FOWLER MARTIN

CHARTERED BUILDING SERVICES ENGINEERS

ELECTRICAL SERVICES SPECIFICATION AND TENDER SUMMARY

UNIVERSITY COLLEGE LONDON
JOHN ADAMS HALL
FLOORS 1 TO 4, PART GROUND FLOOR AND BASEMENT KITCHEN REFURBISHMENT
SUMMER WORKS 2017

REF: SA-1629-ES-SPEC (VERSION 1.0)

10 MARCH 2017

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BAFE Modular Scheme SP203 - Part 1
Modular Scheme SP203 - Part 4

THE BRITISH ASSESSMENT BUREAU ISO9001

THE BRITISH ASSESSMENT BUREAU ISO14001

DOCUMENT RECORD

UNIVERSITY COLLEGE LONDON
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SPECIFICATION AND TENDER SUMMARY
ELECTRICAL SERVICES

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FORMAT OF THE SPECIFICATION

SCOPE OF WORKS

CONTENTS

ABBREVIATIONS

SITE SPECIFIC WORKS INFORMATION

This part of the Specification details the Form of Contract and any other alterations required to the Contract together with additional general conditions that must be observed.

THE WORKS

This part of the Specification describes the extent of the works and general requirements applicable to all trades.

REFERENCE CLAUSES

This part of the Specification comprises detailed clauses that are to be cross referenced with ‘The Works’ clauses.

APPENDICES

SCOPE OF THE WORKS

The University College London, John Adams Hall is a 6 level building consisting of student accommodation, common and plant spaces.

This specification describes the materials, standards of workmanship and extent of the electrical engineering services associated with the part refurbishment of the Basement, Ground, First, Second, Third and Fourth Floors during the summer of 2017.

The works to be undertaken shall comprise:

- Strip out of all redundant systems.
- Temporarily modify fire alarm installation to remove items stopping works proceeding and temporary installation of heat detectors by programming.
- Modification of existing mains distribution. 2 No. distribution boards to be relocated.
- Fire alarm systems modifications to Kitchen and Staff Rest Room.
- New lighting and emergency lighting to bedrooms, Corridors, Staircases and Ensuites.
- New small power to Kitchens.
- Modification of conduits within rear garden to allow new wall opening.

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ABBREVIATIONS:

A	Ampere
AAV	Automatic air vent
ABS	Acrylonitrile budadiene styrene
AC	Alternating current
ad hoc	for this special purpose, improvised
ad lib	impromptu
ad libitum	impromptu
ac	air changes
ACE	Association of Consulting Engineers
ACOP	Approved Code of Practice
AS	Access door
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ATD	Air terminal device
ASD	Atmospheric sensing device
AV	Air vent
AVCD	Automatic volume control damper
BE	Black enamel
BEAMA	British Electrical and Allied Manufacturers' Association
BEMS	Building Energy Management System
BESA	British Electrical Systems Association
BHWS	Blended hot water service
Bone fide	in good faith, genuine
BSRIA	Building Services Research and Information Association
BPV	Ball plug valve
BRE	Building Research Establishment
BRECSU	Building Research Establishment Conservation Support Unit
BS	British Standard
BSC	Biological safety cabinet
BSI	British Standards Institution
BSCP	British Standard Code of Practice
BSPT	British Standard Pipe Thread
BSRIA	The Building Services Research and Information Association
BZP	Bright zinc plated
CA	Contract Administrator
CD	Compact Disc
CFC	Chlorofluorocarbon
CI	Cast iron
CIBSE	Chartered Institution of Building Services Engineers
CIC	Construction Industry Council
CF	Cold feed
CFR	Constant flow regulator
CORGI	Council for Registered Gas Installers
COSHH	Control of Substances Hazardous to Health
CPC	Circuit protective conductor
CS	Commissioning set
CT	Constant temperature
CVS	Commissioning valve set

CWS	Cold water service (Cistern fed)
DC	Direct current
DCV	Double check valve
DIN	Deutsches Institut fut Normung
DN	Diamètre nominal (nominal bore)
DOE	Department of the Environment
DRV	Double regulating valve
DV	Drain valve (includes draw-off cocks and drain taps)
DZR	Dezincification resistant
EC(UK)	Engineering Council (UK)
ELCB	Earth leakage circuit breaker
EPBD	Energy Performance and Buildings Directive
EPSCR	Engineering, Physics and Science Research Council
ESI	Electricity Supply Industry
ESTA	Energy Systems Trade Association
ETB	Engineering and Technology Board
F	Flow
F&E	Feed and expansion
FA	From above
FB	From below
FC	Fume cupboard
FD	Fire damper
FEANI	FédérationEuropéend'AssociationsNationales d'Ingénieurs (European Federation of National Engineering Associations)
FFL	Finished floor level
FMD	Flow measurement device
FMV	Flow measurement valve
FOC	Fire Offices' Committee
FODRV	Fixed orifice double regulating valve
GC	Gauge cock
GPFC	General purpose fume cupboard
GRP	Glass reinforced polyester
GSS	Galvanised sheet steel
HCFC	Hydrochlorofluorocarbon
HDPE	High density polyethylene
HL	High level
HOFR	Heat resisting, oil resisting and flame retardant
HPHW	High pressure hot water
HRC	High rupture capacity
HSE	Health and Safety Executive
HTG	Heating
HU	Hose union
HV	High Voltage
HVAC	Heating Ventilating and Air Conditioning
HVCA	Heating and Ventilating Contractors Association
HWS	Hot water service
Hz	Hertz
IBV	Isolating ball valve

IEE	Institution of Electrical Engineers
IET	Institution of Engineering and Technology
ICEL	Industry Committee for Emergency Lighting
I Mech E	Institution of Mechanical Engineers
IR	Insulation resistance
IV	Isolating valve
J	Joule
JCT	Joint Contracts Tribunal
k	kilo
LFCDA	London Fire and Civil Defence Authority
LIF	Lighting Industry Federation
LL	Low level
LPHW	Low pressure hot water
LPV	Lubricated plug valve
LSF	Low smoke and fume
LSV	Lock shield valve
LV	Low Voltage
m	metre(s)
MCB	Miniature circuit breaker
MCCB	Moulded case circuit breaker
MEL	Maximum exposure limit
MICC	Mineral insulated copper covered
mm	millimetre(s)
MPHW	Medium pressure hot water
MSC	Microbiological safety cabinet
MTel	Mobile telephone number
MuPVC	Modified unplasticised polyvinylchloride
MWS	Mains water service
N	Newton
NB	Nota bene (note well)
nb	nominal bore
NICEIC	National Inspection Council for Electrical Installation Contracting
NRV	Non-return valve
od	outside diameter
ODD	Oxygen depletion device
OES	Occupational exposure standard
ODPM	Office of the Deputy Prime Minister (UK Government)
OV	Open vent
P	Primary
Pa	Pascal
PB	Polybutylene
PCB	Polychlorinated biphenyl
PCB	Printed circuit board
PE	Polyethylene
PE-X	Cross linked polyethylene
ph	phase
PHE	Plate heat exchanger
PP	Polypropylene
ppm	parts per million
PSA	Property Services Agency

PTFE	Polytetrafluoroethylene
PVC	Polyvinylchloride
PVC-C	Chlorinated polyvinylchloride
PVC-U	Polyvinylchloride (unplasticised)
PVDF	Polyvinylidenefluoride
PWC	Physical water conditioner
R	Return
RAEng	Royal Academy of Engineering
RAFC	Radio active fume cupboard
RCBO	Residual current breaker with over-load protection
RCCB	Residual current circuit breaker
RCD	Residual current device
REHVA	Federation of European Heating and Air Conditioning Associations
RIBA	Royal Institute of British Architects
RICS	Royal Institution of Chartered Surveyors
RSJ	Rolled steel joist
RV	Regulating valve
SAP	Standard Assessment Procedure
SC	Stop cock
SEC	Secondary
SBEM	Simplified Building Energy Model
SO	Socket outlet
SO	Supervising Officer
SV	Safety valve
TA	To above
TB	To below
Tel	Telephone number
TP	Test point
UPS	Uninterruptible power supply
uPVC	unplasticised polyvinylchloride
UCL	University College London
UV	Ultra violet
V	Volt
VAV	Variable air volume
VCD	Volume control damper
VIR	Vulcanized India rubber
VODRV	Variable orifice double regulating valve
VRF	Variable refrigerant flow
VRI	Vulcanized rubber insulated
VRV	Variable refrigerant volume
W	Watt
WHV	Wheel head valve
WRAS	Water Regulations Advisory Scheme
WRC	Water Research Company
XLPE	Cross linked polyethylene

A10 PROJECT PARTICULARS

110.000 THE PROJECT

Particulars of the project as a whole are:

University College London
Residents Summer 2017 Works

John Adams Hall - Building Services Modifications and Additions

120.000 THE EMPLOYER – (CLIENT)

University College London
Engineering, Maintenance & Infrastructure
UCL Estates
Bidborough House
20 Mabledon Place
London WC1H 9BF

125.000 THE CHIEF ENGINEER

The Deputy Head of EM&I
University College London
Engineering, Maintenance & Infrastructure
UCL Estates
Bidborough House
20 Mabledon Place
London WC1H 9BF

130.000 PRINCIPAL CONTRACTOR (CDM)

To Be Confirmed

140.000 EMPLOYER'S REPRESENTATIVE

Faithful & Gould
31st Floor
Euston Tower
286 Euston Road
London NW1 3AT

150.000 PRINCIPAL DESIGNER

Faithful & Gould
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Euston Tower
286 Euston Road
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200.000 CONSULTANTS

MECHANICAL AND ELECTRICAL CONSULTANT

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Ingatestone
Essex
CM4 0GB

Tel: 01277 350 802

A11 TENDER AND CONTRACT DOCUMENTS

110.000 THE TENDER DRAWINGS

The tender drawings are listed in Appendix A.

120.000 THE CONTRACT DRAWINGS

The contract drawings are the tender drawings.

140.000 THE PRE-CONSTRUCTION INFORMATION

The ‘Pre-Construction Information’ is a separate document included in the tender package if the project is subject to the requirements of the Construction (Design and Management Regulations).

150.000 INSPECTION

Drawings and other documents relating to the Contract generally may be inspected, by appointment, prior to the submission of tender.

A12 THE SITE/ EXISTING BUILDINGS

110.000 THE SITE/EXISTING BUILDINGS

Drawings showing the site/existing buildings are listed in Appendix A.

130.000 EXISTING MAINS AND SERVICES

The existing services have been identified by visual inspection only and the precise routes/locations of some services cannot be established at this stage.

The Sub-Contractor is to inspect the existing services installation prior to tender and to establish any further information needed to programme and accurately price the works.

The Sub-Contractor's attention is drawn to the drawings showing known existing services and drainage within the site. No claims for want of knowledge of the location/depth of services shall be awarded.

The Sub-Contractor shall establish all necessary levels for the setting out of the works and the location of all services passing through the site, whether necessary for the Contract works or not.

The Sub-Contractor shall protect and maintain all pipes, ducts, sewers, service mains cables and the like until the completion of the works. If they are damaged due to any cause within the Sub-Contractor's control he shall arrange for their prompt reinstatement to the satisfaction of the authorities concerned and pay any costs or charges in connection therewith.

The Sub-Contractor shall not interfere with the operation of existing services.

140.000 HEALTH AND SAFETY FILE

The Health and Safety File for the site/ building may be seen by appointment during normal office hours at the office of Estates, UCL, by arrangement with the Employer.

160.000 ACCESS TO THE SITE

Access to the area of work will only be granted by prior arrangement with UCL Estates/Main Contractor.

The Sub-Contractor will not be given possession of any passenger lifts serving the building(s).

The Sub-Contractor will be given possession of the relevant plant rooms in the building under the UCL 'Permit to Work' procedure in order to carry out mechanical

and electrical work. Access is to be maintained and allowed at all times for UCL maintenance staff to those plant rooms.

Access for operatives will be available during normal working hours Monday to Friday (except Public Holidays) and at other times by special permission from the ER at least 72 hours in advance of commencement of works.

All rubbish debris and bulk materials to be bagged at its point of origin before being moved through the building.

161.000 PARKING

Restrictions on parking of the Sub-Contractors' and employees' vehicles:

The 'site' lies within the Congestion Charging Zone and the Sub-Contractor is deemed to have included all such costs from complying with the congestion charge with its tender.

Parking of the Sub-Contractor's vehicles will not be permitted other than for delivery and/or collection of materials.

Adequate arrangements for reception of materials and equipment shall be made with suppliers to ensure rapid unloading and to minimise time spent on UCL premises.

162.000 USE OF THE SITE

General: Do not use the site for any purpose other than carrying out the works.

The Sub-Contractor is to note that existing buildings will be occupied by staff and students at all times.

Entrances and exits are to be kept clear and unobstructed at all times.

163.000 SITE RESTRICTIONS

The playing of portable radios will not be permitted under any circumstances on UCL premises. The Sub-Contractor should make full provision for working safely within an occupied building.

The Sub-Contractor must also allow UCL Student Accommodation to carry out their summer business activities throughout the contract period in a safe and un-impeded manner.

All areas (other than specific work areas) will be fully occupied for the full duration of the works. Works hours are to be between 8.30am and 5.00pm with no noisy work prior to 10.00am and after 4.00pm Monday to Friday.

All staircases, corridors and entrances must be kept free of all plant, materials and rubbish during UCL hours.

The Sub-Contractor shall provide all his staff and visitors entering UCL property with means of identification to be produced when requested to do so by any member of UCL staff.

164.000 SURROUNDING LAND/ BUILDING USES

General: Adjacent or nearby uses or activities are as follows:

Restricted Areas: Where it is essential to work outside of his designated site area, it will be necessary for the Sub-Contractor to obtain a 'Permit to Enter/Work'.

This will include the following areas:
a) all plant rooms
b) all switch rooms
c) all lift motor rooms
d) all water tank rooms
e) all telephone exchange/Comms rooms

165.000 PERMIT TO WORK SYSTEMS

UCL operates a number of Permit to Work systems. The Sub-Contractor will require a permit to work for the following:

a) permit to work/enter a restricted area
b) entry into confined spaces
c) hot work - use of heat or flame producing equipment (welding/burning)
d) permit to work on specific system

Permit to Work procedures are attached at Appendix B. The Sub-Contractor shall allow in his tender for all costs associated with complying with these requirements.

The Sub-Contractor shall allow for co-ordinating all permits for sub Sub-Contractors and be responsible for signing for access keys. Access keys and permits shall be returned to issuing officer at expiry of the permit. Failure to return a key may result in the Sub-Contractor being charged £100 for its replacement.

170.000 SITE VISIT

Before tendering, ascertain the nature of the site, access thereto and all local conditions and restrictions likely to affect the execution of the contract Works. The Sub-Contractor may make site visits by prior arrangement with University College London, Estates.

A13 DESCRIPTION OF THE WORK

130.000 PREPARATORY WORK BY OTHERS

Prior to the Contract commencing the Employer will remove all items of loose equipment from the area. Fixtures and fittings will not be removed by the Employer.

140.000 THE WORKS

The works shall generally be as described under 'The Scope of Works' at the front of this Specification

240.000 ELECTRICAL SUPPLY

The definition of voltage levels used in this document are as follows:

High Voltage – Voltages exceeding low voltage, as defined in The Electricity Supply Regulations 1988.

Low Voltage – Voltages exceeding extra low voltage but not exceeding 1000V ac or 1500V dc between conductors, or 600V ac or 900V dc between conductors and earth, as defined in BS 7671.

Extra Low Voltage – Voltages not exceeding 50V ac or 120V ripple free dc whether between conductors or to earth, as defined in BS 7671.

Where systems are specified as being maintained "under fire conditions" ensure wiring selected is suitable for the temperatures to be encountered.

Any electrical equipment supplied shall comply with the requirements of the Local Electricity Supplier and the limits for harmonics shall not exceed the limits stated in Engineering Recommendation G 5/4.

250.000 PLANT OPERATING CONDITIONS

Ensure all plant items are suitable for operation in the environment in which they are to be located.

Ensure all plant, motors, starters and ancillary equipment etc. are suitable for operation at full capacity under the following conditions

- Height above sea level not exceeding 1000m.
- Air cooling at an average temperature over 24 hours not exceeding 35^{o}C dry bulb.

- Maximum conditions of 40^{o}C dry bulb and 50 per cent relative humidity.
- Supply voltage approximately sinusoidal

Protect equipment to BS EN 60529:1992+A2:2013.

260.000 ROOM TERMINAL LOCATIONS

The positions of all connection points, accessories, apparatus, equipment and other room terminals shown on the tender drawings are approximate and for guidance in the preparation of the tender.

Agree, with ER, which terminals are subject to final positioning onsite.

Allow for the movement of all such terminals up to a radius of 2.0m from the positions shown on the drawings.

Mounting heights indicated in tender documents are for tender purposes only. Confirm mounting heights with the ER before commencing work on site.

270.000 ELECTROMAGNETIC COMPATIBILITY

Ensure all equipment and systems are installed to provide electromagnetic compatibility within the system and with any other systems installed in the same area.
Ensure all systems and buildings are assessed for protection to, and that such protection meets the requirements of BS EN 62305-1:2006, BS EN 62305-4:2006, BS EN 62305-2:2006, BS EN 62305-3:2006. Ensure all equipment meets the requirements of the appropriate electromagnetic compatibility standard.

