UNIVERSITY OF Southampton

# ESTATES & FACILITIES

Document Title

**Briefing Notes for Electrical Services**

Document Number

**ES/ 002-A**

Note:- This was Formally ES/005-G

**Revision Index for new Number ES / 002**

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| F | 28/03/11 | AKM | Fire Detector Update |
| G | 21/01/14 | AKM | Revised |
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# U N I V E R S I T Y  O F  S O U T H A M P T O N

## BRIEFING NOTES FOR ELECTRICAL INSTALLATION SPECIFICATIONS

### 1.0 INTRODUCTION

Your attention is drawn to the fact that this document is one of a number of documents providing information regarding the quality and standards for M & E services at the University; a full list of the up to date documents is available on the University Estates & Facilities web site

The briefing notes below should be read in conjunction with the University of Southampton Quality Standard.

Care should be taken to match existing systems and components where the project affects only part of a space or area; providing that current standards and legislation are not compromised.

Suppliers mentioned in this document are University preferred and supported. Any proposed alternatives shall first be approved by the nominated University Project Liaison Engineer.

Generally all equipment specified shall be of proven reliability which will enable the University or its chosen contractor to purchase spare parts, in addition all control software shall be 'open protocol'.

All Electrical Systems and Equipment shall be installed in compliance with the current revision of the relevant British / European Standard

### 2.0 CONSULTANTS

The Estates & Facilities Department shall only use Design Consultants who have been vetted through our Health & Safety register and preferably located for ease of attendance to the University of Southampton.

The selected Design Consultant shall be fully conversant and have such qualifications and experience relevant to the type of project being undertaken

### 3.0 CONTRACTORS

The Estates & Facilities Department shall only use Electrical Contractors who have been vetted through our Health & Safety register and preferably based local to the City of Southampton.

Prior to tendering any work a list of tenderers is to be agreed with the University Project Liaison Engineer. Where the Electrical Contractor is to act as a domestic sub-contractor a similar schedule of preferred companies shall be supplied by the University Project Liaison Engineer to the main contractor.

The University has a number of Term Contractors who are familiar with the University systems. The Term Contract Schedules that form part of their contract are applicable only to works procured directly by the University

The selected Contractor shall be fully conversant and have such qualifications and experience relevant to the type of project being undertaken

## 4.0 HIGH VOLTAGE EQUIPMENT

The University owns and operates its own 11,000 Volt (400Amp minimum) network. Generally the principle protection for the network on the main campus is at the intake positions via IDMT relays.

All works associated with the 11,000 Volt network shall be agreed with the Universities High Voltage Network Manager; the University Project Liaison Engineer will provide contact details.

The remainder of the on site network is based upon 'Ringmain' type units, both fixed pattern and extensible

With the current concerns over the implications of SF6 and Oil, the University no longer accepts this for use on its network

The future selection between the types will be directly affected by its position within the network and the networks future development; the University Engineer (HV) will provide guidance.

Close coupled 'package style' substations are not normally acceptable; specific project clarification should be sought from the Universities High Voltage Network Manager; the University Project Liaison Engineer will provide contact details.

A 'VIP300' or similar self-powered protection relay should protect transformer circuits. TLF's can be used in certain applications, specific project clarification should be sought from the Universities High Voltage Network Manager; the University Project Liaison Engineer will provide contact details.

The University operates its own locking procedure therefore the permanent locks will be free issue.

The University has 'in-house' Engineering with 11,000 Volt expertise, who are available to provide information and to proffer design and operational assistance as required.

### 4.1 Substation Configuration

Where the design capacity of the Substation provides for a transformer rating of 1,000kVA or below, the configuration shall be based upon a single transformer; except where specific operational criteria or user requirements indicate otherwise

Where the design capacity of the substation provides for a load over 1,000kVA, then the configuration shall be based upon a minimum of two transformers with a maximum capacity of each transformer not exceeding 1,500kVA; except where specific operational criteria or user requirements indicate otherwise

In all cases the design of the substation shall consider future maintenance of the equipment and its implication on loss of electrical power to the loads

The final substation configuration shall be agreed with the University Appointed HV Engineer

That adequate access for the installation and future replacement of equipment

## 5.0 NETWORK TRANSFORMERS

Network Transformers shall conform to the specification detailed below

Transformers shall be to BSEM 60076:1997 – Amorphous Super Low Loss

Indoor / Outdoor type ground mounted. MIDEL Oil Immersed Naturally Cooled (KNAN)

| | | |
|---|---|---|
| **Rating** (to suit)* | - | Minimum 500 kVA |
| **Phases** | - | Three Phase (Double Wound) |
| **Frequency** | - | 50Hz |
| **Windings** | - | Al / Al or Cu / Cu |
| **HV Winding** | - | 11000 Volts |
| **LV Winding**** | - | 400 Volts (No Load) |
| **HV Tapings** | - | +2.5% +5% 0 -2.5% -5% |
| **Tap Change** | - | Externally operated "off load" switch, operating handle to be lockable in each position, University will provide lock. |
| **HV / LV Connections** | - | Delta/Star N |
| **BS Vector Symbol** | - | Dyn 11 |
| **Insulating Oil** | - | Midel 7131 |
| **Tank Fittings** | - | (Minimum requirement, any additional standard items should not be deleted.) |
| **Neutral** | - | 100% Rated |
| **HV Termination's** | - | Dry termination box with gasket sealed lid. Termination box suitable for 'Raychem' type termination kit, to accept a 3 core (TCTA) XLPE cable. |
| **LV Termination's** | - | Dry termination box with gasket sealed lid, to accept XLPE / AWA single cores. |

- Lifting lugs (Minimum 2)
- Earthing Terminal
- Free Breathing Device, complete with Silica Gel Pot.
- Oil Drain / Sampler Valve and Cap
- Skid Wheel Mounted
- Oil Level Indicator
- Rating and Connection Plate
- Oil Filling Point and Cap
- Jacking Lugs / Points

* New Transformer ratings shall be 500kVA minimum, sized to match the design load profile. Consideration shall be given to 15 – 20% spare capacity for future load expansion. Bespoke ratings shall be avoided.

** LV rating shall be dependant upon the location of the transformer, where the transformer forms a replacement for an existing which is related to a second transformer then the voltage shall be matched that existing (generally 433V).

Buchholz type Transformer protection shall be considered on all transformers above 1000kVA.
L.V. busbars shall be considered on all transformers above 1500kVA.

All new installed or replacement transformers shall have an oil sample taken to produce a full TCR; this will be used as a bench mark against which future tests will be compared

Transformer L.V. interlink between the Transformer and the L.V. Switchboard shall be via single core cables; Bus bar interlinks shall only be considered for transformers of ratings above2,500kVA, by agreement with the University Appointed HV Engineer

## 5.1 Alternative transformers

Resin Cast network transformers are not acceptable.

## 6.0 EARTHING

## 6.1 Substation Earthing System

Where power supply is at high voltage and transformer substations are to be installed, an earth system shall be installed at each substation to provide a TN-S system comprising:

A main earth terminal bar in the LV switchroom associated with the substation. This shall be wall mounted on shock resistant insulators and shall be of 50 mm x 6 mm section copper.

