



**Oakdale Primary School
Expansion Project
MEP Services Stage 3 Employers Requirements**

HBS-SP-MEP-901

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For

Peterborough City Council

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1 INTRODUCTION

1.1 EXTENT OF WORK

The work shall comprise the whole design and construction of the complete mechanical, electrical and public health services (MEP services) for the Oakdale Primary School Expansion project. The construction works shall comprise of the labour and, unless otherwise indicated, all the materials necessary to form a complete mechanical, electrical and public health (MEP) services installation with such tests, adjustments, commissioning and maintenance as may be required to give effective and safe working installations to the satisfaction of the Employer's Representative. HBS have undertaken the engineering design to a level in line with RIBA Plan of Work 2013 Stage 3. The successful Contractor will be expected to proceed in line with the BSRIA Design Framework for Building Services (4th Edition) BG 6/2016, design activities and drawing definitions to develop the design through to handover information.

1.2 THE BUILDINGS

The works to Oakdale Primary school involves the creation of a new 8nr classroom extension (Block N), internal refurbishment/re-modelling of the existing building (Block A) and single classroom extensions (rooms AG06 and AG39) as indicated on the Architectural Stage 3 drawings. This section details the Mechanical and Electrical services engineering proposals for the Stage 3 design.

There are associated external works with the new building, which shall also form part of the contractor's design & build works. The works shall include the strip out of existing service to the existing Nursery building. The contractor shall be responsible for all services tracing, isolation and removal from these buildings (to suite the phasing plan) including any services diversions necessary in order to maintain services to the areas of the school which will continue to operate throughout the duration of the contract.

The appointed Contractor will be required to verify the Employer's outline design and to develop the design in detail and proceed to construct in accordance with the programme constraints and reflecting the spirit of the aesthetic design, spatial requirements, design quality, function and technical requirements of that indicated in the Employers Design Intent. The words "complete MEP services installation" shall mean not only the major items of plant and apparatus described in this specification, but also the incidental sundry accessories and components necessary for the complete execution of the works and for the proper and safe operation of the installation together with their labour charges, whether or not these sundry accessories or components are mentioned in detail within the contract.

Definitions:

Mechanical Contractor – Where this term is used within the specification it shall be taken as the contractor completing the mechanical installation works as detailed in this specification and associated drawings etc. Depending upon the type of contract the term Mechanical Contractor shall equally refer to the Mechanical Sub-Contractor or Building Services Sub-Contractor.



Electrical Contractor – Where this term is used within the specification it shall be taken as the contractor completing the electrical installation works as detailed in this specification and associated drawing etc. Depending upon the type of contract the term Electrical Contractor shall equally refer to the Electrical Sub-Contractor or Building Services Sub-Contractor.

Specialist – Refers to a specialist contractor employed by the Building Services Contractor, Mechanical Contractor or the Electrical Contractor to complete a part of the works on their behalf, the Building Services Contractor, Mechanical Contractor or the Electrical Contractor shall be fully responsible for all works undertaken by the specialist.

Services Contractor – Where this term is used it shall refer equally to the Mechanical Contractor and Electrical Contractor completing the mechanical and/or electrical installation works as detailed in this specification and associated drawings etc. Depending upon the type of contract the term Services Contractor shall equally refer to the Building Services Sub-Contractor, Mechanical Contractor or Electrical Contractor.

Main Contractor – Where this term is used within the specification it shall be taken as the contractor completing the overall contract for the client as detailed in the main contract specification and associated drawings etc. Depending upon the type of contract this shall equally refer to the Builder, Principle contractor or the Mechanical or Electrical Contractor if they are the Main Contractor for the project.

Engineer – Refers to HBS who are the representative of Oakdale Primary School.

Contract Administrator – Refers to representative of the company administering the project as defined in the Main Contract preliminaries.

1.3 DESIGN RESPONSIBILITY

This performance specification shall comprise the design intent documentation for the design, supply and installation of mechanical, water services/public health and electrical services. This performance specification should be read in conjunction with the National Engineering Specification (NES) specific to this project.

The Contractor shall refer to separate documentation for General Contract Conditions, target programme and other Specialist Sub-Contractor scopes of works and requirements.

The contractor shall refer to section A64 of the National Engineering Specification (NES).

The tender documentation represents the sum total of the information available to the Contractor for their detailed design, to be checked against and supplemented by their own surveys as necessary.

The engineering services shall form part of a Design & Build Contract, which assumes the following responsibilities for the Contractor:



- Technical submittals shall include a description of the equipment, with supporting drawings and manufacturer's data. No equipment shall be procured until the technical submissions have been reviewed by the Employer's Agent.
- Detailing of the work and provision of complete production information and drawings based on the information provided. [*HBS detailed M&E drawings are provided but all additional accessories and equipment must be added to supplement information provided to match performance specification*], liaising with the employers agent and others as necessary to ensure co-ordination of the work with the other related building elements.
- Supply, installation and testing of all components, fixings and materials required to provide a complete working installation.
- The Design Team shall be invited to comment on testing/commissioning method statements and be present to witness and sign off prior to delivery.
- Testing and commissioning shall be completed in line with the contract programme and as outlined in the CIBSE commissioning guide.
- Provide schematic(s) of all major services. Schematic(s) shall be fully detailed with flow rates, loads, circuit references etc.
- All manufacturers' drawings and technical details / information.
- Provision of all necessary associated builders work information, including producing builders works drawings.
- Provision of BMS panel drawings, wiring diagrams and cause & effect schedule.
- Provide specialist sub-trade drawings.
- Complete set of information and submissions to Building Control, Fire Officer and other statutory authorities and obtain approval of the works.
- Testing and commissioning of all systems in order to provide an effective working installation to the satisfaction of the Project Manager.
- Seasonal commissioning.
- Building Logbook.
- Building Users' Guide.
- Provide demonstrations and training to the building occupiers in the correct operation of the services.
- EPC calculations and certificates



- Part L2A assessment and associated reports submitted to Building Control for approval

The above list is not exhaustive and as such does not relieve the contractor from their obligations to comply with all the necessary responsibilities detailed in section A64 of the NES and main contract documents.

The work to be carried out by the Mechanical, Electrical and Public Health Trade Contractor (M&E TC) is described within the performance specifications and design intent drawings, and includes the following:

- Provision of Drawings for the works for all services and detailed wiring diagrams for all equipment and control panels.
- Inspecting all plant, equipment and materials as delivered or where specified at the manufacturer's works.
- Arranging delivery, lifting, hoisting and all other storage and movement of all plant equipment and materials.
- Fixing or installing correctly all plant, equipment and materials.
- Testing and commissioning the complete installation including making adjustments as necessary.
- Demonstrating that the equipment is capable of the performance and method of operation specified to the satisfaction and acceptance of the Employer's Representative (including return visits for seasonal tests and commissioning).
- Checking the complete MEP services installation for workmanship or operational defects create a list of defects (snags) and make the list available to the Employer's Representative.
- Arrange for all defects (snags) to be rectified, and check the installation thoroughly before presenting the installation to the Employer's Representative for checking.
- Inform the Representative in writing that the installation is ready for inspection before practical completion.
- Demonstrating that the overall and complete systems perform correctly in the required manner and as intended by the specification to the satisfaction and acceptance of the Employer's Representative. Inclusive of three return visits (minimum) required to demonstrate seasonal performance of the systems.
- Provision a full set of commissioning and test results, in digital format to the Employer's Representative no later than one month before practical completion.



- Providing operating instructions and maintenance manuals for the complete systems in accordance with Oakdale Primary School specific requirements (detailed elsewhere in the ER's).
- Instructing and training the Oakdale Primary School facility's staff in the use, operation and maintenance of the complete MEP services installation in the presence of the Employer's Representative and achieving a signed confirmation of demonstration from the School Representative. The contractor is to provide at least two whole day visits to undertake demonstrations, one prior to handover and a second and next half term approx. 6 weeks later, to allow users to acclimatise themselves with building and produce a list of any queries they may have.
- Handing over all specified tools, keys, spares, oils, chemicals etc.

As part of the technical submissions process throughout the design phase, the Contractor will be required to provide the description of operation for the plant, system and BMS controls associated with the drawings in the submission. In this way it is intended to ensure that all parties have a clear understanding of the design and operational intent, and the text will form the basis of the M&E O&M documents.

The Contractor will be responsible for the appointment of an independent Commissioning Specialist. This shall be carried out within 7 days of his own instruction to ensure that the Contractor's design is developed with systems commissioning and maintenance good practice in mind. Should the Contractor have any concerns regarding the commissioning, validation or functionality of the existing services, this shall be reported in writing to the EA before the commencement of any work.

1.4 INFORMATION TO BE PROVIDED BY THE CONTRACTOR

The Contractor shall submit as part of their tender submission the following information:

- Material specifications identifying clearly any options where they are being offered in line with the contract.
- Schedule of suppliers/manufacturers of main/major items of plant or equipment or systems.
- Schedules of main plant including capacities/duties.
- Outline design drawings and schematics.
- List of Specialist Contractors to be utilised.
- CV's and design warranties for design and technical staff.
- Programme of works and commissioning activities.
- Technical submittal template to be utilised.



1.5 REGULATIONS AND STANDARDS

The design of the building engineering services, systems and installations shall comply fully with the latest editions of all relevant UK and local authority regulations, statutory requirements, design standards and codes of practice including the following:

- IEE Wiring Regulations BS7671:2008 +A3:2015
- British Standards Institution Codes of Practice
- British Standards
- Building Regulations, England & Wales
- WRC Regulations
- Construction Design & Management Regulations
- European Directives
- Harmonised European Standards
- Local Building Control Requirements
- Environmental Health Requirements
- District Fire Officer Requirements
- Factories Act
- CIBSE Guides and Publications
- BSRIA Guides and Publications
- LPC Guides and Recommendations
- Relevant Health and Safety at Work Acts
- Local Water Authority Regulations
- Local Electricity Company Regulations
- Electricity at Work Regulations

The above list of Standards, Regulations and Guidelines is not exhaustive and as such does not relieve the Contractor of their responsibilities to comply with all necessary Regulations and Standards.



The Standards listed above should be considered as minimum requirement for the Contract Works. The standards of materials and workmanship shall be as defined by the National Engineering Specification (NES) document that forms part of this performance specification documentation.

1.6 TECHNICAL SUBMITTALS

Technical submittals shall be provided for each package of work, to illustrate compliance with the performance criteria and associated specifications in the Employer's Requirements.

Technical submittals shall include a description of the system, employer's requirements, design criteria, calculations, supporting drawings and manufacturer's data. Where technical submittals are different from the Employer's Requirements, no equipment shall be procured until the technical submittals have been reviewed and all comments incorporated. Substitutions accepted will be subject to the verification of technical and performance requirements and shall be deemed equal in quality and similar to those specified. Where verification of an alternative product involves significant technical validation, the Contractor may be held liable for the additional works involved by the Client's Consulting Engineer in considering the alternative.

The Main Contractor's Technical Manager shall be responsible for checking submissions and ensuring information is correct, prior to issue to the Employer's Agents for review / comment.

1.6.1 MECHANICAL SERVICES CALCULATION REQUIREMENTS

Detailed calculations and support evidence shall be provided for the following: -

- BRUKL calculations to conform with Building Regulations Part L2A
- Overheating and air quality calculations to confirm compliance with BB101.
- Calculation of 'U' values for each element of the building structure
- Fully detailed and scheduled heat loss and heat gain calculations for all relevant spaces
- Information relevant to the production of the metering strategy inc. predicted building energy usage calculations.
- Heat emitter sizing
- Domestic water services pipe sizing including capacities and flow rates
- LTHW and water services pipe sizing
- All pipework system resistance calculations.
- Ventilation rates
- Gas supply pipe sizing
- Refrigerant suction and discharge pipe sizing



- Supply and extract air volumes, volume flow rates and velocities
- Duct sizes and air velocities
- Acoustic calculations and attenuator selection
- Air diffuser terminal and extract grille selection
- All equipment and plant sizing
- Control system power and control cabling selection
- Estimated annual running costs for all newly installed systems

1.6.2 ***ELECTRICAL SERVICES CALCULATION REQUIREMENTS***

Detailed calculations and supporting information shall be provided for the following: -

- Lighting calculations showing illuminance levels, uniformity achieved
- Emergency lighting calculations showing illuminance levels and uniformity achieved
- Calculations of Daylight Factor for areas using daylight linking
- Lighting Efficiency Schedule in accordance with L2A/L2B of Building Regulations
- Cable calculations for all sub-main and sub-circuit cables indicating cable sizes and type, design currents, design lengths, cable types
- Lightning protection calculations and standard details
- Distribution board schedules
- Earthing and bonding schedule with cable sizes
- Distribution equipment selection
- Fire alarm design certificate
- Fire alarm cause and effect matrix
- Fire alarm equipment selection
- Intruder alarm equipment selection
- Data equipment selection
- Access control equipment selection



- Information relevant to the production of the metering strategy including predicted building energy usage calculations.
- Control system power and control cabling selection
- Estimated annual running costs for all newly installed systems

1.7 COMMISSIONING

It must be demonstrated by the Main Contractor that the proposed design has been vetted by the Commissioning Specialist to ensure that it can be commissioned satisfactorily, and could equally well be re-commissioned any time in the future.

