UWE Estates and Facilities Design Guide

Chapter 7: Electrical Engineering Design

UWE Bristol | University of the West of England

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7.1 Change Control

Version Number	Date of Issue	Chapter Ref	Brief Description of Change(s)
1.4	01/05/19		Various updates and changes throughout all sections.
1.5	NOV 2019		Various updates and changes through sections: 7.4; 7.5.2; 7.6; 7.7; 7.8.4.
2021	JAN2021		Numerous updates and changes throughout all sections. All detailed in 2021 version.
2021	June 2021	CCTV/Access	Various updates descriptive to enhance the document sections.
2022	JAN2022		Numerous updates and changes throughout all sections. All detailed in 2022 version.
2023	JAN2023	7.3.6	New Section added
2023	JAN2023	7.3.7	Section reworded to always include AFDD
2023	JAN2023	7.3.10	Section reworded for Transient over voltage protection
2023	JAN2023	7.3.16	Whole new section added on Under desk / IT Equipment extension cable systems
2023	JAN2023	7.3.21.3	AMENDED: Low energy light sources shall be LED and dimmable fittings.
2023	JAN2023	7.3.22.1	ADDED: Recreation Spaces shall have enhanced Lux.
2023	JAN2023	7.3.27	ADDED: Careful consideration shall be given for tree planting schemes, and increased foliage in warmer seasons.
2023	JAN2023	7.4.2	Wording amended throughout.
2023	JAN2023	7.4.3	ADDED: Fume Cupboards should be of fire resisting construction, provided with smoke / fire detection and consideration for their own suppression system subject to fire risk assessment.
2023	JAN2023	7.5	AMENDED: Wiring systems are supported such that they will not be liable to premature collapse in the event of a fire. To comply with Fire Safety standards, only metal containment and suitably metal cable ties shall be used.
2023	JAN2023	7.6.6	AMENDED: UWE has a legal duty to ensure the evacuation of all building occupants. In all buildings with multiple levels, the provision of 'evacuation lifts' should be required as part of the design. Where the provision of such a lift(s) is discounted the

			arrangements for the evacuation of people with a disability that would prevent them from evacuating the building unaided must be stated in a written risk mitigation statement.
2023	JAN2023	7.6.7.5	Door Design Diagrams added for clarity.
2023	JAN2023	7.7	Red Emergency Phones section wholly revised to green emergency handsets

7.2 Management of Electrical Design

All designers must consult with a range of stakeholders including end-users and the Facilities department, during design development. This may be in the form of structured liaison meetings organised by the internal or external project manager.

7.2.1 Initial Survey

- Survey existing services and ascertain the implications of any new works. A condition survey may be required for works within existing areas. The designer is responsible for checking the suitability of all existing electrical, security & data at project inception.
- The contractor shall allow for advance tracing, identification and recording of all existing LV and ELV circuits that are identified during refurbishment works.
- Consideration and review of case studies and technical papers of similar applications.
- Consider budgetary and energy conservation requirements.

7.2.2 Design Co-ordination

- Liaise with all members of the design team including the building designer and structural engineer to provide an integrated building/ structural / services installation. This must include coordination of electrical contractors' work requirements, plant space and significant apertures within the structure.
- Particular attention must be paid to the end-users small power requirements.
- Coordination is required with the mechanical and any other services, designer regarding the power and control requirements for the mechanical services.
- Likewise, IT infrastructure has specific power, and energy consumptions, requirements which are discussed in this Chapter (but also see Chapter 8). There must be close co-ordination between the electrical services designer and UWE IT Engineers.

7.2.3 Initial Load Assessment

- This supports early assessment of plant space requirements for co-ordination with the building designer.
- An electrical load assessment must be calculated/obtained and ensure that the existing load can accommodate any additional expansion
- Existing load characteristics must be obtained at design stage.
- All design calculations must be provided prior to design approval by estates.

7.2.4 Plant, System Selection and Location

Selected to maximize operational efficiency and availability encompassing any energy saving requirements

7.2.5 Electrical Design Standards

All electrical specifications and designs shall comply with the current BS, CIBSE, BSRIA standards.

If there are any doubts or questions relating to electrical systems or standards, the designer must discuss these with UWE Estates.

7.3 Electrical Systems

The contractor shall allow for advance tracing, identification and recording of all existing LV and ELV circuits that are identified during refurbishment works.
Any circuits that cannot be identified by the electrical contractor shall not be connected back into a new distribution board.
Once these circuits have been left disconnected, if it can be confirmed that they are obsolete the electrical contractor shall remove the circuits in their entirety.

7.3.1 Utilities

The designer shall ensure that, where there is an existing supply to an existing building, it is of a suitable type and capacity for the new anticipated load. Consideration shall be given to the load growth of the installation and time/season of the year. Measurements over a period of 2 weeks taking into consideration seasonal variation in operation shall be taken to ascertain the existing electrical load profile. Where programme allows, the month of monitoring shall apply to the month most anticipated to have the greatest electrical demand.

Where a new supply is required, the designer shall be responsible for liaising with UWE estates engineers to confirm a suitable connection point for a new supply of adequate rating and capacity.
Marker tape shall be installed above all buried cables. The tape shall be yellow PVC or polyethylene ribbon at least 150 mm wide and shall be printed with the words “ELECTRIC CABLE” in bold capital letters throughout its length and at intervals not exceeding 700 mm.

When producing external design drawings please refer to ‘NJUG guidelines on the positioning and colour coding of underground utilities apparatus’.

7.3.2 HV Switchgear and Transformers

Any new substation shall be connected to the site wide HV network, connection details shall be agreed with UWE Estates prior to any works commencing

HV switchgear panels must be built to IEC 60694 and appropriate sections of IEC 62271 -200 2012 or 62271-202:2014 for prefabricated Sub stations.

Switchgear shall be a minimum of IP44 and selected according to site conditions.

Switch Panels shall be equipped with intelligent microprocessor protection relays and trip units offering data measuring and appropriate communication facilities.

All Ring Main Units (RMU) shall be of the Non Extensible Type, unless specified otherwise.

Ring Main units to be provided with VIP protection relays to ensure that discrimination can be achieved. Time fused link may also be considered once full calculations have been carried out at detailed design stage. RMU’s shall also be provided with a voltage presence indicating system and also have a Pfisterer facility to enable phase comparisons to be carried out at the RMU.

Phase rotation shall be verified via the UWE Estates department when replacing equipment to ensure that cross phasing does not occur and supplies are not connected to cross phases.

Each new RMU shall be provided with Earth Fault Passage Indication units.

As far as possible, all new equipment shall be of the same manufacture, the preferred being Schneider Electric utilising 'Ringmaster' units. However UWE is moving towards Ultra Low Loss Amorphous Transformers.

It should also be noted that as of the 1st July 2015 Directive No 548/2014 came into force and is aimed at reducing the amount of energy unnecessarily wasted through transformer losses.

All new transformers shall be, super / ultra-low loss, hermetically sealed. Insulating fluid shall be Model 7131.

Transformers shall be sized to ensure their most optimum performance. Each substation shall require a specialist earthing and bonding design to provide a safe environment and allow the HV and LV earth terminals to be interlinked. New main earth bars shall be required at each substation location. The design will firstly require specialist on-site measurements and survey, as well as the existing fault characteristics and HV supply substation 'hot' or 'cold' designation to be known.

The designer shall engage with a HV an earthing specialist to produce a HV earthing design for each/ all substations. The design shall show details such as the main earth bar and all sized connections and recommendations for all bonding within each substation.

All electrical switchboards shall be provided with a 1m wide carbon free rubber mat or mats having a ribbed upper surface and being of such continuous length to suit the full operating extent of each switchboard.

Where a design entails work on electrical plant within an existing substation, the designer shall include for a HV earthing specialist to produce a report on the existing HV earthing arrangements and provisions. The report and any recommendations shall be discussed with UWE Estates on how these may be implemented in a project. The Report should state parameters such as EPR to confirm whether substation is hot or Cold, Step potential, Touch Potentials and Transfer Potential.

7.3.3 LV Modular Switchboards

Switchboards shall be a minimum of Form 4b Type 6 construction.

Withdrawable Air Circuit Breakers shall be installed (ACB's) on all incoming and bus-section switches. The ACB's shall be equipped with intelligent microprocessor protection relays and trip units offering data measuring and communication facilities.

Switchgear shall have Modbus output, kWh and kVArh digital meters with serial output for A, V, kW, kVAr and power factor. Metering to be provided for each outgoing circuit and be linked to the UWE campus BMS system.
Schneider PM5111 at point of distribution or Schneider EM 3255 at local distribution board.

A separate cubicle shall be provided for the mounting and termination of all metering outputs and external control circuits. Access shall be possible with the switchboard remaining live.

Outgoing switches up to and including 630A shall be Moulded Case Circuit Breakers however fuse-switch types may be considered where necessary to overcome discrimination issues.

Outgoing switches rated 800 amp or over, shall be ACB type.

Switchboards shall incorporate transient voltage surge suppression protective devices in line with current BS7671 regulations.

Allowances of at least 25% spare capacity shall be made to New Projects and 10% spare capacity to the refurbishment Project for future expansion.

Spare cubicles shall be incorporated into the design of LV modular switchboards for future adaptations.
An assessment of the harmonics content and power factor correction requirement for the connected loads shall be made at the design stage. Appropriate measures shall be incorporated into the design of the LV modular switchboards.

The main incomer shall incorporate harmonic monitoring capabilities

Devices for locking-off switches for future maintenance and isolation purposes shall be provided within the specification and final switchboard installations including castell interlocking facility if required. The padlocks and keys shall be suitably engraved for identification purposes.

Access space to be allowed to the rear of the panels to enable maintenance. Resistive rubber mats to BS 921:1976 to be provided for all accessible sides of LV switchboards (in addition to HV).

7.3.3.1 Discrimination/ grading study

The electrical contractor shall allow for carrying out a complete discrimination and protection grading study of the complete electrical distribution system, including all connected equipment.

- Provide fault (short circuit) calculations for the distribution system as indicated on the drawings and a protective device co-ordination study to ensure that all protective devices are co-ordinated. Base the study on the actual devices and cable lengths installed.
- Prepare the fault calculations and protective device study with a network analyser, digital computer or by written calculations, include complete fault calculations for each proposed source and combinations thereof including motor and generator contributions.
- All information must be provided in both paper format and Amtech / NAPIT electronic format.

Carry out the protective device co-ordination study including the following:

- Time-current co-ordination curves graphically indicating the proposed co-ordination for the system on log-log graph transparencies. Include on each sheet, a complete title and one line diagram identifying the specific portion of the system covered.
- A detailed description of each protective device identifying its type, function, manufacturer and time current characteristics and tabulation of recommended settings.
- Include on the curve sheets, system HV equipment relay characteristics, pertinent transformer, motor and generator characteristics including up to the largest outgoing LV circuit breaker/fuse for each distribution board. Indicate manufacturing tolerances clearly showing the final grading margin.

Carry out adjustments of the protection settings to conform with the requirements of the study.
Ensure that discrimination is achieved throughout the network and select protective devices and settings accordingly.

All electrical calculations must be provided in paper format and electronic format to be incorporated on Amtech / NAPIT Pro Design software

7.3.4 LV Panel Boards

Provide all new MCCB panel boards with integral MCCB's for the incoming/outgoing circuits and also incorporate the metering required for monitoring of energy consumption, as required by Building Regulations: Conservation of Fuel and Power, AD L2A. Terminate the incoming main supply via the meter allow for all cabling.

The panel is to be fully fitted with all MCCB's, CTs, measuring instruments, terminations, busbars, shrouds, barriers, indicators, cable extension boxes, corner filler boxes and conductors necessary to form a complete working installation as described in this specification.

The panel is to be front access. Incoming and outgoing cables are generally to be top entry. The mounting height to the top of the panel is not to exceed 2200mm above finished floor level.

All devices are to be adequately labelled and each device is to be complete with identifying reference and description label; 10mm Black lettering on White Ivorine (screw fixed), identifying equipment controlled, phase connection and cable size.

Provide protection against transient over voltage by means of an electronic surge protection unit (SPD) mounted on the load side of the panel board, at the source of the incoming main electrical supply, integral within the new board in a purpose made extension enclosure c/w perspex cover for external viewing without opening the enclosure to match the board in the same compartment as the main meter or externally mounted, in the switch room type Furse ESP415M1R or equal and approved in accordance with BS7671 appendix 16 and BS 62305.

The main switchpanel is to be a wall mounted, MCCB type with the main meter and all sub-metering housed in side extension boxes.

Modular Panel boards shall be built to relevant sections of BS EN 60439.

Provide minimum Form 3b type 2 as standard, or form 4b types 2 and 6 where required suitable for the particular installation with integral 4 pole main breaker where the supply includes a neutral with a separate protective earth.

Provide panel Ratings from 250A up to 1600A, All MCCB's over 100A to have adjustable rating facility.