The main earth bar shall be complete with a matching section bolted test link at each end. One test link shall be connected to the external earthing system the other test link shall be connected to the main building lightning conductor system

An earth electrode system in an external location as close as possible to the main earth bar. For tendering purposes, 4No copper rod sets 2.4 m long x 16 mm diameter shall be allowed for, arranged in a square spaced 3.0 metres apart, unless specified otherwise. Each electrode shall be driven vertically into the ground so that the head is below finished ground level. Each rod shall have a concrete inspection cover and housing. The rods shall be connected together with bare copper strip of 25 mm x 3 mm section buried 500 mm below finished ground level and connected to the rods by purpose made bolted clamps.

Before the electrode system is installed the earth resistivity shall be measured as described in the current revision of BS7430 and the ground checked for suitability of driving earth rods. The conditions shall be reported so that, if necessary, the design can be changed to include additional or different electrodes.

The use of buried Pipework or other Metal Medium in lieu of or in addition to earth rods is not acceptable

On completion of the electrode system the earth resistance of each electrode and of the total system shall be determined as described in the current edition / revision of BS7671, IEE Regulations and the results recorded on a Test Certificate.

An earthing conductor shall be installed from the electrode system to the main earth bar test link. The earthing conductor shall be a minimum 25 mm x 3 mm green/yellow PVC covered copper tape or 70mm$^2$ Green/Yellow PVC covered copper cable.

The ends of the 25 mm x 3 mm green/yellow PVC covered copper tape shall be tinned to a length of 75mm from each end prior to termination.

The earthing conductor shall be connected to one of the earth rods by a purpose made bolted clamp. The earthing conductor shall be terminated with a double crimped or shear off lug securely connected to the earth bar test link by a bolted connection.

The earthing conductor shall be buried 500 mm below ground level and shall enter the building by a duct. Within the building the cable shall be fixed to surfaces by purpose made clips or cleats.

Green/yellow PVC covered copper earth conductors shall be installed from the main earth bar to the items specified below: sizes as stated are minimum unless specified otherwise.

| | |
|---|---|
| Main low voltage switchboard earth bar | 150 $mm^2$ Copper |
| Transformer tank and HV cable sheaths/armour | 150 $mm^2$ Copper |
| HV switchgear | 150 $mm^2$ Copper |
| Main equipotential bonding conductors to building steelwork, crane rails, incoming piped services etc. as specified | 25 $mm^2$ Copper Minimum |
| Any separate circuit protective conductors as | BS7671 IEE Regulations |

All conductors shall be double crimped or shear off lug securely bolted to the main earth bar. Fixing and routing shall be as for the earthing conductor. Earth conductors shall not be routed across floors.

The main low voltage switchboard earth bar shall be used for the connection of all outgoing cable armours to earth. The transformer neutral to earth link shall be provided in the switchboard.

## 6.2 Circuit Protective Conductors

Protection against earth leakage and earth fault currents shall be provided in accordance with the current edition / revision of BS7671, IEE Regulations and the following clauses.

Earth electrode systems shall not be used as paths for earth fault currents.

Steel wire armouring shall not be used as sole circuit protective conductors for circuits

Metal armouring and sheaths of cables must be bonded to the earth terminals of the equipment connected to at each end. The bonding shall be by clamps round the armour or earth tags under the glands with copper conductors to the equipment earth terminals. Where aluminium cable armour and glands are used appropriate measures shall be taken to prevent corrosion of the connection to copper.

Where main and sub-main circuit protective conductors are provided a common copper tape with T joints may be installed. The tape shall be green/yellow PVC covered and of size specified. Joints shall be riveted and sweated, then the exposed metal wrapped with adhesive green/yellow PVC tape. Fixings shall be purpose made clips.

Where protective conductors are run through conduits and trunking for lighting and small power final circuits, each circuit shall have a comparable size protective conductor to a BS7671 with a minimum of 50% of that of the phase conductor. The distribution board shall have an earth terminal block with a separate terminal for each outgoing circuit protective conductor.

Each CPC shall be identified with a proprietary cable numbering system and each cable numbered with its circuit reference

## 6.3 Generator Earthing

Where a standby generator is to be installed the neutral of the generator shall be connected directly to the earth system so that any changeover switch does not disconnect the generator neutral from earth. Likewise the changeover switch should not disconnect the neutral of any power supply transformer from earth.

## 7.0 PRIMARY CABLING

### 7.1 High Voltage

| | |
|---|---|
| Cabling forming part of the High Voltage network shall be | 3 core 185mm$^2$ Cu. XLPE (TCTA) / SWA<br>The Universities system is configured for a minimum of 400Amps. |
| Cabling from the C.B. / switch to transformers upto 2,000kVA shall be | 3 core 95mm$^2$ Cu. XLPE (TCTA) / SWA |
| Cabling from the C.B. / switch to transformers of 2,000kVA to 5,000kVA shall be | 3 core 120mm$^2$ Cu. XLPE (TCTA) / SWA |

### 7.2 Low Voltage

Cabling from the transformer to the main LV switchboard shall include a full rated neutral i.e. 8x 1c or 12x 1c etc. Cu. XLPE / AWA.

Busbar coupling between the transformer and the main LV switchboard shall only be considered if the transformer rating is greater than 2,500kVA or the building configuration will facilitate it.

The sizing of the neutral shall be equal to a minimum of 100% of the phase conductor with additional considerations to the possible effects of Power Factor and Harmonics.

Aluminium Wire Armoured Copper conductor cables are acceptable for main single core LV tails between network transformer LV termination box and the LV Switchboard.

Aluminium Wire / Armoured cables are not acceptable in other parts of the electrical distribution, unless exceptional circumstance prevail, should such a circumstance arise then agreement shall be obtained from the University Project Liaison Engineer before specification.

## 8.0 MAIN SWITCHBOARD

Shall be fully Type Tested and certified.

The L.V. switchboard shall be manufactured with modular construction utilising Schneider ACB's and MCCB's

The Neutral / Earth link point shall be located within a readily accessible section of the L.V. Switchboard, clearly labelled to indicate the location

The Main incomer ACB shall be equipped with an electronic trip unit capable of retaining fault records associated with any tripping of the ACB

The Main incomer ACB shall be equipped with a current display that will provide the indication throughout its range

An Electrical Meter shall be installed on the switchboard to each Incomer; this meter is not designated for energy consumption monitoring. The meter shall provide the following by selection;

Individual Phase load current, the screen shall display all three simultaneously
Phase Voltage Levels, the screen shall display all three simultaneously
Rolling Maximum Demand for kVA, kvAh & kvarh
Peak Maximum Demand for kVA, kvAh & kvarh
Weight settable pulse output

An option for direct IP output should also be considered, requirement shall be agreed with University Project Liaison Engineer

A label shall be installed adjacent to the meter indicating the requirement for the MD record to be zeroed following the event where a dual transformer fed L.V. Switchboard has operated from one transformer

The University does not generally utilise inter-tripping between the L.V. & H.V. components of its Electrical distribution. The exception to this is where through design / site configuration the L.V. link is of excessive length, for this situation REF unit(s) shall be considered

Inter-tripping between the normal and essential mains that prevents the changeover to essential should be avoided

Minimum 25% equipped spare capacity required in switchboard at handover

Minimum Form 4 Standard:-

Type 6 – Additional consideration should be given for instances where large size or parallel cables are needed due to volt drop.

