THE UNIVERSITY of EDINBURGH
Estates Department



Estates Design Guidelines No. 6

Electrical Engineering Services

Important Comment on Estates Design Guidelines, Assets & Standards

These Estates 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.

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1.0 Introduction

1.0 Introduction

The University of Edinburgh (UoE) Estates 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 Estates 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 to ensure subsequent designs are complete, compliant and able to meet the final approved brief when measured in use.

Reference should be made to the relevant UoE Estates Design Guidelines throughout the design drawings and documents and designers should confirm that the appointed Contractors are made aware of the Guidelines to ensure that installations conform to these requirements.

1.1 Important Notice – Essential Prior Reading

It is essential for readers of this document to first refer to UoE Estates 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 UoE Estates Design 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 UoE Estates Design Guidelines 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 UoE 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 UoE 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.

1.4 Glossary of Terms:

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 UoE BSG for their final decision regarding compliance with the documentation.

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.

Quality

The UoE Estates Design Guidelines aim 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 UoE BSG for review.

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 UoE BSG should be contacted for clarity.

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.

Assets and Standards

The UoE Estates 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.

1.5 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.

1.6 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.

1.7 Version Control and Updates

The Estates Design Guidelines are to be reviewed and updated by the Electrical Engineering Services Working Group in each calendar year.

The UoE Estates respective Project Management (PM) teams will send e-mail notifications to the Directory of current Design Teams and Contractors appointed, following any update or change.

Any updates to the Design Guidelines, which cause significant change to a project design, should be raised and discussed with the respective Project Management Team and application of the Change Control Process will be required.

Any new items or amended content shall be highlighted in yellow to enable identification of changes from previous versions.

1.8 Purpose of UoE Design Guideline Number 6

The purpose of UoE Design Guideline Number 6 is to set out the guidelines and standards that apply to University of Edinburgh (hereby referred to as UoE) Estate and its design requirements for Electrical Engineering Services as set out by the Development Services Engineer (Electrical). This document will apply to newly constructed buildings and existing buildings being refurbished. In some cases, this standard exceeds the Building Regulation requirements, as it represents good practice in the Higher Education sector.

The Building (Scotland) Regulations set out to ensure that new buildings and works achieve the objectives of the Building (Scotland) Act 2003 in terms of health, safety, welfare, convenience conservation of fuel, power and sustainable development and the purpose of this guide will be to provide a standard policy specifying the standard that is required by the UoE.

This guidelines document is for designers, engineers, specifiers, installers and commissioning and maintenance engineers of Electrical Engineering Services from Stage (RIBA Stage 2) to when the building is in use (RIBA Stage 7). The design team will be required to align the requirements of the Scottish Buildings Standards Technical Handbook / Building (Scotland) Regulations, fire safety legislation, CDM Regulations, CIBSE Guides and the University

The guidelines document provides an indication of non-prescriptive preferred solutions and appropriate standards. This is not a statement of requirements or intended to replace existing British or European technical standards or national guidance; reference to these will still be necessary.

If due to the nature of the project, certain aspects of Electrical Engineering Services are not covered in these guidelines and standards, the relevant codes of practices, British Standards and building regulations are to be applied and followed. For any general and specific queries, advice is to be obtained from the Building Services Engineer (Electrical.) In the event those documents referred to within this document, which have been superseded, then most recent versions are to be referred to.

Any other doubts, concerns or points of clarification on Electrical Engineering Services, please contact the Development Services Engineer (Electrical.)

This document applies to all buildings managed or owned by the UoE. Any tenanted buildings must not have building works, adaptions or change any building or part of a building which will affect the Electrical Engineering Services or any other building without first receiving permission from Development Services Engineer (Electrical) and the Landlord of the property or nominated agent and written in the respective lease.

This document indicates the University's generic Electrical Engineering Services Client requirements. Consultants must also refer to specific project requirements identified by the University's Project Manager and they must fully integrate any new Electrical Engineering Services with the University's existing legacy systems. Consultants and contractors must obtain approval in writing for any variation from these requirements.

Before incorporating these client requirements in, e.g. tender documentation, etc, please always check with the undersigned that you have current issue of both these client requirements and the field equipment list.

Please always approach the University engineers directly to discuss any point of clarification or possible improvement and to obtain further copies of the client requirements.

Development Services Engineer (Electrical)
Estates Operations
Estates Department
Edinburgh
EH1 1NP
General enquires: 0131 650 9157

1.9 Legislation and Best Practice Standards for Reference

Any design must, as a matter of statute, be compliant with the Health and Safety at Work Act 1974, any relevant legislation and associated Approved Codes of Practice (ACOP's.)

Examples of secondary legislation include; the Provision and Use of Work Equipment Regulations 1998 (PUWER), the Workplace (Health, Safety and Welfare) Regulations 1992, the Electrical Safety at Work Regulations 1989, the Control of Major Accident Hazards Regulations 1999, the Confined Spaces Regulations 1997 and the Gas Safety (Installation and Use) Regulations 1998.

Your attention is drawn in particular to the legal duties placed on designers by the Construction (Design and Management) Regulations 2015.

Suitable and sufficient safe access for maintenance and repair must always be provided.

The University will comply with all relevant legislation and regulations relating to the design and structure of the building. Academic, administrative buildings and all residential property are subject to the requirements of the current Technical Standards (Scotland) Regulations/Building Regulations and CIBSE Guides:

Guide A Environmental Design
Guide B1 Heating
Guide B2 Ventilation and ductwork
Guide B3 Air conditioning and refrigeration
Guide B4 Noise and vibration control for building services systems
Guide C Reference Data
Guide D Transportation systems in buildings
Guide E Fire Safety engineering
Guide F Energy Efficiency
Guide G Public health engineering

Guide H Building control systems
Guide K Electricity in Buildings
Guide L Sustainability
Guide M Maintenance Engineering and Management

These standards allow detailed professional knowledge and judgement to be applied in order to develop a final design solution, which will satisfy projects that are more complicated.

The list of legislations, regulations and guides above is not exhaustive. The Design Team shall prepare and submit project related list as part of RIBA Stage 3 design submission.

1.10 University Approval Procedures

The University governance procedures are described in the Project Delivery Process Map. This includes development of a consultation strategy at RIBA Work Stage 0 and ensuring that there are MEP Design focused consultations with the Estates BSG representatives as part of the project stage approval. Refer to the project T18 document for the schedule of required consultations.

2.0 Electrical Engineering Services Design Criteria

2.0 Electrical Engineering Services - Design Criteria

2.1 General Requirements

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.

The following requirements shall apply to the electrical engineering services on all projects;

- All designs, must, as a matter of statute, be in compliance with all Building Standards 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 comply with BS7671:2018 18th Edition Wiring Regulations current edition/amendment and any associated corrigenda.
- A Departure from the requirements of BS7671 18th Edition Wiring Regulations shall be declared by the project Electrical Consultant/Contractor to the UoE 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.
- It is now a mandatory requirement on all UoE projects for Trimble (Amtech) models (PowerNet, ProDesign, Protect and SingleCable where applicable) to be issued including calculation output reports for cable/busbars/boards and selectivity report for both review and information at each RIBA stage. A final, as installed model/reports shall be issued on completion of the project under the UoE's T59 procedure.
- It is now a mandatory requirement on all UoE projects for lighting models and associated Dialux/Relux calculations in PDF output (General, emergency and external) to be provided at each RIBA stage.

2.2 Design Criteria

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

- Building Standards Regulations and associated Technical Handbooks.
- All relevant British Standards and European Normative Standards.
- All IET Guidance Note and Code of Practice documents.
- UoE Sustainability Strategy and Estates Design Guide No. 11 – Sustainable Design.
- All University Estates Design Guidelines, with specific attention to future maintenance strategies.
- CIBSE Guides and Code of Practice & Technical Memorandums.
- 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 and Energy and Utility Team as part of the T18 consultation process with regards to sustainability strategy and how this should be implemented within the project scope of works. Refer to Design Guide No1 for further information on the T18 consultation process.

The appointed 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. All system demonstrations to UoE Operations team shall be video recorded by the Contractor. The demo digital recordings shall be included as part of the O&M/As-fitted information for the project

The information within this Design Guideline is intended to provide guidance to those responsible for the design and installation of Electrical Building Services within the Estate of the University of Edinburgh.

This Design Guideline is 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 UoE BSG for consideration and approval.

For the avoidance of doubt, the following Design Guideline, given the vast range and type of UoE project, do not specifically detail particular project requirements. This

Design Guideline details fundamental, operational principles that must adhered to and applied to all UoE projects.

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. Refer to Estates Design Guide No. 11 – Sustainable Design for further guidance.
- Provide an electrical installation and associated systems that are appropriate for the intended application, whilst ensuring longevity of installation is provided.
- Locate switchrooms and plantrooms/plant as close as possible to load centres.
- Depending on the criticality of the building/project, the use of busbar risers in lieu of individual sub-main cables could be considered on an individual project basis. This should be reviewed and agreed with the UoE BSG as part of the early stage design review.
- Consider the embodied carbon and whole life carbon footprint of the lighting installation, consideration should be given to the specification of luminaires/manufacturers with “cradle to cradle” certification.

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

- Production and issue of a complete Trimble (Amtech) network infrastructure model (PowerNet, ProDesign, Protect, SingleCable etc.) together with associated output reports.
- Design of all HV and LV cabling infrastructure including fault level study, calculations and selectivity report for all HV/LV cabling to be provided.
- Incoming electrical supply, including application management with local District Network Operator (DNO) (where applicable) or via UoE network infrastructure.
- Temporary site power supply derived from local DNO or 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 UoE 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.
- Electric Vehicle, bicycle and scooter charging installations.
- Photovoltaic systems.
- 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 system, 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.

2.3 Information Security

Where any system or item of equipment requires access to the UoE IT network either locally or externally, the system software will require to be assessed by UoE Estates IT team to ensure the UoE information Security (InfoSec) requirements are met. Generally, the requirements of ISO certification ISO27001 for information security management systems shall be followed. UoE Estates IT will provide an Infosec questionnaire to be completed for each proposed system.

The electrical consultant and contractor are responsible for providing the required InfoSec evidence/questionnaire as required for approval prior to specifying or ordering any system or equipment.

3.0 Power Distribution Equipment, Power Quality and Substation Design

3.0 Power Distribution Equipment, Power Quality and Substation Design

3.1 High Voltage (HV) Switchgear & Transformers

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 either Schneider "Genie EVO" or Brush (previously Hawker Siddeley) "Cryno" range Fixed Pattern Switchgear, vacuum type circuit breakers sized accordingly complete with earth fault, overcurrent and In/Out protection relays (Solkor, Schneider VIP400 or Siemens Argus C) as required. Switchgear shall also be complete with remote trip/close facility and auxiliary battery back-up system.

Emergency stop buttons shall be provided in all HV transformer rooms, these shall generally be located at each exit door from each transformer room. Final strategy and location to be agreed with UoE BSG.

Where HV metering is specified, provide multi-function meters as Schneider PM8240 Powermeter range for the HV meters in order to provide power quality information.

Refer to Estate Design Guideline No. 5 Metering for further information on metering connectivity capability (MODBUS) for all supplies

Transformers shall be as Schneider or equal and approved, Eco-Design Directive tier 2 compliant, super low loss energy efficient, copper wound, free breathing, Cold-Rolled Grain Oriented Electrical Steel (**CRGOES**), MIDEL oil filled, 11kV/433V delta/star DYN11 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.

Packaged substations, including close coupled HV/TX switchgear are not permitted without full and written consent of UoE BSG.

Cast resin transformers are not permitted without full and written consent of UoE BSG.

The final requirements for secondary containment bunding for oil filled transformers shall be agreed with the UoE BSG as the use of MIDEL oils along with the provision of oil level alarms and having an Oil Spill Contingency Plan (OSCP) may eliminate the need for a secondary containment bund. As a minimum the a suitable spill kit shall be supplied within each Tx room as part of the project works. Where there is a specific requirement, oil filled transformer equipment shall come c/w integral easily

demounted base galvanised steel containment bund and be mounted on 100mm concrete plinth.

It shall be noted that projects with a requirement for transformer equipment shall be designed to operate in a resilient N+1 arrangement. 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 UoE 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 UoE 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 or Single core XLPE/screened/SWA/LS0H 6350-11000V BS7835 sized accordingly. All live conductors to be of copper metal design and insulated accordingly. Triff jointing of cables shall be avoided unless agreed with UoE BSG.

Buried direct, HV cabling and associated pilot cabling, shall be surrounded by a minimum of 75mm sand backfill c/w cable marker stokboard installed a minimum of 250mm (200mm for LV) above cabling. These same principles apply to ducted cabling installations. All onsite utility company HV/LV cabling shall be ducted.

Main Contractor shall offer up the following opportunities for UoE BSG and Quality Management Team to inspect;

- All trench excavations works levelled and complete.
- Completion of trench preparation works i.e. sand bedding installed, and trench routes cleared of large stones/rubble, sharp objects or any objects that may cause damage to installed cabling.
- On completion of cable install and prior to final top sand bedding.
- Cable stokboard install prior to final backfill.
- Cable route shall have recessed in ground, concrete warning signs installed at 15-20m intervals and at all changes of direction and any joint locations.
- Final installed cabling routes and cable positions, shall be accurately marked on an as installed drawing in CAD, detailing depths, joints, cable markers etc.
- The above points apply to LV cabling installations also.

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 UoE BSG to discuss flood prevention/detection measures to 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. Note: the UoE preference is to avoid leak detection tapes and utilise wall mounted leak detection probes/sensors.

All new substation/switchroom locations shall not be installed below ground/subterranean level as a minimum requirement. Exception to this shall be considered where an existing building structure or specific site conditions exists, however, this shall be in agreement with the UoE BSG. Maintenance/replacement strategy shall be provided to UoE 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 and BS7430 current edition/amendment).