7.3.5 LV Distribution Boards

Provide split metered combined power and lighting distribution board with integral either separate/ two channel meter to read the total individual loads for both power and lighting, the board must be suitable for reading the lighting and power loads separately and suitable for recording via a BMS system. Provide split type bus bar distribution boards complete with MCB's containing separate sections for lighting and small power in accordance with the following:-

1. Integral incoming switch disconnector.
2. Compliance with BS5486: Part 12
3. Form 2 Separation to comply with BSEN60439
4. MCB Types to suit load characteristics
5. MCB breaking capacity to be selected to give protection from upstream let-through energy of upstream protective device
6. MCB shall comply with BSEN60898 of minimum 10kA rating
7. 25% spare MCB ways provided with blanked off ways

8. Metal enclosures with hinged lockable door and earth tag
9. Line bus-bar shrouding
10. Neutral bus-bar
11. Earth bar
12. Extension enclosures with integral din rails and hinged lockable doors to contain contactors, time clock and other control and protection devices.
13. IEC 60898 & IEC 60947-2
14. Certified by KEMA

Lighting circuits shall be protected by type C MCB's/RCBO as necessary. Circuits serving general socket outlets shall be protected by type B MCB's with integral 30mA RCD's (RCBO). Combined MCB/RCD (RCBO) units shall be of the type that can be accommodated within a single way module. Motor Control and transformer circuits shall be protected by type C MCB's. All MCB's shall be capable of being locked in the off position to allow safe working.

Provide fully typed circuit charts to be mounted inside each DB door using a heavy duty transparent plastic envelope, to correspond with the hand written completed circuit references on the manufacturers installed DB labelling within the distribution boards to indicate which circuit is controlled by each MCB. Information shall include:

1. Name of board
2. Loop impedance and prospective short circuit current at that point
3. Way and phase identification
4. Description of final circuit including radial/ring, equipment served, room reference.
5. Protective device rating and type
6. Circuit and CPC cable sizes and types
7. Any contactors or other control devices acting upon that circuit

Distribution boards shall be labelled to include:

1. Warning Notice 'Danger 400 Volts'
2. Reference and load served e.g. 'DB1 Level 1 Lighting and Small Power.
3. Identification of where the supply serving the board is derived from.

All labels shall be screw/rivet fixed and manufactured from traffolyte material (white/black/white) with characters engraved at least 10mm high.

Distribution boards shall to be surface-mounting and provided complete with miniature circuit breakers, RCD's, and blanking pieces.

Note: All distribution boards unless provided as standard with this facility are to be fitted with an earth bar as an extra item to have the number and size of terminals equivalent to the neutral bar.

Provide electricity warning labels on all doors to rooms leading to distribution boards to comply with BS7671.

Provide distribution board with integral smart meter c/w LED backlight including a modbus output suitable for future connection to the BMS system. The meters will measure the following parameters and also be suitable to read the output for the power and lighting separately and shall be capable to calculates net values for each bus bar and total load through one/two meters to incorporate the following:-

- Voltage

- Current
- Frequency
- Maximum Demand
- Power Factor
- kWH (Kilowatt Hours)

Ensure that the proposed new sub main cabling / protection system is co-ordinated to comply with BS7671.

All water heaters are to be provided with sub meters, in order to comply with the requirements of Part L2A. The items of equipment to be sub metered are listed in the equipment schedule in the Mechanical specification. The sub meters are also to be Modbus protocol as described above.

3No. MCB lock out kits to be provided with each distribution board. The padlocks and keys shall be suitably engraved for identification purposes. All keys to be handed over to UWE estates electrical engineers.

The Distribution board small be a minimum of Form 3, Type 2 (as detailed in BS EN 60439). The designer shall, however, assess the use/application and use a higher rated board if considered necessary.

7.3.6 Critical Supply Boards

In addition to all requirements for section 7.3.5 LV Distribution Boards, consultation must be had with key Stakeholders and Estates Operations, regarding any critical supplies. Critical Supplies shall be fed from a separate supply, such as but not including BMS, Fire Alarms, Security Systems, critical research equipment, etc.

7.3.7 Arc Fault Detection Devices (AFDD)

An AFDD shall be placed at the origin of the circuit to be protected. They shall be installed in line with the current BS 7671 regulations, which recommends following locations:

- Premises with sleeping accommodation
- Locations with a risk of fire due to the nature of stored or processed materials, i.e. BE2 locations (e.g. barns, wood-working shops, stores of combustible materials).
- Locations with combustible construction materials, i.e. CA2 locations (e.g. wooden buildings).
- Fire propagating structures, i.e. CB2 Locations.
- Locations with endangering of irreplaceable goods (e.g. museums)

Approved Equipment and Companies: Schneider, Siemens, Hager.

7.3.8 Labelling System

All electrical switch rooms or electrical cupboards shall be identified with appropriate signage as agreed with UWE estates.

All accessories shall be labelled with the distribution board room number, distribution board number and circuit reference.

Details of cable sizes and type, protection device ratings, and point of origin shall be labelled on all LV switchboards, panel boards and distribution boards.

Details of Z_e readings with the date of test shall be displayed at each switch board/panel board/distribution board.

All distribution boards shall have engraved labels fixed to the front of the distribution board.

Traffolyte labels shall be used to identify all circuit descriptions within each distribution board (adjacent to MCB's).

All cabling shall be identified by ferrule type cable markers on all phases, neutrals and cpc's.

All new distribution board and circuitry shall adopt UWE standard methodology for labelling. Labelling standards to be obtained from estates team.

UWE have an asset tagging system in place, the consultant shall familiarise themselves with UWE requirements and ensure this is captured within the design.

Warning labels showing voltage affixed to all switchboards, panel boards and distribution boards.

7.3.8.1 Circuit Charts

An accurate circuit chart is to be provided for all new distribution boards or boards which have been altered. An electronic copy is to be provided to the UWE Electrical Engineer. A hard copy is to be laminated and positioned adjacent or within the distribution board.
Final Circuit chart/as installed drawings shall show all circuit details including the size of the cable.

Circuit charts are to be produced from Amtech / NAPIT Software either by the contractor or from estates own software.

7.3.9 Metering

Reference Design Guide Chapter 12 Controls.
Metering is an essential component of projects, in particular where spaces are being divided for separate or tenanted usage or where replacement or new heating or cooling systems are being installed or zoned – in such instances it is expected that sub meters will be installed to record consumption. The expectation for all metering is as follows:

- Meter data shall be recorded at half hourly intervals
- All meters will be clearly labelled with serial number and end use
- Renewable energy generation will be sub-metered
- A thorough set of electrical schematics will be provided showing the locations of all meters, as well as information on maintenance and use of meters.

Main/sub metering is to be provided to comply with Building Regulations, Part L2, CIBSE guide TM39 and BREEAM requirements.

For the electricity metering the following principles should be followed:

- At least 90% of the estimated annual energy consumption for each fuel is to be metered separately.
- Any major plant that consumes more than 10% of the building energy should be sub metered.
- Sub metered per floor.
- Sub metering of lighting and small power separately.
- Sub metering any lettable spaces e.g. leased spaces to shops or businesses within UWE. Where meters are used for tenant billing purposes, these should be approved by the Measuring Instrument Directive (MID) or certified under UK national legislation as required.

- Any cooling loads shall be metered separately.
- Suitable for Modbus connection.
- Schneider PM 5111 or iEM 3255 preferred electricity sub-meter.
- Class 1 or 0.5 Current Transformers
- Where current transformers (CTs) are used they shall be appropriately sized to measure the electrical load and ensure they are not oversized.
- CTs shall be installed and secured in accordance with manufacturer's instructions.
- CT shorting terminal blocks shall be installed in an accessible location (e.g. metering compartment)
- Fused disconnect protection shall be provided for each voltage reference and meter power supply.
- All Modbus wiring in panels to be taken to a common accessible terminal within/near the panel
- Labels shall be installed adjacent to each meter describing the meter name in accordance with the university naming protocol.
- All wiring shall be ferruled and clearly labelled/numbered
- Where meters are to be used for tenant billing purposes, these should be approved by the Measuring Instrument Directive (MID) or certified under UK national legislation as required.

Provide a multifunction meter on the incomer to each panelboard to measure the following:

- Voltage (400/230V AC)
- kW & kVA
- Power Factor
- Line current on all phases and neutral
- kWh
- Maximum Demand
- Peak Amps/Volts
- Harmonic monitoring THD

Metering units shall be installed to all distribution boards either in the main switchboard or integrally in each distribution board.
Metering of electricity supplying mechanical plant shall be installed to all distribution boards either in the main switchboard or integrally in each distribution board.

Metering units shall be linked to the Estates Energy Metering system, communicating to the Tridium Niagra system. UWE's current metering contractor is Enica. On large projects, Enica must be engaged at the earliest opportunity (RIBA stage 2) to ensure joined up working. If Enica are not to be engaged directly by the project then a discussion with the UWE Energy Team must take place to agree the types of meters to be installed and metering systems to be utilised.
Where communication is to be via a radio link, an analysis study shall be completed for the buildings to ensure that radio signals can reach the existing transmitter/receiver of the Estates Energy Monitoring Package and that there is spare capacity on the system. Where the signal strength is weak or not present then number of additional transmitter/receiver units shall be installed as required, at Project cost.

All necessary equipment required to ensure that each metering unit can be connected onto the Estates Energy metering systems including data points and power supplies shall be provided. Where required, allowance shall be made for modifying and/or extending the existing system as required ensuring that it is sufficiently sized to accommodate the additional metering units within the buildings and an additional 25% spare capacity.

Where the system needs to be augmented then a complete system shall be installed.

Electricity meters shall be installed in accordance with the current version of BS 7671 (IET Wiring Regulations).

7.3.10 Commissioning and Documentation

All meters shall be commissioned correctly in line with manufacturer's recommendations with evidence to show at least:

- Meter make/model
- Meter serial number
- Meter size (where relevant)
- CT ratios (where relevant)
- Communication settings
    - Modbus settings
    - Pulse ratios
- Photos of the meter and installation
- Meter reading, time and date
- Location description
- MID and/or calibration certificate
- Evidence that Heat meter flow and return temperatures are being accurately measured
- Evidence that current and voltage is being accurately measured

7.3.11 Transient over Voltage Protection (SPD)

- The main switchboard shall have an integral three phase and neutral transient over voltage protection unit to protect the system from the effects of lightning strikes and harmonic spikes.
- SPDs are required unless a risk assessment is performed.
- Should a risk assessment not be performed then protection against transient overvoltage is required.
- Other protection may be required for outgoing supplies, but this shall be determined by the lightning protection and surge protection assessment.

Approved Equipment and Companies – MK, Legrand, Crabtree, or Office Electrics (OE).

7.3.12 Power Factor Correction

If any switchboard has a permanently connected standby generator that supports part or the entire switchboard upon loss of normal mains, the design and installation shall ensure the power factor correction is not active on the bus bar sections of the generator.

A suitably sized spare way on the main switchboard shall be provided for the installation of power factor correction. Power factor correction shall be provided with detuned capacitors to serve the whole building. The switchboard shall have integral power factor correction equipment comprising multiple 25kVA capacitor banks to correct the reactive load and automatic switching control of each bank to apply the necessary capacitance.

The power factor shall be installed to maintain a power factor between 0.95 lagging and unity at any given time.

7.3.13 Harmonic Filters

A suitably sized spare way on the main switchboard shall be provided for the installation of harmonic filters. The harmonic content of the system shall be monitored following the completion of the installation forth first three months and the results shall be made available to the Facilities – Estates Department, UWE University. Should the harmonic content be above the limit as detailed in G5/4 'Limits for Harmonics in

UK Electricity Supply System' then harmonic filters shall be installed to reduce the levels to an acceptable level.

The harmonic content metering capability shall be incorporated in the main incoming supply meters for each LV switchboards.

For particular items of equipment that are known to produce high levels or harmonics, dedicated filtering should be considered at the design stage.

7.3.14 Power Quality

Power quality issues can put a business at risk with electric motors, VSD's, lighting systems and transformers can all have negative effects on harmonics.
Successfully addressing facility-side power-quality issues begins with an effort to track down their causes and locations.
Consideration should be given to installing a Schneider Accusine PCSn unit to monitor currents for disturbances and inject harmonic current to correct them to ensure equipment maintains efficiency and operates correctly.

7.3.15 Small Power Services

The number of socket outlets and dedicated supplies shall be derived from client briefing and project specific room data sheets.

Small power systems shall be designed to comply with the requirements of the latest edition of the IET Wiring Regulations BS7671 and current amendments and other applicable British and European Standards and Codes of Practice.

Room data sheet or drawing detailing the minimum requirements for small power outlets in each area. However where PC's are to be utilised in the space, circuits shall be limited to accommodate a maximum of 6 no. PC's per circuit. Allowance shall be made for future expansion on each other sub circuit.