Type 2 - This may be acceptable for certain low load outgoing ways, i.e. Fire Alarm supplies, where the outgoing cable can be terminated directly to the protective device which is in turn located within its own compartment guidance will be available from the University Project Liaison Engineer prior to specifying

The configuration of the proposed L.V. switchboard shall be agreed with the University Project Liaison Engineer prior to ordering / manufacture

The neutral bus-bar shall be fully rated with the sizing of the neutral considered against the possible effects of Power Factor and Harmonics.

All incoming and outgoing devices shall be complete with fully rated switched neutral considered against the possible effects of Power Factor and Harmonics.

Where the Switchboard will be front access the cable way shall be a minimum of 700mm wide, the access door(s) shall be hinged to provide full width access.

Where the Switchboard will be rear access the cable way shall be accessed via a hinged door(s) to provide full width access.

The external door / panel of all incoming and outgoing circuits shall be fitted with an engraved permanently fixed label detailing the C.T. Ratios installed

i.e.

| Metering C.T.'s<br>100:5 | Protection C.T.'s<br>2000:5 | Etc… |
|---|---|---|

Note:- Protection Type to be Detailed

Outgoing circuits shall be fitted complete with suitably rated C.T.'s for an electricity consumption meter. (See Below)

Energy Metering C.T.'s shall be prewired out to the cable way, or dedicated auxiliary wiring compartment, to facilitate connection through to the meter by others, star point links shall be installed at these terminals

Internal segregation barrier panels shall be either micro perforated steel sheet or 'Makrolon' type, or similar approved 'transparent' material to permit the inspection of any and all C.T.'s installed behind

The Internal segregation barrier shall be configure to facilitate the use of Thermal Imaging devices to aid PPM at termination and C.T points

The L.V. switchboard shall, generally be delivered in sections; it shall be noted that the manufacturer shall be responsible for final site coupling, testing and certification.

The University will require a Factory Acceptance Test for new and replacement L.V. Switchboards, attendees from the University shall be agreed with the University Project Liaison Engineer

## 8.1 ACB SETTINGS

For each L.V. Switchboard a schedule of ACB settings shall be created and included with the As Built Documentation

## 8.2 Surge Protection

Each incoming device shall be fitted with a suitably rated cartridge based surge protector, the device shall provided the following protection;

- Lightning (10 / 350 micro S Wave shape)
- Transformer Tap Changing
- Power station, substation and network faults
- Power Surges and Short Circuits.

## 8.3 Harmonic Filters

In order to facilitate the installation of Harmonic Filtering, either as part of the initial installation or once the load profile is established, a suitably rated C.T.(s) shall be installed on the main incomer(s) and wired to a safe compartment of the switchboard.

In addition any outgoing way with a rating of 800Amp or greater shall be similarly fitted with a harmonic C.T.(s)

To facilitate the connection of the Harmonic Filter the first / second TP & N outgoing way from the main incomer shall be allocated on each switchboard (Section).

## 8.4 Power Factor Correction

In order to facilitate the installation of Power Factor Correction, either as part of the initial installation or once the load profile is established, a suitably rated C.T.(s) shall be installed on the main incomer(s) and wired to a safe compartment of the switchboard.

In addition any outgoing way with a rating of 800Amp or greater shall be similarly fitted with a P.F.C. C.T.(s).

To facilitate the connection of the Power Factor Correction the first / second TP outgoing way from the main incomer shall be allocated on each switchboard (Section).

## 8.5 Generator Facility

Provision shall be included for an input connection from an emergency generator. The generator-input switch shall be rated at 400A (TPSwN) Three Phase with a fully rated switched neutral

The generator connection shall be wired to a separate lockable box to enable connection of the generator tails.

The location of the enclosure shall be such that ease of connection from the generator is facilitated. Should the generator cables be required to enter into the building to connect to the enclosure consideration shall be given to facilitating the cable routing without compromising building security.

The terminals within the connection box shall be phase (colour) true and permanently labelled, i.e. the generator L1 shall be connected to the L1 phase indicated terminal. This will apply to L2 & L3.

## 8.6 Switchboard Schematic

Adjacent to the Switchboard a Schematic diagram, minimum size A2, shall be installed detailing the switchboard, its inputs and loads. Each circuit shall be detailed with the rating of the device and the devices setting. The schematic shall be included in the As Built Documentation in AutoCAD format.

The final format of the schematic drawing shall be agreed with the University Project Liaison Engineer prior to installation. Care should be taken to select suitable coloured inks that will resist fading. The schematic drawing shall be mounted in a secure frame, which is complete with a non-reflective protective plastic sheet covering.

# 9.0 ELECTRICAL / ENERGY METERING

To be read in with the 'Briefing Document for Automatic Metering - ES/021 '

All energy meters shall be supplied complete with calibration and test certificates, which shall be included in the 'As Built Documentation', along with C.T. ratios and settings. It shall be noted that the test certificates shall reflect the actual site operating conditions.

Sub Meter locations shall be carefully planned with due reference to the revised Building Regulations Part L 'Metering for Energy Monitoring'. Before the metering system is fully specified a draft shall be submitted to the University Project Liaison Engineer for discussion and guidance.

## 9.1 Electricity Meters

Meter to be programmed for;
- C.T. Ratio
- Pulse Weight

The selection of C.T. ratios shall be relevant to their design load together with a minimum of 25% potential for future load increase, and not the protective device rating to ensure accurate recording of electricity consumed.

Meters shall not be located within / on the switchboard

## 9.2 RTU's (Meter Data Logger)

Local to each switchboard, or agreed location, a data logger shall be installed. The outputs from the individual electrical meters shall be wired to the data logger.

The data logger shall be supplied complete with enclosure with the individual channels wired to interface terminals for ease of field wiring connections.

The data logger shall be supplied fully equipped with all cards.

The data logger shall be connected to the University data network in accordance with the current standard, or as advised, Krone RJ45 data point dependant upon location refer University Project Liaison Engineer for any clarification.

The electrical supply to the data logger shall be via an independent radial circuit via a secret key switched fused (3Amp) spur complete with neon indication. Multiple data loggers can share the same circuit.

Digital outputs from each electrical meter shall be configured for;

| | |
|---|---|
| 4x120mS pulse for each kWh | for each load below 100Amp |
| 1x120ms pulse for each kWh | for each load 100Amp to 1,000Amp |
| 1x120ms pulse for each 5 kWh | for each load above 1,000Amp |

It shall be noted that the pulsed outputs from any energy meter shall not exceed 8 pulses per second; this shall be considered when selecting meters and their ranges.

The programming of the data logger shall be carried out by the University.

For each data logger a schedule shall be produced detailing the channel allocation and the pulse weight associated with each meter connected

## 9.3 C.T.'s

C.T.'s shall be Class 1 or better; to ensure compatibility it is recommended that the C.T.'s be obtained from the meter supplier.