All systems shall be completely proportionally balanced as necessary to demonstrate compliance with the design criteria.

The Main Contractor shall be responsible for the appointment of an independent Commissioning Specialist that shall be named in accordance with the BREEAM credit requirements. The Commissioning Specialist is required to comment on the Contractor's design as part of the approval process.

The Main Contractor shall provide a detailed commissioning programme that covers all new and existing systems that are to be carried out as part of the Contract. The commissioning programme shall include provisional periods for demonstration and witnessing of systems.

1.8 USER EDUCATION

The successful occupation of the building will to a great extent depend on the occupants' knowledge of how the systems operate. The Contractor shall allow for not less than 3 days of occupant training to ensure that all interested parties are fully briefed on how systems operate and are controlled. Advice on procedures following emergencies or breakdowns shall also be provided at this time. The Contractor shall provide video training and forward proposals to the client for discussion. Follow up training shall be provided for 1 day approximately 3 months after practical completion with an allowance for a further day before the end of the defects liability period. A simple laminated user guide shall be provided by the contractor next to each main component. The user education shall be coordinated with the issue of the Building User Guide.

1.9 OPERATING & MAINTENANCE MANUALS

The contractor shall provide 3 No copies of the Operation and Maintenance (O&M) manuals.

Each manual shall include a CD-ROM sleeve with a CD-ROM disc inserted to the inside cover which includes a fully categorised and searchable electronic PDF version of the manual.

The O&M manuals shall include manufacturer's literature, commissioning reports, certificates, guarantees, warranties, and maintenance agreements etc.

The O&M shall also include the following:



- A description of the mode of operation of all systems installed.
- Electrical test certificates
- starting up, operating and shutting down instructions for all equipment and systems.
- procedures for fault finding.
- “As Installed” drawings of the completed system installations.
- user & operating instructions for dismantling and removing equipment and systems.
- schedules of fixed and variable equipment settings established during commissioning.
- Fire management layout
- emergency lighting layout including schedule of tagged references on each fitting
- a list of normal consumable items and spares provided to the end-user as per the spares list
- contact numbers for manufacturers, installation engineers etc.
- a list of recommended spares to be kept in stock by the Employer
- recommendations for frequency and procedures to be adopted to ensure the most efficient operation of the systems.
- the manual shall include a contents page, page numbers which can be cross-referenced, colour dividers to each section, all text to be type-faced and bound within a lever-arch file. A4 pocket folders shall not be used within the lever arch file.

In the circumstance where any of the above items are missing from the manual or where noted unsatisfactory, the project administrator retains the right to return the manual with comments for modifications to the contractor to ensure compliance has been met.

1.10 **BUILDING LOG BOOK**

A building logbook shall be compliant with the requirements of the Building Regulations, which shall be completed by the contractor and handed to the end-user on completion of the works.

The format of the building log-book shall as a minimum match the format given within the CIBSE TM31 “Building Log Book Toolkit” technical memoranda.

The tagged references on each emergency fitting shall be easily cross referenced with the emergency lighting layout within the O&M manual. The contractor shall ensure each of these labelled reference tags are fixed to the emergency luminaire clearly and at a position which is not obstructed and can be seen from floor level.



The contents for the log book relative to the fire alarm and emergency lighting shall include:

- Name, location & telephone extension number of person responsible for the installation
- Full details of servicing arrangements
- A complete record of all locations from which the system or equipment was tested. The list shall include details of the outcome for the testing
- The dates, times and nature of every defect or fault that has occurred
- Full data, including dates and times, of when these defect or faults were rectified
- The date and times for the servicing of the system
- The date and types of all systems tested
- The types of systems serviced
- The date and times when the system was disconnected or non-operational
- Full details & dates of alterations to the system
- Full details of person/company carrying out works of any kind to the system.

1.11 **SERVICING & MAINTENANCE**

The Contractor shall ensure the design results in low servicing and maintenance requirements.

1.12 **SPARES**

The Contractor shall provide the following spares as part of the contract:

- Filters – one complete replacement of each filter on each AHU (if proposed).
- Motor drive belts – one for each belt driven fan motor
- Lamps –10% quantity of replacement lamps for each type of light fitting.

1.13 **STRIP OUT AND REMOVAL OF EXISTING SERVICES AND INSTALLATION OF NEW PLANT.**

For the strip out and installation of new plant the contractor shall be responsible for:

- Isolation and strip out of all services serving the existing Nursery building. The Nursery building is to be demolished during phase 1.
- Isolation and draining down of the existing LTHW and HWS water circuits to allow strip out of the existing boiler plant at the end of phase 1. The existing heating and mains cold water service pipework serving the existing building shall be reconnected to the new boiler plant at the end of phase 1. Refilling, venting of system and redosing of chemical inhibitors shall also be carried out at this stage.



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- Isolation, drain down and strip out of existing heating and mains cold water pipework shall be carried out during phase 2 and 3. Where existing pipework is installed in floor ducts, it will be drained down and remain in situ.
 - Electrical isolation of plant and motor control panels. Electrical isolation of the main intake switchboards will be carried out by the contractor.
 - The complete strip out of all redundant plant, pipework, fittings, brackets, conduit, trunking, switchgear and control panels.
 - The safe removal and disposal of the existing plant and materials stripped out. The contractor will be required to demonstrate that all materials and plant stripped out and removed from the building are disposed of in a sustainable manner with materials being recycled. The contractor's policy on the management of waste materials shall be provided at tender stage.
 - Provision of crane hire, offloading and the positioning of all new plant.



2 DESIGN CRITERIA

2.1 GENERAL

All systems shall be designed to the scheduled criteria, which represent standard good practise, and, as agreed with the client.

2.2 OUTSIDE CONDITIONS

Winter design -4°C db/100% RH

Summer design 32°C db / 20°C wb

2.3 INSIDE CONDITIONS

Refer to Room Data Sheets.

2.4 POPULATION DENSITY/OCCUPATION LEVELS

Refer to Room Data Sheets

2.5 INTERNAL COOLING LOADS – TEACHING AREAS (ELECTRICAL)

Equipment gain at 15 W/m²

Lighting gain at 10 W/m²

2.6 INTERNAL COOLING LOADS – TEACHING AREAS (OCCUPANCY)

Sensible Gain 70 W/person

Latent Gain 50 W/person

2.7 VENTILATION RATES

Refer to Room Data Sheets.

2.8 BB101 REQUIREMENTS

Thermal modelling has been undertaken using IES Virtual Environment to confirm the proposed ventilation solution for Block N classrooms, classrooms AG.06 (Nursery) and AG.65 (KS1 Year 2), shall provide adequate ventilation and comfortable conditions which prevents overheating of the teaching areas to adhere to the recommended limitations of expected occurrences of operative temperatures in accordance with BB101 Ventilation of School Buildings 2006.

The contractor will be required to demonstrate BB101 compliance for their design.

The criteria of BB101 apply outside the heating season and are for the occupied period of 09:00 to 15:30, Monday to Friday, from 1st May to 30th September. The performance standards for summertime overheating in compliance with Approved Document L2 for teaching and learning areas are:



- There should be no more than 120 hours when the air temperature in the classroom rises above 28°C.
- The average internal to external temperature difference should not exceed 5°C (i.e. the internal air temperature should be no more than 5°C above the external air temperature on average).
- The internal air temperature when the space is occupied should not exceed 32°C.

In order to show the new building will not suffer overheating two of the three above criteria must be met.

2.9 PART L REQUIREMENTS

Block N is required to comply with following requirements of Part L2A. The following building services system criteria have been used in terms of their energy performance for Block N:

SYSTEM	ITEM	CRITERIA
Heat recovery ventilation (NG05 Pupil WCs)	SFP W/(l/s)	1.9
	Heat recovery eff.	75%
Toilet extract ventilation	Extract SFP W/(l/s)	0.5 with PIR control
Domestic Hot Water	Point of use electric	
Boilers	Seasonal Efficiency	96%
Lighting	Average Luminaire Efficacy	84 lm/W
Lighting	Controls	Classrooms – Absence detection & daylight dimming WCs, stores & circulation – Presence detection

Block A refurbished areas and individual classroom extensions to comply with Part L2B.

2.10 FILTRATION

To European Standards to all areas; pre-filter EU3 and final filter EU7.

2.11 INTERNAL NOISE LEVELS

To acoustic consultants requirements. Refer to Cole Jarman’s Acoustic report for details.

2.12 EXTERNAL NOISE LEVELS

To acoustic consultants requirements. Refer to Cole Jarman’s Acoustic report for details.



2.13 PLANT REDUNDANCY

The new secondary heating pumps shall be twin-head type.

The new gas fired boilers (2nr) shall be rated at no less than 60% of the building's maximum heating and hot water demand.

2.14 INTERNAL LIGHTING LEVELS

AREA	Lux Level	Limiting Glare Index	Minimum Colour Rendering (R _a)
General Teaching	350	19	80
Offices	350	19	80
Studio room	350	19	80
Circulation Areas & Corridors	100	25	80
Stores	100	25	80

2.15 FIRE ALARMS

BS5839-1: 2013 and shall be designed to a Category L3 system enhanced

Fire Strategy is designed to BS9999.

2.16 ENVIRONMENTAL DESIGN

The engineering services shall be designed to consider the environmental effects of the building construction and operation. Particular consideration shall be given to the following to ensure the environmental impact of the building is minimised and the occupants are provided with a health work place.

2.16.1 FLUORINATED GASES (CHLOROFLUOROCARBONS)

CFC's shall be excluded throughout the design of the building services. Materials that require the use of CFC's in their production shall be excluded in favour of non-CFC alternatives.

2.16.2 ENERGY CONSUMPTION

The contractor shall ensure that the building elements are designed such that the energy consumption is kept to a minimum within the constraints of the specified operational parameters. All services and plant shall be designed and selected with energy conservation in mind.



2.16.3 ***WATER CONSUMPTION***

The contractor shall ensure that all sanitary appliances, pipework ancillaries and brassware shall be designed such that water consumption is kept to a minimum. Refer to Architect's Outline Specification for sanitary appliance specification.

2.16.4 ***LEGIONNAIRES DISEASE***

The contractor shall design the engineering services to minimise the risk of Legionnaire's disease associated with water supply systems. The recommendations of the Health and Safety Executive and CIBSE shall be adopted by the contractor in this respect.

2.16.5 ***BREEAM REQUIREMENTS***

There are no specific requirements for the project.

2.16.6 ***ENERGY PERFORMANCE CERTIFICATES***

The contractor shall be responsible for producing an as-built Energy Performance Certificate (EPC) as required by the Building Regulations.



3 UTILITY SERVICES

3.1 GENERAL

There are associated utility works, which shall form part of the contractor's design & build contract. This shall include the demolition of the existing Nursery building. The contractor shall be responsible for all services tracing, isolation and removal to the building (to suite the phasing plan) including any services diversions necessary. The buried incoming services to the redundant buildings shall be isolated, capped off and removed as necessary. The contractor shall undertake all necessary buried services surveys. Where live services are identified and required to be retained, the contractor shall allow for all costs associated with diversions as required to enable the new building works to be carried out.