The installation layout drawings for small power shall include all small power outlet locations, circuit references and outlet types. Within all spaces where PCs are likely to be used all twin switched 13A, 230V socket outlets shall have dual earths and outboard switches. The circuit cables shall be 4mm2 and arranged as dual earth circuits.

Dedicated single small power outlets shall be provided for cleaner's use, with the cleaners sockets being single gang colour RED. These shall be equipped with 30mA RCD protection. The designer shall ensure there is a red cleaners socket on all stairwell landings, in each normally occupied room, of 10m spacing intervals in corridors and in large rooms/ areas.

All teaching rooms, lecture rooms and meeting rooms shall be provided with 13A socket outlets, audio-visual outlets, RJ45 outlets for data points and a telephone point for the Audio visual and IT installations, and containment for future Audio visual and IT installations. The requirements are contained in a separate Audio visual and IT specification.

Many people with disabilities use equipment that needs to be recharged regularly. Multiple power points with contrasting colour cover plates shall be available at waist height around rooms.

IT server racks or wall mounted server racks shall be supplied via a dedicated circuit. The protective device will be a 32A type C MCB and supplied via a 32A commando socket.

Where new mains comms rooms are being installed that contain more than one cabinet, the room shall be provided with a dedicated distribution board that in turn supplies the dedicated circuits for commando sockets.

UWE have installed 'Lecture capture facilities' on all campuses. Details on these requirements are to be obtained from UWE Estates.

A documented risk assessment will be required to determine that RCD protection is not necessary. This risk assessment will then need to be attached to the Electrical Installation Certificate.

Approved Equipment and Companies – MK or Crabtree.

7.3.16 Under Desk / IT Equipment Extension Cable Systems

To meet the requirements of *BS6396 Electrical Systems in Office Furniture and Education Furniture*, Faculties and Services must ensure that when purchasing and providing mains power extension cable systems for office furniture and IT systems that they meet this specification. This applies to all new installations, office moves, refits and refurbishments and when assessing and processing Health & Safety workplace and DSE inspections.
All new mains power extension cable systems should be individually 3 to 5 Amp fused and switched sockets on BS6396 compliant products. Such as those indicated below:

4 way mains power base with:
- Individual switched sockets
- Individual 3 to 5 amp fuses

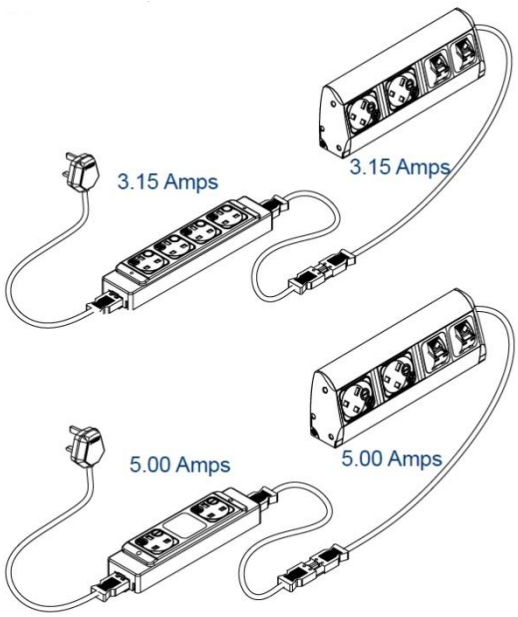
Mains power connection lead, for use with above base, with:
- Wieland connection
- 13 amp sealed UK square pin plug
- 1m, 2m and 3m lengths only

Optional link cable, for use with above, with:
- Dual Weiland connections
- 1m, 2m and 3m lengths only
- Please note; Optional link cable should only be used to meet, but not exceed, the maximum socket/rating combinations allowable under BS6396

They are a Faculty/Service responsibility to meet the regulation. Ordering is available via the ITS online system.

Electrical systems installed in office furniture must meet these regulations and educational furniture is included.
Where the connection to the supply is direct or via an under floor track connector then BS7671 The IEE Wiring Regulations, will apply to the installation.

Electrical accessories used in office and educational furniture installations must be manufactured to relevant electrical Standards, as set out in BS6396, as part of the requirements for overall compliance, of the workstation or screen electrical system, to the Standard.
**BS6396 requires that all sockets installed in accordance with the Standard must be individually fused. The*



diagrams show the maximum number of sockets and their fuse ratings that may be connected to a single 13 Amp mains plug feeding from the building supply.

Sockets installed in or on office and educational furniture are intended to supply power to equipment whose rating does not exceed 5 Amp, the maximum fuse rating allowed in the sockets by BS6396. Most office electrical equipment will run within the 5 Amp maximum. This does not include kettles, fan heaters or vacuum cleaners. Below are some typical examples of office equipment and their running current requirements.

Computer CPU	>2.0 Amp
Monitor CRT type	>1.5 Amp
Lap-top Computer	>1.0 Amp
Desk Lamp	0.25 Amp
Printer or Fax Machine	>2.0 Amp

For compliance with BS6396 and the Electricity at Work Regulations all office and educational furniture electrical installations must be tested to ensure their safety before being handed over for use. This applies to reconfigured as well as new installations. Section 7 of BS6396 details the procedure. Periodic inspection and tests to the same requirements should also be carried out to ensure the continued safety of the office installations. These tests must be carried out by suitably trained personnel and the results documented.

7.3.17 Under Floor Bus-Bar System

In areas with raised access floors an under-floor bus-bar system shall be provided to serve 13A socket outlets.

The bus-bar shall comply with the requirements of the latest edition IET Wiring Regulations. Wiring to the under-floor bus-bar shall be in XLPE/SWA/LSF cabling installed directly on the slab floor (the armour shall not be used as the sole method of CPC or earth reference). All under-floor bus-bar system shall be rated at 63A and shall be supplied cables sized for the full load of the bus-bar. Bus-bar shall be provided under certain teaching spaces, IT suites, meeting rooms, offices and studios where raised floors are available and the diversity of sockets and floor boxes dictates. This shall be considered on a project by project basis.

The under-floor bus-bar system shall enable the connection of the four compartment floor boxes. The bus-bar track shall be located in the floor with the maximum spacing of 5.5 metres between bus-bars and 2.5 metres from walls. The floor boxes shall be fed via prewired 3 metre un-fused tap offs, the use of fused type tap offs to served floor boxes shall not be permitted.

Under-floor bus-bar systems in IT suites and office areas shall be used to enable connection to desk mounted socket outlet modules. The desk mounted 13amp socket outlet modules are to have USB charge facilities and shall be fed via prewired 5 metre fused tap offs which shall exit the floor void via grommets mounted in the floor. The desk mounted socket outlet modules shall be provided as part of the electrical installations work. Each tap off unit identified in the room data sheets shall consist of an electrical supply to the desk mounted socket outlet modules and an RJ45 data outlet.

Floor Boxes shall be of the MK, Crabtree or Legrand type and shall be selected to suit the installation requirements.

Approved Equipment and Companies – MK, Legrand, Crabtree or Office Electrics (OE).

7.3.18 Dado Trunking System

Dado Trunking can be installed in areas where raised floors are not installed. The extent of use of dado trunking shall be discussed with UWE Estates and the architect for each project.

Dado trunking shall be 3 compartment, as per Marco Elite 3 shall be installed around the perimeter of rooms and columns. The dado trunking shall be installed above desk height. The dado trunking shall accommodate a single or twin switched 13 amp socket outlets and CAT 6 data/voice outlets.

The 13amp socket outlets mounted on the dado trunking shall be wired in Ring configuration and NO spurs shall be permitted.

The central compartment covers of the dado trunking shall be grey in order to comply with Part M and provide a 30% visual contrast to the colour of white socket outlets.

Desk mounted socket outlet modules, complete with USB charging points, shall be provided and installed to connect the desk to the dado trunking.

7.3.19 Special Small Power Areas

7.3.19.1 Studios and Workshops

The electrical distribution system in studios and workshops shall be configured such that all of the small power outlets (except cleaner's outlets) can be isolated through one removable key switch located within the studios and workshops.

Emergency stop buttons shall be installed throughout the studios and workshops to isolate power if activated. Stop buttons shall be 'non-latching' type buttons and isolate all power to machinery and open sockets and where applicable Gas shut off interlocking installed.

Socket outlets shall generally have RCD protection except where they have been installed specifically for data equipment. If RCD protection is to be omitted. Then the designer shall produce a documented risk assessment to explain their decision.

Sockets for cleaners shall be installed on a separate circuit and shall not be affected by the emergency stop system.

Machinery socket outlets shall be MK Commando type outlets to prevent students from plugging in unauthorised power tools and the requirement shall be project specific.

7.3.19.2 Laboratories

The electrical distribution system in laboratories shall be configured such that all of the small power outlets (except cleaner's outlets) can be isolated through one removable key switch located within the staff office area.

Emergency Isolation Points, inter-linked to gas supply shall be installed throughout the laboratory to isolate power and gas supply if activated. Stop buttons shall be 'non -latching' type buttons and isolate all power to machinery and open sockets.

Socket outlets shall generally have RCD protection except where they have been installed specifically for computers, etc. If RCD protection is to be omitted. Then the designer shall produce a documented risk assessment to explain their decision.

Red sockets for cleaners shall be installed on a separate circuit and shall not be affected by the emergency stop system.

7.3.20 Electrical Supplies to Mechanical Plant

Installations in connection with mechanical engineering services power supplies and control circuits shall be supplied using information from the mechanical services design.

Power supplies and control cabling shall be provided, as required, to all items of mechanical plant and equipment.

Plant power supplies shall be wired in XLPE/SWA/ LSF cable run on suspended cable tray from mechanical control panels located in the plant rooms.

Equipment power supplies, such as for extract fans, shall be wired in 6491B (XLSF) cable run in trunking and conduit.

The controls wiring shall be installed in cabling and containment systems as required to match the requirements of the Mechanical services design and the requirements of the controls/BMS supplier.

7.3.21 UPS Systems

UPS systems shall be selected to protect 'critical loads' from loss of mains power supply. Typical critical loads to be considered are data storage and processing systems, telecommunications network equipment and point of sales terminals.
Consideration must be given to:

- The size of the load
- The load type
- The load process requirements
- The configuration type i.e. 1N, 2N, N+1 etc.
- The installation of a fully safety interlocked, full wrap around maintenance By-pass
- Separate LV supplies, one to the rectifier and the other to the static by-pass
- The space available to house the equipment
- The suitability of the proposed location (size and weight)
- Access to the proposed locations
- Future expansion of the system
- The additional requirement for mechanical cooling
- Period of autonomy required for each application
- Provision of wrap-around by-pass facility
- Separate supply for static by-pass
- Any provision of UPS shall be considered on a project by project basis, and technical proposals discussed with UWE Estates during the design stage

Approved Equipment and Companies - Chloride or UPS Systems

7.3.22 Generator Systems

Generator systems shall be selected to provide a secondary power supply to various systems in the event of mains power failure.

Typical loads to be considered but not limited to are fire evacuation lifts, evacuation lifts, mechanical smoke ventilation systems and essential supplies.

Consideration must be given to:

- The size of the load
- The load type
- The load process requirements
- The configuration type i.e. 1N, 2N, N+1 etc.
- The space available to house the generator
- The suitability of the proposed location (size and weight)
- Access to the proposed locations
- The additional requirement for mechanical cooling, ventilation, noise and exhaust emissions
- Period of autonomy required for each application
- Fuel storage with fuel polishing facility, double-bunded tank and fully alarmed
- BMS interface required via the data network.
- Any provision of generator shall be considered on a project by project basis, and technical proposals discussed with UWE Estates during the design stage
- Ensure where PFC is installed in an installation with a standby generator that the PFC is disconnected upon a main electrical power failure.

7.3.23 Lighting

7.3.23.1 Lighting Levels and Limiting Glare Indexes.

All lighting is to be designed in line with the relevant standards, including the CIBSE Lighting Guides and Code for Lighting. Recreation Spaces shall have enhanced Lux.

7.3.23.2 Electrical Load and Lighting Calculations

The appropriate load calculations shall be included for all design presented to the UWE Estates Department for comment and/or information. Designers are required to enter the appropriate values into a spreadsheet format. Appropriate Dialux lighting design submissions will be required.

Lighting levels in lux, uniformity, glare indexes along with energy targets and W/m2 values to be submitted for each room/space.

The artificial lighting design shall meet the most current and appropriate requirements of Building Regulations Part L2. Areas that fall outside these parameters shall be highlighted to UWE Estates.

7.3.23.3 General Design Requirements for Lighting

The lighting system shall be designed so that it complies with the most recent edition of Building Regulation Approved Document Part **L.**

Our preferred means of lighting distribution is by the use of modular, plug-in systems (such as Flex 7). This system, however, must not be used on central battery systems where fire-rated cables are required out to each luminaire.

Low energy light sources shall be LED and dimmable fittings.

All luminaires shall have light output ratios (LOR's) of >0.8 and incorporate high efficiency DALI control gear.