The selection of C.T. ratios shall be relevant to their design load together with a minimum of 25% potential for future load increase, and not the protective device rating to ensure accurate recording of electricity consumed.

Care should be taken in selecting C.T. ratings for any adverse loading effect from the extended length of the wiring and the meter used.

Selection of C.T.'s shall consider cable sizing / parallel cables; the C.T.'s shall encompass all conductors in a parallel cabled circuit

Generally split C.T.'s are not acceptable, the exception to this rule is where retrofit C.T.'s are to be installed to existing circuits.

### 9.4 Other Meters

The Mechanical Services Engineers will identify energy meters as part of their design; these meters will normally include;

Water
Gas — There may be multiples of each of these meters
Heat

These meters will be complete with digital pulsed outputs, responsibility for the Electrical Contractor shall be:-

a) Supply and installation of electrical spur adjacent to each meter unit, as / if required.

b) Supply, installation and connection of signal cable from the digital output of the meter to the data logger.

The pulse output values from these meters shall be selected such that they are relevant to their load, where excessive consumption against pulse interval occurs accurate monitoring will not be possible. It shall be noted that the pulsed outputs from any energy meter shall not exceed 8 pulses per second; this shall be considered when selecting meters and their ranges.

Note; It is not uncommon for Heat Meters to have a standard pulse value of 1 pulse per 1MW, this level of value is not suitable for meters at the University

### 9.5 Meter 'Data' Wiring

| | |
|---|---|
| C.T. to Meter | 1.5mm$^2$ Cu Minimum |
| Meter Pulse Output | CW1308 |
| Meter Mod Bus Output | Individual screened paired |

## 10.0 WIRING SYSTEM

Generally all cabling and wiring shall be of BASEC approved cables with copper conductors, LSF format sized to suit their respective load.

Mains & Sub-Mains Power cables shall be generally XLPE / SWA types; sizing of cables that service other distribution, i.e. switchboards – distribution boards etc. shall consider future load expansion.

When sizing of cables the maximum permitted operating temperature of the cable shall be 70°C; whilst XLPE cable can operate up to 90°C, the risk of excess heat adversely affecting automatic circuit protection devices is considered

Final circuits should be rewirable, i.e. single core wiring routed via accessible conduit / cable trunking.

Small power ring circuits shall be wired in a minimum of 2.5mm$^2$ Cu

Lighting circuits shall be wired in a minimum of 1.5mm$^2$ Cu

Cable routing shall have accessible 'pulling' points.

Cable routing mediums shall not be used as the CPC's

With the increase of computers and other types of equipment, which may have high protective

conductor currents, final circuits shall be wired in compliance with the relevant section of BS7671 IEE Regulations, in consideration for high integrity earths

Wiring systems generically referred to TWE are not permitted

Consideration shall be given to projects that will be affected by the revised phase / core colouring.

### 10.1 Labelling

For individual rooms and small areas an engraved 'Black-On-White' label shall be fixed utilising a minimum of 2 screws to the external of the room entrance door(s), hinge side, detailing the electrical circuits contained within, in the format detailed in Section 13

For large and areas and areas where there are in excess of 4No circuits a laminated label shall be affixed to all final internally located connection points detailing the circuit details in the format detailed in Section 13.

In all locations radial supplied circuits shall be fitted with a laminated label detailing the circuit details in the format detailed in Section 13.

An engraved 'Black-On-White' label shall be fixed utilising a minimum of 4 snap rivets to:-

| | |
|---|---|
| Switchboards | 10mm Characters |
| Distribution Boards | 8mm Characters |
| Switch-Fuses | 6mm Characters |
| Local Isolators | 6mm Characters |

All labelling shall be agreed with the University Project Liaison Engineer prior to manufacture

External Labelling shall be engraved 'Black-On-White', permanently fixed such as to ensure the weatherproof integrity.

## 11.0 DISTRIBUTION SYSTEM

Schneider (Merlin Gerin) distribution boards are preferred, with XLPE/SWA/, LSF sub-mains cabling.

Distribution boards shall be complete with 4 pole incoming devices for TPSwN distribution and 2 Pole incoming devices for SPSwN distribution. It should be noted that outgoing ways do not require the neutral to be switched, except where the circuit is to feed an additional distribution board.

The utilisation of an outgoing way for the purpose of the incomer is not acceptable

TP&N Distribution boards shall be ISOBAR Split Metered to segregate Lighting circuits from Small Power circuits. The split ratio shall be as determined by the design, in all cases a minimum of 30% spare ways shall be available to each section at the completion of the construction

SP&N Distribution boards shall be ISOBAR Metered the final configuration of the distribution board shall include a minimum of 30% spare outgoing ways at the completion of the construction.

The pulsed output of the installed meters shall be connected to the local Energy data logger, see University Metering Standard for details

All distribution boards must be lockable with removable key.

Distribution trunking must be accessible (for circuit wiring and ancillary services) along its entire length.

MCB's shall generally be of 'C' type; minimum rating 6Amp.

All switchgear, distribution boards, etc. shall be labelled in compliance with University labelling guidelines; see Section 9

Circuit Neutrals and CPC's shall be clearly identified within distribution boards / panels with a proprietary cable numbering system with their relevant circuit reference.

Main and secondary HUB room shall be equipped with a dedicated distribution board, where practical the sub main for these distribution boards shall be taken direct from the main L.V. Switchboard

Data hubs shall be connected via a BS EN 60309-2 16Amp socket outlet with secondary earth point.

Fire alarm panels shall have dedicated supply directly wired from the main switchboard. The final connection to fire alarm panels shall be via an unswitched fused connection unit with mains present indication.

The University has its own circuit numbering protocol which shall be employed on all projects; see Section 13.

## 12.0 EPO SYSTEMS

EPO systems shall be installed to laboratories, works shops and locations specified by the end user

The EPO system shall isolate all electrical services, with the exception of lighting, that can be viewed from the location of the EPO unit

Zoned EPO systems are not acceptable

The EPO system shall exclude, by agreement, services to refrigerators and freezers

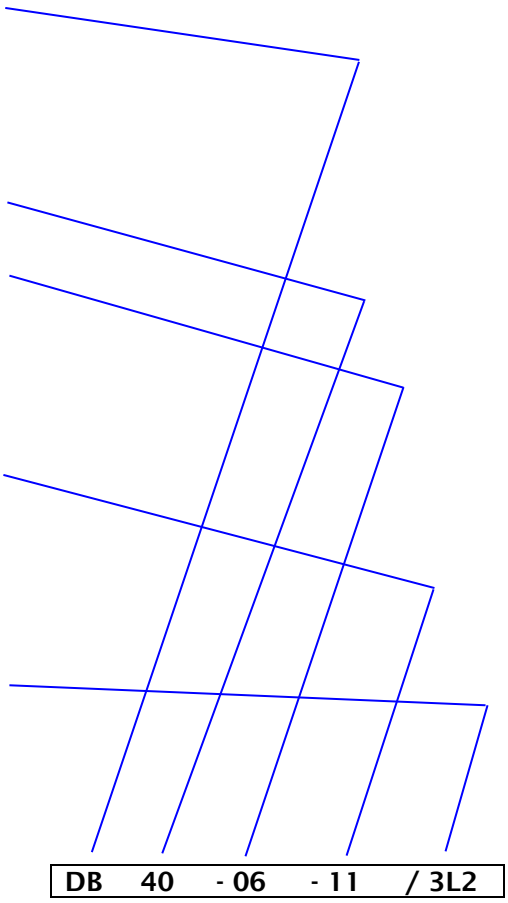
## 13.0 UNIVERSITY CIRCUIT NUMBERING PROTOCOL

The University of Southampton has adopted a standard method for all electrical circuit distribution and identification.