Standard
Particular Scientific and Medical
- BS EN 61000-6-4
- BS EN 55011

Fluorescent lamps and Luminaires
- BS EN 55015:2013+A1:2015

Information and technology equipment
- BS EN 55032:2012

Broadcast receivers and associated equipment
- BS EN 55013 and BS EN 55020

Industrial process measurement and control
- BS EN 60801-2

Other equipment to generic standards
Emissions
Domestic, commercial and light industrial

- BS EN 61000-6-3
- BS EN 55014-1

Immunity

Domestic, commercial and light industrial

- BS EN 61000-6-1
- BS EN 55014-2

Ensure all apparatus covered by the Wireless Telegraphy Act meets regulations issued by the Radio communications Agency.

Ensure all equipment and systems meet the requirements of BS 6701 and BS EN 41003.

Ensure that all cable installations meet the minimum guidance separation in Recommended cable Separations to Achieve Electromagnetic Compatibility (EMC) in Buildings, current editions, published by the EPM.

280.000 PERFORMANCE CHARACTERISTIC DETAILS

Details of the equipment as selected for inclusion into the Works and shall include, in a format to be agreed, the following information:

- Plant item description, reference identification and serial number.
- Electrical input rating - kVA, Volts, Phase.
- Operating mode - duty, standby, generator etc.
- Starting characteristics - starter type, current, start/hour and starting time.
- Performance characteristics - (full load current and power factor).
- Noise level.
- Weight.

290.000 SOFTWARE

Obtain on behalf of the end user all appropriate licenses, permissions, copyright waivers, rights of use and the like from the owners of the software rights.

Ensure that the end user is properly registered with the software supplier for support and appropriate updating. Ensure that application software is written in compliance with BS 7649:1993.

A20 THE CONTRACT

100.000 CONTRACT

Refer to Main Contract Site Specific Works Information NEC.

110.000 DESIGN

The Sub- Contractor is required to undertake the design of the following part or parts of the Works:

- Preparation of builder's work drawings applicable to the services being installed.
- Design, selection, drawing and fabrication of brackets, supports, fixings, casings, enclosures, cabinets, cupboards, etc. associated with the services installation.
- Preparation of working and fabrication drawings, etc. associated with the services installation.
- The co-ordination of detailed services elements within the building fabric.
- The routing and sizing of conduits, trunking, etc. associated to the services installation.
- Provisions to prevent damage due to expansion of pipework and/or conduit.
- Selection of items specified by performance.

250.000 PRODUCT GUARANTEES AND WARRANTIES

Product guaranties and warranties provided by manufacturers, shall be valid or be extended up to the end of the Defects Liability Period.

Any product guaranteed or warranted by a manufacturer for a period of time which extends beyond the end of the defects Liability Period shall remain under guarantee or warranty up to the end of the extended period.

Copies of all guarantees or warranties include in each Operation and Maintenance Manual and hand over one additional set on or before Practical Completion.

A30 TENDERING/ SUBLETTING/ SUPPLY

280.000 SUB-CONTRACT SPECIFICATION WITHOUT QUANTITIES

Where and to the extent that quantities are not included in the specification, tenders must include for all work shown or described in the tender documents as a whole or clearly apparent as being necessary for the complete and proper execution of the Works.

332.000 A SCHEDULE OF RATES

A schedule of rates must be submitted:

- Within the tender return.
- It must include all items and materials included in the tender, together with their rates, extended and totalled. Price Preliminaries separately. Such totals shall agree with the Contract Sum and subtotals shall agree with the priced breakdown of the tender.
- Correction of errors in the quantification will not lead to adjustment of the Contract Sum.

360.000 PROGRAMME

To be agreed with the Main Contractor

370.000 TENDER STAGE METHOD STATEMENTS

Method statements must be submitted before the execution of the contract describing health and safety considerations and how and when the Sub-Contractor proposes and undertakes to carry out the following:

- Builders work
- Craning
- Testing and commissioning
- Temporary works
- Shut downs for changeover of plant

390.000 ALTERNATIVE MANUFACTURERS/SUPPLIERS

In addition to and at the same time as the tender for the Subcontract Works as defined in the tender documents, the Sub-Contractor may, at his discretion, submit alternative manufacturers or suppliers for consideration. Alternatives which would involve significant changes to other work will not be considered.

Such alternative(s) must include all additional costs arising from necessary changes to the details of the installation, including changes to the design and drawings, as well as any associated ancillary equipment items.

Such alternative(s) is/are deemed to be alternative tender(s) and each must include a complete and precise statement of the effects on cost and programme.

Full technical data for each such alternative must be submitted with the Tender together with details of any consequential amendments to the design and/or construction/installation of other parts of the Works.

505.000 SUB SUB-CONTRACTS

Where the Sub-Contractor proposes to sublet any portion(s) of the Sub-contract Works a list must be submitted with the Tender. The list will define such portion(s) and give, for each, the name and address of the proposed Sub Sub-Contractor.

A31 PROVISION, CONTENT AND USE OF DOCUMENTS

100.000 DEFINITIONS AND INTERPRETATIONS

120.000 DEFINITIONS

Meaning: Terms, derived terms and synonyms used in the preliminaries/ general conditions and specification are as stated therein or in the appropriate British Standard or British Standard glossary.

125.000 TERMS USED IN SPECIFICATION

Remove: Isolate, drain, make safe, disconnect, dismantle as necessary and take out the designated products or work and associated accessories, fastenings, supports, linings and bedding materials. Dispose of unwanted materials.

Fix: Unload, handle, store, place and fasten in position including all labours and use of site equipment.

Supply and fix: Includes all labour and site equipment for unloading, handling, storing and execution. All products to be supplied and fixed unless stated otherwise.

Keep for reuse: Do not damage designated products or work. Clean off bedding and jointing materials. Stack neatly, adequately protect and store until required by the Employer or for use in the Works as instructed.

Make good: Execute local remedial work to designated work. Make secure, sound and neat. Includes local redecoration and/ or replacement.

Replace: Supply and fix new products matching those removed. Execute work to match original new state of that removed.

Repair: Execute remedial work to designated products. Make secure, sound and neat. Excludes redecoration and/ or replacement.

Refix: Fix removed products.

Replace: Supply and fix new products matching those removed. Execute work to match original new state of that removed.

Ease: Adjust moving parts of designated products or work to achieve free movement and good fit in open and closed positions.

Match existing: Provide products and work of the same appearance and features as the original, excluding ageing and weathering. Make joints between existing and new work as inconspicuous as possible.

System: Equipment, accessories, controls, supports and ancillary items, including installation, necessary for that section of the work to function.

140.000 MANUFACTURE AND REFERENCE

Definition: When used in this combination:

- Manufacturer: The firm under whose name the particular product is marketed.
- Reference: The proprietary brand name and/ or reference by which the particular product is identified.
- Currency: References are to the particular product as specified in the manufacture's technical literature current on the date of the invitation to tender.

146.000 CURRENCY OF DOCUMENTS

Currency: References to published documents are to the editions, including amendments and revisions, current on the date of the Invitation to tender.

232.000 THE SPECIFICATION

Specification: All sections must be read in conjunction with Main Contract Preliminaries/General conditions.

240.000 DRAWINGS BY THE ENGINEER

The drawings show the general arrangement of the works and design intent but do not necessarily show the exact runs of the pipes, ducts, cables or conduits nor the exact number of fittings required. The Installation Sub-Contractor shall visit site prior to tender to assess the full extent of the work and shall include in his tender for every service and fitting necessary for the proper execution of the work. Dimensions are to be checked on site.

This Specification is to be read in conjunction with the Contract Drawings, one elucidation the other.

In the event of any discrepancy arising between the Drawings and the Specification the Engineer shall decide which is to be followed. Such discrepancies must be pointed out at the time of tendering and will not be accepted as a claim for extra works or materials costs.

315.000 INSTALLATION DRAWINGS BY THE SUB-CONTRACTOR

The Sub-Contractor shall provide co-ordinated installation drawings, builder's work details and comprehensive wiring diagrams in good time for perusal and comment by the Engineer before any installation work is commenced.

The Sub-Contractor shall bear any costs he may incur as a result of delay in providing such drawings, samples, patterns, models or information or as a result of

errors, omissions or discrepancies therein, for which the Sub-Contractor is responsible.

The Sub-Contractor shall at his own expenses carry out, or bear the reasonable cost of, any alterations or remedial work necessary for such errors, omissions or discrepancies for which he is responsible and modify the drawings, samples, patterns, models or information accordingly.

The Sub-Contractor shall at no extra cost to the Employer, amend Working Drawings during the course of the works to show the proposed works whether occasioned by additional works, omitted works, omitted works or for clarity.

Setting out of all works must be approved by the Engineer before final fixing.

Obtain all the information which Sub Sub-Contractors are required to provide in time to meet the programme. Thoroughly check, on the basis of the information available, that dimensions are correct, that account is taken of all related work and that construction is practicable. Note any comments on one copy of the design/production information then submit to the ER with the required number of additional unmarked copies. Such checking will not relieve the ER or the Sub Sub-Contractor(s) of their respective responsibilities for design, co-ordination and documentation.

The Employers Representative (ER) will note any comments on one copy, then return to the Sub-Contractor. Inspection and any comments made by the ER will not relieve the Sub Sub-Contractor(s) of responsibility for design and documentation.

A32 MANAGEMENT OF THE WORKS

140.000 MONITORING

- Progress: Record on a copy of the programme kept on site.

- Avoiding delays: If any circumstances arise which may affect the progress of the Works submit proposals or take other action as appropriate to minimize any delay and to recover any lost time.

The Sub-Contractor shall monitor the progress of the works by "marking up" at no more than monthly intervals a copy of the final agreed master programme to indicate the actual progress of all activities shown thereon. The "marked up" programme shall be kept on site.

160.000 COVERING-UP

Ensure no section of the Works are covered, concealed or insulated until completion of a witnessed satisfactory test.

Give notice when Works which are to be covered or concealed are ready for examination and/or measurement, not less than 7 days.

Give notice to ER.

A33 QUALITY STANDARDS/ CONTROL

110.000 GOOD PRACTICE

Where and to the extent that products or work are not fully documented, they are to be:

- of a kind and standard appropriate to the nature and character of that part of the Works where they will be used.
- suitable for the purposes stated or reasonably to be inferred from the project documents.

In accordance with good engineering practice.

111.000 WORKMANSHIP SKILLS

Operatives: Appropriately skilled and experienced for the type and quality of work.

Registration: With Construction Skills Certification Scheme.

Evidence: Operatives must produce evidence of skills/ qualifications when requested.

112.000 SUSTAINABLE RESOURCES

Materials to be used from sustainable resources where practicable.

113.000 QUALITY OF PRODUCTS

Generally: New.

Supply of each product: From the same source or manufacturer.

Whole quantity of each product required to complete the Works: Consistent in kind, size, quality and overall appearance.

Tolerances: Where critical, measure a sufficient quantity to determine compliance.

Deterioration: Prevent. Order in suitable quantities to a programme and use in appropriate sequence.

170.000 DELETERIOUS MATERIALS

No material generally known to be deleterious are to be used in, or incorporated into, any temporary or permanent Works forming part of the Project.

In particular none of the following items are to be used:

- Asbestos or asbestos based products
- Urea formaldehyde or materials which may release formaldehyde in quantities which may be hazardous with reference to the limits set by the HSE
- Material containing fibres less than three microns diameter or 200 microns long
- Lead or any material or product containing lead which may be ingested, inhaled or absorbed
- Polychlorinated biphenyl
- Fibres not sealed or otherwise stabilised to ensure that migration is prevented
- Vermiculite containing fibrous dust
- Polytetrafluoroethylene (IPTFE) except for pipework jointing
- calcium silicate bricks or materials

Any other products or materials which are generally known within the Building Industry to be deleterious or hazardous to health or safety or to the durability of the property in the circumstances in which they are used including:

- High alumina cement and/or concrete
- Woodwool slabs used as permanent shuttering
- Calcium chloride in admixtures for use in reinforced concrete
- Sea-dredged aggregates for use in reinforced concrete which do not comply with current British Standards
- Aggregates for use in concrete which do not comply with current British Standards
- Alkali reactive aggregates

The Sub-Contractor shall check with the manufacturers and/or suppliers of products and materials that any specified product contains such material. If any specified product contains such material, the Sub-Contractor shall request and alternative specification of product or manufacturer.

171.000 STANDARDS AND REGULATIONS

Provide all materials and works in accordance with the appropriate British Standard or Code of Practice and where no BS or CP is applicable the Agreement Certificate for the particular item.
Comply with all statutory instruments and regulations, relating to the area of the site current at

- the date of tender.

Comply with the requirements of the Local Authority Building Inspector.
Comply with all Statutory Obligations arising from current legislation and regulations, together with other requirements, including, but not limited to, the following:-

- Statutory Obligations
- Health and Safety at Work
- Management of Health & Safety at Work Regulations
- The Working Time Regulations
- Gas Safety, Management Regulations
- Gas Safety (Installation and Use) Regulations
- Building Regulations
- London Building Act and/or Building (Inner London) Regulations
- Public Health Acts
- Electricity Acts
- Electricity, Safety, Quality and Continuity Regulations Electricity at Work Regulations
- The Factories Act
- Clean Air Act
- Clean air (Arrestment Plant) (exemption) Regulations
- The Control of Pollution Act
- Control of Pollution (Amendment) Act
- Workplace (Health, Safety and Welfare) Regulations
- The Construction (Design and Management) Regulations
- Health and Safety (Display Screen Equipment) Regulations
- Control of Substances Hazardous to Health (COSHH) Regulations
- Control of Asbestos at work regulations
- Control of Asbestos at work Amendment, regulations
- Provision and Use of Work Equipment Regulations
- Personal Protective Equipment at Work Regulations
- The Construction (General Provisions) Regulations
- The Construction (Lifting Operations) Regulations
- The Docks Regulations
- Other relevant Safety Regulations
- Liquid Petroleum Regulations
- Public Utility Company and/or Statutory Authority regulations, specifications, and requirements.
- British Standards and Codes of Practice.
- BS 7671 - Requirements for Electrical Installations (IEE Wiring Regulations).
- Insurance Company Requirements.
- LDSA Fire Safety Code.
- IEC Standards.
- Notify all authorities in accordance with their regulations and obtain any required approvals for the installation.
- Where no specific design, performance or installation standards are quoted the following shall apply.
- C.I.B.S.E Guide Books
- Institute of Plumbing - Plumbing Engineering services design guide.
- C.I.B.S.E Technical Memoranda.

- Ensure all equipment and systems are designed and installed in accordance with the relevant standards and that operational compatibility exists between the systems and any other system installed at the same location.
- Supply plant and equipment to achieve the specified design conditions and to provide stable control.

172.000 SERVICES REGULATIONS

New or existing services: Comply with the Bye Laws or Regulations of the relevant Statutory Authority.

173.000 WATER REGULATIONS/ BYELAWS NOTIFICATION

Requirements: Notify Water Undertaker of any work carried out to or which affects new or existing services and submit any required plans, diagrams and details.

Consent: Allow adequate time to receive Undertaker's consent before starting work. Inform immediately if consent is withheld or is granted subject to significant conditions.

174.000 WATER REGULATIONS/ BYELAWS SUB-CONTRACTOR'S CERTIFICATE

On completion of the work: Submit (copy where also required to the Water Undertaker) a certificate including:

- The address of the premises.
- A brief description of the new installation and/or work carried out to an existing installation.
- The Sub-Contractor's name and address.
- A statement that the installation complies with the relevant Water Regulations or Bylaws.
- The name and signature of the individual responsible for checking compliance.
- The date on which the installation was checked.

190.000 TEST CERTIFICATES

Where testing specific to the project is required, ensure test certificates include:

Project title.
Details and date of test.
Instruments used, serial numbers, calibration dates.
Signature of those witnessing test.
Sub-Contractor's name.
Specific location of the item in the Works.

191.000 GAS INSTALLATION CERTIFICATE

Before the completion date stated in the contract: Submit a certificate stating:

- The address of the premises.
- A brief description of the new installation and/or work carried out to an existing installation.
- Any special recommendations or instructions for the safe use and operation of gas appliances and flues.
- The Sub-Contractor's name and address.
- A statement that the installation complies with the Gas Safety (Installation and Use) Regulations.
- The name and signature of the Gas Safe (previously CORGI) registered individual responsible for checking compliance.
- The date on which the installation was checked.

220.000 TESTING AND COMMISSIONING OF SERVICES

Agree a programme for pre-commissioning checks, setting to work, commissioning and performance testing, and allow for all costs incurred.
Where required, provide formal method statements supported by risk assessments detailing all commissioning procedures.

Give notice to the ER and state any requirements for the attendance and co-operation of others.

- Not less than fourteen working days.

Provide all necessary facilities to enable tests to be witnessed and inspections carried out either on site or at manufacturer's works.

The ER will only witness test proceedings, confirm recorded results and determine if the specified requirements have been satisfied.

If following test or inspection any plant or part thereof is shown to be defective or not conforming to the specification the ER will reject such defective parts by written notice, within reasonable time, indicating area of dispute.

- Appoint an 'approved engineer', to supervise the whole of the testing, commissioning, performance testing and instruction of client's staff.

Provide all specialized personnel (including manufacturer's representatives) and co-ordinate their activities.

Test all equipment, material and systems as detailed in Sections. If an inspection or test fails, repeat the procedure, until satisfactory results are obtained.

- Complete all tests before any paint, cladding or similar materials are applied or before services are concealed.

