THE UNIVERSITY of EDINBURGH
Estates Department

Estates Design Guideline No. 6

Electrical Engineering Services

Important Comment on Estates Design Guidelines, Assets & Standards

These Design Guidelines, Assets and Standards and the associated suite of documents have been produced in order to furnish external design consultants and contractors with guidance on required University standards for inclusion within their proposed project design.

These guidelines are to be used as supplementary information during project design stage, and as such, detail the minimum standards expected from the University Estates Department.

Please note, these guidelines do not absolve the project design team including, sub-consultants and sub-contractors of their legal and contractual obligations under, design liability, statutory regulations and health and safety legislation.

EDG No. 6 Electrical Engineering Services - Approval Procedure	
Estates Design Guidelines (Assets & Standards) No. 6 Electrical Engineering Services Lead: Fire Risk Management Group	Name Signed Off Date
Estates Design Guidelines (Assets & Standards) No. 6 Electrical Engineering Services – Check and Approval Director of Estates Operations	Name Signed Off Date
Estates Design Guidelines (Assets & Standards) No. 6 Electrical Engineering Services Approval by EMG and Health & Safety Committee	Name Signed Off Date
Estates Design Guidelines (Assets & Standards) No. 6 Electrical Engineering Services Approval by Estates Committee	Name Signed Off Date
Estates Design Guidelines (Assets & Standards) No. 6 Electrical Engineering Services Sign off by Duty Holder	Name Signed Off Date
Estates Design Guidelines (Assets & Standards) No. 6 Electrical Engineering Services – future review date Sign-off by Responsible Person (Policy)	Name Signed Off Date

Version Control for Estates Design Guidelines (Assets & Standards) No. 6 - Electrical Engineering Services

Version	Date	Nature of Revision	Author	Approved by	Signed
1.0	January 2019	New Guideline	AC		
1.0	February 2020	Revised Guideline	AC		

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1.0 Introduction

The UoE Design Guidelines (as a whole), have been developed for employees of the UoE, Design Teams, Architects, Engineers, Project Managers, external consultants and contractors. This documentation has been developed to enable Design Teams and Contractors to have a broad understanding of the principles that the University of Edinburgh will require to be adopted for any future developments.

The guide is primarily designed to be used in conjunction with Royal Institute of British Architects (RIBA) stages. The actual extent and scope of the design guide to be incorporated for any future development will be based upon the specific project requirements.

The UoE Design Guidelines aim to discuss strategic matters and does not provide an exhaustive treatment of statutory or best practice design and compliance requirements; its primary purpose is to establish a starting point for design briefs, support the consultation process and outline existing assets and standards. It is the responsibility of Design Team readers/duty holders to ensure subsequent designs are complete, compliant and able to meet the final approved brief when measured in use.

1.1 Important Notice – Essential Prior Reading

It is essential for readers of this document to first refer to Design Guideline No.1 entitled *"Estates Design Guidelines (Assets & Standards) Introduction and Application"*, which serves to provide the principles and overview with vital information and context that will apply to all projects.

1.2 Purpose of the University of Edinburgh Estates Design Guidelines (Assets and Standards)

The purpose of the Estates Guidelines is to act as a briefing document to give designers an overview of the minimum design requirements, constraints and challenges presented by the University of Edinburgh's particular needs. It applies to all new-build, refurbishment, minor works and change of use projects, including property leased by the University, controlling quality in the production of designs, specifications and the subsequent performance of buildings, developed to a consistently high standard and ensuring continuity throughout the University Estate.

The University of Edinburgh encourages innovation, however, all project Design Teams should ensure that their proposed projects have end user considerations and ease of maintenance at its core.

The use of the University of Edinburgh Estates Guidelines, Assets and Standards will not take the place of, or remove, any of the professional responsibility from Design Teams and Contractors to fully comply with the requirements within this document. Given the complex, diverse and growing estate, not all eventualities can be fully defined within this document.

Should any projects deviate from these guidelines, a technical submittal outlining the deviation, reason why and impact to the University maintenance strategy should be prepared and forwarded to the nominated University project representative for liaison with the Building Services Group (BSG).

A review of this deviation shall be carried out by the BSG; a final decision on the deviation shall be communicated to the appropriate design/construction team.

1.3 Interpretation of UoE Estates Design Guidelines, Assets and Standards

The Estates Design Guidelines, Assets and Standards are required to be issued with all project contractual documentation in order to inform project design and construction teams of expected standards to ensure quality continuity across its Estate.

Glossary of Terms:

1.3.1 Enforced Requirements

The use of the word(s) ‘shall’, ‘are required’, ‘is required’ ‘must’ or ‘will’ denotes a requirement that is non- negotiable and shall be used as the basis for designs, technical submissions and/or activities. If such a statement conflicts with a statutory obligation then a technical submittal shall be issued to the University project representative for liaison with the BSG for their final decision regarding compliance with the documentation.

1.3.2 Requirements Needing Confirmation

The use of the word ‘may’ denotes a negotiable requirement or indication of a solution, where innovation and further calculation, design and discussion may be required to arrive at an optimised solution.

1.3.3 Quality

The Design Guide aims to arrive at the University of Edinburgh’s highest design aspirations and standards. It may be that, at the University of Edinburgh’s sole discretion, solutions are value managed and then value engineered during subsequent design iterations. Design Teams and Contractors are encouraged to consider where value management and subsequent value engineering may result in an improved financial performance should funding constraints occur. All mechanical and electrical value management and value engineering exercises carried out shall be forwarded to the BSG for review.

1.3.4 Assets and standards

The Design Guidelines endeavours to set out Assets and Standards that will maximise the benefits realisation for the UoE to achieve its strategic objectives and maximise value for money. This will involve coordinated and optimised planning in conjunction with Procurement, robust asset selection with particular reference to existing legacy assets and standards on the University Estate, for reasons of utilisation and continuity of maintenance, replacement of parts, renewal and ultimate disposal.

1.3.5 Currency of Third Party Documents

Where superseded standards and regulatory documents are referred to in the text, the reader shall apply current revisions and amendments to their project. Should there be any ambiguity, the BSG should be contacted for clarity.

1.3.6 Proof

Where the word ‘proof’ is used, e.g. ‘proof is required’, a written report or installation certificate must be produced for approval depending on context.

1.4 Review Design Data Process (RDD)

All proposed designs shall be submitted to the Project Manager, respective Estates Teams and Building Services Group for review and comments, the response will be categorised as follows:

A. Design Team to acknowledge comments and continue to develop the design to the next stage.

B. Design Team to acknowledge comments and update the design in accordance with comments and resubmit for consideration before proceeding to the next stage.

C. Design Team to acknowledge comments and completely review and update the design in accordance to the agreed design principles and resubmit for consideration before proceeding to the next stage.

In addition to the above, the UoE may request specific technical submission to support the RDD and may include the request setting out with proof, e.g. calculations, drawings, etc.

The purpose of the RDD is to ensure designs meet the strategic requirements of the UoE and do not compromise the future operations and maintenance provision. The obligations owed by external architects, consultants and contractors to UoE and their liabilities to UoE is not in any way diminished or otherwise reduced by the RDD.

1.5 The Obligations Owed

By external Design Teams, consultants and contractors to University of Edinburgh and their liabilities to University of Edinburgh is not in any way diminished or otherwise reduced by the approval process. University of Edinburgh is not taking over the roles and duties of the external Design Teams, consultants and contractors who will remain legally responsible for the design and/or works carried out by them or on behalf of their staff, agents, sub- consultants and/or sub-contractors.

1.6 Version Control and Updates

The Estates Design Guidelines, Assets and Standards will be updated annually. The anticipated date of issue being January each calendar year. This is subject to change.

The version number will, using 2018 as an example, move from 2018 V1.0 at the end of January to 2019 V1.0 for the following year. The picture or colour of front cover of each new version will be changed to simplify referencing.

Any new or amended content is highlighted in yellow so readers can easily identify changes from previous versions. If there are no further revisions, a guidance note will accompany the issue.

2.0 Electrical Engineering Services - Design Criteria

- All designs, must, as a matter of statute, be in compliance with all Building Control Regulations, British Standards, CDM Regulations, Health and Safety at Work Act 1974, Electricity at Work Regulations 1989 and all associated Approved Codes of Practice.
- All designs must now comply with BS7671:2018 18th Edition Wiring Regulations current edition/amendment and any associated corrigendum's. Any project designed before the 01st January 2019 under 17th Edition shall be assessed by the design team, should any major changes to the design be required under the 18th Edition, UoE Project Manager shall be notified in writing. To ensure compliance, any project designed under 17th Edition shall be certified and signed off using 17th Edition Certification.
- A Departure from the requirements of BS7671 18th Edition Wiring Regulations shall be declared by the project Electrical Consultant/Contractor to the BSG and recorded on BS7671 electrical certification for compliance. Departures as rule of thumb will not be accepted by UoE, in particular, Departures caused as a result of design/installation errors. Accepted departures shall include declaration from Designer that the resultant degree of safety is not less than that achieved by full compliance and recorded on electrical installation certification.
- All projects shall be designed and constructed in compliance with the Construction, Design and Management regulations 2015. All project team members should be aware of the legal duties placed upon them during all stages of design and construction, ensuring that all building elements are safe to use and maintain by University personnel.

2.1 Design Criteria

The engineering services shall be designed in accordance with the following criteria:

- Building Control Regulations and associated Technical Booklets
- British Standards
- UoE Edinburgh Sustainability Model Evaluator (ESME) Tool
- All University Design Guidelines, with specific attention to future maintenance strategies
- The needs of the occupiers/users and overall project brief
- Flexibility in use and future proofing as far as reasonably practicable
- System reliability, resilience, maintainability and cost in use
- Safety of all end users

Design team shall seek guidance from UoE Project Development Team with regards to ESME and how this should be implemented within the project scope of works.

If it is deemed impractical to pursue an ESME accredited scheme, then the Design Team shall ensure that all relevant good practice design guides and procedures are followed as far as is reasonably practicable to achieve an energy efficient and sustainable development, complying with the University maintenance strategy.

Design Team and Contractors must exercise due care and competence, in ensuring that all operational compliance requirements are delivered and demonstrated under the University T59 handover procedure.

The following information is intended to provide guidance to those responsible for the design of Electrical Building Services within the Estate of the University of Edinburgh.

These Design Guidelines are not intended to be exhaustive or definitive and it will be necessary for users of the guidance to exercise their own professional judgement and competence, when deciding whether to abide by or deviate from it. Any deviations are to be formally captured and issued to the BSG for consideration and approval.

Project design and construction teams shall ensure that all projects are designed and constructed with energy efficiency and future maintenance in mind. Whether it be a new build or refurbishment project, designers should adopt an approach, which recognises the need to:

- Reduce the demand for energy and materials
- Streamline system requirements and management intervention
- Encourage the use of, where practicable, renewable energy sources
- Adopt tried and tested good practice methods to achieve energy consumption benchmarks, with particular reference to BSRIA, Carbon Trust, BRE, etc, in respect of energy and carbon emissions guidance
- Provide an electrical installation and associated systems that are appropriate for the intended application, whilst ensuring longevity of installation is provided.

The design for the Electrical Building Services shall generally be deemed to include but shall not be limited to:

- Incoming electrical supply, including application management with utility provider (where applicable) or via UoE network infrastructure
- Temporary site power supply derived from UoE infrastructure including UoE completion of application document
- Switchgear and associated cabling – Transformers, HV/LV main switchboard and sub-mains distribution boards, interlocking schemes and all protection device settings/selectivity
- Emergency and standby generators including fuel storage and polishing equipment (including liaison with SEPA under MCPD)
- Emergency and standby generator control system inc. load shedding schemes and description of operations/cause and effect strategy (in agreement with BSG)
- Provision for temporary/mobile generator connection
- Temporary electrical enabling works for external/festival events (general and emergency lighting, power supplies, fire detection, etc.)
- Small power installations
- Electrical supplies to mechanical services installations
- Electrical supplies to lifts (Standard, Evacuation and Fire)
- Electrical supplies to End-User specialist equipment
- HV/LV earthing and bonding installations

- Internal lighting installation including lighting control system/philosophy
- Emergency lighting installations
- External and car park lighting installations
- Containment and wiring systems for power, voice and data installations
- Coordination of mechanical and electrical services
- Lightning and surge protection installations (LSPS)
- Fire detection and alarm systems
- Temporary fire detection and alarm systems for external events
- Inclusivity and accessibility system provision – EVC, induction loop, WC alarms, lone worker, paging and access systems
- Intruder detection and alarm installations
- Access control installations
- Closed Circuit Television (CCTV) Installations
- Voice, data and structured cabling installation (please reference UoE IS Guidelines document)
- AV (Audio Visual) installations in accordance with UoE LST Guidance
- PA/VA (Public Address/Voice Alarm) installations
- Uninterrupted Power Supply Systems (UPS) to meet departmental requirements
- Testing, commissioning and bringing into service
- Familiarisation with existing site pre-construction, i.e. site surveys, existing system inspections etc.
- External services including all above/below ground distribution routes
- Building handover – T59 Procedure, Operation and Maintenance (O&M) Manual including all operating instructions and procedures
- Electrical Consultant/Contractor to utilise T59 template provided by UoE BSG and populate to reflect project specific systems and information requirements. Final T59B/C document to be approved by UoE BSG.
- PV Installations, design, testing, commissioning and inclusion for DNO witnessing

3.0 Power Distribution Equipment, Power Quality and Substation Design

3.1 High Voltage (HV) Switchgear

All HV equipment shall comply with all relevant parts of IEC 62271 current edition/amendment, including all British/European standards where applicable.

HV switchgear shall be Hawker Siddeley Fixed Pattern Switchgear "Eclipse" range vacuum type circuit breakers sized accordingly complete with earth fault, overcurrent and In/Out Solkor protection relays as required. Switchgear shall also be complete with remote trip/close facility and auxiliary battery back-up system.

Transformers shall be Eco-Design Directive tier 2 compliant, super low loss energy efficient, copper wound, free breathing, amorphous core, MIDEL oil filled, 11kV/415V delta/star transformers complete with voltage tap changing facilities. Transformers may also be fitted with fully rated Air Circuit Breakers (ACB) complete with fault protection fitted on the Low Voltage (LV) output side of the transformer, or free standing LV cubicles as required. Transformers shall be as manufacturer ABB and/or Wilson.

It shall be noted that projects with a requirement for transformer equipment shall be designed to operate in a resilient arrangement i.e. N+1 etc. Given the specific nature of this requirement, it is vital that the project Electrical Consultant discusses and agrees the building electrical resilience strategy to be provided under the project works with the BSG.

Transformers and associated LV switchgear shall be configured in such a way that allows a transformer to be taken out of service for maintenance activities or operational events without the requirement for a break in supply to buildings/areas served by this equipment i.e. capable of short term parallel between TX equipment, with LV board rated for appropriate fault level rating (kA). Strategy to be agreed with the BSG.

Transformers shall be provided with oil level alarm and overheating trips, connected to HV switchgear. All live conductors shall be of copper type, with appropriate level of insulation and protection to be determined by the installation environment. The neutral conductor shall have the same cross sectional area as phase conductors.

HV cabling shall be 3no. core XLPE/screened/SWA/LS0H 6350-11000V BS7835 sized accordingly. Single core XLPE/screened/SWA/LS0H 6350-11000V BS7835 sized accordingly. All live conductors to be of copper metal design and insulated accordingly.

No provision for remote HV switchgear tripping facility shall be installed on main LV switchboards or located within LV switchrooms.

All HV switchrooms shall come c/w a SP&N consumer unit (described in section 3.4), serving local power and lighting circuits only, with provision included for metering and a dedicated 110v supply.

Consideration shall be given to the nature of the project and any operational requirements/impact to UoE HV Network's and include a provisional cost within project budgets to fund UoE HV Network Operator Authorised Person duties.

During early design consultations, the design team shall assess the risk of flooding on all main/critical substations, switchrooms (HV/LV) and plant locations and liaise with the BSG to discuss flood prevention/detection measures that should be incorporated within project works. General allowance for a flood/leak detection system connected to UoE BEMS network shall be included in all main/critical substation/switchrooms for tender purposes as a minimum.

Substation/switchroom locations shall not be installed below ground/subterranean level as a minimum requirement. Exception to this shall be considered on the basis of an existing building structure or specific site conditions, however, this shall be in agreement with the BSG. Maintenance/replacement strategy shall be provided to BSG for consideration before acceptance of proposal.

Please note: it is the responsibility of the project design team and installing contractor/s to coordinate the mechanical and electrical services installation in such a way that avoids the installation of services containing water/waste routed within any substations/switchrooms, electrical risers/cupboards or areas containing critical mains distribution equipment. Should this occur, these services shall be fully removed and rerouted.

Earthing and bonding shall be designed and installed in accordance with current British Standards (BS7671:2018 current edition/amendment).

For those projects with earth farm requirements, the design/construction teams shall liaise with the BSG to discuss the associated works and proposed final location.

Electrical Consultant shall allow within their tender documents provision for the completion of a grading study to be carried out on all existing sites where protection device grading and settings are unclear or unavailable. This study shall include all HV/LV site installations. All new and existing settings shall be recorded on as installed project main schematic mounted within A0/A1 sized frame on switchroom wall.