The premise of the system is to enable any circuit to be traced back to its original source and through any part.

**Circuit Identification Makeup**

| | | |
|---|---|---|
| First Alpha | **DB** | Acceptable abbreviations;<br>SB = Switch Board<br>DB = Distribution Board<br>BB = Bus Bar<br>CP = Control Panel |
| | | |
| First Numeric | **40** | Building / Substation Number |
| | | |
| Second Numeric | **06** | Way Number on the Switchboard.<br>Way number may be appended with the Phase reference for single phase. |
| | | |
| Third Numeric | **11** | Way Number on the Intermediate Distribution Board, not always present.<br>Way number may be appended with the Phase reference for single phase. |
| | | |
| Final Reference | **3L2** | Final circuit number on distribution board.<br>3 = Way<br>L2 = Phase<br>The way number is used For three phase circuits only |




## 14.0 BUSBAR DISTRIBUTION

Where primary building risers are present consideration shall be given to the use of copper busbar risers to facilitate ease of power distribution.

Separate busbar systems shall be installed; for lighting circuits and such additional as required supporting power requirements.

The busbar configuration shall be such that floor loads utilise tap-off points on that floor.

The minimum rating for the busbar shall be 400A TPN for power and 250A TPN for lighting, configured to provide maximum tap-offs per floor level.

Coordination with other services in the risers shall be carried out to ensure that all tap-offs can be used and access to the tap-offs for cabling is maintained.

Tap-offs units shall be complete with their appropriately rated automatic protective device

In addition to utilising busbars within building risers consideration shall be given for other areas i.e. Workshops, where a high level of distribution versatility is required and below raised floor areas for similar reasons.

Where busbars are installed within restricted access areas the configuration of the tap-off locations shall be carefully planned.

Installation of the busbar shall be carried out utilising the manufacturers supplied torque device.

## 15.0 ELECTRIC MOTORS

The design and specification of plant requiring electric motors shall detail 3 Phase drives where available.

Each electrical motor shall be sized for its duty taking into consideration load profile, frequency of starting, duty standby changeovers etc.

## 16.0 VARIABLE SPEED DRIVES

Variable speed drives shall be utilised where load changes can be expected, i.e 24hr ventilation fans which are affected by building occupancy times, door opening / closing etc.

The location of Variable speed drives shall consider the heat output and ventilation requirement of the unit

Variable speed drives shall be linked to ancillary controls such as differential pressure switches.

In addition the University operates a Trend based BMS which can be utilised for interface control to the variable speed drives.

## 17.0 GENERATORS

Where the installation of permanent generators is included in a project, including such for CHP, a connection point for a mobile load bank shall be installed

Transfer of the output of the generator to the load bank test point shall be via pad-lockable fully rated switches. The configuration of the switches shall be such that temporary cable modifications are not required

The load bank connection point, cabling and switch ratings shall be a minimum of 20% above the rating of the generator

The location of the load bank connection point shall be such that the load back can be positioned in a safe location external to the building

Standby generators will be subject to monthly run tests, the configuration of the switching and controls shall be such that this can be achieved without compromising the normal operation of the building systems

The generator bulk fuel storage shall be capable of supporting the full load operation of the generator for a minimum of 48Hours; the University Project Liaison Engineer will provide guidance to any variation to this

The bulk fuel storage and any link to the generator day tank shall be subject to a permanently installed ‘Fuel Polishing System’

Generator fuel systems shall be interlocked to the fire alarm system such that any activation local to the generator of fuel storage point immediately isolates the fuel delivery to the generator

In addition the generator shall be able to accept emergency shutdown signals from the fire alarm system, local EPO and as such appropriate to the location

The site and control configuration of a generator installation shall be agreed with the University Project Liaison Engineer

## 18.0 UPS SYSTEMS

UPS systems shall be free standing, integrated rack mounting systems are not normally acceptable

UPS systems shall be Three Phase IDMT transformer less, Single Phase UPS systems shall only be acceptable where they are load specific

In general the UPS shall be capable of being remotely monitored for condition and operational readiness, a number of manufacturers offer this facility; however agreement from the University Project Liaison Engineer shall be sought before any selective decision is made

Battery enclosures shall be fitted with a removable internal 'Makrolon' or similar transparent material to facilitate visual inspection of the batteries whilst providing a suitable barrier from the battery terminals

## 19.0 LUMINAIRES

Refer to schedule for a list of preferred manufacturers.

Tungsten luminaires are not acceptable.

Energy efficiency should be one of the primary concerns in the selection of luminaires.

LED luminaires shall be primary choice for all projects with colour temperature 4000°K, providing colour rendering in the order of $R_a$ 80-85, however consideration shall be given for 'Natural / Daylight' for appropriate areas.

Fluorescent luminaires with high frequency control gear and T5 lamps may be acceptable for certain applications.

Generally fluorescent lamps shall be of Tri-phosphor type, colour temperature 3000 to 4000°K, providing colour rendering in the order of $R_a$ 80-85, however consideration shall be given for 'Natural / Daylight' lamps for appropriate areas.

Lower quality ranges of luminaires such as 'battens' and 'pop packs' should be avoided.

"Plastic" diffusers shall be acrylic or polycarbonate. Styrene diffusers are not permitted.

Sealed linear fluorescent luminaries shall be fitted with stainless steel cover retainers in place of the standard plastic.

Lighting installations shall be in compliance with the latest issues of CIBSE Lighting Guides.

Lighting circuits shall generally be protected by 10A devices

Final connections between circuit wiring and internal luminaires shall be via 'Klick' style plug and socket

Final connections between circuit wiring and external luminaires shall be via weatherproof 'Comando'

style plug and socket

## 20.0 EXTERNAL LIGHTING

Refer to schedule for a list of preferred manufacturers.

LED white light luminaires shall be primary choice for all projects with colour temperature 4000°K,

White light metal halide lamps required with UV proofed enclosure and front lens may be acceptable for certain applications.

Controls to be via light sensitive detectors with suitably located key override switches, the use of time switches shall be avoided.

Controls shall be installed to each external luminaire that facilitates the diming of the light output after an adjustable time period when no trigger of the individual PIR has occurred. The luminaire shall ramp to full brightness once any trigger of the PIR has occurred

For maintenance purposes the PIR shall be capable of being remotely operated from a hand held transmitter to both illuminate the luminaire and set through its dimming function. Any and all modifications to the operating sequence of the luminaire shall be possible from the hand held remote by the University's staff

Full system control is not acceptable, each luminaire shall operate as an individual

Consideration shall be given to the utilisation of adjustable light sensitive detectors to overcome areas of late daylight, with suitably located key override switches.

Low level bollard lighting is not acceptable.