Generally, the colour temperature of lamps shall be 4000K (Intermediate).

Provide adequate switching arrangements where applicable to permit 'good housekeeping' by staff and students. The switching facility should provide flexible local control for changing patterns of use and occupation and also permit considerable reductions in lighting load for out-of-hours security patrols.

Careful consideration shall be made for future maintenance tasks in relation to the positioning of luminaires and mounting height. Consider the use of uplighters and suspended lighting systems for rooms with high ceilings. Attempt to eliminate from the design, the requirement for the use of access equipment for future maintenance tasks.

Architectural and interior design requirements should be closely co-ordinated in respect of colour rendering and display effect without compromising energy cost.

Where applicable, a minimum of 10% of each lamp type shall be provided as spares within the specification and be supplied to the Estates project manager at Handover stage.

All indoor lighting shall comply with BS EN 12464 Part 1, in teaching rooms and lecture rooms the consultant shall follow the recommendations of CIBSE Lighting Guide LG5.

For all offices the consultant shall follow the recommendations of CIBSE Lighting Guide LG7.

The design documentation shall be produced, and submitted for examination at the request of UWE estates engineers. This documentation shall include detailed calculation sheets for each sub and final circuit, showing connected load, circuit protection type and rating, load current, voltage drop and derivation of protective conductor sizes.

A luminaire schedule shall be presented to UWE estates during the design stages. This will allow UWE estates to review the selected luminaires and request product samples of any luminaire the university is unfamiliar with. This exercise will need to be completed in sufficient time prior to final order placement with the luminaire suppliers to avoid contract delays being incurred during the installation period.

Circuit header wiring to be selected as appropriate.

Accessibility Guidelines (If applicable)

- All teaching spaces are to be naturally lit as far as possible.
- Flexible lighting options shall be provided with a view to light spectrum, light intensity, and window blinds.
- Lighting levels must be sufficient and not create glare.
- Bare bulbs are to be avoided. Translucent covers to diffuse lights are recommended.
- Harsh strip lighting is not appropriate.
- Flexible lighting to focus on the face of the presenter (so lip-reading is enhanced) and on a sign language interpreter in a lecture theatre or seminar settings.

Approved Equipment and Companies – Zumtobel, Sylvania lighting, Thorlux Lighting (Luminaire manufacturers are reviewed routinely).

7.3.23.4 Daylighting

In accordance with the energy section of the BREEAM assessment, and to help to achieve the required BREEAM rating there is a requirement to incorporate good day lighting into the design.

Consideration shall be given to all spaces where enhanced daylighting can be utilised. The positioning of daylight sensors shall ensure maximum energy savings from utilising natural daylight can be achieved.

7.3.23.5 Task Lighting

If required, due to visual impairment or specific activities, this will be included in the client brief and will be assessed on a case-by-case basis.

7.3.24 Lighting Control

General: The lighting controls within the building shall comply with the most recent edition of Building Regulation Approved Document Part L and LG14: Control of Electric Lighting.

The lighting control system in open space offices shall have the following:

- Absence/ presence detection (PIR's shall have the ability to be programmed as either) incorporating local switching to all office spaces. Absence/ presence detection shall be provided in line with manufacturers specific guidelines so as to detect any personnel in any area and at any workstation.
- In general daylight dimming shall be utilised in areas where natural daylight makes it appropriate to do so.
- Lighting should include photocells where possible to maximise natural daylight.
- Presence detection is used in toilets and corridors. Absence detection is used in other spaces, with a rocker switch by the room entrances to enable users to switch lights on / off when required.
- Store rooms/cupboards which require lighting shall have PIR or manual switch.
- Manual switches where used shall be provided in accordance with the most recent edition of "The Building Regulations Part L2 Section 'Controls for general lighting in all types of spaces'" which stipulates that 'the distance on plan from any local switch to any luminaire it controls should generally be not more than 6 metres or twice the height of the luminaire above the floor if this is greater'.
- Lighting Control Modules shall be used where practicable.
- All luminaires specified shall have a Dali ballast.
- The PC with the lighting control software should utilise an existing PC server, with this software already loaded, elsewhere on the UWE Campus, and link back to this central hub. UWE prefers not to duplicate servers and house unnecessary equipment in multiple locations.

Approved Equipment and Companies – Tridonic Lighting Control.
Deviation from using the Tridonic Lighting Control system may be installed with the pre-agreement with UWE Electrical Engineer, fully explaining the reason for deviation. Where existing equipment and companies have been installed **(**Zumtobel, Thorn, Thorlux, Philips, Sylvania) they may be used in small extensions or refurbishments.

7.3.25 Lighting Control by Area Type

7.3.25.1 Reception Areas

Lighting control shall be provided to allow for the ease of operation of individual circuits and operation of a number of pre-set scenes via a DALI touch screen control panel with graphical display.
Lighting to be controllable as individual effects and areas for scene setting by the lighting control system

7.3.25.2 Café Areas

DALI lighting control shall be provided to allow for the ease of operation of individual circuits and operation of a number of pre-set scenes via a touch screen control panel with graphical display.
Lighting to be controllable as individual effects and areas for scene setting by the lighting control system

7.3.25.3 Exhibition Space

DALI lighting control shall be provided to allow for the ease of operation of individual circuits and operation of a number of pre-set scenes via a touch screen control panel with graphical display.

Lighting to be controllable as individual effects and areas for scene setting by the lighting control system. A system should be installed to control or turn off the lighting out of hours.

7.3.25.4 Teaching Spaces

DALI lighting controls shall be provided by absence/ presence detection and retractive switching. The lighting will generally be provided by rows of luminaires running parallel to the teaching surface.

Local switches shall be provided to allow the occupant to switch 'off' lighting when not required.

Lighting shall be manually switched in rows of luminaires running parallel to the teaching surface so as to turn off lighting adjacent to the interactive whiteboard/projector screen.

Two rows of fittings running parallel to the building perimeter façade shall be provided with daylight linking dimming control to maximise the use of the available natural light.

In general, teaching spaces shall have a Zumtobel Circles Switch providing 3 scenes as detailed below:

Scene	Function provided
1	Lights full on
2	Projection mode (turning lights off adjacent to the screen)
3	All lights dimmed (60%)

In the event that spotlights are required in larger teaching areas to illuminate the speaker's lectern (which can assist with lip-reading etc.), the spotlights shall be selected, positioned and angled to prevent glare on presentation screens or otherwise diminish the visual acuity of presentations.

7.3.25.5 Workshop and Laboratory Rooms

Lighting controls should be provided by absence detection wherever possible. Manual switching should only be installed where there are areas 'hidden' from PIR detectors, for personnel safety.

7.3.25.6 Breakout/Social Learning Areas

Lighting shall be DALI controlled by absence/presence detection and retractive switching for DALI control.

Additional ceiling recessed detectors shall be used to ensure sufficient presence detection coverage is provided to prevent nuisance automatic switching of the lighting.

7.3.25.7 Open Plan and Cellular Offices

Lighting shall be DALI controlled by absence/presence detection and retractive switching for DALI control.

Two rows of fittings running parallel to the building perimeter façade shall be provided with daylight linking dimming control to maximise the use of the available natural light.

Local switching shall also be provided in rows to allow the occupants to switch 'off' or dim lighting when not required.

7.3.25.8 Meeting and Interview Rooms

Generally lighting controls shall be provided by DALI with absence/ presence detection and retractive switching.

Where the meeting room or interview room has an external window then the lighting shall also be daylight linked.

7.3.25.9 Corridors

Lighting controls shall be provided by presence detection. Where appropriate the lighting within corridors shall be linked with photocells such that if there is sufficient natural light, within corridors then the artificial lighting will switch 'off'.

Consideration should be made to corridor illumination when the building is still in use to ensure that people do not step in to unlit corridors. One or two fittings running at 5% background level for fully internal corridors with no windows.

7.3.25.10 Staircases

Lighting controls shall be provided by presence detection. Where appropriate the lighting within staircases shall be linked into photocells such that if there is sufficient natural light within a staircase then the artificial lighting will switch 'off'.

In a building with a networked lighting control system, the lighting on staircases shall remain illuminated when the building is occupied and shall not switch off, except where photocells sense that there is sufficient natural light, until the lighting control system senses the building is empty. Presence detection needs to be highly responsive so that people are not walking into dimly lit stairwell.

7.3.25.11 Library

The lighting control shall be by manual retractive switching and presence detection.

7.3.25.12 PIR Settings (General)

Type or Area	Duration (Mins)
Corridor	20
Stairwells	20
WC's	20
Shower Rooms	20
Changing Rooms	20
Offices (controlled on presence)	20
Classrooms (controlled on presence)	20
Cleaners Cupboard/ Store	10
Kitchenette	20
Equipment Cupboards/ Stores	10
Meeting Rooms	20

7.3.25.13 PIR Settings (Student Accommodation)

Type or Area	Duration (Mins)
Corridor	20
Stairwells	20
WC's	20
Ensuite Bathroom	20
Communal Kitchen	20
Amenity Area	20
Laundry	10
Store	10

Any other areas not covered above must be discussed with UWE Estates.

7.3.26 Emergency Lighting

System to be designed to comply with all relevant parts of the most current edition of BS5266.

Escape routes shall have a system of emergency lighting throughout the route to the final exit from the building.
This must include all accessible Roofs.
Emergency lighting must be provided inside and in the vicinity of technical areas that need to be accessed in an emergency (such as but not limited to assist staff performing isolations etc.).
Escape routes shall be indicated by maintained illuminated signage.

The emergency lighting system shall be a fully automatic, centralised self-testing addressable system.
Where the scope of the project includes the provision of a new addressable system, a data point shall be installed adjacent for future connection to a central monitoring system.

The emergency light fittings shall be LED, self-contained, self-testing and addressable, 3hr duration, appropriately selected for the specific location and fully compatible with Zumtobel SB 128 Emergency Light test modules.

All emergency luminaires shall be wired with DALI cabling to local SB 128 Modules or central battery system.
If there is no SB128, a unit shall be provided if specified within the project scope.
All SB128 units are to be networked back to the Go On software and commissioned as part of any project.
All SB128 units shall have the N Port connection to allow commination via local network outlet.

In buildings where sufficient quantities of emergency luminaires are to be installed and maintenance and access to the fittings may be difficult to change batteries and the like, due consideration shall be given to the use of a Central Battery system.

In buildings where there are large amounts of emergency lighting (up to 30KW) or increased loads as higher lux levels of emergency lighting required i.e. High risk areas, workshops, laboratories or kitchens, due consideration shall be given to the use of a Zumtobel Onlite central power supply emergency lighting system.

The wiring from central battery systems shall be fully fire-rated up to and including connection. Please see the separate section on Fire Stopping, containment and wiring.

Where central battery systems have been fitted adequate cooling must be provided to ensure room temperature of 20 deg C

Approved Equipment and Companies – Zumtobel.
Where existing equipment and companies have been installed (Thorlux) they may be used in small extensions or refurbishments.

7.3.27 Commissioning and Handover

As part of the commissioning process all MAC addresses and administrative passwords are to be recorded. It is important to ensure login details are set to enable increased security and to protect from intrusion as well as to conform to UWE IT Policy.
All emergency lighting control and lighting fixtures shall be labelled and identified in line with UWE Estates emergency lighting labelling requirements including asset numbering. Emergency luminaires shall have identification numbers affixed to the visible part of the luminaire.

Example Handover Pack Checklist/Register

- Asset ID along with fitting type
- MAC Address
- IP Address
- Programmed System Address
- Updated Revit Modelling or Topology Map overlayed onto 2D CAD as a minimum.
- Drawings
- Circuit Detailing
- Commissioning Certification

After a suitable soak test the system shall be handed over with all and any faults fully rectified and the system showing ‘Green’.
All documentation shall be provided to UWE Estates Operations in a timely manner and to give enough time for the information to be reviewed prior to any handover meeting(s).

7.3.28 External Lighting

Where colour rendering is not critical, consideration should be given to the use of more efficient LED sources.

External lighting shall be controlled via the combination of a building mounted photocell, astronomical time clock and 3 position on/off and auto over-ride switch. The time clock and switch shall be accessible to authorised persons only and shall be linked to the BMS system to give an alarm condition on operation.

Any external lighting shall avoid upward light pollution and minimise overspill onto neighbouring buildings, as in accordance with the ILP guidance notes for the reduction of obtrusive light.

Careful consideration shall be given for future maintenance tasks in relation to the positioning of luminaires and mounting height.
Careful consideration shall be given for tree planting schemes, and increased foliage in warmer seasons.

Raise and lower or hinged columns shall be specified and approved maintenance equipment shall be free issued to estates to carry out future maintenance works on all external column mounted luminaires.

Due consideration shall be given to the maintainability on the selection of columns or fittings that can be folded or lowered to limit the need for work at height

Consider the use of LED bollard lights and street lights to illuminate external walkways as opposed to floodlighting an area.