For those projects with earth farm requirements, the design/construction teams shall liaise with the UoE 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 UoE 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 throughout.
- 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).
- All main switchrooms shall be located at ground level.
- 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.
- HV/LV switchrooms (including transformer rooms with MIDEL filled transformers) are considered to be Industrial, normal risk use and generator rooms are considered to be a place of special fire hazard.
- A minimum of 1.5m clearance shall be provided around (front, back, sides, top) all HV/LV switchgear (transformers, HV/LV main switchboard etc.).
- 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.

- 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 UoE BSG) any proposed UoE/SPEN shared/limited access substation configurations.
- Where it is proposed to provide accommodation within a University building to house SPEN HV switchgear or substation, these rooms shall be constructed in accordance with SPEN requirements (SPEN document SUB-03-017). It is the responsibility of the design team to liaise with SPEN as required to agree specification requirements.
- Flood risk assessment shall be carried out on all substation locations.
- Substations are not permitted on areas of proposed land that are exposed to risk of flooding.
- Electrical switchroom doors shall be provided with a minimum height door threshold strip due to the need to move heavy equipment in/out in the future to avoid a step into the room. The external ground outside the room should be laid to grade away and possibly a drainage channel external to door, if possible, to minimise any possible water ingress.
- HV/LV/TX replacement strategy document shall be issued to the UoE BSG for final review and agreement – level access is required for equipment removal and replacement.
- Final substation design, including building fabric and door arrangement is to be agreed with the UoE BSG. Substation buildings shall be capable of achieving sufficient thermal insulation as necessary to provide an appropriate internal environment and avoid moisture ingress via condensation.
- Cable trench locations shall be c/w light weight, heavy duty GRP covers, sized to suit trench dimensions.
- HV, LV and TX room floors inc. trenches shall be treated with polyurethane, anti-slip, resin coating paint.
- All walls shall be painted.
- All doors shall be appropriately fire rated.
- Where louvered doors are being provided this shall be half door only.

The electrical and mechanical services installations within HV/LV/TX switchrooms shall be provided in line with the following:

- 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.
- All HV and LV switchrooms and generator rooms shall be provided with a dedicated lighting and power distribution board to serve electrical services within these rooms. The distribution board shall be deemed as an essential services board and shall be generator backed where a standby generator is

provided under the project scope. The distribution board shall be located within the main LV switchroom.

- All lighting within HV and LV switchrooms (and mechanical plantrooms) shall be mains 230V manually switched only and shall not form part of any building lighting control system.
- HV and LV switchrooms shall be provided with a wall mounted electric heaters, with automatic temperature control to provide background heating to prevent condensation. Quantity to be agreed with BSG.
- 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 / time clock controlled.
- The type of fire detection system within HV rooms shall be carefully considered to minimise maintenance access requirements, aspirating systems are preferred for these areas.
- Mechanical plant is not permitted to be installed within any substation location, and should be physically segregated from all substation equipment – exception for substations requiring additional cooling equipment, which shall be reviewed with UoE BSG. In these instances cooling equipment shall be located within adjacent service corridor where feasible.
- Mechanical plant rooms / wet services are not permitted to be installed directly above main substation/switchroom locations.

3.3 Low Voltage (LV) Switchgear

The main switchboard shall be manufactured by AF Switchgear, Schneider Electric or Legrand (Elsteel Uk) or equal and approved 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 UoE BSG.

All switchboards shall be minimum 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 appropriate voltage 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 where buildings have an N+1 dual transformer arrangement where the fault rating will be higher during switchover between transformers for maintenance.

- 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 shall generally be via an ACB and shall be 4 pole, unless specific project requirements dictate device to be TP&N (e.g. downstream centralised UPS), at which point a technical submittal shall be produced by Electrical Consultant/Contractor detailing reason for selection.
- Where primary and secondary incoming supply breakers have an auto transfer arrangement or an Automatic Transfer Switch (ATS) are installed, these shall be overlapping type and a neutral/earth switch/contactor arrangement shall be provided to ensure no loss of neutral reference. The electrical consultant shall liaise with the proposed switchboard manufacturer to agree the exact requirements and consult with UoE BSG. ATS controllers shall be as manufactured by or ComAP or approved equivalent. The ATS Controller shall also incorporate a BEMS Modbus to allow remote monitoring of the circuit breaker status and run/load status.
- Switch heights not to be above 1800mm FFL, including 100mm minimum concrete plinth.
- Busbars shall be formed of copper and shall be colour coded with phase identification at each cover plate.
- 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 and suitably sized for any harmonic currents.
- 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 mount on 100mm high concrete plinth, in addition to switchboard plinth.
- Protective devices/functional units shall be fused switches, fitted with HRC cartridge type fuses complying with BS HD 60269-2, BS 88-2 current/edition/amendment. MCCBs shall only be considered under special circumstances and subject to consultation and prior agreement of the UoE BSG. For larger outgoing supplies >800Amp, ACBs shall be considered by the designer.
- Note: it is the UoE preference that all outgoing fuse switches and protective devices shall be 4 pole switched type and not solid copper neutral links, 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.

- Where required to suit downstream equipment, the electrical consultant/contractor shall review the requirement to provide a neutral-earth switching contactor arrangement within the main/sub-switchboard(s) to mitigate the risk caused by the loss of the neutral-earth reference to the downstream equipment. A report shall be provided to the UoE BSG detailing the need for this arrangement and a design proposal provided for review.
- The electrical consultant must consider the large compartment sizes required for 4 pole devices during the space planning of the switchboard and switchroom.
- All control equipment housed within switchboards i.e. batteries, control gear etc. must be installed with external identifiers, indicating location and purpose of equipment within the switchboard.
- All switchboard removable panelling shall be c/w with handles, regardless of size, shape and overall dimensions.
- All essential services switchboards/switchboard sections shall be coloured RAL 5017 (Traffic Blue) - for projects with more than one RAL colour requirement such as datacentre projects where various distribution strings are proposed, this shall be agreed with the UoE BSG. Standard non-essential switchboards shall be RAL7035 (light grey) as manufacturers standard.
- Surge protection shall be provided on all main switchboards, and at all strategic network infrastructure locations points in accordance with BS EN 62305-1. The type/rating of SPD shall be selected by the lightning protection specialist. All SPDs fitted to switchboards and distribution boards shall be complete with LED visual indication of operation/status.
- Provision for internal arc fault detection shall be provided on main switchboards and control gear assemblies for specialist applications only or deemed necessary under project requirements.
- Switchboards shall be complete with a minimum of 25% spare outgoing devices/capacity. Note spare ways shall be fully fitted out with a mixture of fuse/switch ratings. Provision to be agreed with UoE BSG.

All LV switchboards at a building intake position shall be designed to have an external generator connection in line with the following requirements:

- Temporary generator connection point (RAL 5017), sized to match the main intake capacity or busbar capacity c/w interlocking scheme. Connection to the switchboard shall be via Litton Powerlock connectors. Liaison with UoE 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.

- Electrical Consultant/Contractor shall include within their tender documentation for temporary generator connection switch and building to be tested on generator during T59 procedure – for the avoidance of doubt, cost associated will be for Electrical Contractor to arrange the delivery of temporary generator to site and undertake necessary changeover demonstration and testing.
- Provision for temporary generator cabling entry point (Letterbox arrangement) shall be designed and included within the building fabric package – further details can be provided by UoE BSG.

As-installed drawings, switching information and ancillary items shall be provided within HV, LV & TX switchrooms as follows:

- Provide and fix to wall within 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 HV, TX and LV switchrooms a full sized A0/A1 framed earthing schematic.
- Provide and fix to wall within 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 UoE BSG for future reference.
- Overhead busbar GA/manufacturers drawings and switchroom layout drawings shall also be provided.
- Provide full sized rubber to IEC61111 in front of all HV and LV switchboards with minimum thickness of 3mm.
- 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 outgoing protective devices on the main switchboard for equipment noted above (PFC/Harmonic filters) shall be provided as a minimum during construction.

LV switchgear design and protective device settings information to be provided for all projects:

- All HV/LV electrical distribution project design shall be submitted to the UoE 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.
- It is imperative that the designer ascertains SPEN incoming HV/LV protective device & relay settings early in the design process to allow full coordination and selectivity study to be carried out ahead of final SPEN equipment procurement to allow final protection provision to be confirmed with SPEN.
- Prior to building handover and practical completion, all switchboards, sub-main switchboards, distributions boards and panels shall be dirt, dust and swarf free. Site inspection shall be undertaken to confirm, Electrical Contractor shall allow for electrical shut down duties to accommodate.

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 supplybusbars.
- 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/or electrical interlocking shall be agreed in conjunction with the UoE 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 UoE 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 UoE 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 UoE BSG for final signage guidance

Labelling shall be fitted to switchboards, distribution boards and separate items of switchgear also including rising busbars, end feed units and tap-offs etc. Labels 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

On all UoE projects, all TP&N distribution boards and SP&N consumer units shall be provided in line with the following requirements:

- All MCB distribution boards shall comply with the relevant parts of BS EN 61439 and BS EN 60947.
- All MCB distribution boards shall be fabricated from rust protected sheet steel and be coated with epoxy powder paint the finished colour to be manufacturers standard.
- Fully shrouded main bus bar assembly which shall include integral provision for shrouding of live parts of a spare way (or their electrical disconnection) and the line terminals of outgoing MCB ways. Where boots or similar devices are supplied to cover live parts of spare ways the board will be deemed not to comply with this requirement.
- Hinged, key lockable front access door and suitable for wall mounting and providing protection to IP3X conforming to IEC 61439 with 250A rated fully shrouded copper busbar and fully rated neutral bar. In-built key 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

- Distribution boards in plant or identified water ingress risk areas shall come c/w with a higher degree of protection IP43
- Suitably rated integral isolator/switch disconnector
- Plastic vision panels on distribution board doors are not permitted
- Suitably sized dual earth terminal bar. The earth bar shall have as many ways as outgoing ways with terminals available for the purposes of supplementary bonding.
- Neutral bars shall be supplied complete with insulating cover requiring the use of a tool to facilitate its removal. The neutral bar shall as a minimum have as many ways as outgoing SP ways
- Final circuit cabling within the distribution board shall be adequately labelled in strict accordance with BS7671:2018, section 514.5
- Separate lighting and power boards are to be provided throughout. Use of combined, split metered boards shall be agreed with the UoE 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 – spare capacity lower than 25% shall be agreed with UoE BSG during detailed design or on site construction stage.
- Note the UoE preference is to provide distribution board spare ways with a full complement of protective devices for tender purposes. Where distribution boards have a large number of future spare ways, a mix of MCBs and blanking poles can be provided, Plastic blanking plates should be avoided.
- Where the contractor proposes to utilise distribution boards complete with pre-manufactured “header/riser” trunking assemblies, the associated trunking system must be of the same type and quality as the primary containment system trunking including the provision of IP4X straps or overlapping lids at section joints to maintain cable protection throughout.

The following distribution board labelling provision is a specific requirement on all UoE projects:

- 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 UoE BSG for future use
- In addition to circuit chart provision, all outgoing circuits/ways on the distribution board fascia shall be labelled. Labels shall be printed text and not hand written.

Where essential services distribution boards are specified, they shall be in line with the following labelling and referencing:

- All essential services distribution boards must have additional traffolyte label to be added to the board as follows “THIS DISTRIBUTION BOARD IS SERVED FROM A GENERATOR BACKED SWITCHBOARD”. This label to be RAL5017 (blue) background with white engraved text.
- All Essential services distribution boards shall be identified in the naming convention by the prefix “E” for example 1F/EP1- denotes First Floor/Essential power board No1

Distribution board location and electrical riser cupboard requirements:

- All distribution boards are to be installed within secure, lockable electrical fire rated cupboards, risers, switchrooms etc. Distribution board risers etc should not be shared with other mechanical services. Exposed distribution boards are not permitted. Dedicated distribution boards for areas such as laboratories can be located local to the room served, these must have key lockable doors. Locations to be agreed with UoE BSG.
- Electrical riser cupboard doors should be full height/width to offer unrestricted access to the electrical equipment and doors should be lockable and suited on the 1-2 key. Provision of both budget locks and key locks on electrical risers should be avoided.

Re-use of Existing distribution boards within refurbishment projects:

- For minor works or smaller refurbishment projects where existing distribution boards are proposed to be retained and reused, the electrical consultant must ascertain early in the design process whether the existing boards are suitable for reuse and protective devices are available, also that the board is compatible with single module RCBOs/AFDDs where required.
- If the existing boards are not compatible, then new distribution boards shall be allowed for within the project scope.
- Any existing distribution board being retained with new circuits being added as part of a refurbishment project must also retain and minimum of 10% spare ways otherwise a new board shall be allowed for.
- The use of existing distribution boards must be agreed during the design stage with the UoE BSG.

3.6 Building Energy Management Systems

Controls and BEMS proposals for any project should be reviewed with the UoE Controls team. Refer to Estates Design Guideline 4 (BEMS) for all BEMS and controls related design guidance. This includes power and wiring requirements.