3.2 GAS

The existing live incoming gas supply to Block A boiler room shall remain as existing. There appears to be an existing redundant incoming mains gas pipe that can remain in situ where it does not affect the proposed building works.

3.3 WATER

The existing incoming mains water supply pipework shall remain as existing in its majority. The available survey and record information has not identified the exact route of the pipework between the existing boiler room and Block N. The Contractor shall investigate the exact route and re-route pipework if required.

3.4 ELECTRICITY

The new incoming mains supplies to each dist board shall be sized to provide 20% spare capacity. The contractor shall provide all trenching and backfill on site for the electrical installation works. Supplies will be run from school main intake, via new 8way MCCB panel replacing existing 6 way TP&N MCCB panel.

3.5 TELECOMMUNICATIONS / DATA

The contractor shall be responsible for the placement of below ground cable ducts for the new communication lines to be procured by the client. The contractor shall liaise and cooperate fully with the requirements of the supplier to ensure their requirements are understood and provided for.

4 MECHANICAL SERVICES

4.1 MECHANICAL SERVICES REQUIREMENTS

The following describes the proposed mechanical services arrangement for each of the development areas.

4.2 MECHANICAL SERVICES STRATEGY

The mechanical services for the project shall comprise the following:

- LTHW heating via new gas fired condensing boilers with secondary heating circuits provided to serve the heating in Block A and N.
- New hot water cylinder to serve existing hot water services in Block A kitchen
- LTHW heating via radiators and heat recovery unit in the Block N pupil toilets.
- Fresh air natural ventilation to Block A classrooms and admin areas via manually opening windows.
- Fresh air natural ventilation to Block N classrooms via motorised windows and louvres and associated controls.
- Mechanical ventilation to toilets, showers, server room and cleaner stores.
- Mains cold water distribution to toilets, classrooms and showers.
- Hot water services to toilets, cleaner stores, showers and nursery sinks via local electric water heaters
- Above ground drainage to toilet areas, showers and classroom sinks
- Automatic control system to control and monitor the new boiler plant.

4.2.1 BLOCK A – SERVER ROOM

The new server room shall be provided with mechanical extract ventilation via a wall mounted extract fan linked to a room thermostat.

4.2.2 BLOCK A – LTHW HEATING SYSTEM

Phase 1

New boiler plant shall be installed as part of Phase 1 to serve both Block N and Block A. The new boiler plant heating pipework shall be connected to the existing Block A heating distribution to serve existing emitters. A new variable flow secondary circuit shall be installed to serve the existing emitters in Block A. The heating system shall be installed using copper pipework.

Phase 2 & 3



During phase 2 and 3 heat emitters and heating pipework shall be replaced in Block A as identified on the drawings and new emitters shall be installed. Various existing emitters shall be relocated as identified on the drawings. A new variable flow secondary circuit shall be installed to serve the new nursery areas.

All existing and new heating circuits shall be commissioned and balanced to suit the final installation.

4.2.3 **BLOCK A – VENTILATION**

Natural Ventilation

Classroom and admin areas shall be naturally ventilated via manually openable windows.

Mechanical Ventilation

Toilets, showers and cleaner stores shall be mechanically ventilated via local dedicated extract system to each area as identified on the drawings. Make-up air shall be via door undercuts. Extract fans shall be ceiling void or surface mounted and controlled by a PIR sensor with fan overrun.

4.2.4 **BLOCK N - VENTILATION**

Natural Ventilation

Thermal modelling has been undertaken using IES Virtual Environment to confirm the proposed ventilation solution for this Block shall provide adequate ventilation and comfortable conditions, which prevents overheating of the teaching areas in accordance with BB101 2006. The combination of opening motorised windows and attenuated weather louvres with motorised dampers achieve compliance with BB101 in conjunction with partially exposed concrete soffit to allow the thermal mass of the roof slab to be used for night cooling. During the day the exposed concrete structure will absorb heat thereby depressing the peak internal temperatures during the day. During the night the slab will be cooled by the fresh air through the louvre openings to purge heat from the rooms using the cooler nighttime air. The window openings are only going to be used at unoccupied times to purge the classrooms during the day because of the ambient noise issues identified on the Acoustic Report.

Mechanical Ventilation

The cleaner store shall be mechanically ventilated via a local dedicated extract system as identified on the drawings. Make-up air shall be via door undercut. The extract fans shall be ceiling void or surface mounted and controlled by a PIR sensor with fan overrun.

The pupil WCs shall be mechanically ventilated by dedicated a heat recovery ventilation unit ceiling mounted in ceiling void within the room. The proposed unit shall be ducted to the external wall to provide supply air intake and exhaust via appropriate plenum under the ceiling void and weather louvre. The unit shall also provide heating to the space via a LTWH coil. The distribution ductwork shall be galvanised sheet with attenuators installed if required to meet the noise criteria specified by the acoustic consultant. The unit shall have integrated time controller, overrun timer and shall be



activated by a room PIR sensor. The supply and extract ductwork shall be connected to extract grilles over each cubicle and supply diffusers outside the cubicles.

4.2.5 BLOCK N – LTHW HEATING SYSTEM

The new boiler plant shall also serve Block N. A new variable flow secondary circuit shall be installed to serve the new emitters in Block N. The new heating system distribution shall be installed using copper pipework.

Heat emitters in classrooms shall be floor mounted steel panel radiators in front of the external glazing complete with TRVs. Heat emitters in the corridors shall be steel panel radiators concealed within perforated casings as identified on the architectural drawings and specification. These radiators shall be sized to account for the casings around them and shall be provided with remote thermostat to control their TRVs.

The pupil WC heat recovery unit shall provide heating in the room via a LTHW coil. Heating flow shall be controlled by a 3 or 4-port control valve linked to room thermostat.

4.2.6 BLOCK A AG.43 STUDIO – HEATING/COOLING

The heating and cooling to the new studio shall be provided by the existing heat pump systems serving the existing classrooms. The internal cassette units and associated pipework and cabling shall be relocated to suit the new layout. The existing wired wall mounted room controllers shall also be relocated to suit the new layout. The external units shall be

4.3 SYSTEM REQUIREMENTS

The following describes the specific requirements for the systems to be designed, supplied, installed and commissioned by the contractor.

4.3.1 MECHANICAL VENTILATION GENERAL REQUIREMENTS

The contractor shall design, supply, install and commission new mechanical ventilation supply and extract systems as described above and indicated on the drawings.

Ductwork serving the supply and extract systems shall comply with the requirements of the specification, NES and DW 144. Radius bends shall be used on all systems. Square mitre bends shall only be used with turning vanes. All ductwork to be pressure tested to the requirements of DW 144 Class A. The supply and extract ductwork within the building shall be insulated.

Fire dampers shall be provided at all compartment walls and the ductwork arrangements shall comply with BS 5588 Pt 9. The fire damper assembly shall be securely mounted and fixed to the wall structure. All fire dampers shall be provided with adequate access for inspection, testing and maintenance of both the fire damper and its actuating mechanism.

System attenuators and anti-vibration equipment shall be provided to meet the specified noise criteria if required.



The air shall be supplied and extracted from each room via supply diffusers and extract grilles ducted to the distribution system via flexible ducting of a maximum of 300mm. Each branch serving a diffuser or grille shall have a volume control damper installed to balance and commission the system. Grille and diffuser positions shall be co-ordinated with the ceiling and lighting layout by the Contractor, with diffuser positioned so that thermal comfort is not compromised.

4.3.2 **HEAT RECOVERY AIR HANDLING PLANT SERVING BLOCK N PUPIL TOILETS**

The new heat recovery air handling unit shall be installed to provide the mechanical ventilation and heating to Block N Pupil WCs as detailed on the drawings.

Units shall be manufactured in aluminium alloy with 25mm double skinned infill panels and extruded aluminium frame or manufactured from Aluzinc with 25mm infill panels, giving low noise levels. It shall be provided with a high efficiency heat exchanger matrix, supply and extract filters, automatic summer bypass, LTHW coil and 3 or 4 port control valve, integral minimum and maximum infinitely variable speed controls, run on timer and fascia mounted failure indication. The unit shall have low energy, high efficiency a.c. fan/motor assemblies with sealed for life bearings. The Impellers shall be high efficiency mixed flow or centrifugal type.

The unit shall have a robust plastic/aluminium heat exchanger matrix with a thermal efficiency of 75% that shall be protected by G4 grade pleated filters on supply and extract. It shall come complete with a condensate drip tray and 22mm drain connection. Alternatively, a condensate pump shall be provided if specified.

The unit shall be constructed with removable panels allowing full maintenance access from the sides

The removable panels shall provide access to the following:

- Supply or extract fan.
- Supply & extract filter.
- Heat exchanger block.
- Speed control commissioning adjustment (min & max).
- Electrical connection terminal blocks.
- LTHW coil

The units shall incorporate the following control functions integrally mounted, prewired and factory fitted by the manufacturer: -

- Integral infinitely variable speed control on supply and extract.
- Integral background ventilation control/set point.
- Integral boost ventilation control/set point.



- Integral BMS interfaces – summer/winter switching, heating control, 0-10V speed adjustment.
- Integral run on timer.
- Volt free failure indication (direct from individual fan).
- Integral S/L terminal for boost trigger from remote switch.
- Integral air off coil temperature adjustment
- Volt free frost alarm/heat demand interface
- The unit shall be controlled by the ECOSMART type control devices (enablers & sensors).

Units shall be as manufactured by Nuaire or equal and approved

The power supply to the units shall be supplied from a local distribution board.

4.3.3 **LPHW BOILER PLANT**

The new heating plant shall consist of modulating gas fired condensing boiler plant rated at a minimum of 120% of the building maximum combined heat and existing kitchen hot water demand. The boilers shall be by Hamworthy or equal and approved with a seasonal efficiency of 96% or greater.

The boiler plant shall comprise of 2nr boilers, operating at 70°C/50°C. Each boiler shall be rated at no less than 60% of the building maximum combined heat and kitchen hot water demand, connected to a primary circulation system using reverse return connection arrangement. Each boiler shall be provided with an inverter driven primary circulating pump.

Each boiler shall be provided with a dedicated flue to discharge to atmosphere at roof level. The final height of the flues shall take into consideration the inlets of the natural and mechanical ventilation inlets, the Clean Air Act and all current legislation.

The primary circulation system shall connect to a vertical low loss header as indicated on the schematic drawing.

The primary circulation shall also include an automatic dirt separator and deaerator unit on the primary flow pipework, as indicated on the schematic drawing, in addition to all necessary valves, strainers, test points, drain cocks and air vents. The dirt separator shall be line size and suitable for the design volume flow rate, capable of removing free circulating air, micro bubbles and particle sizes from 5.

A magnetic filtration unit shall be installed on the primary return pipework to protect the new LTHW system. Chemical dosing shall be provided through the magnetic filtration unit.

The water pressure within the LTHW heating system shall be maintained by a duplex pressurisation set complete with expansion vessel.



From the primary low loss header, the Contractor shall supply and install 4nr Variable Temperature (VF) secondary heating circuits including circulating pumps, control valves and all necessary ancillary valve, strainers, drain cocks, air vents and test point items, to serve the heating circuits as indicated on the drawings.

Each secondary circuit shall be provided with a twin head primary circulating pump set, located within the plant room and shall comprise run and standby variable speed pumps sized to overcome the system pressure drop and to maintain the required flow rate at all times. Pumps shall be inverter controlled for commissioning and to maximise efficiency by altering flow rates at the dictates to the respective system requirements.

End of line fixed double regulation valve shall be installed on Block N and the Nursery secondary heating circuits.

All heating pumps shall be 'A' rated under the Euro-pump Labelling Scheme with magnetic motors as manufactured by Grundfos or equal and approved.

Boiler room ventilation to meet the requirements of BS: 6644 shall be provided to the boiler room.

4.3.4 **LPHW HEATING**

The new primary and secondary LTHW circuits shall be complete with new pumps and controls. The Contractor shall supply and install all necessary valves, strainers, test points, drain cocks and air vents.

The new circulating pumps shall be suitable to overcome the system pressure drops and to maintain the required design flow rate at all times. Pumps shall be inverter controlled for commissioning and to maximise efficiency by altering flow rates at the dictates to the respective system requirements.