- Ensure all requirements such as cleanliness, protection from harmful external and internal elements etc. are provided prior to commencement of commissioning.

- Following satisfactory completion of testing and when the installations are in a safe and satisfactory condition, set to work, regulate and adjust, as necessary, to meet the specified design requirements.

- Provide all necessary instruments and recorders to monitor systems during commissioning and performance testing.

- Provide test equipment subject to a quality assurance procedure complying with BS EN ISO 10012.

- Do not start performance testing, including system demonstration, system proving or environmental and capacity testing, until commissioning of the system is completed to the satisfaction of the ER.

Maintain on site full records of all commissioning and performance testing, cross referenced to system components and on completion of the Works include a copy in each Operating and Maintenance Manual.

Provide all certification documents for approval by the ER before any system is offered for final acceptance.

- Gas, fuel oil, electricity and water for testing and commissioning will be provided by the client

300.000 OPERATION OF SYSTEMS BEFORE THE PRODUCTION OF DRAWINGS AND/OR OPERATION AND MAINTENANCE MANUALS

Provide attendance, at no expense to the Employer, to put into service, operate 24 hours a day and maintain the systems to the Employer's requirements, including the provision of suitable competent labour, in the event that the Record Drawings and/or Maintenance Manuals are not available when the Works would, in the opinion of the ER, otherwise qualify for Practical Completion.

In the event of the Sub-Contractor failing to provide this service satisfactorily the Employer shall be entitled to make his own arrangements and recover the full cost through the Contract.

A34 SECURITY/ SAFETY/ PROTECTION

111.000 PRE-CONSTRUCTION INFORMATION

'The Pre-Construction information' is integral with the Project Preliminaries including, but not restricted, to the following sections:

- Description of project: Sections A10 and A11.
- Client's consideration and management requirements: Sections A12 and A13.
- Environmental restrictions and on-site risks: Section A12 and A34.
- Significant design and construction hazards: Section A34.
- The health and safety file: Section A37.

154.000 OCCUPIER'S RULES AND REGULATIONS

Comply with the occupier's rules and regulations affecting the site.

Copies: "Safety Rules for Sub-Contractors Employed on UCL Premises"

- Location: from Richard Lukos, Safety Adviser (Construction and Maintenance) Safety Services, UCL Estates.
- Arrangements for inspection: Telephone Richard Lukos on 020 3108 8627.

180.000 MAINTENANCE OF EXISTING SERVICES

- Fully maintain all existing services to existing premises during the progress of the Works.
- Fully maintain the following services to existing premises during the progress of the Works.
- Gas
- Water
- Electricity
- Telephones
- Soil and Waste
- Rainwater
- Fire Alarms

Provide any additional work and materials necessary to maintain these services at all times during the duration of the Contract. Any existing services disturbed by the Works are to be reinstated fully in accordance with the standards of quality defined in the specification and to the satisfaction of the ER.

Make all connections to existing services out of normal working hours.

200.000 MOBILE TELEPHONES

Use: Not permitted in the following areas:

- All occupied areas and corridors.

220.000 NOISE

Standard: Comply generally with the recommendations of BS 5228 – 1, clause 9.3 to minimize noise levels during the execution of the Works.

Noise levels from the works: Maximum level:*70*dB(A) when measured from outside a window of any occupied building.

Equipment: Fit compressors, percussion tools and vehicles with effective silencers of a type recommended by manufacturers of the compressors, tools or vehicles.

Restrictions: Do not use:

- Pneumatic drills and other noisy appliances without consent during the hours of 00.00 to 16.00 Mondays to Fridays or Saturdays without prior permission.

- Radios or other audio equipment or permit employees to use in ways or at times that may cause nuisance.

260.000 FIRE PREVENTION

Duty: Prevent personal injury, death, and damage to the Works or other property from fire.

Standard: Comply with Joint Code of Practice 'Fire Prevention on Construction Sites', published by the Construction Confederation and The Fire Protection Association (The 'Joint Fire Code').

Remove rubbish from all areas of work as it arises.

The use of oil and gas heaters for anti-frost measures and drying out is only permitted away from combustible materials.

All fire exits and means of escape routes, including routes through the areas in the possession of the Sub-Contractor are to be kept clear and unobstructed at all times.

All fire fighting equipment is to be kept in a proper working order.

Plastic sheeting used in temporary screens is to be flame retardant.

The Sub-Contractor is to comply with UCL's Fire Safety requirements as displayed in the building or advised by UCL's Fire Officer and to make site operatives aware of these requirements.

Comply with UCL's hot work permit system.

270.000 SMOKING ON SITE

Smoking will not be permitted on site or in any UCL buildings.

A37 OPERATION/ MAINTENANCE OF THE FINISHED INSTALLATIONS

101.000 SUBMISSION OF RECORD DOCUMENTS

To satisfy the provisions of the Health and Safety at Work Act the Employer will not accept handover of the installations until full and adequate information concerning the installations is in the possession of his operating and maintenance staff.

Provide Record Documents - being part of the Works - prior, and as a prerequisite, to Practical Completion to the satisfaction of the ER.

Prepare manuals in draft as the Works progress and make suitable arrangements where the Works are subject to Partial Possession or Sectional Completion.

Submit draft Record Documents to the ER for comment prior to commissioning.

Prepare two temporary Manuals with provisional record drawings and preliminary performance data available at commencement of commissioning to enable Employer's staff to familiarize themselves with the installation. These should be of the same format as the final Manuals with temporary insertions for items which cannot be finalized until the installations are commissioned and performance tested.

Provide the ER with copies of the final Manual TWO WEEKS prior to Practical Completion.

102.000 SUBMISSION OF DOCUMENTS FOR HEALTH AND SAFETY FILE

To satisfy the provisions of the Health and Safety at Work Act the Employer will not accept handover of the installations until full and adequate information concerning the installations is in the possession of his operating and maintenance staff.

Provide Record Documents - being part of the Works - prior, and as a prerequisite, to Practical Completion to the satisfaction of the ER.

Prepare manuals in draft as the Works progress and make suitable arrangements where the Works are subject to Partial Possession or Sectional Completion.

Submit draft Record Documents to the ER for comment prior to commissioning.
Prepare two temporary Manuals with provisional record drawings and preliminary performance data available at commencement of commissioning to enable Employer's staff to familiarize themselves with the installation. These should be of the same format as the final Manuals with temporary insertions for items which cannot be finalized until the installations are commissioned and performance tested.

Provide the ER with copies of the final Manual TWO WEEKS prior to Practical Completion.

Prepare electrical record drawings in accordance with BS EN 61082.

Prepare Operation and Maintenance Manuals for heating systems requiring a trained operator in accordance with BS EN 12170.

Prepare Operation and Maintenance Manuals for heating systems not requiring a trained operator in accordance with BS EN 12171.

110.000 RECORD DOCUMENTS

Provide:

- Record Drawings and Schedules
- Plant Room and Switch Room drawings, schedules and schematics
- Operation and Maintenance Manuals
- Blank Maintenance Logs
- Log book

Ensure record documents clearly record the arrangements of the various sections of the Works as actually installed and identify and locate all component parts.

Ensure record documents make it possible to comprehend the extent and purpose of the Works and the method of operation thereof.

Ensure record documents set out the extent to which maintenance and servicing is required and how, in detail, it should be executed.

Ensure record documents provide sufficient, readily accessible and proper information to enable spares and replacements to be ordered.

Correlate record documents so that the terminology and the references used are consistent with those used in the physical identification of the component parts of the installations.

Demonstrate as required throughout the execution of the Works that complete and accurate records are being maintained and that the record documents are being progressively compiled as the work on site proceeds.
Ensure the Building Log Book contains the information outlined in Section 3.2 of the Building Regulations Part L2, Conservation of Fuel and Power 2000.

120.000 RECORD DRAWINGS AND SCHEDULES

Prepare Record Drawings and Schedules to a scale not less than 1:50 from the 'As Installed' drawings maintained on site as the Works progress. Endorse all such documents 'RECORD DRAWINGS'. Where agreed with the ER certain detailed information may be provided in schedule form. Prepare electrical drawings in accordance with BS EN 61082.

Provide reduced scale copies for inclusion in the operating and maintenance manuals as detailed in clause A37.150.000

Record Drawings and Schedules must include, but are not limited to:

- Location, including level if buried, of Utility Service connections, including those provided by the appropriate Authority, indicating points of origin and termination, size and material of service, pressure and/or other relevant information.
- Disposition and depth of all underground systems.
- Schematic drawings of each system indicating principal items of plant, equipment, zoning, means of isolation, etc. in sufficient detail to make it possible to comprehend the system operation and the inter-connections between various systems.
- Details of the principles of application of automatic controls and instrumentation.
- Diagrammatic dimensioned plans and sections of each system or service showing sizes and locations of all ancillaries, plant, equipment controls, test points, and means of isolation etc. including any items forming an integral part of the engineering systems provided by others (such as plenum ceilings, builders' work shafts, chimneys etc.).
- Identification of all terminals/cables etc. by size/type and duty/rating as recorded from the approved commissioning results.
- Detailed wiring drawings/diagrams/schedules for all systems, including controls, showing origin, route, cable/conduit size, type, number of conductors, length, termination size and identification, and measured conductor and earth continuity resistance of each circuit.
- Ensure routes indicate if cable/conduit is surface mounted, concealed in wall chase, in floor screed, cast in-situ, above false ceiling etc.
- Details of co-ordination of wiring and connections with cable core identification, notation of fire alarm, security, control and instrumentation and similar systems provided as part of the Works.
- Details to show inter-connections between the Works and equipment or systems provided by others to which wiring and connections are carried out as part of the Works.
- Location and identity of each room or space housing plant, machinery or apparatus.
- Dimensioned plans and sections at a scale of 1:20 of plantrooms, service subways, trenches, ducts and other congested areas where in the opinion of the ER smaller scale drawings cannot provide an adequate record. Indicate the location, identity, size and details of each piece of apparatus.
- Manufacturers' drawings of equipment indicting general arrangement and assembly of component parts which may require servicing.
- Internal wiring diagrams together with sufficient physical arrangement details to locate and identify component parts.
- Schedules as required to locate, reference and provide details of ratings and duty of all items incorporated into the Works together with all fixed and variable equipment settings established during commissioning.

- For each programmable control item, schedules indicating for each input and output point connected, full data in respect of that point including reference, type of input/output, connected equipment reference, set values of temperature or pressure etc., set values of start/stop/speed change times, alarm priority, control specification reference and any other such parameters as are applicable.
- Each spare input and output point including reference, type of input/output and space for future entry of appropriate parameters as listed above.
- Logic flow diagrams for each individual control or monitoring specification and for each building services engineering system to illustrate the logical basis of the software design.
- Schedules setting out details of all initial values of user-defined variables, text statements for alarm messages etc.

130.000 PLANT ROOM AND SWITCH ROOM DRAWINGS, SCHEDULES AND SCHEMATIC DIAGRAMS

Provide good quality plant and switch room drawings, schedules and schematics.

Hang the following in each plant room and switch room, any other appropriate location or where directed by the ER.

- Schematic drawings of circuit layouts showing identification and duties of equipment, numbers and locations, controls and circuits.
- Schedules in the form of printed sheets showing the number, type, location, application /service and symbol, and normal operating position of each means of isolation.
- Control schematics.
- Location of all plant and equipment items including plans and elevations of main switchgear showing physical disposition of switches.
- First aid instructions for treatment of persons after electrical shock.
- All other items required under Statutory or other regulations.
- Location of all incoming service isolating and metering facilities.
- Emergency operating procedures and telephone numbers for emergency call out service applicable to any system or item of plant and equipment.
- Prepare electrical drawings in accordance with BS EN 61082.
- Protect surface of drawings by pressure lamination framing under glass or other rigid, transparent, cleanable and protective surface.

150.000 OPERATION AND MAINTENANCE MANUALS

The 'Operation and Maintenance Manuals' must include:

- A full description of each of the systems installed, written to ensure that the all members of the Employer's staff fully understand the scope and facilities provided.

- A description of the mode of operation of all systems including services capacity and restrictions.
- Diagrammatic drawings of each system indicating principal items of plant, equipment, valves etc.
- Details of how to re-commission so that complex plant services within the building can be re-commissioned by an engineer without any historic knowledge of the systems.
- A photo-reduction of all record drawings together with an index reduced size
- Legend of all colour-coded services.
- Schedules (system by system) of plant, equipment, valves, etc., stating their locations, duties and performance figures. Each item must have a unique number cross-referenced to the record and diagrammatic drawings and schedules.
- The name, address and telephone number of the manufacturer of every item of plant and equipment together with catalogue list numbers.
- Manufacturer's technical literature for all items of plant and equipment, assembled specifically for the project, excluding irrelevant matter and including detailed drawings, electrical circuit details and operating and maintenance instructions.
- A copy of the Risk Assessment and Method Statement for the maintenance requirements to control/eliminate legionella bacteria.
- A copy of all Test Certificates, Inspection and Test Records, Commissioning and Performance Test Records (including, but not limited to, electrical circuit tests, corrosion tests, type tests, start and commissioning tests) for the installations and plant, equipment, valves, etc., used in the installations.
- A copy of all manufacturers' guarantees or warranties, together with maintenance agreements offered by Specialist Sub-Contractors and manufacturers.
- Copies of Insurance & Inspecting Authority Certificates and Reports.
- Starting up, operating and shutting down instructions for all equipment and systems installed.
- Control sequences for all systems installed.
- Schedules of all fixed and variable equipment settings established during commissioning.
- Procedures for seasonal change-overs and/or precautions necessary for the care of apparatus subject to seasonal disuse.
- Detailed recommendations for the preventative maintenance frequency and procedures which should be adopted by the Employer to ensure the most efficient operation of the systems.
- Details of lubrication systems and lubrication schedules for all lubricated items.
- Details of regular tests to be carried out (e.g. water cooling towers etc.)
- Details of procedures to maintain plant in safe working conditions.
- Details of the disposal requirements for all items in the works.
- A list of normal consumable items.
- A list of recommended spares to be kept in stock by the Employer, being those items subject to wear or deterioration and which may involve the Employer in extended deliveries when replacements are required at some future date.

- A list of any special tools needed for maintenance cross referenced to the particular item for which required.
- Procedures for fault finding.
- Emergency procedures, including telephone numbers for emergency services.
- Back-up copies of any system software.
- Documentation of the procedures for updating and/or modifying software operating systems and control programmes.
- Instructions for the creation of control procedure routines and graphic diagrams.
- Details of the software revision for all programmes provided.
- Two back-up copies of all software items, as commissioned.
- Copies of relevant HSE/CIBSE/IEE Guidance notes etc.
- Contractual and legal information including but not limited to details of local and public authority consents; details of design team, consultants, installation Sub-Contractors and associated Specialist Sub-Contractors; start date for installation, date of practical completion and expiry date for the defects liability period; details of warranties for plant and systems including expiry dates, addresses and telephone numbers.
- Water hygiene risk assessment method statement

152.000 BMS OPERATION AND MAINTENANCE MANUALS

Confirm that an initial draft of the 'Operation and Maintenance Manual' has been submitted for approval prior to commissioning. Ensure that the operation and maintenance (O&M) documentation is produced as the work proceeds and is updated when necessary. Ensure that this work commences at the start of the contract and is added to/updated as the contract progresses. Confirm that approved final copies of the O&M manuals are provided at handover. Ensure that the O&M manual is properly indexed. Ensure that terminology and references are consistent with the physical identification of component parts.

Confirm that the O&M manual includes the following and is included in the site health and safety file:

- A written description of plant operation.
- Control strategy/logic diagrams recording the final version of configuration software installed at handover.
- Details of system application software configuration.
- A points list including hard and soft-points (all points should have a unique mnemonic)
- A description of user adjustable points.
- Commissioning record details.
- Detailed data sheets for all control components and equipment.
- Wiring circuit details including origin, route and destination of each cable.
- Basic security access to the system.
- Comprehensive instructions for switching on, operation, switching off, isolation, fault finding and procedures for dealing with emergency conditions.
- Instructions for any precautionary measures necessary.

- Instructions for the routine operation of the control system including simple day-to-day guidance for those operating the control system with limited technical skill.
- Instructions for servicing and system upkeep.
- A provision for update and modification.

Confirm that the O&M manual includes comprehensive system operating instructions.

155.000 PRESSURE REGULATIONS

Where plant and equipment provided under this Contract falls in the scope of the 'Pressure Systems and Transportable Gas Containers Regulations 1989' then the following shall apply:

Regulation 5 states that "any person who.....supplies.....any pressure system or any such article shall provide sufficient written information concerning its design, construction, examination, operation and maintenance as may reasonably and foreseeably be needed to enable the provisions of these Regulations to be complied with".

A schedule of articles which shall be provided by the Sub-Contractor and returned to the Engineer at least 6 weeks before Practical Completion of the Contract.

Relevant articles include items such as steam traps, pressure reducing and safety valves, compressed air equipment, pressure vessels, chilling plant over 25kW, bottled gas systems, etc.

156.000 ASSET REGISTER

The appendices of this specification detail an asset register form on which the mechanical/electrical Sub-Contractor shall enter the full details of items of plant, its position and estimated cost of replacement. This form shall be returned to the Estates at least six weeks before practical completion of the contract to enable an asset number to be allocated. A copy of this form shall then be returned to the Sub-Contractor quoting the asset number, which shall be used on record drawings and in maintenance manuals.

UCL maintenance section will produce labels and affix them to the plant.

