



Document Control

Rev	Date	By	Comments
A	Jun'16	L. Davies	Technical update review
B	Oct'17	L. Davies	Technical update review
C	Dec'17	UoL	Sign off for release
D	Apr'19	L. Davies	Technical update review
E	Mar'20	J. Thrupp	Technical Update Review March 2020 Issue

Design Guidance

1. All HV/LV installation works must comply with the latest IET 18th Edition wiring regulations including all amendments.
2. The University's authorising engineer shall be consulted for all HV works. Detailed scheme proposals shall be passed to the AE via the University estates department.
3. The main earthing terminal (MET) shall not form part of the LV switchpanel and shall be wall mounted within the LV switchroom c/w removable test link.
4. A minimum provision of 25% spare capacity on ALL LV distribution switchgear shall be included within the design to allow for future growth and expansion. Spaces within LV switchgear to ensure copperwork present for later introduction of switches, CT's and metering sections to be pre-cut with blanking plates fitted adjacent to all switches for future use. At least half of the 25% spare capacity will be populated with common protective device sizes and types such as 63A, 100A, 250A with a mixture of both SP&N and TP&N devices.
5. HV/LV Network capacity shall also consider the 25% spare capacity requirement in terms of load assessment and future space for switchgear expansion which shall be discussed with the University estates and maintenance departments during concept design stage.
6. Distribution boards shall be positioned within LV service cupboards and switchrooms accessible from the primary circulation routes. Distribution boards shall not be located within IT Hub rooms unless they serve only the circuits within the respective hub rooms.
7. Sub main SWA cables 95mm² or greater to be cleated directly to the building fabric or primary containment regardless of containment type or installation method. Conventional nylon cable ties may be used for all cables below 95mm² with steel tie wraps used at a ratio of 1:3 for rising and inverted containment.
8. Distribution boards shall be provided with traffolyte labels fixed to the outside cover of the distribution board using PVC rivets, indicating the following information:
 - a. Distribution board reference
 - b. Supply origin
 - c. Supply & cable size
 - d. EFLI at DB
 - e. PSCC at DB
9. DB's will be supplied complete with individual padlocking facility (Not suited keys). The University will issue padlocks for installation by the contractor.
10. Primary LV switchgear serving large scale projects (>630A) to include a secondary incoming switch/ACB with bus-coupler arrangement to feed essential services using a temporary standby generator. Assessment of essential loads and equipment split of the bus coupler arrangement to be agreed with the university maintenance department during the design stage. Small scale incoming electrical supplies shall be supplied with a changeover facility and plug in generator position also. This shall apply to all half hourly metered supplies.
11. Power factor correction equipment shall be of the cubicle type generally mounted external to the LV switchgear. Integral switchgear units shall not be permitted. A PFC study is to be undertaken 1-month post PC and PFC equipment shall be retrofitted out of normal working hours to satisfy the University's requirement for a 0.98 minimum power factor. For tender purposes, switchgear connection facility shall be allowed for this later



integration and space within the plant room provided to accommodate on all schemes.