Pipework materials for the LPHW service shall be generally copper. Drain points shall be installed on all system low points and air vents on all system high points. All secondary pipework outside of the plant areas shall be concealed within ceiling voids, risers and dropper casings. All pipework shall be thermally insulated, all joints will be taped and all services identified in accordance with BS 1710. Prior to the application of thermal insulation, the new installation will be pressure tested and the relevant certificate issued as verification.

Pipework material for the LPHW flow and return pipework buried in a service trench between the boiler room and Block N shall be pre-insulated plastic as per Uponor Thermo or equal and approved.

Pipework material for the heating flow and return pipework buried in the floor screed serving Block N radiators shall be plastic with pipe-in-pipe arrangement. Plastic pipes shall be connected to heating manifolds as identified on drawings and shall be as per Uponor TM Flow or equal and approved.

The Contractor shall employ the services of a Specialist Water treatment supplier to recommend a water treatment regime to suit the LTHW system on completion of the installation. The Contractor shall follow these recommendations and provide associated certification in the O&M manuals.



All LPHW heating pipework shall be insulated with materials that are A+ or A rated and shall have a thermal conductivity of less than 0.025 W/mK and shall be responsibly sourced at both key process and supply chain process. All heating pipework thermal insulation within the plant room shall be mechanically protected by metal cladding finish.

4.3.5 **LTHW SYSTEM VALVES**

All new valves for LTHW service shall comply with the requirements the NES specification and shall be selected from the Herz Valves Limited ranges as indicated below or equal and approved.

All circuit regulating valves from DN15 to DN50 shall be DZR Copper Alloy, to BS 7350, screw-down models, with soft seat for positive shut off. These shall be supplied with presetting marker for recording valve set position and suitable for operation up to 110°C at 16 bar and fitted with plugs to allow the fitting of a drain facility where required.

Double Regulating Valves:

Screwed double regulating valves shall be globe pattern and have a non-rising spindle with a double O-ring spindle seal. Pre-setting shall be by limitation of spindle lift with pre-set value displayed through a window in the hand wheel by means of a mechanical digital counter. Valves shall have locking and marking facilities for the pre-setting, as Herz Fig No 4217.

Flanged double regulating valves shall be oblique pattern and have a non-rising spindle with an EPDM coated parabolic disc. Pre-setting shall be by limitation of spindle lift with pre-set value displayed on the hand wheel. Valves shall have locking and marking facilities for the pre-setting, as Herz Fig No 4218.

Commissioning Sets:

Commissioning valves should be fitted in accordance with good practice allowing sufficient straight lengths of pipe upstream and downstream to allow flow stabilisation.

Screwed fixed orifice commissioning sets, DN15 to DN50 shall comprise of a double regulating valve close coupled to a metering station to BS 7350 fitted with self-sealing test points for flow verification. The valves shall be Herz 4217 DRVs. Valves must be sized for the flow rate required for each application as Herz Fig No 4217CS.

Drain Cocks:

Drain Cocks DN10 to DN20 shall be copper alloy, suitable for 120°C at 10 bar, and supplied with chain and cap to cover the connection point for hose union, as Herz Fig No 4119.

Strainers:

Y Pattern strainers DN15 to DN50 shall be DZR Copper Alloy and be fitted with 0.75mm Stainless Steel mesh screens as Herz Fig No 4111.



Y Pattern strainers DN65 to DN300 shall be Cast Iron and shall be fitted with 1.5mm – 2mm stainless steel mesh screens, as Herz Fig No HV185.

Isolating Valves:

DN15 to DN50 shall be ball valves or gate valves and DN65 to DN300 shall be butterfly valves or gate valves, as detailed below.

DN15 to DN50 ball valves shall be full bore, copper alloy, screwed ends to BS 21, as Herz Fig No K-KV or HV85.

DN15 to DN50 gate valves shall be copper alloy to BSEN 12288B, screwed ends to BS 21, as Herz Fig No HV55.

Lockshield Gate valves to be copper alloy to BSEN 12288B, screwed ends to BS 21, as Herz Fig No HV55LS.

Butterfly valves shall be Cast Iron to BSEN 593, wafer pattern fully-lugged with EPDM liner, SS anti-blow out stem, with lockable handle, as Herz Fig No BF-FLL.

Gate Valves shall be Cast Iron to BS 5150 with gunmetal trim, flanged PN16 to BS 4504, as Herz Fig No HV5150.

Non Return Valves:

Non Return Valves DN15 to DN50 shall be of swing check design with copper alloy body and disc to BS 5154, as Herz Fig No HVCH25.

Non Return Valves DN65 to DN300 shall be of swing check design with Cast Iron body and bronze trim to BS 5153 and flanged PN16 to BS4504, as Herz Fig No HV515

4.3.6 HEATING EMITTERS SCIENCE & COMPUTING BLOCK

The heating emitters shall be as detailed on drawings and room data sheets. All emitters shall be sized for the room or space maximum heating load, which shall include an appropriate design and pre-heat margin (to be confirmed as part of the design technical submittal). Final location, dimensions and finishes shall be agreed with the Client prior to order.

Steel panel radiators and LST type radiators shall be installed to the rooms and space indicated on the drawings.

Radiators shall conform fully with the requirements of the European standard for radiators BS EN 442.

New radiators shall be suitable for a maximum test pressure of 6 Bar and maximum operating pressure of 4 Bar. The Contractor shall be responsible for ensuring that all mounting supports and brackets are fixed securely to walls.

All radiators shall be supplied complete with thermostatic radiator valve, and lockshield return valve.



The Contractor shall make allowance for first fixing the radiators, brackets and pipework and for removal of radiators once to allow for decorating followed by replacing the radiators.

The Contractor shall allow for all necessary bleeding of air from new radiators and heating pipework and for balancing the system by regulation of radiator lock shield valves. A suitable number (minimum 2) of radiator vent keys shall be handed over to the Client on completion of the project.

4.3.7 INTERNAL GAS DISTRIBUTION IN EXISTING BOILER ROOM

The contractor shall design supply, install, commission and set to work the existing gas main to the new gas fired boiler plant.

The internal building gas installation shall be as generally shown on the design drawings and within this scope of works and specification. All gas pipework shall be adequately ventilated in accordance with current Gas Regulations.

The contractor shall allow for supplying and installing of gas pipework in medium grade steel and associated safety systems. A solenoid shut off valve shall be installed on the gas to the boilers within the boiler room, installed complete with manual knock-off button adjacent to the exit door and link to the fire alarm system. The electrical supply shall be derived from the new boiler room control panel, which shall feed the gas safety control panel.

The Contractor shall allow for all necessary purging and testing of pipework and shall provide certificates for completed sections of pipework.

The Contractor shall ensure that all work complies with the requirements of The Gas Safety (Installation and Use) Regulations, Health & Safety at Work Act, Pipelines Safety Regulations, Gas Safety (Management) Regulations, BS EN 1775, Institute of Gas Engineers IGE/UP/2 and that the installation is carried out by a Gas Safe registered installer.

All new surface exposed gas pipework above ground shall be carried out in steel tube to comply with the requirements of BS 1387, heavy grade. All tubes shall be provided with the manufacturer's standard protective finish. Pipes for welding shall have plain ends. Elsewhere the ends shall be screwed in accordance with BS21.

Where pipework passes through walls, floors or ceilings, tubular pipe sleeves of a non-combustible material compatible with the pipework shall be fitted.

Pipework shall be properly supported as to avoid any undue risk of damage and shall be supported using malleable iron screw on brackets.

Isolation valves up to 50mm nominal diameter shall be of the lever operated plug type. Valves shall be manufactured from cast gun metal or bronze with taper plug. The valve shall have screwed ends to BS 21.



On completion of the installation, the Contractor shall test the gas tightness of the installation in accordance with the appropriate standard.

All pipework shall be subjected to a tightness test at a pressure at least equal to the one and a half times the operating pressure and not greater than 150 mbar.

All gas pipework exposed to view must be identifiable by colour and/or labelling. Pipework colour coding is given in BS 1710. Where the gas pipework exposed to view is painted, for natural gas the basic identification colour is yellow ochre (Ref. BS 4800 08 C 35).

The Contractor shall be responsible for preparation of the pipework, application of an appropriate number of primer, undercoats and topcoats as detailed within the NES specification, applied to provide a high standard of finish.

The Contractor shall ensure the earth bonding system for all new pipework installations is to current standards, compliant with BS 7671.

The Contractor shall supply and install a line diagram of the new gas pipework system (Minimum Size A3), which shall be permanently displayed within the ground floor plant room. The diagram shall be attached to the wall in a readily accessible position, indicating the position of the gas pipework installation, valves or cocks, pressure test points and electrical bonding; plus clearly stating any essential emergency instructions.

4.3.8 **NATURAL VENTILATION – BLOCK N**

Weather louvres with motorised dampers

Block N classrooms shall be naturally ventilated by weather louvre modules that will incorporate noise attenuation and insulated motorised dampers linked to local room controllers.

The complete louvre system, actuator and control system shall be as manufactured by Monodraught Ventsair system or equal and approved consisting the following:

- External Class A weather louvre manufactured in aluminium construction with airways protected with mesh (32nr.)
- Insulated (U-value of 1.2) motorised low leakage ($2.73\text{m}^3/\text{hr}/\text{m}^2$) at 50 Pa) volume control damper (32nr.)
- Acoustic infill material (To satisfy the noise criteria – refer to Acoustic Consultant's report) (32nr.)
- Internal linear grille (32nr.)
- 2nr iNVent2 fully automatic control system with night time cooling facility as standard (to be fitted in store cupboard locations to be agreed)
- 8nr classroom VA controllers with temperature, CO₂ sensor and override controls.



The classroom controllers shall be wired from the iNvent2 panels which shall be mounted in agreed store cupboard locations. Each iNvent2 panel shall control 4 classrooms. Each iNvent2 panel shall derive power from a local single phase power supply by the Electrical Services Subcontractor, with final connection by the specialist natural ventilation subcontractor. The iNvent2 panel shall provide a 24 volt DC output to provide power and control to the damper actuators. The control shall be based upon an internal space temperature and CO₂ sensors, but limited by a time clock channel, and a minimum ambient temperature limiting set point [adjustable] below which the windows shall not open

For exact weather louvre sizes refer to the Architect's tender drawings and specification. The maximum louvre module depth shall not exceed 450mm.

Louvre and internal grille finishes to be RAL 7016 and confirmed to the Employer's Agent and the Client prior to order.

Motorised windows

Block N classrooms and group room shall be also naturally ventilated by opening windows, which are motorised and linked to a control system – as indicated on the drawings. The new classrooms shall have 4nr high-level automatic opening windows (the Group room 2nr.) available to open only during unoccupied times due to site noise constraints. The Contractor shall supply and install the complete natural ventilation system comprising window actuators, controls system and wiring.

The complete control system and window actuators shall be as manufactured by SE Controls or equal and approved using the NV open/close switch controllers and SECO N 24 25 250mm stroke window actuators. The window actuator shall provide automatic switch off when the end position is reached. The closing of the actuator shall be electronically defined via the pressing force to provide a tight close on every operation. The actuator speed shall be adjustable between 3 and 5mm/s.

The system shall comprise of distributed independent Room Controllers within a single wall mounted unit located in each classroom, providing simple on/off control from within each room. The final location of the room controller shall be coordinated with other installed services, positioned in an accessible area and agreed on site.

The Room controllers shall be wired from a network power supply module (PSU) which shall be mounted in a store cupboard or accessible ceiling void space. The PSU panel shall derive power from a local single phase power supply by the Electrical Services Subcontractor, with final connection by the specialist natural ventilation subcontractor. The control panel shall provide a 24 volt DC output with combined 2 channel output not to exceed 5 Amps, to provide power and control to the window actuators. The control shall be based upon manual on/off operation by the teaching or premises staff.

For exact proposed window sizes refer to the Architect's drawings and specification.



4.3.9 **BMS CONTROLS GENERAL**

The Contractor shall employ a BEMS Controls Specialist Contractor to design, supply, electrically install, engineer, programme and commission the complete BEMS controls system for the new boiler room.

The Specialist Contractor shall be responsible for the design and engineering development of the automatic control and building management system to achieve the specified criteria described within this performance specification and the NES spec. A complete BEMS shall be supplied and installed to provide automatic control and monitoring of the building services installations and feedback of the boiler room plant status/performance for analysis as detailed in the NES specification.