An item of plant as defined as any item of equipment that will require routine maintenance or is permanently connected to the electrical supply. The location of any item shall accord with the finally allocated room numbers shown on the Architects drawings or a brief description if no such number is allocated (e.g. plant room or roof area). The cost of replacement should be at current prices.

160.000 PRESENTATION OF THE OPERATING AND MAINTENANCE MANUALS

Agree format and contents with the ER.

Encase the Manuals in A4 size, plastic-covered, loose leaf, four ring binders with hard covers, each indexed, divided and appropriately cover- titled. Fold drawings larger than A4 and include in the binder so that they may be unfolded without being detached from the rings.

Final copies of the Manual:

- Number of copies: Provide two hard copies and one electronic copy typed in Word and saved in Adobe Acrobat PDF on a Compact Disk.

As-built drawings:

- Number of copies: Provide two hard copies and electronic AutoCAD copies in PDF and DWG format (to supplied as Compact Disks).

170.000 RECOMMENDED SPARE PARTS

Before practical completion submit to the ER a schedule of spare parts as called for in individual sections and any others that the Sub-Contractor recommends should be obtained and kept in stock by the Employer for maintenance of the services installations. Time scale: 2 weeks before Practical Completion
State against each item the manufacturer's current price, including packaging and delivery to site. Identify those items which are additional to those specified for inclusion in individual Sections.

180.000 TOOLS

General: Provide tools and portable indicating instruments for the operation and maintenance of all services plant and together with suitable means of identifying, storing and securing.

Quantity: Two complete sets.

Time of submission: At Completion.

190.000 TRAINING

Before Completion, explain and demonstrate to the Employer's maintenance staff the purpose, function and operation of the installations including items and procedures listed in the Services Manual.

211.000 PLANT MAINTENANCE

The first year maintenance of “primary plant” within the defects liability period shall be included within the contract. This is particularly relevant to plant where the guarantee is dependent upon a prescriptive maintenance schedule such as chillers, boilers, burners, compressors, pressurisation units, heat exchangers, water softeners, controls, etc.

C14 BUILDING SERVICES SURVEY

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

- Obtain and verify currency of existing survey information.
- Determine the location, nature and condition of existing services which are to be adapted or removed.

100.030 SYSTEM DESCRIPTION

Services to be surveyed shall include:

(i) LV Distribution Systems
(ii) Main Containment
(iii) Service risers
(iv) Kitchen Installations
(v) Fire Alarm Installation

100.060 DRAWINGS

The following documents are provided within the tender documentation and are for information purposes only.

Interserve Certification – Appendix F

C90 SPOT ITEMS

PART 1 SYSTEM OBJECTIVES

100.010 SYSTEM OBJECTIVES

This section covers the adaptations to the existing installation and other items not detailed elsewhere.

100.030 SYSTEM DESCRIPTION

The following provisions shall be allowed for:

- Installation of temporary fire alarm heat detectors by programming.
- Allowance to be included to connect all hobs, ovens, cooker hoods and fans, with associated cabling for controls and for installation of free issue PIRs/timers/controllers.
- Cooker hoods to be modified to deactivate controls. Hood to be set to high speed and slider deactivated. Lighting control to remain user operated.
- Allowance to be made for 15 No. additional ‘C’ type luminaires installed.
- Allowance to be made for 15 No. additional ‘Ce’ type luminaires installed.
- Allowance to be made for 10 No. additional ‘B’ type luminaires installed.
- Allowance to be made for 5 No. additional ‘K’ type luminaires installed.
- Allowance to be made for 5 No. additional ‘Ke’ type luminaires installed.
- Allowance to be made for 15 No. additional ‘E1’ type luminaires installed.
- Allowance shall be made to remove section of conduit on external wall in Garden. Between two existing conduit boxes, a conduit is to be taken to low level, protected and installed within the new paving. Cables are to be jointed at the two conduit box locations.
- Allow replacement of 10 No. smoke/heat detectors.
- First Year’s Maintenance on all electrical systems.
- Recommissioning of all systems at 6 months after completion and again at the 12 months End of Defects.

V20 LV DISTRIBUTION

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The Installation Contractor shall include in his tender for the supply, installation, commissioning, testing and setting to work a complete and fully functioning LV distribution system in accordance with the Contract drawings and details contained within this Specification.

100.020 DESIGN PARAMETERS

The LV distribution system shall meet the requirements of BS 7671.

100.030 SYSTEM DESCRIPTION

The works to the LV distribution system shall include the relocation of 2 No. of the existing distribution boards and modifications to existing to allow addition of new circuits for the Kitchens.

A description of works is as follows:

- Existing distribution boards to be rotated 180° to allow access from the Corridor.
- All adaptations to the existing submains to allow reconnection.
- Modify outgoing circuits to allow reconnection.
- Modify existing distribution boards to add new Kitchen circuits.

All outgoing circuits within distribution boards shall be RCBO, unless stated otherwise.

The Installation Contractor must ensure that the existing building supplies remain operational as far as practically possible. If supplies require temporary isolation, agreement must be obtained from the Project Manager before works commence.

PART 2 SELECTION SCHEDULE FOR REFERENCE SPECIFICATIONS

260.000 CONDUIT AND TRUNKING

Refer to Works Section V25.

261.000 HV/LV CABLES WIRING

Refer to Works section V25.

262.000 BUSBAR TRUNKING

Refer to Works section V25.

263.000 SUPPORTED COMPONENTS – CABLES

Refer to Works section V25.

271.000 LV SWITCHGEAR AND DISTRIBUTION BOARDS

271.010 GENERAL:

- Supply switchboard as indicated on drawings detailed within Appendix A.

271.030 SWITCHBOARD:

- Electrical supply
  - Three phase - reference Y71.1020A
- LV switchgear and control gear assembly
  - Cubicle switchboard - reference Y71.2010A
  - Multi-box switchboard - reference Y71.2010C
  - Details of equipment
    - As shown on drawing/schedules as detailed in Appendix A
    - Rated current and rated prospective short - circuit withstand current for indicated seconds 50kA/1 Sec
    - Provide facilities to allow future extension of switchboard 25%
- Assembly construction
  - Floor mounted - reference Y71.2020A
  - Access for cabling – Top entry / top exit
- Enclosures finish
  - Reference Y71.2030A
- Type tests
  - Reference Y71.2040A
- Site built assemblies - reference Y71.2060
- Site modification - reference Y71.2070

271.050 CIRCUIT BREAKERS, TRANSFER SWITCHES AND CONTROL AND PROTECTIVE SWITCHES:

- Manufacturer and reference Merlin Gerin
- Characteristics of circuit breakers, transfer switches and control and protective switches:
  - As shown on drawings/schedules

271.060 SWITCHES, DISCONNECTORS AND FUSE COMBINATION UNITS:

- Manufacturer and reference Merlin Gerin
- Switch-disconnector - reference Y71.2100A
- Fuse combination unit - reference Y71.2100B
- Details of equipment
  - As shown on drawings/schedules

271.080 VOLTAGE SENSING RELAYS:

- Reference Y71.2120

271.090 TRIP/CLOSE SWITCHES AND CONTROL SELECTOR SWITCHES:

- Reference Y71.2130

271.100 CURRENT TRANSFORMERS:

- Reference Y71.2140

271.110 INSTRUMENTS AND METERS:

- Reference Y71.2150A
- Details as shown on drawings/schedules

271.120 ELECTRICAL RECORDING INSTRUMENTS:

- Reference Y71.2160A
- Details
  - As shown on drawings/schedules

271.130 INDICATOR LIGHTS:

- Reference Y71.2170A

271.140 LOW VOLTAGE COILS RATING:

Reference Y71.2180

271.160 FUSES:

- Reference Y71.2200A

271.171 DISTRIBUTION BOARDS:

- Manufacturer: Merlin Gerin
  - Single phase - reference Y71.1020B
- Reference Y71.2210A
- Provide spare ways
  - As shown on drawings/schedules

271.190 MINIATURE CIRCUIT BREAKERS:

- Manufacturer and reference Merlin Gerin
- Reference Y71.2230A
- As shown on drawings/schedules

271.200 RESIDUAL CURRENT DEVICE:

- Manufacturer and reference Merlin Gerin
  - Or approved equivalent
- Residual current monitors - reference Y71.2242
- RCBO's - reference Y71.2245

271.210 CABLE TERMINATIONS:

Reference Y71.2250

271.260 SWITCHGEAR AND CONTROL GEAR ACCESSORIES:

- As shown on drawings/schedules

271.270 WORKMANSHIP

- Fixing - reference Y71.3010
- Mounting height - reference Y71.3020
- Access - reference Y71.3030

- Marking and drawing
  - Reference Y71.3040A
- Cable terminations - reference Y71.3050
- Installation and commissioning
  - Reference Y71.3060A

272.000 CONTACTORS AND STARTERS

272.010 GENERAL:

Comply with work section general clauses reference Y72.1000 and those detailed below.

272.040 CONTROL CIRCUIT DEVICES:

Not applicable

272.050 ISOLATING SWITCHES:

- Manufacturer and reference Merlin Gerin
  - Or approved equivalent
- Electrical supply
  - 3 phase - reference Y72.1010A
- Reference Y72.2070A
  - Isolation as shown on drawings/schedules
- Reference Y72.2070#

272.080 INDICATOR LIGHTS:

- Type LED
- Manufacturer and reference Merlin Gerin.
- Electrical supply
  - Single phase - reference Y72.1010B
- Reference Y72.2100A

272.200 CONTROL SYSTEM FUNCTION CHARTS:

Mains to Generator changer
- Reference Y72.2280A

272.210 WORKMANSHIP:

Reference Y72.3010

274.000 ACCESSORIES FOR ELECTRICAL SWITCHGEAR

Refer to Works section V25.

280.000 EARTHING AND BONDING COMPONENTS

280.010 GENERAL:

Comply with work section general clauses reference Y80.1000 and those detailed below.

280.040 EQUIPOTENTIAL BONDS:

- Main equipotential bonds
  - Reference Y80.2090A
- Supplementary equipotential bonds
  - Reference Y80.2100A

280.050 EARTHING:

- Circuit protective conductors
  - Reference Y80.2110A
- Earthing clamps - reference Y80.2120
- Earth busbars
  - Reference Y80.2130A
- Test links - reference Y80.2140
- Lugs/tags - reference Y80.2150
- Protective cable terminations - reference Y80.2160
- Protective conductor warning notices/labels Reference Y80.2170
- Main earth conductor - reference Y80.2180
- Earth bar label - reference Y80.2190

280.060 WORKMANSHIP:

- Clean earth distribution - reference Y80.3010
- Dissimilar metals - reference Y80.3020
- Stranded conductor joints - reference Y80.3040
- Protective cable terminations

- Reference Y80.3050A
- Reference Y80.3050#

281.000 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES:

281.010 GENERAL:

Comply with work section general clauses reference Y81.1000 and those detailed below.

- Carry out testing and commissioning of electrical services as section

281.020 TESTING AND COMMISSIONING:

- Incorporated equipment characteristics
  - Reference Y81.2010A
- Prospective short circuit current (I_P)
  - Reference Y81.2020A
- Initial verification
  - Reference Y81.2030A
- Test equipment and consumables
  - Reference Y81.2040A
- Testing
  - Reference Y81.2050A
- Continuity of protective conductors
  - ac or dc - reference Y81.2060A
- Earth fault loop impedance (ZS)
  - Reference Y81.2070A
- Settings and adjustments - reference Y81.2080
- Standby generators
  - Reference Y81.2090A
- HV and LV switchgear
  - Reference Y81.2100A
- HV power transformers
  - Reference Y81.2110A
- Specialist installations
  - Fire detection and alarm systems. Reference Y81.2120A
  - Emergency lighting installations Reference Y81.2120E
- Calibration - reference Y81.2130
- Certification and reporting
  - Reference Y81.2140A
- Completion certificates
  - Reference Y81.2150A
- Records - reference Y81.2160

281.030 WORKMANSHIP:

- Conductive parts - reference Y81.3010
- Phase sequence - reference Y81.3020
- High voltage tests
  - Reference Y81.3030A
- Cables
- Conduit, trunking and ducting - reference Y81.3050

282.000 IDENTIFICATION - ELECTRICAL

282.010 GENERAL:

Refer to Works section V25.

290.000 FIXING TO BUILDING FABRIC

Refer to Works section V25.

PART 3 SPECIFICATION CLAUSES SPECIFIC TO V20

300.000 PRODUCTS/MATERIALS

Any material, component or piece of apparatus described in this Specification by a brand name, manufacturer's name or figure number, has been assigned by the Engineer and comply with the requirements of the design intent. These items must be included in the bid.

If the Tenderer considers that a cost reduction may be realised by the use of an alternative equivalent product he is at liberty to identify the product and the cost reduction in a separate letter attached to the bid. The acceptance of any such alternative will be subject to the Engineer's written approval after submission of full details.

Any reference to a supplier's quotation means that there has been discussion and an exchange of information. The Tenderer must ensure that the equipment priced, ordered and installed complies fully with the Specification which may not be as the supplier's quotation.

V21 GENERAL LIGHTING

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The Installation Contractor shall include in his tender for the supply, installation, commissioning, testing and setting to work a complete and fully functioning general lighting system in accordance with the Contract drawings and details contained within this Specification.

100.020 DESIGN PARAMETERS

- Ensure the maintained illuminance levels meet but do not significantly exceed the CIBSE Code for Interior Lighting.
- Ensure the initial circuit luminous efficacy is in excess of 48 luminaire-lumens/watt for fixed lighting installations.
- Ensure lighting scheme complies with the Building Regulations L1 and L2 as appropriate.

100.030 SYSTEM DESCRIPTION

The lighting installation will comprise of modifications and additions to the areas of works.

In each area, the existing lighting circuit shall be adapted only where needed and rewired using single L.S.F cables enclosed within B.E steel conduits. Conduits to be flush installed (or above false ceilings) wherever possible.

All accessories are to be from the MK logic Plus Range.

All circuits shall be installed with protective devices, cable sizes, etc., as indicated on the Contract Drawings.

All circuits are to be wired in a minimum of 1.5mm^2 LSF single cable, with all switches rated at 20Amperes and mounted at 1100mm above finished floor level.

At no occasion will the Installation Contractor ‘wire through’ any light fitting.

Luminaires installed on non-demountable ceilings shall be fixed to two standard BESA boxes for linear, and a single for pendants. The fixed wiring is to be carried out on a ‘loop-in’ basis and terminate in fixed base porcelain connectors, with 3 core or 4 core heat resistant flex used to connect the luminaire.

Luminaires installed on demountable ceilings shall be fed via a MK Ltd Link plug in ceiling roses, 3 or 4 pin dependant on the type of light fitting to be supplied. This should be allowed for all Corridor luminaires including flex replacement.

All light fittings are to be as detailed within the lighting schedule enclosed on the Tender Drawings.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

260.000 CONDUIT AND TRUNKING

260.010 GENERAL:

Comply with work section general clauses reference Y60.1000 and those detailed below.

- Supply conduit and cable trunking as specified in Works Section V22

261.000 HV/LV CABLES AND WIRING

261.010 GENERAL:

Comply with work section general clauses reference Y61.1000 and those detailed below.

261.020 STANDARD FLEXIBLE CORDS AND INDUSTRIAL CABLES:

- Manufacturer and reference: Prysmian
  - Or approved equivalent
- Standard ordinary flexible cords - multi copper cores - reference Y61.2010D

261.050 STANDARD WIRING AND POWER CABLES:

- Manufacturer and reference: Prysmian
  - Or approved equivalent
- Standard power supply cables
  - Thermosetting insulation and copper conductors
- Standard wires for conduit and trunking
  - LSF insulated, with copper conductors - reference Y61.2020G
  - Standard power supply cables, LSF insulation, sheathed - reference Y61.2020K

261.130 CABLE GLANDS:

- Manufacturer and reference: To match cable manufacturer and type
  - Or approved equivalent
- Unarmoured cables, indoors - reference Y61.3010A
- Armoured cables, outdoors - reference Y61.3010E

261.260 WORKMANSHIP

- Cable installation - general - reference Y61.4010

- Cable installation in low temperatures - reference Y61.4020
- Installation of LSF cable - reference Y61.4030
- Installation of unarmoured cables - reference Y61.4040
- Cable installation in conduit and trunking.
  - Reference Y61.4090A
- Cable installation - flexible cords - reference Y61.4140
- Cable jointing and terminating generally.
  - Reference Y61.4150A
- Cable sleeves - reference Y61.4210

273.000 LUMINAIRES AND LAMPS

273.010 GENERAL:

Comply with work section general clauses reference Y73.1000 and those detailed below.