It is the responsibility of designers and contractors to ensure that they have fully familiarised themselves with the requirements of EDGL4 and have incorporated these requirements within their design before these are presented for review with the

University. Below are some key items for which allowance should be made in the design:

- For all new build projects, Schneider EcoStructure or Trend systems shall be designed, installed and commissioned by the incumbent controls specialist contractors with proven knowledge of the University Estates Design Guidelines and the requirements of the UoE Controls team.
- For refurbishment projects, works to existing Schneider or Trend systems shall be designed, installed and commissioned by the incumbent controls specialist contractors with proven knowledge of the University Estates Design Guidelines and the requirements of the UoE Controls team.
- All power supplies for mechanical equipment shall derive from a separate distribution board mounted adjacent to the BEMS control panel. The provision of the distribution board, including protective devices, SPD and the wiring of outgoing ways shall be incorporated within the controls package. The electrical contractor shall be responsible for terminating the submain cable into the distribution board main isolator. The controls contractor and electrical contractor must coordinate their responsibilities/work to ensure correct glanding kits are supplied and check correct protective device and cable ratings are selected for these supplies.
- The controls contractor shall be responsible for all outgoing supplies from the BEMS power distribution board. The appropriate NICEIC certification must be provided for the BEMS power installation.
- All power supplies derived from the mechanical control panel distribution board shall be provided with a local isolator to isolate all power supplies & controls circuit at the plant/equipment served.
- Where power supplies are provided to individual items of mechanical plant that also require a 24v control circuit, an isolator with the appropriate number of poles (e.g. 5 or 6 pole) must be provided so that both the mains and control circuit are isolated. The electrical contractor/consultant must liaise with the controls contractor to agree requirements.
- All HVAC plant shall be connected directly into the BEMS and completely controlled via the BEMS. Packaged controls are not permitted.
- All control valves and actuators controlled by the BEMS shall be supplied by the controls specialist.
- Ensure that any works to existing controls allow for complete removal of any redundant elements. Legacy issues identified with existing controls should also be identified early in the project.
- Prior to controls demonstrations at handover on any project, the pre-demonstration controls handover checklist should be completed and returned to the UoE Controls team. This can be found within EDGL4.

Mechanical power distribution boards & associated power supplies to items of mechanical plant shall be provided in line with the following requirements:

- All power supplies for mechanical equipment shall derive from a separate dedicated distribution board mounted adjacent to the BEMS control panel as described above.
- However, where required and to suit specific plant, larger items of plant e.g. chillers, ASHPs etc, can be supplied directly from electrical switchboards due to the higher electrical loads of these equipment. The supplies to these items of plant shall be installed by the electrical contractor.
- Supplies to local "on-floor" mechanical services supplies such as fan coil units, point of use water heaters, local extract fans and the like shall be derived from local dedicated mechanical services distribution boards by the electrical contractor. Further consideration may be required for certain power supplies, such as immersion heaters, DOL equipment etc.
- All supplies to mechanical equipment must be provided with appropriate isolator switches so that both the mains and control circuits are isolated.
- The final supply and metering strategy for mechanical services must be discussed and agreed with the UoE Energy team and BSG.

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

Circuit protective devices shall be selected and provided to suit the project requirements as follows:

- Design team shall ascertain electrical characteristics of specialist equipment from End-User representatives during early RIBA design stages to ensure final circuit design and protective device is appropriate.
- 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
- 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

Miniature Circuit Breakers (MCB's)

- Shall be manufactured to IEC 60898/IEC 60947-2 (where appropriate)
- MCBs shall be selected to ensure their fault rating is suitable for the installation and full selectivity between MCBs and upstream devices shall be provided.

- Where MCBs are combined with RCDs and AFDDs, single module devices shall be utilised.

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.
- Refer to Section 9.2 for further details on UoE BSG policy on the application of RCBOs.

Arc Fault Detection Devices (AFDD)

The use of AFDD equipment complying with BS EN 62606 is now a requirement for specific applications under BS 7671:2018+A2:2022 18th Edition and IEC 60364-4-42 to mitigate the risk of electrical fires caused by electrical arc events due to faulty wiring, appliances and other fixed electrical equipment.
Combined AFD/RCBO devices utilised on UoE projects shall be of single module construction, where applicable.

Under the scope of works for UoE projects, the Electrical Consultant/Contractor shall include arc fault detection equipment where required, and in the following applications;

- All 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 e.g. wooden buildings
- 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)

AFDDs shall be utilised, where applicable, in the following scenarios that could result in fire; parallel arc, series arc or 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).

AFDDs 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

AFDDs 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

3.8 Transient Voltage Surge Suppression Equipment

Surge protection devices to BS EN 61643 shall be installed in accordance with BS EN 62305-4 and BS 7671:2018+A2:2022 18th Edition, with reference to Chapter 534.

The electrical consultant or specialist design contractor shall ensure that all SPDs are coordinated across lightning protection zones to provide a layered system of protection. The main electrical distribution network shall be fitted with strategically located surge suppression 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. As a general guide the following provision is anticipated:

- All incoming/outgoing service cables (power and comms etc) at the LPZ 0-1 boundary shall be provided with combined Type 1-2 SPDs, this shall typically be at main switchboards and sub-boards or control panels serving items of plant external to the building.
- Protect all internal electrical and electronic equipment at the LPZ1-2 boundary with a coordinated provision of type 2 SPDs, this shall include all internal distribution boards and control panels.
- Where required Type 3 SPDs shall be provided to protect items of sensitive/specialist end user equipment. Electrical Consultant in conjunction with End User representatives shall review specialist user equipment to be used within the project building/facility, giving special consideration to the type of surge protection required to protect specialist equipment and whether separate circuits are required for specialist equipment.
- All SPDs installed within switchboards and distribution boards shall be provided with physical flag indicators to visually indicate the status (healthy, operated etc) of the SPD unit.

The supply chain for SPD's must meet the following requirements:

- NICEIC (SELECT) certifying, testing and certification process
- 10 year no quibble warranty on all SPD equipment
- Full design responsibility
- All fusing systems must have reverse fail LED light - warning system
- All fuse carriers must be rated at 1000V
- All SPD equipment to be 20 percent overrated with thermal trip internally fitted

3.9 Power Factor Correction and Harmonic Filtering

To establish the requirements for power factor correction and harmonic filtering, it will be necessary for the electrical designer 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 UoE 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 with adequate space to house power factor correction equipment should it ever be a future requirement.

Where required, the PFC equipment provided under the contract works shall be housed within a dedicated ventilated cubicle with a door interlocked isolator/fused switch. Capacitors shall generally be in banks of 25kVAr and shall be automatically controlled. PFC reactors shall be de-tuned to reduce third harmonic distortion.

3.10 Uninterruptible Power Supply (UPS)

It shall be noted, should there be a request by End-User representatives during early RIBA stage consultations for UPS back-up to be implemented as part of the main electrical infrastructure or localised to specific electrical infrastructure areas, these UPS systems shall be deemed as a departmental item of equipment.

It will be the responsibility of the School/Department to appoint a specialist maintenance contractor and associated service contract to undertake planned and reactive maintenance, including all repairs, breakdowns and emergency response.

As UoE Estates projects can significantly differ in scope, in relation to criticality and nature, early engagement is essential with both End-Users in consultation with UoE BSG to ensure the UPS requirements and overall performance and installation is agreed.

A responsibility matrix shall be agreed between UoE End-Users and UoE Estates.

This section does not apply to UPS requirements by UoE ISG. Please refer to UoE ISG IT Infrastructure Standards V2.1 2019 – please consult with IS Project Manager during project consultations for confirmation.

3.11 Automatic Metering & Targeting System

For all new building projects and major refurbishment projects a networked Automatic Metering & Targeting System shall be provided as part of the contract. The AM&T system shall be as EL Components.

Refer to Estate Design Guideline No. 5 Metering for further information on the full requirements of the AM&T system.

The AM&T Metering system gateway shall be installed in an accessible location beside switchgear. All electricity, heat and water submeters meters shall be operational and connected to UoE El Components system. This includes local submeters at distribution boards etc.

The consultant/contractor must liaise with the UOE metering team during the early stages of design to agree final requirements and responsibilities.

It is the responsibility of the contractor to ensure that the metering system is fully operational and demonstrated to the UoE Energy Team prior to handover.

The UoE Energy Team should be invited to visit site during construction to review installation locations of gateways and meters and to confirm the commissioning process.

Also as part of the T59B process a site review of all sub-meters shall be carried out by the consultant and contractor in conjunction with the UOE metering team

3.12 General Earthing & Bonding

An earthing and bonding system comprising earth bars and copper conductors shall be installed in accordance with BS7671 and BS7430. Earthing and bonding shall be effected by utilising earthed steel containment and the outer sheath of steel wire armoured cables and dedicated earthing and bonding conductors.

Suitably sized copper earth bars shall be installed in the switchroom, and shall have a minimum of 20% spare capacity.

The electrical system shall be earthed at the main switchroom either via the earth connection provided by the utility or by establishing an earth nest using a buried copper earthing grid to connect into the general mass of earth. The earthing and bonding connections shall include but may not be limited to:

- Main Equipotential Bonding
- Incoming Gas Main
- Incoming Water Main

- Incoming Comms Ducts/Steel Pipes
- Lightning Protection System, if applicable
- Electrical Cable Earthing
- Interconnection to the utility earth (if permitted)
- Functional/Clean Comms Room Earthing
- Mechanical ductwork/pipework
- Structural steelwork
- Metal sinks, basins, etc.
- Suspended ceiling systems
- PV system

The Contractor shall supply and install rubber mats full length in front of all switchgear

Clean earth bars shall be installed within all main and secondary comms cabinet rooms with dedicated clean earth conductor to the building main earth bar. A dedicated earth cable (minimum 16sq.mm) shall be provided from the comms room earth bar to each data cabinet. Refer to UoE IT Standards Guidelines document for further requirements.

4.0 Emergency Generator and Controls

4.0 Emergency Generator and Controls

4.1 Generator Standard Requirements

Stand-by electrical generators shall comply fully with current edition/amendment of BS ISO 8528, ISO 3046, BS5000 and BS EN 60034-22: 2009 and all associated parts where applicable.

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 UoE BSG to suit project and future operational event

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 agreed with the UoE BSG

Agreement with the UoE 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 UoE 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 the 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 UoE BSG), c/w fuel transfer system and associated alarms (overfill, low fuel and bund leak alarms), , non-return valve, 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 are no longer permitted, any exception to this shall be agreed with the UoE 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 is the UoE preferred arrangement (Set mounting of the Generator Main ACB must be agreed with UoE BSG).
- 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 UoE 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 UoE BSG
- As installed, A1 sized, framed electrical distribution schematic and electrical safety/noise/automatic start up notifications
- Generator/controls GA, wiring and location drawings along with mobile generator switching principle document/drawing to be wall mounted within switchroom and at generator switching location. Electronic version to be sent to UoE BSG for future reference

4.2 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.

The generator fuel filling system must be carefully considered especially where the fuel fill point is remote from the generator set and both fuel fill level indictor and over fill alarms must be included within the filling system control panel. These shall be linked to the BMES.

4.3 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 UoE BSG.

Load bank connection point shall be provided for all generators, this shall normally be a via a dedicated way on the Essential Services switchboard or on the generator output panel, agree the final provision with UoE BSG. Cable connection to be via Litton Powerlock connectors and key interlocking is to be provided for the load bank connection.

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

Generator load bank test to be run at:

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

4.4 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.

4.5 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.

4.6 Control Philosophy for Mains Failure/Mains Restoration

The Electrical Consulting Engineer/Contractor shall provide to the UoE 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 UoE 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.

Generator control philosophy diagram shall be mounted adjacent to all generator control panels in A1 sized framing, and provided electronically on CAD to UoE BSG.

Generator control panel shall be c/w "BLACK START TEST" labelled test key switch.

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.

Please note: 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.

4.7 Life Safety Systems Supplies and Infrastructure

Generally the provision of standby generator back-up on UoE projects is for infrastructure power resilience purposes only and to allow maintenance of electrical plant.

Unless there is a specific project requirement such as firefighting lifts or evacuation lifts, mechanical smoke extract/ventilation systems or other critical life safety service, it is not anticipated that the requirements of BS8519:2020 will require to be implemented on UoE projects.

Where there is a specific project requirement, the electrical distribution systems serving critical life safety systems shall generally meet the requirements of BS8519-2020 Selection and Installation of Fire-resistant Power and Control Cable Systems for Life Safety, Fire Fighting and other Critical Applications and BSRIA Life Safety and Firefighting Power Supplies (BG 70_2021).

The Electrical Consulting Engineer/Contractor shall consult with the UoE BSG representative to agree the proposed distribution system and proposals to meet these requirements. It is understood that full compliance with the above requirements may not be achievable in every project. In these instances, the Electrical Consulting Engineer/Contractor shall detail any derogations from the above standards for agreement with the UoE BSG.

5.0 Cable Installations

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 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 both at horizontal & vertical riser penetrations.

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 UoE 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:

System	Cable Types
Mains and sub-mains cablings	Cu XLPE/SWA/LS0H
Small power circuit wring	Cu LS0H singles
Lighting circuits	Cu LS0H singles
Fire alarm detection and warning, including network cabling	Cu Enhanced grade Soft Skin and approved to LPCB certified cable standards only
Specialist equipment and security	As per manufacturer's recommendations and system
Life Safety Systems Cabling including smoke curtains, EVCS & AOVS	Fire resistant cabling with fire survival rating appropriate to the system/use
Site Temporary Cabling	Cu XLPE/SWA/LS0H
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 UoE BSG.

Site temporary cabling shall be in line with the requirements of IET Guide to Temporary Electrical Systems. All site temporary containment must be adequately supported to avoid premature collapse of cabling in the event of a fire.

LSX screened cabling shall only be considered in specific cases where there is a clear benefit to the project in terms of programme and limitations on containment routes due to building fabric make up etc. LSX screened cabling may typically be appropriate for refurbishment projects to avoid disruption to existing building fabric etc. The final cable strategy to be agreed with UoE BSG during the design stage.

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 UoE 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 UoE BSG during early design stages. Generally the requirements of BS6701:2016+A1:2017 must be met. For billing/Tender 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 UoE BSG. Cables with performance rating of Dca shall only be used upon agreement with UoE BSG in specific circumstances.