It shall be noted that any project requiring modifications to existing switchgear (HV/LV/TX), it is the responsibility of the installing contractor in conjunction with the Electrical Consultant to update the electrical distribution schematic mounted on the switchroom wall. Should a switchroom be without a schematic, a cost shall be included to survey the existing board and provide an associated network schematic.

Please refer to Appendix No.3 for list of equipment to be included within project tender documentation for substation locations. Early liaison with the BSG is essential to finalise what equipment from Appendix No.3 should be provided.

3.2 UoE Substation Design – High Voltage, Low Voltage and Transformer Switchrooms

High Voltage (HV), Low Voltage (LV) and transformer (TX) switchroom locations require special consideration for UoE projects, where applicable, to ensure the safety of both UoE personnel and authorised UoE specialist contractors.

The following points shall be implemented into the design and installation of all HV/LV/TX substation locations:

- HV and LV equipment shall be completely segregated

  - Transformers shall have separate, compartmented rooms (freestanding LV ACB cubicles permitted within TX rooms where applicable, providing adequate space is provided)
  - HV switchboard and associated BTU shall have separate, compartmented switchroom
  - LV switchboard and any associated generator/LV controls shall have separate, compartmented switchroom
  - All switchrooms shall contain 2no. access/egress (escape) doors (double door configuration at all points, 1no. set shall open to external/outdoor space as a minimum)
- HV and LV equipment rooms shall be provided with appropriate fire ratings as defined by project Fire Engineer and associated Design Team, in particular where BS8519 current edition/amendment dictates
- Cabling and/or busbar connections between HV and LV equipment to be installed in appropriate, waterproof, fire stopped trenches (between compartments) or overhead at a safe height, supported by heavy duty containment, where applicable
- A minimum of 1.5m clearance shall be provided around (front, back, sides, top) all HV/LV switchgear (transformers, HV/LV main switchboard etc)
- Electrical Consultant shall give consideration to the substation earthing configuration to reduce the rise of potential should a network fault occur i.e. touch, step and transferred potentials. Earthing system design report to be provided.
- Electrical Consultant shall liaise with local DNO during early design stages, to discuss and agree (in conjunction with the BSG) any proposed UoE/SPEN shared/limited access substation configurations.
- Substation locations shall not contain any water services (including heating, sprinkler systems etc), gas or drainage equipment. Ventilation ducts may be permitted should this contribute to the ventilation strategy of the substation
- HV and LV switchrooms shall be provided with a wall mounted electric heater, with automatic temperature control
- Flood risk assessment shall be carried out on all substation locations
- Substations are not permitted on area's of proposed land that are exposed to risk of flooding
- Leak detection connected to UoE critical alarm network, shall be provided in both trench and FFL locations
- General electrical services shall not be mounted directly above HV/LV/TX equipment i.e. lighting, fire detection etc
- Substation lighting levels shall be as described in section 7.1 of this guideline
- External lighting, both general and emergency shall be provided at all substation locations – lighting to be photocell / timeclock controlled
- Mechanical plant is not permitted to be installed within any substation location, and should be physically segregated from all substation equipment
- HV/LV/TX replacement strategy document shall be issued to the BSG for final review and agreement – level access is required for equipment removal and replacement
- Mechanical plant rooms / wet services are not permitted to be installed directly above main substation switchroom locations

- Final substation design, including building fabric and door arrangement is to be agreed with the BSG.

3.3 Low Voltage (LV) Switchgear

The main switchboard shall be manufactured by AF Switchgear and/or E&I Engineering to BS EN 61439 and IEC 61439 current editions and shall be design verified in accordance with these standards. The form of classification shall be Form 4 Type 2 as standard, however, the consultant shall specify Form 4 Type 6 where cable sizes and board fabrication dictates a requirement and notify in writing the BSG. The board shall be IP43 protected unless environmental/area usage factors dictate a higher degree of protection, at which point the project switchboard specification shall reflect this requirement. Sleeved busbar boots are not acceptable and solid insulators must be used.

All switchgear shall be metal clad, totally enclosed, rated at 500 volts and be of unit or cubicle construction, which shall comply with the following requirements:

- Equipment to withstand 50kA for 1 second, a higher rating should be specified if deemed necessary i.e. for systems designed to accommodate short/long term parallel events etc.
- Maintenance access to all internal parts for torque testing of all busbar connections shall be provided. Additionally, clear insulated cover panels shall be installed over all busbar chambers, busbar connections and cable terminations to allow thermal imaging
- Main switchboard incoming protective device to be 4 pole, unless specific project requirements dictate device to be TP&N, at which point a technical submittal shall be produced by Electrical Consultant/Contractor detailing reason for selection.
- Switch heights not to be above 1800mm FFL, including 100mm minimum concrete plinth
- Busbars shall be copper
- Busbar mimic to be indicated on switchboard – solid, riveted, plastic mimic (black tape not permitted)
- Neutral busbar to have the same cross sectional area as phase busbars
- Provide multi-function meters as Schneider PM5111 Powermeter range for the main supply and all outgoing ways, (refer to Estate Design Guideline No. 5 Metering) complete with metering connectivity capability (MODBUS) for all supplies
- Provide suitably sized bare copper earth bar externally at the top rear of the switchboard over the full length of the switchboard
- Securely fix the switchboard to the floor, and mounted on 100mm high concrete plinth, in addition to switchboard plinth
- Space provision for future power factor correction and harmonic distortion filtering equipment shall be allowed for within the switchroom within a separate cubicle from the main switchboard. This equipment shall be sized and installed following data in use capture, subject to a re-visit to site after the first 6 months and before 12 months of operation from meter values
- Adequately sized spare connections on the main switchboard for equipment noted above (PF/Harmonic) shall be provided as a minimum during construction

- The busbars shall be colour coded with phase identification at each cover plate
- Protective devices/functional units shall be fused switches, fitted with HRC cartridge type fuses complying with BS HD 60269-2:2013, BS 88-2:2013 current/edition/amendment, complete with solid copper neutral links. MCCBs shall only be considered under special circumstances and subject to consultation and prior agreement of the BSG
- All control equipment housed within switchboards i.e. batteries, controlgear etc. must be installed with external identifiers, indicating location and purpose of equipment within the switchboard
- All essential services switchboards/switchboard sections shall be coloured RAL 5017 (Traffic Blue) – for projects with more than one RAL colour requirement, this shall be agreed with the BSG
- All LV switchboards at a building intake position shall be designed to have an external generator connection, sized to match the main intake capacity or busbar capacity c/w interlocking scheme. Liaison with BSG is required. Consideration for a temporary generator location should be included within overall building and landscape design, vehicle access shall be provided. Major refurbishment projects shall also incorporate provision for external/temporary generator where applicable.
- Provision for temporary generator cabling entry point shall be designed and included within the building fabric package
- Surge protection to be provided in accordance with CRL assessment
- Provision for internal arc fault detection shall be provided on main switchboards and controlgear assemblies for specialist applications only or deemed necessary under project requirements.
- All outgoing sub-main cabling and associated earth cabling shall be labelled accordingly, at each end, at every 30 metres and entry and exit through building structure
- Provide and fix to wall within both HV, TX and LV switchrooms a full sized A0/A1 framed network schematic detailing equipment served, device sizes, fault levels, protection settings, cable dimensions and reference to switchboard cubicle number
- Provide and fix to wall within both HV, TX and LV switchrooms a full sized A0/A1, framed, as built, switchboard manufacturers general arrangement drawing, detailing makeup of switchboard
- Provide and fix to wall within both HV and LV switchrooms a full sized A4, framed, set of switchboard operational/isolation instructions, electronic version to be sent to BSG for future reference
- Provide full sized rubber mat in front of all HV and LV switchboards
- Switchboard shall be complete with a minimum of 25% spare capacity
- All HV/LV electrical distribution project design shall be submitted to the BSG for review, including all proposed manufacturers data. It is the responsibility of the Electrical Consultant, Electrical Contractor and their nominated HV/LV specialists to ensure that selectivity is achieved.
- The person/s responsible for the design of the selectivity settings associated with the electrical installation (HV/LV) i.e. Electrical Consultant or Electrical Contractor (under CDP) shall verify the design and provide all network characteristics/settings in accordance with BS7671:2018 current edition/amendment, Section 536 and include within O&M information in the form of a detailed report.

Switchgear interlocking schemes shall be provided on all complex electrical projects to aid in the safe operation and switching of all HV and LV distribution equipment. Interlocking schemes shall be provided on all projects that contain but not solely limited to:

- Switching of incomers onto common supply busbars
- Switching UPS systems and generators onto common supply busbars
- Controlling the supply from multiple incomers
- HV & LV voltage hazards
- Earthing systems
- For safe personnel access and operation
- Projects containing a requirement for automatic control/switching of LV distribution equipment that requires the omission of mechanical and electrical interlocking shall be agreed in conjunction with the BSG to suit project and future operational events

It is essential that the coding system provided and implemented within the switchgear interlocking scheme is recorded, documented and handed over to the University within the Operation and Maintenance (O&M) manual as part of the T59 handover procedure. Interlocking key references shall be agreed with the BSG.

The installing contractor shall also provide, the isolation procedure to be followed for that particular installation. Procedure to be typed text, framed and mounted in close proximity to the main LV switchboard. Electronic copy shall be sent to the BSG for future use.

3.4 Safety Signage and Labelling

All safety signs and signals shall be provided in all HV/LV/TX switchrooms, plant rooms, electrical cupboards/risers locations to comply with Health and Safety at Work Act 1974, Electricity at Work Act 1989 and HSE Guidance notes. For avoidance of doubt, safety signs are to be provided as below:

- All entrances to switchrooms and plant rooms (internal and external)
- All M&E distribution cupboards/risers
- University Specific safety signs shall be provided under project works by Main Contractor
- UoE PM to liaise with BSG for final signage guidance

Labelling fitted to switchboards, distribution boards and separate items of switchgear shall be of traffolyte material, coloured white with engraved black text, secured by round head brass or instrument screws. Self-adhesive labels are not acceptable. Labels on switchgear shall indicate:

- Building name and reference number (Main Switchboard incoming point only)
- Reference number of the switch
- The specified current rating and recommended/installed fuse rating
- The item of the distribution network controlled

3.5 Distribution Boards TP&N and SP&N Consumer Units

- Sheet steel enclosure with hinged, key lockable front access door and suitable for wall mounting and providing protection to IP31 conforming to IEC 61439 with 250A rated fully shrouded copper busbar and fully rated neutral bar. In-built locking facilities must be supplied with the same key number for every board, complete with an additional padlock facility for safe isolation.
- Distribution board doors shall be capable of being fully closed, on occasions where final circuits have been isolated and locked off via padlock arrangement
- Suitably rated integral isolator/switch disconnector
- Circuit protective device (MCB/RCBO/AFDD) shall be designed to suit the characteristics and nature of the intended supply it serves
- Circuit protective device type and fault rating shall be specified to suit the point noted above
- Suitably sized dual earth terminal bar
- All circuit protective devices shall be capable of accepting a full range of electrical accessories to allow their adaptation where specified or at a later date to have earth leakage protection, remote tripping facilities or electrical contacts which will signal the position of the main contacts and/or device mechanism (whether tripped or not)
- All circuit protective devices shall be capable of accepting a complete range of mechanical accessories, as a minimum this range shall include terminal shields, padlocking facility and an identification system
- Final circuit cabling within the distribution board shall be adequately labelled in strict accordance with BS7671:2018, section 514.5
- In addition to circuit chart provision, all outgoing circuits on the distribution board fascia shall be labelled. Labels shall be printed text and not hand written.
- Each distribution board shall have a chart stating the location of all points controlled by each circuit with the rating of the protective device for that circuit. The charts shall be typewritten, installed within a securely mounted, plastic sleeve fixed to the inside of the distribution board door, complete with an electronic copy that shall be forwarded to the BSG for future use
- Separate lighting and power boards are to be provided throughout. Use of combined, split metered boards shall be agreed with the BSG prior to tender and will be subject to review of operational requirements and circuits served.
- Distribution boards and all associated switchgear shall be complete with a minimum of 25% spare capacity
- All distribution boards are to be installed within secure, lockable electrical fire rated cupboards, risers, switchrooms etc. Exposed distribution boards are not permitted.
- All essential distribution boards shall be RAL 5017

- The power supplies for the mechanical equipment shall be derived from a separate TPN distribution board mounted adjacent to the control panel. The provision of the distribution board and wiring of outgoing ways shall be incorporated within the controls package. This installation must comply with UoE Estates Design Guideline No.4 Building Energy Management. Further consideration may be required for certain power supplies, such as immersion heaters, DOL equipment etc. The controls section shall be fitted with a local mains isolator, in this application there is no requirement for the isolator to be interlocked with the panel doors.

3.6 Final Circuit Protection Devices (MCB/RCBO/AFDD)

Miniature Circuit Breakers (MCB's)

Shall be manufactured to IEC 60898/IEC 60947-2 (where appropriate) and as described in section 3.5.

Residual Current Circuit Breakers with Overcurrent Protection (RCBO)

Shall be manufactured to BS EN 61009, with a sensitivity of 30mA (or higher sensitivity where deemed necessary by Electrical Consultant/Contractor) and installed to meet the requirements of BS7671:2018 current edition/amendment. RCBO's shall either be single self-contained units enclosed in moulded casings of high dielectric strength or comprise a number of individual components arranged to operate as a single unit.

It is essential that the most appropriate characteristic type for both over/residual current protection be specified to suit electrical load type. It is the responsibility of the Electrical Consultant/Contractor to ensure correct equipment is selected and installed.

Arc Fault Detection Devices (AFDD)

The use of AFDD equipment complying with BS EN 62606 is now recommended for specific applications under BS 7671 18th Edition current edition/amendment and IEC 60364-4-42 to mitigate the risk of electrical fires caused by electrical arc events due to faulty wiring, appliances and other electrical equipment.

Under the scope of works for UoE projects, the Electrical Consultant/Contractor shall assess the need for AFDD devices, which shall be typically included within project design final circuit cabling for the following applications:

- Buildings with student/staff sleeping accommodation
- Buildings/locations identified as having high risk of fire i.e. workshops, storage areas, areas with combustible material build up etc.
- Buildings with combustible constructional materials i.e. wooden buildings etc.
- Listed Historic and Edinburgh City prominent UoE Building's
- Fire propagating structures
- Locations where irreplaceable assets are housed
- The installation of AFDD shall be utilised to protect cabling with high risk of fire, such as:
  - Protruding cables, risk of damage/vandalism/fauna
  - External cables, where applicable, due to risk of weather deterioration

- Unprotected cables in secluded areas (like storage rooms)
- deteriorating cabling or cabling in which the connection boxes are inaccessible (this should not occur on UoE projects)

AFDD shall be utilised, where applicable, in the following scenarios that could result in fire:

- Parallel Arc
- Series Arc
- Overheating of electronic components in loads

As per all protection devices installed within a distribution board, AFDD equipment shall be designed and installed to suit the type of electrical load it serves, and be integrated into the assembly in accordance with the relevant part of the BS EN 61439 series and be of a type declared suitable according to the assembly manufacturer's instructions or literature (Regulation 536.4.203 of BS7671: 2018 refers).

AFDD equipment shall provide as a minimum:

- Detection of abnormal electric arcs
- Protection against load fire due to slow overvoltage events
- Circuit opening and positive break indication
- Fire hazard tripping indicator
- Self-diagnostic facility

Combined AFD/RCBO devices utilised on UoE projects shall be of single module construction, where applicable.

AFD devices shall be capable of a self-test regime every 15 hours, with local pulsating LED indication for the following events:

- Device operational status
- Serial or parallel arc detected
- Overvoltage
- Residual current detected
- Self-testing status
- Supply voltage detected/undetected

3.7 Transient Voltage Surge Suppression Equipment

The Electrical Consultant/Contractor shall determine the requirements for surge protective device (SPD) provision under BS7671:2018 current edition/amendment, Section 534 and BS EN 62305 during detailed design of the electrical services installation and include within the project design documentation.

The main electrical distribution network shall be fitted with strategically located surge suppression equipment/protection devices deemed necessary during the design stage i.e. at origin of supply, sub-distribution equipment and/or specialist equipment.

The detailed design shall determine and specify the type (1, 2 or 3) of SPD to be utilised and ensure it is strategically located in order to protect the building electrical infrastructure and associated specialist equipment, where applicable.

3.8 Power Factor Correction and Harmonic Filtering

To establish the requirements for power factor correction and harmonic filtering, it will be necessary to carry out a site survey to establish the network characteristics and level of harmonic current flowing.

Where significant levels of harmonic distortion are present, these shall be reduced to those levels listed in Engineering Recommendations G5 current edition, at 400V level and at the 11kV level, taking into account background levels and level of automation required.

All LV switchboards shall come c/w suitably sized spare switch/capacity for future connection of both power factor correction and harmonic filtering equipment.

For projects that warrant such an inclusion of works, a cost for a harmonic and power factor survey will be required at tender stage and included as a provisional sum within the contract. This shall include for a study of the electrical loadings and an overall analysis of the electrical system which should include a recommendation for the reduction of total harmonic distortion (THD) and/or system power factor improvement should it be required. Early liaison is required with the BSG to determine if this is required for specific campus locations.