- Supply luminaires and lamps as detailed on the Contract Drawings

273.020 LUMINAIRES:

- Manufacturer and reference: As detailed on the Contract Drawings
- Lamp efficacy - reference Y73.2005
- General purposes - reference Y73.2010A
- General purposes, with safety glass - reference Y73.2010B

273.040 CONTROL GEAR AND COMPONENTS:

- Compatibility
  - Reference Y73.2090A
- Circuit losses - reference Y73.2095
- Fluorescent lamp ballasts and starters
  - Reference Y73.2100A
- Discharge lamp ballasts and starters
  - Reference Y73.2110A
- Capacitors
  - Reference Y73.2120A
- Supply terminals - reference Y73.2130
- Fuse - reference Y73.2140
- Interference - reference Y73.2150
- Remote gear - reference Y73.2160

273.050 LAMPS:

- Manufacturer and reference: As light fitting manufacturer

- Types of high efficiency lamp for non-daylight areas
  - Reference Y73.2165
- Fluorescent lamps
  - Reference Y73.2180A

273.090 LUMINAIRES AND LAMPS WORKMANSHIP - GENERAL:

- Orientation - reference Y73.4010
- Cleanliness - reference Y73.4020
- Material of supporting surface - reference Y73.4060
- Support - reference Y73.4110
- Support by direct fixing
  - Reference Y73.4140A
- Support in suspended ceiling
  - Reference Y73.4150A
- Connections to luminaires - reference Y73.4220
  - MICS cable - reference Y73.4290
- Lighting switches on different phases
  - Separate - reference Y73.4300A
  - Phase barrier - reference Y73.4300B

273.110 LUMINAIRES AND LAMPS WORKMANSHIP

- Support - reference Y73.4110
- Support from trunking - reference Y73.4130
- Connections to luminaires - reference Y73.4220

274.000 ACCESSORIES FOR ELECTRICAL SERVICES

274.010 GENERAL:

Comply with work section general clauses reference Y74.1000 and those detailed below.

- Supply accessories for electrical services as Work Section V22 and as detailed on the Contract Drawings

274.040 INTERIOR LIGHTING SWITCHES:

- Manufacturer and reference: MK Ltd
- General purpose moulded plastic - reference Y74.2020A
- Grid moulded plastic - reference Y74.2020B
- Pull cord - reference Y74.2020C
- General purpose secret key - reference Y74.2020D
- Grid secret key - reference Y74.2020F

- Switch details
  - As indicated on drawings/schedules

274.240 WORKMANSHIP:

- Earthing - reference Y74.3010
- Protection - reference Y74.3020
- Fixing - reference Y74.3030
- Measuring mounting heights - reference Y74.3040
- Accessories mounting heights
  - For the disabled - reference Y74.3070

280.000 EARTHING AND BONDING COMPONENTS

280.010 GENERAL:

Comply with work section general clauses reference Y80.1000 and those detailed below.

- Supply earthing and bonding components as specified in works section W51

281.000 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES:

281.010 GENERAL:

Comply with work section general clauses reference Y81.1000 and those detailed below.

281.020 TESTING AND COMMISSIONING:

- Incorporated equipment characteristics
  - Reference Y81.2010A
- Prospective short circuit current (I_P)
  - Reference Y81.2020A
- Initial verification
  - Reference Y81.2030A
- Test equipment and consumables
  - Reference Y81.2040A
- Testing
  - Reference Y81.2050A
- Continuity of protective conductors
  - ac or dc - reference Y81.2060A
- Earth fault loop impedance (ZS)
  - Reference Y81.2070A
- Settings and adjustments - reference Y81.2080

- Calibration - reference Y81.2130
- Certification and reporting
  - Reference Y81.2140A
- Completion certificates
  - Reference Y81.2150A
- Records - reference Y81.2160

281.030 WORKMANSHIP:

- Conductive parts - reference Y81.3010
- Phase sequence - reference Y81.3020
- Conduit, trunking and ducting - reference Y81.3050

282.000 IDENTIFICATION - ELECTRICAL

282.010 GENERAL:

Comply with work section general clauses reference Y82.1000 and those detailed below.

282.020 LABELS AND NOTICES:

- Reference Y82.2010A
- Fit labels and notices as shown on contract drawings.

282.030 LABELS AND NOTICES MATERIALS:

- Material
  - Reference Y82.2020A
- Fixing
  - Reference Y82.2030A
- Arrangement
  - Reference Y82.2040A
- Lettering and size of labels and notices
  - Reference Y82.2050A

282.040 CONDUCTOR ARRANGEMENT:

- Reference Y82.2060A

282.050 EQUIPMENT SIGNS AND LABELS:

- Safety signs
  - Reference Y82.2070A
- Plant and equipment labels
  - Reference Y82.2080A
- Maintenance notices - reference Y82.2090
  - Equipment
- Engraved accessory plates
  - Reference Y82.2120A

282.100 CABLE IDENTIFICATION:

- Cable identification
  - Reference Y82.2190A
- Terminal marking and conductor identification
  - Reference Y82.2200A
- Cable conductor colour coding
  - Reference Y82.2220A
- Cable jointing and termination - reference Y82.2230
- Cable sheath identification - internal

290.000 FIXING TO BUILDING FABRIC

290.010 GENERAL:

Comply with work section general clauses reference Y90.1000 and those detailed below.

290.020 FIXINGS:

- Standards - reference Y90.2010
- Plugs - reference Y90.2020
- Screws - reference Y90.2030

290.030 WORKMANSHIP:

- Drilling - reference Y90.3010
- Proprietary fixings - reference Y90.3020
- Fixing to reinforced concrete - reference Y90.3030
- Fixing to brickwork - reference Y90.3040
- Fixing to timber rails - reference Y90.3050
- Fixing to hollow stud/tile/block wall
  - Reference Y90.3060A

- Fixing to concrete, brickwork or blockwork
  - Reference Y90.3070A
- Fixing to metalwork
  - Reference Y90.3080A
- Fixing to structural steelwork and concrete structures
  - Reference Y90.3090A

PART 3 SPECIFICATION CLAUSES SPECIFIC TO V21

300.000 GENERAL

300.010 SYSTEM REQUIREMENTS:

Select lighting control equipment suitable to meet system objectives requirements.

300.030 ELECTROMAGNETIC COMPATIBILITY:

Ensure all equipment and systems are installed to provide electromagnetic compatibility within the systems and with any other systems installed in the same location.

310.000 PRODUCTS/MATERIALS

320.000 WORKMANSHIP

320.010 WORK ON SITE:

Ensure that all building works are completed and service connections are provided,

320.020 INSTALLATION:

Install, commission and set to work lighting control equipment in accordance with manufacturer's recommendations and BS 7671. Install infra-red transmission systems and co-ordinate the installation of infra-red systems in the same area in accordance with BS 7693.

320.030 QUALITY CONTROL:

Handle, store and install equipment and components of the lighting control system in accordance with the manufacturer's recommendations.

Obtain all equipment and components from a single source.
Inspect all equipment and components on delivery, before fixing and after installation, and reject and replace any that are defective.
Record all commissioning, measurements and tests.

V22 GENERAL LV POWER

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The Installation Contractor shall include in his tender for the supply, installation, commissioning, testing and setting to work a complete and fully functioning general LV power system in accordance with the Contract drawings and details contained within this Specification.

100.020 DESIGN PARAMETERS

The general LV power system has been designed to meet the requirements of BS 7671 and UCL standards.

100.030 SYSTEM DESCRIPTION

The small power systems to be provided include:

- General small power
- Oven and Hob supplies
- Supplies to fans and ventilation

Where indicated on the Contract Drawings, 13Amp switched RCD socket outlets, switched/unswitched fused connection units, flex outlets or 45Amp double pole switches shall be installed to feed the equipment detailed above. All accessories are to be from the MK Logic Plus Range.

Circuit types are to be as detailed on the Contract Drawings, with LSF singles within steel conduit used to feed the outlets. Cables are to be flush installed (or above false ceilings) wherever possible, with suitable protection provided where concealed or exposed to the Students. All circuits shall be complete with protective devices, cable sizes, etc. as indicated on the Contract Drawings.

Each fan is to be supplied on a separate circuit. The Electrical Sub-Contractor shall also allow to supply and install cooker hoods and to de-activate the controls. Cooker Misers are to be installed with two sensing circuits each, one for the oven and one for the hob. This will intern control the local extract hood.

All other fans will be installed by the Mechanical Sub-Contractor, however, allowance shall be made to supply these fans and wire/fit all ‘PIR’ sensors/controls.

The Electrical Sub-Contractor shall also allow to connect all items of equipment, fans, etc. provided as part of this Contract.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

260.000 CONDUIT AND TRUNKING

260.010 GENERAL:

Comply with work section general clauses reference Y60.1000 and those detailed below.

210.015 APPROVED MATERIALS

Any material, component or piece of apparatus described in this Specification by a brand name, manufacturer's name or figure number, has been assigned by the Engineer and complies with the requirements of the design intent. These items must be included in the bid. If the Tenderer considers that a cost reduction may be realized by the use of an alternative equivalent product he is at liberty to identify the product and the cost reduction in a separate letter attached to the bid. The acceptance of any such alternative will be subject to the Engineer's written approval after submission of full details.

Any reference to a supplier's quotation means that there has been discussion and an exchange of information. The Tenderer must ensure that the equipment priced, ordered and installed complies fully with the Specification which may not be as the supplier's quotation.

260.020 CONDUIT SYSTEMS:

Metal rigid conduit systems shall be installed for fixed LV wiring and control wiring.

- 20mm up to 32mm dia. Complete with fittings.
- Galvanised steel
- Class 2/Class 4

Refer to Clause Y60.2010A, Y60.2010B and Y690.2020A

260.030A STEEL TRUNKING:

Single/Multi-compartment trunking system shall be installed for fixed LV wiring and control wiring.

Sizes as detailed on the Contract Drawings.

- Galvanised steel – refer to Clause Y60.2090B.

260.050 GENERAL WORKMANSHIP:

- General
- Reference Y60.3010A

- Layout - reference Y60.3020
- Spacing - reference Y60.3030
- Condensation prevention - reference Y60.3040
- Protection and repair of steel components - reference Y60.3050A
- Equipment connections - reference Y60.3060
- Cleaning before wiring - reference Y60.3070
- Wiring - reference Y60.3080A
- Builders work - reference Y60.3090

260.070 WORKMANSHIP FOR CONDUIT:

- Draw-in boxes - reference Y60.4010
- Installation of cast in or buried conduit - reference Y60.4020
- Conduit boxes - reference Y60.4030
- Fixing conduit - reference Y60.4040
- Flexible and pliable conduit - reference Y60.4050
- Screwed steel conduit - reference Y60.4060

260.080 WORKMANSHIP FOR TRUNKING:

- Manufacture of trunking - reference Y60.5010
- Access - reference Y60.5020
- Fixing trunking
  - Reference Y60.5030A
- Steel trunking
  - Reference Y60.5040A

261.000 HV/LV CABLES AND WIRING

261.010 GENERAL:

Comply with work section general clauses reference Y61.1000 and those detailed below.

261.020 STANDARD FLEXIBLE CORDS AND INDUSTRIAL CABLES:

- Manufacturer and reference: Prysmian Ltd
  - Or approved equivalent
- Standard ordinary flexible cords - multi copper cores - reference Y61.2010D

261.050 STANDARD WIRING AND POWER CABLES:

- Manufacturer and reference: Prysmian Ltd
  - Or approved equivalent
- Standard power supply cables
  - Thermosetting insulation and copper conductors
  - LSF sheathed and armoured - reference Y61.2020E
- Standard flat cables 2-core or 3-core, with copper conductors; with or without CPC
  - LSF insulated, sheathed - reference Y61.2020J
  - Standard power supply cables, LSF insulation, sheathed - reference Y61.2020K

261.130 CABLE GLANDS:

- Manufacture and ref: As cable manufacture
  - Or approved equivalent

261.260 WORKMANSHIP

- Cable installation - general - reference Y61.4010
- Cable installation in low temperatures - reference Y61.4020
- Installation of LSF cable - reference Y61.4030
- Installation of unarmoured cables - reference Y61.4040
- Cable installation in conduit and trunking.
  - Reference Y61.4090A
- Cable surface installation.
- Cable installation - flexible cords - reference Y61.4140
- Cable jointing and terminating generally.
  - Reference Y61.4150A
- Cable sleeves - reference Y61.4210

263.000 SUPPORT COMPONENTS - CABLES

263.010 GENERAL:

Comply with work section general clauses reference Y63.1000 and those detailed below.

263.040 WORKMANSHIP

- Cable tray installation - reference Y63.3010
- Cable cleats, ties, saddles and clips installation
  - Reference Y63.3020A

274.000 ACCESSORIES FOR ELECTRICAL SERVICES

274.010 GENERAL:

Comply with work section general clauses reference Y74.1000 and those detailed below.

- Supply accessories for electrical services as detailed on the Contract Drawings

274.030 ACCESSORIES COMMON REQUIREMENTS:

- Manufacturer and reference: MK Ltd
  - Or approved equivalent
  - As shown on Contract Drawings

274.090 ISOLATING SWITCHES:

- Manufacturer and reference: MK Ltd
  - Or approved equivalent
- BS EN 60669-1 - reference Y74.2070A
- BS EN 60947-3 - reference Y74.2070B
- Details
  - As indicated on Contract Drawings

274.100 FUSE CONNECTION UNITS:

- Manufacturer and reference: MK Ltd
  - Or approved equivalent
- Switched - reference Y74.2080A
- Unswitched - reference Y74.2080B
- Details
  - As indicated on Contract Drawings

274.110 SOCKET-OUTLETS:

- Manufacturer and reference: MK Ltd
  - Or approved equivalent
- Single, switched - reference Y74.2090A
- Double, switched - reference Y74.2090C
- Details
  - As indicated on Contract Drawings

274.130 CORD OUTLETS:

- Manufacturer and reference: MK Ltd
- Or approved equivalent

274.240 WORKMANSHIP:

- Earthing - reference Y74.3010
- Protection - reference Y74.3020
- Fixing - reference Y74.3030
- Measuring mounting heights - reference Y74.3040
- Accessories mounting heights
- For the disabled - reference Y74.3070

280.000 EARTHING AND BONDING COMPONENTS

280.010 GENERAL:

Comply with work section general clauses reference Y80.1000 and those detailed below.

- Supply earthing and bonding components as specified in Works Section W51

281.000 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES:

281.010 GENERAL:

Comply with work section general clauses reference Y81.1000 and those detailed below.

- Carry out testing and commissioning of electrical services as Works Section V20

282.000 IDENTIFICATION - ELECTRICAL

282.010 GENERAL:

Comply with work section general clauses reference Y82.1000 and those detailed below.

282.020 LABELS AND NOTICES:

- Reference Y82.2010A
- Fit labels and notices as shown on
- contract drawings.

282.030 LABELS AND NOTICES MATERIALS:

- Material
  - Reference Y82.2020A
- Fixing
  - Reference Y82.2030A
- Arrangement
  - Reference Y82.2040A
- Lettering and size of labels and notices
  - Reference Y82.2050A

282.040 CONDUCTOR ARRANGEMENT:

- Reference Y82.2060A

282.050 EQUIPMENT SIGNS AND LABELS:

- Safety signs
  - Reference Y82.2070A
- Plant and equipment labels
  - Reference Y82.2080A
- Maintenance notices - reference Y82.2090
  Equipment
- Engraved accessory plates
  - Reference Y82.2120A

282.070 SPECIAL PURPOSE EARTHING:

- Reference Y82.2160A

282.100 CABLE IDENTIFICATION:

- Cable identification
  - Reference Y82.2190A
- Terminal marking and conductor identification
  - Reference Y82.2200A
- Cable conductor colour coding
  - Reference Y82.2220A
- Cable jointing and termination - reference Y82.2230
- Cable sheath identification - internal

290.000 FIXING TO BUILDING FABRIC

290.010 GENERAL:

Comply with work section general clauses reference Y90.1000 and those detailed below.

290.020 FIXINGS:

- Standards - reference Y90.2010
- Plugs - reference Y90.2020
- Screws - reference Y90.2030

290.030 WORKMANSHIP:

- Drilling - reference Y90.3010
- Proprietary fixings - reference Y90.3020
- Fixing to reinforced concrete - reference Y90.3030
- Fixing to brickwork - reference Y90.3040
- Fixing to timber rails - reference Y90.3050
- Fixing to hollow stud/tile/block wall
  - Reference Y90.3060A
- Fixing to concrete, brickwork or blockwork
  - Reference Y90.3070A
- Fixing to metalwork
  - Reference Y90.3080A
- Fixing to structural steelwork and concrete structures
  - Reference Y90.3090A

V25 WIRING SYSTEMS

100.010 PERFORMANCE OBJECTIVES

The Installation Contractor shall include in his tender for the supply, installation, commissioning, testing and setting to work a complete and fully functioning Wiring systems in accordance with the Contract drawings and details contained within this Specification.

100.020 DESIGN PARAMETERS

Detailed containment design by Installation Contractor for approval.

100.030 SYSTEM DESCRIPTION

The systems shall be as detailed on the contract drawings and those detailed below.

260.000 CONDUIT AND TRUNKING

260.010 GENERAL:

Comply with work section general clauses reference Y60.1000 and those detailed below.