Where appropriate, the Controls Specialist Contractor shall liaise with other contractors and manufacturers to coordinate the BEMS design requirement.

The Controls Specialist Contractor shall also include for any additional points or interlocks, which may be required for the correct functioning of the systems, which may not be specifically listed in the performance specification. Such points may include additional inputs to inform the BEMS the plant is being operated in “hand” or is being overridden etc., to prevent hardware/software conflicts.

The BEMS shall incorporate functionality for the monitoring and (as described) control of HVAC systems, electrical and water metering, energy management, BEMS-attached system alarms, together with data logging, trending, reporting and maintenance management functions related to normal building operations, and interlinks with fire and life-safety systems all as described in the performance specification and indicated on the engineering drawings.

The BEMS shall generally comprise a network of interoperable direct digital controllers communicating with each other on an open protocol wired network. All components and controllers supplied under this contract shall be full peer-to-peer communicating devices. Components or controllers requiring “polling” by a host to pass data shall not be acceptable. The BEMS shall communicate with engineering system plant and equipment such as air handling systems, energy metering systems, and other building management related devices.

The control system shall be based on utilising Siemens manufactured controls or equal and approved. Programmable controllers located within the new control panel shall perform a single control system strategy with full integration and co-ordination between all the mechanical plant as listed in the schedules. The control panel shall be positioned within the existing boiler plant room.

System access shall be via a User Interface/Display Unit located on the Control Panel fascia.

All plant status, alarms, sensor values, setpoints, time/holiday schedules and other system management facilities shall be accessible from these interfaces – dependant on the password level of entry. Any critical alarms shall cause an automatic customised message display at the keypad/display together with activation of an in-built audible alarm sounder.



The open protocol digital controller outstations shall include a reasonable provision for spare capacity for future extension to include additional control points. This shall be at least, but not limited to, 20% spare capacity.

The BEMS installation shall include, but not necessarily be limited to, the following:

- Supply and installation of DDC Outstations suitable for configuration for the control and monitoring of attached equipment and for the relaying of signals to/from monitoring “head end”.
- Supply, installation and programming of fascia mounted user interface unit to be located within control panel
- Supply and installation of BEMS hardware, mounted within the BEMS section of the various motor control panels, as required for the full operation of the BEMS.
- Supply and installation of new mechanical control panel
- Supply and installation of temperature sensors, D.P switches, etc.
- Installation of mechanical services power wiring and associated cable containment systems from mechanical control panels to plant items.
- Installation of all control wiring and its associated cable containment systems between Outstations, Field Equipment and the BEMS Network.
- Installation of remote alarm communication from other independent control systems.
- Installation of wiring from remote check meters and alarm interfaces.

Individual monitoring of energy consumption shall be provided for all new plant and equipment as required under Building Regulations Part L. Automatic meter reading and data collection shall be carried out by the BEMS by a separate graphics page.

Mechanical Control Panels

The Contractor shall design, supply and install the new mechanical control panel to be sited as described above. The panels shall comply with Form 2 segregation in line with BS EN 60439 and shall be wall mounted of the single section type.

The new Control Panel shall house all power and control equipment associated with the new mechanical plant (as listed later), wired in PVC coated cable to klippon type terminals within PVC trunking or protected cable looms. All control circuit cables shall be identified at both ends and all internal components shall be labelled. These shall be cross referred to a record CAD produced control panel wiring diagram - a copy of which shall be kept within the Control Panel and the Operations & Maintenance manual.



Internal control panels shall be to IP43 minimum. A suitable IP rated door-interlocked isolator shall be used wired internally to shrouded incoming power supply terminally. Door interlocked isolators shall be of the type that can allow control panel access by a qualified person using a special tool.

All internal wiring shall be carried out to the control system manufacturer's recommendations with particular attention paid to screened cable requirements and earthing. All screened cabling for sensors and the communication network shall be taken to outgoing terminals with an additional, non-earthed, terminal for screen continuity. Suitably rated control circuit transformers shall be included to serve all BMS controllers and other 24VAC control devices. A separate 24VAC control transformer shall be included within the control panel to serve the keypad/display unit.

Plant operation shall be automatic and any out of hour's operation or override shall be via the keypad/display. For commissioning and maintenance/service purposes there shall be means of overriding the operation of each item of plant and Hand/Off/Auto switches incorporated on the fascia of the control panel.

When incorporated within a system, all safety interlocks such as high limit thermostats, airflow proving switches, H/T cut-outs, panic buttons and other safety devices shall be hard wired whether or not they are duplicated in the BMS software.

Motor starting shall be as follows (if inverter drives are not present):-

- Under 0.36KW / 1ph Contactor Switched
- 0.36KW / 1ph or any size 3ph, up to 5.5KW Direct on Line
- Over 5.5KW / 3ph Star Delta

MCC01 – Science & Computing Block

The new control panel shall be supplied and installed within the existing ground level boiler plant room. The Specialist Contractor shall be responsible designing the panel to suit the space, coordinated with all other services in the plantroom. This shall generally be a wall mounted type panel. This control panel shall be supplied complete with fascia mounted Siemen's User interface module (or equal and approved) to provide graphic displays for monitoring and control of all new installed services and equipment. The MCC control panel shall provide electrical power to the plant located within the plantroom. The new control panel shall provide power and control / monitoring of the following plant and equipment:

- New Gas fired boiler plant
- Gas solenoid valve
- Pressurisation unit



- LPHW pumps, and system temperatures
- Pulse output from heat meters
- Fire alarm interface

The contractor shall be responsible for developing a detailed points schedule and associated description of operation for review / comment by the client's technical advisers.

Fire Condition

The electrical services contractor shall provide a Fire Alarm signal to the BEMS control panel in order to shut the plant down in a fire condition.

Once the fire alarm signal has cleared, the BEMS will enable the plant as required.

Electrical Installation

The incoming electrical power supply to the new MCC control panels (including terminations) shall be part of the Electrical Services Contract. The design engineering, manufacture, supply delivery, installation, testing and commissioning of the complete Automatic controls and BEMS system, including all power and control wiring from MCC's to all field devices, plant and motors shall form part of the Mechanical Services Contract. The Controls Specialist Contractor shall be responsible for all outgoing power wiring from the mechanical control panel to the plant it is controlling and monitoring.

The power wiring shall comprise XLPE/SWA/LSF cables with copper stranded conductors on MDRF galvanised.

All armoured power feeds shall be provided with a separate CPC sized as the main line conductor. All wiring shall terminate adjacent each item of plant in a switch disconnect, which shall be lockable in the "off" position. All wiring shall be installed and tested by an NICIEC Approved Electrical Contractor and shall be installed in accordance with the requirements of the NES specification. All power wiring shall be contained within new galvanised conduit. The Contractor shall coordinate with the Electrical Services Contractor to use their primary containment routes where possible to minimise the visible containment runs. The Specialist Contractor shall produce working drawings clearly indicating proposed runs out from primary containment to all field items.

Control wiring

All controls wiring shall be carried out by the controls Specialist Contractor using cable as recommended by the component manufacturer, contained within galvanised steel trunking and conduit systems. Where new containment is required, the Specialist Contractor shall supply and install the containment and shall be responsible for coordinating the final route with other installed services and the building fabric and structure. The Contractor shall coordinate with the Electrical Services Contractor to use their primary containment routes where possible to minimise the visible containment runs.



All electrical works shall be undertaken, tested verified and commissioned by an NICEIC Approved Electrical Contractor in accordance with BS7671:2008 +A3:2015

Prior to commencing works the Contractor shall verify all wiring details, cable sizes etc. with the Contract Administrator to check requirements against manufacturer's information.

All peripheral final control elements and plant interlocks shall be 24vac SELV where practically possible. A working drawing shall be prepared to show proposed details prior to ordering the equipment.

BMS Commissioning

The Controls Specialist Contractor shall make suitable allowance to ensure that all necessary commissioning is carried out prior to practical completion and all systems have been fully demonstrated prior to handover.

Non-BMS Controls

Plant items and systems having local control shall be adjusted and set-up to perform their control functions independent of the BEMS-type system.

4.3.10 COMMISSIONING GENERAL

The Contractor shall be responsible for the appointment of an independent Commissioning Specialist Contractor either a member of the HVCA Commissioning Group or a member of the Commissioning Specialists Association, who shall be responsible for monitoring and programming pre-commissioning and for executing the commissioning works and where necessary re-commissioning. This shall be carried out within 7 days of the Contractor's own instruction to ensure that the specialist sub-Contractor's designs are developed with commissioning and maintenance good practice in mind. Should the Contractor have any concerns regarding the commissioning, validation or functionality of the services, this shall be reported in writing to the Contract Administrator before the commencement of any work. Adequate allowance shall be made in the Contractor's program of works for commissioning of the services installations.

All commissioning shall be carried out in accordance with the following CIBSE and BSRIA guidelines, and in accordance with the requirements of the NES specification:

Water services:	CIBSE Commissioning Code W BSRIA Application Guide 2/89
Refrigerant pipework:	CIBSE Commissioning Code R
Air distribution systems:	CIBSE Commissioning Code A BSRIA Application Guide 3/89
Control systems:	CIBSE Commissioning Code C



Commissioning shall include but is not limited to the following items and systems:

- Heatpump system
- VRV/F air conditioning systems
- Spilt DX systems
- Mechanical ventilation systems
- Gas fired appliances and equipment
- LPHW boiler
- LPHW heating systems including radiant heating
- Domestic hot and cold water systems
- BEMS Controls

4.3.11 **OPERATING & MAINTENANCE DOCUMENTS GENERAL**

The contractor shall produce operating and maintenance manuals and 'as fitted' drawings detailing the systems installed.

The manuals must include the following information:

- 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.
- A photo-reduction of all record drawings together with an index. Reduced size of drawings to be A3
- Legend of all colour-coded services.
- Schedules (system by system) of plant, equipment, valves, 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 for pseudomonas.)
- 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/IEE 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 defects liability period
- details of warranties for plant and systems including expiry dates, addresses and telephone numbers.
- Design criteria used in the design of the building services installations

Refer to requirements also listed in section A64 of the NES document.

Building User Guide

The Contractor shall be responsible for the production of building services related information for inclusion within a simplified building users' manual or guide, designed to a format to be agreed with the Client, to provide sufficient information in a clear, explicit form for the use of End Users within the building. The purpose of the manual will be to explain how automated systems operate, where User interface is possible and where it is not and how to operate the building services installation in the most efficient manner whilst maintaining occupant comfort. This shall include but is not limited to:

- Explanation of local heating controls.
- Details of VRF system operation
- Details of the mechanical ventilation system.
- Details of PIR activated ventilation shut off.



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- Implications of misuse of installed services
 - Use of the building lifts
 - Details of installed security systems, access control etc.

An additional section of the Building User Guide shall provide Facilities Management with a non-technical summary of the operation and maintenance of all installed systems including the Building Energy Management System (BEMS) and all local controls.

The manual may be produced in electronic format for distribution via the intranet – to be agreed with Client prior to production.



5 PUBLIC HEALTH SERVICES

5.1 DOMESTIC COLD WATER GENERAL

The existing incoming mains water supply shall serve Block A and Block N as identified on the drawings.

New mains water service (excluding the existing kitchen) shall be extended throughout the building to sanitary fittings, hot water heaters and drinking water outlet so that all sanitary fittings have a mains water supply. The mains water distribution shall be complete with stop cocks, drain cocks and double check valves. Pressure reducing valves shall be fitted to prevent excessive pressure at the appliances. Servicing valves for local isolation of the water supply at each appliance shall be supplied and installed. Isolation valves shall be lever operated ball valves. The final service valve on each sanitary hot water outlet shall be Allen key operated ball valves.

New mains water pipework shall be in copper.

A sub-meter shall be provided to the branch serving the new Nursery. The water sub meter shall be installed with volt free contacts for monitoring of water usage should this be required in the future.

The Contractor shall ensure, prior to connection, that all appliances and equipment are complete with the necessary and correct category back-flow prevention devices, in accordance with the Water Regulations. Where an appliance does not have integral backflow protection, the Contractor shall be responsible for providing any additional external devices. Flexible hoses shall not be used in connection with potable water to prevent any enhanced risk of harbouring Legionella bacteria and other potentially harmful bacteria.