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 and data structured cabling shall be installed on their own separate containment systems. 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. This requirement applies to both primary and secondary containment systems.

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	Required 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 Security installations	Separate medium duty Cable tray/basket in conduit only
For fire alarm installations	Separate medium duty Cable tray/basket in conduit only
Sub mains cabling	Galvanised heavy duty cable tray or ladder rack
BEMS Control Cabling	Separate cable basket/heavy duty tray/trunking

6.0 Cable Containment and Associated Fittings

6.0 Cable Containment and Associated Fittings

6.1 Containment Systems - General Requirements

Where only the main containment routes are shown on the design drawings, the Electrical Contractor shall include for, supply and installation of all main and secondary containment. These must meet the standards set out within this guideline and any exception to this must be approved by UoE BSG. The costs for the full containment systems shall be included within the Tender return.

All containment shall be provided with manufacturers proprietary earth continuity copper straps, mounted on both sides of each connecting section. For trunking this will normally be solid earth continuity links, for tray/baskets/ladder solid or braided continuity connectors can be used. Note this is UoE requirement over and above IET regulations.

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 1.2m 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.

Where containment is supported from walls, these should be offset away from the wall by 100-150mm to allow other vertical services to pass behind.

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 UoE 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. This requirement applies to both primary and secondary containment systems. Electrical Consultant/Contractor shall ensure separate containment is provided as part of the project design. Any departure from this requirement shall be agreed in writing from UoE BSG prior to tender/construction stages.

The electrical contractor shall provide appropriate labels to BEMS trunking/tray/basket throughout the containment route length indicating that this containment is “FOR BMS CONTROLS CABLING ONLY”.

6.2 Metal Trunking Systems

Cable trunking shall be manufactured from galvanised sheet steel and be of an approved manufacture. All trunking systems shall be fitted with turnbuckle lids with overlapping edges. Each trunking lid section must be securely fixed.

All trunking system section joints shall be provided with IP4X straps or overlapping lids to maintain cable protection throughout.

Cables within trunking shall be tied at 5m intervals for cables of the same circuit reference. Label ties with circuit reference number at 10 m intervals.

Cable trunking shall be used when three or more conduits are run in parallel

6.3 PVC Trunkings and Multi Compartment PVC Trunkings

Application – dado and skirting trunkings only. PVC trunking shall not be permitted for use as general containment systems.

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.

6.4 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 20 or 25mm diameter. The UoE preference is to generally utilise 25mm diameter conduits to aid future rewiring, however 20mm diameter conduits can be used in certain circumstances/areas, electrical consultant/contractor to consult with UoE BSG to agree provision. 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 UoE BSG. Where permitted, PVC conduits shall be best quality, high impact, rigid heavy gauge complying with BS 4607, supported by non-combustible metallic clips/supports. The PVC material shall have a high resistance to solutions of inorganic acids, alkalis, salts and organic chemicals.

Quick fit conduit (Conlock) 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 metal conduit may only be utilised for final connection to an item of plant.

6.5 Cable Basket

Where cable basket is specified it shall be electroplated heavy-duty cable basket made from high tensile strength 7mm diameter steel rod.

Where cable basket is fitted in floor voids these should be mounted and fixed on Uni-strut type brackets at not more than 1.2m intervals with additional fixings at bends, tees and intersections.

6.6 Cable Tray/Ladder

Containment shall be specified in accordance with BS EN 61537 current edition / amendment.

Cable Tray: Specify perforated galvanised steel, heavy-duty cable tray, return flange 50mm, as a minimum, and be of an approved manufacture.

All galvanised Cable Trays shall be manufactured from pre-galvanised mild steel, to BS EN 10143 with a minimum coating weight of 275g/m^2. Cable tray/ladders shall be capable of carrying without undue deflection, the total weight of cable likely to be carried on the tray regardless of the location of the joints.

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

Cable ladder: Specify galvanised steel, heavy-duty ladder, as a minimum, and be of an approved manufacture.

Ventilated cable tray covers shall be provided to all external trays. The covers shall provide an adequate gap along either side through which air can circulate. Ventilated cable tray covers shall be secured using proprietary clips and fixings in accordance with manufacturers recommendations.

6.7 Containment Workmanship

All electrical services must be installed to a level of workmanship suitable for exposed services and coordinated with other services.

The electrical contractor must allow for detailing and setting out all containment and conduit routes and agreeing these with the architect. For any feature or sensitive areas

requiring enhanced finishes, a typical mock up installation shall be required for sign of the required workmanship standard by the design team and UoE 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 1.2m intervals with provision for additional brackets/fixings at bends tees and interconnections.

Arrange conduit, trunking and ducting to present neat appearance, parallel with other service runs and lines of building construction, except where in screed or in-situ concrete. Ensure plumb vertical runs. The contractor shall consider the most appropriate method of containment for services connecting main containment runs to final outlets to avoid multiple/numerous conduit runs where trunking/basket would be more appropriate.

Drop rod supports for services shall be set out in a symmetrical and regimented layout/spacing. All Unistrut support rods shall be left with approx. 1 inch and ends fitted with caps. All Unistrut sections shall be fitted with white plastic end caps.

Provide clear distance of 150 mm (minimum) between underside of any cable supports and brackets and the topside of ceiling

All cable tray and ladder shall be designed suit the project electrical installation and to incorporate a minimum of 25% spare capacity for future cable installations. Electrical Consultant shall ensure as part of their design that consideration is given to cable arrangements/configurations, required spacing and correction factors.

Electrical Consultant/Contractor shall ensure all sub-main cabling is installed and spaced in accordance with design characteristics.

It shall be noted, the use of rod clips to support containment is not permitted.

Where cable basket/tray containment is routed within ceiling voids or raised access floor voids, the electrical designer must carry out a review with the Architect to ensure all containment routes are fully accessible. This review must include floor tile types, floor covering/finishes and ceiling types. In general, full accessibility to containment installations is required to enable future rewiring/maintenance of the installation.

Where existing containment is proposed to be retained and reused as part of any refurbishment works, the designer must ensure that the containment has adequate capacity for the proposed alterations and additional circuits and that spare capacity is still maintained. The existing containment shall also be reviewed to ensure that differing voltage bands and services are provided with separate containment in line with new installations prior to acceptance of reusing existing containment. The requirements for earth straps and IP4X covers etc described previously shall also be applied to any existing containment being reused.

6.8 Containment and Cabling with Protected Escape Routes.

Containment and cabling routes shall take into account the requirements of section 422 of BS 7671 in relation to protected escape routes. The Electrical Consulting Engineer/Contractor must liaise with the project Fire Engineer and Architect in order to determine protected routes and appropriate containment/distribution routes.

6.9 Fire Stopping of Services

When electrical services pass through fire compartment walls or floors great care must be taken to ensure that the gaps between the services and structure are properly sealed for acoustic and fire rating properties.

To provide a method of future proofing of fire sealed services penetrations to allow the easy installation of additional cables etc, the use of proprietary fire stopping devices should be considered as a preference to the use of intumescent mastic. The most appropriate system will be dependent on the quantity of cables/services and containment system utilised. The designer shall consider the following suggested products:

- EZ Path fire stopping devices and grommets -
- Fire rated cable baskets
- Fire stop blocks, putties and plugs

Other similar products can also be considered. All fire stopping products must be fully certified for the intended application.

It shall be the responsibility of the Installer to ensure that all holes surrounding are filled for both acoustic and fire rating properties. It is the Installer's responsibility to fill all trunking internal spaces/voids with mineral fibre as detailed above.

The design team shall follow the guidance within the ASFP Fire Stopping of Services Penetrations - Best Practice and Design and Installation. The final selection and method of fire stopping of primary services routes shall be reviewed and agreed with UoE BSG/FSU during the design stage and prior to tender.

Where sockets and other electrical accessories are installed within fire compartment walls, the back boxes shall be fitted with intumescent putty pads. The back boxes must not be installed back-to-back. This requirement is in addition to any acoustic requirements for sockets in walls between rooms.

7.0 Lighting, Luminaires and Controls

7.0 Lighting, Luminaires and Controls

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 UoE BSG for review and final decision. LEDS are generally suitable for most uses and are often cost-effective when increased life spans are considered. Effective spacing and daylighting linking can also increase efficiency. Designers shall calculate the building's overall annual effective load and target less than 4W/m2 (wherever appropriate) for general lighting,

In line with the Universities sustainability policy, all new luminaires shall have a CIBSE TM66 Circular Economy Assessment Method (CEAM) minimum score of 2.0. The aspiration is that this will eventually increase to a minimum of 2.5 when more products are readily available. A TM66 CEAM certificate and Environmental Product Declaration (EPD) shall be provided for all luminaires during the technical submittal process.

All lighting installations shall meet the requirements of CIBSE Lighting Guides (including SLL Code for Lighting) and BS12464:1/2 where applicable and CIBSE TM40-Health and Wellbeing in Building Services

Lighting design and installations must also take into consideration the recommendations with SLL Factfile No.19 – Lighting for Neurodiversity. The specific requirements shall be agreed during the T18 consultation process.

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.

Electrical Consultant shall provide at all RIBA stages, lighting calculation reports for review by the UoE BSG which shall be linked to daylight, thermal comfort and energy studies (as requested in Estates Design Guide No.11 - Sustainable Design)

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 UoE BSG for review prior to acceptance of any alternative equipment.

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 control gear
- 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. The design team shall consult with the end-users to ascertain the brief requirements early in the early design stages as part of the T18 process.

All lighting design proposals, including lighting control systems and proposed control philosophy, shall be submitted to the UoE 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 areas such as, full building height atrium's, are not permitted. This applies to catenary wired/mounted internal luminaires also. Lighting scheme for such areas, shall be developed to allow full, safe access without the need for mobile platform equipment.

All luminaires must be securely fixed to, or independently suspended from the structure. No luminaires can be supported by the false ceilings unless otherwise instructed by the University.

Where luminaires are installed on suspended ceilings, adequate metal supports with locking adjustments from the housing of the fitting shall be provided so that the ceiling level can be obtained accurately.

Where luminaires are fixed direct to the building fabric, they shall be fixed strictly in accordance with the manufacturer's recommendations.

Downlight luminaires installed in ceiling tiles shall be provided with appropriate wooden backing plates and installed in accordance with manufacturers recommendations.

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 following table 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 / Controls**
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

Space or Location	Average Illuminance (Lux)	Comments / Controls
Audience area	300-500	
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. Lighting should also be designed to take account of varying heights of desks. Dimmable control gear shall be specified as standard.
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	300	Manual switching
Electrical Switch rooms – HV, LV, TX and Substations	300	Manual switching
Generator Locations/ Compounds	300	Manual Switching
Corridors including stair cores	200	Presence detection
Emergency lighting	As required but	Emergency lighting shall comply with BS5266,

Space or Location	Average Illuminance (Lux)	Comments / Controls
	not less than 1	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 plantrooms & electrical switchrooms	Minimum of 15	Compliance as noted above, luminaires shall not be installed directly over switchgear equipment. Includes all substations (HV/LV/TX), switchrooms, electrical cupboards/risers and generator locations
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)	Minimum of 15	Emergency lighting shall comply with BS5266 includes firefighting equipment and PPE locations
Sports facilities **General lighting** **Emergency/ standby lighting**	 As required by class As required but not less than 1	 In accordance with CIBSE LG4 In accordance with BS5266 and CIBSE LG4 Building specific, based on fire/evacuation strategy
External Roof Level	Minimum of 100 lux general and 15 lux emergency	Manual or automatic control where appropriate c/w hand/off/auto override
Building Accessibility Locations i.e. access ramps, LRV's, lifting appliances etc.	Various – general, emergency and external lighting levels	Lux levels shall be in strict accordance with BS8300-1/2 current edition /amendment. Emergency lighting in accordance with BS5266-1 shall be applied to these areas.

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

The University will also consider the installation of a “wireless controls” system where appropriate and agreed with BSG. The wireless system will use proximity limited communication system between either standalone sensors or sensors integrated into luminaires whereby each luminaire/sensor reacts to occupancy and daylight and transmits data via Bluetooth mesh or infra-red signal to nearby luminaires creating a cascade mesh effect throughout a building. The system must be able to be configured in different tiers from basic functionality “out the box” without expert commissioning, optimised set up to increase energy efficiency and finally customised configuration. The system will comprise gateways, sensors, DALI sensor nodes, mini passive nodes and wireless (battery-less) kinetic light switches and scene plates. The system will be able to be configured as a hybrid wireless/DALI wired system to suit different areas/uses as needed via wireless/DALI gateway. The system will incorporate an integral timeclock to allow time scheduling. The system will be available with bespoke dashboard software to allow remote monitoring of luminaire status/health etc. The lighting control system will be separate to the emergency lighting test system. The use of a wireless control system must be fully discussed and agreed with UoE BSG.

Lighting control systems with cloud-based architecture remote viewing/control functionality are also generally not required unless there is a specific project

requirement. and any proposal to utilise such a system must be fully discussed and agreed with the UoE BSG.

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.

Where the lighting control system requires access to the UoE IT network either locally or externally, the control system software will require to be assessed by UoE Estates IT team to ensure the UoE information security requirements are met. Generally the requirements of ISO certification ISO27001 for information security management systems shall be followed.

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

Control of luminaires, where applicable, shall be designed to meet the requirements of projects to be assessed under the UoE Sustainable Design guide recommendations.

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. Full first years maintenance and support for all lighting control systems shall also be included within the project scope.

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

All lighting control modules (LCMs) or similar connection equipment located within ceiling voids must be fully accessible and shall have their locations indicated by a discreet label/sticker provided on the ceiling grid/tile to provide easy indication of location for maintenance.