Accessible wall mounted luminaires are preferred, (i.e. maximum 4m), where possible. Cable selection and routing should be selected with sympathy to the building structure and use.

In certain areas CCTV will be utilised, the lighting design shall reflect the requirements of this.

## 20.1 FEATURE LIGHTING

In general the University does not utilise Feature Illumination. Where a project is deemed to require such illumination the requirement and methology shall be agreed with the University Project Liaison Engineer

Any luminaires specified for such feature illumination shall be sourced from one of the manufactures detailed; and deviation from the schedule shall be agreed with the University Project Liaison Engineer, and be such that replacement luminaires and service parts are readily available

## 21.0 EMERGENCY LIGHTING

Refer to schedule for a list of preferred manufacturers.

System shall comply with BS5266; with minimum luminaire maintenance of 3 hours.

The Universities preferred method of operation for emergency lighting systems is individual self-contained luminaire (self-test) with Email monitoring reporting via the Web

### 21.1 Central Battery Systems – Not Normally Acceptable

The University has minimal central battery systems which are fast approaching the end of their serviceable life. To that end the University has a program to replace these systems with Self-contained addressable luminaires as supplied by P4

Therefore agreement shall be sought from the University Project Liaison Engineer for any additions to an existing system

The centrally fed luminaires shall be supplied via local phase failure relays and provision of local test switches.

The University of Southampton has its own log book standard which will be free issued.

### 21.2 Web Linked Self Test Self Contained

Self Test / Monitored linked luminaires shall generally be specified at the University.

The system shall report test results and faults utilising Email via the Web

LED luminaires shall be utilised for emergency lighting

In order to assist in the Universities maintenance routines, combination service / emergency luminaries shall be fitted with a discretely visible 10mm diameter red dot.

The preferred manufacturer offers a service to take in other manufacturers' luminaires and convert for Emergency Operation; this is not acceptable to the University.

## 22.0 CONTROL SYSTEMS, EXCLUDING BMS

Control systems shall be relative to the item / system design.

The University in general does not accept wireless control systems, any such proposals shall be submitted to the University Project Liaison Engineer for discussion and decision

Any and all controls shall be direct to location and exclude any form of PC or Laptop software interface to amend or update

### 22.1 Lighting Controls

Lighting controls shall be selected against the requirements of the users and factors affecting energy conservation.

Where appropriate, presence and light level sensing luminaires / systems shall be incorporated.

Luminaire switching shall be configured with respect to room / area configuration, i.e. the luminaires local to the windows shall be controlled separately from the main bulk of lighting.

Maintenance secret key switches to override the presence / light level control shall be provided.

Individual office / small areas shall utilise 1 to 10V dimming

Larger dimming systems shall be based upon 'DALI' protocols. Consideration shall also be given to multi-channel pre-set programmed dimming levels for areas such as lecture theatres, to interface with the lectern / control desk.

The University has an agreement to utilise 'Crestron' as their preferred supplier for Lecture Rooms and Common Learning Spaces to control the AV Systems and Lighting; there is separate specification available for this, the University Project Liaison Engineer will provide details

It shall be noted that the use of 'Crestron' diming ballasts is not acceptable, the methology of control is an interface with the 'Crestron' control panel

It shall be noted that the specification and installation of software based programmable lighting controls is not acceptable

It shall be noted that University employs luminaires within student corridors which are complete with micro-wave sensors; the inclusion of light level sensing should also be included where appropriate

The utilisation of corridor luminaires with micro-wave sensors for academic and research areas may be acceptable, however such utilisation to be agreed with the University Project Liaison Engineer

## 23.0 INDUCTION LOOPS

BDA approved Induction loops shall be installed in the followings areas:-

a. Reception desks, these units shall be built into the reception desk and shall be complete with microphone.

   In reception locations which contain waiting areas an additional induction loop shall be installed to cover the area complete with a dedicated microphone

b. Lecture Rooms, these areas require specialist systems linked to the Teaching desk such that the loop will broadcast all outputs from the desk.

   The location and routing on the loop shall be configured to avoid interference from other devices, i.e. discharge luminaries, dimming systems etc.

c. Interview / Tutorial rooms, these rooms shall be equipped as dictated by the user department. In certain locations a portable unit will suffice in place of permanently installed systems. The department's room data sheets will dictate.

In all cases selection, location and configuration shall consider the privacy / confidentiality of those for whom the system is intended.

## 24.0 ACCESSORIES

Refer to schedule for a list of preferred manufacturers.

Accessories shall generally be of white plastic; however selection of accessories shall consider the decoration / environment of their location.

The University is now in the practice of installing twin switched outlets complete with twin integrated USB charger points. Their use is specific to project areas and as such agreement shall be sought from the University Project Liaison Engineer. The USB charger socket shall be isolated until a plug is inserted into the USB socket

Accessories for plant and workshop type areas shall be of 'metal clad' construction.

All sockets and isolators to be labelled with circuit references in compliance with University labelling guidelines. An approved stick-on label with black lettering on a white background is adequate; see Section 9 & 11.

External sockets / switches shall generally be of weather sealed type located and installed with consideration to internal condensation.

## 25.0 TRUNKING & CONDUIT

Refer to schedule for a list of preferred manufacturers.

Galvanised Steel shall be used for all Plant Areas

White uPVC shall be used for all other areas

Fire rated supports for uPVC conduit shall be colour matched to the conduit

### 25.1 Dado

Dado or skirting trunking shall generally be of white uPVC, size and compartment configuration will be dependant upon service being routed / installed.

Dado / Skirting trunking modifications shall match that which is existing

The University utilises structured cabling as such Dado trunking shall, in general, be 2 compartment

Dado trunking shall be sized in consideration of power / data / telephone cabling to be routed.

It shall be noted that for the majority of new build and refurbishment projects data / coms are structured cabled.

### 25.2 Service

Main trunking systems within risers, plant areas, ceiling voids, etc. are to be in galvanised steel with die cast turnbuckle fix lids.

Sizing of service trunking shall consider not only the recommendations of BS7671IEE Regulations, but also the likelihood of the future increased cable installation.

## 26.0 FIRE ALARM SYSTEM

Refer to schedule for a list of preferred manufacturers.

The fire alarm system shall incorporate a Web Linked panel to enable remote interrogation / monitoring / control of the fire alarm system

System shall comply with BS5839, Category L4/M plus Nominated areas of risk as identified by the Fire Risk Assessment*; utilising intelligent addressable equipment for Academic Areas.

System shall comply with BS5839, Category L2/M plus areas identified by the Fire Risk Assessment*; utilising intelligent addressable equipment for student accommodation areas.

> * The specific Fire Risk Assessment shall be referred to the University Insurance for final system level of protection agreement; the University Project Liaison Engineer shall provide contact details.

Wiring shall be Fire Tuf, Pirelli FP 200 Gold or MICC cable, with red oversheath.

The final selection of cabling shall be dependent upon the project. Where a project utilises parts of an existing installation then the cabling shall be as that existing. Guidance shall be sought from the University Project Liaison Engineer.

A wall mounted floor plan/system diagram legibly detailing the location and device numbering Shall be provided adjacent the Fire Alarm System control panel and any associated repeater / mimic panels.