All pipework and fittings shall be supplied, installed and commissioned in accordance with the NES specification. All pipework shall be supported adequately and thermally insulated where concealed within ceiling voids and pipe casings in accordance with the requirements of the NES specification. All thermal insulation used for the building services installation shall be A+ or A rated in the BRE Green Guide and shall be responsibly sourced. The use of dissimilar material where they are liable to cause corrosion shall be avoided.

Where pipework passes through walls, floors or ceilings, tubular pipe sleeves of a non-combustible material compatible with the pipework shall be fitted. The internal diameter of the sleeve shall, except where necessary to allow for expansion and contraction or where otherwise specified, not exceed the outside diameter of the pipework by more than one pipe size and shall project 3mm beyond the finished surfaces.

A sufficient number of valves must be inserted into the pipework to ensure that the water system is properly installed and tested, as well as being able to isolate for maintenance and/or removal of sections of the system. On completion, the Contractor shall clean all completed pipework, fittings, support steelwork and brackets and make good thermal insulation in accordance with the NES specification.



All new installed pipework should be insulated in accordance with the requirements of BS 6700 and the NES specification all joints shall be taped and all services identified in accordance with BS 1710.

The Contractor shall ensure that in compliance of Regulation 5 of The Water Supply (Water Fittings) Regulations 1999, the appropriate Water Company is notified in advance of the plumbing works being carried out and seek their consent for the works to proceed.

5.2 DOMESTIC HOT WATER GENERAL

Classrooms, showers, WCs, cleaner stores (as identified on drawings and room data sheets)

The domestic hot water shall be provided with point of use unvented electric water heaters as manufacture by Heatra Sadia or equal and approved complete with Building Regulations approved G3 expansion and thermal/pressure relief equipment. The contractor shall be responsible for sizing the hot water demand and associated capacity of the unvented heater.

TMV2 thermostatic mixing valves shall be installed on the hot water supply to all wash hand basins accessed by the students if the tap specified (refer to Architect's specification) does not have a integrated TMV. Full temperature hot water shall be available to cleaner's cupboards for hygiene.

Thermostatic mixing valves shall be complete with check valves, flow regulator, strainers, swivel inlet connections and flat faced union connections for 15mm diameter copper pipework. All thermostatic mixing valves shall be installed in accordance with the manufacturers' recommendation and commissioned in accordance with Water Regulations.

The secondary outlet from the water heaters shall be fully insulated and trace heated using a self-regulating tape to maintain the secondary hot water distribution above 50°C if the first outlet is further than 3 metres from the water heater. The trace heating tape shall be installed up to blending valves and within 300mm of the tap on unblended supplies. The trace heating system controller shall be mounted in the plantroom with the splice units mounted in accessible locations. Warning labels shall be provided fixed to the pipework thermal insulation to identify the pipework has trace heating installed.

Final pipework routes shall be coordinated with other services and the building fabric and structure.

All pipework and fittings shall be supplied, installed and commissioned in accordance with the NES specification. Isolation valves shall be lever operated ball valves. The final service valve on each sanitary hot water outlet shall be Allen key operated ball valves.

All pipework shall be supported adequately and thermally insulated where concealed within ceiling voids and pipe casings in accordance with the requirements of the NES specification. All thermal insulation used for the building services installation shall be A+ or A rated in the BRE Green Guide and shall be responsibly sourced. Surface run visible pipework shall be painted with primer/undercoat and at least two finishing coats in a colour to be agreed prior to installation.

The use of dissimilar material where they are liable to cause corrosion shall be avoided.



Where pipework passes through walls, floors or ceilings, tubular pipe sleeves of a non-combustible material compatible with the pipework shall be fitted. The internal diameter of the sleeve shall, except where necessary to allow for expansion and contraction or where otherwise specified, not exceed the outside diameter of the pipework by more than one pipe size and shall project 3mm beyond the finished surfaces.

A sufficient number of valves must be inserted into the pipework to ensure that the water system is properly installed and tested, as well as being able to isolate for maintenance and/or removal of sections of the system. On completion, the Contractor shall clean all completed pipework, fittings, support steelwork and brackets and make good thermal insulation in accordance with the NES specification.

All new installed pipework should be insulated in accordance with the requirements of BS 6700 and the NES specification all joints shall be taped and all services identified in accordance with BS 1710.

All water systems in the building shall be designed and installed in compliance with the measures outlined in the Health and Safety Executive's Legionnaires' disease – 'The control of legionella bacteria in water systems' approved Code of Practice and guidance.

Existing Kitchen

5.3 CHLORINATION GENERAL

The Contractor shall ensure the water treatment and pipe cleaning processes comply with statutory authority, COSHH Regulations and health and safety requirements. The Contractor shall use a water treatment Specialist Contractor for the analysis, design, supply, installation and operation of any system cleaning and chemical treatment process. The Contractor shall ensure the water treatment and pipe cleaning processes comply with statutory authority, COSHH Regulations and health and safety requirements.

Before any newly installed cold water mains, rising mains, storage tanks, cold water down services and hot water services pipework systems are brought into use for domestic purposes, they shall be disinfected by chlorination executed by the Water Treatment Specialist, in accordance with BS 6700.

5.4 ABOVE GROUND DRAINAGE GENERAL

The Contractor shall allow for the design, supply and installation of all new above ground foul water drainage serving sinks, WC's and wash hand basins etc., as indicated on the layout drawings.

New above ground soil and waste pipework shall be run from appliances throughout the building to connect into the underground foul drainage system, as indicated on the drawings. Drainage shall generally be provided from all domestic sanitary were via internal soil stacks to pop-up locations at ground floor slab level. All drainage shall be designed in accordance with BS EN 12056:2000. The drainage stacks shall be fully insulated for sound insulation.



All new soil and waste systems shall comply with the requirements of BS EN 12056, Building Regulations and the Local Authority requirements for all above and below ground drainage work. All new waste pipework shall be of a suitable size and fall for the appliances connected and appliance use and shall be installed in accordance with the requirements the NES specification.

Where pipework passes through fire compartments, firebreak sleeves shall be fitted.

Access caps shall be fitted at ends of all horizontal pipework, at junctions and changes of direction. Access plates shall be fitted at each floor level immediately above the highest connection, at the foot of each vertical stack and at junctions to horizontal connections to enable the complete disposal system to be internally cleaned and rodded.

The Contractor shall carry out all tests requested by Local and Statutory Authorities on the entire installation and shall supply all necessary clean water, appliances and equipment for this purpose. The Contractor shall be prepared to carry out any test and make available for inspection, any section of the Works at any time during the progress of the Works or after substantial completion of the Works. Test Certificates shall be submitted by the Contractor to the person witnessing the test for their signature of approval to the effect that the system satisfied the requirements of the NES specification. The Test Certificates shall be provided by the Contractor and shall be required to be completed for all sections of the installation. Water flow tests shall also be carried out to ensure the system is clear of debris, and building material.

For details of the below ground drainage system performance specification design, refer to details and drawings provided by the project Structural / Civil Engineer.



6 ELECTRICAL SERVICES

6.1 ELECTRICAL SERVICES STRATEGY

The electrical services for the project shall comprise the following:

- Diversion (lowering) of existing incoming utility services to accommodate new car parking spaces and widened entrance Apron.
- Diversion of existing fibre broadband supply to new server room.
- Termination of existing data cabling (phase 2&3 areas) into new data cabinet to be kept live during phase 1 & 2
- The systems shall be designed in compliance with Part L2 of the Building Regulations
- Provide new 8way MCCB panel to replace existing main LV panel in school main intake.
- Final distribution boards DB-A to DB-G
- Energy monitoring sub-metering
- LV sub main distribution
- Earthing protection systems
- Lightning protection system to new building extensions.
- External lighting to perimeter of buildings, main entrances as drawings.
- External lighting to carpark and pathway as drawings.
- General internal lighting
- Lighting control systems
- Emergency lighting systems and remote testing / monitoring
- Fire alarm – KA wing.



- Class change bell system to each area linked to main school admin office.
- Access control system over IP for remote site monitoring – Paxton net2
- Intruder Alarm system – KA wing
- Asset tagging of valuable items to prevent unauthorised removal
- IT structured cabling installation
- Mechanical services electrical supplies
- Power supplies to mechanical plant
- Disabled alarm call facilities

6.1.1 **STRIP OUT**

The Contractor will be responsible for the complete strip out and removal from site of the existing electrical services installation to refurbishment works areas.

The strip out shall be undertaken to suit the phasing of the works with the Contractor responsible for carrying out any necessary temporary re-routing, diversions and modifications to the system in order to maintain services fully operational to the occupied parts of the existing building during the works.

The Contractor will be responsible for fully surveying the existing services to establish their extent, routing, location of plant and services prior to commencement of works on-site, so that isolation points and any necessary modifications are known prior to the start of the works.

6.1.2 **LV DISTRIBUTION**

Redundant Services

The works are to be undertaken in 3 phases+ an 'enabling phase'.

The existing IT block is to be demolished and currently has its own dist. boards supplied for main intake room. DB-IT this will be disconnected and isolated to enable demolition of the block.

Phase 1 is the construction of new 8 classroom teaching block, this will require new MCCB and submain run externally to the new building to avoid disruption within existing working school.

Phase 2 is the construction of new Nursery block, this will require new MCCB and sub main route to be determined to the new building extension to avoid disruption within existing working school.



The existing main LV MCCB board to be retained until phase 3, LV distribution switchgear, distribution boards and cable trunking etc. feeding the current building to be refurbished and not required for the school in areas outside the scope of the building works to function shall be stripped out and removed from site. Other none related LV distribution equipment shall also be retained such as the existing lightning protection system.

New LV Switch Panel

The new bespoke LV switch panel shall allow for 20% spare capacity and outgoing ways for future expansion.

Within the new panel check meters shall be provided in the switch panel on the outgoing supplies with pulsed output suitable for connection to the BEMS.

The new Panel shall be designed to comply with BS EN 60439-1 form 4a type 2 compartmentalised separation and BS EN 60529 IP31 ingress protection.

Internal busbars shall be manufactured from HDHC copper bar to BS159 and have a short circuit withstand capacity of 50kA for one second.

Air circuit breakers will be of the Eaton MEM3 series. Moulded case circuit breakers to suit. Multi-functional digital meters shall be Socomec A20 & E53 type. Mechanical interlocks shall be Castell Safety International. Or equal and approved.

The Panel and its device's shall be compatible with existing MEMshield3 panel.

Main intake room

The building has a substantial amount of PV panels on the roof 50kW +, due allowance when working on roof adjacent and within electrical main intake room as to working near live generating equipment.

In intake room, (Phase 3) a new main wall mounted triple pole form 4B type 2, MCCB panel board shall be provided in the main electrical intake on the ground floor. The internal separation shall comply with BS EN61439-2 and the BEAMA Guide to Forms of Separation 2011. The panel board shall be from the MEM memshield 3 range or equal and approved. All MCCB out going way protective devices within the LV switch panel shall be of the electronic trip type and capable of breaking on full load and the perspective short circuit currents.

Check meters shall be provided within the switch panel on the outgoing power supplies indicated on HBS electrical schematic. The meters shall have pulsed output suitable for connection to the BEMS for off-site monitoring and data logging to enable building energy trends to be monitored and provided information to facility staff to understand where energy consumption can be reduced. The range of meters shall be selected form the MEM range or equal and approved and shall be selected to ensure the type is compatible with the BEMS.



From this board distribution supplies shall be provided through out Science and computing via XLPE/SWA/LSF submain cables terminating into local MCB distribution boards for general power and lighting and also large mechanical equipment.

The new low voltage switch panel board shall also be provided with class 1 surge arrester.

The electrical distribution equipment shall be provided with a metering strategy complying with Building Regulations Part L 2010 approved document L2A and CIBSE TM39.

6.1.3 **GENERAL POWER**

Redundant Services

The contractor shall disconnect and strip out the existing small power installation throughout refurbishment on a phase by phase basis, and remove all outlets, cabling and conduits etc. from site, except supplies necessary for mechanical equipment, fire alarm and security equipment etc. which is to be retained until Phase 3.(summer holiday works.)