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

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.

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 UoE BSG.

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

A simple user guide on how to operate the lighting controls shall be provided separately to the O&M manual information. In addition, user operations shall be provided in each area where more complex controls are provided such as scene setting etc.

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 UoE 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 i.e. Absence Detection.

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 and lighting to revert to a set level each time the luminaries are switched on.

Arrange for the lighting controls to dim the row of luminaries adjacent to external elevations detecting a high daylight contribution internally, where applicable and agreed with BSG, note this provision may not be suitable to all rooms.

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 230V switching to be provided to all plant areas, these areas should not be controlled via the building lighting control system.

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

The lighting provision to external roof and plant areas should not be limited to walkways/access routes only but should cover the full external roof areas to ensure adequate illumination of roof areas for future access and maintenance.

Emergency lighting should also be provided to access routes/walkways to ensure safe means of escape from all external roof areas.

The type/style of luminaire specified for external roof areas must be a minimum of IP67 rating and must be suitable for installation externally and not under cover.

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 mains voltage light switches and control equipment shall be labelled with serving circuit reference (applies to all areas of the building). This shall include PIR sensors etc. ELV control devices do not require to have circuit labels.

Where lighting control modules are located within ceiling voids, the corresponding ceiling tile below the LCM location shall be labelled with a coloured sticker to allow easy identification of LCM locations. The exact requirements shall be agreed with the UoE BSG.

Lighting control system manufacturers wiring diagrams and as-fitted lighting control drawings with all installed addresses added shall be provided.

The lighting controls specialist shall provide detailed training to the UoE Operations staff over a day prior to handover. In addition to this, a step-by-step user guide in the form of a power point presentation/word document shall be provided which includes relevant screenshots and annotation/instructions showing menu steps etc to clearly show the operator the steps required to make basic changes to the system etc. The exact format and detail will be agreed with the UoE BSG.

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 also 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 the UoE Sustainable Design Guide, however, given the nature of the University of Edinburgh Estate, lighting may be required out with sustainability requirements for security reasons.

Lighting control and hours of operation should be discussed with the UoE BSG and 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.

The external lighting installation shall also consider the requirements for inclusive design such that enhanced illuminance levels are provided to accessible car parking spaces and entrance routes to a building, along with the selection and positioning of luminaires to avoid glare to all building users. Refer to the UoE Inclusive Design Standards for further details.

External lighting shall be Astro/solar time-clock controlled c/w hand/off/auto override facility as Sangamo Suntracker or approved equivalent. Any application that requires manual control shall be agreed with UoE 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.

Please note: Recessed, ground mounted luminaires and catenary mounted external luminaires are not permitted across the UoE Estate.

The proposed use of external lighting bollards to be agreed with UoE BSG prior to design/installation. These shall consider maintenance access and anti-vandalism provisions. The location of bollards should avoid vehicle traffic routes/parking.

On completion of external lighting works, a full set of external services drawings detailing 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 Emergency Lighting

8.0 Emergency Lighting

8.1 Standards

Emergency lighting shall be provided to comply with current legislation, Building Regulations, European Standards and British Standards including BS EN 1838, BS5266-1, BS 5499-4 current edition/amendment and The Health and Safety at Work Act. Luminaires should conform to the harmonised British and European Product Standard BSEN 60598-2-22, ICEL recommendations and Construction Product Regulations. All signs shall be in the form of Euro-pictogram legends with green background to ISO 7010.

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 BS5266-1, 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.

Designers must take cognisance of the use and risk of individual areas within a building and blanket provision of emergency lighting is not expected for areas/rooms under 60sq.m. However, meeting rooms and other areas which are bookable by non-staff members should be risk assessed to determine whether emergency lighting is required e.g. if expected to be used by public or persons with vision impairments.

Where areas are identified as high risk, it should be noted that the higher illumination levels for emergency lighting are only required to the specific high risk task area and not blanket throughout the room.

The designer shall also take into account the following within their design:

- Two emergency luminaires are required within each compartment of the escape route (other than small lobbies).
- Emergency lighting design to include points of emphasis such as fire alarm call points and extinguishers etc as noted in BS5266-1
- Emergency lighting to final point of safety to be considered.
- Exit signage indicating direction of travel to final exit shall be provided within each escape stair landing.

The final emergency lighting provision shall be agreed with the UoE BSG prior to tender.

For further details of the specific UoE requirements and processes associated with the emergency lighting installation in both existing and new buildings, please refer to appendix 6 of this design guide.

8.2 Works within Existing Buildings

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.

Within existing or new buildings where no ATS is present, luminaires with “self-test” function must not be specified for use on existing circuits with keyswitch test facilities. Emergency lighting test key switches shall be grouped at lighting distribution boards rather than within local rooms/areas.

Any new emergency luminaires shall be labelled to match the emergency lighting labelling schedule for the specific building. Refer to the emergency lighting handover requirements section for further details.

Where the existing legends are Euro Signs Directive 1996 compliant, new emergency exit sign luminaire legends to match the existing provision within the building may be allowed to avoid confusion. This provision shall be agreed with UoE BSG/FSU and building control prior to tender.

8.3 New Buildings & Major Refurbishments

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.

For large 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 and reporting 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 ATS system shall be as Philip Payne Specto XT, Clevertronics Zoneworks XT or equal and approved.

In smaller scale buildings, a manual key switch only emergency testing system may be provided. The electrical designer must consult with the UoE BSG to agree the most appropriate system during the design stage.

Please note: Standalone "self-test" luminaires shall not be specified on new or major refurbishment projects.

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. Emergency lighting test key switches are not required where an ATS is provided.

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

Self-contained LED luminaries shall be fitted with integral, nickel hydride, lithium iron phosphate & lithium Nanophosphate 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.

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/2.4GHz (depending on system manufacturer), 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.

Test records and site information shall be maintained in cloud data stored off-site via an ISO27001 accredited company. Cloud based information shall be subject to a Data Impact Assessment (DIPA).

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 500/1000No. emergency luminaires (depending on system manufacturer), that can be allocated and organised into operational groups. System shall be designed 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
- Centralised or De-centralised system types not permitted
- Self-contained, automatic self-test to be used
- 2No. handheld control devices provided at handover
- Minimum 6 year warranty including batteries.

8.4 Emergency Lighting Handover requirements.

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 key switch 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.

Refer to Appendix 6 for further details of emergency lighting systems handover, logbook, certification and operating & maintenance requirements.

Emergency Lighting Labelling

For both major existing/refurbishments and new building projects, where necessary all emergency luminaires shall be labelled in accordance with the UoE standard labelling requirements. Emergency luminaires shall generally be given a sequential number and labelled using numbered “dymo” labels with black text/yellow background. The contractor shall also populate an excel spreadsheet which the UoE shall provide the template for the contractor to complete and return in electronic format. The specific labelling requirements shall be advised by the UoE Compliance/maintenance team.

Emergency Lighting Operation Training

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.

A fully detailed User Guide written in plain English with appropriate screenshots and annotations/instructions showing menu steps etc must be provided for all Automatic Testing Systems with full instructions in the operation of the system, production of test reports and maintenance schedules etc.

9.0 Small Power Installation

9.0 Small Power Installation

9.1 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. Generally the preference is for either floor boxes or floor grommets with power bars for areas with raised access floors. Where floor boxes are specified, these shall have a minimum of two cable access flaps to ensure adequate cable space and provided with 5M un-fused tap-off as standard..

Twin socket outlets c/w integral USB charging 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. USB charging outlets shall not generally be provided at desk/workstations unless part of the above desk power provision. Desk power modules/power bars should not be daisy chained such that more than one desk is power from a single tap-off unless agreed with UoE BSG/users. The design team must agree with the UoE PM whether these form part of the contractor or FF&E fit out post contract works.

USB charging outlets whether separate or integrated into standard 13A sockets shall conform to the requirements of BS1363-2 and BS5733.

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 UoE 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.

Power provision to kitchen & tea prep areas must be carefully considered to ensure circuits are not overloaded. It is generally expected that dedicated radial/ring circuits shall be provided to tea prep areas to suit the proposed equipment with dedicated radial circuits for high load equipment such as water boilers, hot/chilled water taps etc. Note, it is not permitted to serve tea prep areas from underfloor busbars.

Zip Taps and similar instantaneous water heaters are not maintained by UoE Estates/Maintenance Services and are a departmental responsibility. End User team shall be advised of this during early stage T18 consultations.

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

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) as part of the RIBA Stage 2/3 briefing process.

Where underfloor power is provided in the form of 63A power busbar, the design team must ensure these are fully accessible in terms of floor construction and finishes. RCDs shall not generally be located on busbars and tap-offs shall generally be unfused type with prewired metallic flexible connections to floor boxes or power bars. Unless specifically required by end-users it is not a requirement to provide underfloor busbar with additional clean earths. End feed units shall be clearly labelled with circuit references. Busbars shall be fixed with manufacturers standard brackets.

Where floor boxes are specified, they shall be of steel construction with internal outlets to suit the user requirements. The outlet configuration shall be arranged to ensure that plugs with fixed leads are not obstructed by any data ports etc. Floor boxes shall generally include separate RCD protection modules. The depth of floor box shall be selected to provide adequate clearance both to the front and rear of the data outlet for Cat6A cable termination and RJ45/fly lead installation.

Where SELV supplies are required by the users, e.g. workshops or laboratories these shall be derived from appropriately sized safety transformer units. With MCB/RCD or RCBO outgoing protection. The supply to these transformers must consider any inrush currents and Type D MCBs are recommended.

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 areas 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.

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

Power supplies to comms cabinets/racks within MER &SERs shall generally via IEC60309 IP44 2P+N+E commando type switched socket outlet & plug for each PDU strip. Refer to UoE IT infrastructure standards for further details. The sockets for cabinets/rack shall generally be mounted on cable trunking located at the rear of the cabinet row at a maximum height of 400-500mm above the racks to allow easy access for isolation and maintenance.

Power supplies to freezers within laboratory areas etc shall preferably be supplied via local switched socket outlet with integral RCD protection to allow users to locally reset if required. Sockets should be in an accessible location. The circuit arrangement, RCD provision and operational requirements require to be carefully considered to avoid nuisance tripping etc. Final arrangements to be agreed with UoE BSG.

9.2 RCD Protection Requirements

It is UoE policy that RCD protection, where required under BS7671:2018 current edition/amendment, is NOT to be omitted from any UoE project and associated electrical installation. Risk assessing out the provision of RCDs is not generally accepted.

Please note, the final RCD strategy must be discussed with the UoE BSG and the designer must fully consider the final circuit design including equipment earth leakage to ensure sufficient circuits are provided to socket outlets to minimise nuisance tripping. Socket integrated RCDs can be considered on a case by case basis, with the preferred solution being RCD protection on all socket outlet final circuits installed within DB locations.

On occasions, where RCD protection is required to be remote from the distribution board, and integral to items of electrical equipment i.e. within floor service boxes or integrated into socket outlet, these shall be coordinated with area and furniture layouts, to ensure ease of access is provided. Note RCDs within floor boxes or integrated into sockets shall be passive/latching type to avoid nuisance tripping on power cuts.

Where there are sensitive equipment or possibility of high earth leakage currents (e.g. laboratory areas or freezer rooms etc) then RCDs shall be integrated into individual sockets rather than on the circuit to minimise any risk of nuisance tripping. Note integrated RCD sockets shall be passive/latching type to avoid nuisance tripping on power cuts.

For supplies to fume cupboards, the preferred solution is the supply to each fume cupboard to be a radial circuit terminating at a suitably rated isolator switch. The fume cupboard shall incorporate RCD protection on the incomer or integral to socket outlets within the fume cupboard. This provision avoids the duplication of RCD protection. The final strategy to be agreed with the UoE BSG for each project to suit the fume cupboard specification and user requirements.

Where the designer has identified a particular circuit or equipment with high earth leakage currents, they shall review the option of providing Si (Super Immunised) type RCBOs as a preference to omitting RCBO protection.

9.3 Accessories Requirements

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

Area	**Socket type/style**
Wet Areas	Surface mounted IP44/67 polycarbonate as appropriate.
Plantroom / switchrooms etc	surface mounted, metalclad.
Essential supply sockets	Red in colour with appropriate labelling, (PVC / metalclad where appropriate). Note: essential supply "spur" outlets shall also be red coloured. White coloured spur outlets with red rockers may be accepted on a case by case basis if the selected accessory manufacturer does not supply a red outlet as standard.
All other general areas	Generally recessed/surface white PVC / metalclad sockets where project brief dictates. Sockets shall be complete with **red** outboard rockers.

Please note: All socket outlets shall be provided with dual earth terminals.

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 (both wall mounted and on dado trunking).

- Light switches / control equipment
- Emergency system / life safety equipment devices
- Lift Controls etc.

The requirement for contrasting LRVs will be dependent on factors such as wall finishes etc which must be reviewed by the design team.

Where required, contrast of sockets and white finished walls will generally be achieved by either graphite/grey coloured cover plates with white rockers or white cover plates with red rockers and graphite surround accessory. Where white sockets are installed within dado trunking, contrasting trunking lid sections shall be provided.

The final strategy shall be agreed with the UoE BSG and building users.

The setting our of sockets, light switches and other outlets shall generally be in line with BS8300-2:2018 clause 15.7.2 and figure 18.

9.4 Outlet Back-boxes Requirements

Plastic fast fix back boxes for accessories are not permitted on the UoE Estate, any unauthorised use of these boxes will result in the installation being removed and metal back boxes fitted. All back boxes shall be constructed from pressed steel.

All back boxes shall be not less than 35 mm depth with adjustable lugs to ensure the connection unit are true and square. Ensure back boxes are flush with the wall finish and make any adjustment to depth using metal extension rings. The use of the wall finish depth as an extension of the box shall not be accepted.