Once the results of a harmonic and power factor study are available then capacitor banks may be sized and/or harmonic filtering equipment implemented.

It is the responsibility of the Design Team to ensure that the main electrical switchroom has been sized to house power factor correction equipment should it ever be a future requirement. PFC equipment provided under contracted works shall be housed within a dedicated ventilated cubicle with a door interlocked isolator/fused switch. Capacitors shall generally be located in banks of 25kVAr and shall be automatically controlled.

3.9 Uninterruptible Power Supply (UPS)

All UPS systems shall be designed to provide a clean, continuous AC supply with accurate regulation of the voltage and frequency, stabilised by microprocessor control. Power for the unit shall be derived from the normal mains supply or from the emergency standby battery during mains failure events.

UPS systems shall comply fully with BS EN 62040-1-3 current edition with all designs must be agreed prior to tender by the associated end user departments.

The UPS systems shall be of the solid-state type rated for continuous duty and be of modular or stand-alone construction as required. For modular construction, each module should be cabinet mounted and include static transfer switch, rectifier/inverter/charger input (internal) maintenance bypass and be supported by multi-string standby batteries. Level of resilience to be provided by the UPS shall be agreed with End User representatives in consultation with the BSG.

The UPS shall provide minimal harmonic distortion back onto the network. Should the unit be of a modular design, each module should include all necessary components to operate individually and include its own indicator/controls per module, all UPS equipment should be provided with an interlocked full external by-pass switch.

The use of IGBT technology with microprocessor digital control shall be considered and utilised where required.

Upon failure of the primary AC supply, input power for the inverter is automatically supplied from the batteries, with no interruption of supply to the critical load is permissible.

Provide equipment, which will at all times:

- Maintain the batteries fully charged, except during mains failure support/operation
- Stabilise the voltage
- Suppress spikes in the electricity supply
- Filter the supply to remove harmonic distortion
- Maintain the supply to the equipment served

UPS equipment shall form a packaged unit, complete with indication panel to indicate status, output, alarms, etc., and with all items mounted in a lockable rigid steel cabinet. Complete with sealed maintenance free batteries located in a sealed ventilated compartment contained within the same housing as the other components, or can be located in open racks, subject to agreement with the department End-User and BSG.

The UPS shall have a constant duty, on-line inverter with sine-wave output and static bypass switch. The UPS shall also have a reserve input switch, if required. The UPS shall also have a maintenance bypass switch.

- The UPS power rating (VA) shall be calculated and sized accordingly to ensure required loads are achieved to suit end-user needs
- The load power factor shall be in the range of 0.9-unity. The load crest factor shall be minimum 3:1. The overload capability shall typically be 125% for 10 minutes or 150% for 1 minute
- The input/output voltage rating shall be 400V and/or 230V +/- 10%. The frequency must match the requirements of the load, but shall normally be 50/60 Hz
- Transfer time shall be within ¼ cycle. Typically 5-6 milliseconds
- Total Harmonic Distortion (THD) shall be <3% for non-linear loads (BS EN 62040-3)
- Transient Regulation shall be < +/- 5%

Batteries shall be sealed valve-regulated lead-acid, maintenance-free type (SVRLAs). Cognisance shall be taken of the need for recycling or proper disposal of batteries in accordance with EEC directives.

Autonomy shall typically be 20-30 minutes, however, this must be calculated and agreed in conjunction with the University Department End-Users. The charge rate to be sufficient to restore the battery from discharged state to 95% duty (this applies to batteries sized for discharge periods of less than 30 minutes) within ten times the discharge period.

System operation shall be fully automatic with self-test and self-diagnostic facilities. The unit shall have a fully automatic bypass.

- User-interface shall be via RS232 port RG45 to be agreed
- Communications shall be one of the following: network – via Ethernet

The UPS units shall be fully factory tested to BS EN 62040-3:2011. The full test procedure to be agreed prior to carrying out the test, however, a full type test to be assumed with the addition of tests relevant to the site and application of the UPS.

Audible noise shall be typically <50dBA where situated within an office environment and <70dBA where situated within a machine room.

Operating temperature shall typically be 0-40°C. Battery performance shall be designed to suit the environmental temperature conditions to ensure the optimum autonomy required is achieved. Batteries shall be load tested on site to verify.

The UPS shall comply fully with CISPR 32, Class B for office environments and Class A for industrial environments with regard to EMC-Emissions. The UPS shall be Surge-Tested to ANSI C62.41 current edition. When serving IT equipment, UPS shall conform to BS EN 55032.

This section acts as a standard performance specification for UPS systems to be utilised across the Estate, however, it is essential that the Electrical Consultant/Contractor liaise with the departmental team responsible for use and maintenance of the system to ensure that all performance requirements are achieved. As projects differ in complexity in terms of use, installed environment etc. Early engagement is essential to ensure all details/requirements are included within project scope.

4.0 Emergency Generator and Controls

Stand-by electrical generators shall comply fully with current edition/amendment of BS ISO 8528, BS5514, BS5000 and BS EN 60034-22: 2009 and all associated parts where applicable.

Where an emergency backup generator is to be installed, the Electrical Consultant/Contractor shall liaise with the BSG during early design stages of the project to ascertain if the generator is to be utilised to operate under a Short Term Operation Reserve (STOR) agreement.

- The system shall be fully automatic and shall function on a mains-fail basis. The main LV switchgear shall incorporate the necessary mechanical and electrical interlocked automatic changeover controls. However, in the event projects containing a requirement for automatic control/switching of LV distribution equipment that requires the omission of mechanical and electrical interlocking, this shall be agreed in conjunction with the BSG to suit project and future operational events
- As a minimum requirement for tender, the generator design shall include for full mains synchronisation to ensure a seamless no break return to mains is provided
- Break transfer schemes shall be in agreement with the BSG

Agreement with the BSG is required on the output of equipment and the system configuration to be served as “essential services” before finalising the design and installation.

Associated generator fuel tank provision (day and bulk tanks) shall be integrally bunded and comply with SEPA oil storage regulations. Both tanks shall be full at practical completion/handover stage. Generator and associated fuel tanks shall be provided with leak detection system.

During early RIBA stages, the design team shall identify the requirements for a generator and in consultation with the BSG, liaise with SEPA (Scottish Environment Protection Agency) to discuss their proposal initially before an application for permit is made.

Whilst it is envisaged that any generator proposed for inclusion as part of the project requirements, will act as emergency backup only, which will run less than maximum permitted hours per year, as medium combustion plant (MCP) equipment it may still require a permit and registration with SEPA and should be included for under the project scope of works.

The Electrical Consultant shall provide feedback to the University from discussions held with SEPA and advise if an application for permit is required under Medium Combustion Plant Directive (MCPD). On confirmation of this, the University shall provide the Electrical Consultant/Contractor a Letter of Authority (LoA) to liaise with SEPA on behalf of the University.

To avoid any impact to project programme, the application for permit/variation/transfer/ surrender shall made as a minimum on the timescales noted on the following:

- New permit applications – 4 months
- An application for a variation – 4 months if consultation is undertaken under the terms of the regulations and 3 months in other cases
- An application for a transfer – 2 months

- An application for surrender – 3 months

The stand-by generator system shall include for dedicated day and bulk storage fuel tanks (underground tanks to be agreed with the BSG), c/w fuel transfer system and associated alarms (overfill, low fuel and bund leak alarms), appropriate weatherproofed, bunded acoustic enclosure (for external locations), control suite, silenced exhaust systems (max 75 dBA @ 1M), electrical starting systems, auxiliary power supplies with further provision included for fuel polishing equipment, where applicable.

Remote fill point, associated fuel pipework, exhaust/vent pipe, 2no. access chambers and alarm equipment as noted above, shall be provided for all external fuel tanks (above/below ground where applicable). All pipework fill, feed and return lines shall be doubled skinned. All pipework shall be pressure tested and certified with no leaks at practical completion/handover.

Roof mounted generator sets shall be agreed with the BSG, subject to fire risk assessment/Fire Engineer report being carried out. Remote fill points for such sets shall be IP67 rated, surface mounted to building structure or free standing where applicable, located to allow fuel delivery vehicle access c/w overfill/low level/bund leak visual and audible alarm signals to the delivery driver/operative. High level/overfill alarm to be set at 95% of tank capacity. Fuel fill line to have overfill prevention.

The proposed fuel line shall be kept externally enclosed within the building structure, fully accessible with the following:

- Double skinned, armoured fuel fill line
- Labelled every 5m as diesel

Generators housed within external acoustic enclosures shall be provided with the following as a minimum:

- ISO type container, fire rated, corrugated sheeting and fully welded construction
- Free standing MCCB/ACB form 4 type 6 cubicle
- Cable entry gland plate
- Removable louvered air inlet/outlet attenuators
- Primary and secondary silencer equipment
- Corner castings (all corners)
- Steel chequered, bunded plate floor
- Mounting pad
- Generator to have anti-vibration equipment installed
- Fixed blade weather louvres
- Bird Guard
- Leak detection system, linked to UoE BEMS critical alarms
- 2no. access/egress door points with panic release bolts
- Emergency stop buttons (on genset and externally mounted on container)
- Internal general and emergency LED lighting
- External general and emergency lighting with IP rated switches
- 2no. IP65 rated 13A sockets

- SPN distribution board
- Fire detection (sensor, MCP's and VAD's), linked to building system
- Container to be RAL5017 (other RAL colour proposals to be agreed with the BSG)
- For enclosures mounted at height, metal, galvanised steps with handrail shall be provided (general and emergency lighting to be provided at step locations)
- Generator flue, c/w drainage provision, route from enclosure to end point to be reviewed by the BSG
- As installed, A1 sized, framed electrical distribution schematic and electrical safety/noise/automatic start up notifications

4.1 Generator Operating Conditions

The generator shall comprise a diesel engine, close coupled to a fully rated rotating field alternator and all associated equipment necessary to form a fully operational system capable of operating within ambient temperature conditions of -5°C to +40°C with a maximum relative humidity not exceeding 50% at 40°C or 90% at 20°C.

The diesel engine should be fitted with an electronic governor and should be capable of meeting all the constraints of the specification and design brief using diesel fuel oil to the latest standards.

The fuel supply provided to serve the generator shall be c/w a fire valve in order to isolate the fuel supply in the event of fire conditions. A spring pressure, fusible link, catenary wire system shall be installed. System shall be interfaced to the associated building fire alarm system to raise an alarm.

4.2 Output of the Set

Unless otherwise stated the set shall have an electrical output of nominal 230V single phase/400V 3 Phase 50Hz with a continuous kVA rating to suit the essential services or full building load for a period of 12 hours and shall operate at a power factor of not less than 0.8 lagging.

Single step load to be agreed prior to generator approvals/submittals or installation with the BSG.

Load bank connection point shall be provided for all generators.

Electrical Consultant/Contractor shall allow a cost within their design/technical submittal for a load bank test to be carried out on site, to be witness by the BSG.

Generator load bank test to be run at:

- 100% full load – 3 hour minimum
- 110% full load – 1 hour minimum

4.3 Alternator

The alternator shall be screen protected and drip proof to IP23 minimum with a continuously rated 400V, 50Hz 4 wire, star connected, alternating current machine of the brushless excitation, screen protected, fan ventilated, rotating field, separately excited type and shall be self-regulating direct coupled to the diesel engine prime mover.

The alternator shall be provided with a separate Permanent Magnet Generator (PMG) excitation system to enhance the short circuit maintenance capability of the machine to a minimum of 300% FLC for 5 seconds to facilitate operation of circuit protective devices.

The alternator and its associated excitation system shall have a minimum class H insulation throughout.

The alternator will be directly coupled to the engine and will include excitation system, automatic voltage regulator, voltage adjusting potentiometer and under speed protection.

The output voltage of the generator shall be automatically maintained within ± 2% of the declared nominal voltage from no load to full load inclusive of speed variation of ± 4% at any power factor between unity and 0.8 lagging by a suitable voltage regulator mounted in the alternator control box. Provision shall be made for adjusting the generator voltage within plus or minus 5%.

After any change of load the maximum transit voltage shall not vary by more than + 13% of the rated voltage and shall recover within ±3% within 0.2s.

The frequency of the generator shall be maintained at ±1% inclusive of no load to full load speed variations of ± 4%.

A 4 pole ACB with fully adjustable over-current and earth fault protection shall be provided to isolate the generator supply from the generator fed section of the main LV switchboard. The ACB shall be complete with shunt trip and padlock arrangement. The main breaker shall be suitably rated and of a size suitable for termination of the main supply cabling.

A controls selector switch shall be incorporated as part of the set and shall include a suitable five position rotary selector switch giving “automatic”, “manual”, “test off load”, “test on load” and “off” positions, with “engine switched off” warning light in the latter position. With the switch in the “off” position, it shall not be possible to start the engine in any way what so ever.

A services maintenance switch shall also be provided for use in conjunction with the generator control panel to enable works to be carried out on the control panel and LV switchboards. Means shall also be provided for automatically stopping the engine in the event of operation of any of the engine safety devices and prevent further starting until reset by hand.

4.4 Earthing

All generators, engine, acoustics, exhaust system, container and metal casings and other non-current carrying metalwork shall be bonded to the main framework of the unit and to an earthing terminal sited adjacent to the outgoing supply cable termination terminals. Such earthing terminals shall be clearly marked.

4.5 Control Philosophy for Mains Failure/Mains Restoration

The Electrical Consulting Engineer/Contractor shall provide to the BSG representative a description of operation on the controls logic for the emergency generator in terms of applied loading to the set and any associated load shedding scheme. A detailed mains failure/restoration operational cause and effect document shall be prepared by the Consulting Engineer/Contractor and generator/controls specialist and issued to the BSG representative for approval prior to issuing of tender/construction documentation.

Generator control system shall include a separate, IP65, stand alone, factory built, control and mains synchronising panel c/w with minimum 18" touch screen, front end HMI, housing all sensing/control circuits, control/indication/engine start up test facilities, metering equipment, ventilation control and associated G99 relay equipment. For electrical safety, continuity and maintenance purposes, UoE operate ComAP control system only on generator sets.

All generators shall be c/w connection to UoE BEMS critical alarm network for monitoring of generator start up during mains failure events, oil/fuel level alarms and leak detection system.

All generator control cabling shall be labelled and housed/mounted on its own separate containment ensuring complete segregation from all other circuit cabling, to ensure clarity of maintenance.

It is the responsibility of the Electrical Consultant, Electrical Contractor and Generator Specialist to submit and manage the G99 application for all generator sets. The Electrical Consultant/Contractor will be provided with a Letter of Authority (LoA) to act on behalf of the University.

5.0 Cable Installations

5.1 Cabling Installations General

All cabling installations shall comply with the current edition of BS 7671:2018 current edition/amendment.

All cabling throughout the associated installation, as per BS7671 Regulation 521.10.202, shall be supported by means to prevent premature collapse. For avoidance of doubt, this no longer applies to escape routes only.

The proposed method of cabling installation shall be discussed and agreed with the BSG prior to tender and shall be suitable for its intended application. Cabling shall be installed with the appropriate mechanical protection. General wiring cables shall be manufactured to the appropriate British Standard and shall be carried out as follows:

Cabling within buildings shall be provided with relevant Declaration of Performance (DoP) and Construction Product Regulation (CPR), BASEC and LPCB compliance documentation and shall be as below:

A. Mains and sub-mains	Cu XLPE/SWA/LS0H
B. Small power circuit wiring	Cu LS0H singles
C. Lighting circuits	Cu LS0H singles
D. Fire alarm detection and warning systems	Cu Enhanced Soft Skin and approved to LPCB certified cable standards only
E. Specialist equipment and security	As per manufacturer's recommendations and system wiring
F. Site Temporary Cabling	Cu XLPE/SWA/LS0H
G. LSX Screened	LS0H. Cable type permitted on case by case basis only. Permission to be obtained by UoE BSG prior to installation. No clipping direct. Cable colour TBC with BSG.

PVC/PVC flat twin and 3 core cable **must not** be used and is **not** considered an acceptable means of cabling by UoE and therefore the Design Team or contractor shall have written acceptance from the BSG prior to tender for the use of such cabling by exception.

LSF cabling and small power modular wiring systems are not to be specified or utilised on UoE projects.

Cable Euroclass CPR rating for LS0H cabling utilised on UoE projects shall be discussed and agreed with the BSG during early design stages. For billing purposes a minimum performance of Cca s1a d1 a1 shall be specified, however, any areas requiring a higher performing cable shall be reviewed with the BSG.

A technical submittal shall be issued to the UoE BSG and Quality Management Team containing the following information for proposed cabling:

- Testing body
- Name and address of manufacturer

- Year cable introduced to market
- DoP Number
- European Standard – BS EN 50575:2014+A1:2016
- Unique ID code
- The intended use – BS EN 50575:2014 +A1:2016

All BEMS control cabling shall be installed on a separate containment system

It shall be noted that armour only earthing is not permitted without the written consent of the BSG. A separate CPC shall be provided for all sub-main distribution. Should separate CPC's not be provided the designer shall issue electrical calculation information and written confirmation of compliance.

