Institute of Sports, Exercise & Health

MacDonald Buchanan House - Sports Institute

Electrical Services Specification

SPC-04

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Job number 218598-01

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Appendices

1 Electrical Particulars

1.1 General

This specification covers the supply, installation, testing and commissioning of the electrical services for the first and second floor refurbishment of 170 Tottenham Court Road, London and represents the design which has been developed to a level commensurate for Contract.

1.2 Scope of Works

The Contractor shall include for the supply, installation, testing, commissioning, proving, demonstration and setting to work of all items of equipment and materials required to complete the electrical services. This shall include all skilled and unskilled labour and all incidental items necessary for the full completion of the works, ready for handing over to the client in working order, in accordance with the agreed programme, along with all supporting handover documentation.

The extent of the electrical works shall include but not be limited to:

- Low Voltage (LV) distribution (including main and sub-metering).
- Earthing and equipotential bonding installation.
- Lightning protection (Bonding roof plant to the existing network).
- Small power distribution.
- Cable containment systems.
- Lighting & emergency lighting.
- Lighting control and emergency monitoring systems.
- Fire alarm and detection systems.
- Standby Generator
- Staff/patient alarm System
- Audio Frequency Induction Loops.
- Containment and power for structured cabling & ICT systems. (Refer to separate ICT report).
- Containment and power for security systems (Refer to the separate security report).
- Testing of all materials and installations as detailed in the specification. Leaving all installations and plant in complete and proper working order to the satisfaction of the Contract Administrator (CA).

The Works to be executed under this Contract are described in the following systems descriptions, accompanying equipment data sheets, schedules and as shown on the issued drawings. The contractor shall ensure that the specification Equipment Data Sheets are read and adhered to.

The Contractor shall provide everything necessary for the full completion of the Works and the Works shall be executed in a workmanlike manner to the complete satisfaction of the CA.

The Contractor shall provide and forward to the CA for approval, detailed Working (installation) Drawings, covering all aspects of the Contract and shall include for the production of such drawings and other documents as required by this Specification.

In addition to the above works, the Contractor shall also include for the following:

- Full liaison with other Contractors during commissioning and performance testing of their works, and to ensure compatibility of control and commissioning interfaces.
- Supply and identification of all labels for all plant, equipment and cable containment.
- Make due allowance in the electrical installation for all tolerances, movements (building and thermal) and deflections, and provide all items required to accommodate them.
- Liaison with Statutory Authorities.
- Liaison with specialist MRI/Xray subcontractors.
- Liaison with specialist ICT subcontractors
- Testing, commissioning and demonstrating to the CA and Insurance companies.
- Submission of final installation Record drawings and O&M manuals.

The Contractor shall ensure that all sub-contractors and suppliers are provided with all relevant parts of the Building Services Documents.

The Contractor shall develop the information contained on the Contract drawings into installation drawings incorporating all necessary co-ordination of the services, including manufacturer specific dimensions and the access spaces for operation and maintenance. No work shall be carried out until these drawings have been reviewed and accepted by the CA. Where specific space is required for access, this shall be indicated on the installation drawings.

The Contractor shall submit with their Tender, a list of drawings that are intended to be produced, including details of content, scale and the purpose of the drawing. The issue of drawings shall be indicated on a preliminary programme which shall also be submitted with the Tender return. Sample drawings shall also be provided with the Tender return, showing the proposed standard of detail to be expected on these drawings. In any case the minimum level of detail on these drawings shall be commensurate with that specified elsewhere in this document.

The Contractor shall liaise with the local authorities to obtain approval and licences for all working systems.

1.3 Statutory Requirements.

The Contractor shall ascertain the requirements and procedures of the Local Authority's Regulations and shall include for and pay all fees or charges to allow the full completion of Works.

On completion, the Contractor shall instruct the Client's personnel and the CA on the operating and maintenance of all systems and shall provide bound and electronic manuals, as specified.

The Contractor shall be responsible for rectification of all defects for 12 months after the issue of the practical completion certificate.

A practical completion certificate shall only be awarded against a 'defect free' building.

1.4 Compliance with Regulations and Standards.

Where such standards exist, all the materials, equipment, components, electrical installations, and tests provided shall comply with the requirements of the appropriate current European Standards, British Standards, Specifications, the latest version of BS7671 the Requirements for Electrical Installations of the Institution of Electrical Engineers, United Kingdom.

The installation shall also conform to all Statutory Requirements, including the appropriate sections of the following:

- Relevant current British Standards (BS) and Harmonised European Standards (EN)
- Guidance Notes on the IEE Wiring Regulations published by the IET
- Electrical Supply Regulations and Codes of Practice (Electricity of Works Regulation).
- Health and Safety at Work Act and other Statutory Health and Safety Documents
- Construction (Design and Management) Regulations (CDM) –
- European Directives.
- Electrical Equipment [safety] Regulations
- The CA reserves the right to undertake an external audit against any of the above safety standards. 2 weeks' notice shall be provided to the contractor of its intent in this regard.

The Contractor shall keep a copy of the aforementioned Regulations, Supplements and Addenda or published revisions thereto on site at all times during the continuance of the Contract.

All equipment shall be suitable for an ambient temperature of 30^{o}C and relative humidity of 95%. Samples or any other information required on the materials proposed shall be made available for approval.

If the Contractor offers materials, equipment or tests which conform to standards other than the aforementioned, full details of the difference between the proposed standard and the equivalent British Standard, or EN in so far as they affect the design and performance of equipment, shall be supplied by the Contractor to the CA during the contract period. The CA reserves the right to accept/reject any item in this regard.

Generally, all installations shall be carried out in accordance with manufacturers' written instructions. Copies of these instructions shall be given to the CA as soon as possible after the commencement of the Contract.

Clauses in other sections of the Contract Document shall also apply to this section where applicable.

2 Low Voltage (LV) Power Distribution

2.1 Main LV Switchboards & Sub-main Distribution

There are 2 No existing Form 4, Type 2 LV switchboards Reference: LV1 & LV2, located adjacent to each other, in a dedicated LV switchroom at basement level -1.

Each switchboard is a fed from a dedicated 400Amp UK Power Network (UKPN) service heads located in the same switchroom.

As part of the fit-out work the Contractor shall modify the existing switchgear and power supplies on LV1 and LV2 to accommodate the requirement for increased electrical load on the first and second floors. Reference should be made to the LV schematic drawing E-SC-00-01 for details.

To reconnect power supplies from LV1 to LV 2 the cables will have to be extended using suitable cable joints. Refer to the equipment data sheet *V32 Low voltage power cables* for cable joint details.

The new power supplies supplied from LV1 shall distribute to the floors above via the existing vertical cable trays in the main electrical riser at the north end of the building. This riser will also serve power supplies to roof of the building.

Where cables pass through existing fire barriers the Contractor shall completely reseal with the appropriate fire resistant material to maintain fire separation.

When the works are completed the Contractor shall display an updated copy of the As-Fitted Low Voltage Distribution schematic in the existing wall mounted glazed frame adjacent to the switchboard.

2.2 LV Panel Boards

Existing Schneider Powerpact 4 MCCB Panelboards Ref: DBO1, DBO2 are located on the first and second floors. These panelboards shall be retained and shall feed the existing 12 way Lighting distribution board and a new 18-way small power distribution boards plus their associated AC unit on their respective floor.

A new 4 way panel board shall be installed on the roof for mechanical plant. The panle board shall be installed within a weatherproof GRP enclosure.

This panelboards shall be a non-compartmentalised type and constructed in accordance with EN 60 439-1 to a minimum rating of Form 3B, type 2.

The panelboard shall be metal clad comprising of two sections, front access wall mounted with top incoming and top outgoing cable facilities, incorporating a degree of protection to minimum IP31.

Each panelboard consists of an incoming switch isolator, bus-bars and Moulded Case Circuit Breakers (MCCBs) all as described in the Equipment Data Sheets.

The panelboard shall have a prospective short circuit capacity (PSCC) of 25kA for 1 second certified by ASTA. Restricted earth fault and IDMT over current protection shall be provided. The neutral shall be fully rated and the earth bar shall run the full length of the panelboard.

Four busbars shall be made with copper and provided for the L1, L2 and L3 phases and full-sized neutral. The panelborad shall also be fitted with Transient voltage surge suppression device.

Each section of the switchboard shall be extendable and the switchboards shall have a space allowance for an extra 20% of each outgoing device for future use.

An engraved plastic label shall be securely fixed to the panelboard denoting its reference and general description. All functional devices shall also be labelled to indicate the current rating and purpose of the device.

This panelboard shall be mounted within an IP65 Feeder Pillar type enclosure and shall be:

i. be fabricated in 3mm thick mild steel plate 'Hot dip Galvanised' to BS EN ISO 1461 with mono-pitched roof.

ii. be ingress protected to IP65.

iii. be fitted with a 2. no double hinged lockable doors

iv. be fitted with hidden hinges, fabricated from stainless steel.

Provision shall be made in the base of each enclosure for incoming and outgoing supply cables

The doors to all areas containing switchgear, such as electrical risers and cupboards, shall be labelled to indicate that they contain electrical switchgear, the reference of the switchgear and the maximum voltage hazard anticipated. Warning notices shall also be provided together with a notice indicating that access is for authorised personnel only.

2.3 LV Distribution Boards

The distribution boards feeding the lighting shall be retained for the final circuit wiring, with each assembly being refitted with MCBs and/or RCDs, RCBOs, as required where spare ways are indicated these shall be fitted with blanking pieces. A minimum of 25% spare capacity shall be provided at each distribution board for future use.

Due to the quantity of circuits a new distribution boards shall be provided on each floor for the small power circuits.

Each assembly shall consist of an incoming switch isolator, bus-bars and Miniature Circuit Breakers (MCBs), RCDs, RCBOs, Contactors, etc, all as described in the Equipment Data Sheets and Distribution Boards Schedules.

The distribution boards shall be Type B, ASTA BEAB certified, fully type tested to EN 60439-1 and suitable for surface mounting, with lockable doors and isolation provided by an on-load integral switch-disconnector. All distribution boards shall be at a minimum Form 3b. Busbars shall be fully shrouded and all neutral and earth bars shall be split for a neater cabling solution. Note: Each neutral and earth connection shall have an individual terminal. The connections to the neutral bar shall be made to correspond with the order of the phase connections. Similarly, all earth connections shall be made to a separate earth bar within the distribution board.

The contractor shall ensure that all distribution boards are from the same manufacturer as the existing for continuity and standardisation of equipment type. Note: The contractor shall, when selecting the equipment, ensure that it is suitable for the space allocated within each riser cupboard.

All distribution boards shall be fitted with miniature circuit breakers (MCB), where spare ways are indicated these shall be fitted with blanking pieces. A minimum of 25% spare capacity shall be provided at each distribution board for future use.

All miniature circuit breakers (MCBs) shall be arranged in vertical formation, being double banked for triple pole and neutral boards. Each miniature circuit breaker shall generally be type C for lighting, B for small power and D for small motor circuits, rated for the duty as required by the load and capable of withstanding a fault load of 15kA. Residual Current Devices (RCD) with an earth leakage current not exceeding 30mA shall be provided to all socket outlets that can be used by the staff and general public, including cleaner outlets, lighting circuits within shower rooms, changing rooms and low level external lighting.

Where TP&N MCB distribution boards are used, it shall be made possible for either triple pole and/or single pole MCB's and/or double pole (switched Neutral) RCBOs to be fitted as may be required. Note: The contractor shall not to install single pole RCBO’s (unswitched neutral). The distribution boards shall be installed at a convenient height not exceeding 2 metres to the top of the board.

Each distribution board shall be provided with a circuit schedule identifying each individual circuit giving reference, description, rating of protective device and connected load. The schedule shall be typed on an A4 laminated sheet protected by a clear plastic envelope securely fixed to the inside face of the distribution board door. In addition, an engraved plastic label shall be securely fixed to the board denoting its reference and general description.

The units shall be constructed of materials capable of withstanding the mechanical electrical and thermal stresses as well as the effect of humidity which are likely to be encountered in normal service. Enclosure shall be of high quality steel, suitable for surface mounting.

Cable terminals shall be of correct current rating and shall securely clamp the conductor without causing damage. All final circuit conductors shall be appropriately marked with cable ring markers indicating the circuit number and where appropriate phase connection.

Enclosures unless indicated otherwise shall be constructed according to BS 5420. All covers, doors and access plates into the distribution boards shall be gasketed to achieve a minimum protection as follows:-

- Internal: IP31
- External: IP65

Access for cabling shall be from the front only. Internally, masking plates of incombustible and hard insulating material shall be fitted to prevent accidental contact with live parts.

All distribution boards shall be provided with locks with a universal key to fit all.

2.4 Cabling & Final Circuits.

Circuit and system cabling shall generally be provided as follows:

Cables shall generally be routed vertically through electrical risers and horizontally above the suspended ceiling. Final circuit cable routes to equipment and outlets shall be routed within the partition walls.

Cable support systems shall be arranged to maintain good and efficient access for installation, future maintenance and modifications.

Wherever possible, a minimum separation of 300mm shall be maintained from communication services cable containment systems.

Bunching of cables shall not be permitted and air space must be provided between each cable as required by the IEE Wiring Regulations.

Surface run cables shall be installed on galvanised cable ladder rack or cable basket/tray which shall be manufactured to EN 61357 standard. Single cable runs shall be clipped on semi-channel or direct to the structure or unistrut, where applicable.

All mains cables installed shall be identified by means of engraved or traffolite labels at intervals not exceeding 30 metres. These labels shall bear details of the cable size, number of cores, function, and reference number and shall be securely attached to the cables with tie wraps. In addition to this each mains cable shall be labelled at the supply end and the load end just prior to its termination point and shall be clearly visible without accessing equipment.

All cables for essential supplies shall be fire rated to accord with relevant codes and shall be distributed using diverse routes to the “normal” LV distribution via dedicated cable tray.

Where cables penetrate structural slabs/walls, or ‘fire rated’ walls, LSF heavy duty sleeves shall be provided and installed to protect the cables. Appropriate fire rating shall be installed complete with appropriately sized cable blocks and blind blocks sufficient to completely seal the transit after the installation of cables is complete.

Where cables penetrate acoustically rated walls, appropriate acoustic backfilling rating shall be installed complete with appropriately rated proprietary products.

Refer to architectural and structural drawing for details of construction requirements.

All LV cables shall be cross linked polyethylene insulated, steel wired armoured, low smoke fume sheath cables with copper conductors (XLPE/SWA/LSF) conforming to relevant standards routed on dedicated containment routes and systems as shown on the drawings and schedules.

Final circuits shall generally be configured as follows:

- Lighting 10A MCB wired in 2.5mm^2 multi-core cabling within metallic trunking and/or non-metallic heavy duty LSF conduit, unless specified otherwise.

- Small Power 20A or 32A MCB / RCBO wired in 4mm^2 multi core cabling wired in radial or ring configuration within metallic trunking and/or non-metallic heavy duty LSF conduit, unless specified otherwise.

All systems shall be installed flush unless specifically indicate otherwise.

All visible cable conduit shall be installed in galvanised metal conduit and shall be subject to the Architects final approval. Cables installed in plantrooms shall be installed using surface mounted galvanised metallic conduit to the final outlet. Cables installed externally shall also be wired in galvanised metal conduit. Fire alarm cables shall be of either 'standard' fire rated or 'enhanced' fire rated as required by Code. All such cabling shall be fixed to dedicated cable containment systems as shown on the drawings. The outer LSF sheath shall be coloured RED.

Each cable shall be manufactured in one complete length and no through joints shall be allowed on new cables without written authorisation from the Engineer.

The contractor shall carry out on site measurements of the defined cable route of each sub-main cable, prior to ordering the cable. This shall allow the Engineer to check against the calculated cable length to ensure the correct cable is specified.

All other miscellaneous systems cabling are described in the various systems descriptions and separate specialist ICT report.

2.5 Metering units

Electrical meters shall be provided as indicated on the LV schematic.

The meter units are to consist of a digital display that is capable of indicating the A, V, kW, KVA, KWh. Electricity sub-meters shall be equipped with modbus interface card on RS485/Modbus protocol.

Accuracy rating of the meters shall be in accordance with EN 62053-21/23

2.6 Transient Voltage Surge Suppression

The Contractor shall provide all necessary electronic equipment to prevent against transient overvoltage caused by electrical switching events and/or secondary effects of lightning, as shown on the drawings and described in the specification.

This equipment shall be suitable for 3 phase (4 pole) operation and shall be rated to protect the installed equipment shown on the drawings. The protective devices must be suitable for "low let through" voltage with the devices specified as "Enhanced" as outline in EN 62305. The system shall be maintenance free and have a minimum life expectancy of 20 years. The system must be provided with a continuous visual status monitoring front panel.

Equipment must be tested according to BS 2914 and UL 1449 Cat. A & B.

3 Small Power Installation.

3.1 General.

A complete small power installation shall be provided to all defined areas of the project.

The small power installation shall comprise electrical supplies serving general purpose socket outlets, and all other systems which require power such as CCTV cameras, security systems, life safety systems, mechanical plant, medical equipment, etc.

The wiring shall be carried out in a combination of single core LSF cables in heavy gauge non-metallic LSF conduits and or by means of XLPE/SWA/LSF cables feeding specific equipment. (Refer to the distribution board schedules and drawings for details)

All power circuits, equipment and accessories shall be designed for continuous operation and 400/230V 50Hz supplies as applicable.

Due to the high protective conductor currents associated with high concentrations of computer terminals, all small power circuits feeding these areas shall have a dual earth terminals. The minimum size conductor used for socket outlets shall be $4mm^2$.

The positions of all power supplies and outlets are indicative approximate locations and final locations shall be checked against the Architects setting out drawings.

Within plant rooms, and ancillary areas, all galvanised trunking and conduit shall be surface mounted.

Accessory finishes shall be strictly to the Engineer's requirements.

3.2 General Purpose Socket Outlets.

These shall be switched, complying with BS1363 and shall be installed in the position shown on the drawings and shall be of the 13 amp flat pin type.

The socket outlet finish shall match the chosen lighting switches in that particular room or area.

Switched socket outlets shall comply with BS1363. The switched socket interior shall be mounted to the grid which shall have provision for both lateral and vertical adjustment. The grid shall be of 16 s.w.g. mild steel, zinc plated to a minimum of 5 microns thick.

The front cover plate shall be secured to the grid plate and switched-socket interior by countersunk screws finished to match the cover plate.

For flush installations the cover plate shall overlap the box by 7mm and for surface installations it shall be the same size as the galvanised cast iron boxes which shall be employed in such locations. In plant rooms and similar areas the switch sockets shall be industrial pattern galvanised and on the roof and external areas all switch sockets shall be weatherproof.

Socket outlets for cleaner's shall be provided on every level of the building, generally in corridors or notional corridors at 15 metre intervals. The sockets shall be twin 13A switched socket outlets with integral 30mA earth leakage 'RCD' protection. The sockets shall be wired with a dual earth cabling arrangement. The minimum size conductor used for socket outlets with shall be $4mm^2$.

3.3 Fused Connection Units.

All fused connection units shall be supplied and installed as shown on the drawings and manufactured in accordance with BS5733. These shall match the chosen lighting switches and socket outlets in that particular room or areas.

Fused connection units shall be mounted in suitable sheet steel or insulated boxes with conduit entries. Where units are required flush, the outlet box shall be fitted with adjustable fixing lugs.

Where detailed on the drawings, these units shall be provided with a cable entry facility with provision for changing the cable.

All fuses shall be of the cartridge type complying with BS1362.

Un-switched fused connection units with neon indicators shall be provided for fire alarm panels, security equipment etc such that they cannot be advertently switched off or tampered.

All fused connection units shall have traffolyle labels indicating equipment served.

3.4 Double Pole Switches.

All double pole switches shall be supplied and installed as shown on the drawings and manufactured in accordance with BS 3676. These shall match the chosen electrical accessory in that particular room or area.

Double pole switches shall be mounted in suitable sheet steel or iron clad boxes with conduit entries. Where units are required flush the outlet box shall be fitted with adjustable fixing lugs.

Where required these units shall be provided with cable entry facility with provision for changing the cable.

3.5 Local Isolators.

All local isolators shall be supplied and installed as shown on the drawings and shall be of the 500 volt duty type.

Enclosures for isolators shall be fabricated from rust-protected sheet steel in stove paint finish with gasketed doors and fitted with chromium plated front mounted operating handles with "On/Off" indication and provision for internal fixing unless otherwise specified.

The isolator shall be suitable for padlocking in the "Off" position.

Interiors shall comprise porcelain bases fitted with non-ferrous (brass) conducting components. Switches shall be of the quick make break type suitable for use on either AC or DC. Shields shall be fitted over both fixed and removable contacts.

All equipment shall be tested to BS 5419 category AC 23. Where isolators are to be weatherproof they shall generally be as described above and in addition shall be provided with cast iron enclosures fully gasketed to prevent the ingress of water and suitably finished to prevent the effects of corrosion.

Stay put stop buttons operating on the control circuit of the motor starter shall not be used as the sole means of isolation of a motor and each starter shall be provided with an isolator. Where stay-put stop buttons are specified a warning notice shall be mounted adjacent to the button to read as following "Emergency Stop - isolate and lock off at starter isolator" in Maltese and English.

Where stop buttons are provided for motors with assisted start type starters it shall only be possible to restart the motor in the normal sequence.

3.6 Miscellaneous Equipment Installation.

3.6.1 Room Thermostats/Detectors for A/C.

These shall be mounted on a BS 4568 terminal conduit box and shall be located as indicated on the drawings.

The Contractor shall by responsible for the supply and installation of the necessary conduit work and terminal conduit boxes to suit the requirements of the mechanical installation works.

3.6.2 Sanitary ware PIR's

PIR's shall be provided to control the water valves on all WC's, sinks, urinals etc. which shall be integrated into the selected sanitary ware.

The Contractor shall by responsible for the supply and installation of the necessary local 230V LV power, transformers, ELV wiring, conduit work and terminal conduit boxes to suit the requirements of the final selected sanitary ware.

3.6.3 Locally Controlled Extract Fans.

Locally controlled extract fans may be connected either to the lighting circuits or via a fused spur box power circuits, unless otherwise shown on the drawings provided the load does not exceed 2 amps.

The final connection to the fan shall be made by means of white LSF insulated and sheathed flexible cable connected to a white 5 amp plug and socket which shall be mounted immediately adjacent to the fan.

3.6.4 Heat Maintenance Tapes.

Electric heat maintenance tape shall be provided on all hot water pipework from the water heaters to outlet sink taps. (Refer to the Public Health drawings for

details). The contractor shall allow for a local fused connection unit adjacent to each tape.

All heat maintenance circuits shall be protected with RCD protected dedicated radial circuits originating from the local distribution board.

Final connections to the heat maintenance tape shall be by non hydroscopic heat resisting cable with an LSOH sheath.

Heat maintenance tape requiring a supply in toilet areas shall be fed from an unswitched flex outlet adjacent to the tape and operated by a suitably labelled switch outside the toilet area.

3.6.5 Cover Plate Finish.

The cover plate, finish for all electrical accessories shall be high quality brushed stainless steel. The cover plate shall be of slim-line design (with a minimalist profile) type. Note: All socket outlets shall be provided with shutter arrangements. All cover plates in plant rooms, stores, risers/cupboards, above ceilings etc. shall be of the metalclad type (metallic powder coated finish that is corrosion and scratch resistant) and high impact resistant.

Samples of all cover plates shall be submitted to the Engineer for approval prior to ordering.

4 Diesel Generator

4.1 General

The Contractor shall be responsible for the design, supply, delivery, installation, testing and commissioning of the proposed packaged Diesel Generator set complete with acoustic enclosure as shown on the drawings and described in the specification.

The contractor shall employ a specialist company to undertake these works. The specialist company shall have the qualifications, proven record and shall have successfully executed projects of similar magnitude and complexity in the last 5 years. The specialist company shall provide a certificate(s) verifying compliance of testing and commissioning to the relevant standards.

A standby generation set shall be provided to back up the MRI scanner roof level chiller and the power to the ICT Server rooms in the event of a power failure. (Refer to the LV schematic for the generator size and associated power supplies)

This specification covers the requirements for the operation and performance of the diesel generating set. The set shall comprise of a diesel engine coupled to three-phase alternator with its controls, instruments, protective devices, cooling equipment, batteries, battery chargers, fuel oil equipment and all other necessary accessories and auxiliary equipment mounted on common base frame for direct mounting onto the roof.

The sets shall be designed for automatic stand-by operation. At mains interruption the generator shall be able to start automatically and supply, with no fault, the electrical load with the required characteristics.

4.2 Power Requirements

The generating set shall provide the rated power, under the prevailing local ambient conditions as mentioned below without interruptions for a period of 24 hours so that no derating factor needs to be applied to the generator set.

- 1 No. 80 kVA standby diesel generator at 0.8 p.f. lag, 400/230V 3-phase and neutral, 4-wire, 50Hz supply.
- Ambient Temperature: Between -4^{o}C and 30^{o}C
- Relative humidity: 95%

4.3 Functions Required

The generating set shall be capable to take the full load in less than 10 seconds. under ambient temperature after the failure of the mains supply and to operate in the automatic, manual and test modes. The mode selector switch shall also have an OFF position to switch the entire automatic gear off.

4.3.1 Automatic Mode

In case of total mains failure or failure in one phase or drop in voltage by at least 15% in one or more phases, the set shall automatically start with an adjustable time delay from 0-10 sec.

The consumer shall only be switched over to the generator when the later has attained full voltage. If full line voltage is restored before the generator attains full voltage, the consumer shall not be switched over but shall continue to be supplied with mains voltage. In such case the starting sequence of the set shall not be interrupted but the generator shall continue to operate without load until the automatic stopping procedure is initiated. When full line voltage is restored, the consumer shall be switched over to the mains, after a time delay adjustable from 0-10 sec. After the consumer is switched over the set shall be automatically switched off with a time delay adjustable between 30-600sec.

In case of mains failure again during the stopping sequence, the sequence should be interrupted and the starting sequence should begin.

4.3.2 Test Mode

When this mode is selected, the generating set shall automatically start and continue to run until the mode switch is returned to the AUTO or the OFF position. During the operation of the set the consumer shall remain connected to the mains. In case of mains failure the system should be able to transfer the load as in the AUTO mode. During test running, it shall be possible to change over manually the consumer from the mains to the generator and vice versa.

The generator shall have provision for connecting a load bank for periodic testing as part of the maintenance program.

4.3.3 Manual Mode

In this mode the set shall be started manually by the appropriate push button and be stopped by the emergency stop button. Manual changeover of the consumer from the mains to the generator and vice versa shall be possible.

4.3.4 Starting Procedure

If the engine fails to start on the first attempt, (10 sec. cranking), the starter motor shall re-engage after 10 sec. rest and crank again for further 10 sec. The cycle shall be repeated for a third time. If the engine fails to start again, then the relevant alarms shall be switched ON and no further attempts be made.

4.3.5 Protection Devices

The generating set shall be provided with protection devices for automating stopping of the engine in case of:

- Failure to start in three attempts
- Low oil pressure and
- Engine high temperature

In case of generator overload, the consumer shall be disconnected from the stand-by supply and visual alarm shall be provided.

4.4 Generator Neutral Earthing

The Contractor shall be responsible for the installation, testing and commissioning of all the works necessary for satisfactory earthing of the neutral point of the Generator.