260.020 CONDUIT SYSTEMS:

- Metal
  - Rigid
    - Class 2 - reference Y60.2010A
      - Fittings
        - Reference Y60.2020A
    - Class 4 - reference Y60.2010B
      - Fittings
        - Reference Y60.2020A
    - Stainless steel - reference Y60.2010C
      - Fittings - reference Y60.2020C
  - Flexible, LSF sheathed - reference Y60.2010D
    - Fittings - reference Y60.2040A
- Support and fixing - reference Y60.2170

260.030 METAL TRUNKING:

- Drawing reference 986-ES-605
- Cable trunking and fittings
  - Reference Y60.2080A
- Trunking Type
  - Standard cable trunking.
  - Lighting trunking.
  - With Compartments.
- Installation
  - Surface.
- Trunking
  - Class 2 - reference Y60.2090A
  - Class 1/3 - reference Y60.2090B
  - Lighting trunking cover - reference Y60.2090C
- Separate or multi-compartment trunking
  - Reference Y60.2150A
- Support and fixing - reference Y60.2170

260.050 GENERAL WORKMANSHIP:

- General
  - Reference Y60.3010A
- Layout - reference Y60.3020
- Spacing - reference Y60.3030
- Condensation prevention - reference Y60.3040
- Protection and repair of steel components
  - Reference Y60.3050A
- Equipment connections - reference Y60.3060
- Cleaning before wiring - reference Y60.3070
- Wiring
  - Reference Y60.3080A
- Builders work - reference Y60.3090

260.070 WORKMANSHIP FOR CONDUIT:

- Draw-in boxes - reference Y60.4010
- Installation of cast in or buried conduit - reference Y60.4020
- Conduit boxes - reference Y60.4030
- Fixing conduit - reference Y60.4040
- Flexible and pliable conduit - reference Y60.4050
- Screwed steel conduit - reference Y60.4060

260.080 WORKMANSHIP FOR TRUNKING:

- Manufacture of trunking - reference Y60.5010
- Access - reference Y60.5020
- Fixing trunking
  - Reference Y60.5030A
- Steel trunking
  - Reference Y60.5040A
- Trunking of insulating material - reference Y60.5060

HV/LV CABLES AND WIRING

261.010 GENERAL:

Comply with work section general clauses reference Y61.1000 and those detailed below.

- Supply HV/LV cables and wiring as drawing schedules.

261.020 STANDARD FLEXIBLE CORDS AND INDUSTRIAL CABLES:

- Manufacturer and reference Prysmian
  - Or approved equivalent
- LSOH sheathing - reference Y61.2005
- Standard ordinary flexible wires - single copper core - reference Y61.2010A
- Standard LSF flexible wires - single copper core - reference Y61.2010B
- Standard heat resisting (95^{o}C or more) flexible wires - single copper core - reference Y61.2010C
- Standard ordinary flexible cords - multi copper cores - reference Y61.2010D
- Standard HOFR flexible cords - multi copper cores - reference Y61.2010E

261.040 MINERAL INSULATED WIRING AND POWER CABLES:

- Manufacture and reference Prysmian
  - Or approved equivalent
- LSOH sheathing - reference Y61.2005
- Light duty mineral insulated cables
  - Thermoplastic outer covering - reference Y61.2040A
  - LSF outer covering - reference Y61.2040B
- Heavy duty mineral insulated cables
  - Thermoplastic outer covering - reference Y61.2040C
  - LSF outer covering, standard fire performance - reference Y61.2040D
  - LSF outer covering, enhanced fire performance - reference Y61.2040E

261.050 STANDARD WIRING AND POWER CABLES:

- Manufacturer and reference Prysmian
  - Or approved equivalent
- LSOH sheathing - reference Y61.2005
- Standard power supply cables
  - Thermosetting insulation and copper conductors
    - Sheathed - reference Y61.2020A
    - Sheathed and armoured - reference Y61.2020B
  - LSF sheathed and armoured - reference Y61.2020E
- Standard wires for conduit and trunking
  - LSF insulated, with copper conductors - reference Y61.2020G

261.060 CONTROL AND AUXILIARY CABLES:

- Manufacturer and reference Prysmian
  - Or approved equivalent
- LSOH sheathing - reference Y61.2005
- Paired UTP unarmoured control cables - reference Y61.2050A
- Paired UTP armoured control cables - reference Y61.2050B
- Paired STP unarmoured control cables - reference Y61.2050C
- Paired STP armoured control cables - reference Y61.2050D
- Multi-core unarmoured auxiliary cables - reference Y61.2050E
- Multi-core armoured auxiliary cables - reference Y61.2050F
- Multi-core unarmoured LSF sheathed auxiliary cables - reference Y61.2050G
- Multi-core armoured LSF sheathed auxiliary cables - reference Y61.2050H
- Control and auxiliary cables with definite fire performance - reference Y61.2050I
- Fire Alarm cables - reference Y61.2050K

261.080 STANDARD COMMUNICATIONS CABLES:

- Manufacturer and reference Belden
  - Or approved equivalent
- LSOH sheathing - reference Y61.2005
- Standard filled communications cables, for outdoor and underground - reference Y61.2070A
- Standard communications cables, for indoor use - reference Y61.2070B

261.110 INFORMATION TECHNOLOGY CABLES:

- Manufacturer and reference Belden
  - Or approved equivalent
- Structured wiring - reference Y61.2100A

261.130 CABLE GLANDS:

- Manufacturer and reference as recommended by cable manufacture
- Unarmoured cables, indoors - reference Y61.3010A
- Unarmoured cables, outdoors - reference Y61.3010B
- Armoured cables, dry indoors - reference Y61.3010C
- Armoured cables, indoors - reference Y61.3010D
- Armoured cables, outdoors - reference Y61.3010E

261.140 CABLE SEALS AND GLANDS - MINERAL INSULATED CABLES:

- Manufacturer and reference as recommended by cable manufacture
- Heavy duty mineral insulated cables - protected 'd', 'i', or 'n' for hazardous areas - reference Y61.3020A
- Heavy and light duty mineral insulated cables - protected 'e' for hazardous areas - reference Y61.3020B
- Heavy or light duty mineral insulated cables - temperatures up to 105^{o}C - reference Y61.3020C
- Light duty mineral insulated cables - temperatures up to 105^{o}C - reference Y61.3020D

261.160 CABLE TERMINATING AND JOINTING SOCKETS:

- Manufacturer and reference as recommended by cable manufacture
  - Or approved equivalent
- Reference Y61.3040A
  - Connection type
    - As shown on drawings/schedules

261.170 INSULATING TAPE:

- Type
- Application
- Manufacturer and reference as recommended by cable manufacture
  - Or approved equivalent
- LSF insulating tape - reference Y61.3050A
- PIB insulating tape - reference Y61.3050B
- PVC insulating tape - reference Y61.3050C

261.180 CABLE JOINTS AND TERMINATIONS:

- Manufacturer and reference as recommended by cable manufacture
  - Or approved equivalent
- Reference Y61.3060A

261.230 CABLE DUCTS:

- Reference Y61.3110A

261.240 CABLE SLEEVES:

- Reference Y61.3120A

261.250 CABLE COVERS AND MARKERS:

- Reference Y61.3130A

261.260 WORKMANSHIP

- Cable installation - general - reference Y61.4010
- Cable installation in low temperatures - reference Y61.4020
- Installation of LSF cable - reference Y61.4030
- Installation of unarmoured cables - reference Y61.4040
- Cable trenches.
  - Reference Y61.4050A
- Cable installation in trenches - reference Y61.4060
- Cable ducts.
  - Reference Y61.4070A
- Cable installation into ducts - reference Y61.4080
- Cable installation in conduit and trunking.
  - Reference Y61.4090A
- Cable installation on tray and rack - reference Y61.4100
- Cable surface installation.
  - Reference Y61.4110A
- Cable installation - mineral insulated cables
  - Reference Y61.4130A
- Cable installation - flexible cords - reference Y61.4140
- Cable jointing and terminating generally.
  - Reference Y61.4150A
- Terminating - mineral insulated cables.
  - Reference Y61.4180A
- Cable joints - mineral insulated cables.
  - Reference Y61.4190A
- Cable sleeves - reference Y61.4210

SUPPORT COMPONENTS - CABLES

263.010 GENERAL:

Comply with work section general clauses reference Y63.1000 and those detailed below.

263.020 CABLE SUPPORT AND FINISHES:

- Cable supports and finishes
  - Reference Y63.2010A

263.030 CABLE SUPPORT SYSTEM:

- Perforated tray - reference Y63.2020A
- Cable rack - reference Y63.2020B
- Cable cleats - reference Y63.2020C
- Proprietary cable ties - reference Y63.2025A
- Cable clips - reference Y63.2025B
- Two way saddles - reference Y63.2025C
- Cable basket - reference Y63.2025D

263.040 WORKMANSHIP

- Cable tray installation - reference Y63.3010
- Cable cleats, ties, saddles and clips installation
  - Reference Y63.3020A

IDENTIFICATION - ELECTRICAL

282.010 GENERAL:

Comply with work section general clauses reference Y82.1000 and those detailed below.

282.020 LABELS AND NOTICES:

- Reference Y82.2010A
- Fit labels and notices as shown on
  - UCL design brief

282.030 LABELS AND NOTICES MATERIALS:

- Material
  - Reference Y82.2020A
- Fixing
  - Reference Y82.2030A
- Arrangement
  - Reference Y82.2040A
- Lettering and size of labels and notices
  - Reference Y82.2050A

282.040 CONDUCTOR ARRANGEMENT:

- Reference Y82.2060A

282.045 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

- Reference Y82.2085

282.050 EQUIPMENT SIGNS AND LABELS:

- Safety signs
  - Reference Y82.2070A
- Plant and equipment labels
  - Reference Y82.2080A
- Maintenance notices - reference Y82.2090
- Colour corrected light fittings - reference Y82.2100
- Motors and starters labels
  - Reference Y82.2110A
- Engraved accessory plates
  - Reference Y82.2120A
- Switchgear
  - Reference Y82.2130A
- Distribution boards - reference Y82.2140

282.055 GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT IN ACCORDANCE WITH BS EN 80416:

Reference Y82.2085

282.060 SCHEMATIC DIAGRAMS:

- Reference Y82.2150A

282.070 SPECIAL PURPOSE EARTHING:

- Type
- Application
- Reference Y82.2160A

282.080 INDICATOR LAMPS AND PUSH BUTTONS FOR POWER SYSTEMS:

- Reference Y82.2170A

282.090 CONDUIT AND TRUNKING COLOUR CODING:

- Reference Y82.2180A

282.100 CABLE IDENTIFICATION:

- Cable identification
  - Reference Y82.2190A
- Terminal marking and conductor identification
  - Reference Y82.2200A
- Underground cable identification
  - Reference Y82.2210A
- Cable conductor colour coding
  - Reference Y82.2220A
- Cable jointing and termination - reference Y82.2230
- Cable sheath identification - internal
  - Reference Y82.2240A
- Cable sheath identification - external
  - Reference Y82.2250A

282.110 ADDITIONAL SAFETY SIGNS:

- Reference Y82.2260A

FIXING TO BUILDING FABRIC

290.010 GENERAL:

Comply with work section general clauses reference Y90.1000 and those detailed below.

290.020 FIXINGS:

- Standards - reference Y90.2010
- Plugs - reference Y90.2020
- Screws - reference Y90.2030
- Cast-in fixings - reference Y90.2040
- Shot fired fixings - reference Y90.2050
- Self adhesive fixings - reference Y90.2060
- Proprietary channel inserts - reference Y90.2070
- Non-penetrative support systems - reference Y90.2080

290.030 WORKMANSHIP:

- Drilling - reference Y90.3010
- Proprietary fixings - reference Y90.3020
- Fixing to reinforced concrete - reference Y90.3030
- Fixing to brickwork - reference Y90.3040
- Fixing to timber rails - reference Y90.3050
- Fixing to hollow stud/tile/block wall
  - Reference Y90.3060A
- Fixing to concrete, brickwork or blockwork
  - Reference Y90.3070A
- Fixing to metalwork
  - Reference Y90.3080A
- Fixing to structural steelwork and concrete structures
  - Reference Y90.3090A

V40 EMERGENCY LIGHTING

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The Installation Contractor shall include in his tender for the supply, installation, commissioning, testing and setting to work a complete and fully functioning emergency lighting system in accordance with the Contract drawings and details contained within this Specification.

100.020 DESIGN PARAMETERS

The emergency lighting system shall meet the requirements of BS 5266-1 as amended.

100.030 SYSTEM DESCRIPTION

The Installation Contractor shall include for the following elements of the work within his tender:

a) Removal of any redundant luminaires and wiring.

b) Installation of a new Emergency Lighting System to comply with BS 5266-1:2005 with intake rooms.

c) Install containment and wiring to incorporate the new emergency lighting luminaires.

The emergency luminaires will be surface mounted and be complete with equipment to power a lamp for a minimum of 3 hours on mains/circuit failure.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

260.000 CONDUIT AND TRUNKING

260.010 GENERAL:

Refer to Works section V25.

261.000 HV/LV CABLES AND WIRING

261.010 GENERAL:

Refer to Works section V25.

274.000 ACCESSORIES FOR ELECTRICAL SERVICES

274.010 GENERAL:

Refer to Works section V22.

282.000 IDENTIFICATION - ELECTRICAL

282.010 GENERAL:

Refer to Works section V25.

290.000 FIXING TO BUILDING FABRIC

290.010 GENERAL:

Refer to Works section V25.

PART 3 SPECIFICATION CLAUSES SPECIFIC TO V40

300.000 GENERAL

Any material, component or piece of apparatus described in this Specification by a brand name, manufacturer's name or figure number, has been assigned by the Engineer and comply with the requirements of the design intent. These items must be included in the bid.

If the Tenderer considers that a cost reduction may be realised by the use of an alternative equivalent product he is at liberty to identify the product and the cost reduction in a separate letter attached to the bid. The acceptance of any such alternative will be subject to the Engineer's written approval after submission of full details.

Any reference to a supplier's quotation means that there has been discussion and an exchange of information. The Tenderer must ensure that the equipment priced, ordered and installed complies fully with the Specification which may not be as the supplier's quotation.

300.010 EMERGENCY LIGHTING SYSTEM:

The luminaires and equipment shall be supplied by the manufacturers detailed on the Tender Drawings.

300.020 ILLUMINATION OF SIGNS:

- Application: As indicated on Contract Drawings
- Illuminate exit, emergency exit and escape route signs so that they are legible at all times, by
    - luminaires external to sign.
    - lamps contained within sign.

310.000 PRODUCTS/MATERIALS

310.010 LAMPS FOR EMERGENCY LIGHTING:

- Manufacturer and reference: To match Luminaire supplier
- Or approved equivalent

310.020 SELF-CONTAINED EMERGENCY LIGHTING LUMINAIRE SYSTEM AND EQUIPMENT:

- Application: As detailed on Contract Drawings
- Manufacturer and reference: As detailed on Tender Drawings

- Standard - BS EN 60598-2-22.
- Categories
  - Non-maintained.
- Batteries for self-contained luminaires
- Sealed nickel-cadmium cells.
- Type
- Self-contained luminaire.
- Self-contained illuminated sign.
- Ancillaries
- Green LED luminaire healthy indicator.

310.060 ANCILLARIES:

Provide ancillaries in accordance with the appropriate standards and regulatory authority requirements.

- Controlled test and maintenance system.
  - For luminaire groups

320.000 WORKMANSHIP

320.010 INSTALLATION:

Install, test and commission emergency lighting system in accordance with BS 5266-1, BS EN 50172 and ICEL 1003.

320.020 SELF-CONTAINED LUMINAIRES:

Ensure self-contained luminaires are not installed where temperatures are likely to exceed manufacturers recommended maximum.
Ensure fluorescent luminaires are not used at temperatures below that specified by manufacturer.

320.030 EQUIPMENT:

Install equipment in accordance with manufacturer's recommendations.

W50 FIRE DETECTION AND ALARM

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The Installation Contractor shall include in his tender for the supply, installation, commissioning, testing and setting to work a complete and fully functioning fire detection and alarm system in accordance with the Contract drawings and details contained within this Specification.

100.020 DESIGN PARAMETERS

The fire alarm system has been designed to meet the requirements of BS 5839-1:2002.

100.030 SYSTEM DESCRIPTION

The works to be carried out under this Contract shall comprise:

- All isolation, stripping out and adaptations of the existing fire alarm systems within the building, necessary for the execution of the works.
- Provision of temporary and permanent modifications to the existing fire alarm system to maintain operation and continuous functioning of the systems within areas of the building not forming part of the site.
- The temporary installation of Heat Detectors (by programming) which may be affected by the works. On completion of the works the original programming must be reinstated.
- The installation of new fire alarm system devices as indicated on the Contract Drawings and details contained within the Specification.
- Testing and Commissioning of the system.

The Installation Contractor shall appoint the following specialist fire alarm installation contactor to undertake the supply, second fix, testing and commissioning of the system modifications.

Fisk Fire Protection Ltd
Orchard House
34-35 Orchard Street
Chelmsford
Essex
CM2 0HD

Tel: 01245 244399
Fax: 01245 244398

The Installation Contractor shall allow for all necessary attendance in connection with the specialist fire alarm contractor for the installation.

All costs associated with the specialist fire alarm contractor shall be borne by the Installation Contractor.

The Installation of the system shall meet the requirements of BS 5839.

100.100 ISOLATION OF EXISTING SYSTEMS

The existing systems shall not be turned off, isolated or disconnected in any way without the express written permission of the PM. Written permission will only be granted once full details of the necessary disconnection, including services affected with duration of interruption, have been established.

After permission has been granted, care shall be taken to ensure that the disconnection of any existing circuits, which may be interconnected with circuits in areas outside the boundary of the contract area, is carried out in a safe manner. The existing fire alarm installation, outside the boundary of the site, shall be left operational at all times and shall not be removed.

100.110 SURVEY OF EXISTING SYSTEMS

The Contractor shall be responsible for carrying out a thorough survey of the existing fire alarm system prior to the commencement of the works.

Any faults found on the system shall be reported to the PM, in writing, on the day they are found.

The survey must establish the extent of each system, and the demarcation/cross over point where the Contract area finishes.

The Contractor shall inform the Engineer of:

- Any fire alarm circuit from outside the contract area, which may be affected by the works

- Any fire alarm within the contract area, which serves an area outside the contact area.