All external cabling and containment shall be specified and installed to suit all environmental conditions including UV protection.

Full consideration shall be given to the current to be carried in the various sizes of cables when determining the number of cables to be installed in a containing system. All containment shall be sized and installed in order to carry the required number and weight of required cabling and shall not exceed the space factor requirements as stipulated in BS 7671. All containment should have a minimum of 25% spare capacity for future installations. Overloaded containment identified during construction works or familiarisation visits by UoE Estates Team will not be accepted for handover.

Cable routes are to be thoroughly planned and shall only run parallel to the building structure, horizontally and vertically. All cables should be installed without joints and diagonal point to point wiring is **not** acceptable.

All associated external electrical distribution routes including all earth farm locations and mechanical services shall be recorded in the format of an "as installed" drawing, including buried depths, and included within O&M documentation for future reference. It is the responsibility of both the installation contractor and M&E Design Team to check the accuracy of all as installed information. An as installed external services drawing shall be provided and mounted within an A0/A1 sized frame and mounted adjacent to main network schematic within HV/LV switchroom.

5.2 Cable Containment

Provide the following to contain and support cables:

Application	Proposed Installation
For lighting wiring in ceiling voids, etc.	Galvanised steel trunking
For small power wiring in floor voids to serve busbar	Galvanised steel trunking and rigid conduit or cable tray and XLPE/SWA/LS0H cables
For small power for general purposes	Galvanised steel trunking and multi compartment trunking
For final circuit wiring at switchgear in switchroom	Galvanised steel trunking
For voice and data cables in ceiling void	Cable basket

For voice and data cables in floor voids	Cable basket
For drops to switches	Galvanised screwed conduit
For fire alarm installations	Separate Cable tray/basket in conduit only
Sub mains cabling	Galvanised cable tray or ladder rack
BEMS Control Cabling	Separate cable basket/tray/trunking

Cabling clipped direct to building structure is not permitted.

6.0 Cable Containment and Associated Fittings

Cable trunking shall be manufactured from galvanised sheet steel and be of an approved manufacture.

Fire barriers in trunking in accordance with the relevant regulations shall be provided at appropriate locations by binding the cables and filling the spaces with a non-combustible material, of which shall be carried out and approved by fire-stopping specialist, this shall also be approved in consultation with the UoE FSU and BSG.

All cable containment systems within ceiling voids and floor voids shall be securely fixed by means of Uni-strut bracket at not more than 1m intervals with provision for additional brackets/fixings at bends tees and interconnections. In general, full accessibility to trunking and conduit installations is required to enable future rewiring of the installation. G hanger support brackets shall not be utilised for containment installations.

Pull tests shall be carried out with all calculation and test results provided to project Structural Engineer for review.

It shall be noted that it is the responsibility of the Main Contractor, in conjunction with their M&E sub-contractor to coordinate both the M&E services support structure and ceiling support structure to ensure adequate space is provided to provide separate support systems. Ceiling support systems shall and will not be permitted to be fixed to M&E services support structure.

Conduit boxes within the building fabric, where access cannot be obtained after completion of the installation, is not permissible. Wire suspension kits for cable tray, cable basket and trunking systems is not permitted.

All cabling shall be installed in accordance with BS7671:2018 Section 528, neither voltage band I or band II shall be contained within the same wiring system. For maintenance of asset purposes and clarity of installation for identification, only points 3-5 of section 528.1 shall be permitted on the University Estate.

Please note: no on-site fabrication of bends, tees and reducers is permitted. Factory made accessories only are to be used on all containment. All accessories are readily available in standard sizes, however, should an accessory not be available as standard but can be manufactured, contractor shall include this in their tender cost. On-site fabrication will not be accepted, without written consent of the BSG, any unauthorised on-site fabrication will result in full removal. Any permitted on site fabrication will require demonstration to UoE Estates to meet or exceed an IP4X rating.

Data cable matting systems used to protect against physical damage, thermal shock and moisture within suspended floors are **not** permitted across the University Estate (unless agreed with UoE ISG). Unauthorised use of this system type will result in full removal. All data cabling to be mounted on basket/trunking/tray where applicable.

All fire alarm and BEMS control cabling shall be installed and mounted on its own separate containment. No other cabling is to be installed within this containment. Electrical Consultant/Contractor shall ensure separate containment is provided as part of the project design. Departure from this requirement shall be agreed in writing from BSG prior to tender/construction stages.

All containment shall be provided with earth continuity copper straps, mounted on each side of connecting section.

6.1 PVC Trunkings and Multi Compartment PVC Trunkings

Application – dado and skirting trunkings only.

All trunking shall comply with BS EN 50085 current edition/amendments and shall be of an approved manufacture.

Cabling installed within PVC dado trunkings shall be supported by non-combustible means.

PVC containment i.e. dado trunking, shall not be utilised at ceiling level or above ceiling voids to provide a final route/connection to wall mounted dado trunking. Non-combustible means i.e. galvanised steel trunking/galvanised conduit to be used.

PVC containment over the head of doorframes is not permitted.

6.2 Steel Conduit and Conduit Fittings (General)

Conduit installations shall comply fully with BS 7671 current edition/amendment. Conduit shall be Class 4 heavy gauge welded to BS 4568 for screwed conduit installations, solid drawn and screwed for flameproof installations.

Provide galvanised steel conduits, use conduits not less than 20mm diameter. Cabling within conduits shall not be at maximum capacity or overloaded at project handover, any apparent stress on cabling will not be accepted.

Ensure that conduits have adequate provision for draw-in boxes on straight conduit runs at not more than 9 metre intervals and not after more than two right angled bends.

All cabling installed on basket, connecting to conduit shall have a conduit gland bracket installed.

PVC conduit is not permitted without full written approval of the BSG. Where permitted, PVC conduits shall be best quality, high impact, rigid heavy gauge complying with BS 4607,supported by non-combustible means. The PVC material shall have a high resistance to solutions of inorganic acids, alkalis, salts and organic chemicals.

Quick fit conduit systems are not permitted and are not considered acceptable for final circuit wiring. Unauthorised use of this system type will result in full removal.

Quick fit conduit systems, as mentioned above, are exempt for BEMS system cabling for mechanical protection measures only.

Flexible conduit is not permitted for final circuit wiring. Flexible conduit may only be utilised for final connection to an item of plant.

6.3 Cable Basket

Where cable basket is specified it shall be electroplated heavy-duty cable basket made from high tensile strength 7mm diameter steel rod and shall generally be supplied in 3000mm lengths at widths from 50mm to 500mm and raised edge of 54mm.

Where cable basket is fitted in floor voids these should be mounted and fixed on Uni-strut type brackets at not more than 1m intervals with additional fixings at bends, tees and intersections.

6.4 Cable Tray/Ladder

Containment shall be specified in accordance with BS EN 61537:2007

Cable Tray: Specify perforated galvanised steel, heavy-duty cable tray, as a minimum, and be of an approved manufacture. Cable tray shall be in standard section of 2400mm lengths and in widths of 100mm to 600mm and a raised edge of 35mm. Cable tray shall be of a gauge to suit the application and structural loading but shall generally not less than 1.5mm for up to 300mm and 2mm over 300mm wide.

Flexible, rollout cable tray is not permitted for use without written approval of the BSG.

Cable ladder: Specify galvanised steel, heavy-duty ladder, as a minimum, and be of an approved manufacture. Cable ladder shall be in standard 3000mm lengths and in widths 150mm-1050mm where applicable, with a minimum depth of 125mm, with rung spacing as per manufacture, usually 300mm as standard.

Alternative sizes and duty required of those stated above shall be made to order to suit the required application, whilst providing spare capacity as required.

All cable containment systems within ceiling voids and floor voids shall be securely fixed by means of Uni-strut bracket at not more than 1m intervals with provision for additional brackets/fixings at bends tees and interconnections. In general, full accessibility to trunking and conduit installations is required to enable future rewiring/maintenance of the installation.

7.0 Lighting, Luminaires and Lamps

7.1 Design Objectives and Luminaire Performance

All general (internal/external) and emergency lighting products shall be designed, supplied, installed and commissioned in accordance with all relevant parts of BS EN 60598, 61347-1/2, 62262, 62504, 62717 (current edition/amendments), Construction Product Regulations (CPR) and specified to suit environmental conditions.

University of Edinburgh policy going forward is to install LED lighting as a minimum requirement, with exceptions made for any required end-user specialist lighting. Any deviation to an alternative light source shall be submitted to the BSG for review and final decision.

All lighting installations shall meet the requirements of CIBSE Lighting Guides (including SLL Code for Lighting) and BS12464:1/2 where applicable.

Electrical Consultant/Contractor shall provide all luminaire photometric data and plugin files in accordance with BS EN 13032:1-4, BS EN 62717 and LM79-08, that were utilised to carry out lighting designs on UoE projects, failure to do so, or should this information not be provided by the manufacturer, luminaires are not approved for use.

It is the responsibility of UoE appointed Electrical Consultant/design team to carry out a thorough performance review on luminaires that are proposed by Main/Electrical Contractors as “alternatives” or under a value engineering exercise to ensure that quality and performance of luminaire equipment is fit for purpose and in keeping with UoE maintenance strategies. All luminaire technical submittals must be sent to the BSG for review prior to acceptance of any alternative equipment.

By exception noted above, where fluorescent lamps or other lamps are required to be specified, high frequency electronic ballasts will be used, consideration shall only be given to the use of alternative control gear options for project specific reasons. Case for this shall be presented to the BSG for consideration and approval.

Proposed LED light sources and lighting control equipment shall comply with performance requirements of BS EN standards noted above and achieve a minimum performance as below:

- 5 year minimum warranty on all electrical components and controlgear
- Test data for a minimum of 12,000 hours
- Minimum L80B50 – 50,000 hours, 25° ambient temperature
- Control gear to be ENEC approved
- Failure rate ≤0.2% per 1000 hours
- Driver equipment shall be ≥0.9 power factor, ≥0.85 efficiency, <20% THD
- Efficacy of Luminaire minimum
  - Feature/Display Lighting >90llm/w
  - Downlights >100llm/w
  - Recessed Modular >120llm/w
  - Surface Linear >120llm/w
  - Suspended >120llm/w

During project design, consideration shall be given to the operational output/performance and intensity of luminaires with regards to UoE Staff and Students who may experience neurological conditions such as photophobia.

Control of lighting is an essential part of energy saving, the use of automatic absence and presence detection is encouraged where applicable and to suit the nature of end-user requirements.

All lighting design proposals, including lighting control systems and proposed control philosophy, shall be submitted to the BSG for review prior to tender stage.

All final connections to luminaires shall be readily accessible above ceilings. Access hatches shall be provided in all plasterboard ceilings strategically placed in order for ease of access to connections. Failure to provide access to connections shall not be accepted by UoE Estates. This requirement applies to wall mounted surface/recessed luminaires also.

General and emergency lighting shall be provided within all risers, cupboards, accessible roof areas and all external plant/equipment locations. Applies to both mechanical and electrical equipment areas.

All general and emergency luminaires, including controls, within stair cores are to be surface wall mounted at a readily accessible height with appropriate IP and IK ratings. Luminaires are not permitted to be mounted on slab above or recessed into walls.

Luminaires mounted at inaccessible area's such as, full building height atrium's, are not permitted. This applies to catenary wired/mounted internal luminaires also. Lighting scheme for such area's, shall be developed to allow full, safe access without the need for mobile platform equipment.

The following illuminance levels listed for lighting design purposes relate to the average level on the horizontal working plane 750mm above floor level. Both CIBSE LG series and BS12464 should also be referenced. The table below indicates lux levels and controls to be provided as a minimum, all other lighting factors such as UGR, uniformity and colour rendering should comply with standards noted on previous page, with particular reference to design of lighting incorporating measures to reduce impact of lighting on UoE Staff/Students who may experience neurological conditions.

Space or Location	Average Illuminance (Lux)	Comments
Seminar rooms	300-500	Scene set control and in accordance with CIBSE LG 5 and end-user requirements
Lecture theatres		
Demonstration area	500-750	Scene set control and in accordance with CIBSE LG 5 and end-user requirements
Audience area	300-500	Scene set control and in accordance with CIBSE LG 5 and end-user requirements

Cellular office	300-500	Automatic control, lux level shall suit particular function of office and comply with CIBSE LG7 and end-user requirements
Open plan office	300-500	Automatic control, lux level shall suit particular function of office and comply with CIBSE LG7 and end-user requirements
Reception/entrance foyer	200	Automatic or manual control (building dependent) lux level shall suit particular function of reception/foyer area and comply with CIBSE LG7 and end-user requirements
Toilets	200	Presence detection
Laboratories	500+	Laboratory type dependent, use of lab area to be identified during early stage of design and lux level shall reflect specific use of lab. Reference to CIBSE LG's and BS12464 is required. Control philosophy of light to meet end-user requirements
Conference rooms	500	Scene set control and in accordance with CIBSE LG 5 and end-user requirements
Stores	100	Presence detection
Computer equipment room	300	Presence detection
Computer micro-lab	350-400	Absence detection control and in accordance with CIBSE LG 5/7 and end-user requirements
Staff mess room	200	Presence detection
Plant rooms	200	Manual switching
Electrical Switch rooms – HV, LV, TX and Substations	200	Manual switching
Generator Locations/Compounds	200	Manual Switching
Corridors including stair cores	200	Presence detection
Emergency lighting	As required but not less than 1	Emergency lighting shall comply with BS5266, design shall include for all areas within building such as escape routes, open areas, high risk areas and changes of level and direction, etc.

Emergency lighting in plant areas including substations (HV/LV/TX), switchrooms, electrical cupboards/risers and generator locations	Minimum of 15	Compliance as noted above, luminaires shall not be installed directly over switchgear equipment.
External pathways	5	Photocell/time clock controlled c/w hand/off/auto override facility, lighting shall be designed, coordinated and installed with site surveillance systems in mind, i.e. CCTV
Car parks external **Underground**	20 100	Photocell/time clock controlled c/w hand/off/auto override, lighting shall be designed, coordinated and installed with site surveillance systems in mind, i.e. CCTV
Life safety system Control and Indicating Equipment (CIE) including firefighting equipment and PPE locations	Minimum of 15	Emergency lighting shall comply with BS5266
Sports facilities **General lighting** **Emergency/standby lighting**	 As required by class Building specific, based on fire/evacuation strategy	 In accordance with CIBSE LG4 In accordance with BS5266 and CIBSE LG4
External Roof Level	Minimum of 100 lux general and 15 lux emergency	Manual or automatic control where appropriate c/w hand/off/auto override

Any specific area's proposed under project works not mentioned in the table above, levels shall be taken from BS12464:1/2 and CIBSE LG Series where applicable.

Lighting design for lecture theatres shall be in accordance with CIBSE LG5: lecture, teaching and conference rooms. The lighting installation shall be fully controllable with a minimum of four scene settings, controllable from both the main entrance to the lecture theatre and from the main teaching lectern. The lighting design shall also be compatible for interface with the main equipment located within the teaching lectern. In the event of fire alarm activation, all lighting shall return to full illuminance with all AV equipment muted.

7.2 Lighting Control Systems

Lighting control systems shall be designed and installed with simplicity in mind, utilising traditional and simplistic lighting control solutions such as presence/absence detection and manual switching (plant spaces only) throughout the University Estate, ensuring energy efficiency is achieved, whilst providing ease of maintenance.

Modular plug in lighting control systems are permitted for ease of maintenance. Should this system type be proposed, flexible LS0H cabling to LCM shall be adequately supported by non-combustible means with cabling not exceeding a maximum of 2m in length. Appropriate quantity of LCM units shall be designed/specified to reduce cable lengths. Should a requirement exist for cabling to exceed 2m, this shall be in full agreement with UoE Estates with confirmation from system manufacturer provided to ensure operational capability is not impacted.

Intelligent lighting control systems are permitted in agreement with the BSG, however, Design Teams should note that in principle, complex lighting control systems are not to be utilised unless the nature of the project has a specific requirement/function i.e. laboratories etc.

In the event that an intelligent lighting control system is to be provided under project works it should be known that the University will only accept a DALI (Open Protocol) system. System shall not be limited to use of a single manufacturer luminaires.

Control of luminaires, where applicable, shall be designed to meet the requirements of projects to be assessed under UoE ESME documentation.

Lighting systems (general and emergency) that require any form of proprietary software or license/maintenance agreements with manufacturers are not permitted.

Electrical Consultant/Contractor shall ensure allowance is made within their tender documentation for extensive training of UoE personnel, with the option given to shadow the lighting specialist during commissioning of the system.

All lighting control equipment shall be installed within a secure location, i.e. electrical risers, electrical switchrooms (LV) etc.

Lighting control systems and associated luminaires/sensors, in all areas, shall have flexibility for increasing/decreasing lighting levels and switching arrangement, within each space to be adjusted via handheld controller and/or app based technology. 2no. controllers to be provided as part of system.

The lighting control philosophy to be used shall be agreed with the BSG representative during the design stage and prior to tender.

The lighting controls should be easily maintained, without the need for UoE Estates operatives to interrogate/access an interoperable centralised control unit or front end PC. It shall be noted that wireless, battery operated lighting control switches are not permitted across the Estate.