The earth resistance shall be less than 1 ohm. All systems and equipment shall be earthed in accordance with BS7671 (IEE Wiring Regulations) BS7430 (code of practice for earthing) and all other relevant BS and EN Standards. The low voltage standby diesel generator room shall consist of 2 No. independent earth electrodes.

Connection to the earth electrodes shall be made in an approved cable connection box with a removable cover and with approved soldered joints clamps. A permanent label indelibly marked with words "Safety Electrical Earth - Do Not Remove" shall be permanently fixed at the point of this connection.

The installation shall be of the highest quality, in accordance with the Electrical Supply Regulations and to the satisfaction of the Engineer.

4.5 Fuel Tank

The stand-by generator set shall be provided with a set mounted base fuel tank (day tank) with a minimum run time of 8 hours at 100% load.

In addition, a standalone 500 litre integrally bunded/Double skin bulk fuel tank that allows a minimum run time 24 hours at 100% load shall also be provided.

The bulk tank shall consist of fuel shut-off solenoids, and a control panel and shall shall be positioned to allow a gravity feed to the day tank.. The contractor shall also provide a fuel filter and water (moisture) separator.

A local IP65 rated fuel fill point cabinet shall be provided at ground floor at the rear of the building. The fill point shall be fitted with a bulk tank fuel gauge to prevent overflow, an automatic fire shut-off valve and be permanently positioned in a naturally ventilated location.

The fabricated fuel feed and fill pipes shall be surface mounted and routed up the outside of the building to the bulk storage tank. The fuel feed and fill pipe shall also be integrally bunded (double skinned) and painted black in colour

The outside surfaces of the bulk fuel set shall be finished to the same colour as the generator set and agreed with the Engineer.

4.6 Noise Control-Acoustic Enclosure

The generating set shall be totally enclosed in an acoustically treated enclosure. It shall be provided with suitable doors for gaining access for routine plant maintenance and operating controls. In cases of major overhauls the enclosures should be designed that they can be easily removed from the set without specialist equipment. The design of all doors, access hatches, seals etc shall be of an

appropriate acoustic design, construction and sealing so that the overall enclosure sound insulation is maintained.

The enclosure shall be equipped with specially designed air inlet and outlet sound attenuators so that the overall sound attenuation of the air duct shall be 40dBA at 1 meter on-axis (external).

The generator flue shall be attenuated as required so that the overall external sound level at the flue termination shall be 40dBa at 1m, 90 degrees off axis.

All generator shall be placed on either anti-vibration mountings, neoprene anti-vibration layer/mat or anti-vibration coils. This equipment shall then be bolted or fixed to a plinth or building structure and the bolts torqued appropriately.

The design of the enclosure and the mounting of the generator and associated services (including flues) shall be installed and fixed in position fully in accordance to the recommendations of the manufacturer and the building structure is free of any vibrations from the set (and associated services). The noise from the set shall not exceed 75dBA at 1 metre in any direction.

4.7 Exhaust System and Smoke Control

Combustion efficiency shall be sufficiently high to ensure a colourless exhaust when burning the specified liquid fuel under any condition of load.

A complete exhaust ducting with all necessary bends and accessories shall be provided to suit the engine layout. The exhaust ducting shall be provided with suitable lagging of calcium silicate or equal and approved. Sheet metal cladding for the lagging shall also be provided.

The system shall be provided with silencing to less than 40dBA at 1 metre (externally).

4.8 Information required prior to delivery

The construction of the necessary base for the generating set shall be provided by the Structural Contractor to meet the specific requirements of the specified generator set. Therefore, the Contractor shall provided the following information a maximum of one month after the Contract is signed.

- Fixing details and weights for the stand-by generating set.
- The recommended general layout of the generator such for mechanical duct connections, the fuel pipe location, the size of any required builders work openings.
- Details for the construction requirements of the bulk fuel tank

5 Earthing Arrangement.

5.1 General.

All earthing and bonding installation and equipment shall comply with the requirements of the IEE Wiring Regulations (Now IET) 17th Edition and BS7430, Code of Practice for earthing. The earthing system shall be TN-C-S and shall be distributed by either the Steel Wired Armour (SWA) of the main/sub-main cables or via dedicated Circuit Protective Conductors (CPCs). Main and supplementary bonding shall also be provided, as necessary.

Descriptions of earth conductors or electrode locations are intended to define the minimum standards to which the installation shall conform. Reference to the cross-sectional area of conductors in this Specification and the drawings relate to the minimum size of conductors that shall be accepted.

Connections to the main earth bar shall include, but not be limited to, the following:

- Main switchboard frames
- External earth electrodes
- Lightning protection system
- ICT/Communications clean earth (functional earth)
- Main incoming services pipe work
- Generator earth bar
- Circuit protective conductors, via LV switchboards.

The earthing shall provide sufficient low impedance to facilitate satisfactory protection and operation of protective devices under fault conditions.

Functional earthing bars, separately bonded to the main earth bar shall be installed in all ICT and MRI scanner equipment rooms.

In order to comply with BS7671, earthing requirements for the installation of equipment having high protective conductor currents all power circuit serving high concentrations of computer terminals, staff desks, audio equipment etc shall have a separate earth conductor.

All conductors shall be suitably identified using a cable marker.

An earth conductor shall be provided between each LV switchrooms main earth bar so that all areas of the development are connected to the same system earth.

Types of protective conductor that the Contractor shall consider that are relevant to this scheme are:

- A cable containing a protective conductor must comply with the British Standard for that cable.
- In a final ring circuit the protective conductor must be arranged as a ring in the same way as the phase conductors with each end of the protective conductor connected to the earth terminal of the circuit. This does not refer to the metal cable covering or enclosure.

- Protective conductors formed by the metal enclosures of factory made switchboards, distribution boards etc. must be designed to satisfy to the need for (i) protection against detrimental mechanical, chemical or electrochemical effects, (ii) have a conducting sectional area not less than that which is calculated by formula in IEE Regulations 17th Edition and (iii) have provisions for connecting other protective conductors at all branch points on the assemblies.
- The sheath and/or armour or metallic covering of a cable used as a protective conductor must meet the requirements stipulated at items (i) and (ii).
- It is prohibited to use flexible metal conduit as a protective conductor. A separate protective conductor must be fixed to the outside of the flexible conduit and terminated on the equipment at each end.
- Exposed metal enclosures of equipment must not be used as a protective conductor for other equipment.
- Conductive parts not forming part of the electrical installation must not be used as protective conductors. Permanently fixed and reliable extraneous metal parts may, however, be utilised for supplementary bonding.

5.2 Earthing Terminal.

The building existing main earthing bar/terminal (MEB) is located in the main LV Switchroom which is a copper earth bar mounted on the wall by means of ceramic insulators. The contractor shall extend the earth bar as required to ensure that a minimum of 20% spare capacity is allowed for.

5.3 Protective Conductor.

All internal conductors shall be in the form of single core copper LSF insulated cables coloured yellow/green. All external single-core cables forming part of the earthing system shall be of stranded copper, insulated to 450/750V standards with yellow/green LSF. These cables shall comply with BS6004.

Protective conductors shall be supplied and installed in accordance with IEE Regulations 17th Edition.

5.4 Equipotential Bonding.

Bonding conductors shall comply with IEE Regulations 17th Edition.

All exposed conductive parts (non-current carrying metal work) associated with the electrical power distribution network equipment and ancillaries, and all extraneous metal work as listed below, shall be made electrically continuous throughout and be effectively bonded to the main earth bar. These shall include:

- All metal cable ladder racks, cable trays, trunking, conduit etc.
- All metal pipe work.
- All metal duct work.
- All exposed metalwork including pipes, handrails, metal decking etc (cables to be routed as inconspicuously as possible).

- Plant room equipment and steel support frames.
- Metal enclosures.
- Cases and enclosures of all electrical switchgear.
- Floor and ceiling supports.

Where metallic pipe services such as main gas, main water and dry risers enter each floor, they shall be effectively equipotentially bonded to the main earthing bar on each floor, as near as possible to the point of entry. These connections shall be made with solid copper conductors of minimum cross section in accordance with IEE Regulations. These bonds shall be installed as inconspicuously and neatly as possible. The connections shall be visible after installation.

Main equipotential conductors should be as short as possible and their resistance from bonded part to the main earthing bar should not exceed 0.05Ωs.

5.5 Supplementary Equipotential Bonding.

The purpose of this supplementary bonding is to reduce the voltage occurring between conductive parts should an earth fault occur not only in the circuit feeding the room containing a shower but anywhere in the installation. This bonding is therefore intended to reduce the shock risk. The basic requirement concerning supplementary equipotential bonding is prescribed in IEE Regulation.

In situations such as shower rooms, kitchens, laundries or any situation where there is exposed metal and socket outlets or fixed appliances are installed, all metalwork including hot and cold water pipes, waste pipes, metal drainage boards, the casing of electrical appliances shall be effectively bonded to the earth continuity conductor so as to ensure that no difference in electrical potential can arise between these items.

Supplementary bonding shall be taken from the final circuit protective conductor or link adjacent items of exposed metalwork. The supplementary bonding conductors shall be a minimum size of 4mm² and be mechanically protected and enclosed.

5.6 Structural Steelwork Bonding.

Steelwork bonding shall be installed utilising bolted or (thermic process) welded connections. Close coordination shall be made with other trades to ensure the timely installation of bonding conductors during the construction programme. Bonding of structural steelwork shall be carried out in accordance with the IEE Regulations and shall include but not be limited to the following:

- Exposed Main Structural Columns and Beams
- Metallic Louvres and Grilles
- Steel Doors and Frames
- Mechanical and HVAC Plant

5.7 Lightning Protection

A series of lightning protection system resistance tests shall be carried on the existing lightning protection system. If any results present an issue to the integrity or performance of the lightning protection system then the Contractor shall inform the Engineer of these results and an explanation as to the potential problems and remedial works required.

All new roof level plant and metal projections including air conditioning units, handrails, extraction fans, pipes, etc. shall be bonded to the existing air termination network. Such connections shall employ tinned copper connections or other approved equipment to avoid galvanic corrosion.

The lightning protection system shall be in full compliance with the EN 62305.

5.8 Additional Earthing Requirements.

The contractor shall also be responsible to provide separate functional earth bar for the ICT equipment room(s) MRI system rooms. The functional earth bars shall be separately bonded to the main earth bar for a clean earth.

Earthing requirements for the installation of equipment having high protective conductor currents all power circuit serving high concentrations of computer terminals, staff desks, AV equipment etc shall have separate earth conductors.

6 Labels.

The Contractor shall supply all labels, nameplates, instruction plates and warning plates necessary for the identification and safe operation of the Works.

All inscriptions shall be engraved, the materials and finishes to be to the Engineer's approval.

All labels, nameplates and instruction and warning plates shall be securely fixed to items of plant and equipment with stainless steel rivets, plated self tapping screws or other approved means. The use of adhesives shall not be permitted.

Warning plates shall be placed in prominent positions wherever it is necessary to warn personnel of danger.

All equipment within panels and desks shall be individually identified.

Each circuit breaker panel, electrical panel, relay panel etc., shall have a circuit designation label. Corridor type panels shall additionally have circuit designation labels within the panels.

All main earth conductors installed above ground shall be identified by means of engraved or traffolite labels at intervals not exceeding 30 metres. These labels shall bear details of the cable size, function, and reference number and must be securely attached to the cables with tie wraps.

7 Lighting Installation.

The contractor shall supply, install, test and commission the complete lighting and emergency lighting installation as described within the specification and indicated on the lighting layout drawings.

The contractor shall refer to the luminaire schedule included in Appendix C for details of the specified luminaires.

7.1 Method of Light Control

The switching shall be achieved by using a KNX Intelligent Lighting Control system.

The lighting circuits shall be power in LSF insulated cables with a minimum cross sectional area (CSA) of 2.5mm^2.

7.2 Intelligent Lighting Control System.

The Contractor shall be responsible for the supply, delivery, installation, testing and commissioning of the lighting control system as shown on the drawings and described in the specification.

The contractor shall employ a specialist company to undertake these works. The specialist company shall provide a certificate(s) verifying compliance of testing and commissioning to the relevant standards.

The system shall be in accordance with the European Installation Bus EIB (now known as KNX -Konnex) standard technology. The KNX/EIB technology system is a decentralised data bus system.

The system's application in this project shall cover the following:

- Control lighting
- Dimming
- Time Control
- Log & record
- Emergency lighting testing and monitoring

All equipment supplied under this Contract shall be standard products from manufacturers, regularly engaged in the production of such equipment. All equipment which forms part of this system shall be sourced from the same manufacturer.

The system shall be tested and commissioned by an Authorised Engineer of the manufacturing company.

Where indicated on the layouts, lighting circuits shall be connected to a 16Amp TPN linear lighting busbar. (refer to the following section for details)

Each area shall have addressable KNX scene set lighting control devices which shall sit on a KNX bus or connected direct to the linear busbar.

The contractor shall agree with the Architect the final location of the lighting switch positions.

Where indicated, luminaires shall be supplied complete with digital addressable high frequency dimmable ballasts (DALI). A DALI network connection to each luminaire with a DALI ballast shall be provided. The DALI pairs (DALI network bus) shall be run back to the KNX/EIB Lighting Control Panel mounted adjacent to the corresponding lighting distribution board. DALI cabling shall be a pair (2Core) of unshielded, 1.5mm2 600V rated cable. Where luminaires are not provided with Dali ballasts (namely the decorative D-Type fittings) a local Dali gateway address shall be provided to control the designated group of light fittings.

Lighting control shall be achieved by virtual group control of addressable luminaires combined with intelligent addressable KNX/EIB input devices (Passive infrared Presence & Absence detectors, scene set switches, daylight sensors, timers etc) and carried out by the lighting control panels located adjacent to the local distribution boards. Refer to the overall lighting schematic drawing for further system details.

The lighting control panels (LCP) shall consist of a KNX/EIB bus power supply, DALI controller and intelligent switch actuators all contained within a polycarbonate enclosure with din rail mounted modular components.

There shall be a LCP for every lighting distribution board each requiring a dedicated 230V power circuit. The LCP shall house the system devices and the related control equipment depending on the number of circuits being controlled. This shall ensure the power wiring between the distribution board’s and the control modules inside the LCPs are kept to a minimum. The LCPs shall be surface mounted with polycarbonate enclosures together with built-in DIN-rails for easy installation of the control equipment. Note: A terminal rail shall be provided to allow external cabling connections.

A KNX/EIB bus wire shall be wired radially to each addressable input device and terminate in a bus connector, ready for connection to the input device (can be wired in star or daisy chained but not looped/ringed). Note: The bus wiring shall be installed in the same containment as allocated for lighting final circuits. A maximum of 64 devices per run, or 350m length of run to the furthermost device, each run shall be designed to contain a maximum of 50 devices so future expansion is possible.

Each bus device shall be given a physical address by which it is interrogated or reprogrammed. The installation bus shall work with group addresses. A group address shall be allocated to one or more sensors or actuators and this forms the assignment between the bus devices.

The cable to be used for bus wiring shall be 0.8mm^2 solid copper shielded 4 Core EIBA approved KNX/EIB/LSOH sheated cable (green LSOH sheath).

The system shall be programmed through an RS232 interface which can be installed anywhere (accessible) in the bus system. The physical addresses and the switching group assignments shall be stored by the bus devices in an EPROM. The user can change the bus device assignments and other parameters using a

laptop and ETS (EIBA Tool Software) without having to manipulate the device locally.

The passive infrared presence and absence (movement) detectors shall be as follows:

- Directional detectors with 180^{o} coverage
- Area detectors with 360^{o} coverage

All types of detectors shall be as flush and discrete as is practicable. Accessory finishes shall be strictly to the Architects requirements.

The number and location of these movement detectors are indicatively indicated on the drawings. The contractor shall check with their specialist supplier at Tender stage that the range and coverage of the detectors offered is sufficient. If more detectors are required than the quantities shown on the drawings then the contractor shall highlight this and include in their price all costs associated with these additional detectors, including any additional design costs.

Monitoring of the emergency lighting throughout the building shall also be provided by the KNX/EIB bus system. Tests shall be scheduled automatically and performed as a fully automated routine conforming to British & Europeans Standards, with all logs recorded by the head end P.C. located in the main reception office.

This head end laptop controller shall be connected by low voltage bus to various scene-set controllers throughout the building, each capable of stand-alone operation in the event of a central failure.

In addition, the bus system shall include Wi-Fi access and a number of jacks within the Riser cupboards to allow a portable controller to be plugged in and to perform the lighting control and programming functions of the headend.

The lighting control system shall provide full flexibility, and allow each individual component to be switched and/or dimmed as required. It shall also provide a 365-day timeclock to allow the lighting in various areas to be automatically switched on and off for the Centre’s hours of operation and for the performance schedule. It shall also be sufficiently flexible to allow simple reprogramming for unforeseen events within the building.

Emergency luminaires shall be provided with DALI ballasts as indicated on the luminaire schedule that allows the use of the KNX/EIB lighting control systems data to drive down re-lamping and maintenance costs by utilising real data. In addition to standard information such as indicating faults on the lamp, control gear or battery, the system shall also provide information on the device status, type of lamp and type of emergency unit and battery. Historical data shall be stored for record purposes.

The manufacturer / supplier shall carry out pre-programming of devices prior to delivery and to consult with the client to agree the final lighting control philosophy. The supplier shall finally visit the site to ensure all software is correctly configured.

The control strategy shall be as follows:

Room Type	Control Requirements
Plant rooms and cleaners stores	Manually switched.
WCs and changing rooms	Presence detection.
Circulation	Long range prescience detection.
Open Plan Office	Presence detection with daylight linked dimming. Scene selection switches to be installed for manual override and dimming.
Cellular Office	Manually switched on with absence detection and daylight linked dimming. Scene selection switches to be installed for manual override and dimming.
Seminar Rooms	Prescience detection and daylight linked dimming. Scene selection switches to be installed for manual override and dimming.
Consultants rooms	Prescience detection and daylight linked dimming. Scene selection switches to be installed for manual override and dimming. External “room occupied” switch control.

7.3 Linear Lighting Busbar

The Linear busbar LCM’s system shall be a Zumtobel Tecton system (or equal and approved) and shall be arranged in continuous rows above the suspended ceiling fixed direct to the slab or wire suspended as appropriate.

They shall be manufactured from robust steel sections with black polyester resin finish. A factory supplied, purpose built cutting tool shall be used to cut the rows to the desired length.

Each section shall have solid copper conductors embedded within precision moulded continuous profiles running the entire length of each section including across joints between sections as follows;

5 x 2.5mm2 for 3 phases, neutral and earth

6 x 1.5mm2 for control functions and emergency lighting.

Control lines must be capable of being separated into sections if required using clip-in separator devices, which may be positioned at any point in a row.

Electrical connections to the busbar shall be made via pre-wired end feed units that can be installed anywhere on the busbar via plug-in terminals. If continuous rows are interrupted to avoid other building services or structures then purpose made tap off and end feed-out units shall be employed. Pre-wired node connectors shall be used to change direction.

Flexible cable connections to luminaires shall be via a fused connector with a simple plug-in mechanism such that circuit selection is simple and does not require the use of extra components or modifications to the wiring. For maximum flexibility, connectors must be capable of being positioned at any point in a continuous row, including at section joints.

PVC cover strips shall be cut to length to finish open sections between connectors.

7.4 Local Light Switches.

7.4.1 General.

Light switches shall be intelligent addressable KNX input device with on/off or multiple scene setting control positions as shown on the drawings or described in the lighting control strategy.

The mounting height to the bottom of the switch shall be 1000mm unless otherwise specified. Where the structure and furnishings permit, the distance from the edge of the architrave to the near edge of the switch shall be 150mm.

The switches or scene controllers shall be arranged in multi-gang format and shall be labelled in a suitable manner to indicate the scene or group of lights they control. The final arrangement aon labels shall be agreed with the Architect.

The swing of all doors shall be checked on site before marking out any chase for switch positions.

7.4.2 Recessed Light Switches.

Recessed light switches shall be fitted to recessed outlet boxes. The contractor shall agree with the lighting control provider the suitable depth of the outlet box.

The face plates of flush light switches shall be fixed square and flush with the wall.

7.4.3 Surface Light Switches.

Surface mounted light switches shall be fitted to either malleable cast iron or pressed steel boxes of minimum depth 37mm.

Weatherproof light switches shall be mounted in cast alloy or iron boxes unless otherwise specified. Cord operated light switches shall be fixed to circular conduit boxes using extension rings. The switches shall be finished to accord with the requirements of the Engineer. They shall be fitted with an operating cord of suitable length.

7.5 Lighting Points.

7.5.1 General

The contractor shall supply, install, test and commission the complete lighting and emergency lighting installation as described within the specification and indicated on the lighting layout drawings.

The contractor shall refer to the luminaire schedule included in Appendix C for details of the specified luminaires.

7.5.1.1 Room indicator lights

Illuminated “room occupied” and radiation warning signs shall be installed as indicated on the layouts and on the ADB sheets.

The indicator lights shall be installed complete with dedicated status switch which shall be integrated onto the KNX lighting controller inside each consultants room.

Illuminated “radiation warning” signs shall also be installed outside of the xray room. This shall be linked to the xray control area. The Contractor shall liaise with the x-ray specialist supplier to agree how this is wired and controlled.

7.5.1.2 Medical examination lights

Ceiling mounted medical examination lights shall be installed where indicated on the layouts and within the ADB sheets.

Luminaires shall be supplied complete with dedicated dimmable switch.

The contractor shall ensure that appropriate supports are installed to support the weight of the fitting within the ceiling tile.

7.5.1.3 Plant Room & Service Riser Lighting.

A simple lighting scheme using fixed or chain suspended linear fluorescent luminaires with IP65 prismatic diffusers shall be provided to all plantrooms & service risers.

The final lighting installation in Plant Rooms shall not be carried out until services plant, pipework ducting and equipment have been finally placed in position.

7.5.1.4 Suspended Ceilings.

Ceiling layout plans shall dictate the final positions of lighting points and these must be used for setting out purposes.

On no account is the suspended ceiling construction to carry the weight of any light track or luminaire; each shall be separately supported from the underside of the slab over, unless otherwise specified.

7.6 Emergency Lighting Central Battery

An active standby (AC-AC) static inverter emergency lighting central battery system shall be provided to a number of lighting circuits in in accordance with BS 5266 and EN 1838. The central battery shall be located in the plant room area on the first floor.

The active standby static inverter system shall be compliant with EN 50171 and ICEL 1009 and rated with autonomy (standby time) of 3 hours. The system control panel shall consist of an alpha numeric liquid crystal display (LCD), multi-colour LED indication and provide system status, parameter measurement and alarm status information. A mimic diagram located within the switch room shall show system status. Note: The monitoring of the emergency lighting throughout the main building shall be provided by the KNX/EIB bus system.

Standard system features (as per EN 50171 compliance) to include:

- System configured with active standby capability (for energy efficient emergency lighting)
- Inverter shall be rated at 120% of the rated system load for the rated duration.
- Monitoring of open battery circuit breaker
- Battery recharge of 12 hours to 80% of specified (repeat) duty
- Remote monitoring via volt free contacts
- Valve regulated (sealed) lead acid battery with 10 year guarantee
- Ability to support all types of lighting loads (i.e. LED’s, fluorescent lighting etc)
- Full microprocessor control panel including diagnostics and mimic diagrams
- Solid state changeover device (not contactor controlled)
- Panels to be front access for flexible positioning and ease of maintenance
- External maintenance bypass ‘make before break’ (permits the electrical isolation of the system from the mains allows inverter to be removed for maintenance without having to disconnect the lighting load)
- Separate hold-off relay panels (for emergency lighting circuits) as indicated in the schematic
- Inverter to consist of a three phase rectifier with constant voltage, current limited charger with remote temperature compensation sensor.
- Inverter output to be capable of sustaining at least 200% of the nominal output rating for 60 seconds to provide fault clearance capability.
- Volt free change-over contacts to be included to provide for remote indication or monitoring (Contacts rated at 10A, 250Vac)
- Inverter control cubicle to be fitted with thermostat controlled forced air cooling.
- Provision for a remote alarm system monitoring to alert the designated FM Management of the following: low battery, mains failure, total static inverter shutdown, static inverter common alarm etc.

A minimum illumination level of 1 lux is required to be provided anywhere on the centre line of an escape route. This illuminance must be provided for the full duration and life of the system. 50% of the illuminance must be available within 5 seconds and the full value within 60 seconds of supply failure. To accord with the Code requirements a uniformity ratio of 40:1 maximum to minimum must not be exceeded.

Illuminated emergency exit signs will be installed in accordance with BS 5266 and EN 1838

Signs which are provided at all exits intended to be used in an emergency and along escape routes will be illuminated to indicate unambiguously the route of escape to a point of safety. Refer to the Architect and Fire consultants drawings to confirm final positions.

The contractor shall allow for power control and monitoring through the KNX lighting control system to all emergency exit signs.

8 Automatic Fire Alarm and Detection System (AFADS)

8.1.1 General

The Contractor shall be responsible for the supply, delivery, installation, testing and commissioning of the complete fire detection system as detailed on the drawings and described in the specification.

The contractor shall employ a specialist company to undertake these works. The specialist company shall have the qualifications, proven record and shall have successfully executed projects of similar magnitude and complexity in the last 5 years. The specialist company shall provide a certificate(s) verifying compliance of testing and commissioning to the relevant standards.

This specialist company shall be subject to the approval of the Engineer.

The building shall be provided with an addressable fire alarm system with double knock, staged evacuation in the event of an alarm.

The Contractor shall be responsible for the following:

- Providing a new Fire Detection System for the first and second floors from the existing Main Fire Alarm Control Panel inclusive of detectors, Aspirating smoke detection systems, break glass switches, door magnetic holders, visual alarms, control units etc., all as indicated on the drawings.
- Installation Testing and Commissioning.
- Connection of the system to the mains supply and earthing, as applicable.
- The installation of a new fire alarm loop feeding the first and second floors plus all necessary cabling accessories.
- Application to other authorities involved, for the approval of parts of the installation or equipment, as applicable.
- Any other works shown on drawings or described elsewhere or required for the completion, correct and safe operation of the installation.
- The supply and installation of the necessary provisions to facilitate connection with other systems, as specified elsewhere in this specification or drawings.
- The supply of operational, maintenance manuals.
- Spares (to be recommended by the contractor).

8.2 System Description.

An existing Honeywell Notfier fire alarm system is installed providing coverage across the building. A main fire alarm panel is installed in the basement level -1 and a repeater panel is installed within the main reception, this panel provides coverage of levels basement, ground, 1, 2,3 and 4

A second main fire alarm panel is installed on the 5th floor and provides coverage of the 5th and 6th floor hotel.

The panels are networked together such that if an alarm is triggered on either system the evacuation signal will be triggered on the other following an investigation period or double knock.

An existing fire alarm loop is installed through the first and second floors. The existing fire alarm loop shall be fully removed and a new loop installed to feed the first and second floors.

The system shall include, but shall not be limited to fire detection initiating and indicating devices of Analogue Addressable Type, power supplies, cabling and accessories to provide a complete operating system according to BS 5839-1.

Detection coverage shall meet the requirements for a Category L1 system, for the protection of life, as defined by BS5839-1 and the relevant section of EN54.

The alarms shall be a 2 stage, "Alert & Evacuation". A user definable time delay shall occur between these 2 automatic alarms to allow the facilities management team to investigate and verify the security status of the building. If a fire signal is received the alarm shall be raised in all areas of the building by means of fire alarm sounders.