All backboxes shall be compatible with the wiring system used and shall be complete with CPC terminal. The electrical contractor must ensure the earth terminal(s) of each accessory is connected to the box earth terminal with a green/yellow insulated protective conductor fly lead. The use of cover screws for earth continuity shall not be accepted.

9.5 Office Desk Power

The provision of power and data to office desks shall be carefully considered by the designer in discussion with the users and BSG. The inclusion of above/below desk power modules/bars must be agreed with the UoE Project Manager to determine whether these are within the project contract works or as part of the UoE FF&E fit out package.

For the provision of below/above desk power modules and bars the following guidance must be included:

- Standard “extension socket” type leads must not be used.
- Power bars etc must only be used for powering desk power such as PCs etc, they are not to be used for powering heaters or MFD printers and the like.
- Power bars and desktop power modules must be sourced from a reputable UK manufacturer
- Depending on whether fed directly from underfloor busbars or via a 13A plug from a floor box etc the power bars must comply with BS 7671 Requirements for electrical installations or BS 6396 Electrical systems in office furniture and educational furniture respectively.
- Each individual socket must be individually fused at 3.15Amps
- Requirement for RCD protection module on the power bar to be agreed with BSG depending on the existing circuit/socket arrangement and RCBO provision.

The use of portable power battery packs for workstation small power applications is generally discouraged. Where end users request the provision of such devices, the proposed use and scope must be carefully considered and discussed with the UoE BSG and FSU representatives. Any use of these devices not specifically agreed with UoE Estates is prohibited.

9.6 Small power for Audio Visual systems

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 meeting & teaching spaces systems 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.

9.7 Small power for Electric Smart Storage Heaters

Where specified within student residences projects all new smart storage heaters should be installed with two power supplies – one for the off-peak electricity supply and one for the peak supply.

The off-peak supply powers the storage heater function of the heater and uses the cheaper electricity rate, where available, to charge up the heaters overnight. The off-peak supply should be installed using an un-switched fused spur. This prevents users from turning off the off-peak switch, which prevents the storage heater function being used, and means the heaters will operate only on the peak supply as a fan heater. An unswitched fused spur means the heaters can operate in the most energy efficient and cost-effective way.

The peak supply powers the fan, boost function, controls and overall heater functionality. The peak supply should be installed using a switched spur. This switch can be turned off to completely disable all functions of the heater (when the users don't need any heating), and must be switched on for the heater to work.

The display panel has a battery (coin-type) which will maintain the settings on the heaters for 6-9 months when it is switched off at the wall. Allowances should be made for these batteries to be replaced in the future; the lifespan is quoted as >5 years in the installation manual.

The heater controls can be locked off to users with the use of a pin code, leaving the "boost" and "advance" modes available to be used. The UoE Energy team should be consulted with for the most appropriate settings (setpoints, time schedules and control locks) for new heaters.

10.0 Fire Detection Systems

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10.1 Fire Alarms General

The fire alarm system shall be fully compliant with BS5839-1:2025 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 Design Team will advise on the type of Fire Detection & Warning Systems to be installed as defined in BS 5839, Pt 1 2025 and in accordance with specific building design requirements and recommended/risk assessed within the relevant project fire engineering report.

The Fire Detection & Warning Systems will be a minimum of L1 category installation, to primarily to protect life. The final category proposed by the Design Team is to be reviewed in collaboration with the FSU, and must be included in the Fire Safety Strategy and Fire Safety Design Summary documents. An L1 category system shall be allowed for billing/tender purposes.

Where the building or refurbishment project includes the provision of “meeting pods” the designer must take cognisance of the guidance note published by the UoE FSU regarding detection and alarm provision within these pods. This guidance note can be provided upon request if required to suit individual projects. Further information is also provided within Design Guide No 9 Fire Safety Management.

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.

Due to the fire alarm system being a life safety system, it is the UoE preference where possible that the supply, installation and commissioning of the complete fire alarm system within new buildings is carried out by the UoE incumbent maintenance contractor in order to ensure familiarity with university procedures, this shall be discussed with the UoE BSG prior to tender.

For refurbishments, alterations, or modifications to existing buildings/systems all work associated with the fire alarm system must be carried out by the UoE incumbent maintenance contractor to avoid any issues with responsibilities between contractors.

For refurbishment/alterations to existing buildings it is imperative that any works instructed affecting fire alarms, that the updating and replacement of existing Fire Alarm Zone charts and detection layouts must be included in the project scope and provided under the contract. As-Installed zone charts rather than design intent plans to be supplied by the Contractor. Copies of existing zone charts held by the UoE can be issued to design team/contractor upon request.

Copy to be of as-installed all zone charts/plans must be installed on site adjacent to the main fire alarm panel and electronic copy issued to UoE BSG.

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

Fire Alarm Cables

All fire alarm detection and warning systems cabling shall utilise copper conductors with Enhanced grade Soft Skin insulation and approved to LPCB certified cable standards only.

The above requirement shall also apply to network cabling between fire panels. Note it is the UoE preference that all networked fire panels are hard wired and do not use wireless/radio transmission unless specifically agreed with UoE Estates/FSU.

Where alterations are being proposed to existing fire alarm systems, any new loop cabling shall be enhanced grade. Where the existing cabling is MICC type, the use of enhanced grade soft skin cabling in lieu of MICC cabling shall be agreed with the UoE BSG,

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 UoE 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)
- Evacuation strategies are to be agreed with UoE FSU. Note, UoE buildings should not be afforded any delay/phased evacuation arrangements unless specifically agreed with the UoE FSU.
- Fire detection alarm signal shall be connected to, and alert UoE Security via the UoE iStar critical alarm system
- The SFRS shall be alerted as soon as possible by the fastest means possible. This is normally by the person discovering the fire. This will be by operating the nearest alarm call point or by calling 999.

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 Control & Indicator Panel

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 contractor 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 UoE 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 (note the requirement for combined sounder/beacon bases to have separate addresses).

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 metalclad 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.

System Devices

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

On new build projects, combined programmable rate of rise heat and optical smoke "multi-sensor" devices are the Universities preferred option.

On existing buildings where a specific area of a building is being refurbished, the detector/sensor type shall match the provision elsewhere in the wider building and to suit the specific area/environment where installed.

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 UoE 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.

All automatic detectors must be positioned such that they are readily accessible for testing and maintenance. The design team and contractor must fully coordinate the installation of MEP services to ensure that smoke detectors mounted on soffits or in ceiling voids are not obstructed by other services below which renders these devices inaccessible.

If any smoke detector etc is found to be obstructed and not accessible for maintenance, then either the detector or other service will require to be relocated by the contractor prior to acceptance of the installation.

Automatic point detectors located within roof lights etc are not permitted due to accessibility. These areas shall be protected via aspirating systems with capillary outlets as required unless an appropriate mounting arrangement and access strategy for point detectors is agreed.

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.

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.

As a general guide the plant isolate button should isolate relays for BMS plant, fire curtains & access control during weekly tests. However, any lifts and the EVC system are to be kept off the isolation function to allow these to be tested routinely.

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 UoE preference is for the system devices to have the function to allow sounders to be silenced but VIDs/VADs continue to operate. Where combined sounder/beacon bases are installed these shall have separate addresses.

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.

On new build projects, all manual call points shall be provided with clear plastic protective cover plates to prevent inadvertent use as per the guidance in BS5839. On existing buildings where a specific area of a building is being refurbished, the provision of protective cover plates shall match the provision elsewhere in the wider building. A dedicated set of plans showing the manual call point locations (in addition to fire alarm as-fitted drawings) along with a table/list of call point locations shall be provided at handover to assist the building manager in weekly testing.

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.

10.2 Visual Alarm Devices

Visual Alarm 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.

Supplementary and proportional, visual indication (VIDs) shall be provided in all areas on UoE buildings/projects.

The provision of VADs/VIDs shall also consider any enclosed “meeting pods” being provided under the project scope to ensure where the required alarm audibility levels within the pod are not being met that supplementary visual indication devices are provided within the vicinity of the pods.

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

10.3 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
    - Areas 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.

Where aspirating dire detection systems are proposed these must be of the "laser scanning" type smoke detection units, FAAST detector units are not accepted on UoE projects.

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 areas 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. Where panels are located within risers, an identification label shall be provided on the riser door noting that aspirating panel located within. A dedicated set of plans showing the locations of Aspirating detection panels (in addition to fire alarm as-fitted drawings) shall be provided at handover to assist the building manager in weekly testing.

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.

10.4 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 areas 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.

10.5 Smoke Ventilation Systems

General

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

Mechanical Smoke Extract & Clearance Systems

Smoke extract or smoke control systems shall be designed by a suitably experienced Specialist in consultation with the UOE Development Engineer, UOE Fire Safety unit and the projects designated Fire Engineer. Refer to UoE Estates Design Guideline No.3 for further details.

Where an automatic smoke damper control system is proposed this shall be interfaced to the fire alarm system and BMES. Refer to Design Guide No 9 Fire Safety Management for further Guidance.

Natural Smoke Ventilation Automatic Openable Ventilators (AOVs)

The provision of natural smoke ventilation shall be discussed and agreed with UoE Fire Officer in principle.

The complete smoke ventilator(s) and control system shall comply with the requirements of BS EN 12101: Parts 1-10. The architect/design team must provide a compliance checklist for all smoke ventilation systems.

All cabling associated with the smoke ventilation system must be suitably fire rated, this shall include the mains power supply cabling.

The strategy of operation to be agreed with UoE Fire Officer and the BSG. 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. All control systems shall be c/w 24 hour battery back-up facility.

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 as part of the project works.

The associated controls for the smoke ventilation system and any AOV system required as part of the building fire strategy must be “open protocol” to allow open market maintenance.

The design team must consider the location of the associated smoke ventilation controls, battery and PSU enclosures to ensure that these are located within an easily accessible location for future maintenance. Location to be reviewed with the UoE BSG. Final locations of control/battery/PSUs shall be indicated and described on the fire alarm layout as-fitted drawings.

Local isolation is required at each PSU enclosure by means of an un-switched or key operated fused spur outlet with neon indicator and clearly labelled “smoke vent”.

The design team shall also consider the access and replacement strategy for the smoke ventilator/AOV including means of roof access, logistics of manhandling or lifting requirements for complete openable ventilator and method of removing and replacing the openable ventilator unit. The UoE BSG team must be consulted during the design stage to agree replacement strategy.

10.6 Smoke / Fire Curtains

The use of fire/smoke curtains shall be considered as a last resort in terms of fire strategy/compartmentation. The UoE preference is to utilise fire rated glazing or fixed systems rather than motorised where possible in order to minimise ongoing maintenance issues with fire curtains.

Where fire/smoke curtains are considered the only feasible option, the location of curtain motors and controllers must be considered by the design team to ensure these are located within an easily accessible and maintainable location. The access to these critical parts shall be demonstrated to the UoE prior to acceptance. Access via MEWP/spider lifts is not considered to be acceptable.

Local isolation is required at each system control panel by means of a switched fused spur outlet with neon indicator and clearly labelled with the system type.

All cabling associated with the smoke curtain installation must be suitably fire rated, this shall include the mains power supply cabling.

11.0 Assistance and Communication Systems

11.0 Assistance & Communication Systems

11.1 Emergency Voice Communication (EVC) System

An Emergency Voice Communication (EVC) system shall be provided in all buildings, where applicable, in accordance with BS9999, BS5839-9 and BS8300-1 and 2 current edition / amendment.

The EVC system shall be a hard-wired system utilising enhanced grade fire resistant cabling. Wireless systems are not permitted.

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, protected lift lobbies, external spaces or anywhere deemed a requirement under the project scope.

Outstation type and colour shall be designed and installed in accordance with specific building requirements including fire and evacuation strategies, the UoE preference is for green coloured outstations. Outstations shall generally be c/w induction loop, braille, tactile and luminescent text. The location and height of outstations must be reachable to wheelchair users.

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

Emergency lighting shall be provided at all TWS outstation locations, achieving no less than 5 lux as per BS5266-1.

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.

Generally, unless there is a specific project requirement, the EVC system shall not be interfaced to operate only on fire alarm signal, the EVC system shall be operational at all times to allow use during non-fire related building evacuations.

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.

11.2 Accessible Toilet Call Alarm System

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

- 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. The location of the reset button should be reachable from the WC in case of a false alarm.

11.3 Induction Loops

A fixed induction loop system shall be provided in accordance with BS8300-1/2 current edition/amendment at all front facing student/staff/general public reception areas (including library and café service points), all lecture theatres/auditorium, seminar/meeting rooms and all conference facilities. Appropriate signage shall also be provided.

Refer to UoE Estates Design Guide No12 – Inclusive Design or further guidance on the requirements for induction loops.

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 provision must be coordinated with the AV installation and agreed with the UoE Learning Spaces Technology Team.

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

11.4 Paging System

A building paging system, if deemed a requirement under the project scope, during End-User consultations or as part of the building, UoE Fire Safety Unit approved, fire escape strategy 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.

11.5 Other Distress Alarm Systems

In areas such as laboratories where there is lone working with a risk of injury, consideration should be given to the position of an emergency pull alarm or panic alarm button at the accessible workstation which signals to the security or servitor point. The alarm should also have an audible sound to alert the attention of passers-by. The designer shall consult with the UoE BSG and Inclusive design manager for project specific guidance.

12.0 Lightning Protection Systems

12.0 Lightning Protection System

12.1 Design Criteria

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 BS7671:2022 current edition/amendment.

Note the calculated risk level must clearly indicate the class of Lightning Protection System to be installed, general for UoE buildings an LPS class 3 or 4 is anticipated.