Provide for each group of luminaries equipment which includes:

a) Passive infra-red presence/absence detectors to control banks or groups of fittings; the coverage of which should be designed in accordance with manufacturers' recommendations

b) Local momentary override switch for each bank or group of fittings controlled by presence detectors

c) Daylight sensors to control banks or groups of fittings along each elevation. This system shall only be implemented with formal approval of both end-users and the BSG.

The mode of operation should be agreed with all relevant parties including user groups but typically shall be configured as follows:

7.3 Circulation Areas

Arrange the system in each section so that the luminaries served by the lighting control installation are switched on automatically when a person enters a circulation area, with the luminaries remaining energised until the circulation area has been vacated.

Arrange the system so that the time lapse between an area being vacated and the “off” signal being given can be set from 1 to 30 minutes.

Certain projects may require lights to dim down to a pre-set level and remain until presence is detected. This type of design and control philosophy shall be agreed with the BSG.

7.4 Offices

Arrange the system in each section so that the luminaries serving a group of workstations will remain off until manually switched on at a wall mounted retractive switch. Arrange the installation to maintain the luminaires on until the area has been vacated.

Arrange the system so that the time lapse between an area being vacated and the “off” signal being given can be set from 1 to 30 minutes.

Arrange the system to automatically vary the output of the luminaries serving a group of workstations to maintain a constant lighting level on the working plane. Ensure that the level of illumination can be adjusted to suit a change of use.

Arrange the controls to allow manual override of the lighting level via a wall switch to allow increase or decrease in the level.

Arrange for the controls to revert to a set level each time the luminaries are switched on.

Arrange for the lighting controls to switch the row of luminaries adjacent to external elevations detecting a high daylight contribution internally, where applicable.

7.5 Research Areas

Lighting control shall be dependent of end-user specific use. Lighting control equipment should be located for ease of maintenance and not mounted directly above specialist equipment locations.

7.6 Toilets

Arrange the system to bring the luminaries automatically into operation when a person is present. Arrange the system such that the time lapse between an area being vacated and the “off” signal being given can be set from 1 to 30 minutes.

7.7 Plant/Comms/Roof Mounted Plant Areas

Manual switching to be provided.

Roof mounted plant shall have general (and emergency) lighting installed and switched as appropriate to suit access requirements.

7.8 Commissioning

Allow for the installation to be programmed, commissioned and demonstrated to the users by the lighting control manufacturer to the satisfaction of UoE Estates Team. Hand-held controllers, where applicable, shall be provided to UoE Estates for future maintenance/reconfiguration of lighting.

It is the responsibility of the installing contractor in conjunction with Electrical Consultant to liaise with all lighting manufacturers/specialists (internal, external and emergency) pre-installation, to determine final wiring arrangements for lighting control systems.

Electrical Consultant shall allow within their tender documentation provision for the lighting manufacturer commissioning team to carry out a return visit 3 months post-handover for any required remedial or reconfiguration works requested by end-users.

All light switches and control equipment shall be labelled with serving circuit reference (applies to all areas of the building).

It is important to note that all end-users have specific requirements for their research, laboratory, workshop and write-up areas and as such all lighting control shall be discussed at length with the nominated user group during detailed design stage. As referenced above, all ceiling mounted lighting control equipment locations shall be coordinated with specialist equipment locations. This applies to UoE LED replacement projects.

7.9 External Lighting

All external lighting luminaires shall be designed, supplied, installed and commissioned in accordance with all relevant parts of BS EN 60598, 61347-1/2, 62262, 62504, 62717 (current edition/amendments), Construction Product Regulations (CPR) and specified to suit environmental conditions.

Where applicable, lighting shall comply with project specific UoE ESME requirements, however, given the nature of the University of Edinburgh Estate, lighting may be required out with ESME requirements for security reasons.

Lighting control and hours of operation should be discussed with the BSG and UoE Security Department. Coordination between camera locations and external lighting is essential to ensure appropriate lux levels are provided to supplement the image quality of camera equipment and to ensure clashes are avoided.

Any external lighting columns with proposed integral security/WiFi equipment shall be in agreement with UoE BSG/Security/ISG.

External lighting levels shall be in accordance with CIBSE LG6, BS12464-2 and BS5266 current edition/amendment.

LED lighting is to be provided for external lighting throughout the Estate and shall meet required lux levels, glare ratings, colour rendering and uniformity levels. Consideration shall be given to light pollution and its impact on surrounding areas including end-user activities.

External lighting shall be photocell or time-clock controlled c/w hand/off/auto override facility. Any application that requires manual control shall be agreed with BSG.

External lighting columns, for maintenance access, shall be complete with raise and lowering facility. Counterbalance equipment for such columns shall be included within project specification.

External luminaires must have the appropriate IP rating to prevent the ingress of liquids when exposed in open atmosphere, including the provision for seasonal expansion and contraction, to allow the IP rating to be maintained. Electrical Consultant/Contractor shall consult with proposed lighting manufacturer before installation of fittings within exposed atmosphere environments to ensure appropriate IP rating is being provided.

Recessed, ground mounted luminaires are no longer permitted across the UoE Estate.

Catenary mounted external luminaires are not permitted.

Use of external lighting bollards to be agreed with UoE BSG prior to design/installation.

On completion of external lighting works, the following shall be provided;

- External services drawings, detailing;
  - external lighting (including emergency) luminaire locations
  - External lighting control device locations i.e. photocell
  - Internal lighting control device locations i.e. time clock, HOA control
  - DB, circuit number and phase references
  - Circuit cable routes/ducting
  - Location of DB serving luminaires
  - As installed luminaire schedule to be provided on drawing
  - As installed drawing to be mounted in A3 frame at serving DB location
  - Drawings to be provided in CAD and PDF formats

8.0 Small Power Installation

8.1 Small Power General

The small power installation shall be designed in accordance with BS 7671:2018 current edition/amendment. A design review with the nominated End-User group should be carried out during detailed design in order to finalise small power provision for general use power/data and particular requirements for specialist equipment.

Electrical distribution of power and data to workstation positions to be reviewed on a case by case basis in consultation with End-User group and UoE Estates/BSG.

Twin socket outlets c/w USB connection are permitted across the Estate where the use of such a connection is warranted i.e. break out space, cafes etc. Use of such sockets is to be kept to a minimum. All socket circuits shall be RCD protected i.e. RCBO.

Please Note:

As a rule of thumb, RCD protection, where required under BS7671:2018 current edition/amendment, is NOT to be omitted from any UoE project and associated electrical installation.

Design Teams / Electrical Consultants / Electrical Contractors are not permitted to omit RCD protection from any socket outlet without first carrying out a detailed risk assessment, supplemented by a technical report explaining reason/case for omission.

All risk assessments, shall be carried out in full consultation with the UoE BSG. The BSG will liaise with End-User representatives/Building Technical Manager to discuss the management of this requirement and agree if the omission of RCD protection is appropriate. Project Design Team will be notified in writing of this decision.

Number of twin socket outlets per circuit are to be designed to suit area/building use. High integrity earthing shall be provided where applicable. All small power supplies (FCU's / Isolators)/sockets etc. to be labelled with circuit reference, indicating DB reference, phase and circuit number.

Socket outlets under seats in lecture theatres are not permitted, however, should a specific requirement be identified within the project scope of works, this should be agreed with the BSG.

General provision shall be made for sockets used for cleaning purposes. These sockets are to be supplied on their own dedicated circuit and distributed in a coordinated manner across the proposed building. Sockets shall be metalclad/PVC where applicable and engraved in red lettering "CLEANING USE ONLY".

Socket outlets serving room booking screens to be on dedicated circuit, with appropriate means of local and accessible isolation. Power and data provision (where applicable) shall not be installed above ceiling / acoustic raft level.

Socket outlets shall be installed a minimum of 500mm from sink locations.

Socket outlets, as a minimum requirement, shall be as noted below:

Plant / Switchroom locations – surface mounted, metalclad

Essential supply sockets – red in colour with engraved labelling (PVC / metalclad where appropriate)

All other areas – Generally recessed/surface white PVC / metalclad sockets where project brief dictates. Sockets shall be complete with red outboard rockers.

All University accommodation shall be fitted with adequate power provision to suit the locations of workstations and furniture. Design Team are required to complete room data sheets (RDS) for all necessary power requirements as requested by the Client/User group representative(s).

Small power modular wiring systems are not permitted. Should such a system be proposed for a specific technical/project application, a technical submittal shall be provided, with further on site review/s of the proposed installation area's with UoE Estates representatives. A decision on the use of the proposed modular wiring system shall be provided in writing to the UoE PM. This type of system shall not be included or form part of UoE project electrical design.

Data provision for all items of equipment/WiFi to be agreed with the UoE Information Services Group.

All general use electrical accessories shall comply with BS8300-1/2:2018 in achieving required Light Reflectance Values (LRV), to ensure appropriate colour contrast is upheld for inclusive design. This applies to, but not limited to:

- Socket and data outlets
- Light switches / control equipment
- Emergency system / life safety equipment devices
- Lift Controls etc.

Electrical Consultant and wider Design Team shall engage during the early stages of project design with the UoE Learning Space Technology (LST) Team to ascertain the small power/AV/data/cabling requirements for teaching space system technology to be utilised. Engagement with UoE LST department by design/construction team (in conjunction with UoE PM) for coordination purposes is strongly encouraged throughout the construction phase.

Electrical Consultant/Contractor shall ensure that all electrical attendances and coordination of the installation required for LST and access control systems shall be provided under contract works i.e. power supplies, power outlets, data, AV outlets, secondary containment etc.

9.0 Fire Detection Systems

9.1 Fire Alarms General

The fire alarm system shall be fully compliant with BS5839-1:2017 and all other statutory legislation. All fire detection system designs must be approved by the University Fire Safety Unit and the BSG prior to tender.

The system design category of the fire detection system shall be in accordance with specific building design requirements and recommended/risk assessed within the relevant project fire engineering report, however, as a minimum standard, L1 category shall be provided for billing purposes. The project design team, in particular the Electrical Consultant and Fire Protection Engineer shall forward the proposed design documents and fire engineering report prior to tender for review by UoE Fire Safety Unit and BSG recommending the level of category to be provided based on fire and evacuation strategy proposals.

Where the project covers the design for HV substations, special consideration should be given to the requirements for automatic fire detection. Where substations are an integral part of the building, the fire alarm system shall be configured such that the substation shall have its own, clearly identifiable fire alarm zone for operational purposes.

Testing of automatic detection equipment in HV substations should also be given some consideration given the special access requirements required. Integral substations, where possible, shall have aspirating equipment installed, with panel and testing point located in LV switchroom side.

At project handover the Electrical Consultant/Contractor shall ensure that a full set of as installed fire detection drawings indicating locations of main/repeat panels and all associated system equipment i.e. call points, detectors, interfaces labelled with system it serves, void detection and remote indicators etc. Drawings shall be c/w device reference numbers correlating with the label reference on the installed device are provided in both paper and electronic (CAD and PDF) copies. Installed decibel (dB) levels shall also be recorded on the as installed drawings. An electronic copy of the fire alarm zonal chart shall be provided in both CAD and PDF also.

Labelling of fire detection devices shall be typed text labels and not hand written.

Mode of Operation

Manual System - In the event of a fire condition in any section of the building, the whole building shall be evacuated and the University of Edinburgh Security team shall be automatically signalled via the University dedicated telephone line/iStar system. Where dedicated University telephone lines are not available i.e. remote buildings signalling will be undertaken via an auto-dialler utilising GSM technology to UoE Custodian ARC, however, this should be agreed with the BSG.

Automatic Fire Detection - In the event of a fire condition in any section of the building, the system shall operate in the following manner:

- Full Evacuation (dependant on fire evacuation strategy)
- Phased Evacuation (dependant on fire evacuation strategy)
- Evacuation strategies are to be agreed with UoE FSU

- Fire detection alarm signal shall be connected to, and alert UoE Security via the UoE iStar critical alarm system

Batteries
Suitably rated battery units are to be installed as necessary to power the system having capacity to suit electronic sounders/VADS/Flashing Beacons/ Bells etc. The battery units to be housed in a finished metal cabinet with adequate ventilation. Sealed lead acid batteries, fully charged, to be supplied. The batteries shall be capable of maintaining the system in full normal operation for a period of 24 hours and at the end of the period, still have sufficient capacity to provide the evacuation alarm in all zones for a further 30 minutes.

Main Indicator Panel and System Devices

Control and Indicating Equipment - The control and indicating equipment (CIE) shall be of the fully "Open Protocol" central processing unit type. As manufactured by Honeywell Morley IAS Ltd or Advanced Electronics Ltd or any equivalent University approved control panel manufactured in accordance with BSEN54-2 and BSEN54-4. It shall incorporate the following:

- The CIE shall be modular in construction allowing for future expansion of the system
- The CIE shall be able to be easily configured to meet the exact detection zone and output mapping requirements of the building considered
- The CIE shall be microprocessor based and operate under a multitasking software program. Operating programs and configuration data must be contained in easily up-datable non-volatile memory. (EEPROM)
- The CIE shall incorporate a real time clock to enable events to be referenced against time and date. This clock shall be accurate to within 1 minute per year under normal operating conditions
- It shall be possible, for an Engineer to perform configuration upgrades on site by using the on-board keyboard or plugging into the CIE a portable personal computer. Configuration data shall be retained and provided to the University at handover
- Advanced graphical user interface
- Main Panels shall be generally located in the main entrance foyer of a building, with ready viewing and access for Fire and Rescue Services. Panels are NOT to be hidden from view to meet architectural expectations:
    - Main panels only at main FRS entrance, no touchscreen repeaters permitted.

The Specialist Fire Alarm company responsible for the installation shall operate an approved document control system for retention of configuration data.

The CIE, together with associated automatic/access controlled doors shall comply with BS7273-4:2015. The project Fire Protection Engineer/Architect shall identify each door as either 'Critical', 'Standard' or 'Indirect' during the fire strategy report and provide to Electrical Consultant for inclusion in their design works. All doors and their mode of operation during a fire alarm activation shall be demonstrated to UoE Fire Safety Unit and the BSG during T59 procedure. The Fire Strategy, Fire Design Summary and Fire Manual are to be developed in full consultation with the FSU.

The CIE shall comprise separate processors, and cross monitoring of each other's correct operation for the major functions of the system. In particular, different processors must be used for the main control function, the detection input and alarm output functions and the display and control function.

No more than 500 addressable input or output points shall be controlled by a single processor.

The CIE shall prevent unauthorised use of the manual controls by using the on-board keyboard.

The CIE shall be capable of operating with any of the following type of automatic detection equipment:

- Analogue Addressable Detectors
- Analogue Addressable Manual Call Points
- Analogue Addressable Ancillary Devices

Addressable input and output devices shall be connected to addressable loops capable of accepting up to 126 devices. The CIE shall have a minimum capacity for operating 2 fully loaded addressable loops. This shall be extendible up to a maximum capacity of 6 addressable loops. Design of the fire alarm system shall make provision for a minimum of 25% spare capacity in each loop for future extension of the system.

The fire alarm panel shall have a pre-alarm warning facility, to ensure the earliest possible warning of a potential fire condition without raising the full alarm condition. The fire alarm panel shall automatically adjust the alarm and pre-alarm threshold levels to compensate for changes in detector sensitivity due to contamination and the CIE shall have a dirty detector fault warning facility.

Provision shall be made for each addressable loop to be sub-divided into a maximum of 8 geographical zones. The section of wiring corresponding to each zone circuit shall be protected from faults in other sections by short circuit isolator units.

In order to facilitate re-configuration and system extension, the allocation of addressable identities to devices shall be independent of their physical arrangement on the loops.

The CIE shall have provision for the connection, either locally via a parallel port or remotely via a serial port, of a 40 character line printer.

The main panel shall have the provision of semi-recessed wall mounted steel cabinets and lockable front access. The CIE shall have the provision to network with full repeater or text message repeaters via 485 modules. The communication shall be bi-directional and shall support verification.

The CIE shall incorporate all necessary electronic circuitry for the system and shall have the following panel controls and indicators:

- Power AC Healthy
- Common Fire
- Common Fault
- System/CPU Fault

- Charger Supply Fault
- Battery Supply Fault
- Alpha numeric displays giving alarm type, alarm address and zone, plus a user programmable 40 character English language descriptor
- Paper printer giving time and details of every event (optional)

The panel shall incorporate the following features:

- An ability to precisely locate a detector in alarm and display in English a text message indicating device number/room/zone location
- Common sounder outputs
- 1 to 6 loops of maximum 126 addressable points
- Single or two stage alarm selectable for any silence able output
- Push button switches for silence alarms, evacuate, reset, and accept event
- Retain its memory in event of mains and battery failure
- Status LED's for line fault, alarm, and system fault. 40 character alphanumeric display for event message. 40 character printer for hard copy of all events (optional). 24 hour clock for logging of events. 16 keypad for entering control commands to the system, such as test/isolate. On/off and override of outputs
- Software defined zoning, with detector isolate and test by zone, or individual address
- 500 event internal memory for incident investigation and maintenance purposes
- The control key pad shall be fitted with a built in timing facility to deactivate access after a pre-set time, e.g. 1-20mins

The Fire Alarm Control Panel is to be located (unhidden) within the vicinity of the Main Entrance foyer to the building, visible from the outside of the building complete with all associated framed fire alarm zone diagrams including red metal clad fire proof lockable box for life safety system keys. EVC outstation locations are to be clearly visible on fire alarm zone chart. Repeat panels are not permitted at main entrance locations.