Adjacent to the main fire alarm panel a suitable lockable enclosure shall be fitted to house the system logbook. (The University of Southampton has its own log book and enclosure standard and will be free issue).

Override key switches for ancillary services shall be provided at main control panel to permit normal system testing without closing down ancillary systems i.e. main gas valve, vent plant etc.

Device bases shall be marked with their system address.

Automatic Detectors, shall be Multi-sensor type incorporating Optical smoke chamber, Ionisation detectors are not suitable for use at the University

Addressable strobes shall be used in addition to Bell Sounders in noisy and high occupancy location

The addition of strobe Indication units should be considered for use in WC's.

Strobes shall be of the variable frequency type.

The inclusion of 'Visual Alarm Devices' (BS EN 54-23:2010) shall be dictated with reference to the Fire Risk Assessment

Fire Alarm Panels shall be complete with event printer.

To reduce false alarms detectors utilising a 'double sampling' also referred to as 'Double Knock' system shall be used causing the detector to activate an alarm signal only if 'smoke' is detected for two successive sampling periods.

Bell sounders **only,** shall be used for Academic Blocks (Electronic sounders reproducing the sound of bells are not generally acceptable but will be considered on a project by project basis, agreements shall be sought from the University Project Liaison Engineer)

Electronic Multi-tone Sounders or bell sounders shall be used in Accommodation Blocks.

It is a requirement that the University or its chosen contractor shall be freely able to purchase spares for any new fire alarm system and that all control software is to be 'open protocol'.

### 26.1 Wireless – Radio Linked Fire Alarm Systems

Generally these are not considered appropriate for the University of Southampton.

Should circumstances indicate that this type of system offers benefits over and above wired systems, i.e. listed buildings or short term / temporary locations, the circumstance shall be discussed with and agreement sought from the University Project Liaison Engineer

### 26.2 Aspirated Systems

Refer to schedule for a list of preferred manufacturers.

Aspirated systems shall be considered for high risk and difficult access areas where standard surface point detectors are not acceptable.

### 26.3 Radio Linked Emergency Pagers

Consideration shall be given to the inclusion of a radio pager system linked to and controlled via the Fire Alarm system.

The specific Fire Risk Assessment shall be the basis for this consideration.

## 27.0 FIRE BARRIERS

All cable and service routes that penetrate fire barriers shall be fitted with proprietary intumescent fire seal protection.

Cable trunking shall be sized such as to allow for cable capacity and capacity for the proprietary intumescent fire seal protection.

There are many types of systems on the market; any such system shall be agreed with the University Project Liaison Engineer. The use of simple fire rated foam fill will not normally be acceptable

## 28.0 FIRE CURTAINS & SHUTTERS

The use of fire curtains and shutters is usually restricted to specific locations, as such their configuration shall be carefully considered

Where the fire curtain and shutter is encased as part of the fire compartmentation access ways, or removable panels shall be incorporated to allow for the future removal / replacement of the fire curtain / shutter material

The location and access to the control panel, reset facility and track installation shall be configured such that ease of resetting is maintained; in addition the installation shall avoid compromising the smooth operation of the fire curtain or shutter through penetrative fixings

## 29.0 STANDARD WORKSTATION ARRANGEMENTS

The University has a separate detailed specification covering its requirements; this shall be used in conjunction with the project brief.

## 30.0 COMPUTER WORKSTATION ROOMS

The University of Southampton has a separate standard which is dependant upon the particular installation; these details should be, in part, supplied with the overall design brief or direct from the Estates & Facilities, Engineering Design Section.

## 31.0 CONTRACTUAL CO-ORDINATION

A clause shall be included in the specification to positively identify responsibility and ensure co-ordination of services is carried out.

Electrical Consultants will be expected to liaise with consultants of other disciplines to ensure co-ordination of all aspects of the design.

## 32.0 INFORMATION INTERCHANGE

The University of Southampton, University Project Liaison Engineer, is available to provide information concerning its systems and nuances to the Consultant to assist in the preparation of, and be adequately covered by, the tender documentation.

## 33.0 ANCILLARY SERVICES

Provision shall be included to allow wiring to data, telecommunication systems, BMS etc.

The University utilises a specialist contractor to install / test/ commission / certify its data and telephony requirements - the University Project Liaison Engineer will provide contact details.

The University of Southampton has a separate standard for structured cabling, also available on the Estates & Facilities website.

## 34.0 ENERGY EFFICIENCY

Refer to the University of Southampton, Estates & Facilities, Engineering Design Section Manager for any particular requirements; the University Project Liaison Engineer will provide contact details.

## 35.0 CCTV & SECURITY SYSTEMS

Refer to University standard, which is available on the Estates & Facilities website.

## 36.0 LIFTS

Refer to University standard ES / 007, which is available on the Estates & Facilities website.

## 37.0 COMMISSIONING & COMPLIENCE

Inspection, Testing and Commissioning shall be carried out as described below and certificates issued

before handover of the installation. Concealed or buried work shall be inspected and tested before any permanent covering is applied.

Before commissioning can begin, all installations must have been completed and tested in all respects as called for in the Specification.

Commissioning shall mean the advancement of all the Building Services Systems from the state of static completion to full working order adjusted to the design requirements.

All test equipment and skilled supervision shall be provided.
Seven days' notice shall be given in writing of the time of inspection, testing and commissioning, including that of concealed or buried work, so that witnessing by others can be arranged if required.

For complex installations an approved checklist shall be compiled to record success of all tests, measured readings and adjustment settings.
Where witnessing is arranged, prior tests shall be carried out to ensure that the witnessed testing and commissioning is not prolonged by fault finding and rectification.

Instruments

The cost of providing all instruments and associated equipment, attendance of the specialists as required shall be included in the Tender. A recent calibration certificate for each instrument shall be available for inspection and included in the 'As Built Documentation'.

A schedule of the instruments to be used shall be submitted to the Engineer for approval prior to the commencement for commissioning and testing.

Inspection and Testing

Inspection and testing shall be carried out in accordance with the current revision of IEE Regulations (BS 7671) and CIBSE commissioning codes both during and after erection.

Certificates and schedules for all systems shall be issued and included in the 'As Built Documentation'.

## 38.0 WITNESS TESTING

As part of the compliance for certain equipment for any given project a representative from the University will require attendance to Factory Acceptance Tests (F.A.T.) and Site Acceptance Tests (S.A.T.), the University Project Liaison Engineer will advise who will attend

In order to ensure that the attendance of the University representative(s) is included the costs associated with the attendance shall be included within any tender invitation. The inclusion shall cover relevant transportation, accommodation and sustenance to the location of the F.A.T.

During the construction of the works there will be a requirement by the University to attend site to witness test such installations and equipment as appropriate. An agreed program of attendances shall be agreed with the University Project Liaison Engineer

## 39.0 ASSETT REGISTER

The University has a standard for the project assets; the starting point for this register is at the design and specification stage.

The University Project Liaison Engineer will provide such guidance as required to assist in the initial configuration of this register

## 40.0 AS BUILT DOCUMENTATION

The University of Southampton, Engineering Design Section, has a specific specification for 'As Built Documentation', ES / 013, which is available on the Estates & Facilities website.