12. Harmonic filtration shall comply with ERG54.
13. As part of any large-scale refurbishment or new build development TM39 metering schedules shall be completed as part of the design process and submitted to the UOL energy monitoring team for review/approval. Performance specified projects shall ensure that the design subcontractor completes the metering strategy schedule as part of the final design.
14. Upon project completion calibration and commissioning certificates shall be provided for all types of meters (including heat, gas and water meters) and collated within the electrical O&M manuals under the respective section.
15. DB's shall not be 'bushed' or 'coupled' to trunking networks which will limit spare capacity for future cabling additions. DB's shall be slotted where connected to trunking systems for maximum future flexibility using grommet strip or similar.
16. Surge protection shall be provided in accordance with the IET wiring regulations with full consideration given to BS EN 62305 protection against lightning. Unless the design suggests otherwise, type 1+2 surge protection shall be provided as standard.
17. All HV/LV systems shall undertake a full network grading study to be reviewed with the University appointed authorised person. Assumed HV network defaults shall not be used for this purpose.
18. All HV infrastructure works shall allow to employ the University preferred HV network maintenance specialist to undertake final switching and to oversee connection works. Grading and network design studies shall be reviewed with the University appointed authorised person and the network specialist prior to works commencing.
19. The university HV switching matrix board located in the Adrian building substation shall be updated by all contractors adding to or amending the HV network. Modifications to the matrix shall be allowed for within the project costs.
20. Where standby generation is provided, both in permanent and temporary arrangement, the LV distribution shall be configured to ensure that the following elements are also provided with a backup power source:
 - a. Cold water booster set
 - b. Comms room power (Including cooling)
 - c. Lab power (% determined on a project basis however all lab fridges to be incorporated)
 - d. Built in and free standing freezers
 - e. LEV systemsWhere standby generation is provided, a dedicated 'no break' UPS shall be provided to support the connected load for approx. 30 minutes in the event of a generator failure. UPS facilities shall be housed within dedicated positively pressurised switch rooms maintained at a maximum temperature of 24°C. UPS provisions beyond that of life safety systems shall be considered for all business-critical systems associated with each development. The consultant shall discuss with the University project manager the business-critical systems that will require UPS support during concept design stage in order to provide a minimum 30-minute backup supply to the same.
21. Generator connections to the LV distribution network (Permanent connections only), shall be configured to Auto restore on sensing of mains return however this shall not be a synchronous supply restoration and a break in supply will be permitted.
22. Temporary generator connection points shall be provided for all developments involving primary switchgear replacement or provision. Assessment shall be made in relation to the set down location of the temporary hire set. The point of connection to the mains serving the LV switchgear shall be at the closest point possible to the set down location on the external façade or no greater than 10m. A dedicated access plate shall be provided to all copperwork where temporary generator connections are to be provided such that switchpanel plates may be replaced whilst temporary cabling is in-situ.
23. All switches, isolators and circuit protective devices including MCB's, MCCB's, ACB's and cubicle assemblies shall be capable of being locked off to ensure safe isolation of supply. This shall also include local points of isolation in addition to the source of supply.



Design Components

Service	Manufacturer	Comments
HV Switchgear	Schneider	Fixed pattern – Genie range Ring main units – Ringmaster
Transformers	Merlin Gerin ABB	Transformers shall be of the MIDEL 7131 type. Transformer tapping's shall be capable of being adjusted to suit the preferred operational voltage of 400V/230V. HV metering shall be provided to all privately-owned UOL switchgear to measure transformer losses. The metering shall be connected to the Universities Data bird network which is detailed elsewhere in the University standards.
Standby Diesel Generators	Aggreko Broadcrown Addicott WB Power Services Dale Power Solutions Musgrave generators	Generator selection to suit project specific application. Generator specification to be discussed and agreed with University maintenance department. Key considerations: <ul style="list-style-type: none"> • G59 on load testing requirements • Fuel storage • Load acceptance classification • Acoustic treatment and attenuation • Controls and monitoring • Annual maintenance agreements Catalytic converters shall be fitted to all generator exhaust systems where new generators are provided.
Main LV Switchgear	Michael Smith Switchgear Blackburn Starling MCH Switchgear KDS Solutions	Cubicle switchgear arrangement for LV distribution >400A Form 4 Type 2 minimum protection requirement Components to be Schneider (Merlin Gerin) Functional devices <630A to be MCCB's Functional devices >630A to be ACB's
Sub LV Switchgear	Michael Smith Switchgear Blackburn Starling MCH Switchgear KDS Solutions	Sub distribution switchgear <400A to be of the modular panel board MCCB type. Form 3b type 2 minimum protection requirement MCCB's to be 65kA rated as a minimum
MCB Final Distribution	Schneider (Merlin Gerin) Acti9 Isobar P range	MCB's to be 10kA rated as a minimum Dual earth bars to be provided for all high integrity earthing All Distribution boards shall be fitted with a padlock facility
PFC	Merlin Gerin Power Capacitors Ltd ABB Michael Smith Switchgear	High-Low magnitude fault current protection. Individual discharge resistance fitted internally. Capacitors shall be of the solid type and shall be mounted horizontally and suitable for high harmonic loads. PFC equipment shall be DC modulating in order to improve efficiency