Where phased evacuation is a requirement of the fire warning system, the design team shall seek clarification from the project Fire Engineer and UoE Fire Safety Unit as to the exact time delay between phases and any required voice recordings, risk assessed accordingly.

Automatic detectors - care must be taken when positioning any automatic detectors on ceilings, avoiding the occurrence of steam or cooking fumes i.e. at kitchens and bathrooms. Consultation with the Fire Safety Unit and BSG should be sought to determine the type of detector used, e.g. multi-sensor, optical smoke detector etc. Special consideration shall be given to cold storage and specialist research area's where condensation build up is likely, detector mounting base shall be specified to suit environmental conditions i.e. Apollo deck head base etc.

Configuration – automatic fire detection devices shall be configured in groups so as to afford the facility to isolate AFDs within zones without isolation of manual call points. Alternatively, the CIE should be capable of isolation of fire zones without isolating MCPs.

AFDs within accommodation blocks shall be able to facilitate timed control sensitivity.

All detectors must be of an “open protocol” as Apollo Ltd (Discovery Range) or any equivalent University approved unit.

Remote indicators shall be an LED mounted on a white face plate. The face plate shall be permanently inscribed “Fire-Remote Indicator”. The complete unit will be suitable for both surface or flush mounting on a standard switch type box. Remote indicators shall be provided on all addressable systems.

All heat and smoke detectors shall be mounted on an addressable base, compatible with both the system and the detector.

Each sounder circuit shall be powered by a sounder control unit which shall provide control, monitoring and power. Each SCU shall have a monitored power supply. The unit shall be fitted with red LED to indicate operation of unit and shall allow for pulsing a continuous operation.

Each loop shall be arranged in multiple zonal sections with quantities of detectors and manual call points in each section. A short isolation base or unit shall be located between each section.

If a short circuit occurs, the SCI shall isolate only the section in which the short circuit occurs. The main fire alarm panel will record the event activate the fault indication and continue to monitor the sections unaffected by the short circuit.

It is the responsibility of the Project Fire Engineer and Mechanical/Electrical Consultant to consider future fire alarm cause and effect strategies during the operational design of their respective installations, and how such equipment should function in the event of a fire alarm activation. This philosophy shall be provided to the Electrical Contractor and Fire Alarm specialist for production of the building cause and effect strategy.

In general, provision should be made available to shutdown all mechanical plant, interface relays shall be provided to each of the items of plant that are required to shutdown. Design team shall identify items of plant that support the fire strategy that should not be shut down in the event of fire alarm activation and discuss with UoE Fire Safety Unit and BSG.

In some cases, there may be an existing provision for a fire alarm panel to be fitted with a Fireman’s Plant Isolation Key-switch. The University Fire Safety Unit and BSG should be consulted to agree whether this provision should be retained in operation.

A non-latching key-switch or a latching key-switch with visual and audible facility, to be fitted to or adjacent to the main fire alarm control panel. When the key-switch is operated and released this would initiate a time isolation relay, which would prevent any plant shutdown or remote signal occurring during any periodic testing. On a given time i.e. 30 minutes, the fire alarm will revert back to normal status. This key-switch will be fully monitored via a loop interface to allow indication of the key-switch status.

In the event of fire activation the services to boiler plant and the associated gas shutdown valve would only be interrupted by the activation of the of the local boiler room fire detection devices.

Upon fire alarm activation, an interface unit shall be provided to override and mute/switch off any audio visual (AV) equipment and associated presentations. Lighting control systems shall also be interfaced and restored to full output upon activation.

On initiation of a confirmed alarm signal in any area i.e. the sounders where detailed will sound throughout the building and the alarm type, zone device address and full description will indicate on the main control panel. Simultaneously, a printed copy of the event shall be made on acceptance of the alarm, silencing of the alarm sounders or any other operator-initiated event shall be recorded on the printer, including the time of the event.

Audible sounders operating at 24 volt DC shall be electronic sounders and produce warning within the specified areas as shown on the drawings. The decibel output of the sounders shall be so sized to give adequate audibility to comply with the Fire officer requirements. Audible sounders shall be the Banshee type or equal with internal connections set to warn 110DB at 1 metre output. Should loop powered sounders be specified, then the system shall facilitate a loop current capability of not less than 500m. The design shall also allow for a 25% spare capacity in the loop power for future sounder additions.

The addressable manual call points shall monitor and signal to the control equipment the status of a switch operated by a “break glass” assembly. The call point shall be capable of being tested using a special key without the need for shattering the glass, and shall provide an integral red LED to indicate activation.

The designer of the fire alarm system shall include within their tender documents the provision for first year’s maintenance of the system. This is in accordance with current legislations during the twelve months following the date of the practical completion of the system installation.

Weekly test of the system – during the weekly test of the system the CIE shall facilitate the following function(s):

a) Initiation of the keypad by inserting a unique four digit pin number. NB the keypad shall time-out after 5 minutes from the last event.
b) A mechanical key switch shall be activated to override I/0 units controlling mechanical ventilation plant, gas shut-off valves or any other designated item of plant designed to shut down in the event of fire alarm activation.
c) Once the test point has been activated, the sounders shall be silenced then reset at the CIE. The key-switch shall be returned to its “normal” state.

Lift Interface: upon activation of the alarm system, an addressable input/output unit shall be located in close proximity to the lift to send a volt free signal to the lift controller. Thereafter, the lift shall return to a predetermined floor, the doors open and the lift shall be rendered “Out of Use”. Overriding of the lift I/O device shall not apply during a weekly test.

9.2 Visual Audible Devices

Visual Audible Devices are to be utilised, where required, across the University Estate to aid in the safe evacuation of staff and students who have impaired hearing or working within a high background noise environment, in accordance with BS5839-1:2017, EN54-23-2010 and Scottish Building Regulations whilst achieving full compliance with the Equality Act 2010.

VADs may be utilised in the form of beacons or combined sounder/beacon devices to suit the required application and meet the required performance as described with EN54-23. Colour of the VAD and classifications (wall, ceiling, open category) shall be determined during early design stages achieving a uniform level of 0.4lux within the space.

VADs shall generally be provided in the following locations:

- Temporary waiting spaces (to avoid conflict with FA dB levels and EVC communication)
- Sanitary accommodation
- Student/Hotel accommodation
- Switch/plant room locations
- Identified lone worker locations
- Areas deemed necessary under Fire Risk Assessment/Fire Engineer Report

The use of VADs shall be determined during early design stages and agreed with UoE FSU, BSG and local Building Control representatives. Should VADs not be deemed a requirement this shall be intimated to the University groups mentioned previously.

Visual Indicator Devices (VIDs) in the form of flashing beacons must not be used to warn building occupants of a fire alarm condition, however, they may be used as a supplementary indicator or as a remote indication of detector activation i.e. externally to direct the fire and rescue service to the origin of fire.

The project design team shall ensure that the following points are considered during the design of VADs:

- What ambient light level is required?
- Should VADs be wall or ceiling mounted?
- Use of the space, including the orientation and activities of occupants
- Any obstructions to the VAD, providing clear line of sight
- Ensure larger coverage areas have sufficient quantity of devices
- Impact of VADs on power requirements
- Consideration shall be given to occupants with photosensitive epilepsy in open areas

For further information on VAD requirements, please see Estate Design Guideline No.9 – Fire Safety and No.12 Inclusive Design

9.3 Aspirating Systems

Aspirating fire detection systems shall be installed in accordance BS EN54-20, BS5839-1 and BS6266 current edition/amendment and LPCB/FIA code of practice.

Aspirating systems are permitted for use across the UoE Estate where specific applications may dictate, such as:

- Areas where future access is limited i.e. due to height or restricted access
- Area's across the Estate deemed critical and require higher sensitivity for early warning i.e. archives, data centres, clean rooms, biological/medical research etc.
- Area's requiring sensitive environmental control
- Heavily serviced area's that restrict the performance of detectors
- Building voids i.e. floors, ceilings etc.

The Electrical Consultant/Contractor shall determine the classification (A/B/C sensitivity) of the system during early stages of design in consultation with the UoE BSG/FSU and provide a design/installation to reflect this. Fire detection specialist shall produce a detailed, software aided, calculation/report for the design of the aspirating pipe network, capillaries and hole sizes to be installed on the project and include within the fire detection technical submittal for that project and forward to the UoE BSG for review.

A cause and effect shall be provided for the building fire detection system incorporating aspirating system operation.

Aspirating detector panels, PSU's and battery enclosures shall be installed in secure locations i.e. electrical switchrooms and electrical risers etc. and labelled accordingly. An aspirating detector zone chart detailing area's served and pipework routes shall be installed next to each aspirating detector panel.

Please note: all aspirating system pipework shall be RED in colour. White aspirating pipework **is not permitted** across the Estate. All pipework routes shall be carefully considered and coordinated prior to installation.

All drilled and extended capillary type sampling points shall be labelled for future ease of identification. Pipework shall be free from debris i.e. dust, dirt, swarf prior to final connection of pipework to aspirating panel. Pipework shall be secured via non-combustible means at 1m intervals.

End cap test points shall be provided on all pipework runs, at an accessible height below ceiling level.

Aspirating detector panels shall be configured to alert of fault/alarm at main fire detection CIE.

Aspirating system shall be commissioned in accordance with manufacturer's requirements and relevant codes of practice and demonstrated to UoE Estates under the T59 procedure. All design, commissioning and installation certification will be required for handover.

9.4 Gas Extinguishing/Suppression Systems

Given the specialist nature of these systems, a full consultation with the UoE BSG/H&S/FSU shall be held to discuss the requirement for such a system. On review, of the project requirements and particular application/criticality of the building, a decision shall be made as to whether this system type shall be implemented into the project. The Project Fire Engineer in conjunction with the Electrical Consultant shall provide a detailed report based on the health and safety, operational and technical requirements for this system.

Should a gaseous extinguishing/suppression system be approved, this shall be installed in accordance with BS7273-1:2006, BS7273-2:1992 and BS6266:2011, with consideration given to the requirements and recommendations in BS5839-1:2017 and EN54-20 for area's protected by gaseous suppression systems.

Given the complexity of the UoE Estate, it is unrealistic for this document to cover every eventuality, criticality or specific End-User requirement, hence the need for detailed consultations on these systems and proposed gas types, however, as a minimum the following will be considered during early design stage and discussed with the UoE BSG:

- Operational and control philosophies of the system
- Automatic and manual operation to be provided including hold off facility
- Control panel/bottle locations i.e. within secure areas etc
- Audible and visual discharge warnings
- Integration with other fire safety/detection/access and HVAC systems
- System contribution and operation in relation to building cause and effect matrix
- Control panel, gas cylinder, gas distribution points and remote monitoring of equipment locations
- Gas extract system to be utilised
- Any perceived risks to UoE Staff/Student health and safety
- Future maintenance strategy and required system protocols
- Specialist training of UoE personnel to be included under contract works
- Emergency lighting (15 lux) to be provided at all panel, control and gas storage/bottle locations.

10.0 Emergency Voice Communication (EVC) System

10.1 Communication System

An Emergency Voice Communication system shall be provided in all buildings, where applicable, in accordance with BS9999:2008, BS5839-9:2011 and BS8300:2018.

System shall be as Baldwin Boxall manufacture, containing a master alarm panel (located next to main fire alarm panel at fire and rescue service entrance) with Type B Temporary Waiting Spaces (TWS) outstations on all landings.

Outstation type and colour shall be designed and installed in accordance with specific building requirements including fire and evacuation strategies.

Temporary Waiting Space (TWS) locations as standard, shall now be shown on all fire alarm zonal charts, indicating location and unit reference in correlation with master panel reference and signage provided at EVC outstation. Installing Contractor shall provide all TWS signage and insert outstation reference and location information.

An override/test key switch shall be provided on all new and where possible, existing master EVC panels to allow for training/maintenance purposes.

A recessed EVC TWS outstation shall be provided and integrated into all evacuation/firefighting lift cars as standard, linked to master EVC panel at main entrance.

EVC system shall not have accessible toilet alarm interfaced to system.

In addition to the EVC outstation, any evacuation lift, deemed necessary under the project evacuation/fire strategy, shall have a dedicated communication system, which is operated from the evacuation control station located at the exit level landing. The communication system shall allow two-way communication between the lift car, landings and the control station. When the evacuation lift facility is enabled, it shall not respond to any other calls than those from within the lift car. The lift will park at the designated floor with its doors open to allow the safe evacuation of the individuals.

10.2 Accessible Toilet and Distress Alarm System

An accessible toilet/distress alarm shall be provided in accordance with BS8300-1/2:2018 in all accessible toilets and changing facilities with local alarm indication. Alarm signal shall also link to the following, building dependent:

a) Separate accessible alarm panel, located in building management/security office or at building reception point, location to be reviewed and confirmed pre-tender

System shall contain emergency pull cord with integrated reassurance indication, wall mounted over door combined sounder/visual indicator unit and local reset button. The alarm pull cord shall be accessible for the full height of the room and extended under tension at low level using eyelets.

10.3 Induction Loops

An induction loop system shall be provided in accordance with BS8300-1/2:2018 at all front facing student/staff/general public reception areas, all lecture theatres, seminar/meeting rooms and all conference facilities. With reference to installation, testing and commissioning, the induction loops in adjacent areas must not conflict or pick up adjacent signals and interference. Induction loops must be coordinated with AV equipment.

System loop shall be integrated into accessible building fabric, with local amplification and permanently fixed notice (provided by specialist installer).

At project design stage, the design team shall liaise with UoE Access and Equality Manager/BSG to determine which areas are to contain a hearing support system.

10.4 Paging System

A building paging system shall be provided in accordance with BS8300-1/2 and shall take the form of a fully “open protocol” pager system interfaced with the fire alarm system. Provision for this system shall be included in all tender documentation as a minimum with final confirmation of system provided by UoE Fire Officer, Equality Team and the BSG.

The project fire engineer shall risk assess the need for this system within the project building and include within their fire engineering report if it is to be included with building fire and evacuation strategies.

10.5 Smoke Ventilation System

Smoke ventilation system shall be provided in accordance with BS 7436-8:2013, Building Control Regulations, proposed fire strategy and fire detection cause and effect strategy.

Final smoke ventilation shall be discussed and agreed with UoE Fire Officer in principle. As a minimum, smoke ventilation control switches shall be provided at access level and top floor of the building. Switches shall be orange in colour and clearly labelled “smoke vent” and be c/w with integrated protective plastic cover.

Strategy of operation to be agreed with UoE Fire Officer and the BSG.

Depending on fire strategy and fire alarm cause and effect, smoke vent operation is at the discretion of the Fire and Rescue Service and not an Automatic Opening Vent (AOV), however, should this strategy be revised in future, connection should be left to interface smoke vent system to fire alarm system.

All systems shall be c/w 24 hour battery back-up facility.

11.0 Emergency Lighting

11.1 Standards

Emergency lighting shall be provided to comply with current legislation, Building Regulations, European Standards and British Standards including BS1838:2013, BS5266-1:2016, BS 5499-4:2013 and The Health and Safety at Work Act. Luminaires should conform to the harmonised British and European Product Standard BSEN 60598-2-22, BSEN 62304:2012, ICEL 1001 Part II and Construction Product Regulations.

Emergency lighting systems shall provide the facility for safe evacuation of all persons from the building, with strategically placed emergency luminaires with a minimum 3 hour battery autonomy. Design Team shall ensure that emergency lighting is provided to meet the requirements of BS5266, Table E.1 for specific locations with further reference to UoE Guidelines (Section 7.0).

All exit signage shall be of maintained (illuminated) type, exit signage commissioned/installed as non-maintained is not permitted and will require reconfiguration to suit.

For existing buildings to be refurbished, the design of the emergency lighting system layout may be constrained by existing legacy issues. The project Electrical Consultant shall ensure that the proposed testing method reflects that of the existing building. Should a refurbishment project be within a building that contains an automatic self-test system, the emergency lighting shall be of the same manufacturer, and commissioned onto the existing system.

For new buildings and major refurbishment projects, the emergency testing shall be by means of an addressable, automatic test system (ATS), that will allow automatic testing in accordance with BS5266, BS1838, BS EN 50172 and BS EN 62034. The system and operating protocol shall be agreed with UoE BSG to ensure this is line with future maintenance strategies. The system shall be capable of automatically carrying out functionality and duration tests at frequencies that are equal to or exceed the requirements of current codes of practice and capable of testing all emergency luminaires simultaneously. Final testing schedule shall be agreed with UoE BSG/Maintenance. System shall be capable of allowing testing schedule to be altered by UoE Maintenance to suit End-User requirements. Systems with a closed protocol or restricted purchasing of replacement parts/devices or conversions are to be agreed with UoE BSG/Maintenance Teams. Systems not approved or in line with maintenance strategies that have been installed will be removed and replaced at the installing contractors own expense.