Approved Equipment and Companies – Thorlux, Zumtobel, Sylvania, Philips.

7.4 Fire Alarm System

7.4.1 General requirements for the Fire Alarm System

UWE minimum standard is full compliance to BS5839-1 L3 Category.
Areas specifically identified as “Critical Areas of High Risk”, and defined in the UWE Fire Safety Standard FSS10, shall be to enhanced L3, or L2, or L1 standard.
All UWE sleeping accommodation shall be in full compliance to L1 category.

Fire alarm systems shall all be in compliance to all relevant current standards, such as but not limited to:

- BS5839-1 (L3 Non-Residential including critical areas as defined in UWE FSS10, L1 Residential).
- EN54
- BS6266
- BS8434
- BS7629
- BSEN50200
- BAFE SP203
- Requirements of local building control/fire officer
- Building Regulations part M
- Certified by a certification body such as the loss prevention councils LPS 1014

7.4.2 System Description

Provide a fire alarm system (FAS) installation type analogue addressable to enable a precise description of the location of the fire on the main panel within all areas. The FAS shall contain a minimum of two loops for detectors, sensors, alarms, interfaces and all output devices.

The system shall be provided by - Gents Fire Detection with a Vigilon main interactive digital analogue addressable fire sensor control system complete with S Quad sensors/speech sounders.

Provide a new fully functional semi recessed (if possible) panel with back lit LCD display located within the main reception entrance area and repeat panels as required by building regulations/fire strategy requirements.

The main panel shall incorporate an individual programme facility/integral key switch to enable isolation for a pre–programmed group of interfaces units to prevent activation during periods of routine testing or maintenance. The alarms will activate throughout the building to enable a complete evacuation of all personnel. Provide automatic smoke and heat detection throughout the building according to the above description and manual call points with resettable elements a transparent hinged protective cover on all escape routes, within 30m of any position in the building, at all exits, and designated plant room areas.

Any and all alterations, removals, and additions of any device shall also be updated on the Gent / ADT fire alarm graphical representation system in the Security Control Room.

Provide Cause and Effect based on the following:
The building evacuation zones will be in accordance with building control requirements. In the event of fire alarm activation within the academic areas the complete building shall receive a continuous sounder evacuation alarm.
It is exceptionally important that all devices, including auto-door and hold-open interface units, as well as sounders and beacons, are fed from the correct panel, within the same Fire Zone.
There will be doors located on Zone boundaries which will need to be fed from both Zones.

The following external interfaces shall operate on a fire alarm activation:

- Automatic operation of the fire alarm sounders.
- Volt free contact to indicate to the Mechanical systems the building is in fire alarm condition.
- Visual alarm devices will pulse.
- Automatic door interfaces will operate allowing free exit/access to the building.
- Indicate the location of the fire.
- Interface with the data network (for remote monitoring) via the main panel.
- Interface with incoming gas supply/shut off valve.

The sounder installation shall comply with BS5839 and the building shall be subjected to an audibility test upon completion of the system and the fitment of all doors. Upon activation the sounders should achieve a minimum of 65dB(A) at any location or a minimum of 5dB(A) above any background noise.

Provide S-Quad sensors throughout all areas of the building (including void areas if required) with the exception of the kitchen/plant room, which will be provided with heat detectors. The S Quad sensor supplied from the loop shall incorporate the following:

- Sensor – dual angle optical scatter technology/heat suitable for the environment/area.
- Speech voice message (four different standard messages stored in each device)
- Sounder with adjustable sound levels and soft start.
- VAD – built in high intensity flashing strobe.

Provide flashing beacons and sounders on accessible roofs.
Provide flashing beacons and sounders to external entry & exit doors in order to prevent re-entry into the building prior to full clearance of the fire alarm activation.
Provide flashing beacons in all accessible WC's.

The fire alarm system shall be wired in FP200 multi-core CWZ rated pliable fire resistant cable (Firetuf or similar) with red low smoke fume zero halogen outer sheath. No cables smaller than 1.5mm2 cross section shall be used. All cabling shall be mechanically secured using copper coated P-Clips and stainless steel tie wraps

The fire alarm panel shall incorporate battery extender boxes capable of supporting the system for approx. 4 days in the event of mains power failure. This will add future resilience to the fire system during emergencies and aid electrical HV/LV maintenance requirements during outages. The standby batteries shall be mounted within, below, or next to the main Fire Panel. If the batteries are to be mounted outside the main Fire Panel, they shall be mounted within a separate enclosure in the plant room/agreed designated room but not in the entrance area. Equipment requirements consist of:

- 1 x Fire system battery storage metal box, key locked, wall mounted. (Part: VS-BATTBOX-72)
- 8x 21Ah Fire panel standard batteries. (Part: 4015-602-YFR Panasonic 21Ah-12v)
- Associated battery leads for parallel connection to 48v DC GENT Fire Panel supply requirements.

For ALL new fire alarm installations, all loop cards shall have VIG-LPC-EN high power 800ma loop cards on all panel loops. To a maximum or no more than, 155 devices per loop, calculating device loading, to deliver the required 25% spare capacity requirement on loop milliamps, loop device numbers and the overall system design. This shall enable, with the 25% spare capacity panel requirement, the future expansion of the system using higher power V-VAD (Quad) detectors (Voice/Strobe) and Sounder beacons up to 2km max loop length.

For upgrades to legacy fire alarm systems, the legacy panels must be surveyed for loop card upgrade along these lines, as new S-Quad and Q-cubed devices are compatible. This will mitigate the need to expand physical loop numbers to circumnavigate a 400ma power restriction, reducing cabling and allowing larger area voice/beacon coverage from individual control panels.

Ensure that an output signal is linked to the main mechanical control panel/access control/ventilation plus all items required by building control to provide automatic shutdown upon fire alarm operation.

General Installation

Obtain detailed wiring diagrams from the manufacturer/specialist installer for the proposed overall installation. Provide installation wiring diagrams fully detailed for comments four weeks prior to installation.

The fire alarm cabling will be recessed if possible within the general areas and installed on cable tray systems following main containment routes or clipped to the building structure elsewhere. Final drops to points of use will be either concealed within cavities or installed in recessed/surface galvanised conduits minimum 20mm diameter.

Provide zoning proposals for the building and LPS1014 Certificate prior to commencement of design/ installation.

Allow for the equipment manufacturers to provide full instruction of the complete FAS for the Employer's Representative after the contract completion date. This shall include a practical demonstration of the installation and equipment. The Installer shall be responsible for arranging the required demonstration and agree the time and dates regarding the overall contract programme works.

Upon completion prior to Employer's demonstration/handover the contractor shall provide operation and maintenance manuals, record drawings and test/completion/commissioning certificates in accordance with BS5839. Record all the test results and present them in tabulated form and indicate on As Fitted drawings. Issue FAS test certificates as detailed in BS 5839, comprising, installation and commissioning documents.

Provide sensors/detectors in voids, shafts exceeding 800mm depth (refer to Architects layouts for details), and areas with restricted access complete with remote LED indicators that are to be flush fixed in a clearly visible location and suitably labelled to indicate their function.

Where wiring passes through fire compartment walls the wiring is to be sleeved with metal conduit or trunking and the sleeve packed with fire resistant material on completion of the works. Refer to the building drawings for the location of compartment walls

During the design consideration should be given to the life cycle costs of alternatives, expected service life, maintenance requirements and maintenance strategy.

The installation and commissioning shall be carried out by a Gents approved system integrators installer to also connect to the existing site network.

Spare capacity shall be made available for future expansion of the system.

Remote indicators will be required for all concealed detection devices and interface units.
Flashing beacons shall have a red lens and be EN54-23 compliant. They shall be positioned at various locations which will include corridors and communal areas, bars and café areas, lecture theatres, classrooms, plantrooms, toilets etc. or other locations where deaf and hard of hearing users may be alone, including bedrooms, ensuites, kitchens and common rooms in selected campus residential accommodation.

Plant override test switches shall be a key operated type.

In areas where entertainment equipment will be used, fire alarm interface units shall be installed to disconnect the power to the equipment in the event of fire alarm activation.

7.4.3 Fire Alarm System / Mechanical Systems Interface

A fire alarm system interface unit shall be installed adjacent to each mechanical plant control panel. This shall include the ventilation system and boiler plant control panels.

In addition interfaces for but not limited to systems such as smoke dampers, gas solenoid valves, CHP's etc. shall be included.

Fume Cupboards should be of fire resisting construction, provided with smoke / fire detection and consideration for their own suppression system subject to fire risk assessment.

7.4.4 Fire Alarm System / Access Control Systems Interface

All doors with electro-magnetic locking systems shall include a provision to allow the door to be opened in the event of a fire alarm or other emergency situation. Normally this means that the locks will automatically disengage upon activation of the fire alarm.

A fire alarm system interface unit shall be installed adjacent to each secure door with an additional manual break glass override – coloured green – mounted local to the door.

Careful co-ordination is to be ensured between the lock installer and fire alarm system specialist.

7.4.5 High risk areas

If the UWE Security Services Department, in consultation with end-users, determines that an area represents a high security risk they can require that electro-magnetic locks on vulnerable doors do not release automatically upon activation of the fire alarm. The University Health and Safety team will be notified of this decision and this decision will need to be recorded (e.g. in the fire strategy and/or fire risk assessment).

7.4.6 Fire Alarm System Interface

All fire alarm system interfaces are to be installed in GENT S4 Interface Enclosures Plastic s4-34490. It is preferable to install 4 way interfaces as standard for future proofing, as opposed to single way. Both single and four way should be input/output capable.

7.5 Containment and Wiring

The designer shall utilise a factor +50% when sizing containment systems to allow spare capacity for future adaptations.

Particular attention must be given to the selection of cable containment used to ensure the integrity of the containment if subjected to fire.

All pre-harmonised coloured wiring shall not be reused and must be replaced with new LSFOH cable of the appropriate size and type (This may mean changing the existing cable size to ensure BS7671 compliance).

Wiring systems are supported such that they will not be liable to premature collapse in the event of a fire. To comply with Fire Safety standards, only metal containment and suitably metal cable ties shall be used.

7.5.1 Individual Wiring Methodology

7.5.1.1 Small Power

Final circuit wiring shall be wired in 6491B singles. Each final circuit cable in the distribution board shall be fitted with a propriety cable ferrule system identifying the final circuit cable reference. The cabling shall be sized in accordance with the latest edition of the IET Wiring Regulations.

Final circuits shall be installed in galvanised steel trunking and conduit within ceiling voids and enclosed in galvanised steel conduit in walls.

Where it has been agreed with the UWE Electrical Engineer that final circuits may be wired utilizing 6242B LSF cables they shall be contained within steel wire basket and in all instances secured with metallic cable ties.

In the plant and switch rooms final circuits shall be wired in 6491B LSFOH single core cables in exposed galvanised steel trunking and conduit.

Within teaching spaces and the like Marco Elite 3 compartment White dado trunking must accommodate CAT 6 data cables. Contrast inserts or contrasting dado lids are to be provided behind accessories for DDA Compliance.

All ring final circuits shall be a minimum of 4mm^2 conductor CSA.

7.5.1.2 Lighting

Internal lighting circuit cables shall not be less than 1.5 mm² or more than 2.5mm² conductor CSA. Final circuit wiring shall be LSF0H single core cable, reference 6491B, enclosed in galvanised steel trunking and conduit. The installation shall be concealed in the fabric of the building, flush down walls and recessed in ceiling voids.

Lighting circuits containing high wattage luminaries (above 150W) shall be individually designed. Cable sizes, protective devices shall be carefully calculated to suit the particular installation in these cases.

MCBs and RCBOs shall be 10A Type C with the load on each MCB limited to 5A maximum.

Luminaires are to be installed and wiring following the manufactures recommends methodology.

Above suspended ceilings, lighting control modules shall be utilised and associated flexible leads. Emergency luminaries shall be connected varied connectors to distinguish between lighting and emergency lighting luminaires. Lighting control modules shall be located in the ceiling void, adjacent to the luminaire fixed to the building structure/trunking, behind an accessible ceiling tile.

Where luminaries are fixed directly to the building soffit they shall be connected direct to the final circuit wiring with the final connections using heat resistant single core wiring from terminations in accessible conduit boxes or adaptable boxes.

7.5.1.3 Emergency Lighting

All wiring shall comply with BS5266-1.

Central battery emergency luminaire cabling shall have a minimum conductor CSA of 2.5mm2.
Wiring shall be FP200 enhanced or an equivalent approved standard and sized in accordance with respective circuit loading.

Central battery emergency luminaire cabling shall be installed on separate or segregated containment exclusive for the use of emergency lighting cabling.

The use of proven metal cable fixings shall be utilised throughout. Plastic will not be acceptable.

Approved Equipment and Companies – Prysmian, Nexams

7.5.1.4 Fire Alarm

All wiring to comply with BS5839-1. Cabling must meet the FP200 enhanced standard or equivalent.