New Small Power Provision

The electrical installation shall fully comply with all current British Standards and Regulations, Local Authority requirements and pertinent European standards in their entirety; this includes the latest issue of the IET Wiring Regulations, BS7671:2008 +A3:2015

The contractor shall supply a small power installation which shall include general power socket outlets, socket outlets for cleaners and fused connection units for heaters, hand driers, disabled toilet alarms, and other equipment shown on the indicative HBS drawings.

Where the accessories are located below ceiling level they shall be flush mounted. In addition, where fused connection units are supplying heaters, hand driers, disabled toilet alarms etc., from the fused connection units there shall be flush concealed conduit installed to the rear of the appliance for the final connection cabling (flex outlet plates on any visible appliance).

General power socket outlets shall be wired on dedicated rings using XLPE/LSF cables with a minimum size of 2.5mm. The general socket outlets shall be provided with identification labels which shall state the circuit they are supplied from.

In science rooms the power to student pods shall be fed from dedicated radial circuits that can be energised / de- energised from wall mounted knock off button on teaching wall. Each science rooms will be provided with and essential circuit not controlled by knock off button that will be used for essential supplies such as fridges, aquariums, or specialist experiments run overnight etc

Lighting supplies shall be wired on dedicated radials using XLPE/LSF cables with a minimum size of 1.5mm.



Cleaner's sockets shall be wired on dedicated ring circuits using XLPE/LSF cables. The socket outlets shall be provided with identification labels which shall state which circuit they are supplied from.

Power to pedestal sockets on science pods Science shall be fed from adjacent wall via conduits in the screed.

Final circuit wiring to twin 13A switched socket sockets and other outlets shall be taken from the local distribution board. Sockets shall be double gang unless stated otherwise.

Areas with interactive whiteboards shall be provided with facility for the incorporation of a ceiling projector (or other preferred projector type and location) and data connection point to an interactive white board.

All power circuits shall be protected via residual current protective devices unless the supplies are specifically for fixed equipment.

The electrical contractor shall include for all final connection to other equipment, typically fire alarm panels, ceiling mounted fan coil units, toilet alarm panels, intruder alarm systems etc. The fused connection units shall each be provided with an identification label which will state which circuit they are supplied from.

In the offices, classrooms, ICT benching and fixed reception desks 3 compartment PVC dado trunking shall be provided to distributed power and other service to the desk.

Final circuits shall be fed via a network multi compartment galvanised steel cable trunking and galvanised conduit. Dado trunking to be used in most areas and conduits chased into walls.

Cable ladders and trays shall be provided to support the new sub mains cables to distribution boards and mechanical control panels. Support cable trays shall be installed generally within the electrical risers the ceiling void in the reception area. Internal cable trays supporting LV supplies shall be of the medium gauge type. External cable trays shall be heavy gauge. All containment shall be fixed using proprietary fixings into the building fabric. Under no circumstances shall primary cable containment systems be suspended / fixed or supported from secondary building structures. The contractor shall be responsible for the design of such fixings and calculating the required quantity of supports for the containment system at 100% capacity (not the cable capacity occupied at the time of installation).

6.1.4 **GENERAL LIGHTING INSTALLATION**

Redundant Services

The contractor shall disconnect and strip out the existing lighting installation throughout the existing building to be demolished on a phase by phase basis and remove all luminaires, cabling and conduits etc. from site.



New teaching block, Nursery and refurbished areas

The lighting shall be predominantly LED and All luminaires shall have DALI control gear. With in-built Pir/photocells.

The lighting shall be designed to meet with the requirements set out within BS5266-1:2016, CIBSE code of practice for lighting and Part L 2A and 2B of the building regulations.

Any display spaces/walls shall be provided with lighting facilities suitable to the space including facilities for illumination exhibits such as LED track lighting. Multigang switching controls would be provided to this area located at the main reception desk.

Lighting to the circulation and stairwells shall be bulkhead / semi recessed LED type fittings with emergency 3hr integral backup, as indicated on HBS stage 3 drawings.

General

All lighting shall be by Thorlux and Thorn Lighting or equal and approve. Please see HSB luminaire schedule for luminaire specification requirements.

6.1.5 LIGHTING CONTROLS

New teaching block, Nursery and refurbished building.

The lighting is to be controlled using a combination of Daylight Linking, Absence and Presence detection. **There shall toggle switch for switch line and retractive switch for Dali manual dimming.** It shall be used with motion sensors and daylight control units to provide presence/absence detection and daylight-based linking of luminaires. Ie auto/off switch and dimming switch for each group of lights.

Classrooms, offices, prep rooms shall have absence detection which shall be provided by an automatic presence detector connected to the DALI control line such that luminaires can be manually switched on and automatically switched off if no movement is detected.

Within pre room there will be a chemical store the store shall have a luminaire that is spark proof and switched externally to store.

Lighting in main entrance, circulation areas, stairwells and store rooms shall have presence detection shall be provided by an automatic presence detector connected to the DALI control line such that luminaires can be automatically switched on if movement is detected and automatically dim down for 10mins and then be switched off if no movement is detected.

Classroom or teaching areas are to be controlled using the DALI protocol and each room will be able to control lighting with both daylight optimisation and absence detection. A multi gang light switch



will be provided controlling each row/group of lights. When the room becomes vacant, the lighting will be programmed to switch off after 15 minutes of no detection.

Individual Daylight sensors will be the “look out” type as combined PIR/daylight sensors are less effective and are therefore not approved. Unless combined sensors are built into each luminaire such as Thorlux smart lighting.

6.1.6 **EXTERNAL LIGHTING**

External lighting shall be provided for safety and security purposes.

Separate manual override switches shall be mounted adjacent to the control panel together with the emergency lighting control contactors and test switch.

External lighting mounted on the building shall be controlled locally with a separate enclosure containing a time clock and contactor. Photocells mounted around the building shall override the time clock.

The lighting shall be designed to meet the requirements of the Institution of Lighting Engineers guidance notes on the reduction of obtrusive lighting and CIBSE Lighting Guide 6.

Please see HBS luminaire schedule for luminaire specification requirements.

6.1.7 **EMERGENCY LIGHTING**

General

The emergency lighting shall cover all escape routes from the building, which shall include corridors, rooms and areas of risk to injury. The lighting shall be designed to meet the requirements set out within BS5266-1:2016. Emergency lighting shall be provided throughout the building.

Emergency testing shall be carried out via contactors adjacent to dist. board and emergency lighting test switch by CP electronics ELT 10, located adjacent to each deist board and utilising contactors for each lighting circuit.

Please see HBS schedule for equipment requirements.

All areas shall have standalone emergency LED escape and exit signage lighting. This lighting shall have integral 3-hour integral emergency battery pack.

The anti-panic LED's shall be capable of covering 10 sqm when mounted at a ceiling height of 2.5m; and escape LED's shall be capable of 13.5m spacing's when mounted at 2.5m height.

Please see HBS luminaire schedule for luminaire specification requirements.



6.1.8 DATA & TELECOMS - Please refer to ICT responsibility matrix.

The Contractor shall employ a specialist sub-contractor to design, supply, install, commission and test an ICT installation to Oakdale Primary School requirements and as indicatively shown on the HBS design drawings.

It is imperative to keep all data live during phase 1 to the rest of the school; the location of the new server room has been chosen to enable picking up of existing data cables that runs past this location. The existing main data cabinet is located in current ICT suite due to be demolished for phase 1 works.

All primary and secondary containment systems, back boxes and face plates for data / telephone cabling and data cabling will be provided along with all racks, passive and active equipment and final connections.

New data cabling which shall be Cat 5e shall be provided. The Cat 5e cabling will emanate from a new server room in main building, (adjacent to new 8 classroom block), size and location of cabinet to be confirmed via discussion between the ICT specialist and Oakdale Primary School IT services.

Initially move existing data cabinet from the ICT suite to the existing outside ex-WC area adjacent to bin store. This space will form part of the new server room. Because the existing data cabinet is wall mounted the contractor is to supply a new 42'u' data cabinet to be installed during phase 3 or when the server room is formed, bearing in mind the fact that the school need to kept live with data during phase 1&2.

The telecom switch is currently located in the admin office due to be refurbished in phase 3, we propose there are two options, option 1 to move telecom switch into adjacent room to be office/meeting room and run multi core back to server room. Option 2 to relocate telecom switch into server room and extend existing telecom cables both BT and extensions from server room to existing location in admin suite. The end result being a system that runs telecom extensions over the data network via a voice patch panel in data cabinet.(not VOIP).

Telecommunications shall be run through the data cabling in the new and refurbished areas. The contractor shall allow for all works associated with this. A multi core cable will be required to provide telecom extensions from the telecom switch to the new main server room voice patch panel.

The drawings identify only the primary cable containment route and the contractor shall be responsible for the installation of the secondary cable containment i.e. conduits, minor basket routes, recessed containment etc. The specialist ICT subcontractor shall determine the precise requirements in terms of cable containment to each building with Oakdale Primary school IT Services.

The ICT specialist subcontractor shall be expected to liaise with Oakdale Primary School IT Services to ensure the installation proposals meet the required needs of the client. The ICT specialist subcontractor shall make due allowance for a number of DTM meetings to be held in this respect.

The specialist ICT Contractor will be responsible for all testing associated installed ICT installation.



The Contractor shall include for all works associated with the provision of dedicated BT phone lines for the Redcare monitoring facility for the intruder alarm.

6.1.9 **FIRE ALARMS**

Redundant Services

The contractor shall disconnect and strip out the existing fire alarm installation throughout the building during each phase of works and remove all associated equipment, cabling and conduits etc. from site. It is envisaged that the fire alarms will be run back to the existing fire alarm panel during phase 1 & 2, and then into new fire alarm panel during phase 3.

General

The purpose of this specification is to provide functional description of the site and the systems to be designed and installed for the purpose of Tenderers pricing the work and delivering the systems described herein. The new fire alarm system is to be open protocol and therefore can be maintained by any maintenance contractor in the future.

This document represents a performance specification and details design intent. The Contractor is responsible for designing a system that will meet the requirements of this document and delivering the system in accordance with the requirements of this specification.

Where requirements of encompassing documentation and this document conflict or contradict the more onerous requirements from either shall apply.

This specification describes the functional requirements of the system, elements of intended operation and usage, and installation requirements for both general and specific systems.

The Contractor shall employ a specialist sub-contractor to design, supply, installation testing and commissioning of a complete Fire Alarm system.

The contractor shall employ the school existing Fire Alarms system maintainer "KA wing Ltd" to undertake the fire alarm design, supply and commissioning. (as a minimum KA wing to commission)

KA WING GROUP

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The building is to be equipped with an addressable fire detection system to meet the requirements of BS5839-1: 2013 and shall be designed to a Category L3 system. The buildings fire detection systems



shall be interfaced with a number of i/o devices around the building controlling, doors, mechanical plant.

The building shall be zoned to enable staged evacuation if required. The fire alarm system shall be provided with a 2 stage alarm system stage one shall provide an audible visual alarm at the main reception desk, facility manager's office and Principles office. The staff shall then acknowledge the alarm at the fire panel, but if the alarm is not acknowledged within a set period i.e. 5 minutes then the system shall go to stage 2 full alarm evacuation. After acknowledging the alarm, the staff shall investigate the alarm to establish if there is a fire from which they shall either dismiss the alarm as false and cancelling the alarm or accepting the alarm where by the system shall go into stage 2 full alarm and evacuation. A pre-recorded evacuation instruction alarm shall then sound throughout the building. This is subject to review by the fire consultant.

The new main panel for the site shall be located in the new lobby area of main building(phase 3) and shall require a communication unit and telephone line such as 'Red Care' for connection to a monitoring station.

The new systems shall be linked to the school existing fire alarm panel so they work simultaneously in the event of a fire during phase 1 &2.

All the break glass units are to be covered with audibly alarmed protection covers to prevent false alarms.

Fire Alarm Installation

The fire detection and alarm system shall be designed and installed in full accordance with BS7671:2008 +A3:2015 IEE Regulations for Electrical Installations, and BS 5839: Part 1: 2013

All 230 volt cabling systems supplying life safety systems shall comply with BS 6387.