Once the CRL has been calculated and LPS identified, this must then inform the selection of Surge Protection Devices to correctly determine the Type of SPD and the maximum impulse current per pole.

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

12.2 Air Termination Network and Down Conductors

The UoE preference is for air termination network and down conductors to utilise copper conductors with PVC sheath. Generally, bare metal down conductors and air termination tape shall not be accepted. Installations, particularly down conductors, shall be discreet and unobtrusive particularly on listed building facades. The colour of PVC sheath shall be selected to best match the building façade finish.

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.

12.3 Earth Rods and Pits

Copper earth rods/plates shall be provided for each earth electrode c/w heavy-duty concrete earth pit and access cover. These must be clear and free of debris; particular attention shall be paid to access covers to ensure the lift eyes are clear of any ground finish materials etc.

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.

13.0 Security Installations

13.0 Security Installations

13.1 Security Systems General Requirements

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

Full details of the requirements for security systems including CCTV and Intruder alarm systems are provided within UoE Estates Design Guide No.8.

Requirements for access control systems should be referenced in Information Services – IT Infrastructure document V2.1 – May 2019. Please note, final consultation with the UoE CIS team is required during design stage to ensure the responsibilities and requirements are understood and incorporated within the contract.

Separate containment shall be provided throughout for security systems cabling.

13.2 Electronic Locking Devices

Note: all electronic locking devices must be 12Volt type with a maximum current draw of 3Amps to be compatible with the UoE supplied PSU equipment.

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 electronic locking devices 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, this provision shall normally take the form of motorised panic bar locking devices.

All access-controlled doors located on internal escape routes shall fail-safe open and shall also be provided with appropriate locking hardware to ensure that the locking device is mechanically overridden at all times, refer to UoE Estates Design Guide No.9 for further guidance.

The Design Team shall follow the requirements set out in section 2.9.18 – 21 of the Non-Domestic Technical Standards in relation to the provision of locking mechanism's (including the appropriate overrides) and their application throughout a building.

Access controlled door strategy (including review of locking devices) to be reviewed at an early design stage with nominated End-User groups, UoE BSG/ISG and Security.

13.3 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

14.0 IT Infrastructure

14.1 Design Criteria

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

Data connections required for specific items of equipment or users shall be agreed after discussion with the UoE Information Services Group (ISG), with reference to the Information Services – IT Infrastructure Standards document.

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.

Separate containment shall be provided throughout for IT infrastructure cabling.

14.2 BEMS systems

Please note the following requirements below

- For each Ethernet type controller a University IT network point(s) shall be installed within close proximity of each control panel and controller. Note a

network point is required for each individual controller and there may be a number of controllers in each BMES panel.

- the final number of data points must be agreed with the BMES specialist, however the consultant must allow sufficient quantity of network points at each control panel/outstation at tender.
- 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.

15.0 Electric Vehicle and Bicycle Battery Charging Points

15.0 Electric Vehicle and Bicycle Battery Charging Points

15.1 General

The Project Design Team shall consult with the University of Edinburgh's Project Manager during RIBA early stages to ascertain if electric vehicle/bicycle charging points form part of the strategy for that particular project. The provision of charging points shall also be in accordance with the City of Edinburgh Council Planning policy for new projects.

15.2 Electric Vehicle Charging Facilities

Should vehicle charging points be required, they shall be in compliance with BS7671:2018 current edition/amendment, specifically section 722, IET Code of Practice for Electric Vehicle Charging Equipment recent edition and IEC 62893 1-3:2017.

The design team must liaise the UoE BSG and FSU to agree project specific requirements for vehicle charging point locations and equipment (charger types).

UoE BSG at design stage. Specific project requirements may come from Planning Conditions and the design team must consult with the relevant local authority. In addition the UoE may stipulate installing duct infrastructure for future EV charging facilities, these shall be agreed with the UoE PM and BSG during the briefing stage.

EV Charge Point Technical Specification:

- Rating: Either 1P+N+PE 7.4KW 32A Fast charge or 3P+N+PE 22KW 32A rapid chargers
- Dual or single charging outlets
- Integrated Load management software
- Type 2 shuttered socket outlet
- Mode 3 PWM control
- Overcurrent & safety protection MCB & RCD
- Class 2 Surge protection
- RFID reader

The location of any electric vehicle charging points shall be carefully considered during the design stage, generally charging points shall be located external to buildings and not within basement or enclosed carparks.

The specific requirements for earthing of vehicle charging system shall be taken into account by the designer, the UoE BSG preference is to avoid the use of TT earthing systems and to utilise an O-PEN protective device.

The EVC specialist supplier/installer shall provide full management support for billing and administration processes for 12months. Note OCPP (Open Charge Point Protocol) compliant software (OCPP1.5 or 1.6J) is required for back of house systems

EV charger units shall have 4G/GPRS/GSM and wi-fi connectivity. All existing EVC units on the UoE Estate operate on the Chargeplace Scotland network, https://chargeplacescotland.org/. This is currently under review and the design team must consult with the UoE BSG for final requirements.

15.3 Electric Bicycle Charging Facilities.

The increased use of electric bicycles shall be taken into account by the design team where provision of cycle storage facilities is provided. The provision and location of charging facilities for electric bicycles and the particular fire risks these present shall be carefully considered. The design team must liaise the UoE BSG and FSU to agree project specific requirements. Charging of electric scooters are not permitted within UoE buildings as it is currently illegal to ride them on public property/land in the UK.

Reference must be made to the UoE FSU risk assessment for the storage and charging of e-bikes, a copy of this risk assessment can be provided upon request.

The following enhanced fire safety provisions shall be considered in the electrical systems design:

Internal Storage and charging facilities

Fire resistant compartment (Medium duration with FD60S doors)
Sprinkler suppression is not recommended

- Combustible wall and ceiling linings are not permitted
- Existing fire alarm system to be extended to incorporate automatic detection (combined smoke/heat sensor) and break glass call points within the charging location.
- Local aspirating detection system to the charging area to provide alert warning to the main building fire alarm system.
- RCDs provided for each charging socket
- Charging facilities restricted to 4 hour charges via timeclock/contactor or similar arrangement
- Auto electricity shut off upon activation of the fire alarm system
- No combustible storage permitted
- Secure access provided

- Electro-mechanical locking devices provided for rooms with a single means of escape
- Suitable 'Lithium-ion hazard warning signage clearly displayed
- A 'Fire Action Notice' displayed adjacent to the exit door
- If the facility is to be in a true basement (accessed only from the level above), additional advice should be obtained from the FSU.

External storage and charging facilities

- RCDs provided for each charging socket
- Charging facilities restricted to 4 hour charges
- Auto electricity shut off upon activation of the fire alarm system
- Auto shut off if temperature reaches -4oC
- No combustible storage permitted
- Secure access provided
- Electro-mechanical locking devices provided for facilities with a single means of escape
- Suitable 'Lithium-ion hazard warning signage clearly displayed
- A 'Fire Action Notice' displayed adjacent to the exit door

If the facility has additional facilities therein (electrical switchgear, bin storage etc.), additional advice should be obtained from the FSU

15.4 Other Battery Charging Facilities.

Where the end users or school/department have requested battery charging facilities for charging of wheelchairs, laptops or portable radio batteries etc, the charging facilities for these must be carefully considered. The designers shall also take cognisance of UoE FSU Guidance note 14a for battery storage.

The design team shall liaise with the UoE BSG/H&S/FSU teams for agree project specific risks and any mitigation protocols required to be included in the design.

16.0 Utility Application, Planning and Management

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 for quotations 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. The final connection quotes will then normally be paid and accepted by the University.

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.

Note it is the UoE preference for all projects to apply direct to the local utility asset owner (SPEN) for new electricity connections rather than utilising IDNO/ICP providers. Should there be a specific requirement to utilise a multi utility contractor this must be discussed and agreed by the UoE BSG.

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

17.0 Photovoltaic (PV) Installations

17.1 Standards and Regulations

The complete Photovoltaic (PV) installation shall comply with the following publications:

- BS7671:2018 current edition/amendment,
- BS EN 62446-1:2016+A1: 2018,
- Microgeneration Certification Scheme (MCS) Microgeneration Installation Standard MIS 3002 Installation standards
- 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

In addition to the above, all PV installations shall meet the requirements of the RICS RC62: Recommendations for fire safety with photovoltaic panel installations

The Electrical Consultant, Electrical Contractor and PV specialist shall complete and submit the RC62 design and installation checklist at the appropriate project stages and submit to the UoE BSG Representative for approval.

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.

- Single installation covered by G98:
  - Notification to DNO must be completed within 28 days of commissioning

- 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

- 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 and 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

Performance Guarantee

As part of the tender return, the Contractor shall provide as part of his proposal:

- Maximum anticipated annual power contribution information
- Average anticipated annual power contribution information
- Guaranteed minimum annual power contribution information.

The successful contractor shall be expected to enter into a Performance Guarantee for a period of 10 years with the Employer based upon the guaranteed minimum annual power contribution level offered with compensation to the Employer should this level not be met.

The level of compensation to be paid annually shall be the calculated power contribution loss incurred by the Employer.

Performance Testing and Monitoring

The PV specialist Contractor shall remotely monitor the PV installation for a period of 12 months post-handover for diagnostic and energy data collection via a data logger with GPRS communication.

For the PV System the Contractor will be required to carry out performance testing after commissioning. Performance testing will be split into two separate tests:

- A short-term test to measure performance ratio
- A year long-term test after 12 months and 24 months from commissioning to measure annual performance ratio

The test will encompass the entire PV system, such that the test is undertaken for all panels and inverters. All energy measurements will be taken from a meter connecting the PV system to the existing 11kV infrastructure.

The exact performance test procedure will be proposed by the Contractor and agreed prior to the test being carried out. The test shall be witnessed by the Employers representative..

In addition to the above, the Contractor is to provide flash test report for all modules, identified by module serial numbers (in Excel format). The sum of the modules flash test power is to be not less than the total plant rated installed capacity.

Data will be automatically collected along with results with a data recording rate of at least one minute. Weather sensors, Plane-of Array (POA) pyranometer and the data logger used shall be permanently located at the site. All the real-time data is integrated with local data server. Post completion of the test, the raw data in suitable format will accompany the test report at a minimum of 1-hour resolution for the test.

Short-term test

This test shall take place after completion and measures the performance ratio over a minimum period of 15 days and compares it to an expected value of performance ratio taken from a model of the final design. This model will be submitted by the Contractor to the client at the design stage and shall show the expected monthly performance ratios for the system taking account for the variation of performance ratio across the year.

Long-term test

Following handover of the system, the 1-year and 2-year performance test windows shall begin. During this period, system performance shall be measured in line with a Class B System as per IEC 61724-1 in order to measure the performance of the system over a longer period of time.

In line with the requirements of a Class B System as per IEC 61724-1, the Contractor shall define a detailed system-specific test plan for each performance test prior to test commencement.

This test procedure includes all specific requirements and agreements for test execution and data reduction. The test procedure shall be provided to the Employer prior to test commencement, with the Employer given 4 weeks to review and approve. Test cannot commence until the Employer has approved the test procedure

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 consultant or specialist designer must ensure that the proposed PV connection point has been fully considered against the specific requirements of BS7176:2018 section 551.7 and 712.551 which requires that the PV array is connected to the supply side of any current using equipment and that the switchgear assembly is suitably rated for both mains and PV generating supplies operating in parallel.

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

<u>PV Module</u>

- 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.
- PV cells to be provided with secondary safety fixings via “gripple wire” to secure the cell to the support system in the event of failure of the primary fixing system.
- 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. As a minimum inverters must include insultation monitoring (IEC 62109) and arc fault protection (IEC 63027) functions.
- Pre-programme inverters to run an insulation resistance test initiated at sunrise, just as the modules begin to generate, in order to detect a first fault array condition as soon as is reasonably possible. Arrange that this fault condition raises an alarm to BMS.
- 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
- Inverters to be IP67 rated as a minimum.

PV System Operational & Installation Requirements

- Provide a system which can be maintained without the need of cranes to replace modules.
- Consider bird-proofing solutions for the PV panels
- 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.
- Particular care shall be taken during installation of DC cable connectors & terminations to follow manufacturers installation guidelines with cross-mating only connectors from same manufacturer used and ensure the number of connectors are minimised. Ensure DC cable connections are not over torqued.
- 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
- MODBUS meter output for monitoring of kWh electrical generation connected to the building AMR system network including alarm for indicating loss of PV under mains failure. A meter at the PV switch on main / sub-DB also acceptable as long as connected to AMR by Modbus.
- Local indication of inverter failure
- Manual reset facility under mains failure
- Lockable AC &DC isolators to be provided at each invertor in addition to the main system isolator switch. Provide an additional isolation switch(s) where the system cables enter the building at the top floor riser level.
- Separate DC isolators shall be avoided where possible and these shall be incorporated into the invertors.
- **Important Note:** All AC cabling, including between the local isolator and PV inverter, must be sized on the maximum capacity of the inverter not the maximum PV generation to allow for future expansion.
- Provide a means to manually isolate the entire PV array from the building electricity supply and the remainder of the electrical system. Locate the isolator adjacent to, or integrated with, the inverter.
- Where the system DC voltage is above 1500Volts, provide a firefighter safety switch (FSS) for each PV array to enable automatic safe isolation of DC generation during an emergency or fire alarm. In addition where the inverters are not installed directly where the DC cabling enters the building then a fire fighter safety switch shall be installed on each string. For example, if the PV panels are on the 3rd floor and the inverters are on the ground floor. Use switches from the Santon Firefighter Safety Switch range or an equal alternative
- Consideration should also be given to interlinking the PV mains connection to the fire alarm system via a contactor arrangement or via fire input to the PV inverters such as a Firefighters Gateway controller to automatically isolate the PV system in the event of a fire evacuation and provision of remote operating panel adjacent to the main fire alarm panel with keyswitch arrangement. The final arrangement/requirement for this shall be agreed with the UoE BSG representative.
- PV systems to be suitably earthed and bonded to proposed/existing building earthing/lightning protection network
- Surge Protection Devices (SPDs) shall be installed on both the AC and DC sides in order to fully protect the invertor.