An evacuation alarm signal is provided on the existing fire alarm panel which transmits a signal automatically to a recognised central monitoring station to call for the assistance of the emergency services. The Contractor shall retest and commission this system as part of these works.

The equipment offered and the installation shall fully comply with the requirements of this specification, the latest editions of all relevant Regulations and Codes of Practices, and in particular, the latest editions of the following documents:

- EN54 (Harmonised European Standard)
- BS 3116 Part 4
- BS5839 Part 1
- BS5588-6
- BS 7671
- BS 6266
- The Building Regulations
- Local Fire Brigade Regulations (and Chief Fire Officer requirements)
- Loss Prevention Standard
- Health and Safety Act

Fire alarm sounders shall be provided to all areas of the building. Where necessary and as indicated on the drawings, the sounders shall be enhanced with xenon beacons.

An Aspirating Smoke Detection (ASD) system to the ICT server rooms shall be provided and Co-ordinated with the ICT specilist.

Manual call points within the building shall be set to silent 'Alert mode' whereby the Facilities Management /Security Personnel within manned security room shall be notified and within the allocated (user defined) search time, diagnose the

situation. All manual call points shall incorporate tamperproof flaps and be installed in accordance to BS 5839.

Plant rooms and back of house areas that are considered as areas of high ambient noise levels, combination of electronic sounders and xenon (flashing) beacons shall be provided.

The fire alarm system shall be wired in fire resistant cables (MICC or the like), fixed on galvanised cable trays and secured with steel cable ties. The cables shall be of 'Standard' fire resistance type (unless specified otherwise) and certified to BS 6387 category CWZ (except for Smoke and Heat Exhaust Ventilation Systems [SHEVS] components which shall be specified to BS 7346-6), BS 7629, BS 8434-1 and approved/certified by the Loss Prevention Council Board (LPCB). Fire rated cables shall be BASEC approved and carry the BASEC mark. The network cable shall be of the 'Enhanced' fire resistance type.

Protected circuits that are also required to remain effectively operational when subjected to fire conditions are required to be specified as 'Enhanced' fire resistant type in accordance with BS7346-6.

Fire alarm interfaces shall be provided to mechanical plant, security, access control, gas-isolation valves, lighting control system etc, as indicated.

The new addressable loop shall be fitted with up to 80% of the maximum permissible number of devices in order to provide future spare capacity.

8.3 Initiating Devices.

8.3.1 Addressable Manual Call Points, Break Glass Type.

Addressable manual call points shall be provided in all areas.

The manual call points shall use a key operated test and shall be designed so that after actuation they cannot be restored to normal use except by the replacement of a break-glass type element. The call points also shall have a positive visual indication of operation.

Manual call points shall be constructed of flame resistant plastic with clearly visible instructions provided on the break-glass. The word FIRE shall appear on the front of each manual call point.

Manual call points shall be suitable for surface mounting, or semi-flush mounting as required.

The Contractor shall install adjacent to each manual call point label plate which inform the public as to how/when to use this device.

8.3.2 Analogue Optical (Photoelectric) Smoke Sensors.

Optical smoke detectors shall comply with EN 54-7 or equivalent.

The sensors shall be analogue addressable devices, and shall connect with two wires to one of the fire detection control panel signalling line circuit loops. The optical sensor shall also be ceiling mounting

The sensor shall use the optical (light-scattering) principle to measure smoke density. Upon command from the fire detection control panel the optical sensor shall send data to the panel representing the analogue level of smoke density.

The optical sensor shall provide a test means whereby they shall simulate an alarm condition and report that condition to the fire detection control panel.

The optical sensor shall provide address-setting means on the sensor head using switches.

The optical sensor shall transmit to the panel along with its address the type of sensor.

The optical sensor shall have dual alarm and power LEDs for 360° visibility. Both LEDs shall flash under normal conditions, indicating the sensor is operational and in regular communication with the fire detection control panel. The system shall have the capability to suppress the flashing of the LED in areas as required. Both LEDs shall be illuminated on steady basis in the event of an alarm.

An output connection shall be provided in the base of the sensor to connect an external remote alarm LED.

The Optical sensor sensitive shall be set through the fire detection control panel and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.

Using the panel software the sensor shall automatically compensate for dust accumulation and other slow environmental change affecting sensor performance. The sensors shall be listed by LPCB as meeting the calibrated sensitivity test requirements of EN 54-7.

8.3.3 Analogue Heat Sensors.

Analogue Heat Sensors shall comply with EN 54-5:2001 or equivalent.

Heat sensors shall be analogue addressable devices, and shall connect with two wires to one of the fire detection control panel signalling line circuit loops. The heat sensors shall also be ceiling mounting.

The heat sensor shall use and electronic sensor to measure ambient temperature. Upon command from the fire detection control panel the heat sensor shall send data to the panel representing the analogue level of temperature.

The heat sensors shall provide a test means whereby they shall simulate an alarm condition and report that condition to the fire detection control panel. The test simulation shall be by means of a special test magnet, or remotely initiated from the control panel.

The heat sensor shall provide address-setting means on the sensor heat using switches.

The heat sensor shall transmit to the panel along with its address the type of sensor.

The heat sensor shall have dual alarm and power LEDs for 360° visibility. Both LEDs shall flash under normal conditions, indicating the sensor is operational and in regular communication with the fire detection control panel. The system shall

have the capability to suppress the flashing of the LED in areas as required. Both LEDs shall be illuminated on steady basis in the event of an alarm.

An output connection shall be provided in the base of the sensor to connect an external remote alarm LED.

8.3.4 Aspirating Smoke Detection system.

8.3.4.1 System Requirements.

A high performance aspirating smoke detection system shall provided in the ICT server rooms in accordance with the requirements detailed in the BFPSA Code of Practice for Category 1 Aspirating Detection . The proposed system shall be manufactured by a firm whose quality equipment is in compliance with international standards ISO 9000. The Contractor shall provide ISO 9001 certificate to prove the quality of all equipment.

The system shall be designed to provide Primary/Secondary Sampling to the protected area and the sensitivity shall be variable between normal/enhanced/very high.

The system shall incorporate a high performance laser based particle detection system based on the principal of forward light scatter, a high efficiency aspirator and a sampling pipe system designed to sample air from within the protected areas

The system shall incorporate a facility to desensitise detector alarm thresholds by a pre-programmed percentage to accommodate planned occurrences that may cause unwanted alarms.

The system shall interface with the main building Fire Alarm system for remote monitoring of multiple alarm levels and faults.

8.3.5 Fire Alarm Interface Modules

Addressable control modules shall be provided to supervise and control the operation of conventional indicating appliances.

The circuit shall be 24 VDC, polarised (supervised) for audio/visual alarm indicating devices. For fan shutdown or other auxiliary control functions, the control module may be set to operate as a dry contact relay.

The control module shall address-setting means on the monitor body using switches.

Fire alarm interfaces shall be installed as follows:

- Door hold open devices shall fail safe shut in the event of a fire
- Access control doors shall fail safe open in the event of a fire alarm.
- Fire dampers shall close in the event of a fire
- The air handling unit shall switch off in the event of a fire
- VRF control units shall switch off the VRFs

8.3.6 Short Circuit Isolator Units.

The Short Circuit Isolators shall be installed along the loop circuit for short circuit protection.

In the event of short circuit on the loop only the section between the isolators shall be affected.

8.4 Visual Alarm Warning Device.

Flashing beacons shall be installed where indicated on the drawings.

Beacon shall be of low profile with Red lens made from a durable polycarbonate material or integrated with the smoke, heat or sounder equipment as required.

Flash Rate:	No less than 1/second
Operating power:	2W + 20%
Operating Voltage:	24V DC.

8.5 Electromagnetic Door Holders (Magnetic Locks).

The Door Holder shall be fitted with a spring loaded release pin. On power-off the release pin shall ensure that the given door is pushed away from the electro-magnet.

The Door Holder shall comply with the requirements of EN 61000-3-2 and EN 61000-6-3.

The Door Holder shall be equipped with a replaceable fuse and it shall have protection against reverse polarity.

Operating voltage:	24V DC
Current consumption:	No more than 80mA
Holding force:	100 N(π) + 15%
Protection:	IP 51

9 Nurse call system

9.1 General

The Contractor shall be responsible for the supply, delivery, installation, testing and commissioning of the a nurse call systems as detailed on the drawings and described in this specification.

The nurse call system and sound distribution system shall comply with Health Technical Memorandum HTM2015 and NHS Model Engineering Specification C49.

The system shall operate as a self-contained system with a dedicated power supply unit and reception indicator unit, as indicated on the drawings.

The system shall have the facility for two-way speech between patient and staff, and staff to staff. The two-way speech facility shall be flexible in design to allow the interchangeability of handsets to provide patients with speech or non-speech handsets at the discretion of staff.

9.2 Operation of the System.

The system shall have the facility to record call activity via software on an existing PC to record the time, date and location of each call on the system and staff responses to each call.

Cover plate finishes shall be either satin stainless steel, or powder coated creamy white subject to the Architects approval.

9.2.1 Call types.

The system shall have six distinct levels of call: -

Patient-to-Nurse Call – sounder 1 second on, 9 seconds off, lamps continuous.

Bathroom Call – sounder 1 second on, 3 seconds off, lamps continuous.

Emergency Call – sounder two-tone, 1.0 second cycle, lamps flashing 0.5 seconds on, 0.5 seconds off.

Cardiac Call – sounder two-tone (higher pitch than Emergency), 0.5 second cycle, lamps flashing 0.5 seconds on, 0.5 seconds off.

Priority of calls shall be as follows: -

1. Cardiac Call.
2. Emergency Call.
3. Bathroom Call.

9.2.2 Operation of the Patient-to-Nurse call system from a bedhead unit or remote call unit.

The patient will make a call by depressing the orange call button on the handset, or on the call/reset unit. This will illuminate the following lights until reset.

i. A reassurance light on the handset. This informs the patient that the call has been registered.

ii. The reset lamp on the bedhead unit or call/reset unit associated with that call.

iii. The overdoor lamp outside the room from which the call has been made.

iv. The overdoor lamp outside the corridor from where the call was made.

The LCD display at the Reception (NSU) and Staff Speech Unit/ Staff Display Unit will show the location of the call, with audible annunciation from a sounder.

9.2.3 Operation of the Patient-to-Nurse call system from WC's and shower rooms.

The patient will make a call by, either pulling the ceiling pull cord, or pressing the nurse call button. This will illuminate the following lights until reset from either the bedhead unit or the call/reset unit.

i. A reassurance light on the ceiling pull or by wall point.

ii. The reset lamp on the bedhead unit or on the call/reset unit associated with that call.

iii. The overdoor lamp outside the bedroom or room from which the call has been made.

iv. The overdoor lamp outside the corridor from where the call was made.

The LCD display at the Reception and Staff Speech Unit/ Staff Display Unit will show the location of the call, with audible annunciation from a sounder.

If the system is set up to give a higher priority to bathroom calls, patient-tonurse calls are automatically stored.

9.2.4 Operation of the Emergency Call (staff-to-staff).

Through each floor there are emergency call switches. Mounted either on bedhead units or as stand-alone units, the switch is a red pull-push switch engraved EMERGENCY PULL.

To summon assistance, the nurse must pull the switch, which will illuminate the same lamps as for the patient-to-nurse calls. These lamps will flash to signal that they are a higher priority.

When this assistance switch is used it will be a priority call and consequently any other patient-to-nurse call, or bathroom call that has been made will be automatically stored. The stored calls will be reinstated when all assistance calls have been cancelled by pushing the switch to its "off" position.

9.2.5 Operation of the Cardiac Call (staff-to-staff).

Where required, black pull-push switches are fitted onto plates engraved CARDIAC CALL.

To alert staff, the switch must be pulled which will illuminate the appropriate room light and, if in a bedroom, the corridor overdoor lamp also. These lamps will flash to signal the higher priority of the call. When the switch is used it has the highest priority and consequently any other patient-to-nurse, bathroom call or nurse-to-nurse call will be automatically stored. Any stored call will be reinstated when all cardiac calls have been cancelled by pushing the switch to its “off” position.

9.2.6 Operation of two-way speech (where applicable).

Two-way speech facilities shall be available between patient and staff, from the Reception and the bedhead unit via the patient handset. Between staff and staff from the staff speech unit and the Reception, or between staff speech units.

9.2.6.1 Patient-to-staff speech

The patient will make a call from the handset to the Reception. The nurse can either respond to the call by attendance, or by initiating a speech call with the patient by pressing the “open speech” key on the Reception. Speech is also open one way from the Reception.

A ring tone will then sound at the patient’s handset and upon pressing the orange call button on the handset, the speech channel will be open to the Reception. With the speech channel fully open the nurse can then reset the patient call from the Reception.

The patient call can be cancelled from the Reception. The nurse can initiate a call to a patient from the Reception by directly dialling the patient’s bedhead unit. The nurse initiates the process via the “speech dial” key and follows the on-screen prompts.

10 Audio Frequency Induction Loop System

The Contractor shall supply, install, test and commission an induction loop systems (AFILS) in the building for the hard of hearing in accordance with BS 7594.

Audio frequency induction loops shall be installed in the following rooms:

- Seminar Room 1
- Seminar Room 2
- Meeting Room
- Reception Office

The Contractor shall ensure that there is no cross talk between systems and between rooms.

Counter top induction loop systems shall be installed at the main reception desk on second floor.

The systems employed shall comply with:

- Part M of the Building Regulations
- Disabled Discrimination Act
- BS 7594 Code of practice for audio-frequency induction-loop systems (AFILS)
- BS 8300 ‘Design of buildings and their approaches to meet the needs of disabled people — Code of practice’
- Recommendations of the National Institute for the Deaf

The AFILS shall provide enhanced speech facilities between two parties in each location.

The Contractor shall install the system in accordance with the equipment manufacturer’s instructions.

The AFILS systems shall be tested and commissioned by the specialist Contractor.

11 Information and Communication Technology (ICT) Structured Cabling System.

ICT cabling and equipment is to be designed and installed by the clients nominated specialist as part of an existing framework agreement.

The contractor shall be responsible for the supply and installation of all containment associated with the ICT installation including cable basket, conduits and back boxes. Containment shall appropriate for the installation of CAT 6A cabling.

12 Security Systems

Details of the complete security system that comprises of CCTV, Electronic Access Control, Intercom systems and Intruder Detection system shall be detailed in a separate security specification and drawings provided by the clients nominated specialist.

The contractor shall allow for all power supplies and containment associated with the security system.

Where access control doors are specified, the contractor shall install a green break glass units and fire alarm interface such that the door fails safe open in the event of an evacuation.

13 Fire Stopping Around Electrical Services.

The Contractor shall supply and install special fire-stopping materials to fully seal services where they pass through fire rated elements.

All electrical services passing through openings in floors and through fire compartment walls within each floor, shall be fully sealed to the opening with tested and approved proprietary fire stopping materials, to resist the passage of fire and smoke.

All fire stopping materials to be manufactured under the quality assurance of EN ISO 9001:2008. All materials shall be installed strictly in accordance with the Manufacturer's written instructions by suitably experienced and qualified installers.

Fire compartment walls within each floor shall typically include, but not be limited to: walls separating complete accommodation from common access areas such as corridors, lift accesses and emergency escape routes, stair wells, plant and equipment rooms etc.

Any such services referred to above passing into and through electrical switchgear rooms on each floor shall be sealed in the above manner at all floor and wall openings.

Any such services referred to above which are contained within a fire rated service shaft must be sealed in the above manner where ever they pass through the

walls of the shaft into other fire compartments if they are not sealed at each floor level within the shaft.

Where closed cable trunking penetrates fire rated walls or floors, the inside of the trunking shall have a proprietary intumescent sealing material installed around the wires and cables to prevent the passage of fire through the trunking.

Depending upon the particular size, configuration of openings and ease of access, install either (a) Proprietary Intumescent Seal Bags of the most appropriate size packed tightly inside the trunking; or (b) Special Intumescent Foam Strip cut to the required size and fitted inside in layers to completely fill the trunking.

The fire stopping materials shall be selected to be the most suitable for each individual situation depending upon the particular size, configuration of openings and ease of access, as recommended by the Manufacturer, and to the approval of the Engineer.

All fire stopping materials shall provide a minimum 2 hours as defined by the requirements of BS 476- 20:1987, or for other period of time if specified elsewhere by the Architect.

All fire protection materials shall be approved by the Local Fire Prevention Authorities and Engineer.

Appendix A

Electrical Data Sheets

ARUP

Electrical Specification Data Sheet
Contents

Job Title: MacDonald Buchanan House - Sports Institute

Job Number: 218598-01

Package Reference: Contract

ARUP

Electrical Specification Data Sheet
V12 Electricity Generation Plant
Short Form Version with Test Schedules

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

General Data

Reference	Standby generator	Model Reference	
Location	Roof level	Manufacturer	Broadcrown Group, FG Wilson, Emergency Power Supplies, Caterpillar or equivalent & approved
Drawing Reference			
Number of Sets	1		
Test Schedules	See Sheets 6-9		

The Tender shall include the tests scheduled above

Scope of work	Manufacture, works test, delivery to site, installation, commissioning, site test
Scope of supply	Generator set, controls and changeover switchgear, exhaust system, bulk fuel tank Interconnecting cabling and pipework
Construction	Engine/alternator supported on anti-vibration mounts on rigid bedplate
Enclosure	

Application Criteria

Application	
Modes of start-up and control	Automatic start on mains failure. No-break return to mains with automatic synchronising and paralleling. Switch selectable automatic or manual changeover on mains return. Facility for no-break load transfer to generator for load test. Full G59/1 protection, maximum time in parallel with mains 5 minutes.

Generating Set Performance

Note: Performance figures refer to the finished installation, complete with all exhaust systems, cooling systems, silencers and acoustic treatment. Any power required to drive ancillary equipment such as fans and pumps shall be additional to the rated output.

	Required	Offered	
Rated voltage	400		V
Number of phases	3		
Frequency	50		Hz
Rated output @PF = 0.8	30		kVA
Prospective fault current			kA
at point of installation (Mains parallel operation only)			

	Required	Offered	
Speed	1500		r/min
Performance class	G3		
Note - For class G4 use Long Form Data Sheet			
Ambient temperature (Min)			°C
Ambient temperature (Max)			°C
Altitude	<1000		m

Details of Equipment Offered

Engine manufacturer	
• Model reference	
Alternator	
• Model reference	

Heat output

Engine		kW
Alternator		kW
Exhaust system		kW

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Electrical Specification Data Sheet
V12 Electricity Generation Plant
Short Form Version with Test Schedules

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Manufacturing Standards

		Required	Offered
Generating set		BS 7698 (BS ISO 8528)	
Engine	(If generating set not manufactured		
Alternator	to BS 7698 (BS ISO 8528))		
Silencer			
Bulk fuel tank		BS 799 Pt5	
Lead-acid batteries		BS EN 50342 & BS EN 60095	
Nickel-cadmium batteries		BS EN 60623	

Load Schedule

Ref no	Description of load	Starting			Running		Loads already connected **
		kVA	p.f.	Time	kVA	p.f.	
1	MRI scanner chiller						
2							
3							
4							
5							
6							

** Combined loads already connected to generator when this load is applied

Additional Information on Load Schedule and Application Criteria

Additional Project Information

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Engine Data	Required	Offered
Fuel(s)	Diesel	
Overspeed device (to BS 5514 pt6)	Yes	
Lubricating oil system		
Electric oil heating (with indication)	Yes	
Sump drain pipe		
Cooling System		
Cooling medium	Water	
Electric water heating (with indication)	Yes	
Radiator	Set mounted - belt driven fan	
Starting System		
Starting method	Electric starter motor	
Number of electric starter motors	1	
Number of battery sets	1	
Battery type	Heavy duty lead acid	
Battery mounting	Set mounted	
Engine driven charging alternator (with indication)	Yes	
Panel mounted static charger (with indication)	Yes	
Fuel System		
Day tank location	Set mounted	
Day tank capacity	8 hours minimum @100% load	
Day tank maximum capacity (litres)		
Day tank fuel gauge	Yes	
Bulk tank location	Roof of the Western Range building	
Bulk tank capacity	300 litre	
Bulk tank fuel gauge	Yes	
Bulk tank construction (Single/Double skin)	Integrally bunded / Double skin	
Fuel transfer pumps	Electric + semi-rotary manual	
Location of transfer pumps	Generator bulk tank plantrrom	
Day tank fuel dump valve	Yes - to Bulk fuel tank	
Fire protection shut-off system	Yes	

Alternator Data		
Type	Self-regulating, self-excited, brushless	
Insulation class (Min)	H	
Degree of protection (Min)	IP21	
Anti-condensation heaters	Yes	
Special load conditions		

Other		
Fuel transfer pipes	Integrally bunded/Double skin	
Fuel filter and water (moisture) separator	Yes	
Remote fill point cabinet (colour & location to be agreed with the Architect)	Yes - IP65 rated (minimum)	

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Controlgear and Switchgear

	Required	Offered	
Engine controls and protection system	Set mounted		
Duty Selector Control	Set mounted		
Location of changeover switchgear	Separate wall mounted		
• Cable entry	Bottom		
• IP Rating (Min)	IP 31		
• Lockable doors	Yes		
Dimensions of free-standing panel			
Alternator protective device type and rating *	As standard - No RCD		
Alternator switchgear type (3/4 pole)	3-pole		
Location of alternator neutral-earth connection **	Main switchboard		
Star-point contactor required	No		

* If overcurrent protection is provided this shall not incorporate any earth fault protection

** Where the neutral-earth connection is outside the scope of supply of this switchgear, the alternator star-point shall not be earthed to the generator frame.

Mains failure settings

Mains failure detection voltage range	Adjustable 80 - 95%		
Engine repeat start attempts	3		
Engine start delay	0-10		sec
Mains restoration timer (Run-on on-load)	30-180 (adjustable)		sec
Engine stop delay (Run-on off-load)	60-300 (adjustable)		sec

Monitoring and Control Devices - Minimum requirements

Instruments and gauges	**Offered**		**Offered**
Voltmeter - one with selector switch		Lubricating oil pressure gauge	
Ammeter - one per phase		Water temperature gauge	
Hours run counter		Frequency meter	
Status indicators			
Mains in limits (Standby to mains sets only)		Set in limits	
Mains on load (Standby to mains sets only)		Set on load	
Generator shut-down system			
Low oil pressure		Overspeed	
High water temperature		Alternator fail	
Generator overload			
Others			
Fail to start indication		Audible alarm with mute	
Volt-free contacts for remote alarm		Lamp test pushbutton	

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Electrical Specification Data Sheet
V12 Electricity Generation Plant
Short Form Version with Test Schedules

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Ancillaries

Exhaust system	Required	Offered		Required	Offered
Normal industrial silencer			Lagging		
Residential silencer			Cladding		

Works Testing

	Required	Offered		Required	Offered
Works Tests to BS ISO 8528:Pt 6	Yes		Number of persons attending	TBC	
• ISO standard functional test	Yes		Days notice required	30	
• ISO standard acceptance test	Yes		Power factor(s) for load tests	0.8	
• Tests as attached Schedule	Yes		Transient recorder printouts	Yes	
Calibrated test instruments to be provided by generator manufacturer				Yes	

Site Testing

	Required	Offered		Required	Offered
Works Tests to BS ISO 8528:Pt 6			Number of persons attending	TBC	
• ISO standard functional test	Yes		Days notice required	30	
• ISO standard acceptance test	Yes		Power factor(s) for load tests	Unity	
• Tests as attached Schedule	Yes		Transient recorder printouts	Yes	
Calibrated test instruments to be provided by generator manufacturer				Yes	

Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including: Technical Preliminaries Drawings*

2 *Tenderers shall complete these Equipment Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

5 *Generator sets shall have means for lifting and moving the set into position*

6 *Hand and electric fuel transfer pumps shall be self-priming type*

7 *Flexible cables shall be used for final connection to generator set. A local terminal box shall be used if required. Cables shall be oil and fuel resistant*

8 *Fuel lines shall be black iron pipe, steel or copper tubing. Galvanised pipes or zinc-bearing alloys shall not be used*

9 *Flexible piping or bellows shall be provided between the engine and the exhaust system.*

10 *Exhaust systems within buildings and elsewhere as indicated shall have thermal insulation material applied to pipework and silencers to limit surface temperatures to 55°C and be completed with embossed aluminium cladding*

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

Additional Project Requirements

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Generator Test Schedule - Sheet 1

Manufacturer	
• Address	
• Telephone	
Test engineer	

Customers name	
• Address	
• Telephone	
Customer's representative	

Works reference number			Alternator manufacturer		
Serial number			• Model		
Engine manufacturer			• Serial number		
• Model			Control gear details		
• Serial number			• Circuit diagram numbers		
Rated speed		r/min	Rated kVA		kVA
Rated voltage		V	Rated kW		kW
• Phases			Site rating kVA		kVA
Rated frequency		Hz	Site rating kW		kW
			• Ambient temperature		°C
Type of fuel oil used for tests			• Altitude		m
Type of lube oil used for tests			• Relative humidity		%

Preliminary static checks

	Result		Result
Completeness of items supplied to be tested		Only authorised persons present	
Alignment		Warning notices displayed	
Tightness of pipework joints and components		Cooling system filled	
Guards and other protective measures		Lubricating oil system filled	
Live terminals adequately protected		Connecting cables adequate	
Earth connections satisfactory		Batteries correct	
Obstructions or hazards			

Observations

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

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Generator Test Schedule - Sheet 2

Preliminary running checks

	Result		Result
Engine start and stop controls		Oil and water leaks	
Engine oil pressure		Phase sequence	
Nominal voltage and frequency		Vibration	

Observations _____

Monitoring and Control Device Checks

		Result			Result
Preheating system - oil			Lubricating oil pressure low	Indication	
Preheating system - water			Lubricating oil pressure low	Trip	
Failure to start	Indication		Engine water temp. high	Indication	
Battery charger failure	Indication		Engine water temp. high	Trip	
Fuel level low - day tank	Indication		Generator overspeed	Indication	
Fuel level high - day tank	Indication		Generator overspeed	Trip	
Fuel level low - bulk tank	Indication		Alternator Fail	Indication	
Fuel level high - bulk tank	Indication		Alternator Fail	Trip	
Duty/standby selector switch			Generator overload	Indication	
Duty/standby cycling timer			Generator overload	Trip	

Instrument Checks

Lubricating oil pressure gauge			_____		
Water temperature gauge			_____		
Hours run counter			_____		

	Indicated	Measured **		Indicated	Measured **
Voltmeter - L1			Ammeter - L1		
Voltmeter - L2			Ammeter - L2		
Voltmeter - L3			Ammeter - L3		
_____			_____		
_____			_____		

** Accuracy of test instrumentation	Required		Required
Voltage	1,5 %	Real power	1,5 %
Current	1,5 %	Reactive power	1,5 %
Frequency	0,5 %	Power factor	3 %

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Generator Test Schedule - Sheet 3

Load Tests

Rated load kVA		kVA	Rated voltage		V
Rated load kW		kW	Power factor		
Rated current		A	Rated frequency		Hz
Rated maximum single step load from no load					%

Single Step Loads

Load step	Transient deviation			Steady state		
	Hz	A	V	Hz	A	V
No load						
No load to 25% rated load						
25% rated load to no load						
No load to 50% rated load						
50% rated load to no load						
No load to 75% rated load *						
75% rated load to no load						
No load to 100% rated load **						
100% rated load to no load						
No load to 110% rated load						
110% rated load to no load						

* Or maximum rated single step load if less than 75%.