Fire alarm cabling shall be installed on separate or segregated containment exclusive for the use of fire alarm cabling.

The use of proven metal cable fixings shall be utilised throughout. Plastic will not be acceptable.

Approved Equipment and Companies – Prysmian

7.5.2 Individual Containment Methodology

General - Standard galvanised steel trunking or conduit and accessories is to be used throughout the site with heavy gauge trunking or conduit in boiler and plantrooms.

Dado Trunking - 3 compartment Marco Elite 3 white PVC dado trunking, with grey lids.

SWA Cables - Heavy duty galvanized steel cable tray and cable ladders/racks.

Data and Voice - Dedicated, medium/ heavy duty galvanized steel cable basket.

Fire Alarm - Dedicated, medium/ heavy duty galvanized steel cable tray with metallic cable ties.

Security - Dedicated, medium/ heavy duty galvanized steel cable basket.

Approved Equipment and Companies –

- Dado trunking - Marco Elite 3
- Accessories - Honeywell MK or Crabtree
- LS0H Cables - Delta Crompton, Prysmian or Draka UK

7.6 Ancillary Services

The electrical services consultant shall ensure they interface with UWE specialists for particular ancillary systems to ensure they have fully understood UWE requirements and have made suitable allowances within the design to capture requirements.

7.6.1 Lightning Protection System and Surge Protection

The electrical consultant shall engage a lightning protection specialist and provide them with all required information to carry out a complete lightning protection risk assessment to ascertain the requirements for the particular project.

The contractor shall be responsible for employing a lightning protection specialist, the lightning protection specialist shall identify the category of lightning protection system and be responsible for carrying out a compliant design and full installation.

Consideration shall be given by the lightning protection specialist to hide and conceal all down conductors wherever possible.

The electrical contractor shall ensure that the cost of the lightning protection system is identified at tender return.

Within BS EN62305, surge protection is a fundamental part of a lightning protection system. The purpose of lightning current surge protection is to protect against dangerous sparking to minimise the risk of loss of life and damage to the structure.

Additional co-ordinated surge protection may be required to protect sensitive electrical and electronic equipment within the building or structure. The purpose of co-ordinated transient over-voltage surge protection is to protect electrical and electronic systems and equipment from the secondary effects of indirect lightning and switching transients, generated downstream of the lightning current surge protection.

Designed to All relevant British Standards, specifically BS EN62305 and BS 7430.

Approved Equipment and Companies – Furse

7.6.2 Assistance Call Systems

Assistance call systems shall be installed in all accessible WC's. The visual beacon shall be located above the door of the WC. Alarms, both audible and visual, shall be given local to the accessible WC and also be signed to show the need to contact the main reception within the building (if manned and applicable) or the campus gate house. Local signs shall read: "When Light Flashes and Alarm Sounds, Contact East Reception on 0117 3289999 for assistance."

All assistance call systems shall be linked into the building fire alarm system using interface units, such that they are all then also represented on the main graphical fire system head end display in the Control Room.

The reset button shall be located within the accessible WC.

Approved Equipment and Companies – Wandsworth

7.6.3 Wall Clocks

Unless a central system has been requested, where wall mounted clocks are required, they will be radio controlled (MSF), with integral batteries and securely fixed in the required locations.

Approved Equipment and Companies – *None specified at present*

7.6.4 Electrical hand and hair dryers

Hand dryers to be installed against tiled walls.
Hand dryers shall incorporate an overheat protection device and where appropriate installed in accordance with DDA and part M requirements.

Approved Equipment and Companies – Dyson Airblade V or Xcelerator or Airforce or Xcel Thin Air Electrical Hair Dryers

Hair dryers shall be installed as required within RDS where appropriate installed in accordance with DDA and part M requirements.

7.6.5 Hearing Assistance Systems

Analogue infrared transmission equipment should be installed to all large Lecture Theatres and at reception Counters. They should also be installed within teaching rooms and meeting spaces as appropriate. The system shall be compatible with other units installed throughout UWE.
The presence of an induction loop or infrared hearing system shall be indicated by standard symbol signage.
All equipment to be housed in a locked cabinet secured to the building fabric.
All systems are to be supplied with radio microphones.

Approved Equipment and Companies – Details can be obtained from UWE IT Services who manage the portable hearing loop devices.

7.6.6 Lifts

- Lifts are to be designed to comply with:

  - The Lift Regulations 1997
  - Part M of the Building Regulations.
  - All relevant parts of BSEN 81
  - The Lifts Directive 2014/33/EU
  - EN81-20:2014 Safety rules for the construction and installation of lifts — Lifts for the transport of persons and goods Part 20: Passenger and goods passenger lifts.
  - EN81-28:2018 Safety rules for the construction and installation of lifts -Lifts for the transport of persons and goods -Part 28: Remote alarm on passenger and goods passenger lifts
  - EN81-50:2014 Safety rules for the construction and installation of lifts -Lifts for the transport of persons and goods -Part 28: Remote alarm on passenger and goods passenger lifts
  - EN81-70:2018 Safety rules for the construction and installation of lifts - Particular applications for passenger and goods passenger lift - Part 70: Accessibility to lifts for persons including persons with disability
  - EN81-73:2016 Safety rules for the construction and installation of lifts - Particular applications for passenger and goods passenger lift Part 73: Behaviour of lifts in the event of fire
- UWE has a legal duty to ensure the evacuation of all building occupants. In all buildings with multiple levels, the provision of 'evacuation lifts' should be required as part of the design. Where the provision of such a lift(s) is discounted the arrangements for the evacuation of people with a disability that would prevent them from evacuating the building unaided must be stated in a written risk mitigation statement.
- The lift shall be large enough to allow wheelchairs to turn around and/or have space for a carer to share the lift.
- Buttons and panels should be designed and positioned to be usable from a wheelchair and by persons with reduced manual dexterity and impaired vision (e.g. large buttons, with a good visual contrast between the number and the button).
- Lifts must have trip counters fitted.
- Signage in lifts shall be large clear and contrasting.
- Auditory messages and visual indication must be provided to inform users of floor levels and door opening and closing.
- Lighting levels shall be compliant with levels stated within BSEN 81.
- Remote communication must be installed in all lifts in the form of an auto-dialler on a copper network. Each lift at UWE shall have an analogue telephone line installed to make an emergency call back to Security Control Room. The line must be provided under the UWE Lift Line Contact and as such must be ordered via UWE's Unified Comms team. Also see section 7.6.4.
- The interface for the lifts shall bring the lift to the ground floor and park with doors open on operation of the fire alarm system.
- Provide an air sampling system detection at the top of each lift shaft with an accessible control panel at the top floor.
- Careful co-ordination is to be ensured between the lift installer and fire alarm system specialist.
- A lift's location in the building shall be clearly signed.
- Consideration shall be given to the provision of more than one lift in a building to allow for repairs, maintenance and break downs.
- Lifts shall be installed as full evacuation lifts to BS 9999:2017 and useable in the event of a fire.
- Lighting and power sockets within the lift shaft must be designed and installed by the lift specialist installer.
- Lifts may also have to comply with the following standards when fitted into an existing building:-
  - EN81-21:2018 Safety rules for the construction and installation of lifts - Lifts for the transport of persons and goods - Part 21: New passenger and goods passenger lifts in existing building.*
- *Should it be determined that the refuge spaces are not available as required by EN81-20:2014, then the University would expect a derogation against 2.2 of the EHSRs of Lifts Directive 2014/33/EU to be sought from BEIS or whichever department is allocated responsibility at tender stage.

- When Vandal resistance has been requested or environment indicates it is required: EN81-71:2018 Safety rules for the construction and installation of lifts - Particular applications to passenger lifts and goods passenger lifts - Part 71: Vandal resistant lifts
- When travel to top floor from Fire Service Access level exceeds 18000mm or the requirement for a Fire Fighter Lift has been indicated: EN81-72:2015 Safety rules for the construction and installation of lifts - Particular applications for passenger and goods passenger lifts -Part 72: Firefighters lifts
- Lift doors will be resistant to fire for 120 minutes and comply with EN81-58:2018 Safety rules for the construction and installation of lifts - Examination and tests - Part 58: Landing doors fire resistance test.
- The testing of any new install shall be to BS8486-3:2017 Examination and test of new lifts before putting into service – Specification for means of determining compliance with BS EN 81.
- Part 3: Passenger and goods passenger lifts conforming to BS EN 81-20.

Minimum Expectations (to be read in conjunction with lift traffic analysis)

- Minimum Lift Size 630Kg 8 Persons Type 2 Access (1100w x 1400d x 2200h)
- Minimum Entrance size 900 x 2000
- Preferred size 1000Kg 13 Persons Type 3 Access (1100w x 2100d x 2200h)
- Entrance size 1000 x 2000
- For travel up to 4 floors or less than 10,000mm Lift Speed 1.0 m/s
- For travel above 4 floors or 10,000mm Lift Speed 1.6m/s
- For travels above 10 stops or 30,000mm Lift Speed 2.0m/s
- Minimum Lift Size 630Kg 8 Persons Type 2 Access (1100w x 1400d x 2200h)
- Minimum Entrance size 900 x 2000
- Preferred size 1275Kg 17 Persons Type 5 Access (1400w x 2000d x 2200h)
- Entrance size 1100 x 2100
- For travel up to 4 floors or less than 10,000mm Lift Speed 1.0 m/s
- For travel above 4 floors or 10,000mm Lift Speed 1.6m/s
- For travels above 10 stops or 30,000mm Lift Speed 2.0m/s
- All lifts to be Motor Roomless in design
- Permanent Magnet Gearless Motor VVVF to operate closed loop.
- Designed for 240 starts per hour
- Stopping accuracy +/- 6mm under all load conditions
- Controllers shall be located in a locked panel that shall be located on the top floor, all control equipment / panels to be **open protocol** with built in programmers not removeable from site.
- All operating parameters shall be readily accessible and re-programmable by third party maintenance service provider.
- Shaft position system up to four floors tape head and monitor above four floors USP system.
- Doors to be stainless steel and have box framed architraves also in stainless steel. Door operator to be VVVF and capable of advance door opening.
- Autodiallers to be Windcrest or equal and approved by Estates Engineer.
- BREEAM Requirements
- Traffic Analysis (Trip counter)
- VVVF Drive units
- Standby Mode for controllers and indicators
- Energy efficient LED lights

Approved Equipment and Companies – Consultation must be had with Estates Operations Electrical Engineer.

7.6.7 CCTV, Intruder Alarm, Access Control, Auto-Doors and Car Park Barrier Systems

The electrical services designer shall liaise with the UWE Security Services Department, the Intelligent Building Engineer and building designer to determine the requirement for CCTV, Intruder alarm, access control, auto doors, and car park barrier systems. The designer shall incorporate these requirements into the design to be provided by the electrical services contractor and allow for all necessary power (radial unswitched fused spurs), fire alarm interfaces, data outlets etc. The designer shall further include all containment and ducting requirements.

It is essential that designers consider maintenance/replacement access to cameras without the need for additional cost access vehicles. Normal installation of CCTV to be stepladder access; approx. 2.4-3m

7.6.7.1 Access Control

Design of access control systems is somewhat complex dependant on the door systems in use, but as a design standard the following should be adhered to for design:
ALL ACCESS DOORS: Fitted with Hands free (touch free), request to exit sensors, located with DDA consideration to mitigate the use and fitting of additional DDA buttons.
As of June 2021, design improvement and availability of increased maglock sheering strengths has led to a design change whereby a standard (default) maglock for all door types within UWE can be specified, regardless of external/internal needs or restriction of frame size etc.

Default maglock details;	1500kg Alpro AL2400LP 12/24v L Bracket ALAMLB2400 Z&L bracket ALAMZB2400

A suitable maglock is to be provided for ALL operational leafs on the said door system, including ¼ doors etc. Access controller must have integration with Fire Alarm system, by means of a Fire interface device, on the correct fire zone, and is required to disable door locks (maglock) on activation of the fire alarm. Note. Actual Maglock only to be disabled, not the complete door system and all other functions, these are to remain active. Fire integration must be to relative fire zone based on door physical location, no cross zone connection, even if it means installing multiple fire integration.

7.6.7.2 Comms Rooms

Mechanical locking barrel option on 1513 plant room lock suite. Key override box external to the room that has the ability to disable the lock when the relevant access panel is installed in the said room.

7.6.7.3 Auto Swing Doors

Sideways opening/sliding doors are to be avoided if access control is required unless an operational necessity, as they are problematic for access installation.