- 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
- 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. Consideration must be given to the proximity of PV panels to loose stone roof coverings and potential for damage to the panel installation by birds. The Design Team must consult with the UoE BSG on locations and possible mitigation strategies such as providing netting to stone roof coverings.
- **Important Note:** Loose stone roof coverings present a maintenance and H&S issue for UoE Estates and is therefore discouraged. The specification of this type of roof covering must be reviewed and agreed with UoE Estates/BSG team.
- All bolts on the PV panel fixings and supporting framework etc shall be hand tightened using a torque wrench and tightened to manufacturer's specified torque settings. Power tools must not be used.
- All PV panel(s) and supporting frame fixing bolts etc must be inspected at handover and a full bolt torque schedule provided, further checks 6 months after handover and at end of 12-month defects shall be included by the installing contractor to ensure tightness of all fixing bolts.
- A fully detailed maintenance checklist following the guidance within Solar Energy UK O&M Best Practice shall be included within the O&M manual
- PV array and inverter as-installed layout drawings, schematics and wiring diagrams to be provided adjacent to PV DB and invertor locations. AC/DC main isolator locations to be clearly identified.

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. The location of these must be considered early in the design stage so as not to impact access/maintenance space within these rooms. Electrical designer to consult with UoE BSG to agree location. The invertor and isolator locations must be clearly indicated on the PV system as-fitted drawings.

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.

Where the PV system requires access to the UoE IT network either locally or externally, the control system software will require to be assessed by UoE Estates IT team to ensure the UoE information security requirements are met. Generally the requirements of ISO certification ISO27001 for information security management systems shall be followed.

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.

Prior to acceptance the PV Specialist contractor shall complete the following installation checklist and submit to the UOE BSG for acceptance:

Meter	
Are correct labels installed	
Health & Safety Items	
Safety signage in place (dual supply label and system diagram)	
Safety signage provided on junction boxes /isolators indicating electrical shock and are junction boxes/isolators lockable	
PV Warning sign in place	
DC warning signs fitted on DC cables	
No equipment or materials left on roof	
All access and egress points clear and unobstructed	
AC & DC cables correctly separated	

Sufficient ventilation around invertors	
Roof condition inspected for any signs of damage	
Solar panels	
Panels inspected for integrity/damage. Check for cracks, delamination, breakage, burn marks, micro cracks etc.	
Check for new shading against design conditions.	
Mounting System	
Check mounting system secured, signs of slippage etc.	
Check framing system for distortion	
Check clamps remain in correct position as per design	
Check for any sharp edges to identify potential cable damage	
Check torque settings for all bolts against manufacturers design and torque schedule.	
Secondary gripple wire restraints been fitted to panels	
Any visible corrosion, sagging, deformation, breakage to any part of the mounting frame	
DC & AC Cabling	
All cables secured, clear routes, free from stress and sharp edges, discolouring or damage	
AC isolation switches work and are able to lock off, secured adequately and free from discolouring or damage.	
Check and verify all DC connectors are watertight, correctly torqued and secured with the correct roof spacing	
Check junction boxes are correctly sealed , cable glands tightened and no water/dust ingress.	
Check all internal junction boxes are securely fixed, all earth cables secure and free from stress.	
Check all AC cables are not compromised or damaged.	
Inverters	
Check operating correctly and no warning or error messages.	
Visual inspection to check internal components for signs of corrosion, water ingress, damage or wear. Check al seals and gland for IP56 rating.	
Check all cable connections and switches are tight.	
Check adequate ventilation provided to invertor location	
Invertors labelled correctly and visible	
Check all cables are secured and free from damaged,	
Check integrity of fuses and surge protection.	
Check integral DC isolators are functional/operational	

System schematics fitted and safe isolation procedures displayed.	
Weather sensors	
Check all electrical connections are tight and sealed etc.	
Check all cables secured and no signs of damage.	
Check sensor for operation, damage and securely fixed	

18.0 Desired Electrical Installations by Room or Building Function.

18.0 Desired Electrical Installations by Room or Building Function.

Whilst the guidance within this design guide applicable to all UoE development projects, it is recognised that certain projects have additional project specific requirements which will require further detailed discussions.

The project design teams and electrical consultant/electrical contractor must consult with both the End-Users and BSG to understand specific project briefing requirements and design considerations during the early RIBA stages of the project.

It is anticipated that future versions of the design guides shall incorporate specific requirements once these have been fully developed.

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

19.0 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.

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	Keith Robertson keith.robertson@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	BSG Personnel
Central Area Campus, Holyrood & Pollock Halls	Michael Cowe michael.cowe@ed.ac.uk
Easter Bush and Kings Buildings Campus	Kevin Wood kwood2@ed.ac.uk
BioQuarter, Western General Hospital	Michael Cowe michael.cowe@ed.ac.uk

20.0 APPENDICES

20.0 APPENDICES

20.1 Appendix No. 1: Schedule of Existing Assets

Item	Manufacturer	Description
HV Switchgear	Brush / Schneider	Eclipse range, vacuum type circuit breakers
Transformers	Wilson / Schneider	As described in HV section
LV Switchgear	AF Switchgear / Schneider	As described in LV section
Metering Equipment	Schneider	Schneider PM5111 / PM8000 Range
Distribution Boards	Various Manufacturers	Schneider Acti 9/KQ Loadcentre ranges etc.
Cabling	BASEC, LPCB and CPR approved manufacturer	As described in cabling section
Standby Generator and Fuel Storage	FG Wilson / Cummins	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 Whitecroft Organic Response Trilux SmartScan	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.

	Helvar.	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	NVRs Geutebruck (Central Area & Kings Buildings), 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.

20.2 Appendix No. 2: 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:

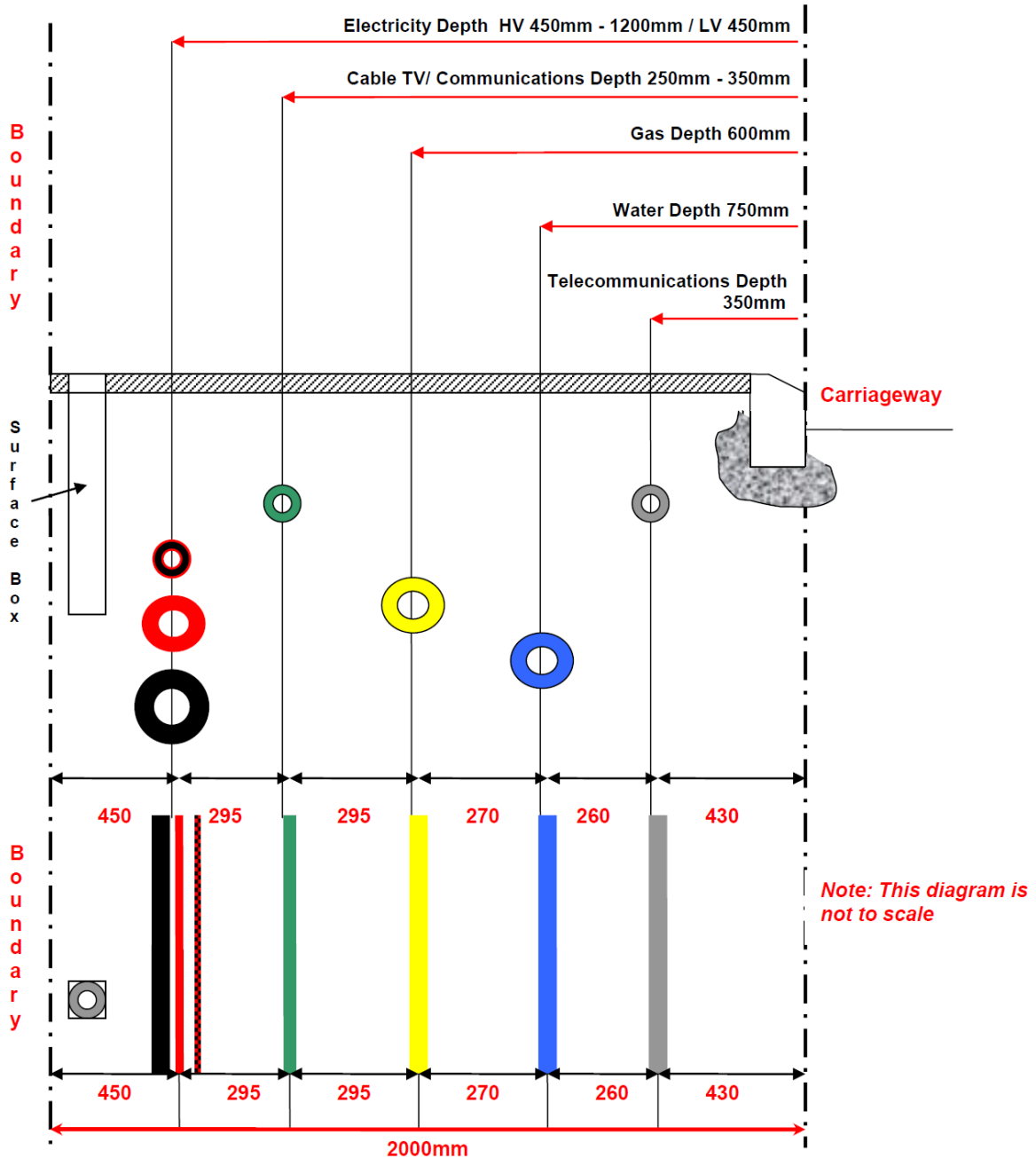
1. Sub-station building fabric, weather proofing a flood barrier protection c/w LEAK detection alarms
2. Sub-station – spill kit and cleaning materials
3. Sub-station distribution board, socket outlets including USB connection
4. Sub-station log books
5. Sub-station desk and hard wooden chairs 2No.
6. 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

20.3 Appendix No. 3: 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.



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20.4 Appendix No. 4: 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

20.5 Appendix No. 5: Emergency Lighting Process for Existing and New Assets

THE UNIVERSITY of EDINBURGH

Purpose

The purpose of this document is to provide guidance, to both design and construction teams on UoE projects to ensure that any modifications or replacements made to existing emergency lighting systems across the UoE Estate are captured and shared with UoE Estates Operations. It is essential that life safety systems such as emergency lighting are effectively managed, and continued compliance is achieved.

This document will outline the steps and guidance that should be followed during the early stages of UoE Development and Operational Team projects.

Pre-Start

At the pre start stage of any project including emergency lighting these steps and guidance should be followed:

- Confirm that the proposed emergency light testing strategy matches the existing emergency light installation as per Estates Design Guidelines (Assets & Standards) No. 6 - Electrical Engineering Services – Section 8.2
- More than one emergency lighting system is not permitted as per Estates Design Guidelines (Assets & Standards) No. 6 - Electrical Engineering Services – Section 8.3
- Maintenance Service can assist by confirming existing emergency lighting system if required, please contact:
    - Paul Miller, Maintenance Service Coordinator: Paul.Miller@ed.ac.uk
    - David Dorman, Compliance Area Team Leader: ddorman@ed.ac.uk
- Inform the Maintenance Services Compliance Team of any potential impact to their monthly or annual statutory emergency light testing during the project by contacting:
    - David Dorman, Compliance Area Team Leader. ddorman@ed.ac.uk
    - Bryan Thacker, Compliance Team Administrator. bthacker@ed.ac.uk
- If existing emergency lights require to be removed then record the fitting ID number and inform the Maintenance Service Compliance Team who will update their recording system.

- If installing new emergency lights then please request new lighting ID numbers from the Maintenance Services Compliance Team by:
    - Supplying a design drawing (if available) showing the following
        - Existing lights to be removed
        - New lights to be installed
        - Key Switch location if appropriate.
    - Arrange for the new Emergency Lights to be labelled with ID numbers supplied.

Please note the following:

- Exit signage must be maintained as per Estates Design Guidelines (Assets & Standards) No. 6 - Electrical Engineering Services – section 8.3
- All emergency light should be wired from local circuit only, as per Estates Design Guidelines (Assets & Standards) No. 6 - Electrical Engineering Services – Section 8.1
- Stand-alone self-test Emergency Lights should not be used. Maintenance Services must have control over testing times in all locations.
- Cabling clipped direct to building structure is not permitted.

Practical Completion

At the practical completion stage of any project where emergency lighting has been included these steps and guidance should be followed;

- Ensure that a three-hour duration test has been carried out on the new emergency lights.
- If emergency lights have been added to an existing circuit then all emergency lights on this circuit must be three hour tested and the details recorded and sent to Maintenance Service Compliance Team so that they can update their records.
- Provide Maintenance Service Compliance Team with a copy of the relevant Certificate as below for their records:
    - Emergency Lighting Completion Certificate (New installation or a Major Alteration to an Existing Installation). BS 5266-1:2016. Annex H
    - Emergency Lighting Small New Installation Certificate (Small New Installation of up to 25 Self Contained Luminaires). BS 5266-1:2016. Annex I
- The following certificates do not substitute as an Emergency Light Installation Certificate:
    - Minor electrical works installation certificate (alteration to existing circuit) – BS 7671
    - Electrical Installation Certificate (new circuit) – BS 7671
- Provide an Emergency Light Log Book as per BS 5266-1:2016. Section 11 (Maintenance Services can supply a template upon request)

- Arrange for a demonstration of the altered/new emergency light system to the Maintenance Services Compliance Team.
- Provide link to the as-fitted drawings upon completion.