** Or maximum rated single step load if less than 100%. Test to be carried out first to approximate "cold start" conditions

Observations

Load Duration Tests

Load - 100% rated load				Engine oil pressure	Engine oil temp	Engine water temp	Alternator outlet air temp
Time	Steady state readings						
	Hz	A	V				
Start							
15 minutes							
30 minutes							
60 minutes							
90 minutes							
120 minutes							
180 minutes							
240 minutes							

Observations

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Generator Test Schedule - Sheet 4

Overload Test

Load - 110% rated load				Engine oil pressure	Engine oil temp	Engine water temp	Alternator outlet air temp
Time	Steady state readings						
	Hz	A	V				
Start							
15 minutes							
16 minutes							
17 minutes							
18 minutes							
19 minutes							
20 minutes							
21 minutes							
22 minutes							

Observations

Acceptance

Signed for manufacturer		Signed for customer	
Test Engineer's name		Representative's name	
• Signature		• Signature	
• Date		• Date	

Comments

ARUP

Electrical Specification Data Sheet
V31 Low Voltage Switchgear
Distribution Boards Using Miniature Circuit-breakers

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

General Data

Distribution board ref (s)	All	Manufacturer	Schneider (Merlin gerin), ABB or equivalent & approved.
Manufacturers model ref			

Manufacturing Standards

MCB boards	BS 5486 Pt 12 / BS EN 60439-3	RCCBs	BS EN 61008
Consumer units	BS EN 60439-3	RCBOs	BS EN 61009
Incoming isolation device	BS EN 60947	Miniature circuit-breakers	BS EN 60898

Important

- This Data Sheet indicates the type of Distribution Board and Miniature Circuit-breakers required
- The Distribution Board Schedules give details of individual MCBs, RCDs, incoming devices and cable sizes

Distribution Board Individual Data

Construction data

Reference	Mounting	Enclosure material	Lockable doors	Integral isolation device	IP rating	Cable/conduit entry		Pre-drilled gland plates	Anticipated short-circuit current (kA)	Backup protection	
						In	Out			Type	Rating

ARUP

Electrical Specification Data Sheet
V31 Low Voltage Switchgear
Distribution Boards Using Miniature Circuit-breakers

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

Miniature Circuit Breakers - General Data

Operational voltage	230/400	V	Manufacturers range		
Mounting	'DIN' rail		Rated short-circuit capacity	15	kA

Miniature Circuit Breakers - Requirements

	Required	Offered			Required	Offered
Rated current range				**Instantaneous tripping characteristics**		
Minimum			A	To BS EN 60898	Yes	
Maximum			A			
Residual current device				**Pole arrangements**		
Combined (RCBO)	Yes			1p	Yes	
Separate (RCCB)	Yes			2p, one protected		
Tripping current (s)	30		mA	2p, two protected	Yes	
Time delay			Sec.	3p	Yes	
Test button	Yes			3p - switched neutral		
Trip on power failure	No			4p	Yes	
High crest factor loads	Yes			Used for Isolation	Yes	
Energy limiting classes						
B-type MCBs	Any			C-type MCBs	Any	
Auxiliaries						
Changeover switch				Shunt trip release		
Contacts NO				Undervoltage release		
Contacts NC				Lockable in OFF position	Yes	

Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including:*
Technical Preliminaries
Drawings

2 *Tenderers shall complete these Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
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5 *Spare ways in distribution boards shall be blanked off*

6 *A permanent circuit way chart shall be provided for each distribution board*

7 *Outgoing ways shall be clearly identified*

8 *Neutral conductor terminals shall be sized for full size neutral conductors*

9 *The integral isolation device shall be a switch-disconnector and shall be capable of being padlocked in the OFF' position.*

10 *Distribution boards without local isolation shall have supply 'ON' indication*

11 *Multi-pole MCB boards shall be Type B as per BS 5486: Part 12.*

Additional Project Requirements

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

General Data

Switchboard reference (s)		
	LV1 & LV2	

Note: This Data Sheet covers the requirements for Indicating and Measuring Instruments only.

Selector switch type reference

The following selector switch configurations shall be provided where indicated in the individual schedules

A3	Ammeter switch, 3-phase, 3-wire systems	L1, L2, L3, Off
V3	Voltmeter switch, 3-phase, 3-wire systems	L1-L2, L2-L3, L3-L1, Off
V3+E	Voltmeter switch, 3-phase, 3-wire systems with earth point reference	L1-L2, L2-L3, L3-L1, L1-E, Off

Analogue Indicating Instruments

General requirements	**Required**	**Offered**
Manufacturing standard	BS 89 / BS EN 60051	
Accuracy class index :		
• Switchboard indicating instruments	1.0	
• Ammeters & voltmeters on motor control panels	2.5	
Measurement method		
• AC Voltage	Direct 400V AC	
• AC Current	Via 5A CT secondary	
•		
Movement type	Moving Iron	
Mounting	Flush	
Glass	Low reflectivity	
Meter reading under normal operating conditions (unless shown below)	60-75 % of f.s.d.	
External zero adjustment	Yes	
Motor starter ammeter scale overload margin	6 times	

	Offered
Manufacturer	
Model reference	

Analogue meter schedule

Switchboard / way ref (s)				
Meter size	mm	96x96		
Meter shape		Square		
IP Rating (External)	(min)	IP65		
Voltmeter scale	V			
CT Primary	A			
Ammeter scale	A			
Kilowatt meter scale	kW			
Selector switch type reference				

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Digital Indicating Instruments (Single Function)

General requirements

		Required	Offered
Manufacturing standards			
• Safety		BS EN 61010-1	
• EMC Immunity		BS EN 61000	
• EMC Emissions		BS EN 61000	
• Transducers		BS EN 60688	
• Power measurement		BS EN 62053-21	
Accuracy			
• Switchboard indicating instruments	(min)	± 0.5% ± 2 counts	
• Ammeters & voltmeters on motor control panels	(min)	± 0.5% ± 2 counts	
Measurement method			
• AC Voltage		Direct 400V AC	
• AC Current		Via 5A CT secondary	
•			
•			
Mounting		Flush	
Front window		Low reflectivity	
Overload protection - continuous	(min)	120% of rating	
Overload protection - voltage	(min)	150% for 10 secs	
Overload protection - current	(min)	1000% for 3 secs	
Resistive ammeter shunts		Shall not be used	

	Offered
Manufacturer	
Model reference	

Single function digital meter schedule

Switchboard / way ref (s)				
Display type		LCD		
Number of digits		3½		
Power supply		As tripping battery		
Meter size		96 wide x 48 high		
IP Rating (External)	(min)	IP65		
CT Primary	A			
Selector switch type reference				

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Digital Multi-Function Metering Systems

Switchboard ref (s)	All		

General requirements

		Required	Offered
Manufacturing standards			
• Safety		BS EN 61010-1	
• EMC Immunity		BS EN 61000	
• EMC Emissions		BS EN 61000	
• Transducers		BS EN 60688	
• Power measurement		BS EN 62053-21	
Accuracy			
• Voltage	(min)	± 0.5% ± 4 digits	
• Current	(min)	± 0.5% ± 4 digits	
• Power	(min)	± 1.0% ± 4 digits	
• _____	(min)		
Voltage input		230/400V AC	
Current input		Via 5A CT secondary	
Display type		Backlit screen	
• Number of parameters displayed	(min)	4	
• Screen update interval		1 sec	
Auxiliary power supply		230V AC	
Measurement type (Unbalanced load)		3Ø, 4-w, 3 element	
Outputs			
• Number of individual pulsed outputs	(min)	2	
• Number of analogue outputs	(min)	2	
• Rating of analogue outputs		4-20mA	
• Proprietary bus outputs		Modbus RS485	
Mounting		Flush	
Meter size	mm	96mm square	
Overload protection - continuous	(min)	600V, 6A	
Overload protection - voltage	(min)	200% for 1 sec	
Overload protection - current	(min)	2000% for 1 sec	

	Offered
Manufacturer	
Model reference	

Measurement Parameters

	Screen display		Analogue output		RS232 output		Pulse output	
Voltage (V)	**Required**	**Offered**	**Required**	**Offered**	**Required**	**Offered**	**Required**	**Offered**
Line 1 - Line 2	Y				Y			
Line 2 - Line 3	Y				Y			
Line 3 - Line 1	Y				Y			
Line 1 - N / Earth point	Y				Y			
Line 2 - N / Earth point	Y				Y			
Line 3 - N / Earth point	Y				Y			
Line - Line average								

Continued on next page ……

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

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Measurement Parameters (Continued)

	Screen display		Analogue output		RS232 output		Pulse output	
Current (A)	**Required**	**Offered**	**Required**	**Offered**	**Required**	**Offered**	**Required**	**Offered**
Line 1	Y				Y			
Line 2	Y				Y			
Line 3	Y				Y			
Sum								
Average								
Power - active (W)								
Line 1	Y							
Line 2	Y							
Line 3	Y							
Sum	Y				Y			
Power - reactive (Var)								
Line 1	Y							
Line 2	Y							
Line 3	Y							
Sum	Y				Y			
Power - apparent (VA)								
Line 1	Y							
Line 2	Y							
Line 3	Y							
Sum	Y				Y			
Power factor (PF)								
Line 1								
Line 2								
Line 3								
Average	Y							
Phase angle								
Line 1								
Line 2								
Line 3								
Average								
Active energy (Watt-Hours)								
Import	Y				Y			
Export								
Reactive energy (VAr-Hours)								
Import	Y							
Export								
Max demand - current	Y							
Max demand - active power	Y				Y			
VA-Hours								
Amp-Hours								
Frequency	Y							

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

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Energy Meters

	Required	Offered
Manufacturing standard (kWh, kVAr and MD electro mechanical meters)	BS 5685 or	
	BS EN 62053-11	
Manufacturing standard (kWh, kVAr and MD static meters)	BS EN 62053-21	
Maximum demand integration period	30 minutes	
Accuracy class designation	2.5 (or better)	
Operation on 4-wire system with unbalanced load	Yes	
External data transmission		
• kWh consumption	Yes	
• kW maximum demand	Yes	
• Time reset pulse for maximum demand	Yes	
• _____		

Current Transformers

Note: Requirements for CTs for protection purposes are given on the Circuit-Breaker Data Sheets.

		Required	Offered
Manufacturing standard		BS EN 60044-1	
Secondary current		5A	
Rated burden	VA or Percentage of total connected burden	Min 150%	
Accuracy class designation:			
• Tariff metering		0.5	
• Non-tariff metering		1.0	
• Switchboard indicating instruments		1.0	
• Motor starter ammeters		3.0	
Common CTs for metering and protection circuits		No, separate CTs	
Secondary earthing		Bolted links	
Test blocks		No	
Magnetisation curves		No	
Type test certificates		No	

Voltage Transformers

Note: Not required for direct 230/400V connection

		Required	Offered
Manufacturing standard		BS EN 60044-2	
Secondary voltage		110V	
Rated output	VA or Percentage of total connected burden	Min 150%	
Accuracy class designation:			
• Metering		1.0	
• Switchboard indicating instruments		1.0	
• Motor starter voltmeters		3.0	
Common CTs for metering and protection circuits		No, separate CTs	
Secondary earthing		Bolted links	
Test blocks		No	
Type test certificates		No	

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Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including:*
Technical Preliminaries
Drawings

2 *Tenderers shall complete these Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

5 *Wherever possible indicating instruments shall be from the same manufacturer to present a consistent appearance*

6 *Instruments shall be logically grouped relative to the associated equipment*

7 *Dual-ratio CTs shall be provided with two separate secondary windings capable of being connected in series or in parallel*

Additional Project Requirements

ARUP

Electrical Specification Data Sheet
V31 Low Voltage Switchgear
Moulded Case Circuit Breakers - Short Form

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

General Data

Switchboard ref (s)	All	Manufacturer	Schneider (Merlin gerin), or equivalent & approved.
Manufacturing standard	BS EN 60947-2		

This Data Sheet shall be read in conjunction with the Low Voltage Switchgear Assemblies Data Sheet

Common Performance Data

	Required	Offered			Required	Offered	
Operational voltage	400		V	Short-circuit making capacity			kA
Prospective short-circuit current	25		kA	Short-circuit breaking capacity			kA
Utilisation category	B			Short-time withstand current	25		kA
Installation method	Fixed			• for	1		sec

Circuit Breaker Data

For details of individual circuit breakers see

Cable schedules ref(s)		Drawing no(s)	

Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including: Technical Preliminaries Drawings*

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3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

Additional Project Requirements

ARUP

Electrical Specification Data Sheet
V31 Low Voltage Switchgear
Power Monitoring System

Job title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job number:	218598-01	Purpose of issue:	Contract	Revision:	C1

General data

Meter ref (s)	All	Model reference	
		Manufacturer	
		Telephone number	
		Fax number	
		Address	

Standards

General	BS EN 61000-6	BS EN 62053	
		SEMI F47	

Metering

	Required	Offered	
Input ratings			
• Voltage input	230/400		V
• Over voltage input range	25		%
• Current input	5		A
• Over current input range	25		%
• Frequency	50		Hz
Installation	3Ph-4Wire-Y		
Instantaneous RMS measurements			
• Voltage, per phase and total	Yes		L-L/L-N
• Current, per phase, total & neutral	Yes		
• Real, reactive & apparent Power, per phase & total			
• Power factor (lead/lag), per phase and total	Yes		
• Voltage & current unbalance			
• Phase reversal			
• Frequency	Yes		
Energy RMS measurements			
• kWh	Yes		
• kVArh			
• kVAh			
Demand and peak demand of instantaneous values			
• kW	Yes		
• kVAr			
• kVA	Yes		
Uni - or Bi-directional Energy Measurements			
• Uni-directional, imported or exported only	No		
• Imported, exported, absolute & net	Yes		
Integrated Display	Yes		
Mounting	Panel Mounted		

Job title: MacDonald Buchanan House - Sports Institute — Date: 22-Oct-12

Job number: 218598-01 — Purpose of issue: Contract — Revision: C1

Power quality

	Required	Offered	
Waveform recording			
• All metered characteristics to be displayed as waveform	Yes		
• Sample rate for one cycle display on meter screen	128		
• Sample rate per cycle for multiple cycle display on meter screen	16		
• Sub-cycle disturbance capture	Yes		
Harmonics			
• Recording of up to	63rd		harmonic
• % total harmonic current distortion	Yes		
• Odd harmonics only display	Yes		
• Even harmonics only display	Yes		
• All harmonics displayed at once	Yes		
• Crest Factor	Yes		
Symmetrical components			
• Zero sequence voltage, angle & magnitude			
• Zero sequence current, angle & magnitude			
• Negative sequence voltage, angle & magnitude			
• Negative sequence current, angle & magnitude			
• Positive sequence voltage, angle & magnitude			
• Positive sequence current, angle & magnitude			
Sag/swell monitoring			
• Magnitude & duration	Yes		
Transient detection at 50Hz	20µs		
Fault Capture			
• Voltage	1200V peak		
• Current	70A (inst. Peak)		

Logging & recording

Historical logging			
• Storage capacity	4 MB min		
• Events	500		
• Data (all parameters every 15 mins)	1		years
• Waveforms	180		
Minimum and maximum logging			
• Log min. & max. values on any parameter daily/monthly	Yes		
Event logging and alarming			
• Configurable event priorities	Yes		
• Define alarm conditions	Yes		
• Timestamp events/alarms	Yes		

Mathematics, logic & control

Mathematical functions to define formulas for on-board calculations		
• Arithmetic		
• Comparison		
• Logical		
• Trigonometric		
• Mathematic		

Job title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job number: 218598-01 Purpose of issue: Contract Revision: C1

Programmable logic and setpoint control

	Required	Offered	
• Adjustable setpoint to trigger data logging	Yes		
• Adjustable setpoint to trigger waveform recording	Yes		
• Adjustable setpoint to trigger on-board relays	Yes		
• Adjustable setpoint to trigger clearing & and reset functions	Yes		

Inputs/outputs

• On board digital inputs	8		
• On board digital outputs	4		
• On board analogue inputs			
• On board analogue outputs			
• On board relays (N/C)	1		
• On board relays (N/O)	1		
• Communication port	Ethernet		
• Data rate	10		Mbps

Display

• LCD	Yes		
• User access code	Yes		

Accuracy

• Voltage (L-N)	± 0.1		%
• Voltage (L-L)	± 0.1		%
• Current (L & N)	± 0.1		%
• kVA	0.2		Class
• kW	0.2		Class
• kVAr	0.2		Class
• kVAh	0.2		Class
• kWh	0.2		Class
• kVArh	0.2		Class
• Frequency	± 0.005		Hz
• Power Factor at Unity PF	± 0.2		%
• Harmonics	IEC 61000-4-7		%
• Crest Factor	± 1%		Full scale

Current transformers

		Required	Offered
Manufacturing standard		IEC 60044-1	
Secondary current		5A	
Rated burden	VA or Percentage of total connected burden	Min 150%	
Accuracy class designation:			
• Tariff metering		0.5	
• Non-tariff metering		1.0	
Neutral CT		Yes	
Secondary earthing		Bolted links	
Magnetisation curves		No	
Type test certificates		No	

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Job number: 218598-01 Purpose of issue: Contract Revision: C1

Voltage transformers

		Required	Offered
Note: Not required for direct 230/400V connection			
Manufacturing standard		IEC 60044-2	
Secondary voltage			
Rated output	VA or Percentage of total connected burden		
Accuracy class designation:			
• Metering			
Secondary earthing			
Type test certificates			

Additional information

1 *Meters shall be capable of communicating with an energy management system solution and other devices via an internet enabled connection. Local RS485 or RS232 outlets shall be provided for this purpose.*

2 *Current and voltage transformers used for measuring harmonics shall have a flat response at high frequencies up to the frequency of the highest harmonic specified in this data sheet.*

Additional Project Requirements

Job Title: MacDonald Buchanan House - Sports Institute — Date: 22-Oct-12

Job Number: 218598-01 — Purpose of Issue: Contract — Revision: C1

General Data

	All
Operational voltage	400 V
Manufacturing standard	BS EN 60947-3
Fuse manufacturing standard	BS 88 / BS EN 60269

Model reference	
Manufacturer	Schneider (Merlin gerin),
Telephone number	Legrand, MK,
Fax number	or equivalent.
Address	

This Data Sheet shall be read in conjunction with the Low Voltage Switchgear Assemblies Data Sheet

Data for each device

See the Low Voltage Switchgear Assemblies Data Sheet for operating voltages

Reference			
• Equipment controlled			
• Switchboard reference			
• Drawing reference			
Type of device (See note below)			
Operation	Independent manual		
• Spring charge	Not applicable		
• Spring release	Not applicable		
• Operating handle	Rotary		
Breaking medium	Air		
Mounting	Fixed		

Note: Equipment having additional capability may be substituted, e.g. a switch-disconnector may be used in place of either a switch or a disconnector but not vice versa

	Required	**Offered**	**Required**	**Offered**	**Required**	**Offered**	
Operational current	Varies						A
Number of poles	3P+N						
• Neutral switching capacity	N-A						A
Utilisation category (Minimum)	AC23						
Rated duty							
Making capacity							kA
Breaking capacity							kA
Short-time withstand current	25						kA
• for	1						sec
Auxiliary contacts (NC)							
Auxiliary contacts (NO)							
Enclosure material	N-A						
• Enclosure IP rating	N-A						
• Locking door	N-A						

(N-A = Not applicable, Unint = Uninterrupted)

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Data for each device

See the Low Voltage Switchgear Assemblies Data Sheet for operating voltages

Reference			
• Equipment controlled			
• Switchboard reference			
• Drawing reference			
Type of device (See note below)			
Operation	Independent manual		
• Spring charge	Not applicable		
• Spring release	Not applicable		
• Operating handle	Rotary		
Breaking medium	Air		
Mounting	Fixed		

Note: Equipment having additional capability may be substituted, e.g. a switch-disconnector may be used in place of either a switch or a disconnector but not vice versa

	Required	**Offered**	**Required**	**Offered**	**Required**	**Offered**	
Operational current							A
Number of poles	3P+N						
• Neutral switching capacity	N-A						A
Utilisation category (Minimum)	AC23						
Rated duty							
Making capacity							kA
Breaking capacity							kA
Short-time withstand current							kA
• for	1						sec
Auxiliary contacts (NC)							
Auxiliary contacts (NO)							
Enclosure material	N-A						
• Enclosure IP rating	N-A						
• Locking door	N-A						

(N-A = Not applicable, Unint = Uninterrupted)

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Additional Requirements

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4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

5 *Enclosures shall be suitably sized to accommodate terminations. Refer to cable schedules for conductor size and type*

6 *Equipment shall be clearly labelled with function and reference by means of permanently fixed engraving laminate labels*

7 *Devices using electrically charged springs shall have additional provision for manual charging*

8 *Disconnectors shall only be used where they will be required to make or break negligible currents*

9 *Equipment shall have provision for locking in the 'OFF' position. Earthing switches shall have additional provision for locking in the earthed position*

10 *Six-pole devices used for motor isolation may be formed by two separate three-pole units mounted in the same enclosure with internal mechanical linkage*

11 *Where disconnectors are used for motor isolation Normally Open auxiliary contacts shall close after and open before the main contacts*

Additional Project Requirements

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Electrical Specification Data Sheet
V31 Low Voltage Switchgear
Low Voltage Switchgear Assemblies

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

General Data

Applicable to	Modification to existing LV1 & LV2 plus all panelboards	Manufacturer	Schneider (Merlin gerin), or equivalent & approved.

Manufacturing Standards

General	BS EN 61439	Voltage transformers	BS EN 60044-2
	BS EN 60947	Current transformers	BS EN 60044-1

BS EN 61439-1 Conformity

Assembly type	Type-tested assembly
Declaration of conformity to Low Voltage Directive	Required
Independent test authority certificates	
• Complete compliance (with the appropriate British Standard)	Required
• Short-circuit rating	Required
• Type Tests	Required
• Making and Breaking capacity	Required
• Supplementary tests	

Associated Data Sheets

This Data Sheet shall be read in conjunction with the following Data Sheets:	Date	Revision
Air Circuit Breakers		
Air Circuit Breakers - Short Form		
Moulded Case Circuit Breakers		Rev 0
Moulded Case Circuit Breakers - Short Form / Nominated Manufacturer		Rev 0
Switches, Disconnectors and Fuse-combination Units		Rev 0
Instruments and Metering		Rev 0
Power Factor Correction		
Batteries and Chargers		

Common Performance Data

Nominal system voltage	400	V	Number of phases	3	
Frequency	50	Hz			

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Electrical Specification Data Sheet
V31 Low Voltage Switchgear
Low Voltage Switchgear Assemblies

Job Title: MacDonald Buchanan House - Sports Institute — Date: 22-Oct-12

Job Number: 218598-01 — Purpose of Issue: Contract — Revision: C1

Common Electrical Data

	Required	Offered			Required	Offered	
Spring Motor Voltage	Standard		V	Shunt Trip Voltage	Standard		V
Spring Motor Frequency	Standard		Hz	Shunt Trip Frequency	Standard		Hz
Solenoid Voltage	Standard		V	Undervoltage Trip Voltage	Standard		V
Solenoid Frequency	Standard		Hz	Undervoltage Trip Frequency	Standard		Hz
Closing release voltage	Standard		V	MCCB drive motors	Standard		V

Note - Where requirements are "Standard" manufacturers should enter the value for their standard product

Testing and Certification

	Required	Offered
Primary Injection Testing	No	
Secondary Injection Testing	Yes	
IP Rating Confirmation Certificate	No	
IK Rating Confirmation Certificate	No	

Works Inspection and Testing

	Required	Offered
To be witnessed	Yes	
Number of OAP attendees	TBC	
Days notice required	7	
Works location		
(To be completed by Tenderer)		

Individual Switchboard Data

Switchboard reference	Existin LV1 & LV2	All Panel Boards	
Location	Basement -1	Varies	
• Indoor / outdoor		Indoor / Outdoor	
• Atmospheric conditions	95% Rel. Humidity	95% Rel. Humidity	
• Maximum ambient temperature	30	30	°C
Description	LV Switchboard	Panel Boards	
Drawing reference	LV schematic	LV schematic	

Busbar Data	Required	Rated	Required	Rated	Required	Rated	
Operational current (Main busbar rating)							A
Neutral busbar rating							A
Earth busbar rating							A
• Neutral earthing method	Solid		Solid				
• Removable neutral-earth link	Yes		Yes				
Prospective short-circuit current							kA
Short-time withstand current			36				kA
• for	1		1				sec
Peak withstand current							kA

Job Title: MacDonald Buchanan House - Sports Institute — Date: 22-Oct-12

Job Number: 218598-01 — Purpose of Issue: Contract — Revision: C1

Individual Switchboard Data - Continued

Segregation	**Required**	**Offered**	**Required**	**Offered**	**Required**	**Offered**
Switchboard reference	Existing LV1 & LV2		All Panel Boards			
Segregation to BS EN 61439 ('Form')	4		3			
• Type (Forms 2 - 4)	2		B			
Form 1 assemblies only						
• Shrouding against accidental contact						
• Door interlock on incoming isolator						
Enclosure						
Enclosure type (BS EN 61439 Annex C)			Noncompartmentalized			
Mounting			Wall			
• Plinth (& Height)						
• Plinth material						
• Plinth provided by						
Enclosure material			Steel			
Colour			Standard			
Cable entry			Top/Bottom			
Cabling access			Front			
Maintenance access			Front			
IP rating - normal			IP31 or 65			
IP rating - door open			IP2X			
IK rating			Standard			
Vermin proof			Yes			
Main busbar location			Standard			
Earth bar location			Standard			
Extensible (At end when viewed from front)			Yes			
Selector switches - key operation			No			
• See Additional Information page			No			
Emergency pushbutton reset (Twist / Key)						
CTs for connection to remote PFC relays						
• Location						
• Ratio						
• Phase						
Anti-condensation heaters						
• All cubicles						
• Specific cubicles (Specify)			External Yes			

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Electrical Specification Data Sheet
V31 Low Voltage Switchgear
Low Voltage Switchgear Assemblies

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Dimensions

	Allowed	Offered	Allowed	Offered	Allowed	Offered	
Maximum floor loading							kN/m²
Height							mm
Length							mm
Depth							mm

Tripping / Closing Batteries and Charger

Battery and Charger details: As below

	Required	Offered
Battery location	In dedicated compartment in switchgear	
Charger location	In dedicated compartment in switchgear	
Type of battery	Sealed nickel cadmium	
Type of cell container	Prismatic (Rectangular block)	
Battery manufacturing standard	BS EN 60622	
Battery charger manufacturer		
Battery manufacturer		
Battery type number		

Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including: Technical Preliminaries Drawings*

2 *Tenderers shall complete these Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

5 *Busbar and incomer safety shutters shall be clearly identified*

6 *Busbar and isolating contacts shall be colour coded or labelled for phase indication*

7 *Provision shall be made to prevent danger or damage due to open circuit in current transformer secondary circuits*

8 *Proprietary test blocks for test and calibration purposes shall be accessible from the front of the panel*

9 *Equipment for indication and/or operation shall be mounted not less than 300mm and not more than 1800mm above finished floor level*

10 *Cubicles containing functional units shall have front hinged doors opening to not less than 85º*

11 *Each functional unit shall have an integral isolating switch interlocked with the door - the switch shall isolate all incoming supplies*

12 *Non-interlocked doors shall be fitted with cylinder locks unless specified otherwise. Each cylinder lock shall be supplied with two permanently labelled keys.*

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13 *A lockable wall mounted key cabinet shall be provided*

14 *All current carrying parts shall be copper*

15 *Busbar assemblies shall be four pole, air insulated*

16 *Supplies to functional units shall have dedicated conductors (not loop-in)*

17 *Enclosures containing functional units shall be labelled with circuit and unit reference and current rating.*

18 *Labels shall be engraved type made from multi-layer laminate - labels shall be fixed with instrument screws*

19 *Current transformers for connection to remote Power Factor Correction relays shall be fitted with shorting links*

21 *Vermin proof enclosures shall be fitted with internal barrier plates or grills at the bottom to prevent entry of vermin, irrespective of whether any underground ducts or trenches are sealed or not. Ventilation grilles shall be fitted with suitable internal wire mesh.*

22 *Supplies to anti-condensation heaters shall be separately protected and have a separate means of isolation in each cubicle. The supply shall not be interrupted by the main incoming circuit breaker. A warning label shall be fitted to the front of the cubicle*

Additional Project Requirements

23. Mimic lines showing busbar routes & control lines to be provided to panel facia.

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Electrical Specification Data Sheet
V32 Low Voltage Power Cables
Including Installation Requirements

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
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General Data

Drawing ref(s)

LV Schematic
& cable schedules

Manufacturer

BICC, Fulgor,
Draka, Prysmian,
AEI cables or equivalent

Cable Schedule references

This Data Sheet shall be read in conjunction with the following Cable Schedules and Drawings:

Sub main & earth cable schedules	
electrical schematics plus	
other other tender drawings	

Related Data Sheets

This Data Sheet shall be read in conjunction with the following Data Sheets:

	Revision
Cable tray and Ladder	0
Installation of Cable Ducts	0

Common Cable and Installation Standards

Quality Assurance

Cable types, installation methods and cable test methods offered to meet this specification shall be manufactured, procured, works tested and installed on the site as part of an approved Quality Control scheme.

