even a messaging for the building type of system with a press of a button.

3.7 Data Strategy

A comprehensive IT network shall be provided to ensure the delivery of IT services for data and voice connectivity throughout the building.

The Comms /Server room is being served from a dedicated 200A 3 phase electrical supply located in an electrical cupboard on the basement of House No. 42.

The Comms /Server room features 8 data cabinets in the centre of the room. The incoming supply serves the Comms /Server room through a wall mounted switchboard located outside the Comms /Server room. The switchboard is providing power to the Comms /Server room and its associated equipment including the UPS unit and the air conditioning units. The switchpanel is in a good condition with no apparent issues being identified.

In addition to the above, there are two 3 phase distribution boards (Distribution Board A and Distribution Board B) in the Comms /Server room as well as a UPS maintenance bypass switch and a UPS. The UPS is manufactured by Riello. UPS unit and the external battery box are reaching their expected design life and should be replaced.

The data cabinets house the CCTV recording equipment and viewing station, servers, storage and switches for the University. Additionally, The Comms /Server room houses the second core switch of the University (the first is in Malet Street's Comms /Server room), a telephony system and has data links to other buildings of the University. The Comms /Server room houses 2 racks next to the door that satisfy the requirements of the 9 Houses.

There is a fire suppression/extinguishant system (Gent-Trinity) installed in the Comms /Server room and an intruder alarm system (crown) and surveillance CCTV system.

The previous Stage 2 report recommended replacement of the UPS unit and the battery box however it is our understanding that Comms /Server room is largely to be excluded from scope other than changes required to support the new infrastructure. The Comms/Server room shall remain operational throughout the works. The existing gas suppression system in the comms/server room shall remain.

We propose new floor mounted cabinets to be located within the 4th floor offices in order to feed the upper floors. Additional racks shall be incorporated in the basement Comms room to support the PA/VA system.

Additional server rooms are distributed across the basement level to sub-distribute the structured cabling network and ensure full coverage within the 90m certification constraints.

Back bone OM4 fibre cabling will connect the main core server and hub rooms distributed in a network radial topology with diverse connections for network security. A multicore voice network cable will be provided for VoIP connection between Comms /Server rooms to supply the whole building.

The client will install analogue copper telecoms lines for the fire alarm, security, lifts and Redcare system.

Racks will be 42U 1000mmx 800mm provided complete with adjustable feet, doors and cable management. The distributed structured cabling systems will be generally installed below the raised floor on ICT rubber mats. High level services will be installed in a lined basket.

Power will be distributed through the rack via a high-level commando socket plugged into a rack PDU (Power distribution unit - By others).

Final connections will be terminated into RJ45 outlets mounted in dado trunking.

Generally, an allowance of 2 data point per desk has been made for offices. Where room sharing is adopted 1.5 data points per desk will be provided (3No. per pair of desks). Refer to high- and low-level typical room strategy layout drawings. Student will be typically served by WIFI.

Data outlets will be provided for but not limited to the following:

- Data Outlets to the desk
- WIFI
- AV equipment
- Televisions/information screens
- CCTV
- Access control

The Comms /Server room and Comms rooms will be fully serviced with power, lighting, and air conditioning. A dedicated power supply c/w surge protection will supply the cabinets. A clean functional earth network will be provided.

All racks will be provided with 1200mm clearance to the front and rear of the cabinets.

All circuits will be clearly labelled at all terminations and outlets.

3.8 AV Strategy

AV media wiring points will be installed in accordance with the ICT package to classrooms, meeting rooms and lecture theatre. Media plates and interconnecting wiring will be installed between the AV screens and the teaching bases.

Data outlets will be wired to all televisions for use as information screens and/or TV's via the IT network.

3.9 Security Systems

Security systems for the university will consist of the following:

- Access Control
- Intruder detection
- CCTV (Internal)

3.9.1 Access Control

The existing access control system which the new system has to comply and connect to is SALTO. SALTO is the preferred provider of access control system for the university.

The access control system will be designed and installed in accordance with all relevant standards and Building Bulletins, including BSEN 50133-7, ACPO recommendations and Secure by Design.

The system will comprise door controllers, push-to-release buttons, proximity card/fob readers, intercom, wall/desk mounted handsets with lock release, mag-locks and emergency break glass units.

Additionally, the system will be provided with card/fob programming equipment to enable the school to programme new cards and reprogram existing cards to suit access requirements.

Access controlled doors will be programmed to interface with the panic alarm system and perform lock down of various doors in the event of the panic alarm being operated.

The access control devices and the system must work on the existing SALTO Space Software platform running at the University.

Where rooms are not a part of the escape route and are not critical XS4 handles seems may be provided. Final type of access control shall be confirmed in the later design stages.

Access controlled doors will be programmed to interface with the panic alarm system and perform lockdown of various doors in the event of the panic alarm being operated.

Door controllers will be provided with back-up batteries to maintain the system operational under failure of the normal supply for a minimum back-up period of 3 hours.

The access control systems will operate as complete systems all associated door controllers linked via a data bus cable and controlled via a designated computer terminal pre-loaded with access control software to be located in the main estates office.

Computer software and licences will be provided. The head-end computers will be located in the main estates office and will be provided by the University.

Proximity fobs/cards will be provided with the new system.

Contractor to include for all necessary power supplies and cable containment associated with the access control system.