Emergency lighting automatic test systems shall be provided and operate independently of the general lighting installation. Where an ATS is being provided, combined/integral general and emergency luminaires are not permitted. Separate Emergency luminaires shall be provided.

For maintenance and warranty reasons, no luminaires shall require special conversion by emergency lighting manufacturer for use on the system.

For the avoidance of doubt, more than one type of emergency lighting system/testing method within each new build or newly refurbished building is not permitted. The building emergency lighting system shall operate in its entirety as one complete system.

Self-contained LED luminaries shall be fitted with integral nickel cadmium, nickel hydride and lithium iron phosphate (higher temperature applications) leak proof battery packs giving a 3-hour minimum duration in the event of mains failure. In addition, luminaries shall be fitted with a red/green LED to give indication/status of the condition of the luminaire, green = healthy, red = attention required. The central test system shall monitor system luminaires and alert the Universities nominated maintenance team via email alert. System shall also test, record and send report to the University once every 7 days.

During commissioning of the system, the Consultant, Contractor and emergency lighting specialist shall agree the self-testing schedule with UoE Estates Maintenance/BSG, however, as a rule of thumb; no testing schedule shall operate during working hours. Specialist research areas/environments require particular testing schedules and cognisance should be paid to this during design/commissioning of the system.

Electrical Consultant/Contractor shall ensure allowance is made within their tender documentation for extensive training of UoE personnel, with the option given to shadow the lighting specialist during commissioning of the system.

It is the responsibility of the installing contractor to liaise with the emergency lighting manufacturer/specialist pre-installation, to determine final wiring arrangements for emergency lighting systems.

All emergency luminaires are to be wired from a local lighting circuit only. This includes both manual and automatic test systems.

The emergency lighting system shall be monitored and controlled by a local gateway control device utilising a wireless mesh network. All devices shall be networked together to provide a fully operational system, providing one point of testing. System shall operate at a frequency of 868MHz, with a transmission of less than 1% of time. Electrical Consultant/Contractor shall assess the suitability of such a system before final install, in particular, where proposed for historic/listed UoE buildings. Should this system type not be deemed as suitable, a hardwired automatic test system shall be provided. For ease of maintenance/replacement parts, system shall be of UK manufacture only.

The system shall allow access to remotely view the status of the emergency lighting system in the building via UoE network/or manufacturer hosted UoE controlled website.

Emergency lighting system shall utilise GSM communication or UoE LAN connected technology, however, this shall be provided with no operating restrictions, downstream operational costs or regular top-up required. ‘Free software upgrades’ to gateway/control devices shall be available for download as and when they are released by the manufacturer, and shall be installed by the manufacturer at no additional cost to UoE.

System gateway device shall be located in a secure building location, electrical switchroom or electrical riser/cupboard only.

The system shall come complete with an Ethernet interface/integrated web server for monitoring and control of emergency lighting luminaires connected to the automatic test system. All gateway/control devices shall be capable of communicating wirelessly with handheld maintenance devices. 2No. handheld devices shall be provided under the project works at handover. Devices to have silicone sleeve, sealed keypad, infrared technology and mini torch facility.

The system topology shall allow connection of additional luminaires at any point, ensuring expansion of the system is possible without the need to purchase further front-end operational units. The system gateway shall allow central control for a maximum of 500No. emergency luminaires that can be allocated and organised into operational groups. System shall designed in order to provide a spare capacity of 25% for future additional luminaires.

The system shall be capable of continuously scanning the connected network of luminaires to obtain status information from each lighting unit and displaying live information about the status of all connected luminaires as HTML pages to be viewed using web browser software.

The system shall incorporate the following, but not limited to:

- Local indication status of “communicating”, “everything OK” or “faulty emergency light”
- Building name and reference number
- Location and reference number of each luminaire
- PDF format drawings uploaded and accessible from system software/website package, detailing device technical details, locations and configuration
- IP65 rated gateway
- All emergency lighting equipment to be CE marked, complying with CPR’s
- Adjustment of the testing day and time for all individual emergency lighting luminaires to suit local requirements
- Polarity free
- Recording of all faults
- Storage of all information concerning each emergency lighting unit for a minimum of 4 years, but should not be limited to this
- Automatic configuration of the system
- Data protection through password control
- Automatic testing carried out on a nominal seven-day cycle in full compliance with BS EN 1838/BS 5266 Pt.7 requirements
- Two sets of volt free relay contacts to be available for output of fault alarm if required
- Email facility is available to facilitate fault information to be sent to a minimum of two designated recipients as required by the University
- Facility is available to monitor volt free fire alarm contacts and switch emergency lighting on if required
- 230v ± 10% 50/60Hz input
- De-centralised system type not permitted
- Centralised system type not permitted
- Self-contained, automatic self-test to be used
- 2No. handheld control devices provided at handover

At project handover the Electrical Consultant/Contractor shall ensure that an emergency lighting log book is provided (in accordance with BS5266, Annex J) c/w lighting calculations, commissioning and design certification, as installed lighting drawings and schematics c/w control device, installed lux levels and luminaire locations including device reference numbers correlating with the label reference on the installed luminaire are provided in both paper and electronic (CAD and PDF) copies. This applies to both automatic test and manual test keyswitch system arrangements.

An emergency lighting completion certificate and manufacturer certificate of commissioning (ATS) must be provided on all UoE projects regardless of size, value or complexity, with a copy inserted into both O&M manual (electronic/hard copy) and emergency lighting log book.

12.0 Lightning Protection System

A calculated risk level (CRL) assessment shall be carried out by Electrical Consultant/Contractor and design undertaken to meet CRL in accordance with BS EN 62305 and BS7671:2018 current edition/amendment.

Buildings with existing lightning protection systems should be extended/modified where necessary, with new equipment/plant bonded in accordance with BS EN 62305 in order to provide full coverage and protection.

Installations, particularly down conductors, shall be discreet and unobtrusive particularly on listed building facades.

Copper earth rods/plates shall be provided for each earth electrode c/w heavy-duty concrete earth pit and access cover.

Earth pits shall be designed to withstand vehicular traffic where required.

It is the responsibility of the installation contractor to ensure existing underground services are identified prior to any ground works.

The installation shall be constructed to facilitate routine and recommended inspection and testing in accordance with current codes of practice.

13.0 Security Installations

The Design Team shall consult with the University of Edinburgh's "in house" Security Department and the BSG to determine the exact scope of work in respect of the extent and nature of the security systems to be employed.

Please note, Estates Design Guideline No.8 – Security Installations will be issued and uploaded to the UoE Design Guideline webpage a short time after the release of this revised No.6 2020 version.

Requirements for access control systems should be referenced in Information Services – IT Infrastructure document V2.1 – May 2019. Upgrade works have been undertaken to upgrade UoE access control system to C*CURE 9000, design team shall engage at an early stage with UoE IS to determine if this system should be utilised on the project. This document is currently undergoing a further review, with a new revision becoming available thereafter. Design/Construction teams will be notified when this becomes available.

It is the responsibility of the Design Team during design consultations to liaise with the UoE PM and End-Users to determine the operational principles of each internal and external access controlled door to ensure the correct system and associated door furniture/ironmongery/electrical attendances are included within the design tender documentation.

The use of maglocks across the UoE Estate for both internal/external access controlled doors shall be discussed at early design stage with the UoE FSU/BSG/ISG and externally via local Building Control, however, as a rule of thumb, maglock devices should be avoided. Final exit doors shall allow free egress at all times, including during fire alarm/mains failure events, whilst maintaining secure control of ingress to the building.

Access controlled door strategy to be reviewed at an early design stage with nominated End-User groups, UoE BSG/ISG and Security.

13.1 Existing Buildings

Agree with the University Security Team a preferred installation for extending the existing security alarm system to new presence detectors, window contacts and door contact positions. Agree also the need for additional CCTV equipment linked to the University Security main control room as necessary.

All existing systems shall be surveyed by the Electrical Consultant/Contractor to ensure proposed system extension works are possible and compatible with existing technology. Should there be compatibility issues, this shall be raised pre-tender to UoE PM/BSG/Security teams for review, with allowance made within the project for upgrade works.

Please reference No. 8 Security Design Guidelines for more details (guideline to be issued, liaison with UoE Security/BSG required in the interim period).

14.0 IT Infrastructure

The designer shall consult with the University of Edinburgh's Information Services Department to determine the exact scope of work in respect of:

- Overall structured cabling network/distribution system
- Network provision (cabled)
- Network provision (wireless LAN)
- Telephony (VoIP)
- Telephony (analogue)
- Telephony (mobile)
- Audio/visual equipment
- Access controlled doors/alarm monitoring
- Digital signage
- Standard desktop provision
- Printing shared MFDs
- Network points in relation to CCTV system
- BEMS systems – Please note the following changes below
    - For each Ethernet type controller a University IT network point shall be installed within close proximity of the control panel or controller.
    - The IT point shall be installed and commissioned by the appointed data network installer. The Controls Contractor shall be responsible for the connection between the IT point and controller.

Design teams shall liaise with both End-Users and UoE ISG at an early design consultation stage, to determine the exact requirements for data provision and overall structured cabling network strategy to be utilised.

Data connections required for specific items of equipment shall be agreed after discussion with the UoE Information Services Group (ISG), with particular reference to the ICT Design Guidelines, Assets and Standards.

Please check that you have the most up-to-date version of this document by contacting UoE Estates or Information Services Group or discussing at early design consultation meeting.

This document has been developed for Design Team architects, electrical/data consultants, main contractors, suppliers, installers, or anyone responsible for the design, specification, planning or installation of IT infrastructure.

UoE authenticated users can find copies on IS ITI Infrastructure Intranet SharePoint.

Please reference Information Services – IT Infrastructure document V2.1 – May 2019.

15.0 Vehicle Charging Points

The Project Design Team shall consult with the University of Edinburgh's Project Manager during RIBA early stages to ascertain if vehicle charging points form part of the strategy for that particular project.

Should vehicle charging points be required, they shall be in compliance with BS7671:2018 current edition/amendment (amendment No.1), specifically section 722, IET Code of Practice for Electric Vehicle Charging Equipment recent edition and IEC 62893 1-3:2017.

All vehicle charging point locations and equipment (charger types) shall be agreed with UoE Estates at design stage.

16.0 Utility Application, Planning and Management

For all new build, refurbishment and/or upgrade works it is the responsibility of the Mechanical and Electrical Consultant to make an application to local utility providers in order to provide a new/upgraded supply or removal of existing connections based on the project brief and associated estimated connected building loads.

It is the responsibility of the Design Team to carry out preliminary discussions with the local utility provider to ascertain local network capability and existing service routes in order to include all requirements, including wayleaves, associated with new supplies or diversion of existing within their project design and tender documents. In addition, the Design Team must clearly identify any reinforcement of networks required to provide the capacity to meet the project requirements and secure a firm breakdown of all associated costs.

The Mechanical and Electrical Consultant shall ensure that all liaison, coordination and all BWIC with utility works are included within their Builders Work Schedule/specification document and issue as part of their billing package for costing.

Once procurement of the associated project is complete, it is the responsibility of the nominated main contractor in liaison with the Design Team to manage and coordinate all required utility works. Main contractor shall engage and notify the utility provider of their intended works and programme accordingly and provide regular updates to the University (UoE PM/BSG/Energy Teams).

All underground utility connections and associated University of Edinburgh services/assets shall be laid at a depth as recommended by The National Joint Utilities Group, Volume 1 NJUG Guidelines on the Positioning and Colour Coding of Underground Utilities' Apparatus Guidelines – Appendix No. 4.

Any external services on University property that will/do not comply with these guidelines shall be brought to the attention of the BSG.

17.0 Photovoltaic (PV) Installations

17.1 Standards and Regulations

Photovoltaic (PV) installations shall comply with BS 7671:2018 current edition/amendment, BS EN 62446-1:2016, Microgeneration Certification Scheme (MCS) and relevant Building Control regulations.

The following ENA Engineering Recommendations shall be applied to all PV installations across the University Estate, effective from dates shown below:

- Engineering Recommendation ENA G98 (current edition) – recommendations for the connection of small scale embedded generators (up to 16A per phase) in parallel with public low voltage distribution networks
- Engineering Recommendation ENA G99 (current edition) – recommendations for the connection of generating plant 50kW 3-phase or 17 kW single phase to the distribution systems of licensed distribution network operators

It is the responsibility of the Electrical Consultant, Electrical Contractor and PV specialist to submit and manage the associated generation applications noted above. The Electrical Consultant/Contractor will be provided with a Letter of Authority (LoA) to act on behalf of the University.

The nominated PV specialist shall be MCS, ISO and NICEIC accredited and provide a dedicated Project Engineer to manage the onsite installation of panels and associated support/mounting systems, grid connections, submissions, approvals and generation agreements on behalf of the Electrical Contractor.

17.2 District Network Operator Liaison

As noted in previous section, the installing contractor/PV specialist in conjunction with the project design team must liaise with the local DNO to notify the intention to install or confirmation of installation of embedded generation as defined below.

a) Single installation covered by G98

- Notification to DNO must be completed within 28 days of commissioning

b) Multiple installations covered by G98 or installations in close geographical proximity to one another

- Application to proceed prior to commencing works (G98 multiple system application form)
- On commissioning – notification and commissioning form as per single installation

c) Larger installations covered by G99

- Written approval from DNO to be gained prior to works commencing
- Commissioning process as required by DNO

Please note that for PV installations the principal contractor will appoint the DNO as authorised persons to oversee the system inspection, testing and commissioning requirements, documentation and labelling process. The UoE BSG shall be invited to witness all G98/99 testing.

All other testing of the photovoltaic system shall be carried out in accordance with BS7671, BS62446 and MCS guidance. All testing results and certification shall be provided within the project O&M manual for handover to the University.

17.3 Photovoltaic System Performance

The project design team shall determine the requirements of the proposed PV system and include the proposed performance within their RIBA stage reports for review by the University BSG Energy team.

The type and generation of PV cells, proposed for use shall be included within the report.

The design team shall carry out an assessment during the design stage to determine the best arrangement of panels to fit the allocated space to optimise solar capture. The assessment shall be based on local climate data.

The following factors shall be considered during the design stage, this is not an exhaustive list:

- Orientation to provide maximum power output and performance
- Proposed roof structure or existing roof structure including any existing warranties, and proposed mounting system
- Arrangement of PV panels on roof locations with consideration given to both existing and proposed new services
- Final spacing/orientation of PV panels to avoid shading
- Final panel locations shall have access provided for future maintenance
- PV panels proposed for roof top locations with no access, or access required via access platform/boom lifts are not permitted. A dedicated safe access route shall be provided
- Equipment structural loadings shall be assessed and confirmed acceptable by the project structural Engineer
- Warranty of associated PV equipment or better:
    - 25-30 year minimum power output warranty (PV cells)
    - 10 year product warranty on materials/workmanship
    - 10 year product warranty (Inverter)
    - All items to be CE marked and comply with CPR/MCS accredited

17.4 Photovoltaic System Installation

The installation of PV equipment shall be done so in compliance with BS7671:2018 current edition, with reference to MCS/ECA Guide to the Installation of Photovoltaics document.

The PV equipment installation shall be deemed to include but not limited to the following:

PV Module

- Roof/ground (where applicable) mounted PV module providing specified kWp
- PV cell type to be polycrystalline, monocrystalline or hybrid (where applicable) type complying with MCS guidance
- PV cell support system including all bracketry, frames and rails, providing a roof compatible, non-destructive fixing method. Technical submittal shall be provided to project Structural Engineer and UoE for review and comment.
- Support system shall avoid roof penetration.
- Tier 1 PV modules
- Self cleaning
- PV cell c/w diode protection
- PV Wind Loading minimum 2400pa or specified to suit project
- PV Snow Loading minimum 5400pa or specified to suit project
- PV cell IP68 rated junction boxes

Inverters

- Inverter efficiency 98%+
- Inverter THD <3%
- Inverters c/w protection devices as required
- Inverters – Transformerless
- Inverters c/w digital display, password protected, fully open protocol
- Inverters c/w multi-unit connectivity/communication
- External/accessible inverter isolation points (AC/DC)
- Inverter output 230v single phase or 400v three phase 50hz
- Minimum inverter power factor 0.99

PV System Operational Requirements

- Electrical cabling containment system associated with the PV installation including galvanised steps for safe access over containment to be provided where required on roof locations
- PV cabling shall be mounted both externally and internally on its own containment, sharing with other services containment is not permitted
- Entire PV installation shall be arranged to ensure system output is balanced across all phases
- General and emergency lighting shall be provided at all PV array locations including at any stepover of containment as required
- Fall arrest systems shall be provided, where required, for access to PV array locations
- Supply and installation of cabling associated with the PV installation to inverter locations
- Import/Export metering installation in compliance with UoE metering guidelines and MCS guidance

- Pulsed output (MODBUS) functionality for monitoring of kWh electrical generation providing BEMS connection to UoE network, including alarm for indicating loss of PV under mains failure
- Manual reset facility under mains failure
- Commissioning and installation of generation agreement relay equipment (G98/99) and all other applications required by DNO.
- For tendering purposes, the design team shall allow for the Supply and installation of graphics display panel at agreed location (usually building reception/main entrance) for the associated PV system per building, which displays as a minimum electricity generation, electricity exported (where applicable) and CO2 savings generated
- PV systems to be suitably earthed and bonded to proposed/existing building earthing/lightning protection network
- All PV equipment shall be labelled accordingly with safety/warning notices at key distribution points i.e. dual supply points, service terminations, junction boxes, inverters, AC/DC isolation points, string cabling etc.
- Electrical/PV distribution schematic to be mounted at interconnection point, detailing protection settings and shutdown/start-up procedures
- Full demonstration required to UoE Estates on completion of works
- Design Teams shall ensure proposed PV locations on both existing and proposed new building take full cognisance of other services and building fabric elements in close proximity

Inverters to be mounted externally shall be housed within a weatherproof enclosure with final positions agreed for future access/maintenance by UoE Estates.