Cable Manufacturing Standards

Cables shall be manufactured, designed and works tested to comply with the requirements of BS/ IEC standards or CENELEC harmonised specifications. All cables shall be BASEC certified.

EMC Considerations

All wiring systems and cable-connected ancillary devices shall be installed in accordance with the requirements of EMC Directive 2004/108/EC.

Cable Identification Colours

Only applicable to installations commencing on site after 31st March 2004 and before 1st April 2006

	Preferred	Offered
Colours conforming to BS 7671 Amendment 1 : 2002 (Red / Yellow / Blue / Black)		
Colours conforming to BS 7671 Amendment 2 : 2004 (Brown / Black / Grey / Blue)	Yes	

Important

- This Data Sheet gives requirements for the installation of Low Voltage power cables only. The requirements for wiring cables (including MICC) and flexible cords are detailed on the Low Voltage Wiring Cables data sheet
- The Drawings and Schedules give details of individual cable types and sizes
- Cable lengths stated on the Drawings or in the Cable Schedules are for design purposes only and are not be used for tender or construction

ARUP

Electrical Specification Data Sheet
V32 Low Voltage Power Cables
Including Installation Requirements

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Common Performance Data

	Required	Offered
System nominal voltage (L-E/L-L)	230/400	
Cable rated voltage (L-E/L-L)	600/1000	
Conductor construction (Aluminium conductors only)		
Sheath colour		

Manufacturing Standards

XLPE/PVC cables	BS 5467	
PVC/PVC cables	BS 6346	
XLPE/LSF cables	BS 6724	
Fire-resistant LSF cables	BS 7846	

Particular requirements for cable types:

	Fire-resistant LSF cables must have a minimum fire survival time of 120mins when tested, as described in BS 7346-6

Particular Requirements

	Required	Offered
Glands • Earth stud • Material (if not brass)		
Single point bonding • Cable numbers	No N/A	
Joint type • Manufacturer • Manufacturer's type ref.		
Test joints • Type/Number		

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
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Test Requirements

D.C. Insulation test	All cables shall be subjected to an insulation test. Test voltage levels and times shall be in accordance with requirements given in the relevant Standard for the particular cable type. Test voltages may be increased gradually to the full value where permitted by the Standard.
Other tests	Where the relevant Standard for the particular cable type specifies or recommends additional tests then these shall also be carried out.

Tests shall be carried out immediately after installation

General Installation Requirements

Installation standard	BS 7671 and the Guidance Notes published by the IEE.
Manufacturer's seals, labels etc	To be retained for inspection
Handling, installation, jointing, termination	In accordance with manufacturer's recommendations
Minimum bending radius during installation	Not less then manufacturer's recommendations
Cable temperature at time of installation	In accordance with manufacturer's recommendations
Cable temperature prior to installation	In accordance with manufacturer's recommendations
3-phase groups of single core cables	Installed in trefoil
Emission requirements for 'LSF' cable accessories	As BS 6724 for cables
Installation of 'LSF' cables in ground or ducts	Only with manufacturer's written approval
Prolonged immersion or aggressive atmospheres	Manufacturer's written confirmation required

Joints and Terminations

Joints	Intermediate joints shall only be permitted where specifically indicated on the drawings or where the length of cable required is in excess of the length obtainable in one piece from the cable manufacturer. All joints shall be shown on the Record Drawings.
Termination of conductors of 25mm² or greater	Compression lugs
Termination of conductors of 16mm² or less	Compression lugs or screw clamp terminals
Termination of conductors of 6mm² or less	Compression lugs, screw clamp terminals or pinch screw terminals
Test joints and samples	Prepared in accordance with BS 6910
Cable sockets and ferrules	Compression type
Joint materials	BS EN 61238
Joint materials - performance	BS 4579
Earth continuity bonds - performance	BS 7197
Terminations on motors or vibrating apparatus	Where cables terminate directly into a motor or apparatus subject to vibration, the cable shall be adequately supported so that no undue strain is placed on the cable terminations. If necessary the final connection shall include a loop of cable to absorb excess movement.
Termination of over-sized cables	Where the specified cables are too large to be terminated directly into a motor or other apparatus, or where otherwise indicated on the drawings, the cable shall terminate in a junction box or isolator mounted adjacent to the apparatus. The final connections shall be made with multi-core cable or single core cables run in flexible conduit. On circuits where the cables have been sized for voltage drop, the cable size may be selected on current rating. A separate protective conductor shall be installed.

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Cable Glands

To be fitted	All entries into switchgear, terminal boxes or other enclosures
Manufacturing standard	BS 6121 or BS EN 50262
Type	As appropriate to cable type and approved by cable manufacturer
PVC or PCP shrouds	On external installations
Gland material - steel armoured cables	Brass (Unless specified otherwise in Particular Requirements)
Gland material - aluminium armoured cables	Tin-nickel plated brass or aluminium alloy (Unless specified otherwise in Particular Requirements)
Locknuts and earth tags	Same material as gland
Armouring of single-core cables	Bonded and earthed at both ends

Labelling

General	Cables shall be labelled at both ends except where cables terminate in full view onto a clearly labelled switch, starter or similar piece of apparatus or onto a motor or other item of equipment the function of which is evident. All cables terminating on the back or in the base of a cubicle type or similar switchboard or control panel shall be labelled
Additional for cables above ground	In all riser cupboards and at intervals not exceeding 30 metres.
Additional for buried cables	At joint positions and in draw pits
Means of identification - cables	Sleeve markers threaded onto carrier strip
• Material	Stainless steel or LSF
Information displayed	Cable number, size, number of cores, function
Means of identification - cable sealing boxes	Screw fixed engraved plastic or brass label
Identification of control cables	Plastic ferrules bearing indelible characters

Cable Spacing

Type of service	Horizontal spacing	Vertical spacing
LV cable - LV cable **	50mm	300mm
LV cable - HV cable	300mm	300mm
HV cable - HV cable **	300mm	300mm
LV cable - communications cable	300mm	300mm
HV cable - communications cable	300mm	300mm

** For single-core cables - distance between the groups of cables, not between the cables in a group.

Note - unless shown otherwise on drawings

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Cable support

Single-core cables laid in trefoil	Secured in purpose-made trefoil cleats
Single-core cables laid side by side	Individually secured using non-ferrous cleats.
Non-metallic cleats for LSF cables	LSF material.
Fixings for fire rated cables	Able to withstand fire for same duration as cable
Multi-core cables on ladder or tray	In single layer, secured with cable ties
• Cable tie material	Stainless steel
Cables in bundles	Ties to retain all cables of group
Cables in vertical runs	Supported with load bearing cable cleats or saddles
Installation on structural steelwork	Cable supports attached by girder clips or similar
• Drilling/welding of structural steelwork	Not permitted

Note - unless shown otherwise on drawings

Calculations required	Where cables are cleated to ladders on alternate rungs, such that the cables are suspended above the intermediate rungs, or wherever the weight of the cables is not supported at each rung of the ladder, calculations shall be provided to demonstrate that the maximum loading per rung is not exceeded.

Cables Installed in Air

Manner of installation	
• Cables installed directly on walls	Vertically or horizontally
• Cables on ceiling or roof structures	Parallel with or perpendicular to building structural elements
Separation from water, gas, piped services	Minimum 150mm
Separation of HV and LV cables	On separate ladder or tray
Cables in trenches	On cleats, clips or saddles on sides or bottom of trench.

Note - unless shown otherwise on drawings

Spacing of Clips or Saddles

Overall diameter of cable	Horizontal spacing	Vertical spacing
Up to 9mm	250mm	400mm
9 - 15mm	300mm	400mm
15 - 20mm	350mm	450mm
20 - 40mm	400mm	550mm
Above 40mm	Manufacturer's recommendation	

** Cables shall additionally be fixed 150mm on either side of a set or bend

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Underground Cable Installation

Building entries	In ducts
Under roads, railways, paved areas	In ducts
In corrosive soils	In ducts
Elsewhere	Direct buried
Crossing other services	Below intersecting piped services subject to cable depth < 2m
In ground liable to subsidence	Cables 'snaked' from side to side in trench
Adjacent to joints, draw-in pits, building entries	Cables 'snaked' from side to side in trench for 3m

Note - unless shown otherwise on drawings

Depth of Laying

Type of ground	HV Cables	LV Cables
Cables in open ground or under paved pedestrian areas - Residential sites	750mm	500mm
Cables in open ground or under paved pedestrian areas - Commercial sites	900mm	600mm

Note - unless shown otherwise on drawings

Cables Installed in Ducts

Duct diameter	100mm or as indicated on drawings
Space factor	25%
Multiple LV cables in ducts	Permitted
Multiple HV cables in ducts	Cables of same circuit or associated pilot/protection cables - permitted Cables of different circuits - not permitted
Sealing of ducts entering buildings	Pourable gypsum compound or polymeric sealant, gun applied elastic sealant or expanding polyurethane foam sealant. Application shall be in accordance with manufacturer's recommendations

Note - unless shown otherwise on drawings

Trenches and backfill

Cable bed	Salt-free sand or selected soil bed minimum 100mm deep below cable
Cable covering	Salt-free sand or selected soil bed minimum 100mm cover above cable
Multiple tiers of cables in same trench	Vertical separation of 300mm salt-free sand or selected soil
Inspection requirements	Trenches available for inspection prior to backfilling

Note - unless shown otherwise on drawings

Markers and covers

Marker slabs	Reinforced concrete
Marker posts	Reinforced concrete
Sample required	Yes - post and slab
Marker post location	Maximum 50m spacing on underground cable routes, joint positions, changes of direction, both ends of road and rail crossings
	Marker slabs shall be used where posts may cause obstruction to vehicles or pedestrians or be liable to damage

Note - unless shown otherwise on drawings

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Marker post inscription

• HV cable routes	HIGH VOLTAGE CABLES
• LV cable routes	ELECTRIC CABLES
• Joint positions	ELECTRIC CABLE JOINT
Cable covers	100 - 150mm above all direct buried cables
Material	Plastic, interlocking concrete or earthenware
Impact resistance	To BS 2484
Marker tape	Yellow plastic, buried 300mm below surface above all direct buried cables

Note - unless shown otherwise on drawings

Transits and Fire Stopping

Installation of proprietary cable transits	Strictly in accordance with manufacturer's recommended procedures
Cables passing through walls etc	Sleeves to be installed to facilitate installation and withdrawal of cables
Internal diameter of sleeves	12mm to 25mm larger than cable diameter
Sleeves through floors and fire-rated walls	Steel
Sleeves through ceilings, non fire-rated walls, etc	Heavy-gauge LSF
Projection of sleeves	
• Cables passing through floors	50mm
• Cables passing through external walls	50mm
• Other transits	5mm
Sealing of cables into sleeves	
• Through fire rated structures	To achieve fire rating not less than that of original construction
• Through external walls	Additional sealing with flexible rubber boot or shroud over sleeve projection

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including:*
Technical Preliminaries
Drawings

2 *Tenderers shall complete these Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer.*
Any deviation shall be identified by the Tenderer

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

Additional Project Requirements

ARUP

Electrical Specification Data Sheet
V32 Low Voltage Wiring Cables
Including Installation Requirements

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

Cable Schedule references

This Data Sheet shall be read in conjunction with the following Cable Schedules and Drawings:

Common Cable and Installation Standards

Quality Assurance	Cable types, installation methods and cable test methods offered to meet this specification shall be manufactured, procured, works tested and installed on the site as part of an approved Quality Control scheme.
Cable Manufacturing Standards	Cables shall be manufactured, designed and works tested to comply with the requirements of BS/ IEC standards or CENELEC harmonised specifications. All cables shall be BASEC certified.
EMC Considerations	All wiring systems and cable-connected ancillary devices shall be installed in accordance with the requirements of EMC Directive 2004/108/EC.

Important

- This Data Sheet gives requirements for the installation of Low Voltage wiring cables (including MICC) and flexible cords.
  The requirements for power cables are detailed on the Low Voltage Power Cables data sheet
- The Drawings and Schedules give details of individual cable types and sizes
- Cable lengths stated on the Drawings or in the Cable Schedules are for
  design purposes only and are not be used for tender or construction

Cable Identification Colours

Only applicable to installations commencing on site after 31st March 2004 and before 1st April 2006

	Preferred	Offered
Colours conforming to BS 7671 Amendment 1 : 2002 (Red / Yellow / Blue / Black)		
Colours conforming to BS 7671 Amendment 2 : 2004 (Brown / Black / Grey / Blue)	Yes	

Data for Specific Cables

- This table gives additional requirements for the specific cables listed below

Cable ref	Location	Requirements

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

General Installation Requirements

System nominal voltage	230/400V
Installation standard	BS 7671 and the Guidance Notes published by the IEE.
Certification	All cables BASEC certified
Manufacturer's seals, labels etc	To be retained for inspection
Handling, installation, jointing, termination	In accordance with manufacturer's recommendations
Minimum bending radius during installation	Not less then manufacturer's recommendations
Cable temperature at time of installation	> 0°C
Cables temperature prior to installation	> 0°C for 24 hours
Direction of run on walls	Vertically or horizontally - diagonal runs not permitted
Direction of run on ceiling or roof structures	Parallel with or perpendicular to the structural elements of the building.

Small Wiring Cables and Flexible Cords

Method of installation	Loop in
Maximum number of conductors on any terminal	3
Connections to cables	Only in fittings, accessories or equipment enclosures
Underground installation	Not permitted for cables to BS 6004, BS 6007 or BS 7211
Incompatible materials	PVC not to be in contact with expanded polystyrene insulation

Single-Core Cables

Manufacturing standard - PVC cables	BS 6004 Table 1a
Manufacturing standard - LSF cables	BS 7211 Table 3
Method of installation	In conduit or trunking
Conductor type	Stranded copper
Conductor minimum size	1.5mm²
Circuit protective conductor	Separate single core cable (Applies to metallic conduit systems also)

Flat Twin and Multi-Core Sheathed Cables

Manufacturing standard - PVC/PVC cables	BS 6004 Table 4 and/or 5
Cables in plaster or concrete	Run in PVC or steel conduit or channel - direct embedding not permitted
Mechanical protection	All external installations, internal installations below 1.8m
Installation in floor or ceiling voids	As detailed in BS 7671

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Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Mineral Insulated Cables

Manufacturing standard - cables	BS EN 60702-1
Manufacturing standard - terminations	BS EN 60702-2
Class	Heavy duty 750V
Sheath	LSF material
• Colour - general power	Orange
• Colour - fire alarm and emergency lighting	Red
Twisted conductors	Minimum 20 twists per metre
• Identification	Sheath to be suitably marked to differentiate from untwisted cables
Cables buried in plaster or concrete	Sheathed cables permitted - unsheathed cables not permitted

Note - unless shown otherwise on drawings or schedules

Glands to be installed	All terminations
Glands for sheathed cables	To have plastic shroud
Glands installed on non-conducting materials	Earth tail seals or sheath earth bonds
Glands and terminations	Installed strictly in accordance with manufacturer's recommendations
Sheath cutters and special tools	Supplied and approved by cable manufacturer
• Crimping tools	Suitable for solid conductors
Termination of conductors 6mm² or greater	Compression or cone grip lugs
Terminations of conductors 4mm² or less	Compression lugs, screw clamp or pinch screw terminals
Termination of single core cables	In accordance with manufacturer's recommendations

Site fabricated clips	The use of bare or PVC covered copper strip for site fabrication of saddles or clips will not be permitted.	
Cable clips and saddles - unsheathed cables	Plain copper	
Cable clips and saddles - sheathed cables	Plastic covered to match cable	
Spacing of cable clips and saddles	Overall diameter of cable (mm)	Horizontal & vertical fixing centres (mm)
	Up to 7.5	450
	7.5 to 12.5	600
	above 12.5	750

Surge suppressors	On inductive equipment in accordance with manufacturer's recommendations
Insulation d.c. test voltage	As BS 7671 (500V for 400V systems)
Test results	Two insulation tests minimum 24 hours apart - second reading shall shall be higher than first and not less than 100 megohms

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Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Flexible Metal Clad Cables

Approval standard	BASEC certification
Flexible sheath	Galvanised steel
Conductor material	Copper
Conductor insulation	PVC, PVC/nylon or LSF
Colour coding	As BS 7671 for non-flexible cables for fixed wiring
Circuit protective conductor	Integral green/yellow insulated copper conductor
Sheath bonding	Earthing and bonding as for fixed metallic conduit system
Glands and accessories	Supplied and approved by system manufacturer
Sheath cutters and special tools	Supplied and approved by system manufacturer

Fire Resistant Cables

Manufacturing standard	
Category to BS 6387 (Minimum)	C W Z
LPCB Certification	Required
Intermediate joints	Not permitted
Cable fixings	Able to withstand fire for same duration as cable

Data for Miscellaneous Cables

- This table indicates cables used for final connections to equipment or not scheduled elsewhere.
- Where no British Standard is given, cables shall be to BS 6004, BS 6007, BS 6500 or BS 7211 as appropriate.

Reference or Description	No of cores	CSA (mm^2)	Sheath colour	Temp. rating	Cable Type

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Electrical Specification Data Sheet
V32 Low Voltage Wiring Cables
Including Installation Requirements

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including:*
Technical Preliminaries
Drawings

2 *Tenderers shall complete these Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

Additional Project Requirements

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Electrical Specification Data Sheet
V33 Busbar Trunking
(Small Power and Lighting)

Job Title: MacDonald Buchanan House - Sports Institute — Date: 22-Oct-12

Job Number: 218598-01 — Purpose of Issue: Contract — Revision: C1

General Data

Application	See layout drawings	Model reference	
		Manufacturer	
Location (s)		Telephone number	
		Fax number	
Manufacturing standard	BS EN 60439-2	Address	
• Accessories	BS 5733		
• Fuses	BS 88/BS EN 60269 or BS 1362		

Busbar Data

Location	See layout drawings		Prospective short-circuit current		kA
Drawing reference			Ambient temperature	30	°C
Conductor configuration **	L1,L2,L3,N,HIE,CE		Incoming feed location	End	
Busbar nominal rating		A	Supply cable type		
System nominal voltage	230/400	V	Number and size		
Frequency	50	Hz	Protective device / rating		

** E = Protective earth, CE = Functional ('Clean') earth, HIE = High integrity earth as per Section 607 of BS 7671

	Required	Offered			Required	Offered	
Phase conductor rating			A	Standard lengths			mm
Neutral conductor rating	100%		A	Tap-off spacing (max)	300		mm
Separate earth conductor rating	100%		A	IP rating			
Conductor material	Copper			Enclosure material			
Short circuit rating	16 (min)		kA	Impedance - milliohms/metre (max)			
ASTA Certificates required	No			• Phase busbar			
Maximum allowable heights (Fixed to flat floor)				• Neutral busbar			
• Trunking	20		mm	• Protective earth			
• Tap-offs / accessories	50		mm	• Functional earth			

Tap-off Units

1 - Pole units				3- Pole units			
Rating			A	Rating			A
Protective device				Protective device			
Cable length			mm	Cable length			mm
• Size			mm²	• Size			mm²
• Type				• Type			
Phase (Fixed / Selectable)							

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Electrical Specification Data Sheet
V33 Busbar Trunking
(Small Power and Lighting)

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Additional Requirements

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Technical Preliminaries
Drawings

2 *Tenderers shall complete these Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

5 *Similar trunking systems used for different services shall be identified either by colour coding or by a different type of tap-off connector. It shall not be possible to connect a tap-off unit for one service into trunking provided for a different service*

6 *Positive means for securing the tap-off to the busbar shall be provided*

7 *Flexible metal conduit shall be connected to the protective earth but shall not be used as the circuit protective conductor*

8 *Fused tap-off units rated up to 13A shall incorporate fuses to BS 1362. Higher rated units shall incorporate fuses to BS 88 / BS EN 60269*

9 *Trunking shall be installed in accordance with the manufacturer's recommendations. End feed units and stop ends shall be individually secured*

10 *Bends, corners and joggles shall be made using manufacturer's pre-assembled units. Where necessary trunking lengths may be connected by two end feed units connected together by cables in flexible metal conduit*

Additional Project Requirements

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

General Requirements

This Data Sheet covers earthing and bonding in LV Installations. The requirements for earthing systems are covered on the Substation and System Earthing Data Sheet

Installation standard	BS 7671 and the Guidance Notes published by the IEE. BS IEC 61000-5-2

Cables

Minimum size	2.5mm²
Cable insulation colour	Green/yellow
Installation of single core cables	
• Direction of run on walls	Vertically or horizontally - diagonal runs not permitted
• Direction of run on ceiling or roof structures	Parallel with or perpendicular to the structural elements of the building.

Joints, Terminations, Connections, Labelling

Joints	Only where unavoidable
Terminations	
• Conductors of 25mm² or greater	Compression lugs
• Conductors of 16mm² or less	Compression lugs or screw clamp terminals
• Conductors of 6mm² or less	Compression lugs, screw clamp terminals or pinch screw terminals
Connections	
• To pipework etc	BS 951 clamps
• To earth bars, sinks etc	Compression lug with nut, bolt and lockwashers
• To metal reinforcement or structure	Purpose made clamps
Labelling	
• Required at	Connection point of all bonding conductors to extraneous conductive parts
• Wording	"Safety Electrical Connection - Do Not Remove"

Equipotential Bonding

Bonding shall be installed:	As Below

	Bonding required	Size (mm²) [1]
Metallic services entering or leaving the building	To main earthing terminal at each point of entry or exit	As BS 7671
Steel reinforcement or structure	To main earthing terminal or bar	As BS 7671
Metal sinks, basins, etc (Including pipes)	To earth terminal of nearest 13 Amp socket outlet	4
Cable tray, ladder, trunking etc		
• Entering or leaving substations	To main earthing terminal or bar	25
• At distribution boards or switchboards	To earthing terminal of the associated board	25
• Along runs	Wherever support system is not electrically continuous	25
Metallic ductwork and pipework		
• Ductwork	To earthed frame of electrically driven plant	25
• Insulating joints	Across joint with copper braid bonding conductor	25
Metallic cladding over thermal insulation	To fixed metalwork forming part of the electrical installation	4

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Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Equipotential Bonding (Continued)

Suspended ceilings [2]

Raised floors [2]

To luminaire earth terminal - minimum one bond per 20m²	2.5
To underfloor distribution system - minimum one bond per 10m²	10 (refer to deatil drawing)

[1] Unless indicated otherwise on schedules or drawings

[2] Unless manufacturer gives other specific recommendations in which case these shall be observed.

Records

1 Earth fault loop impedances shall be measured at all distribution boards, motor control centres, miscellaneous plant, etc. The results shall be included on the schedules of sub-circuit insulation resistance.

2 Earth fault loop impedances shall be measured on all final circuits. The results shall be included on the schedules of final circuit insulation resistance.

The schedules for these records shall be provided by the Contractor.

Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including: Technical Preliminaries Drawings*

2 *Tenderers shall complete these Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

5 *Bonding for ceilings and floors shall be in addition to any fortuitous connections via luminaires or equipment*

6 *Bonding conductors and connections shall be installed so as to be clearly visible and shall not be covered by lagging or be otherwise obscured*

7 *Where connections occur between dissimilar metals precautions shall be taken to avoid corrosion*

Additional Project Requirements

ARUP

Electrical Specification Data Sheet
W50 Fire Detection and Alarms

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

General Data

System type	L1	Model reference	
System operation	Automatic	Manufacturer	AFA Minerva, Gents,
	Addressable	Telephone number	Notifier (Honeywell),
	Analogue	Fax number	Siemens, Johnsons Controls,
Manufacturing standards	BS 5839, BS EN 54	Address	Menvier,
			or equivalent
LCS 1014 certificated firm	Yes		
LPCB component approval	Yes		

Fire Authority	Fire Prevention Officer	
Contact name		
Telephone number		
Fax number		

Associated Documents

Fire zone drawings	Refer to the Architects dwgs	Main panel drawings	
Fire event logic diagram		None	
Cause and effect diagram		Hazardous area drawings	N/A

System Data

	Required	Offered
Audible alarms	Electronic Sounders	
Connections by	Fixed wiring	
Detector wiring	Loop	
Field programming of main control panel	As per existing main fire alarm panel	
• Programming device to be supplied		
Device address programming	Programmable from existing central control panel	
Detectors and sounders on same circuits		
Battery standby duration	As per existing	
Battery alarm duration	As per existing	
Battery type	As per existing	
Mains supply	As per existing	
Abnormal environmental conditions	As per existing	
Transient surge suppressors required on		

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Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

Samples

Samples required of	Smoke detectors, Heat detectors	
	beacons, sounders, beam detectors,	
	call point, interface modules,	

Note: Fully detailed drawings and samples shall be submitted for comment prior to manufacture of major components

Cable Types	**Required**	**Offered**
Detector wiring type	Standard	
• BS 6387 Category	CWZ	
Alarm wiring type	Standard	
• BS 6387 Category	CWZ	
Communications circuits wiring type	Enhanced (fire alarm network)	
• BS 6387 Category	CWZ	
Connections to other equipment	Standard (EXCEPT SHEVV)	
• BS 6387 Category	CWZ	
Connections to SHEVS components	Enhanced	
• BS 6387 Category	CWZ	

Note: Unless specifies otherwise, all cables to have red oversheath

Modular Wiring System		
• See drawings	N/A	
• Samples required of	N/A	

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Smoke Control Outputs

Ventilation fans	Yes	See fire alarm alarm layout drawing and schematics
Smoke extract fans		
Ventilation louvres		
Curtains / barriers		
Stair core pressurisation		

Outputs to Other Equipment

	Required	Details / Drawing No
Central station	Yes	
Voice alarm		
Security system	Yes	
AutoDial external assistance	Yes	As per existimng
Lighting controls	Yes	
Sprinkler system		
Lifts	Yes	As per existimng
Escalators		
Door and window releases	Yes	
Communications equipment	Yes	
Audio visual equipment	Yes	
Mechanical plant	Yes	
Pre-action sprinkler systems		

Inputs from Other Systems

	Required	Details / Drawing No
Extinguishing systems		
Gas detection		
Sprinkler systems		
AutoDial external assistance		
Air sampling detection systems	Yes	
Voice alarm		
Security system		
Lighting controls		
Communications equipment		
Mechanical plant		
Pre-action sprinkler systems		

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Main Control Panel

Reference	Existing	Location	Basement -1
• Detail drawings		• Refer to drawings	
Finish		Mounting	Wall
• Detail drawings		• See drawings	

	Required	Offered		Required	Offered
No. of zones	As plans		IP Rating		
Expansion capability	40%		Modular construction		
Mimic (Integral / Remote)	Integral VDT		AutoDial		
• Detail drawings			Fault warning sounder level		

Mandatory Manual Control Options	Required	Offered
Silence fire alarm devices and silence control sounder combined	Yes	
Mandatory Indication Options		
Fire alarm and zone of fire combined	Yes	
Fault alarm and zone of fault combined	Yes	

Optional Manual Controls	Required	Offered		Required	Offered
Delay on alarm transmission	Yes		Disable input interface	Yes	
Silence fault alarm	Yes		Test system	Yes	
Disable single detector	Yes		Reset software failure counter	Yes	
Disable alarm sounders	Yes		Reset automatic reset warning	Yes	
Disable link to remote centre	Yes		Change configuration data	Yes	
Disable control of other systems	Yes				

Local Optional Indications

Supply fail			Alarm record		
Battery low			for period (hrs/days)		
Charger fail			Faults record		
Software failure			for period (hrs/days)		
			Printer		
			noise level (max dB(A))		

Local Power Control and Indications

Ammeter			Charge indicator		
Battery test switch			Fuse failure indicator		

Double knock in areas :	As cause and effect schedule
`Fireman's control' of :	

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Auxiliary/Slave Control Panels

Reference	N/A		
• Refer to drawings			
Location			
• Refer to drawings			
Finish			
• Refer to drawings			
Mounting			
• Refer to drawings			
Mimic (Integral / Remote)			
• Refer to drawings			

	Required	Offered	Required	Offered	Required	Offered	
No. of zones							
Expansion capability							
Modular construction							
Rack mounted							
IP Rating							
AutoDial							
Fault warning sounder level (@ 1 m) - minimum							dB(A)
Mandatory Manual Control Options							
Silence Panel Alarm and Silence Fire Alarm Combined	Yes						
Mandatory Indication Options							
Zone of fire and fire alarm combined							
Zone of fault and fault alarm combined							
Optional Manual Controls							
Override transmission delay							
Silence fault alarm							
Disable single detector							
Disable alarm sounders							
Disable link to remote centre							
Disable control of other systems							
Disable input interface							
Test system							
Reset software failure counter							
Reset automatic reset warning							
Change configuration data							

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Auxiliary/Slave Control Panels (Continued)

Local Optional Indications	Required	Offered	Required	Offered	Required	Offered	
Reference	N/A						
Supply fail							
Battery low							
Charger fail							
Software failure							
Alarm record							
• for period							hr
Faults record							
• for period							hr
Printer							
• noise level (max)							dB(A)
Other (Specify)							

Remote Indicator (Repeater) Panels

Reference							
• Refer to drawings							
Location							
• Refer to drawings							
Finish							
• Refer to drawings							
Mounting							
• Refer to drawings							
Indications	**Required**	**Offered**	**Required**	**Offered**	**Required**	**Offered**	
Fire alarm							
Fire zone							
Fault							
Fault zone							
System on							
Detectors operated							
Detectors disabled							
Link disabled							
Output disabled							
Supply fail							
Battery low							
Charger fail							
Software failure							

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

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Computer Graphic Displays

Requirements: Device addresses to be derived by the Contractor

Smoke Detectors

	Required	Offered
Point-type - ionisation	Yes	
• manufacturer		
• model reference		
Point-type - photo-electric	Yes	
• manufacturer		
• model reference		
Beam type	Yes	
• power supply		
• manufacturer		
• model reference		
Aspirating type	Yes	
• power supply		
• manufacturer		
• model reference		
Duct detectors		
• air velocity range		
• duct dimensions		
• sensitivity		
• operating temperature range		
• manufacturer		
• model reference		

Heat detectors

	Required	Offered
Fixed temperature	Yes	
• operating temperature		
• manufacturer		
• model reference		
Rate of rise	Yes	
• response grade	1	
• manufacturer		
• model reference		
Rate of rise - high temperature	No	
• temperature range		
• manufacturer		
• model reference		
Linear	No	
• integrating/non-integrating		
• manufacturer		
• model reference		
High sensitivity detectors	No	
• sensitivity		
• manufacturer		
• model reference		

Manual Call Points

Surface mounting	Yes	
• IP rating	IP24	
• finish	Red plastic	
• manufacturer		
• model reference		

Flush mounting	Yes	
• IP rating	IP24	
• finish	Red plastic	
• manufacturer		
• model reference		

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Electrical Specification Data Sheet
W50 Fire Detection and Alarms

Job Title: MacDonald Buchanan House - Sports Institute — Date: 22-Oct-12

Job Number: 218598-01 — Purpose of Issue: Contract — Revision: C1

Alarms

	Required	Offered			Required	Offered	
Electronic sounders	Yes			**Bells**			
• frequency	To BS		Hz	• level			dB(A)
• level	To BS		dB(A)	• load			W/A
• load			W/A				
				Klaxons	None		
Audio-visual annunciators	Yes			• level			dB(A)
• visual - colour	White			• load			W/A
• visual - brightness			Cd	• power supply			V
• audible - level (Adjustable)			dB(A)				
• audible - frequency			Hz	**Beacons**	Yes		
• load			W/A	• colour	Red		
• power supply			V	• flash energy			joules
				• flash frequency	0.5 - 2		Hz
Voice sounder units							
• level			dB(A)	• load			W/A
• frequency response			Hz	• power supply			V

message 1 _____

message 2 _____

message 3 _____

Note: Sound levels are in dB(A) at 1 metre

Mounting Heights

Sounders/beacons	Min 2.1m		Call points	1.35m affl	

Other Operation Data

Staff alarm requirements _____

_____

Exceptional ambient conditions _____

Night setback requirement _____

Additional Requirements for Radio-Linked Systems

	Required	Offered		Required	Offered
Alarms at detectors			Alarms at call points		
• Type			• Type		

Additional power supply requirements _____

_____

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Information to be supplied

	Required	Received	Remarks
Record drawings	Yes		
Operating and maintenance instructions	Yes		
System log book	Yes		
Recommended spare parts to be held	Yes		
Testing & commissioning certification	Yes		
Detailed circuit diagrams for:			
• Field loop cabling	Yes		
• Control panel inputs	Yes		
• Control panel outputs	Yes		
•			

The Instructions shall include a full set of drawings, all manufacturers' handbooks for proprietary items and spare parts lists. Full details shall be provided of all manufacturers and suppliers.

Inspection, Testing and Commissioning, Certification

	Required	Offered	Areas
Wiring insulation tests	Yes		All areas
Device functional tests	Yes		All areas
Signals to and from ancillary equipment	Yes		All areas
Detector performance tests [1]	Yes		All areas
Sound level measurements [1]	No		All areas
Radio linked systems - signal strength [1]	No		

[1] Note: These measurements and performance tests are additional to the functional tests required by BS 5839 / BS EN 54

Staff Training Requirements

	Required	Offered
Date of start of training	Practical completion	

	Number	Level	Training to include
Number of staff to be trained	TBC by Client	Basic	Alarm reset, routine sounder tests
	TBC by Client	Medium	1/3/12 monthly checks as per BS 5839/BS EN 54
	TBC by Client	Advanced	Fault finding, modifications to system

- Operating and Maintenance Instructions and proposals for staff training shall be provided in accordance with the construction mangers programme.
- The instructions shall describe the system operation, zoning, routine care and maintenance, fault finding procedures and the function and settings of all controls.
- The system operation instructions shall cover the actions required in the event of fire alarms and fault alarms.

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Fixed Price Maintenance

Period	Required	Offered
• 1 year	Yes	
• 2 years	Yes	
• 3 years	Yes	
• 'x' years	Option	
•		

See separate maintenance data sheet

Spare Parts

Required		Supplied	
Description	Quantity	Description	Quantity
Optical detectors	TBC		
Beacons	TBC		
Breakglass call points	TBC		
Breakglass call point replacement glass	TBC		
Fuses	TBC		
Specialist tools	TBC		
Smoke test equipment	TBC		
Heat Detectors	TBC		
Detector bases	TBC		
Breakglass call point keys	TBC		
Beam detector plates	TBC		

Testing of Detectors

- Five percent of each type of detector in each detection zone shall be tested, subject to a minimum of two where there are less than 40. If any detector fails the test in the first sample, a second random sample of five percent shall be tested. If there is a failure in this second sample then all detectors shall be tested. Any detectors failing the test shall be replaced.
- Apparatus used for testing detectors shall be mounted on suitable poles so that the use of step-ladders is not necessary.
- Synthetic smoke for testing detectors shall comply with the COSHH Regulations and shall leave no residue which may affect the detector.

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Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including: Technical Preliminaries Drawings*

2 *Tenderers shall complete these Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

GENERAL

5 *Where expansion capacity is specified it shall be possible to expand and modify the system with the minimum of disturbance to the existing installation. Enclosures shall have sufficient space to accommodate the specified expansion capacity*

6 *Modular control panels shall utilise plug-in cards allowing future expansion and tailoring of detection zones and outputs*

7 *It shall be possible to set any zone to test mode for testing of detectors and call points without raising an alarm condition*

8 *Sounder and loudspeaker circuits shall have facility for testing by operation for a short period followed by a longer off period, typically one second on and 10 seconds off, repeated for as long as required.*

9 *In addition to sounders, visual alarms shall be provided in areas where ambient noise levels exceed 95dB(A).*

10 *Power supplies for associated and ancillary equipment shall be independent of the fire alarm system power supply. Means of isolation and disabling of automatic operation shall be provided.*

11 *In systems with distributed processing each outstation shall remain autonomous in operation in the event of interrupted communication between the outstation and the main fire alarm panel*

12 *In integrated systems fire alarm signals shall have priority over any other systems and shall not be delayed in operation by any manual or automatic event*

13 *The layout of control panels in integrated systems shall be arranged so that fire alarm controls cannot be confused with other controls*

14 *Faults in associated equipment shall not affect the performance of the fire alarm system.*

15 *Power failure alarms shall have a short time delay sufficient to allow for restoration or transfer to an alternative supply.*

16 *Detectors and alarms shall not be fixed to temporary or movable parts of the building fabric unless unavoidable*

WIRING

17 *Electrical power for operation of detectors and alarms shall be provided through the circuit wiring. Where the power for ancillary devices such as aspirating system air fans is taken from local mains connections the supply shall be monitored by the fire alarm system.*

18 *Where loop wiring systems are used each leg of the loop shall pass through a different fire zone as soon as practicable after leaving the fire alarm panel*

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INPUT AND OUTPUT MODULES

19 *Addressable input modules shall be used to interface signals from detectors or other devices with simple switch contacts. The circuit wiring to the device shall be monitored by the addressable input module*

20 *Addressable output modules shall be used to interface signals to devices by means of volt free changeover contacts. The contact rating shall be as in the schedules. Unless specified otherwise, on loss of power the volt free contacts shall fail to the 'safe' condition*

21 *Where the power consumption of an input or output module is such that power cannot be taken from the detector circuit, the module shall be provided with any necessary power supply, battery and charger. These shall be monitored and an alarm shall be generated in the event of failure.*

DETECTORS

22 *Point detectors shall be plug-in type. Detector bases shall be of a standard type, allowing any point type detector to be plugged into any base*

23 *Detectors shall be protected against damage by reversed polarity or faults on the wiring system*

24 *Detectors shall include built-in visible alarm indication and provision for the connection of remote visual indicators*

25 *Air-duct probe detectors shall use standard smoke detectors. The unit shall be designed so that all servicing can be carried out without affecting the duct system*

26 *Detector bases shall be suitable for mounting onto standard electrical back boxes or directly on ceilings and soffits.*

27 *Where detectors are mounted at heights exceeding 3m above finished floor level, suitable apparatus for the testing and removal/replacement of detector heads shall be provided.*

28 *Analogue type detectors shall provide compensation for soiling.*

29 *During construction works temporary covers shall be fitted to detectors to prevent ingress of dust and debris*

ASPIRATING TYPE DETECTORS

30 *Aspiration smoke detection systems shall be self contained and incorporate a power supply, battery and charger. These shall be monitored and generate a fault alarm on failure. A fault alarm shall be generated if the airflow falls below a predetermined minimum.*

31 *Each zone shall have separate sampling tubes. Multiple zones may be connected to a common sensing chamber via a manifold. The system shall be balanced to ensure that all zones are correctly monitored.*

32 *Where the sampling tubes and sampling unit are not installed in the same room, any differences in air pressures shall not be sufficient to prevent correct operation of the system. Where necessary, the discharge air from the sampling unit shall be returned to the protected space.*

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33 *Systems shall not cover more than one zone where differences in air pressure could affect correct operation*

MANUAL CALL POINTS

34 *Manual call points shall be suitable for flush mounting on standard switch boxes or surface mounting on purpose made boxes. Surface mounting boxes shall match the colour and appearance of the call point.*

35 *Where call points are installed before the system is commissioned a cover or label shall be provided to indicate that the call point is not available for use.*

36 *Manual call points installed in areas where fragments of broken glass could be a problem shall utilise frangible elements where the broken pieces are contained within the cover of the call point.*

37 *Where the design of the call point requires the use of a hammer or striker to break the frangible element, a suitable device shall be installed adjacent to the unit.*

BEAM DETECTORS

38 *Beam detectors shall minimise false alarms caused by momentary passing objects, sunlight and heat haze.*

Additional Project Requirements

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Electrical Specification Data Sheet
W53 Disabled Call System

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

General Data

Reference	Disabled call bell	Manufacturer	Schneider (Merlin gerin), Legrand, MK, or equivalent.
Location			
Associated Drawings			
Standards	BS8300:2009		

General	Required	Offered
Addressable System	Yes	
Network		
- Hard wired	Yes	
- Radio	No	
Network Topology	Standard	

Outside Room	Required	Offered
Indicator Light	Yes	
Buzzer	No	
Colour	Standard	
Finish	BSS	

Within Room		
Pull Cord	Yes	
Reset Button	Yes	
Reassurance Light	Yes	
Buzzer	Yes	
Power Supply Unit	Yes	
Colour	Standard	
Finish	BSS	

Main Control Panel		
Battery Backup	24	hrs
Indicators		
- Power	Yes	
- Alarm Activated	Yes	
- Charging	Yes	
- Battery Status	Yes	
- Alarm Location	Yes	
- Fault	Yes	
Buzzer	Yes	

BSS - Brushed stainless steel

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Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including:*
Technical Preliminaries
Drawings

2 *Tenderers shall complete these Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

Additional Project Requirements

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

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General Data

Design standards	
• Lightning protection	BS EN 62305
• Earthing	BS 7430
Manufacturing standard	BS EN 62305
Drawings	

Specialist Contractor: Furse, Omega red Group; Wallis or equivalent

Specialist Contractor to be responsible for	Checking system for BS EN 62305 compliance (with calculations)
Drawings required from Contractor	

Air Terminal Network

	Required	Offered
Conductor material	Copper	
Covering	Bare	
Conductor type	Flat tape	
Conductor size	25 x 3 mm	
Fixing type	Refer to typical detail sheets	
Connection and joint type	Proprietary clamps	
Vertical finials		
• Length		
• Multiple point		
• Type		
Special requirements		
• PVC type fixings NOT PERMITTED	Metallic	
• Glue/Adhesive patches NOT PERMITTED		

Down Conductors

	Required	Offered
Conductor material	Copper	
Covering	PVC - (colour to match building fabric)	
Conductor type	Flat tape	
Conductor size	25 x 3 mm	
Fixing type		
Connection and joint type	Proprietary clamps	
Test joint location	600mm above grade	
• Type		
Special requirements		
• Conductor below test joint	Bare copper	
•		

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Earth Electrodes

	Required	Offered
Electrode type	Circular rod	
Electrode material	Molecularly bonded copper clad steel	
Electrode dimensions	15mm diameter	
• Rod total length	2400mm	
Borehole backfill	Bentonite (If required)	
Earth rod pit - body	Concrete	
• Approx dimensions	320 x 320 mm	
Earth rod pit - lid	Concrete	
• Lid inscription	"Earth rod"	
Special requirements		
•		
•		

Connections to Metalwork

Air terminal to reinforcing steel	Refer to typical detail sheets	
Earth electrode to reinforcing steel	Refer to typical detail sheets	
Air terminal to parapet	Refer to typical detail sheets	
Down conductor to window frame	Refer to typical detail sheets	
Special requirements		
•		
•		

Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including:*
Technical Preliminaries
Drawings

2 *Tenderers shall complete these Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

5 *The entire lightning protection system, apart from natural building elements used as part of the system, shall be the product of one manufacturer*
All items shall be installed in accordance with the manufacturer's recommendations, including fixing to the fabric of the building

6 *Where building elements are to be used as part of the lightning protection system they shall be tested during construction to ensure that the resistance is low enough for the purpose. A formal record shall be kept of the resistance readings taken*

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7 *The weatherproofing of the building shall not be impaired in any way by fixings or by any part of the lightning protection system. Work on flat roofs shall be co-ordinated with the roofing contractor.*

8 *Ionisation, lightning attraction or dissipation terminals or other devices which purportedly allow a reduction in the number and/or sizes of air terminations and down conductors shall not be used*

9 *Co-axial down conductors shall not be used*

10 *Contact between dissimilar metals shall be avoided, except as permitted in BS EN 62305-3. Precautions shall be taken to prevent long-term corrosion. Bimetallic connectors shall be installed with corrosion inhibiting compounds in accordance with the manufacturer's recommendations*

11 *The surfaces of aluminium to aluminium joints shall be thoroughly cleaned and a suitable oxide inhibiting compound shall be applied*

12 *Where conductors cross building expansion joints, a flexible link in the form of a loop or a braided or stranded length of conductor shall be incorporated. The flexible link shall be firmly fixed on both sides of the expansion joint*

13 *Copper clad steel rods shall have rolled threads with the copper cladding maintained throughout. Couplings shall be of silicon aluminium bronze and shall be fully threaded to allow metal-to-metal contact of the rods. Couplings shall be counter-bored and of sufficient length to completely cover and protect the threaded portion of the rods to minimise corrosion.*

14 *Driving heads for the rods shall be high tensile steel and shall be fully threaded to ensure head-to-rod contact*

Additional Project Requirements

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Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Inspection and Test Certificate

I/We being the person(s) responsible for the Inspection and Test of the Lightning Protection System certify that the said work is to the best of my/our knowledge and belief in accordance with the Recommendations of BS EN 62305 except for departures, if any, stated in this Certificate.

Name (In Block Letters) _____

Position _____

For and on behalf of _____

Address _____

_____

_____

Telephone number _____ Fax number _____

Signature _____ Date _____

Test Conditions

Date _____ Soil type _____

Time _____ Condition _____

Weather _____ Reference earth details

Other details

(e.g. measures to reduce soil resistance) _____

Deviations from BS EN 62305

_____

_____

_____

Test Results

Individual readings

Electrode Reference	Resistance to Earth (Ohms)	Electrode Reference	Resistance to Earth (Ohms)	Electrode Reference	Resistance to Earth (Ohms)

Overall resistance to earth _____ Ohms

ARUP

Electrical Specification Data Sheet
W61 Transient Over Voltage Protection

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

General Data

Standards	BS EN 62305 BS EN 60099 IEEE C62 - Series	Manufacturer	Schneider (Merlin gerin), or equivalent & approved.

Schedule of Protection Devices

See page 2

Installation Requirements

1 *Devices shall provide protection between all conductors listed in the schedule. (Line(s)-neutral, line(s)-earth and neutral-earth.)*

2 *Devices shall be installed fully in accordance with the manufacturers requirements, particularly with respect to the need for additional overcurrent protection and cable connection criteria.*

3 *Devices installed externally to associated switchboards or distribution boards shall be installed within a suitable enclosure. Enclosures shall be openable only with a key or tool.*

4 *Isolators for protection devices shall be permanently labelled and marked 'Do not switch off'.*

5 *Steady-state earth leakage current information shall be confirmed by the equipment supplier. The electrical installer shall make due allowance for these currents when installing the devices in the electrical system.*

6 *Devices shall be equipped with indication to provide protection status.*

7 *Where specified as 'Visible status indication', the system status indication shall be visible without opening the switchboard or enclosure either via a clear polycarbonate window or by remote indication on the front face of the enclosure.*

8 *Where multiple devices are installed in a common enclosure the connections shall be configured to prevent inductive coupling between protected and unprotected cables.*

9 *Technical details relating to the performance of devices shall be provided by the manufacturer. All details shall be obtained by laboratory tests and not by theoretical calculation derived from the performance of one or more components.*

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Schedule of Protection Devices

Required

Switchboard reference	Way	Voltage	Wires	*Location category	*System exposure	Isolator	Mounting (Internal/ external)	Transient let-through (V Peak)	Remote monitoring	Visible status indication
Refer to dwgs.	4P	400/230	L L L N E	B	High	No	Int	600	No	Yes

Notes * In accordance with BS EN 62305, Part 4

Offered

Switchboard reference	Manufacturer	Model reference	Fuse rating (If req)	Earth leakage current mA	Comments
Refer to dwgs.					

ARUP

Electrical Specification Data Sheet
W61 Transient Over Voltage Protection

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including:*
Technical Preliminaries
Drawings

2 *Tenderers shall complete these Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

Additional Project Requirements

ARUP

Electrical Specification Data Sheet
Y60 Conduit and Trunking
Including Installation Requirements

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Schedule of Conduit Types

Area	Material	Gauge	Class of finish	Colour	Connection type	Adaptable boxes	Flexible conduit sheath
All	Galvanised Steel	Heavy	4	Standard		Galvanised	LSF

Schedule of Trunking Sizes

Area	Material	Overall depth	Compartment widths				Colour	IP rating	Protection class	Lid fixing
All	Galvanised Steel		See	Drgs			Standard		3	Yes

Note - This Data Sheet covers only general purpose trunking for distribution system wiring.

There is a separate Data Sheet for trunking incorporating accessories for final circuits etc.

Manufacturing standards

Rigid steel conduits and fittings	BS 4568 and BS EN 50086 (or BS EN 61386)
Flexible steel conduit	BS EN 50086-2-3 (or BS EN 61386)
• Adapters	BS EN 50086 (or BS EN 61386)
Non-metallic conduits and fittings	BS EN 50086-2.1 (or BS EN 61386) or BS 4607 as appropriate
Accessory boxes for flush mounting	Steel to BS 4662 (Unless specifically indicated otherwise)
Conduit boxes for suspension of luminaires	Metal to BS 4568 or BS EN 50086 (or BS EN 61386)
Steel trunking	BS 4678 : Pt 1
Non-metallic trunking	BS 4678 : Pt 4

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

Conduit - General Requirements

	The installation shall comply with the following requirements:
Conduit installation	Concealed in internal areas with plastered or similar finishes
Direction of run on walls	Vertically or horizontally - diagonal runs not permitted
Direction of run on ceiling or roof structures	Parallel with or perpendicular to the structural elements of the building.
Installation in suspended ceilings	Separate from ceiling supports
Minimum conduit diameter	20mm
Bends and sets	Formed from straight lengths
• Manufactured bends etc	Only where essential
Inspection fittings	Not permitted
Building movement joints	Expansion couplings shall be installed.
Draw-in boxes on straight runs	Every 9m, not to contain joints
Drain points	Standard BS boxes containing no live terminations

Note - unless shown otherwise on drawings or schedules

Steel Conduit - Additional Requirements

Bonding across expansion couplings	Earth continuity links of 4.0mm² green/yellow insulated copper wire
Connections to distribution boards, trunking, etc	Conduit coupling and hexagon male smooth bore brass bush
Alternative for connections to trunking	Terminal or through way box on trunking - connection by brass bush
Three piece conduit unions	Where required
Running couplers and backnuts	Only if essential
Nippling	Not permitted
Surface mounting	Spacer bar saddles
• Rough surfaces	Distance saddles
Spacing of supports	As Guidance Notes to BS 7671
• Adjacent to bends and accessories	Maximum 150mm
Repair of damaged surfaces	Zinc rich epoxy primer - applied in accordance with manufacturer's instructions
Clip-in conduit accessories	Suitable for use with light or heavy gauge conduit.
• Method of attachment	Spouts and couplers fitted with spring steel claw to bite into the conduit Withdrawal of conduit only by twisting in anti-clockwise direction

Non-Metallic Conduit - Additional Requirements

Gauge for exposed surface installation	Heavy gauge
Gauge for casting in-situ	Heavy gauge
Gauge for concealed installation	Light or heavy as in schedule
Bending method	Internal spring - sizes up to 25mm may be cold set
Jointing method	Solvent adhesive - in accordance with the manufacturer's instructions
Surface mounting	Spacer bar saddles
Spacing of supports	Maximum 500mm
• Adjacent to bends and accessories	Maximum 150mm
Boxes	Web moulded spouts, brass inserts

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

Installation of Cast-in and Buried Conduits

	The installation shall comply with the following requirements:
System configuration	Loop-in
Cover in concrete	Minimum 25mm
Cover in plaster	Minimum 5mm
Steel conduit buried in building fabric	Two coats bitumastic paint shall be applied to exposed threads, vice marks, etc
Boxes not installed flush with surface	Extension rings of same section shall be fitted
Testing - steel conduit systems	Electrical continuity and resistance shall be tested prior to pouring concrete

Trunking - General Requirements

Segregation in multi-compartment trunking	Maintained throughout including all accessories
Trunking installation	Lid on top wherever possible
Direction of run on walls	Vertically or horizontally
Direction of run on ceiling or roof structures	Parallel with or perpendicular to the structural elements of the building.
Installation in suspended ceilings	Separate from ceiling supports (Unless specifically indicated otherwise)
Bends, tees, connections etc	Manufacturer's standard fittings only
• Site manufactured bends etc	Not permitted
Spacing of supports	Maximum 2m
• Adjacent to bends and accessories	Maximum 150mm
Cable supports on vertical runs	Maximum 3m spacing
Cable retaining straps	Maximum 1m spacing
Building movement joints	Expansion couplings shall be installed.
Long continuos runs	Expansion joints in accordance with manufacturer's recommendations
Drain points	Not into enclosures containing live terminations

Steel Trunking - Additional Requirements

Protection class - external installation	Class 3
Protection class - internal installation	See schedule
Bonding across trunking joints	Tinned or plated copper links (min 12x1.5mm)
Bonding across expansion couplings	Braided copper tape links (min 15x2mm)
Fire barriers	Proprietary fire barriers - rating not less than that of original construction
Cable separators on horizontal runs	Insulated pins at maximum 2m intervals (Trunking > 100x50mm)
Repair of damaged surfaces	Zinc rich epoxy primer - in accordance with the manufacturer's instructions

Non-metallic Trunking - Additional Requirements

	The installation shall comply with the following requirements:
Material thickness	Minimum 1.5mm
Lid fixing	Clip on
Installation	Self-adhesive trunking to have additional mechanical fixings.