Provision to be made for enough space for access control installation in relation to DORMA (or equal supplier and approved in advance) power door units, sensors and doors arms. Normal space requirement is 15cm above door frame head, and 15cm on each door head (Leaf). Auto doors will also require an additional ‘Auto Door Integration Box’ due to the operational complexities, installed above and close to the said door. Cross power connections from/to access control devices and/or DORMA power door units is not allowed. Each system is to provide its own power needs. Only integration signalling cabling is allowed to/from each system. The installation must be completed as follows:

- In full accordance with EN:16005
- Each unit wired separately into its own 13 Amp fused spur unit and not linked to other door or access systems.
- Following a written Risk Assessment of the area and use and possible future use of the entrance/location
- Low energy applications without full door mounted safety are not permitted
- Roller blind type Fingerguards must be fitted at all times if fitting to existing doors. If new Aluminium doors are being installed, they must be manufactured with circular anti-fingertrap protection as standard
- Push Pads should be avoided. Touch Free devices should be used to mitigate risk of transmission of viruses as well as enhancing accessibility and conforming to DDA.
- Controlled, Asset tagged, and signed off by MGS via Term Contractor (UWE approved and appointed Door Contractor), added to the master spreadsheet and UWE database.
- MANUAL LOCKS (Auto Swing Door/Auto Sliding Door) These types of powered opening doors, are NOT to be fitted with Manual/Key locks of any description. Included in these are dead locks, shoot bolts, flip locks, frame locks, flush bolts or door bolts. Nothing that has the manual capability to hold the door shut when the auto opener engages. Any pre-fitted instances of these type of locks must be removed or made inactive. Only the access control maglocks are to hold the door for security purposes.

7.6.7.5 Auto Side Sliding Doors *("Star Trek" Doors)*

Auto side sliding doors should be avoided unless an absolute design necessity as they are problematic for access control installation. Consultation with Estates must take place should they be required, and if required they are to be installed to comply with the same needs of 'Auto Swing Doors', as above.

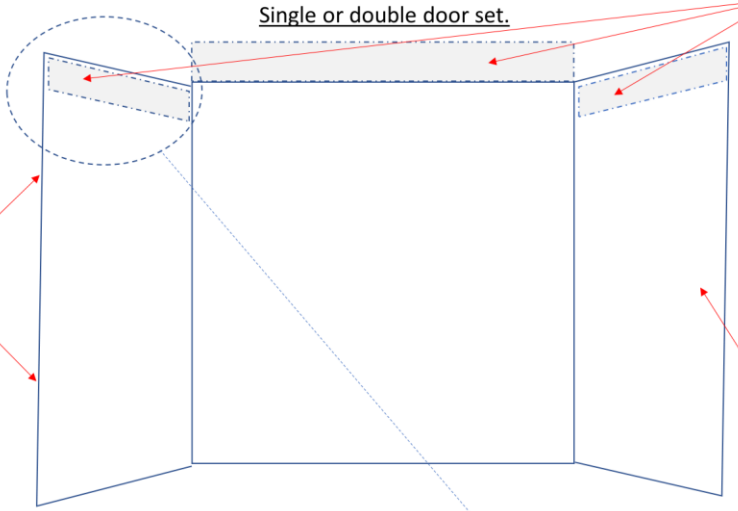
7.6.7.6 General

Design consideration should be given to doors over 2040mm in height to mitigate locked pull/push movement and the subsequent sheer on oversize doors. Glass frameless doors should be avoided due to the fact that there is no available mounting area for access control devices in the frame, and difficulties mounting on glass. Provision of door handles should be considered in a fire/no power situation, especially on auto doors. Exit/entry capability must be maintained when doors are considered manual state.

Access Control & Powered Doors – Default Layout

Example: External doors
Single or double door set.

Extras Required for Access Control that need to be allowed for:
Access controller With Electrical spur.
Data Outlet.
Fire interface.
Swipe.
RTE Hands Free.
Emergency Break Glass.



15cm head above door and on leaf head as an exclusion zone.
For:
Powered full length opener/closer unit.
Door closer arms.
Maglocks.
Intruder Alarm sensors.
Safety Sensors

Note: Exclusion zones need to be solid construction to allow mounting. No glass panels etc. An access control door should either be solid (wooden door), or have mid level brace (aluminium door), no full length glass panels, this reduces frame twisting and shearing effect against locks.

No shoot/manual bolts to be fitted in secondary leaf

No manual locks to be fitted in primary leaf.

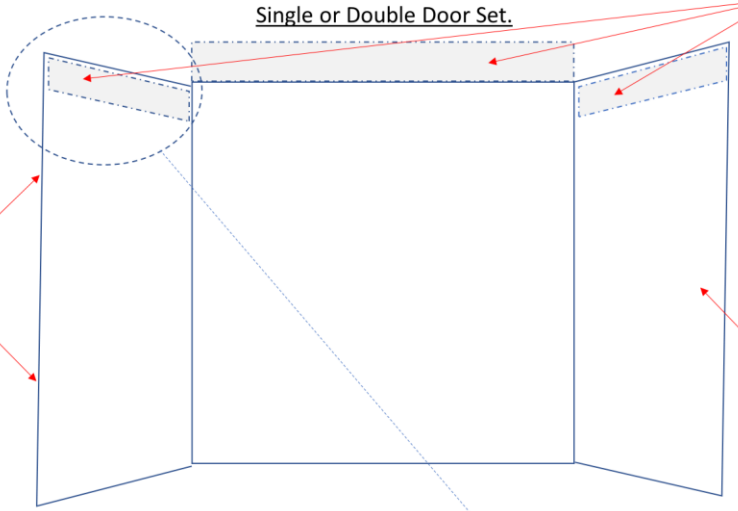
Allow first 12 inches from door head edge for maglock install, followed by closer arms and Intruder sensors.
Safety sensors to be installed below or at the limit of the 15cm exclusion zone.

Note (Not Shown):
Allow door guards for safety? Door Kick plates if needed? Allow pull handles to open door in power failure?
Allow any (Extra) fire holdback integration with access?

Access Control with Door Closers – Default Layout

Example: Storeroom/Office
Single or Double Door Set.

Extras Required for Access Control that need to be allowed for:
Access controller With Electrical spur.
Data Outlet.
Fire interface.
Swipe.
RTE Hands Free.
Emergency Break Glass.



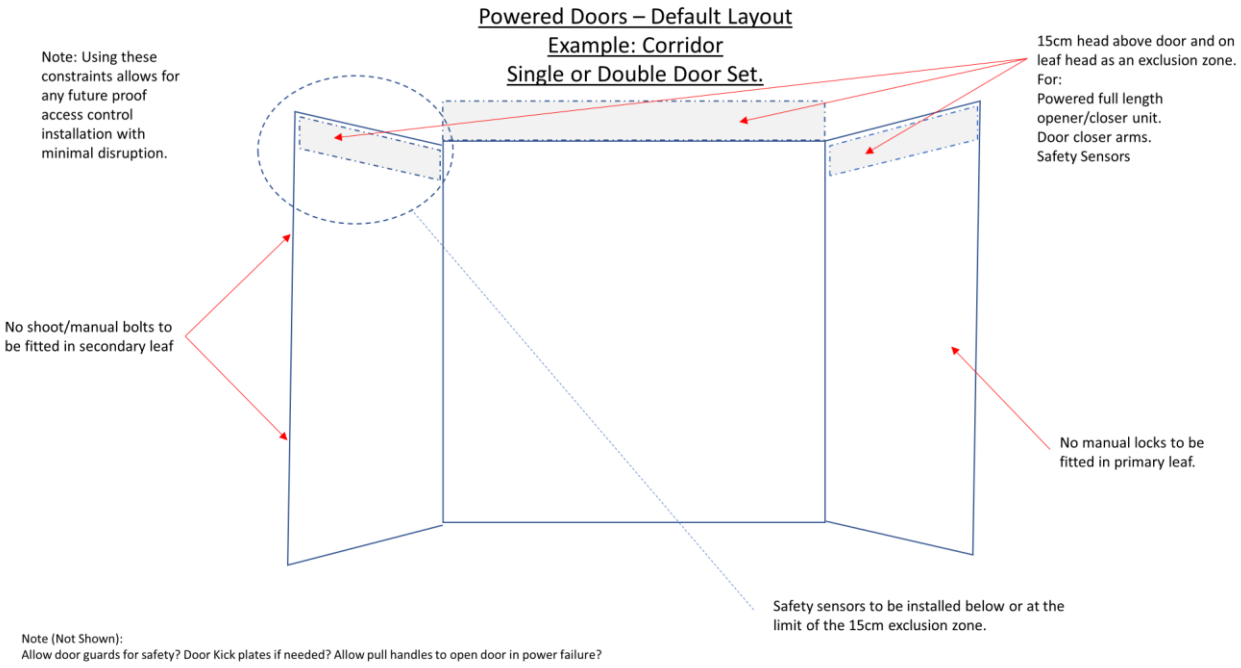
15cm head above door and on leaf head as an exclusion zone.
For:
Door Closer.
Door closer arms.
Maglocks.
Intruder Alarm sensors.

No shoot/manual bolts to be fitted in secondary leaf

No manual locks to be fitted in primary leaf.

Allow first 12 inches from door head edge for maglock install, followed by closer arms and Intruder sensors.
Safety sensors to be installed below or at the limit of the 15cm exclusion zone.

Note (Not Shown):
Door Kick plates if needed? Allow pull handles to open door?
Allow any (Extra) fire holdback integration with access?



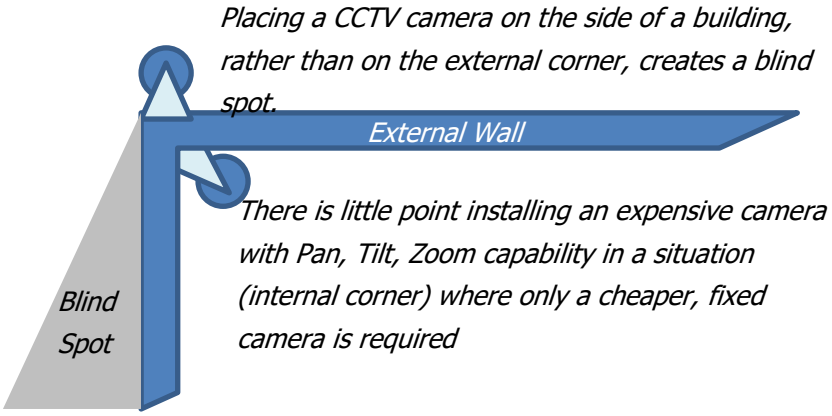
7.6.7.7 Cabling Containment for security systems

All cabling from data outlet to security device, i.e. the patch cabling. Must be installed in it's own containment to prevent tampering or removal, especially when the patch cable exits any ceiling cable trays to the device itself. At no time should a data outlet be installed so near to a security device that it is allowing accessibility to be able to disconnect the device. Should this be unavoidable, then the outlet and the patch cable connection must be secured in a secure box.

The designer shall collate all the necessary commissioning certificates for these services for submission to the Estates PM.

7.6.7.8 CCTV

There are numerous examples of the wrong type of CCTV cameras being installed and/or being installed in the wrong location. Examples are shown in the image below and highlights the need to discuss with Security, and for CCTV provision to be shown on co-ordinated drawings:



Installation of POE (Power over Ethernet) cameras are to be considered over mains required cameras in all cases.

All CCTV mounting as follows
External.

1. PTZ/High end zoom CCTV, flat roof building, to be mounted on swing out, weighted, maintainable arms, on the building roof areas.
2. PTZ/High end zoom CCTV, mounted on actual building envelope, to be mounted on suitable fixed bracket, maintainable arms, within reach of 12-step stepladders.
3. Fixed, single/180/270 mounted on actual building envelope, suitably high for maintenance.
4. CCTV poles and masts should be avoided. They present problems for maintenance, and for the required ducting and cabling/power distance problems that come with pole mounting CCTV. CCTV to be mounted on buildings only. CCTV poles, masts and posts that would be located in grounds areas away from buildings are to be discouraged, unless fully justified for Security and/or necessity of use.
5. Adequate dedicated data ducting to be provided. Max length 90m from relevant switch. (see data ducting specs)
6. Data and power required shall be provided within one metre left/right/above of the CCTV location, in an external IP65 type externally mounted box

Internal.

1. Fixed, single/180/270/360 mounted in clear, unobstructed, maximum coverage locations to facilitate requirements, preferably at threshold of building.
2. Internal CCTV that is tasked to view external doors from in to out must be capable of viewing through any glass partitions/doors.
3. PTZ/High end zoom CCTV is discouraged internally, unless fully justified for security and/or necessity of use.
4. Data and power required shall be provided within one metre of the CCTV location.

Monetary value charge for each camera to be included as part of any project is to be costed for storage space utilisation for recording 30 days constant primary stream to full resolution of each camera (days x Gb day space x Gb cost).
Monetary value of this recording space is to be charged to project costs and held by Estates for expansion/maintenance of recording system hardware.

It is legally required to provide CCTV signage. All works must allow for installation of CCTV signage. This signage must be provided by the project. The wording is to be agreed with UWE Security.

7.6.7.9 CCTV in Lifts

Data cabling to CCTV provided within lifts must be cabled as per UWE data cabling specification including any patch cabling to the said camera. No analogue or twisted pair conversions or relay boxes within lift shafts or any part of the installation will be accepted due to data loss.