Design Components

Service	Manufacturer	Comments
Isolators / Switch Fuses	Eaton MEM	
Uninterruptable Power Supplies	Riello Eaton ASC	<p>UPS to be configured as an N+1 arrangement to offer limited supply resilience.</p> <p>UPS' shall be interlocking to prevent parallel connection and shall incorporate a manual bypass switch for maintenance purposes.</p> <p>Key requirements for the UPS array shall include:</p> <ul style="list-style-type: none"> • Data link for remote BMS monitoring via LAN/ethernet • Auto battery test facilities with deep discharge protection • Battery banks with isolation per string (2 minimum) • Components to be 'Hot swappable' incl. batteries • Input/Output filters • Remote EM power off signal (Fire alarm or Fireman's Sw) • Full alarm monitoring of both UPS status and faults
Horizontal / Rising Busbars	Merlin Gerin – Canalis Barduct Ltd	<p>25-5000A lighting/ small/ medium/ high power busbar to suit application. Low impedance busbar for medium/ high power installations to limit voltage drop.</p> <p>Areas with a large floor plan shall consider rising busbar systems in place of conventional submains for future flexibility.</p> <p>Tap off units to be interlocked and utilise MCCB protective devices. All systems shall provide facility for live connection of tap-off units. At least 1No spare tap-off unit shall be connected to the busbar system at handover for future use.</p> <p>Cabling between busbar tap-off units and final equipment shall utilise tri-rated singles in PVC sheathed metallic conduit for ease of removal.</p> <p>Full size neutral required and consideration to be given to high integrity earthing requirements where high earth leakage is anticipated.</p> <p>Metering of DB's connected to busbar trunking shall be locally metered and connected to the metering software.</p>
HV Submain cabling	Any BASEC member	All HV installations shall consider the National Joint Utilities Group documentation as a minimum installation guide in relation to installation quality and setting out.



Design Components

Service	Manufacturer	Comments
LV Submain cabling	Any BASEC member	<p>All submain conductors shall be copper (Cu)</p> <p>LSZH/ LSOH (Zero/ low halogen – Thermosetting) insulated, armoured and sheathed, multicore LV power cable (XLPE/LSF/SWA/LSF)</p> <p>LSZH/LSOH (Zero/ low halogen – Thermosetting) insulated and sheathed, single core power cables (XLPE/LSF/AWA/LSF)</p> <p>LV power cables shall generally be wired to BS6724 (600/1000V)</p> <p>Cable identification markers shall be fitted at each end of the submain cable at the point of termination</p>
LV Final circuit wiring	Any BASEC member	<p>LSZH/LSOH (Zero/ low halogen – thermosetting) insulated singles shall be used for general fixed wiring purposes ONLY. Cabling to be contained in galvanised trunking and/or conduit where surface fixed or recessed.</p> <p>Twin & Earth cabling shall only be considered for residential accommodation installations as detailed within design guide GD08. Any deviation from the above cabling method shall be presented to the estates team as a derogation for approval prior to specification.</p> <p>The use of firetuff cabling shall not be permitted for wiring of lighting and power services.</p>

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Service	Specialist	Address & Contact Details
HV Distribution cabling and switchgear	Central Power	Central Power (Senior Appointed Person) Unit 1 Great Barr Business Park Baltimore Road Great Barr West Midlands B42 1DY Tel: 0121 358 1142 Email: info@centralpower.co.uk
UoL Authorising Engineer	ETA Projects	ETA Projects (Authorising Engineer) 5 Bear Lane London SE1 0UH Tel: 0207 902 8570 Email: info@etaprojects.co.uk
Generators	Aggreko Broadcrown Addicott WB Power Services Dale Power Solutions Musgrave generators	Aggreko Tel: 03458 247365 JCB Power Products Broadcrown LTD Tel: 01889 272200 Addicott Electrics Ltd Contact: Mark Styler Tel. No. 01626 774087 Mobile: 07770 437138 Email: mark.styler@addicotelectrics.co.uk WB Power Service Tel: 0115 944 4422 Email: sales@wbpsltd.co.uk Dale Power Solutions Tel: 01723 514032 Email: info@dalepowersolutions.com Musgrave generators Tel: 01327 703868 Email: info@musgrave-generators.com

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Service	Specialist	Address & Contact Details
LV Switchgear	Michael Smith Switchgear Blackburn Starling MCH Switchgear KDS Solutions	Michael Smith Switchgear Ltd Contact: Sean Smith Tel. No. 0116 283 4825 Mobile: 07809 146778 Email: sean@mssl.uk.com Blackburn Starling & Company Limited Tel: 0115 986 6331 Email: mraynor@blackburn-starling.co.uk MCH Electrical Systems Tel: 01902 404050 Email: sales@mchelec.co.uk KDS Solutions Tel: 01952 605023 Email: info@kds-solutions.co.uk