ARUP

Electrical Specification Data Sheet
Y60 Conduit and Trunking
Including Installation Requirements

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including:*
Technical Preliminaries
Drawings

2 *Tenderers shall complete these Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

5 *Conduits shall be installed in a neat and tidy manner, boxes and accessories shall be correctly aligned.*

6 *Conduits shall enter boxes at 90° to the face*

7 *Only galvanised accessories shall be used with galvanised conduit*

8 *Where conduits have to run in close proximity to metal pipes or other metal enclosed services, the metalwork of the services shall be bonded to the conduits with a bonding conductor*

9 *Non-metallic conduit, fittings and accessories shall be of the same manufacture and colour*

10 *Fittings or luminaires shall not be hung from non-metallic conduit boxes*

Additional Project Requirements

ARUP

Electrical Specification Data Sheet
Y60 Surface Trunking
Including Installation Requirements

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

General Data

Drawing ref(s)		Manufacturer	
Manufacturing standards	BS 4678 Pt4 (Plastic)		
(Where appropriate)	BS 4678 Pt1 (Steel)		

Schedule of Trunking Types and Sizes

Type of trunking	Area	Material	Colour or finish	Profile or drawing reference
Refer to low / high level containment drawings				

Type of trunking	Overall Depth	Overall Width	Compartments		Fixing method or other details
			Number	Width	
Refer to low / high level containment drawings					

Note - This Data Sheet covers trunking for final circuits, including types incorporating accessories.

There is a separate Data Sheet for general purpose trunking for use with conduit wiring systems.

Outlets and Accessories

	Required	Offered
Socket outlets - BS 1363	Yes	
Socket outlets - other	Yes	
Data outlets	Yes	
Telephone outlets	Yes	

ARUP

Electrical Specification Data Sheet
Y60 Surface Trunking
Including Installation Requirements

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including:*
Technical Preliminaries
Drawings

2 *Tenderers shall complete these Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

5 *All trunking components and accessories shall be from the same manufacturer*

6 *Multi-compartment trunking systems shall maintain segregation between compartments throughout the system. Isolator spacers or crossover bridges shall be installed at junctions and accessory adapters.*

7 *Trunking systems for site wiring shall accept standard wiring accessories*

8 *A full range of matching electrical accessories shall be available for plug-in busbar systems, including pre-wired accessory boxes to accept standard accessories*

9 *Connections between lengths of trunking, between trunking and accessories and between different styles of trunking, for example between architrave and skirting runs, shall be made using purpose made components supplied by the trunking manufacturer. Site fabricated joints and connections shall not be used.*

10 *Socket outlets not mounted directly in trunking shall be installed above the trunking using the manufacturer's standard adapters*

11 *Wall and ceiling mounted systems shall incorporate sufficient wire restrainers to ensure that wiring stays in place when the lids are removed*

Additional Project Requirements

ARUP

Electrical Specification Data Sheet
Y63 Cable Tray and Ladder
Including Installation Requirements

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Schedule of Tray and Ladder Types

Area	Type	Material	Finish	Colour	Connection type	Covers (Type)	Spare capacity
All	Ladder	Galvanised Steel	Standard	Standard		N/A	20% Min
All	Tray	Galvanised Steel	Standard	Standard		N/A	20% Min
Refer to low / high level containment drawings							

Schedule of Loadings

Type of tray / ladder	Nominal size	Load kg/metre
Contractor to confirm		

Type of tray / ladder	Nominal size	Load kg/metre
Contractor to confirm		

- Loadings are given for uniformly distributed loads for the weight of the cables only
- Trays, ladders and supports shall additionally allow for fixings, covers and the spare capacity given above
- **Load calculations and details of proposed support systems shall be submitted for approval before any orders are placed or manufacturing work put in hand**

Tray and Ladder - General Requirements

	The installation shall comply with the following requirements:
Manufacturing standard	BS EN 61537
• Support system components	BS 6946
Range of accessories	Purpose made by tray or ladder manufacturer.
Joining of tray or ladder and accessories	In accordance with the recommendations of the manufacturer
• Nuts, bolts, washers and other fastenings	Of compatible materials
• Bolt type	Domed or mushroom heads - installed with nuts facing away from cables
• Cutting	Along a line of plain material - not through perforations
• Holes in trays	Bushed with suitable grommets
• Midspan joint location	One-quarter of span distance away from support position
Additional supports	Within 150mm of all accessories, expansion joints and changes of direction

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Tray and Ladder - General Requirements (continued)

	The installation shall comply with the following requirements:
Bonding across expansion joint gaps	Earth strap - 4mm² minimum
Clearance behind installed runs	Minimum 25mm
Covers	Same material and manufacture as tray or ladder
• Joints	Need not coincide with joints in tray or ladder
Load calculations and proposed support systems	To be submitted for approval before installation commences

Steel Tray and Ladder - Additional Requirements

Maximum deflection between supports	1/360 of span length.
Galvanising standard	Hot-dip galvanised to BS EN ISO 1461 after manufacture.
Repair of damaged galvanised surfaces	Zinc rich epoxy primer - applied in accordance with manufacturer's instructions
Systems with non-conducting finish	Earth continuity straps shall be fitted at all joints

Non-Metallic Tray and Ladder - Additional Requirements

Maximum deflection between supports	1/300 of span length.

Wire Basket Tray - Additional Requirements

Maximum deflection between supports	1/300 of span length.
Tray sides - width to 300mm	40mm (Minimum)
Tray sides - width > 300mm	60mm (Minimum)
Wires - normal tray	Steel rod not less than 3.5mm diameter
Wires - tray deeper than 55mm	Steel rod not less than 5mm diameter
Cable / conduit take-off points	Purpose made units supplied as part of basket tray system
Cutting	Adjacent to a rod so that the rod forms the end of the installed section
Systems with non-conducting finish	Earth continuity straps shall be fitted at all joints

Hangers and Supports

Support system	Constructed from proprietary framing system components
• Material	Same material as the tray or ladder (Unless specifically indicated otherwise)
Minimum factor of safety	4
Drop rods	Minimum 6mm diameter
Lateral supports - systems using drop rods	Bends, intersections and at intervals not exceeding 15 metres on straight runs
Galvanising standard	Hot-dip galvanised to BS EN ISO 1461 after manufacture.
Repair of damaged galvanised surfaces	Zinc rich epoxy primer
Plastic end caps	On exposed support channel ends in accessible positions

Rag bolts or similar fixings requiring grouting	Not permitted
Drilling or welding of structural steelwork	Not permitted

ARUP

Electrical Specification Data Sheet
Y63 Cable Tray and Ladder
Including Installation Requirements

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

Transits and Fire Stopping

	The installation shall comply with the following requirements:
Installation of proprietary cable transits	Strictly in accordance with manufacturer's recommended procedures
Cables passing through walls etc	Sleeves shall be installed to facilitate installation and withdrawal of cables
Internal diameter of sleeves	12mm to 25mm larger than cable diameter
Sleeves through floors and fire-rated walls	Steel
Sleeves through non fire-rated walls, etc	Heavy-gauge PVC
Projection of sleeves	
• Cables passing through floors	50mm
• Cables passing through external walls	50mm
• Other transits	5mm
Sealing of cables into sleeves	
• Through fire rated structures	To achieve fire rating not less than that of original construction
• Through external walls	Additional sealing with flexible rubber boot or shroud over sleeve projection

Additional Requirements

1 *These Data Sheets shall be read in conjunction with all relevant sections of the Specification including: Technical Preliminaries Drawings*

2 *Tenderers shall complete these Data Sheets, including blank 'data cells', to confirm details of the equipment being 'offered' with the Tender.*

3 *Equipment offered for any alternative Manufacturers shall be equivalent to that offered by the Preferred Manufacturer. Any deviation shall be identified by the Tenderer*

4 *All special tools required for the operation, maintenance and repair of the equipment shall be identified and included in the Tender.*

5 *Where trays or ladders cross open spaces or in other locations where no structure is available on which to fix cable supports, suitable fabricated steel auxiliary supporting structures shall be provided.*

6 *Where tray and ladder systems are supported by drop rods additional restraints shall be included to provide adequate lateral support. Restraints shall be installed at all bends and intersections and at intervals not exceeding 15 metres on straight runs. Support rods shall be at least 6mm diameter. Trapeze or other hangers shall be clamped on the drop rods between two nuts.*

Additional Project Requirements

ARUP

Electrical Specification Data Sheet
Y65 Accessories for Electrical Services
Accessories and Mounting Heights

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

General Requirements

Details of accessories are given on the following page.

Where no specific requirements are indicated the following shall apply:

Flush mounted accessories shall be of white moulded plastic, surface mounted accessories in plantrooms (etc) shall be metalclad

Plate switches for lighting circuits shall be rated at 10A for fluorescent loads

Socket-outlets shall be to BS 1363, 13A with switch

RCDs shall have 30mA trip current

RCDs shall not trip on loss of supply

Accessories of each style shall be from the same manufacturer's range to provide a consistent appearance and finish and shall be installed in accordance with the manufacturer's recommendations.

Manufacturing Standards

13A socket-outlets	BS 1363	Switches rated up to 63A.	BS 3676 or BS EN 60669-1
Socket-outlets incorporating RCDs.	BS 7288		
Fused connection units	BS 1363	Switches rated more than 63A	BS EN 60947-3
Shaver supply units	(BS 3535-1) & BS EN 61558	Electronic dimmers for tungsten lamps	BS 5518 or BS EN 60669-2
Shaver socket-outlets	BS 4573	Ceiling roses (Fixed type)	BS 67
Cooker control units	BS 4177	Luminaire support couplers	BS 6972
• Flex connection unit	BS 5733		
Round pin socket-outlets, 2A, 5A, 15A	BS 546	Bayonet lampholders	BS EN 61184
Industrial sockets & connectors	BS EN 60309	Edison screw lampholders	BS EN 60238
		Plastic junction boxes.	BS 6220
		Accessories not covered by other specific standard	BS 5733

Mounting heights

Socket outlets		Other	
• General areas			
• Plant rooms			
• Above work surfaces			
Switches			
• General areas	1050		

Note: All dimensions in mm

Other Requirements

- Accessory plates shall be secured to boxes with not less than two screws
- BS 546 socket outlets shall have shutters
-
- Electronic switches shall comply with BS EN 55014 for interference suppression
- BS 4573 shaver socket-outlets shall not be installed in bathrooms

Preferred Manufacturer		Manufacturer Offered	
Manufacturer	Legrand, MK, Jung, Gira or equivalent.	Manufacturer	
		Range(s)	

Job Title: MacDonald Buchanan House - Sports Institute Date: 22-Oct-12

Job Number: 218598-01 Purpose of Issue: Contract Revision: C1

Accessories - Specific Requirements

Accessory Type	Multigang switch Switchpanel	Switch/Scene Plates Switchpanel	Multigang Socket Socket Outlets	Multigang Socket Socket Outlets	Fused Connection Units
Location	Plantrooms/Stores	All areas	Plantrooms	All areas	All areas
Finish	KNX metalclad	KNX compliant BSS	MK Metalclad Plus	MK Edge	MK Edge
Mounting	Surface/recessed	Recessed	Surface/recessed	Recessed	Recessed
Rating	ELV	ELV	13A	13A	13A
Gang	As specified	As specified	2	2	2
Poles	Single	Single	Double pole	Double pole	Double pole
Fused	N/A	N/A			
Fuse rating					To suit load
RCD rating (mA)			30mA	30mA	
Neon indicator	No	No	No	No	No
WP IP Rated	Yes	No	Yes / As specified	Yes / As specified	
High integrity earth	N/A	N/A	Yes	No	
Clean earth	N/A	N/A	Yes / As specified	No	
Notes / Labels *BSS - Brushed stainless steel*					

Preferred manufacturer					
• Range					

Offered

Manufacturer					
Range					
Model reference					

ARUP

Electrical Specification Data Sheet
Y65 Accessories for Electrical Services
Accessories and Mounting Heights

Job Title:	MacDonald Buchanan House - Sports Institute			Date:	22-Oct-12
Job Number:	218598-01	Purpose of Issue:	Contract	Revision:	C1

Additional Requirements

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Technical Preliminaries
Drawings

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Additional Project Requirements

Appendix B

Luminaire Schedule

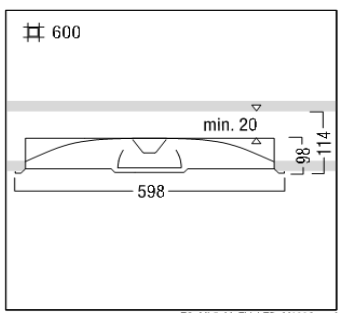
ARUP

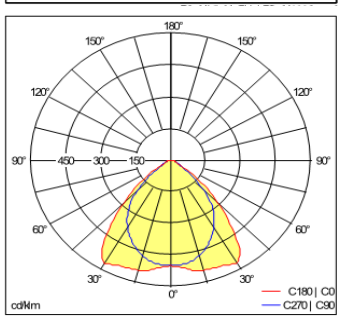
Equipment Data Sheet
V59 Lighting Schedule

Job Title:	ISEH			Date:	22/10/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	C1
				Luminaire Reference:	A1

TYPE A1

General Appearance





Luminaire

Manufacturer	Zuntobel
Manufacturing standard	BS EN 60598
Product Name	MELLOW LIGHT V LED
Article No	42180974
EMC	BS EN 55015

Light Source

Type	LED
Wattage	52W
Designation	
Colour / Beam	4000k

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Integral

Accessories

Lens	
Baffle	
Other	

Location

General areas

Equipment supplied to be as specified or equal approved

Additional Information

1.
2.
3.
4.
5.

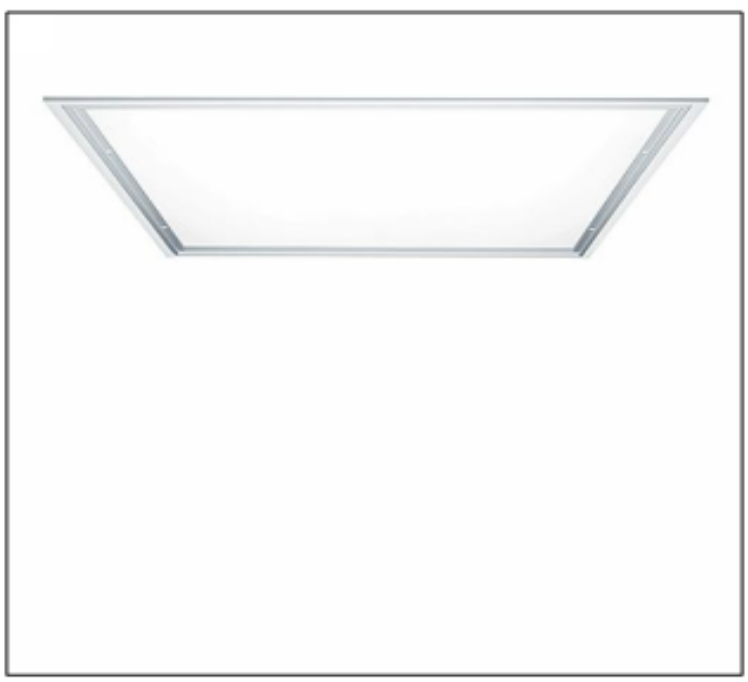
ARUP

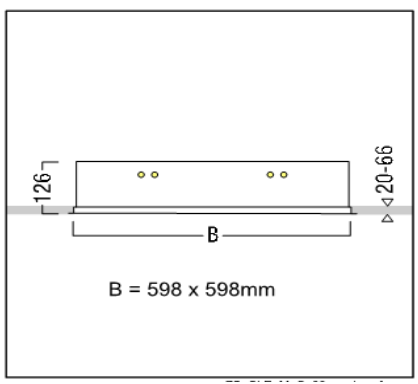
Equipment Data Sheet
V59 Lighting Schedule

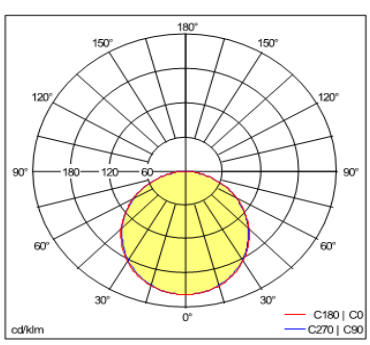
Job Title:	ISEH			Date:	22/10/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	C1
				Luminaire Reference:	A2

TYPE A2

General Appearance







Luminaire

Manufacturer	Zuntobel
Manufacturing standard	BS EN 60598
Product Name	Clasic Clean M600
Article No	
EMC	BS EN 55015

Light Source

Type	LED
Wattage	52W
Designation	
Colour / Beam	4000k

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Integral

Accessories

Lens	Opal Diffuser
Baffle	
Other	IP5X Dustproof Diffuser

Location Clinical Spaces

Equipment supplied to be as specified or equal approved

Additional Information

1.
2.
3.
4.
5.

ARUP

Equipment Data Sheet
V59 Lighting Schedule

Job Title:	ISEH			Date:	22/10/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	C1
				Luminaire Reference:	B1 & B1E

TYPE B1 & B1E

General Appearance

Luminaire

Manufacturer	Zuntobel
Manufacturing standard	BS EN 60598
Product Name	Slotlight II Chanel
Article No	Varies
EMC	BS EN 55015

Light Source

Type	LED
Wattage	Varies subject to length
Designation	
Colour / Beam	4000k

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Integral

Accessories

Lens	
Baffle	
Other	

Location Corridors

Equipment supplied to be as specified or equal approved

Additional Information

1. The Contractor shall liaise with Zumtobel lighting to provide a continuous row of the Slotlight II product along both sides of the corridor areas as detailed on the layout drawings. The contractor, in conjunction with Zumtobel, shall provide all fixings, brackets, Led light strips, corner luminaires and ancillary products to complete this installation.
2. The contractor shall also integrate 600mm length of LED (reference B2) into the channel which shall be linked to the emergency lighting central battery system.

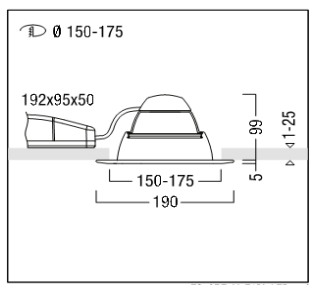
ARUP

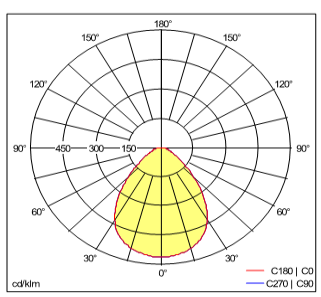
Equipment Data Sheet
V59 Lighting Schedule

Job Title:	ISEH			Date:	22/10/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	C1
				Luminaire Reference:	C1

TYPE C1

General Appearance





Luminaire

Manufacturer	Zumtobel
Manufacturing standard	BS EN 60598
Product Name	CREDOS E
Article No	60813649
EMC	BS EN 55015

Light Source

Type	LED
Wattage	14W
Designation	
Colour / Beam	4000k

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Remote

Accessories

Lens	
Baffle	
Other	IP44

Location Showers

Equipment supplied to be as specified or equal approved

Additional Information

1.
2.
3.
4.
5.

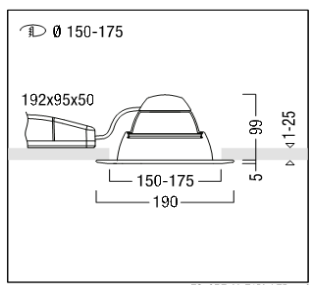
ARUP

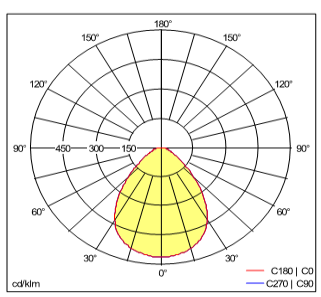
Equipment Data Sheet
V59 Lighting Schedule

Job Title:	ISEH			Date:	22/10/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	C1
				Luminaire Reference:	C2

TYPE C2

General Appearance





Luminaire

Manufacturer	Zumtobel
Manufacturing standard	BS EN 60598
Product Name	CREDOS E
Article No	60813715
EMC	BS EN 55015

Light Source

Type	LED
Wattage	26W
Designation	
Colour / Beam	4000k

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Remote

Accessories

Lens	
Baffle	
Other	IP44

Location Showers

Equipment supplied to be as specified or equal approved

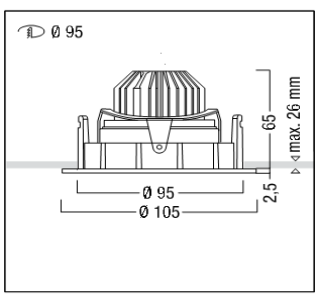
Additional Information

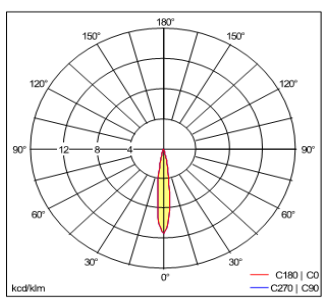
1.
2.
3.
4.
5.

Job Title:	ISEH			Date:	22/10/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	C1
				Luminaire Reference:	C3

TYPE C3

General Appearance





Luminaire

Manufacturer	Zumtobel
Manufacturing standard	BS EN 60598
Product Name	MICROS
Article No	60812832
EMC	BS EN 55015

Light Source

Type	LED
Wattage	6/1,2W
Designation	
Colour / Beam	4000k

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Remote

Accessories

Lens	
Baffle	
Other	IP2X

Location Lobbies

Equipment supplied to be as specified or equal approved

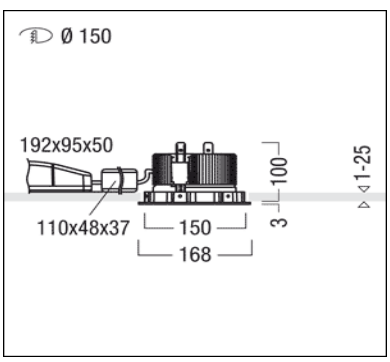
Additional Information

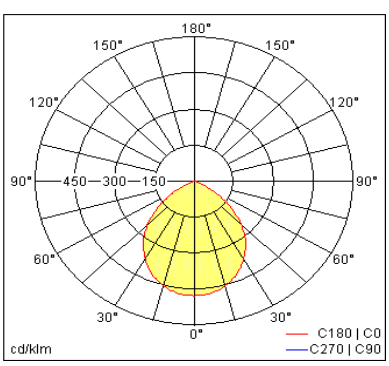
1.
2.
3.
4.
5.

Job Title:	ISEH			Date:	22/10/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	C1
				Luminaire Reference:	C4

TYPE C4

General Appearance





Luminaire

Manufacturer	Zumtobel
Manufacturing standard	BS EN 60598
Product Name	Panos Infinity E150 LL
Article No	60812688
EMC	BS EN 55015

Light Source

Type	LED
Wattage	23W
Designation	
Colour / Beam	4000k

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Remote

Accessories

Lens	
Baffle	
Other	White Trim

Location Reception

Equipment supplied to be as specified or equal approved

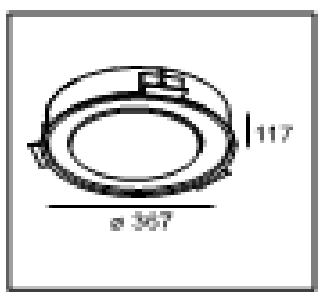
Additional Information

1.
2.
3.
4.
5.

Job Title:	ISEH			Date:	22/10/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	C1
				Luminaire Reference:	D1

TYPE D1

General Appearance



Luminaire

Manufacturer	Zumtobel
Manufacturing standard	BS EN 60598
Product Name	Downut
Article No	11036209
EMC	BS EN 55015

Light Source

Type	T16
Wattage	55W
Designation	
Colour / Beam	4000k

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Remote

Accessories

Lens	
Baffle	
Other	With white flange

Location Lift Lobbies

Equipment supplied to be as specified or equal approved

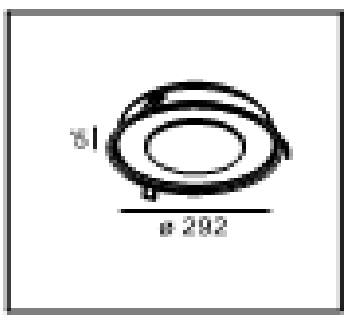
Additional Information

1.
2.
3.
4.
5.

Job Title:	ISEH			Date:	22/10/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	C1
				Luminaire Reference:	D2

TYPE D2

General Appearance



Luminaire

Manufacturer	Zumtobel
Manufacturing standard	BS EN 60598
Product Name	Downut
Article No	11036709
EMC	BS EN 55015

Light Source

Type	T16
Wattage	22W
Designation	
Colour / Beam	4000k

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Remote

Accessories

Lens	
Baffle	
Other	With white flange

Location Lift Lobbies

Equipment supplied to be as specified or equal approved

Additional Information

1.
2.
3.
4.
5.

ARUP

Equipment Data Sheet
V59 Lighting Schedule

Job Title:	ISEH			Date:	22/10/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	C1
				Luminaire Reference:	D3

TYPE D3

General Appearance

Luminaire

Manufacturer	Benjamin herbert
Manufacturing standard	BS EN 60598
Product Name	Frame
Article No	
EMC	

Light Source

Type	Metal halide
Wattage	35W
Designation	
Colour / Beam	4000k

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Remote

Accessories

Lens	
Baffle	
Other	Powder coated matt white

Location Reception

Equipment supplied to be as specified or equal approved

Additional Information

1.
2.
3.
4.
5.

ARUP

Equipment Data Sheet
V59 Lighting Schedule

Job Title:	ISEH			Date:	22/10/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	C1
				Luminaire Reference:	D4

TYPE D4

General Appearance

Luminaire

Manufacturer	Baker Group
Manufacturing standard	BS EN 60598
Product Name	Pixel
Article No	
EMC	

Light Source

Type	Compact flourescent
Wattage	3x12W
Designation	
Colour / Beam	4000k

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Integral

Accessories

Lens	Gloss White
Baffle	
Other	

Location Reception

Equipment supplied to be as specified or equal approved

Additional Information

1.
2.
3.
4.
5.

Job Title:	ISEH			Date:	22/10/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	C1
				Luminaire Reference:	D5

TYPE D5

General Appearance

Luminaire

Manufacturer	Norman Foster
Manufacturing standard	BS EN 60598
Product Name	Gherkin 60
Article No	
EMC	

Light Source

Type	
Wattage	120W
Designation	
Colour / Beam	4000k

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Integral

Accessories

Lens	White
Baffle	
Other	

Location Reception

Equipment supplied to be as specified or equal approved

Additional Information

1.
2.
3.
4.
5.