Inverters to be mounted internally shall be done so within a local electrical switch/plant room location.

Should the proposed or existing building be supported by a back-up generator the PV system shall have a connection to the generator control panel and/or generation agreement relays to ensure that in the event of a mains failure the PV cell array will automatically cease operation/generation. In such an event PV arrays will require manual reset by the University Estates Operation Team.

UoE projects with proposed roof PV systems shall provide direct and safe roof access via the internal layout of the building to this equipment, without the need for scaffolding, mobile platforms or external ladder/s.

Warranties noted above for all PV equipment shall begin on the date of building practical completion. All paperwork associated with warranties to be included within O&M Manual.

18.0 Application for a Site Electricity Metered Supply (Temporary) Process

Under new policy, it is now essential for all contractors proposing to use the Universities utility network for temporary power supplies to complete an application request document, which shall be forwarded to the University EDM / PM for Liaison with the BSG.

18.1 Application Steps

i. Applicant requesting a Site Metered Supply (Temporary) completes the application form as detailed in Appendix No. 5 and submitted to the Appointed Project Manager at the earliest meaningful time in the project programme.

ii. Project Manager to review the application for accuracy and completeness.

iii. Project Manager to liaise with the BSG Development Engineer, who will review the site conditions and confirm the availability of a supply with the wider UoE Estates Operations Team.

iv. The BSG Development Engineer in conjunction with UoE Operations will respond and confirm acceptance of application.

v. All works associated with the design, installation and connection of temporary metered supplies shall be carried out by the Main Contractor and their nominated sub-contractor.

vi. Nearing completion of the construction works, the UoE Project Manager will advise the Development Engineer of a disconnection date for the Site Metered Supply (Temporary).

Please refer to Appendix No.5, this document shall be issued electronically on request, to be completed in typed format by the installing contractor/design team and submitted to the University Development Engineer copying University Project Manager on correspondence.

UoE Development	BSG Personnel
Electrical Connections	Andrew Caswell andrew.caswell@ed.ac.uk

For any other projects not specifically managed by the University Development Team, direct liaison is required with the BSG.

Please contact the following for proposed temporary connections:

UoE Campus Location	BSG Personnel
Central Area Campus	Heather Fleming Heather.fleming@ed.ac.uk
Peripheral Area (Easter Bush and Kings Buildings Campus)	Alan Carracher Alan.carracher@ed.ac.uk
Peripheral Area (BioQuarter, Western General Hospital)	Roddy Gordon Roderick.gordon@ed.ac.uk

19.0 APPENDICES

19.1 Appendix No. 1: Schedule of Existing Assets

Item	Manufacturer	Description
HV Switchgear	Hawker Siddeley / Brush	Eclipse range, vacuum type circuit breakers
Transformers	ABB/Wilson	As described in HV section
LV Switchgear	AF Switchgear/E&I Engineering	As described in LV section
Metering Equipment	Schneider	Schneider PM5111 Range
Distribution Boards	Various Manufacturers	Acti 9/KQ Loadcentre ranges etc.
UPS	Riello	As described in UPS section. System to be specified to suit specific department requirements.
Cabling	BASEC, LPCB and CPR approved manufacturer	As described in cabling section
Standby Generator and Fuel Storage	FG Wilson	Generator to have 1st year maintenance included in contracted works
Generator Controls	ComAP Control Suite	As described in generator section
Wiring Accessories	Various Manufacturers	All wiring accessories to be CPR accredited. Accessories to achieve required LRV's. Metal clad in all plant areas
Lighting (Internal/External)	Various manufacturers	All lighting to be LED and designed to suit environment. Maintenance/replacement of all fittings to be considered.
Emergency Lighting	Various Manufacturers	Emergency lighting system to be addressable, self-test, GSM/LAN connected and provide backup alternative automatic testing (ATS). Agreement with BSG required.
Lighting Control	Various manufacturers	No complex front-end systems that require interrogation for maintenance are permitted. System

		type may be required within sensitive areas, therefore, system shall be agreed with the BSG. Modular lighting systems permitted.
Fire Detection	Advanced/Apollo/Vesda	System to have 1st year maintenance included under contract works.
EVC System	Baldwin Boxall	System to have 1st year maintenance included under contract works
Structured Cabling	Commscope	Refer to IS Guidelines
Containment	Various manufacturers	As described in sections 5.0 and 6.0
CCTV	Geutebruck recorder, Milestone (Little France) Avigilon (Easterbush), Camera Manufacturer (open protocol only)	Early liaison required on all projects with UoE Security Team. System to have 1st year maintenance included under contract works
Intruder Alarm	Various	Early liaison required on all projects with UoE Security Team. System to have 1st year maintenance included under contract works
Access Control Systems	C*CURE 8/9000, iStar etc	Refer to IS Guidelines. All access control requirements to be discussed with CIS Manager and BSG at design stage
Lifts	In compliance with UoE Lift Guidelines	All lift proposals to be sent to BSG at early stage for UoE independent lift consultant review. System to have 1st year maintenance included under contract works

All proposed project equipment and associated manufacturers, including any associated calculation documents shall be provided via technical submittal to the BSG for review prior to ordering.

Warranty information shall be provided within O&M documentation on all installed mechanical and electrical equipment, detailing duration (start/end dates), transfer of warranty from purchasing contractor to UoE (if required) and specific requirements for systems where warranty is dependent on general maintenance.

19.2 Appendix No. 2: Design Guidelines

No	Proposed Design Guidelines and Standards Name	Existing Relevant Guide
1	General Introduction to Design Guidelines, Assets & Standards Principles and Application	New
2	Mechanical, Electrical and Plumbing (MEP) Testing & Commissioning	Not Available
3	Mechanical Engineering Services (including Specialist Installations)	3.0 Mechanical Engineering Guidelines
4	Building Energy Management Systems (BEMS)	4.0 Controls
5	Metering of Utilities & Energy	New
6	Electrical Engineering Services	6.0 Electrical Engineering Guidelines
7	Lift Installations	7.0 Lift Installations
8	Security Services	To be Issued early 2020
9	Fire Safety Management	9.0 Fire Safety
10	Building Fabric (including generic room data sheets and standard finishes)	New
11	Sustainable Design Standards for Buildings and Infrastructure Works	Not Available
12	Inclusive Design	Accessibility Access Standards Dec 2015
13	Wayfinding and Signage	Leading the Way - Signage Protocol Document - Dec 2015
14	Landscaping	Not Available
15	Space Management Standards (including room numbering)	Not Available
16	Asset Management (including asset tagging)	In Development
17	Teaching and Learning Space (including AV standards & pedagogy)	Not Available
18	CAD Drawing Specifications for External Organisations	Not Available
19	Building Maintenance and Operations Manuals, Log Book and Handover Procedures	New
20	Contractor's working on the University Estate (including Asbestos Management)	Not Available
21	Building Information Management (BIM) Protocol	Not Available
22	Decommissioning University Buildings and Facilities	Not Available

19.3 Appendix No. 3: Sub-station Plant and Equipment List

Sub-station – information, plant, tools, instruments, equipment and signage to be supplied under contract works (liaison with BSG required for final requirements):

1. Sub-station framed A0/A1 network schematic diagram – with spare drawing copies provided
2. Sub-station "as built" drawings, GPRS information and list available as a package in PDF format
3. Drawing hanger system, secure cupboard for equipment
4. Sub-station operating and maintenance manual complete with records
5. Sub-station earthing arrangements
6. Sub-station asset management inventory
7. Sub-station hazard assessments
8. Emergency planning battle box and First Aid Kit
9. Secure fire proof cupboards with key cabinet

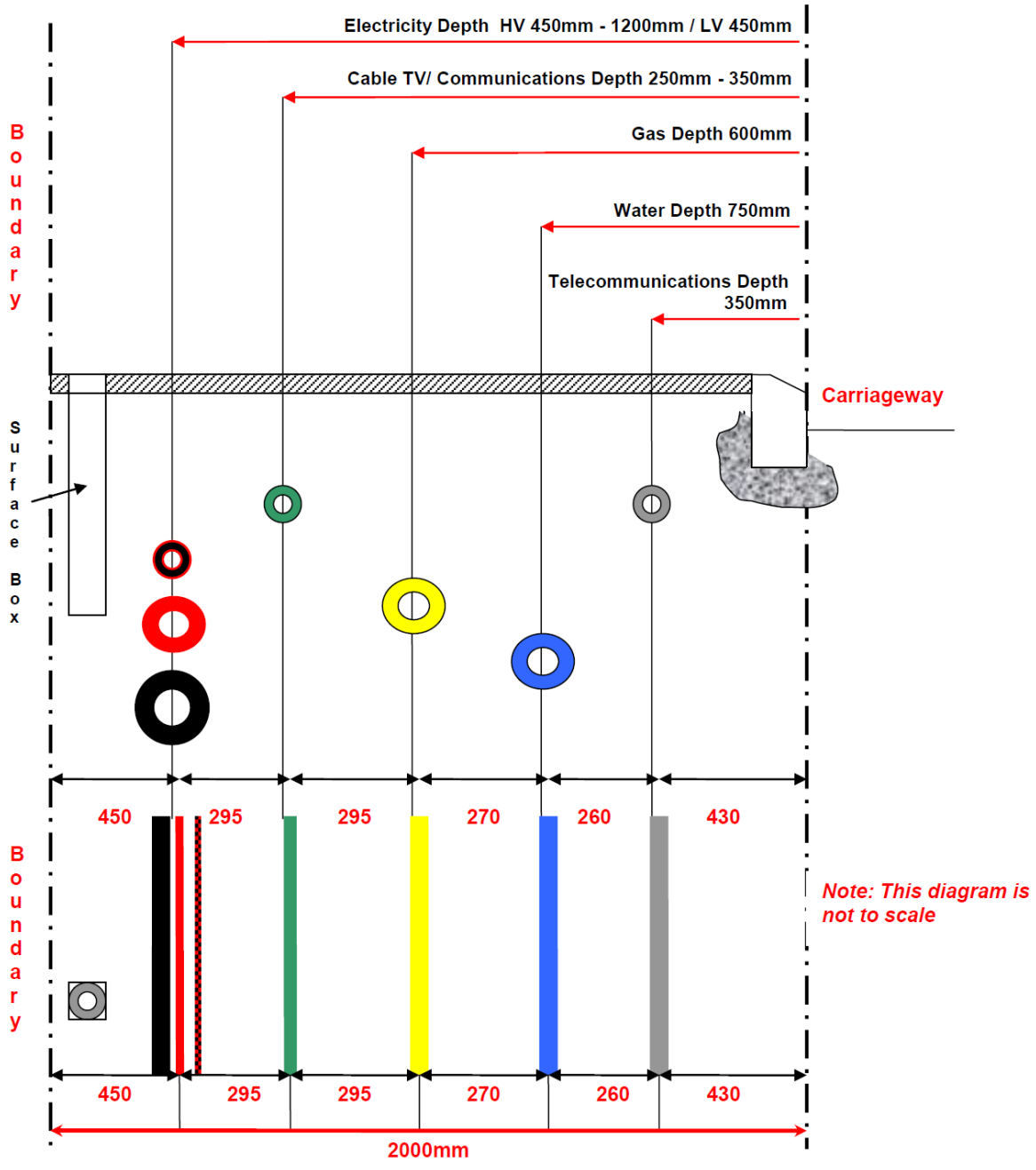
Sub-station – fabric and finishes:

1. Sub-station building fabric, weather proofing a flood barrier protection c/w LEAK detection alarms
2. Sub-station – spill kit and cleaning materials
3. Sub-station distribution board, socket outlets including USB connection
4. Sub-station log books
5. Sub-station desk and hard wooden chairs 2No.
6. Sub-station LED lighting and emergency lighting in each unit (internal and external)
7. Sub-station fire detection measures
8. Sub-station tripping batteries and maintenance log book
9. Sub-station doors, name plates, signage, labelling, maintenance, security and locks
10. Sub-station rating plates, name plates and operational signs
11. Sub-station safety signs and lock system
12. Sub-station ventilation, mesh for grilles and tubular heating with stats
13. Sub-station phones and directory, Scottish Power, key people, local hospital and emergency services
14. Sub-station – white board or chalk board
15. Mimic panel (incoming substation only)
16. Sub-station – rubber mats
17. Sub-station – campus map with sub-station walking routes
18. Lifting keys for floor plates
19. Sub-station CCTV cameras and access point
20. Sub-station brush and shovel
21. Sub-station coat hooks and key rack
22. Sub-station electric shock poster and first aid guidance
23. Sub-station electricity at work regulations

19.4 Appendix No. 4: NJUG Guidelines on the Positioning of Underground Apparatus for New Development Sites

FIGURE 1 - Recommended Positioning of Utility Apparatus in a 2 metre Footway

Note – the same positioning should apply in the carriageway/service strip (if safe and practical to do so) where a development has no footway(s) available for services and/or the boundary of the property is on the carriageway (please refer to minimum depths in carriageways). For further advice please contact the asset owner.



19.5 Appendix No. 5: Application for a Site Electricity Metered Supply (Temporary)

THE UNIVERSITY of EDINBURGH

TEMPORARY ELECTRICAL SITE SUPPLY CONNECTION – APPLICATION DOCUMENT

Completing this form accurately will help us process your application as quickly as possible Please complete all sections relevant to your project		
1) Applicant Details		**Date:**
Title:	First Name:	Surname:
Company:		Job Title:
Address:		Telephone:
County:		Mobile:
Post Code:		E mail:
2) Site Address for Temporary Connection		
Project Name:		Campus:
Address:		Post Code:
Switchboard Ref:		SB Location:
Distribution Board Ref:		DB Location:
Estates/End-User Representative:		Shutdown Dates Agreed with Estates/User?
3) Authorised Site Representative Details		
Title:	First Name:	Surname:
Company:		Job Title:
Address:		Telephone:

County:	Mobile:
Post Code:	E mail:

4) Principal Contractor

Company:	
Address:	Telephone:
County:	Mobile:
Post Code:	E mail:

5) Principal Designer Details – Construction Design and Management (CDM) Regulations 2015

Title:	First Name:	Surname:
Company:		Job Title:
Address:		Telephone:
County:		Mobile:
Post Code:		E mail:

6) Site and Load Details

Depending on your project, there may be a requirement to install a substation on your site. Our design team will discuss this with you in more detail but it would be helpful at this stage if you could indicate a preferred location on a plan.

Commencement Date of Temporary Metered Supply	
Termination Date of Temporary Metered Supply	
Single Phase Capacity required in kVA	
Three Phase Capacity required in kVA	

7) Load Details About Any Motors or Other Big & Disturbing Loads

Some types of load can disturb our electricity network. Please provide details of any air conditioning, fuel or heat pumps, lifts, motors, refrigeration, welders or other industrial machinery. If the electrical characteristics are unknown, please refer to the manufacturer or the equipment installer.

Type of appliance (e.g. motor, welder, heat pump, wind turbine)	Rating [kW]	How often will the appliance be started in one hour?	Single or three phase?	Starting method	Starting current

8) Any Diversion of Infrastructure Required?
• If applying for diversion work please provide a full description of the work that you propose to carry out. • Please detail whether you require the diversion of electricity cables, overhead lines or substations. • Please send us detailed plans of your works to allow us to identify the impact on our electricity assets • What is the planned start date for your work? • All RAMS to be issued for review only by UoE • If required, dates of isolations to be carried out by UoE

9) Site Development and Location Plan Information	
• Provide a site drawing showing the site development to enable an accurate assessment of requirements including proposed switchboard location to be utilised for temporary connection • Which roads, if any, are impacted? • The site boundary • The location of temporary site accommodation • The location of the proposed metered site supply • Any proposed duct and cable route including switchgear locations • Any buildings that will be demolished • Any existing service routes (if known)	Plan:

10) Any Additional Information
Please provide any additional information that you think will help us process your application, e.g. any details of End-User affected equipment, End-User consultation carried out at proposed dates agreed, site hazards or areas of contamination

Signature of Applicant	
Printed Name/Date	
Acting on behalf of company name	

Completed Application Form is to be returned to Appointed UoE EDM / Project Manager at the earliest possible time in the project to liaise with UoE Building Services Group

THE UNIVERSITY of EDINBURGH
Estates Department

University of Edinburgh
Estates Department
9-11 Infirmary Street
Edinburgh, EH1 1NP