The system will operate such that doors are held via magnetic locks at the head of the door. Under normal conditions, the door locks to release upon presentation of valid card to card reader, operation of press to release button or emergency break glass. Or upon signal from fire alarm system.

Local override keys will be provided on the secure side of the door to allow for normally open doors to be access controlled during evening community events.

Under a fire alarm condition all access control doors will default to open to facilitate in the safe evacuation of the building occupants.

3.9.2 Intruder detection

Intruder detection will be installed to protect the contents of the University at out of hours. The system will include contact on Ground Floor external doors and windows and PIR detectors to all main circulation corridors, stairwells and general open areas will high value equipment.

3.9.3 CCTV

A new IP based CCTV system shall be provided. The system will be provided in accordance with the latest NSI (National Security Inspectorate) recommendations and by a NACOSS Gold/SSAIB accredited installer.

System cabling will be routed from point of utilisation to the University server room and terminated within patch panels mounted within a data cabinet.

HD NVR recording equipment will be linked to the IP network and allow for secure remote internet connection to view and download images.

The system will be capable of recording and reproducing images from which individuals may be readily recognised in the areas specified, both during daylight and in darkness. Images recorded shall be suitable for use as evidence in a court of law.

3.10 Accessible Toilet Alarm

The accessible toilet alarm will form part of the EVCS system. Alarms will be relayed to the front reception desk as well as local sounder and visual alarm, connectivity will be provided to allow signals from these to also be relayed to the estates office for times when the building reception is not manned. The system will require manual reset at the point of alarm.

A local Part M kit will be provided in each accessible toilet c/w alarm pull cords and alarm reset unit. Each toilet will have an overdoor beacon and sounder.

3.11 Induction Loops

Induction loop amplifier kits will be installed within the reception, all classrooms with over 30 people, lecture theatre, admin offices. Meeting rooms to comply with Part M of the Building Regulations and the Equality Act 2010.

The induction loop systems should comply with BS7594 an EN60118-4.

3.12 Lighting Protection

Currently no lightning protection is installed on the building, and it is not currently a condition of the building's insurance. A risk assessment has however been carried out by a specialist in accordance with BS

EN 62305 part 2. Based on the risk assessment the lighting protection is based on a category IV system. The Contractor is to employ a specialist to provide a lightning protection system that uses the structure of the building.

The Systems shall comprise of an air termination(s), down conductor(s), testing joint(s), earth termination(s) and earth electrode(s). Steel reinforcing in columns shall be used for down conductors providing their continuity is maintained and current carrying capacity is adequate.

All roof level exposed metal work or roof mounted plant shall be bonded to the air termination network. Testing joints shall be provided in a convenient position for testing, approximately 1 metre above ground level. Earth electrodes shall consist of building structure, metal rods or tapes or a combination of these.

The electrical and communications installation will be enhanced with electronic surge protection.

4. FIRE PROTECTION STRATEGIES

Hydrock have separately produced a fire safety strategy report to inform the project. The recommendations of this have informed the services design. A summary of some of the potential fire protection strategies is detailed below.

It should be noted that the below provision is complaint with the proposed strategy, however has based upon maintaining a level of protection that is no worse than that which currently exists. The existing fire strategy is has not yet been made available to the fire engineering team for review, and this is anticipated to occur in the near future. If this identifies existing provision, greater than the design team is currently aware of, the design will need to be updated to include it.

4.1 AOVs and Smoke Ventilation systems

There are no specialist smoke ventilation strategies such as AOVs, or smoke ventilation systems required under part B of the building regulations 2010 and so no provision has been made within the design for these.

4.2 Sprinklers

Sprinklers are not a requirement under part B of the building regulations 2010 and so have not been provided within the design.

4.3 Door Hold-Opens

Door hold-opens shall be provided which shall fail closed in the event of a fire. Power supplies, and fire alarm interfaces to enable this shall be provided. The locations of door-hold-opens are shown on the architectural access and security strategy drawings (64 series).

4.4 Emergency Lighting

Emergency lighting shall be provided as detailed within the electrical section of this report.

4.5 Interfaces with MEP systems.

The Fire alarm shall be provided with interfaces to the below systems:

- Electromagnetic hold-open devices on fire doors – released to closed position;
- Security systems on exit doors – released as required;
- Lifts – returned to ground level and held in position;
- Gas supply valves (plant areas) – isolate;
- Heating, ventilation and air conditioning systems – shut down to restrict spread of smoke and hot gases.

4.6 Service Penetrations

The basement is required to be a separate fire compartment, and so all MEP services passing between the basement and ground floor shall be provided with adequate fire protection in the form of fire stopping, or fire smoke dampers to achieve the specified 60-minute fire rating.

4.7 Fire Curtains

There is potential for a fire curtain to be required at the basement level to ensure that the open staircase proposed at the rear of the ground floor does not compromise the compartmentation of the basement. Power supplies and fire alarm interfaces shall be allowed for to support the operation of this.

4.8 Disabled Refuge call points

The project fire strategy does not allow for disabled refuges, and so call points are not currently included within the design of the fire alarm systems.

4.9 Sealing of existing builders work

Where existing services are to be stripped out, any redundant penetrations are to be made good, and fire stopped to provide the level of fire resistance identified in the fire strategy report.

4.10 Gas Suppression

An existing gas suppression system is installed to the comms room at basement level. This will be retained in the proposed scheme.

Appendix A- Overheating Assessment