All cables shall be fire resistant LSOH FP200 GoldR or FP200 FlexR type cable installed on dedicated cable containment systems or clipped directly to building fabric. Cables shall be run horizontally or vertically: diagonal runs will not be acceptable.

Cables shall be installed in accordance with the manufacturer's recommendations and multiple runs of cable shall utilize a dedicated cable basket for horizontal and vertical distribution.

All cable sheaths, shrouds, dips and saddles shall be manufactured from low smoke zero halogen materials coloured red.

Cables shall be securely fixed near bends, termination points and on straight runs at intervals no greater than recommended by the cable manufacturer or the 17th Edition Wiring Regulations.

At detector and sounder locations, cables shall terminate in galvanized BESA or MI clamp junction boxes.



Where possible, all circuit cabling shall be concealed within the building fabric or within voids. Installations shall be flush or surface as dictated by architectural finishes.

Wiring to flush accessories, i.e. call points, shall be installed in conduits flushed into the wall and secured. Conduits shall be 'set' clear of the wall within the ceiling void and terminated in brass ring bushes. A flush steel box shall be coupled to these conduits at the accessory position using couplers and brass bushes. Recessing of plastic boxes shall not be permitted.

Within ceiling voids, cables shall be fully supported by means of drop rods, cable tray or Unistrut to within 500mm of the accessory to be supplied. Steel support systems shall be rigid and fixed at least two separate positions along its length. Attachments to ceiling tile or ceiling grid systems will not be acceptable.

Fire Alarm Manual Call Points

The Contractor shall supply and install red flush or surface-mounted addressable call points conforming to the requirements of BS 5839: Parts 1 & 2.

Call points shall be labelled "Fire - Break Glass" and shall be mounted 1200mm AFFL, to underside of box. The lid retaining fixing screw shall be a slotted standard design.

A label shall be fixed to the call point indicating the address and loop number. The label shall be white/red/white Traffolyte fixed with epoxy adhesive.

Manual call points shall be provided on the following basis:

- i) On all exit routes (travel distance not to exceed 30m)
- ii) Final exits to open air
- iii) Exits from all plantrooms
- iv) Floor landings of stairways

Call points shall incorporate plastic coated glass key operated test facility and red LED to provide visual indication that the call point has been operated.

Fire Alarm Automatic Detectors General

All detector heads shall incorporate visual indicators and plug-in universal bases for interchangeable plug/socket arrangements with other detector types.

Detectors installed in an obscured position shall be provided with remote visual indicators. Each detector base and/or remote indicator shall be fitted with an engraved label identifying zone and address. Remote indicator labels shall identify the location of the remote device.

Fire Alarm Heat Detectors



The Contractor shall supply and install heat detectors that are either fixed temperature type or rate of rise temperature type, complying with BS 5445.

Fire Alarm Smoke Detectors

The Contractor shall supply and install optical type smoke detectors complying with BS 5447.

Detectors shall be installed in the following areas:

All defined escape routes

Room leading on to escape routes

Plant rooms and store rooms

Voids in excess of 800mm

For rooms adjoining escape routes, detectors shall be mounted on the ceiling adjacent to each door. Should a single detector provide coverage to the room in accordance with BS 5839, the detector shall be positioned centrally to provide total room coverage.

Detectors shall be finished in white.

Fire Alarm Sounder/Beacons

The Contractor shall supply and install red alarm sounders of the solid state type or combined sounder beacons suitable for operation on 24V

Sufficient sounders shall be provided to achieve an alarm sound level of 65dBA, or 5dBA above background noise level.

Sounders shall be mounted 300mm below ceiling levels. Sounders shall not be mounted in ceiling voids.

In areas where high ambient noise levels exist or may be present intermittently i.e. noisy mechanical plant areas etc. then sounders shall be supplemented by beacons.

Beacons shall be provided in corridors, circulation spaces within the hub/pods, disabled WC, and main reception.

Fire Alarm Short Circuit Isolators

The Contractor shall allow for the supply and installation of short circuit isolators to suit the loop and zones. All isolators shall be installed in an easily accessible location.

Fire Alarm Testing and Commissioning



The Contractor shall make all necessary site inspections, adjustments and tests during installation to suit the demands of the programme and partial possession where applicable to the project and to allow for a full inspection and commissioning test prior to handover to the client.

The installation, testing and commissioning shall be modelled on those presented in BS 5839.

During the installation, arrangements shall be made for inspections and tests to be carried out in the presence of the Engineer and upon completion the final commissioning tests shall be carried out in the presence of the Engineer.

Audibility tests throughout the building shall be fully demonstrated to the Engineer and in the presence of the Fire Officer/Building Control.

Two copies of all test data shall be submitted for acceptance on completion.

The agreement shall commence upon completion and official handover of the building.

A logbook shall be provided to record all activities before and after handover.

Fire Alarm Logbooks

The logbook provided by the Contractor shall be handed to the Employer. It shall be in 3 parts to record events, maintenance and replacement parts.

Fire Alarm Interface Relays

Input / Output Relay devices shall be connected onto the addressable loop circuits and shall be addressable. Each device shall be located within 1m, to the equipment with which they are to interface.

Fire Alarm Equipment Supplies

A dedicated protective device shall serve the fire alarm control panel and associated equipment shall be coloured red and labelled "Fire Alarm Supply: Do Not Switch Off".

6.1.10 **SECURITY SYSTEMS**

Redundant Services

The contractor shall disconnect and strip out the existing intruder alarm installation throughout the building during each phase of works and remove all associated equipment, cabling and conduits etc. from site. it is envisaged that the intruder alarms will be run back to the existing intruder alarm panel during phase 1 & 2, and then into new intruder alarm panel during phase 3.

General



The purpose of this specification is to provide functional description of the site and the systems to be designed and installed for the purpose of Tenderers pricing the work and delivering the systems described herein.

This document represents a performance specification and details design intent. The contractor is responsible for designing a system that will meet the requirements of this document and delivering the system in accordance with the requirements of this specification.

Where requirements of encompassing documentation and this document conflict or contradict the more onerous requirements from either shall apply.

This specification describes the functional requirements of the system, elements of intended operation and usage, and installation requirements for both general and specific systems.

The contractor shall employ a specialist subcontractor design supply, installation testing and commissioning of a complete security system consisting of Intruder Detection Systems and CCTV.

The contractor shall employ the schools existing security system maintainer "KA Wing Ltd" to undertake the fire alarm design. (as a minimum KA wing to commission)

KA WING GROUP

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Intruder Alarms

Both buildings shall be equipped with a new security alarm to cover the whole of the ground floors and first floors, any insurance requirements in compliance with the crime prevention officer and DD243. The system shall be monitored through Red Care.

Panic buttons shall be provided, which on activation shall notify the monitoring station of the alert and on receipt of the alarm shall inform the Police to attend. This facility shall be provided within the Principles office or other rooms / areas which require additional cover.

The new intruder alarm system in new teaching block shall be linked back to the existing intruder alarm system.

The new system in the building

Security alarm detection shall generally be provided to the following areas:

Microwave detection devices shall be provided within the large open plan areas.



All perimeter ground floor doors shall be provided intrusion detection devices.

The ground floor rooms with external glazing accessible to general public.

Server room(s)

6.1.11 **CCTV**

The contractor shall supply twin data points above the ceilings in various location around each building, some in circulation areas and h/l corners of building for external camera. These data points are to be for future use of CCTV specialist and capable of POE for CCTV cameras. Contractor to decide locations.

6.1.12 **ACCESS CONTROL SYSTEMS**

The building shall be provided with a proximity access control system to provide controlled access to the following areas:

- Main entrance lobby entrance doors (front door)
- Nursery extension. (one door)
- Pupil entrance/ community entrance, (one door)
- Additional areas that may require access control:
 - Computer server room(s)
 - Access to external gates.
 - Access to offices
 - Mechanical and electrical service plant rooms
 - Staff only areas

This system shall be designed and installed in compliance with BSEN 50133.

The system shall comprise of proximity readers located on the 'public' unsecure side of the door which operate the lock release within the door by the key fob being offered up to the proximity reader. On the secure side of the door a flush mounted stainless steel exit button with an additional flush mounted green emergency break glass unit shall be provided to allow the door to be opened normally and in the event of an emergency scenario. Both controls shall open the door release mechanism.

Both building shall be provided with a Paxton NET 2 PC based system or equal and approved. At each door on secure side a data point shall be provided above ceiling for networking the system

The Access control system can be time activated such that outside of set hours access can only be obtained by persons with the correct access fob or card.



6.1.13 **DISABLED TOILET ALARMS**

The disabled WC's shall be provided with a disabled alarm call facility providing both a visual and audible alarm upon activation of a pull cord within each respective disabled toilet.

They shall be linked to a central location in each area building. The indicator panel shall be wall mounted in corridor, and shall have an audible alarm and also be able to show the location of the alarm activation, by room and building reference details.

6.1.14 **REFUGE ALARMS**

n/a

The system shall be designed and installed in accordance with BS 5588.

6.1.15 **CLASS CHANGE BELLS**

The whole school with class change bell system, the system is to be stand alone and will be controlled by a (Danfoss Randal 842) class change timer located in admin office with a manual push button.

6.1.16 **LIGHTNING PROTECTION**

The new teaching building ,Nursery extension and classroom extension shall be protected by a lightning protection system provided in accordance with latest BS EN 62305:2006.

The contractor shall employ a lightning protection specialist to design, supply, install and test the lightning protection installation.

The lightning protection system shall be installed generally shall comprise of earth electrodes contained within heavy duty concrete inspection pits. The colour and location of the down conductor tapes shall be coordinated with the structure of the building. Where possible the steel substructure shall be used as a down conductor but shall be subject to consultation with the specialist designer and the structural engineers.

Lightning protection extends beyond simply bonding exposed parts to lightning conductors. The Contractor shall ensure equipment supplied is provided with protection systems to signal, data and power networks serving any equipment that may be vulnerable to voltage transients. This shall include interconnecting cables to external devices as well as the bonding of exposed parts to lightning protection systems. All surge suppression devices shall be located as close as is practicable to the point of entry to the building, or, if applicable, adjacent/within the enclosure at which transmission media change from copper to fibre optic. The equipment manufacturers' instructions and recommendations shall be observed in applying the protection. All surge suppression shall be properly and adequately earthed.

6.1.17 **EARTHING AND BONDING**

An earthing system shall be provided to each building in accordance with BS7671:2008 +A3:2015, IET Wiring Regulations and BS 7430: Code of Practice for Earthing.



System supply shall be TN-C-S and protection against indirect contact shall be by earthed equipotential bonding and automatic disconnection of supply.

A main earth bar of copper mounted on insulated bobbins shall be installed in the switchrooms and shall provide connections points for the following:

- Earthing conductors to electrodes.
- Switchboard earth bars.
- Lightning protection system.
- Local piped services, including mains water and gas.
- Structural steelwork and support systems.
- Clean earth bars to communications rooms.
- Comms Rack.
- Server Cabinet.
- Transient Voltage Surge Suppressor.

All equipotential bonding shall be carried out using LSOH cables coloured green/yellow.

Armoured cables shall be terminated by means of a proprietary cable gland c/w earth tag. Means of earthing shall not be solely reliant on the gland termination to the steel plate, a separate earth cable lead shall be provided between gland and equipment earth terminal.

Where necessary to comply with the cable calculations for fault levels, supplementary earthing cables shall be provided, installed adjacent to the associated supply cable.

All primary cable containment (cable rack, tray, etc.) shall be mechanically connected to ensure electrical continuity. On primary services routes, at 20m intervals, primary cable containment and metallic trunking systems shall be mechanically and electrically continuous throughout their length. Brass continuity links shall be fitted to all trunking joints.

Distribution boards shall be earth bonded to adjacent structural steelwork, process services and electrical containment systems.

Final circuit protective earthing shall be achieved through the use of separate earthing conductors, using LSOH insulated singles installed in conduit/trunking.



7 APPENDICES

- 7.1 APPENDIX A - MEP SCHEDULE OF WORKS.**
- 7.2 APPENDIX B - MECH EQUIPMENT SCHEDULE.**
- 7.3 APPENDIX C – ELEC EQUIPMENT SCHEDULE.**
- 7.4 APPENDIX D – ICT RESPONSIBILITY MATRIX.**