- Any existing circuits which will be affected by the works in the contract area.

100.130 FIRE ALARM CABLING

The cable shall be MICS sheathed 2 core 500v grade with a minimum size of 1.5mm^2. All cables are to be sheathed with a red cover throughout, with standard BESA Boxes, glands, earth tag pots and shrouds used.

Where three or more cables are to be installed together or within voids a suitable sized cable basket shall used.

All fire alarm cables shall be separated from all other cables by a minimum of 300mm.

100.140 FIRE ALARM SYSTEM

The Contractor shall include for the following elements of work within his tender:

1. All necessary attendances in connection with the Specialist Fire Alarm Contractor.

2. All costs associated with the Specialist Fire Alarm Contractor.

3. Temporary installation of heat detectors to replace the existing smoke detectors within all working areas. On completion of the works in each area the smoke detectors are to be replaced.

4. Installation of a new fire alarm system to meet the requirements of BS 5839-1:2000.

5. All associated electrical supplies.

100.150 EXISTING FIRE ALARM SYSTEM

The Contractor shall allow to test the existing system before the commencement of any works.

The existing fire alarm system is to be kept fully operational until the new system has been installed, tested, commissioned and after the ‘Soak Period’.

The Contractor will be responsible for all maintenance and repairs to the existing system during the works.

The existing system can only be removed once approval has been given by the PM.

100.160 TEMPORARY FIRE ALARM WORKS

The Contractor shall include for the provision of adaptations to the existing system to remove any part supplied by adjacent areas.

Allowance shall be made to employ the Specialist Fire Alarm Contractor to carry out these modifications and recommission the system within adjacent systems.

They shall also be employed to carry out any other temporary connection or modification to allow the works to proceed.

At the completion of any temporary fire alarm adaptations or permanent modifications, the systems shall be recommissioned and an appropriate Commissioning Certificate issued.

Any temporary modifications to the systems shall be carried out outside of normal hours and completed before any other works are carried out within this area.

100.170 SYSTEM EQUIPMENT

The new fire alarm system shall comprise of equipment as detailed on the contract drawings.

100.180 SOAK TEST PERIOD

The Contractor shall Soak Test the new system for a minimum of one week.

In the event of a fault occurring during this period, the duration will be extended by a week from the fault date.

Until the system has covered a 7-day period without a fault occurring, it will not be deemed completed.

100.190 COMMISSIONING

The fire alarm systems shall be fully commissioned by Fisk Fire Protection Limited, at the completion of any temporary/permanent modifications, and at the completion of the overall works.

Each time the system is commissioned a satisfactory fire alarm system commissioning certificate shall be produced by Fisk Fire Protection Limited and issued to the PM.

100.200 FIRE ALARM LOG BOOK

The Contractor shall record details of all the modifications (temporary and final) to the fire alarm system in the Clients fire alarm system log book.

The Contractor shall note that great importance will be placed on the quality and accuracy of the information incorporated in the log book which shall include the provision of drawings for the new system.

100.210 TESTING

In addition to the commissioning to be carried out by the fire alarm specialist, the Contractor shall conduct test prior to, during and at the completion of each area of the installation works and finally at the completion of the maintenance period. Before any cable is concealed the Contractor shall offer the PM completed test sheets for each area. Testing shall be carried out to meet the requirement of BS 7671, and at the completion of the project, as a pre-requisite of Practical Completion, an appropriate completed NICEIC Certificate.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

261.000 HV/LV CABLES AND WIRING

261.010 GENERAL:

Comply with work section general clauses reference Y61.1000 and those detailed below.

261.050 STANDARD WIRING AND POWER CABLES:

- Manufacturer and reference: MICS
- Or approved equivalent
- Standard power supply cables
- Thermosetting insulation and copper conductors
- LSF sheathed and armoured - reference Y61.2020E
- LSF insulated, sheathed - reference Y61.2020J
- Standard power supply cables, LSF insulation, sheathed - reference Y61.2020K
- Standard cables with definite fire performance - reference Y61.2020M
- Standard cables where penetration by sharp objects is a high risk - reference Y61.2020N

261.130 CABLE GLANDS:

- Manufacturer and reference: To match cable type and manufacturer
- Unarmoured cables, indoors - reference Y61.3010A
- Unarmoured cables, outdoors - reference Y61.3010B
- Armoured cables, dry indoors - reference Y61.3010C
- Armoured cables, indoors - reference Y61.3010D
- Armoured cables, outdoors - reference Y61.3010E

261.260 WORKMANSHIP

- Cable installation - general - reference Y61.4010
- Cable installation in low temperatures - reference Y61.4020
- Installation of LSF cable - reference Y61.4030
- Installation of unarmoured cables - reference Y61.4040
- Cable surface installation.
- Cable jointing and terminating generally.
- Reference Y61.4150A
- Cable sleeves - reference Y61.4210

263.000 SUPPORT COMPONENTS - CABLES

263.010 GENERAL:

Comply with work section general clauses reference Y63.1000 and those detailed below.

263.020 CABLE SUPPORT AND FINISHES:

- Application: All
- Cable supports and finishes
- Reference Y63.2010A

263.030 CABLE SUPPORT SYSTEM:

- Manufacturer and reference: Uni-Trunk Limited
- Or approved equivalent
- Perforated tray - reference Y63.2020A
- Proprietary cable ties - reference Y63.2025A
- Cable basket - reference Y63.2025D

263.040 WORKMANSHIP

- Cable tray installation - reference Y63.3010
- Cable cleats, ties, saddles and clips installation
- Reference Y63.3020A

274.000 ACCESSORIES FOR ELECTRICAL SERVICES

274.010 GENERAL:

Comply with work section general clauses reference Y74.1000 and those detailed below.

- Supply accessories for electrical services as Works Section V22.

274.020 SAMPLES:

Provide samples of the following items: All accessory types to be used.

280.000 EARTHING AND BONDING COMPONENTS

280.010 GENERAL:

Comply with work section general clauses reference Y80.1000 and those detailed below.

- Supply earthing and bonding components as specified in Works Section W51.

281.000 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES:

281.010 GENERAL:

Comply with work section general clauses reference Y81.1000 and those detailed below.

281.020 TESTING AND COMMISSIONING:

- Incorporated equipment characteristics
- Reference Y81.2010A
- Prospective short circuit current (I_P)
- Reference Y81.2020A
- Initial verification
- Reference Y81.2030A
- Test equipment and consumables
- Reference Y81.2040A
- Testing
- Reference Y81.2050A
- Continuity of protective conductors
- ac or dc - reference Y81.2060A
- Earth fault loop impedance (ZS)
- Reference Y81.2070A
- Settings and adjustments - reference Y81.2080
- Specialist installations
- Fire detection and alarm systems - BS 5839. Reference Y81.2120A
- Calibration - reference Y81.2130
- Certification and reporting
- Reference Y81.2140A
- Completion certificates
- Reference Y81.2150A
- Records - reference Y81.2160

281.030 WORKMANSHIP:

- Conductive parts - reference Y81.3010
- Phase sequence - reference Y81.3020

282.000 IDENTIFICATION - ELECTRICAL

282.010 GENERAL:

Comply with work section general clauses reference Y82.1000 and those detailed below.

282.040 CONDUCTOR ARRANGEMENT:

- Reference Y82.2060A

282.050 EQUIPMENT SIGNS AND LABELS:

- Safety signs
- Reference Y82.2070A
- Plant and equipment labels
- Reference Y82.2080A
- Maintenance notices - reference Y82.2090 Equipment
- Engraved accessory plates
- Reference Y82.2120A

282.100 CABLE IDENTIFICATION:

- Cable identification
- Reference Y82.2190A
- Terminal marking and conductor identification
- Reference Y82.2200A
- Cable conductor colour coding
- Reference Y82.2220A
- Cable jointing and termination - reference Y82.2230
- Cable sheath identification - internal

290.000 FIXING TO BUILDING FABRIC

290.010 GENERAL:

Comply with work section general clauses reference Y90.1000 and those detailed

below.

290.020 FIXINGS:

- Standards - reference Y90.2010
- Plugs - reference Y90.2020
- Screws - reference Y90.2030
- Proprietary channel inserts - reference Y90.2070

290.030 WORKMANSHIP:

- Drilling - reference Y90.3010
- Proprietary fixings - reference Y90.3020
- Fixing to reinforced concrete - reference Y90.3030
- Fixing to brickwork - reference Y90.3040
- Fixing to timber rails - reference Y90.3050
- Fixing to hollow stud/tile/block wall
- Reference Y90.3060A
- Fixing to concrete, brickwork or blockwork
- Reference Y90.3070A
- Fixing to metalwork
- Reference Y90.3080A
- Fixing to structural steelwork and concrete structures
- Reference Y90.3090A

PART 3 SPECIFICATION CLAUSES SPECIFIC TO W50

300.010 TYPE OF SYSTEM - GENERAL

Application : To work areas.
Standard : BS 5839-1.

300.020 CONNECTION TO LOCAL AUTHORITY FIRE BRIGADE

Existing.

300.030 ZONES

Application: Multiple per floor
Standard - BS 5839-1.
Zones

- Number: As indicated on the contract drawings

Show the location of zones by:-

- Specially prepared plan of building, permanently mounted adjacent to the indicator panel.

Zone testing

- Provide a means of testing wiring of each zone of system.

300.040 CONTROL SYSTEM

Application: Throughout building
Standard

- BS 5839-6 Annex B.
- BS EN 54-2 and BS EN 54-4.

Analogue addressable.

300.060 MONITORING

Provide all end of line and other circuit elements to ensure the system is fully monitored to comply with BS 5839.

300.080 REMOVAL OF TRIGGER DEVICE

Provide precautions against removal of trigger devices.

- Use trigger devices wired on circuits separated from manual call points.
- Route wiring so that manual call points precede trigger devices in circuit.
- Use trigger devices that are removed only by a special tool.
- Use trigger devices with bases that provide circuit continuity with trigger device removed.

Ensure that, where alarm sounders use same wiring as trigger device, removal of trigger device does not affect operation of alarm sounder.

300.100 REMOTE CENTRE

Make provision to send signal to remote centre.
- Location: UCL Security
- Signals
  - Alarm.
  - Pre-alarm.
  - Fault.
  - Zone isolated.

300.110 FIRE ALARM SPECIALIST

Engage a specialist to develop the design, supply, install, commission and set to work the fire alarm system.
- Specialist: Fisk Fire Protection Ltd

310.010 MANUAL CALL POINTS

Manufacturer and reference: Apollo Fire Detection Ltd. 55000-906
Standard
- BS EN 50130-4.
- BS EN 54-11.

Indication of operation
Protection against accidental operation
Mounting
- Flush.
- Weather resistant.

Operation
- MCP activation response within 1 second.
- Field programmable to trigger alert or evacuate alarms.
- Test key
- Addressable.
- Monitored.
- Integral activation indicator
- Manual operation
  - Key switch.
  - Break glass.
    - Anti-fragmentation film.
  - Thumb pressure.

310.020 AUTOMATIC DETECTORS

Provide automatic fire detectors from the same manufacturers and with common facilities.

- Standard - BS EN 50130-4.
- Plug in bases.
- Common base for all detector types.
- Addressable detector base.
- Mechanical device to accept only
  - Optical smoke detectors.
  - Heat detectors.
- Detectors locking.
- Communicate detector status & address
- Address code setting
  - Manual.
  - Software.
  - Separate addressable plug for each detector.
- Visible activation indicator.
- Visible remote indication for detectors concealed.
- Auxiliary contact
- Label detector and bases with address number.
- Colour of devices: White
- End of line device mounted in sensor

310.030 HEAT DETECTORS

Manufacturer and reference: Apollo Fire Detection Ltd. 55000-400
Point type

- Standard
  - BS 5446-2.
  - BS EN 54-5.

Heat-sensitive element

- Fixed temperature element.

Types

- Analogue addressable.

Temperature setting: 60^{o}C.

310.040 SMOKE DETECTORS

Manufacturer and reference: Apollo Fire Detection Ltd. 55000-600
Detector type

- Optical.
- Point type.
  - Standard
    - BS 5446-1.
    - BS EN 54-7.

- Analogue addressable.

310.045 MULTI-SENSOR DETECTORS

Manufacturer and reference: Apollo Fire Detection Ltd. 58000-700
Characteristics
- Addressable.
- Monitored.

310.070 SOUNDERS

Manufacturer and reference: Apollo Fire Detectors Ltd.
Standard - BS 5839-8 Annex
Sounder types
- Electronic sounder.
- Addressable.

Sounder characteristics
- d.c.
- Voltage 17 – 20V
- Sound power output (dBA): 100

Colour
- White.

Finish
- Protection to BS EN 60529
- Weather proof.
- Internal.

310.080 FIRE ALARM CONTROL AND INDICATING EQUIPMENT

Manufacturer and reference: Existing

310.110 ANCILLARY SERVICES

Make provision to open or close circuits of ancillary services by means of relay or similar device.
- Standard
  - BS EN 54-2.
  - BS EN 50130-4.
- Services
  - Closing of windows, smoke and fire doors.
  - Controlling ventilating systems.
  - Emergency lighting
- Relay type
  - Addressable

  - Monitored.
  - Power from addressable loop.
  - Activation indicator
- Input
  - Monitored
  - Addressable
- Activation indicator
- Output
  - Monitored.
  - Door holder.
  - Plant

310.130 REMOTE INDICATOR MODULE

Manufacturer: Apollo Fire Detection Ltd.
Standard
- BS EN 54-2.
- BS EN 50130-4.

Driven by its associated detector.
Monitored for open and short circuits.

310.140 LINE ISOLATOR MODULE

Manufacturer: Apollo Fire Detection Ltd.
Standard
- BS EN 54-2.
- BS EN 50130-4.

Derive power from addressable loop.
Visible LED indicator that module has tripped.
Maximum of 15 devices per short circuit device.
Maximum of 7 units per loop.

310.150 VISIBLE ALARMS

Manufacturer and reference: Apollo Fire Detectors Ltd. 55000-878
Standard
- BS EN 54-2.
- BS EN 50130-4.

Flashing.
High power LED.
Power supply: d.c.

320.010 QUALITY CONTROL

Handle, store and install equipment and components of the fire detection and alarm system in accordance with BS 5839 and the manufacturer's recommendations.

- Obtain all equipment and components from a single source.

Inspect all equipment and components on delivery, before fixing and after installation and reject and replace any which are defective.
Record all commissioning tests and provide the certification required by BS 5839-1.

- Provide manufacturer's certificates of equipment design to an approved quality management system and CIE component selection.

320.020 SMOKE DETECTOR INDICATORS

Fit smoke detector indicators external to doors, where zone is divided into rooms.

320.030 MANUAL CALL POINTS

Where manual call points are sited in zones.
Wire into detector circuit for fire zone.
Wire manual call points sited on staircase landings as a separate zone.

320.040 RECORD DRAWINGS AND OPERATING INSTRUCTIONS

Provide instructions on use of installation to person responsible for use of premises.
Supply the user with a logbook and certificate of installation and commissioning, in accordance with BS 5839-1, Appendix B and D.
Provide record drawings to user for maintenance and record purposes.
Show position of various items of equipment, junction boxes, etc, and sizes and routes of cables and wires. Include wiring diagrams of junction boxes and distribution cases.

Provide circuit diagrams of fire alarm system and its components.

320.050 CABLE INSTALLATION

Plan and install all fire detection and alarm system cables in accordance with BS 5839-1 and the cable manufacturer's recommendations.

- Run cables point to point without tees or spurs.

- Design loop load to not exceed 80% of cable capacity.

W51 EARTHING AND BONDING

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The Installation Contractor shall include in his tender for the supply, installation, commissioning, testing and setting to work a complete and fully functioning earthing and bonding system in accordance with the Contract drawings and details contained within this Specification.

100.020 DESIGN PARAMETERS

The earthing and bonding has been designed to meet the requirements of BS 7671.

100.030 SYSTEM DESCRIPTION

The earthing and bonding of the entire services installation and the building fabric, finishes, etc. shall comply with the requirements of BS 7671.

The method of fault protection against shall be by protective earthing, protective equipotential bonding and automatic disconnection of supply.

All final circuits shall be provided with separately wired circuit protective conductors which shall be connected to the earthing terminals of all equipment, outlets, etc. These CPC'S shall be at least the same size as the phase conductors unless stated otherwise.

The new trunking, baskets and trays shall be electrically continuous throughout their length and shall be bonded to the earth terminals of the distribution boards by a minimum 10mm^2 XLPE insulated cable.

The hot and cold water pipes at sink positions shall be bonded to each other and to the sink basin using minimum 4mm^2 LSF insulated cables.

The water and gas services pipework entering the area shall be bonded to each other and to earth using a minimum 25mm^2 cable.

Where a number of items are noted as being bonded, (to each other and to earth), they shall be bonded to a single continuous conductor which has the insulate locally removed to facilitate the bond to the cable and such that disconnection of one bonding position does not affect remaining connections.

A main earthing bar is to be provided at each LV Distribution position.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

280.000 EARTHING AND BONDING COMPONENTS

280.010 GENERAL:

Comply with work section general clauses reference Y80.1000 and those detailed below.

281.000 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES:

281.010 GENERAL:

Refer to Works section V25.

282.000 IDENTIFICATION - ELECTRICAL

282.010 GENERAL:

Refer to Works Section V25.