Approved Equipment and Companies –
CCTV/Access Control, Equipment – Wise (Hanwha) CCTV cameras that work in conjunction with Wise (Hanwha) CCTV system.
Continuum Access Control. Note. Proposal to move forward onto new system. Consideration to be made as default onto this system once in place for all access control elements.
CCTV/Access Control, Installer – KSCM
Security Alarm Equipment – Galaxy Honeywell Dimension series.
Security Alarm Equipment/Installer – Shield Fire & Security
Car Park barriers – CAME. (Barrier installer KSCM)

7.7 Emergency Voice Communications Refuge System (EVC)

Install a disabled refuge intercom system to provide voice communication between each disabled refuge space and the Campus Security Office in Frenchay 1E020, and the Bower Ashton Security Office BA-F and Glenside Porters Lodge GL-H. The system shall comply with all requirements of BS5839:Part 9 / BS9999 / BS8300 and consist of the following:

(a) Fully recessed mounted master station/indicator panel LCD display backlight with a microphone and speaker allowing hands-free 2 way communication located adjacent to the fire alarm panel at the Building Ground Floor main entrance. The panel is to be linked to all refuge spaces and all accessible WC alarms and be mounted at 1.4 – 1.5m AFFL to the centre of the panel. This shall be enabled to have individual refuge space voice communications to Frenchay Security Office 1E020, Bower Ashton Security Office BA-F, or Glenside Porters Lodge GL-H.

(b) Fully recessed mounted intercom outstations sited at each refuge space as indicated on the layout drawings. The outstations to provide hands-free communications and induction loop output for hearing impaired users, mounted at 0.9 – 1.2m AFFL to the centre of the panel.

(c) Provide fire resisting enhanced system cabling for the installation type FP200 or similar. Allow for all necessary fire rated wiring between the indicator panel and the disabled refuge intercom in accordance with the manufacturer's recommendations. Include for 230V supply to the main panel and power supply unit including 8 hour stand by battery to be located in an adjacent secure area.

(d) Liaise with the UWE H&S Team to agree suitable locations for Refuge Spaces. A purpose made system shall be installed and linked to the Frenchay Security Office 1E020.

(e) Provide an interconnection between the main Disabled refuge control panel and the main building fire alarm panel.

(f) Careful consideration must be taken to decide between photo-luminescent signs and illuminated signs. Signs must be provided, including but not limited to, ‘Fire Exit’ with a Disabled symbol and arrow pointing correct direction, ‘Emergency Door Release’ indicating green break glasses, red ‘Fire Alarm Call Point’ (MCP) sign, etc.

Approved Equipment and Companies – Baldwin Boxall via Defensor Fire Ltd.

7.7.1 Red Emergency Telephones

There are some legacy red emergency telephones across UWE, and no further red analogue telephones are to be installed. These are being replaced with green Emergency Telephone Handsets connected via the Baldwin Boxall Refuge system. If no Baldwin Boxhall system exists then one must be provided.
The electrical services designer shall consult with the UWE Health & Safety Team and UWE Security Team to determine suitable locations for green emergency telephone handsets. Emergency handsets shall be installed and linked to the Campus Security Control Room Balwin Boxall Refuge system in Frenchay 1E020, as well as the local Security Control Room at Bower Ashton or Glenside for those locations.

The emergency handsets shall incorporate a direct communication system to allow direct conversation between the person requiring assistance and Security personnel. The handsets must be pre-programmed to

call the Frenchay Security Office Refuge system upon lifting the receiver. Each handset must be labelled and must be clearly marked by the installation team with the phone's location.

It is the responsibility of the Project Team to supply, install and commission the system. Liaison and consultation will also be required with the Fire Safety Term Maintenance Contractor.

Approved Equipment and Companies – Baldwin Boxall – Green Refuge phone. Part Number BVOCET.

7.7.2 Lift Phones

For new installation of Lift Phone lines at all UWE locations, the following are required:
A Copper link with enough capacity for emergency phones, Lift lines +5% for future expansion.
For Frenchay campus the link must be made from the comms room in the building back to room 2B12.
For Glenside campus the link must be made from the comms room in the building back to room 1B31b.
For Bower Ashton campus the link must be from the comms room in the building back to room 0B04.
The Emergency Handset must be installed at a level accessible by everyone.

Discuss the requirements of the installation with the Unified Comms Team first by raising a request via email to itonline@uwe.ac.uk
The Unified Comms Team will then raise a quote from the UWE supplier and pass back for approval before ordering. The Unified Comms team will require two weeks to process the request with the UWE supplier and then confirmation and agreement from Estates.

It is the responsibility of the Project Team to supply, install and commission the system. Liaison and consultation will also be required with the Fire Safety Term Maintenance Contractor.

7.8 Data Cabling and Fibre

Please also refer to Design Guide Chapter 8 IT Infrastructure.

BSCL (South West) Ltd are the incumbent contractor for all installations of UWE network outlets, patch leads, CAT version data cable, IT switches, IT racks, WiFi AP's and all fibre cabling within all UWE buildings and ducting both internal and external. This list is not limited to the above and could include secondary systems such as:

- Emergency Telephone lines
- IP telephone systems
- Intercom systems
- BT line requirements
- 'Dark' Fibre requirements
- Lease lines
- Fibre between controllers (mainly UWE fire system)

Basically, anything that sits prior to any outlet, or connects into or around the UWE network system and the cabling for it, falls under BSCL/ITS Network Services remit to install.
Items that sit after outlet are not included, such as CCTV cameras, controllers etc.

All of the requirements above must, without fail, be arranged and agreed in advance with ITS network services. No other data cabling company or sub-contractor is to be used to install any of the above without express permission from ITS network services.

When designing & planning new build and existing build refurbishment that requires additional external duct routes for fibre/data cabling, there must be extensive collaboration and agreement with the following parties to determine the requirement for UWE network infrastructure;

A. Estates Department (Intelligent Building Systems Engineer)
B. ITS Networks Team.
C. The incumbent UWE Data Cabling Contractor (presently BSCL)

The design, location and size of the relevant duct/s to be installed and the number of required inspection chambers, should be in consideration with existing route runs, to ensure both future proofing and interconnection.
As a rule of thumb, or design standard, the following criteria should be met for any new duct run for Data/Fibre;

1. Ideal depth across site (Hard or Soft Dig) 450/500 mm minimum.
2. Minimum 2 x 110mm (4 inch) plastic rigid ducting pipe externally ribbed with smooth interior, colour PURPLE.
3. All ducts shall be provided with polypropylene draw cords and Black & Yellow marking system.
4. Maximum of 90m between inspection chambers.
5. Inspection chambers are to be of 1200mm x 600mm design, with twin chamber covers. (Location will determine actual chamber specification structural requirement)
6. Chamber covers are to be labelled with signage 'DATA SERVICES'.
7. A gradient from the centre of each run, to the corresponding inspection chambers at each end should have a gradient run between 1 in 110 and 1 in 125 towards each chamber, to allow natural water drainage or prevent flooding from said inspection chambers.

There is a design expectation to allow both redundancy and future proofing as default around the entire new build, building circumference ducting should be designed in as standard. With set points into the build. Existing chambers within sensible reach should be joined to the new and not bypassed. There should be no dead ends and the new duct should flow into the existing duct infrastructure at more than one point, unless geographical or operational needs curtail this.

7.8.1.1 Fixed IP Addresses

System devices that require fixed IP addresses, such as CCTV, Access Control, BMS, Intruder Alarm Etc must be collated by the relevant project, or PM, and requested via the ITS online system to ITS, with an attached IP Request sheet. This must be planned in advance and in conjunction with data outlet installation via BSCL/ITS Networks. See 'Pre-Handover Programme' project timeline, critical steps, in a separate document. ITS will only issue fixed IP addresses, when both BSCL Outlet Trace & Test info and IP request sheet have been received and authorised. All these details must be controlled by, and through, the relevant project or PM for dissemination to contractors/sub-contractors.

7.8.2 Intercom Voice/Video Systems General

Excluding Fire Refuge Intercom call systems. All new voice/video intercoms, serving a new building or refurbished area, internally or externally, are to be network based Stentafon systems, provided by Schneider Electric. Installed and configured onto the existing Stentofone server within the ITS Server room FR-B-1-1B012. No other hard wired, off network, or bespoke network-based Intercom is to be installed. Including any 'telephone to telephone' alternative solution to a manufacturer designed intercom.

7.9 Energy

7.9.1 Photovoltaics (Where Required)

Refer to the requirements of BS7671, including section 712.

7.9.2 Inverters

Consultant to ensure that a voltage optimiser system, or micro inverter system i.e. an inverter system that offers individual module control visibility on the PV array is specified.

7.9.3 Online monitoring

As a minimum, the online system must have the capability for .csv data exports of hourly generation data.

7.9.4 Considerations

Isolation of the PV System is to be provided in a location that is readily accessible, does not require entry into high hazard areas to operate, and does not introduce a hazard or foreseeable risk to Operations and Security / Maintenance Staff / Fire Services when the system requires isolating in an emergency fire situation.
Lightning protection, earthing and protective equipotential bonding to be fitted.
Data point to be located next to inverter panels.
Safe Access for maintenance and replacement.
Battery storage where appropriate (co-ordinate with architect to ensure that suitable battery storage is included if required).
Ensure volt drop of a.c. connection is minimised to prevent the nuisance tripping of the inverter.

7.9.5 Demand Side Response

During the design stages the MEP consultants shall consider ways of reducing non-essential energy without affecting business operations, comfort or product quality.

This may apply during the operational hours (occupied hours) of the building or out of hours.
Items that should be considered are:

- Reduce HVAC to minimum levels.
- Reduce lighting to minimum levels.
- Shut down select buildings or areas of buildings.
- Raise set points on chillers a few degrees
- Shut down laundry washers and dryers
- Transfer load to back-up generator.

7.10 Commissioning

The designer shall ensure that the systems proposed are fully commissionable.
Commissioning shall be carried out to manufacturers' recommendations.
CIBSE commissioning codes and BSRIA guides shall be adhered to.

100% of electrical installation test results shall be checked by the electrical designer. They shall also witness the electrical installation testing to verify their accuracy.
All final documentation shall be issued in both pdf format and electronic format and must be incorporated on Amtech / NAPIT Fast Test. All results must pass Amtech / NAPIT Verification with all boxes filled out.

The electrical designer shall attend and witness fire alarm commissioning work and verify sound level tests.

The electrical designer shall attend and witness emergency lighting commissioning work and lighting level tests to verify their accuracy.

The contractor shall present a schedule of all commissioning and dates available for inspections for the electrical designer and UWE estates engineers.

UWE Soft Landing and Handover Processes, UWE drawing and BIM standards are to be followed.
All final certification and compliance documentation must be issued and accepted prior to final hand over of the electrical installation.

7.11 Management of Isolation

All works, method and procedures shall be in accordance with UWE Procedures and Permits. As a general procedure, the UWE Term Contractor is used to manage isolations.

7.12 Appendix

Item / Description	Manufacturer	
Main Switchgear Panel	Schneider / Hagar	
Distribution Boards	Schneider Acti Isobar P / Hagar	
Transformer	Wilson E3 Amorphous transformer	
XPLE/SWA/LSEZH Cable	BICC/AEI/DELTA/Eland/Prysmian/Nexans (BS 6724)	E&A
General Lighting & Small Power Cabling	BICC/AEI/Eland – 6242B	E&A
Cable Tray/Trunking/Conduit/Basket	Legrand/Cablofil/Unitrunk	E&A
Dado Trunking (White UPVC)	Marco	
Modular Plug-in Ceiling Roses	MK Link/MEM/Klik	E&A
General Luminaires	Zumtobel/Philips/Sylvania/Thorlux/Hacel/Fagerhult	
Exit Luminaires & Emergency Luminaires	Zumtobel	E&A
External/Car Park Luminaires	Philips/Thorlux/Zumtobel/Sylvania	E&A
Light Switches – General	MK grid plus switch arrangement	E&A
Light Switches – Dimmable	Zumtobel	E&A
Switch/Sockets/Fused Connection Units	OE Electricals/MK/Crabtree	
Arc Fault Detection Devices	Schneider, Siemens, Hager	
Surge Protection Devices (SPDs)	Schneider, Siemens, Hager	
Metering – Panel boards	Schneider PM5111	
Metering – Distribution Boards	Schneider A9MEM3255	
Fire Alarm Equipment	Gents – S Quad detectors open protocol	
Fire Alarm Cabling	Firetuff /FP200 Gold/FP400/FP600	E&A
Lighting Controls	Tridonic Lighting Control	
Industrial Isolators	Eaton MEM – Rotary switched type RDMP IP65	E&A
Refuge communications	Boxall	E&A
Floor Boxes	MK Ackermann/Powerplan/Unitrunk	E&A
Suspended/Retractable sockets	Reelcare/Marcaddy	E&A
Extended Power Modules	OE Electrics	