## LIST OF PREFERRED MANUFACTURERS / SUPPLIERS

| | Preferred | Range | Alternative | Range |
|---|---|---|---|---|
| Contractors | Selected from University H & S List | | Contact University Project Liaison Engineer | |
| Primary High Voltage Equipment | Hawker Siddeley | Eclipse | Schneider – By agreement with the University HV Engineer | Genie Evo |
| Secondary High Voltage Equipment | Schneider – Future Development | Ringmaster<br>'SE / CE' Extensible | Contact University Project Liaison Engineer | |
| HV Protection Relay IDMT | MICOM | 140 Series | MICOM<br>Schneider | 120 Series<br>VIP 300 Series |
| Transformers | Wilson Power Solutions | Al/Al/ or Cu / Cu<br>Amorphous KNAN | ABB – Brush<br>Schneider | KNAN SLL<br>KNAN SLL |
| Voltage Optimisation | Refer to University Project Liaison Engineer | | | |
| Main Switchboard | GR Electrical<br>AF Switchgear<br>MARDIX | Schneider<br>Schneider<br>Schneider | Schneider<br>Underwoods | Schneider |
| Sub-Main & Final Distribution Boards | Schneider - Merlin Gerin | | No alternative | |
| MCCB's, MCB's, fuses, etc. | Schneider - Merlin Gerin | | No alternative | |
| TP & SP Isolators, Switchfuses, etc | MEM | | Square D, Dorman Smith, Schneider - Merlin Gerin | |

| | | Preferred | | Range | | Alternative | | Range |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| UPS Systems | | Emerson Power | | Trinergy<br>Cube<br>Liebert | | Contact University Project Liaison Engineer | | |
| | | | | | | | | |
| Luminaires - Internal | | ASD<br>Concord/Marlin<br>Designplan<br>JCC LED<br>Philips | | | | Crompton<br>Dextra<br>Fluorel<br>Glamox<br>Pierlite | | To Match Existing |
| | | | | | | | | |
| Luminaires - External | | ASD<br>BEGA<br>Concord/Marlin<br>Designplan<br>Holophane<br>Philips | | | | Fluorel<br>Glamox<br>Zumtobel | | To Match Existing |
| | | | | | | | | |
| Emergency Lighting – Central Battery | | Contact University Project Liaison Engineer | | | | | | |
| | | | | | | | | |
| Self-Test Emergency Lighting – Central Battery | | Contact University Project Liaison Engineer | | | | | | |
| | | | | | | | | |
| Emergency Lighting – Self Contained Auto Test | | P4 Fastel | | Quatrum – LED<br>SatiLed<br>etc. | | | | |
| | | | | | | | | |
| Copper Busbar Distribution - Risers | | Siemens (Barduct) | | Min 400Amp Power<br>Min 250Amp Lighting<br>BD Range | | Schneider | | |

| | | Preferred | | Range | | Alternative | | Range |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| Copper Busbar – Resin Cast | | To Be Agreed | | | | Contact University Project Liaison Engineer | | |
| | | | | | | | | |
| Variable Speed Drives | | Danfoss<br>Honeywell | | | | | | |
| | | | | | | | | |
| Electrical accessories: sockets, fused spurs, control switches, etc. in Offices, laboratories, – | | Crabtree<br>MK | | White plastic - Or to match decoration | | GET<br>MEM | | To Match Existing<br>To Match Existing |
| | | | | | | | | |
| Electrical accessories– Workshop, Plant Rooms, etc. | | Crabtree<br>MK | | 'Metal Clad' | | GET<br>MEM | | To Match Existing<br>To Match Existing |
| | | | | | | | | |
| Lighting Control Switches, Grid Type | | Crabtree<br>MK | | | | GET<br>MEM | | To Match Existing<br>To Match Existing |
| | | | | | | | | |
| Dado Trunking 3 Compartment | | Crabtree<br>MK | | | | Marshall Tufflex, Mita, MEM | | To Match Existing |
| | | | | | | | | |
| Dado Trunking 2 Compartment | | MK | | 2Comp | | Contact University Project Liaison Engineer | | To Match Existing |
| | | | | | | | | |
| Automatic Presence Controls | | B.E.G. | | | | By Agreement | | To Match Existing |
| | | | | | | | | |
| Galvanised Steel Trunking | | Unitrunk | | | | Tamlex, Alto, | | To Match Existing |
| | | | | | | | | |
| Galvanised Steel conduit | | Unitrunk | | | | Tamlex, Alto, | | |
| | | **Preferred** | | **Range** | | **Alternative** | | **Range** |
| | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Galvanised Steel Cable Tray | | Unitrunk | | | | Unistrut | | |
| | | | | | | | | |
| Galvanised Steel Cable Ladder – Light Duty | | Unitrunk | | | | Unistrut | | |
| | | | | | | | | |
| Galvanised Steel Cable Ladder – Medium & Heavy Duty | | Vantrunk | | | | Unistrut | | |
| | | | | | | | | |
| Cable Basket | | Unitrunk | | | | Unistrut | | |
| | | | | | | | | |
| uPVC Conduit | | MK | | | | Marshall Tufflex, Mita, Alto | | |
| | | | | | | | | |
| uPVC Trunking | | MK | | | | Marshall Tufflex , Centaur, Mita, | | |
| | | | | | | | | |
| Cables LSF | | BASEC Approved | | | | No alternative | | |
| | | | | | | | | |
| Extract Ventilation Fans | | Vent Axia Ltd | | | | Xpelair, | | |
| | | | | | | | | |
| Fan Controllers | | Vent Axia Ltd | | | | Xpelair, | | |
| | | | | | | | | |
| Point of use water boilers | | Zip Hydroboil | | HS Range<br>To suit Location | | By Agreement | | |
| | | | | | | | | |
| Fire Alarm Equipment - Panels | | Advanced | | Current | | None | | |
| | | | | | | | | |
| Fire Alarm Equipment – Detectors | | Apollo | | Discovery Multi-sensor Detector Series | | None | | |
| | | | | | | | | |
| VAD's | | Apollo | | | | | | |
| | | | | | | | | |
| | | **Preferred** | | **Range** | | **Alternative** | | **Range** |
| | | | | | | | | |
| Fire Alarm Equipment - Commissioning | | Detect Fire & Security. | | | | Contact University Project Liaison Engineer | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Fire Alarm Equipment – Radio Linked | | EMS | | The use of this type of equipment is strictly limited. Contact University Project Liaison Engineer | | | | |
| | | | | | | | | |
| Aspirated Systems | | Vesda | | | | None | | |
| | | | | | | | | |
| Radio Linked Emergency Pagers- Subject to FRA | | To Be Agreed With the University Project Liaison Engineer | | | | | | |
| | | | | | | | | |
| Induction Loops | | To Be Agreed | | | | Contact University Project Liaison Engineer | | |

NOTE:- Preferred manufacturer list is in alphabetical order and does not reflect the order of preference; in all cases the selection of the manufacturer and range will be relative to the project and where applicable the matching of that which is existing

Any selection from the 'Alternative' lists shall be agreed with the Appointed University Project Liaison Engineer