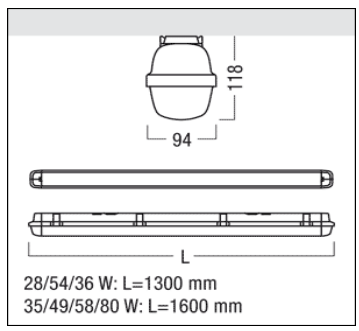
ARUP

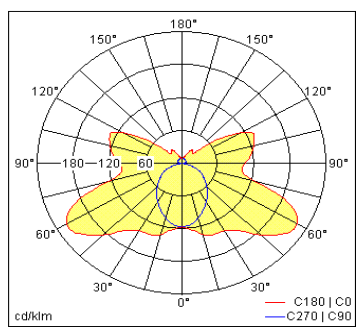
Equipment Data Sheet
V59 Lighting Schedule

Job Title:	ISEH			Date:	22/10/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	C1
				Luminaire Reference:	F1

TYPE F1

General Appearance





Luminaire

Manufacturer	Zumtobel
Manufacturing standard	BS EN 60598
Product Name	CHARIO II - 1x35
Article No	42923390
EMC	BS EN 55015

Light Source

Type	1 x T16
Wattage	35W
Designation	
Colour / Beam	4000K

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Integral

Accessories

Lens	
Baffle	
Other	IP 5X High Impact Diffuser

Location Hub Rooms

Equipment supplied to be as specified or equal approved

Additional Information

1.
2.
3.
4.
5.

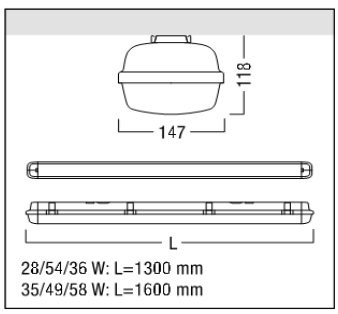
ARUP

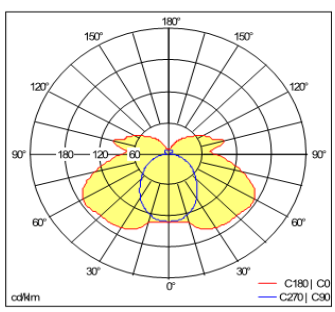
Equipment Data Sheet
V59 Lighting Schedule

Job Title:	ISEH			Date:	23/08/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	1
				Luminaire Reference:	F2

TYPE F2

General Appearance





Luminaire

Manufacturer	Zumtobel
Manufacturing standard	BS EN 60598
Product Name	CHARIO II - 2x35
Article No	42923062
EMC	BS EN 55015

Light Source

Type	1 x T16
Wattage	2x35W
Designation	
Colour / Beam	4000K

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Integral

Accessories

Lens	
Baffle	
Other	IP 5X High Impact Diffuser

Location

Hub Rooms

Equipment supplied to be as specified or equal approved

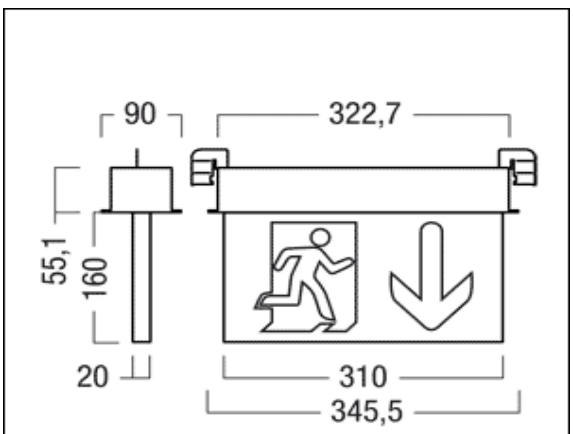
Additional Information

1.
2.
3.
4.
5.

Job Title:	ISEH			Date:	23/08/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	1
				Luminaire Reference:	EXIT

TYPE EXIT

General Appearance



Luminaire

Manufacturer	Zuntobel
Manufacturing standard	BS EN 60598
Product Name	Onlite Aetsign
Finish	Recessed control gear
EMC	BS EN 55015

Light Source

Type	LED
Wattage	4.5W
Designation	
Colour / Beam	

Control Gear / Transformer

Type	Electronic Addressable
Dimmable	NA
Location (Remote/Integral	Integral

Accessories

Lens	
Baffle	
Other	

Location Escape Routes

Equipment supplied to be as specified or equal approved

Additional Information

1. Maintained emergency exit luminaires.
2. Emergency luminaires to be fed from Onlite low power system, central battery system with central test and monitoring facility and monitoring facility
3.
4.

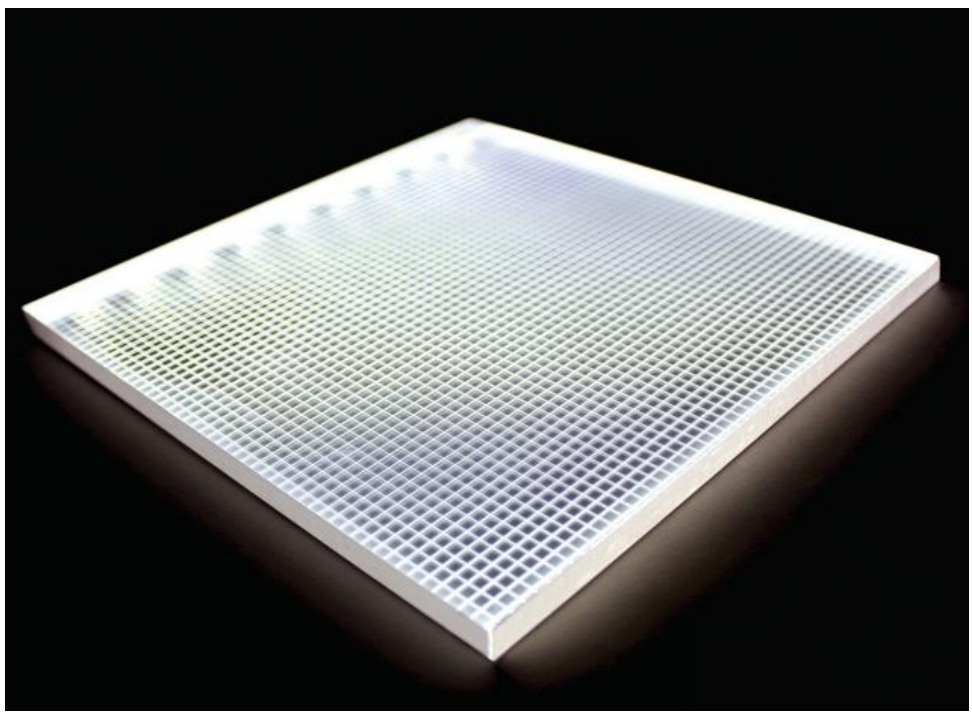
ARUP

Equipment Data Sheet
V59 Lighting Schedule

Job Title:	ISEH			Date:	23/08/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	1
				Luminaire Reference:	G1 & G2

TYPE G1 & G2

General Appearance



Luminaire

Manufacturer	Applelec
Manufacturing standard	
Product Name	LED light sheet
Article No	
EMC	

Light Source

Type	
Wattage	0.25W
Designation	
Colour / Beam	3700k

Control Gear / Transformer

Type	Dali
Dimmable	Yes
Location (Remote/Integral	Remote

Accessories

Lens	
Baffle	
Other	IP54

Location Reception

Equipment supplied to be as specified or equal approved

Additional Information

1. 300x300mm in size will be positioned behine the architects designed signage.
2.
3.
4.
5.

ARUP

Equipment Data Sheet
V59 Lighting Schedule

Job Title:	ISEH			Date:	23/08/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	1
				Luminaire Reference:	H

TYPE H - (NOTE PRODUCT TBC BY CLIENT)

General Appearance

Luminaire

Manufacturer	Coolview
Manufacturing standard	BS EN 60598
Product Name	C50GXC Exam Light - Ceiling Mount
Finish	
EMC	BS EN 55015

Light Source

Type	Tungston Hallogen
Wattage	50W
Designation	
Colour / Beam	

Control Gear / Transformer

Type	E
Dimmable	Yes (with lical light switch)
Location (Remote/Integral	

Accessories

Lens	
Baffle	
Other	

Location

Equipment supplied to be as specified or equal approved

Additional Information

1. Local light switch as part of fitting
2.
3.
4.
5.

ARUP

Equipment Data Sheet
V59 Lighting Schedule

Job Title:	ISEH			Date:	22/10/2012
Job Number:	218598	Purpose of Issue:	Contract	Revision:	C1
				Luminaire Reference:	I

TYPE I

General Appearance

Luminaire

Manufacturer	Elekoled
Manufacturing standard	BS EN 60598
Product Name	ElectorFlex
Article No	42923390
EMC	BS EN 55015

Light Source

Type	LED
Wattage	4.9W/m
Designation	
Colour / Beam	Cool White

Control Gear / Transformer

Type	24V DC Driver
Dimmable	No
Location (Remote/Integral	Remote

Accessories

Lens	
Baffle	
Other	

Location

Pelmate details

Equipment supplied to be as specified or equal approved

Additional Information

1. Equal and approved alternatives for the proposed fitting may put forward by the contractor for consideration
2. **Tridonic DALI Adressable relays shall be installed where required to link the fitting to the controls network.**
3.
4.
5.

Appendix C

Distribution Board Schedule

Level 1 Small Power

DISTRIBUTION BOARD REFERENCE: DB/01/SP							Revision: C1				
INCOMING DEVICE TYPE: Switch Disconnector							FED FROM: DB1				
INCOMING DEVICE RATING (A): 125A							DIST BOARD LOCATION: Riser Cupboard				
NUMBER OF WAYS: 24							OUTGOING DEVICE TYPES: MCBs & MCB/RCDs				
WAY	DEVICE TYPE	DEVICE RATING (A) (AMPS)	CABLE TYPE	CABLE SIZE (mm²)	CPC SIZE (mm²)	CIRCUIT TYPE	CONNECTED LOAD (A)			DESCRIPTION	COMMENTS
							L1	L2	L3		
1L1	Type B MCB	40	XLPE/SWA/LSF	10	Arm + 4mm	Radial				SP&N Busbar Track Office 1,2 and 3	
1L2	Type B MCB	40	XLPE/SWA/LSF	10	Arm + 4mm	Radial				SP&N Busbar Track Human Physiology	
1L3	Type B MCB	40	XLPE/SWA/LSF	10	Arm + 4mm	Radial				SP&N Busbar Track Open Plan Office	
2L1	Type B MCB	40	XLPE/SWA/LSF	10	Arm + 4mm	Radial				SP&N Busbar Track Office 4 and 5	
2L2	Type B MCB	20	LSF Singles	4	4	Radial				Fused connection units for VRF units Human Physiology	
2L3	Type B MCB	40	XLPE/SWA/LSF	10	Arm + 4mm	Radial				SP&N Busbar Track Open Plan Office	
3L1	Type B 30mA RCBO	16	LSF Singles	4	4	Radial				Shaver Socket	
3L2	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Cleaners Socket Human Physiology & Biochem Lab	
3L3	Type B MCB	40	XLPE/SWA/LSF	10	Arm + 4mm	Radial				SP&N Busbar Track Seminar Rooms	
4L1	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Existing Trace heating WCs	
4L2	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets Biochem Lab	
4L3	Type B 30mA RCBO	20	XLPE/SWA/LSF	4	4	Radial				Cleaners Sockets Open Plan Office	
5L1	Type B MCB	32	LSF Singles	4	4	Radial				Existing DWC Shower TP&N	
5L2											
5L3											
6L1	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Cleaners Socket Outlets Offices 1 to 5 / Plant/ Hubroom	
6L2	Type B MCB	16	LSF Singles	4	4	Radial				Existing WC electric heaters	
6L3	Type B MCB	16	LSF Singles	4	4	Radial				Existing Water Heater	
7L1	Type B MCB	20	LSF Singles	4	4	Radial				Fused connection units for VRF units Offices 1-5	
7L2	Type B MCB	20	LSF Singles	4	4	Radial				Socket Outlets Biochem Lab Refridgerators	Outlets to be labelled Refrigerator
7L3	Type B MCB	20	LSF Singles	4	4	Radial				Fused connection units for VRFs in Open Plan Office	
8L1	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Wall mounted Sockets Offices 1,2,3,4,5	
8L2	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Cleaners Sockets - Store and Goods Reception and meeting	
8L3	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets Seminar 1	
9L1	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Maintenance sockets Plant room	
9L2	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets Human Physiology	
9L3	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets Seminar 2	
10L1	Type C MCB	20	LSF Singles	4	4	Radial				Hand Dryers Male change	
10L2	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets Human Physiology	
10L3	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets Staff Kitchen	
11L1	Type B MCB	20	LSF Singles	4	4	Radial				Hand Dryers Female change	
11L2	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets - Store and Goods Reception and meeting	
11L3	Type B MCB	20	LSF Singles	4	4	Radial				Fused connection units for VRF units - Seminar rooms	
12L1	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Cleaners Sockets - Changing rooms and store	
12L2	Type B MCB	20	LSF Singles	4	4	Radial				SP&N Busbar Track MDT Meeting / Office 6	
12L3	Type B MCB	16	LSF Singles	4	4	Radial				Door Hold Open Devices	

Level 1 Small Power

DISTRIBUTION BOARD REFERENCE: DB/01/SP							Revision: C1				
INCOMING DEVICE TYPE: Switch Disconnector							FED FROM: DB1				
INCOMING DEVICE RATING (A): 125A							DIST BOARD LOCATION: Riser Cupboard				
NUMBER OF WAYS: 24							OUTGOING DEVICE TYPES: MCBs & MCB/RCDs				
WAY	DEVICE TYPE	DEVICE RATING (A) (AMPS)	CABLE TYPE	CABLE SIZE (mm²)	CPC SIZE (mm²)	CIRCUIT TYPE	CONNECTED LOAD (A)			DESCRIPTION	COMMENTS
							L1	L2	L3		
13L1	Type B MCB	20	LSF Singles	4	4	Radial				Fused connection units for VRF units changing rooms	
13L2	Type B MCB	20	LSF Singles	4	4	Radial				Fused connection units for VRF units - meeting/Store/Office 6	
13L3	Type B MCB	20	LSF Singles	4	4	Radial				Staff Kitchen - Fridge Circuit	Outlets to be labelled Refrigerator
14L1	Spare	20									
14L2	Type B MCB	16	LSF Singles	4	4	Radial				FCU for Induction Loop MDT Meeting	
14L3	Type B MCB	16	LSF Singles	4	4	Radial				FCU for Induction Loops - Seminar Rooms	
15L1	Spare	20									
15L2	Spare	20									
15L3	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Cleaners Sockets Corridor	
16L1	Spare	20									
16L2	Spare	20									
16L3	Type B MCB	16	LSF Singles	4	4	Radial				Dish washer Circuit - Staff Kitchen	
17L1	Spare	20									
17L2	Spare	20									
17L3	Spare	20									
18L1	Spare	20									
18L2	Spare	20									
18L3	Spare	20									
19L1											
19L2											
19L3											
20L1											
20L2											
20L3											
21L1											
21L2											
21L3											
22L1											
22L2											
22L3											
23L1											
23L2											
23L3											
24L1											
24L2											
24L3											

Level 2 - Small Power

DISTRIBUTION BOARD REFERENCE: DB/02/SP							Revision: C1				
INCOMING DEVICE TYPE: Switch Disconnector							FED FROM: DB2				
INCOMING DEVICE RATING (A): 125A							DIST BOARD LOCATION: Riser Cupboard				
NUMBER OF WAYS: 18							OUTGOING DEVICE TYPES: MCBs & MCB/RCDs				
WAY	DEVICE TYPE	DEVICE RATING (A) (AMPS)	CABLE TYPE	CABLE SIZE (mm²)	CPC SIZE (mm²)	CIRCUIT TYPE	CONNECTED LOAD (A)			DESCRIPTION	COMMENTS
							L1	L2	L3		
1L1	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets - Gym	
1L2	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets - Exam 2&3	
1L3						Radial				Reserved for MRI small power circuits	Circuits installed by specialist
2L1	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Floor Boxes - Gym	
2L2	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Cleaners Sockets - Exam 2&3	
2L3						Radial				Reserved for MRI small power circuits	Circuits installed by specialist
3L1	Type B MCB	16	LSF Singles	4	4	Radial				Refridgerator Circuit Gym	Outlets to be labelled Refrigerator
3L2	Type B MCB	20	LSF Singles	4	4	Radial				FCUs for VRF units - Exam2/Exam3/Reception	
3L3						Radial				Reserved for MRI small power circuits	Circuits installed by specialist
4L1	Type B MCB	20	LSF Singles	4	4	Radial				FCUs for VRF units - Gym/Ultrasound	
4L2	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket outlets - Exam 7 & 8	
4L3						Radial				Reserved for MRI control room VRF units	Circuits installed by specialist
5L1	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets - Image Reporting Room/ Clean Utility	
5L2	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets - Reception Desk	
5L3	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				FCUs for VRF units - Store/Hub Rooms	
6L1	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets - Ultrasound/Dirty Utility	
6L2	Type B MCB	16	LSF Singles	4	4	Radial				Existing WC electric heaters	
6L3	Type B MCB	16	LSF Singles	4	4	Radial				Existing Water Heater	
7L1	Type B MCB	20	LSF Singles	4	4	Radial				FCUs for VRF units - Clean utility/ Treatment/Exam 1	
7L2	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets - Reception Office	
7L3	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Reserved for X-Ray Room small power circuits	Circuits installed by specialist
8L1	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Cleaners Sockets	
8L2	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets Exam 4	
8L3	Type B MCB	16	LSF Singles	4	4	Radial				Hand dryer	
9L1	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outets - Treatment Room and Exam room 1	
9L2	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets Exam 5 & 6	
9L3										Reserved for X-Ray Room small power circuits	Circuits installed by specialist
10L1	Type B MCB	16	LSF Singles	4	4	Radial				Door hold open devices	
10L2	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Cleaners Sockets	
10L3										Reserved for X-Ray Room small power circuits	Circuits installed by specialist
11L1	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Cleaners Sockets Corridor	
11L2	Type B MCB	20	LSF Singles	4	4	Radial				FCUs for VRF units - Exam4/5/6/7/8	
11L3										Reserved for X-Ray room VRF units	Circuits installed by specialist
12L1	Type B MCB	32	LSF Singles	4	4	Radial				Existing Shower	
12L2											
12L3											

Level 2 - Small Power

DISTRIBUTION BOARD REFERENCE: DB/02/SP							**Revision: C1**				
INCOMING DEVICE TYPE: Switch Disconnector							**FED FROM: DB2**				
INCOMING DEVICE RATING (A): 125A							**DIST BOARD LOCATION: Riser Cupboard**				
NUMBER OF WAYS: 18							**OUTGOING DEVICE TYPES: MCBs & MCB/RCDs**				
WAY	**DEVICE TYPE**	**DEVICE RATING (A) (AMPS)**	**CABLE TYPE**	**CABLE SIZE (mm²)**	**CPC SIZE (mm²)**	**CIRCUIT TYPE**	**CONNECTED LOAD (A)**			**DESCRIPTION**	**COMMENTS**
							L1	**L2**	**L3**		
13L1	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets - Ultrasound	
13L2	Spare	20									
13L3	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets Hub Room	
14L1	Spare	20									
14L2	Type B MCB	16	LSF Singles	4	4	Radial				Fused Connection for nurse call system panel	
14L3	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Socket Outlets - Storeage	
15L1	Spare	20									
15L2	Spare	20									
15L3	Type B 30mA RCBO	20	LSF Singles	4	4	Radial				Cleaners Sockets	
16L1	Spare	20									
16L2	Spare	20									
16L3	Spare	20									
17L1	Spare	20									
17L2	Spare	20									
17L3	Spare	20									
18L1											
18L2											
18L3											

ICT Distribution Board

DISTRIBUTION BOARD REFERENCE: DB/02/ICT							Revision: C1				
INCOMING DEVICE TYPE: Switch Disconnector							FED FROM: UPS				
INCOMING DEVICE RATING (A): 125A							DIST BOARD LOCATION: Hub Room 2nd floor				
NUMBER OF WAYS: 8							OUTGOING DEVICE TYPES: MCBs & MCB/RCDs				
WAY	DEVICE TYPE	DEVICE RATING (A) (AMPS)	CABLE TYPE	CABLE SIZE (mm²)	CPC SIZE (mm²)	CIRCUIT TYPE	CONNECTED LOAD (A)			DESCRIPTION	COMMENTS
							L1	L2	L3		
1L1	Type B MCB	16	LSF Singles	4	4	Radial				16Amp BS 60309-2 Outlet for ICT rack	
1L2											
1L3	Type B MCB	16	LSF Singles	4	4	Radial				16Amp BS 60309-2 Outlet for ICT rack	
2L1	Type B MCB	16	LSF Singles	4	4	Radial				16Amp BS 60309-2 Outlet for ICT rack	
2L2											
2L3	Type B MCB	16	LSF Singles	4	4	Radial				16Amp BS 60309-2 Outlet for ICT rack	
3L1	Type B MCB	16	LSF Singles	4	4	Radial				16Amp BS 60309-2 Outlet for ICT rack	
3L2											
3L3	Type B MCB	16	LSF Singles	4	4	Radial				16Amp BS 60309-2 Outlet for ICT rack	
4L1	Type B MCB	16	LSF Singles	4	4	Radial				16Amp BS 60309-2 Outlet for ICT rack	
4L2											
4L3	Type B MCB	16	LSF Singles	4	4	Radial				16Amp BS 60309-2 Outlet for ICT rack	
5L1											
5L2											
5L3											
6L1											
6L2											
6L3											
7L1											
7L2											
7L3											
8L1											
8L2											
8L3											

Level 1 - Lighting

DISTRIBUTION BOARD REFERENCE: DB/01/LTG	**Revision: C1**
INCOMING DEVICE TYPE: Switch Disconnector	**FED FROM: DB1**
INCOMING DEVICE RATING (A): 125A	**DIST BOARD LOCATION: Riser Cupboard**
NUMBER OF WAYS: 12	**OUTGOING DEVICE TYPES: MCBs & MCB/RCDs**

WAY	DEVICE TYPE	DEVICE RATING (A) (AMPS)	CABLE TYPE	CABLE SIZE (mm²)	CPC SIZE (mm²)	CIRCUIT TYPE	CONNECTED LOAD (A)			DESCRIPTION	COMMENTS
							L1	L2	L3		
1L1	Type C MCB	16	LSF Singels	4	4	Radial				TP&N Lighting Track	
1L2											
1L3											
2L1	Type C MCB	16	LSF Singels	4	4	Radial				TP&N Lighting Track	
2L2											
2L3											
3L1	Type C MCB	16	LSF Singels	4	4	Radial				TP&N Lighting Track	
3L2											
3L3											
4L1	Type C MCB	16	LSF Singels	4	4	Radial				TP&N Lighting Track	
4L2											
4L3											
5L1	Type C MCB	16	LSF Singels	4	4	Radial				TP&N Lighting Track	
5L2											
5L3											
6L1											
6L2											
6L3											
7L1											
7L2											
7L3											
8L1											
8L2											
8L3											
9L1											
9L2											
9L3											
10L1											
10L2											
10L3											
11L1											
11L2											
11L3											
12L1											

Note: MCB/RCD devices are to take one single phase outgoing way on a distribution board

Level 2 - Lighting

DISTRIBUTION BOARD REFERENCE: DB/02/L	**Revision: C1**
INCOMING DEVICE TYPE: Switch Disconnector	**FED FROM: DB1**
INCOMING DEVICE RATING (A): 125A	**DIST BOARD LOCATION: Riser Cupboard**
NUMBER OF WAYS: 12	**OUTGOING DEVICE TYPES: MCBs & MCB/RCDs**

WAY	DEVICE TYPE	DEVICE RATING (A) (AMPS)	CABLE TYPE	CABLE SIZE (mm²)	CPC SIZE (mm²)	CIRCUIT TYPE	CONNECTED LOAD (A)			DESCRIPTION	COMMENTS
							L1	L2	L3		
1L1	Type C MCB	16	LSF Singels	4	4	Radial				TP&N Lighting Track	
1L2											
1L3											
2L1	Type C MCB	16	LSF Singels	4	4	Radial				TP&N Lighting Track	
2L2											
2L3											
3L1	Type C MCB	16	LSF Singels	4	4	Radial				TP&N Lighting Track	
3L2											
3L3											
4L1	Type C MCB	16	LSF Singels	4	4	Radial				TP&N Lighting Track	
4L2											
4L3											
5L1	Type C MCB	16	LSF Singels	4	4	Radial				TP&N Lighting Track	
5L2											
5L3											
6L1											
6L2											
6L3											
7L1											
7L2											
7L3											
8L1											
8L2											
8L3											
9L1											
9L2											
9L3											
10L1											
10L2											
10L3											
11L1											
11L2											
11L3											
12L1											

Note: MCB/RCD devices are to take one single phase outgoing way on a distribution board

Emergency Lighting DB

DISTRIBUTION BOARD REFERENCE: DB/02/L	**Revision: C1**
INCOMING DEVICE TYPE: Switch Disconnector	**FED FROM: DB1**
INCOMING DEVICE RATING (A): 125A	**DIST BOARD LOCATION: Riser Cupboard**
NUMBER OF WAYS: 8	**OUTGOING DEVICE TYPES: MCBs & MCB/RCDs**

WAY	DEVICE TYPE	DEVICE RATING (A) (AMPS)	CABLE TYPE	CABLE SIZE (mm²)	CPC SIZE (mm²)	CIRCUIT TYPE	CONNECTED LOAD (A)			DESCRIPTION	COMMENTS
							L1	L2	L3		
1L1	Type C MCB	10	2Core + Earth FP 200	2.5		Radial				Level 1 Emergency Lighting Circuit 1	
1L2	Type C MCB	10	2Core + Earth FP 200	2.5		Radial				Level 1 Emergency Lighting Circuit 2	
1L3	Type C MCB	10	2Core + Earth FP 200	2.5		Radial				Level 1 Emergency Lighting Circuit 3	
2L1	Type C MCB	10	2Core + Earth FP 200	2.5		Radial				Level 1 Emergency Lighting Circuit 4	
2L2	Type C MCB	10	2Core + Earth FP 200	2.5		Radial				Level 1 Emergency Lighting Circuit 5	
2L3	Type C MCB	10	2Core + Earth FP 200	2.5		Radial				Level 1 Emergency Lighting Circuit 6	
3L1	Type C MCB	10	2Core + Earth FP 200	2.5		Radial				Level 2 Emergency Lighting Circuit 1	
3L2	Type C MCB	10	2Core + Earth FP 200	2.5		Radial				Level 2 Emergency Lighting Circuit 2	
3L3	Type C MCB	10	2Core + Earth FP 200	2.5		Radial				Level 2 Emergency Lighting Circuit 3	
4L1											
4L2											
4L3	Type C MCB	10	2Core + Earth FP 200	2.5		Radial				Level 2 Emergency Lighting Circuit 4	
5L1											
5L2											
5L3										Reserved for X-Ray/MRI room emergency lighting	
6L1											
6L2											
6L3										Reserved for X-Ray/MRI room emergency lighting	
7L1											
7L2											
7L3											
8L1											
8L2											
8L3											

Note: MCB/RCD devices are to take one single phase outgoing way on a distribution board