PART 3 SPECIFICATION CLAUSES SPECIFIC TO W51

300.000 GENERAL

300.010 STANDARDS:

Carry out electrical system earthing work in accordance with BS 7671 (IEE wiring regulations), BS 7430, Electricity, Safety, Quality and Continuity Regulations and Local Electricity Supply Authority Requirements.

- Comply with the requirements of BS EN 50310.

300.020 EARTHING AND BONDING SCHEDULE:

Carry out earthing and bonding installation:-

- as indicated on the Contract Drawings
- as required by BS 7671

300.040 EXISTING INSTALLATIONS:

Check earth continuity conductors and loop impedance values of existing installation. Report defects and elements not in accordance with BS 7671 (IEE Regulations) before connecting new or modified installations to existing supply.

300.060 RISE IN POTENTIAL IN TELECOMMUNICATIONS

Ensure the potential rise in telecommunications circuits due to power system earth faults is limited, as BS 6701, to

- 430V.

300.070 EXCHANGE OF INFORMATION:

Consult with the electricity supply company regarding the earthing arrangements of the installation. Construct the earthing system to the requirements of electricity supply company. Ensure any part of the earth fault current path provided by the electricity supply company or others is suitable for the operation of the earth fault protection to be installed. Obtain the agreement and permission of undertakings providing services which are to be bonded to the earthing system.

310.000 PRODUCTS/MATERIALS

310.020 MAIN EARTH TERMINAL:

Provide earth bar at incoming electrical service position, for each switchboard.

- Bond earth terminals and metallic structure of switch and control gear and plant.

- Connect each earth terminal to all other earth terminals by a ring conductor sized as BS 7430 and BS 7671.
- Location
- Adjacent to main LV switch panel.
- Mounting
- Mount earth bar on insulated supports located at 300mm centres for 25mm bar and 450mm centres for 50mm bar, giving 30mm clearance at rear of bar.
- Drill clearance holes, one for each cable plus 30% spare holes (two minimum) at 50mm minimum centres through bar for connection of cable lugs. Ensure clearance holes are minimum necessary size to maintain adequate lug/bar contact.

310.030 MAIN EARTH TERMINAL CONNECTIONS:

Connect main earth conductors and main equipotential bonding conductors to main earth terminals.
Terminate circuit protective conductors on switchboard earthing bar.
Terminate conductors with

- compression type lugs suitable for bolting direct to bar.
- Extend protective conductor from incoming main cable gland direct to main earth terminal.
- Extend separate protective conductor from main earth terminal to main switch/switch panel served by incoming main cable.
- When main cable is provided by electrical supply Company, extend separate protective conductor from Main Cable armouring gland or direct earth terminals or PME earth installed by supply Company to main earth terminal.
- Bond all main equipment and plant to an earth terminal, connected to the bonding ring conductor.

310.150 TELECOMMUNICATIONS FUNCTIONAL EARTH:

- Application: To all telecommunications equipment
  Provide functional earth in accordance with BS 6701 and BS 7430.

320.000 WORKMANSHIP

320.010 INSTALLATION OF EARTHING SYSTEM:

Carry out installation of earthing system in accordance with BS 7671 (IEE Regulations) and BS 7430.

320.040 MAIN AND SUPPLEMENTARY EQUIPOTENTIAL BONDING:

- Application:
  Bond in accordance with BS 7430 and BS 7671 to main earth terminal all extraneous conductive parts of the installation.
- Ensure the following services are bonded.
- Main water pipes.
- Main gas pipes.
- Fuel oil pipes.
- Air ductlines.
- Heating pipework.
- Chilled water pipework.
- Exposed metallic parts of building structure.
- Thermal insulation metallic cladding.
- Metallic cable sheaths of all cables except British Telecom.
- Lightning protection systems.
- Others
  Bond with supplementary equipotential bonds to protective conductor system, all simultaneous accessible conductive.
- Ensure the following areas are bonded to BS 7671, Section 601.
- bathrooms and shower rooms.
- boiler houses.
- calorifier rooms.
- all other plantrooms.
- wet and damp process areas.
- kitchens and laundries.
- Bond to non-current carrying parts of Electrical Installation in associated spaces to BS 7671 and BS 7430.
- Use clamps to BS 951 for bonding of pipes.

320.050 MEDIUM VOLTAGE CABLE SHEATHS AND ARMOUR:

Bond the sheaths and armour of medium voltage cables solidly to earth,

- 3 core cable - At both ends.
- Single core tails
- At both ends of tail.
- Single core cables
- Solid.
- Single point
- Cross-bonding

320.060 LOW VOLTAGE SHEATHS AND ARMOUR:

Bond the sheaths and armour of low voltage cables solidly to earth,

- 3 core cables, at both ends.
- Single core cables

- At both ends.
- Single point, with separate circuit protective conductors.

320.080 IDENTIFICATION:

Use numbered and/or lettered plastic cable sleeves to indicate circuit numbers and phases of corresponding phase conductors.

Ensure conductors are connected to earth bar in same sequence as phase and neutral conductors.

Identify at substation, switchboard and building earth bars each protective, bonding and earthing conductor. Provide labels on bars adjacent to each conductor.

320.130 EARTHING OF CONSTRUCTION SITE ELECTRICAL SYSTEMS:

Earth construction site electrical systems to BS 7430, BS 4363 and BS 7375.

Y60 CONDUIT AND TRUNKING

Y60.1000 GENERAL

Y60.1010 STANDARDS:

Provide conduit and cable trunking in accordance with the relevant British Standards and in particular the requirements of BS 7671 Requirements for Electrical Installations (The IET Wiring Regulations).

- BS7671 Amendment 3

Y60.2010A CONDUIT SYSTEMS METAL RIGID CLASS 2:

- Fittings
  - 2020A RIGID CONDUIT SYSTEM - METALLIC CONDUIT:
    Use couplers to match conduit grade and finish.
    Use solid couplers to join lengths of conduit.
    Conduit fittings and adaptable boxes
      Material - Malleable iron adaptable boxes.
      Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
      Ensure fittings are same class and finish as associated conduit system.
      Supply covers for circular or adaptable boxes in the same material and finish as boxes.
      Use steel dome or cheese headed screws to secure covers for Class 2 finish.
      Use brass dome or cheese headed screws to secure covers for Class 4 finish.
      Limit number of entry holes within loop-in boxes to four.
      Adaptable box, minimum size - 100mm x 100mm x 50mm.
    Connections
      Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes.
      Use solid couplers.
    Conduit fixing saddles - Spacer bar.
    Plugs - Hexagonal malleable iron.
    Locknuts - Hexagonal steel.
  - 2020B RIGID CONDUIT SYSTEM - METALLIC CONDUIT AS DRAWINGS/SCHEDULES:
    Use couplers to match conduit grade and finish.
    Use solid couplers to join lengths of conduit unless inspection couplers are shown on the drawings or schedules.
    Conduit fittings and adaptable boxes
      Material - Malleable iron adaptable boxes.
      Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
      Ensure fittings are same class and finish as associated conduit system.
      Supply covers for circular or adaptable boxes in the same material and finish as boxes.
      Use steel dome or cheese headed screws to secure covers for Class 2 finish.

Use brass dome or cheese headed screws to secure covers for Class 4 finish.
Limit number of entry holes within loop-in boxes to four.
Adaptable box, minimum size - 100 mm x 100 mm x 50 mm.
Connections
Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes.
Use solid couplers.
Conduit fixing saddles - Spacer bar.
Plugs - Hexagonal malleable iron.
Locknuts - Hexagonal steel.
Provide conduit systems to BS EN 61386. Use conduit of each type from one manufacturer.
Material - Metal, steel.
Method of connection - Threadable.
Suitability for bending - Rigid, BS EN 61386-21.
Electrical characteristics - with electrical continuity.
Resistance against corrosive or polluting substances
Conduits with same protection outside and inside BS EN 61386-1 Table 10 Class 2
Medium protection
E.g. stove enamel or air drying paint.

Y60.2010B CONDUIT SYSTEMS METAL RIGID CLASS 4:

- Fittings
  - 2020A RIGID CONDUIT SYSTEM - METALLIC CONDUIT:

Use couplers to match conduit grade and finish.
Use solid couplers to join lengths of conduit.
Conduit fittings and adaptable boxes
Material - Malleable iron adaptable boxes.
Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
Ensure fittings are same class and finish as associated conduit system.
Supply covers for circular or adaptable boxes in the same material and finish as boxes.
Use steel dome or cheese headed screws to secure covers for Class 2 finish.
Use brass dome or cheese headed screws to secure covers for Class 4 finish.
Limit number of entry holes within loop-in boxes to four.
Adaptable box, minimum size - 100mm x 100mm x 50mm.
Connections
Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes.
Use solid couplers.
Conduit fixing saddles - Spacer bar.
Plugs - Hexagonal malleable iron.
Locknuts - Hexagonal steel.

- 2020B RIGID CONDUIT SYSTEM - METALLIC CONDUIT AS DRAWINGS/SCHEDULES:

Use couplers to match conduit grade and finish.
Use solid couplers to join lengths of conduit unless inspection couplers are

shown on the drawings or schedules.
Conduit fittings and adaptable boxes
Material - Malleable iron adaptable boxes.
Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
Ensure fittings are same class and finish as associated conduit system.
Supply covers for circular or adaptable boxes in the same material and finish as boxes.
Use steel dome or cheese headed screws to secure covers for Class 2 finish.
Use brass dome or cheese headed screws to secure covers for Class 4 finish.
Limit number of entry holes within loop-in boxes to four.
Adaptable box, minimum size - 100 mm x 100 mm x 50 mm.
Connections
Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes.
Use solid couplers.
Conduit fixing saddles - Spacer bar.
Plugs - Hexagonal malleable iron.
Locknuts - Hexagonal steel.
Provide conduit systems to BS EN 61386. Use conduit of each type from one manufacturer.
Material - Metal, steel.
Method of connection - Threadable.
Suitability for bending - Rigid, BS EN 61386-21.
Electrical characteristics - with electrical continuity.
Resistance against corrosive or polluting substances
Conduits with same protection outside and inside
High protection - Hot dip zinc coating. BS EN 61386-1 Table 10 Class 4.

Y60.2020A RIGID CONDUIT SYSTEM - METALLIC CONDUIT:

Use couplers to match conduit grade and finish.
Use solid couplers to join lengths of conduit.
Conduit fittings and adaptable boxes
Material - Malleable iron adaptable boxes.
Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
Ensure fittings are same class and finish as associated conduit system.
Supply covers for circular or adaptable boxes in the same material and finish as boxes.
Use steel dome or cheese headed screws to secure covers for Class 2 finish.
Use brass dome or cheese headed screws to secure covers for Class 4 finish.
Limit number of entry holes within loop-in boxes to four.
Adaptable box, minimum size - 100mm x 100mm x 50mm.
Connections
Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes. Use solid couplers.
Conduit fixing saddles - Spacer bar.

Plugs - Hexagonal malleable iron.
Locknuts - Hexagonal steel.

Y60.2020B RIGID CONDUIT SYSTEM - METALLIC CONDUIT AS DRAWINGS/SCHEDULES:

Use couplers to match conduit grade and finish.
Use solid couplers to join lengths of conduit unless inspection couplers are shown on the drawings or schedules.
Conduit fittings and adaptable boxes
  Material - Malleable iron adaptable boxes.
  Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
  Ensure fittings are same class and finish as associated conduit system.
  Supply covers for circular or adaptable boxes in the same material and finish as boxes.
  Use steel dome or cheese headed screws to secure covers for Class 2 finish.
  Use brass dome or cheese headed screws to secure covers for Class 4 finish.
  Limit number of entry holes within loop-in boxes to four.
  Adaptable box, minimum size - 100 mm x 100 mm x 50 mm.
Connections
  Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes. Use solid couplers.
Conduit fixing saddles - Spacer bar.
Plugs - Hexagonal malleable iron.
Locknuts - Hexagonal steel.

Y60.2080A CABLE TRUNKING AND FITTINGS:

Comply with BS 4678. Use trunking of each type from one manufacturer.

Y60.2090B METAL SURFACE TRUNKING - ZINC FINISH:

Material
  Steel trunking to BS 4678-1. Supply partitions and covers same material as trunking.
Gauge of metal - Table 1 BS 4678.
Trunking type
  Standard cable trunking with compartments.
Style
  Use trunking manufactured with inward return edge flanges and fitted with flange couplers which ensure that when the cover is removed a minimum of 80% of the nominal trunking or compartment width is available for access.
Protection to BS 4678-1
  Electroplated zinc having a minimum thickness of zinc coating of 0.0012mm inside and outside.

Hot dip zinc coated steel to BS EN 10326, BS EN 10327 or BS EN 10143.
Finish - Manufacturer's standard, all surfaces.
Colour - Self Colour or Manufacturer's standard.
Fixings
Use purpose made brackets to fix to structural steel or suspension rods.
Provide external fixing lugs where specified protection for the installation is IP44 or greater.
Fittings
Use bends, tees and angles of similar gauge, type and finish as trunking body and supplied by same manufacturer.

Use purpose Partitions and Covers
Ensure partitions are electrically continuous with the body of the trunking or provide a connector for a circuit protective conductor.
Ensure gap between partitions and lids maintains segregation of circuits.
Provide individual mounting plates for each accessory mounted on trunking covers.
Material - Same material as trunking.
Joints made jointing pieces fixed with screws into captive nuts. Ensure screws do not protrude through the nuts.
Ensure rigidity of trunking is maintained across joint.
Ensure external dimensions of trunking are maintained and not reduced by more than 4% across joints between trunking lengths and/or fittings.
Use purpose made fittings of the same manufacture where trunking connects to switchgear and distribution boards.
Provide flanges for connection of flush floor trunking to vertical trunking to maintain the cross sectional area of compartments with 50 mm minimum radius.
Maintain electrical continuity at each joint by a copperlink, (tinned copper for galvanized trunking), fixed on outside of trunking, secured by screws, nuts and shakeproof washers. Screws must not project through the nut. Make provision for continuity to be achieved without need to remove paint from ferrous metal where trunking has a painted finish.
Screws, Nuts, Washers
Do not use self tapping screws. Use cheese or round head screws except where provision is made for the use of counter-sunk heads.
Material
Use steel zinc coated
- BS 3382 Parts 1 and 2.

Cable supports
Provide horizontal trunking with removable cable retainers or bridges to retain cables in situ.
Provide vertical trunking with pin racks to support cables at 3000 mm maximum spacing.
Use insulated pins or insulation sleeved pins on pin racks.

Y60.2110A SERVICE OUTLET BOXES:

- Recess lids

Provide service outlet boxes and junction boxes constructed from sheet steel with same finish as trunking.

Maintain continuity and segregation of compartments through boxes and fit flyovers where necessary.
Provide service outlet boxes with separate and segregated access to outlets associated with each wiring compartment. Fit cable guard or grommet to each section.
Incorporate spigots on boxes for connection to trunking.
Make frames adjustable on each corner, recess lids.
Manufacture frame and lids for service outlet boxes and junction boxes of cast metal, and suitable to accept type of floor covering.
Outlet plates
- Provide outlet plates for each low voltage compartment equipped with socket outlets.
- Provide outlet plates for each extra low voltage compartment equipped with items.
- Provide outlet plates for each telephone compartment that ensure the telephone compartment and its outlet plate conform to the requirements of BT and of the telephone system installer, equipped with telephone outlets.
- Provide blank outlet plates for any unused compartments.

Y60.2120A POWER POLES:

Provide service poles complete with associated conduit or trunking fittings. Maintain continuity and segregation of circuits throughout. Provide outlet boxes with separate access to wiring compartments.
Material - Extruded Aluminium.
Finish - Manufacturer's standard.
Fixings - Free standing or complete with fixing brackets at top.

Y60.2150A SEPARATE OR MULTI-COMPARTMENT TRUNKING:

Use separate trunking or multi-compartment trunking for segregation of services.
Ensure steel partitions have a provision for connecting a circuit protective conductor.
Provide separation of wiring for circuits as required by BS 7671.

Y60.2170 SUPPORTS AND FIXINGS:

Provide proprietary suspension systems comprising channel sections with return lips and compatible fixing accessories made of material to BS EN 10162, BS EN 10210 and/or slotted angles to BS 4345.
Ensure support components for Class 4 conduit have the same finishing method as the conduit carried out after manufacture. Ensure components in direct contact with conduit match profile of conduit.
Ensure all steel components such as studding, bolts and steel screws, bolts, nuts and washers are either cadmium plated and passivated or zinc electroplated to BS 3382 after manufacture. Do not use metal fixing components likely to deteriorate and/or cause damage through electrolytic action.

Y60.3010A GENERAL:

Ensure entire system is electrically and/or mechanically continuous, to BS 7671.

Fire barriers

Comply with the requirements of BS 7671 wherever the conduit or trunking passes through the perimeter of a fire compartment (wall, floor or ceiling).

Appearance

Arrange conduit, trunking and ducting to present neat appearance, parallel with other service runs and lines of building construction, except where in screed or in-situ concrete. Ensure plumb vertical runs.

Cable installation

Install cable in conduit, trunking or equipment enclosures only when completely erected throughout its length.

Do not use framework of partitions or similar unless indicated.

Building expansion and settlement

Make provision in conduit and trunking at expansion and settlement joints to allow for movement of building structure. Provide circular through or adaptable boxes no more than 300 mm either side of expansion or settlement joints for conduit crossing.

Join boxes with flexible steel conduit type C or conduits arranged to form a telescopic joint and cover overall with PVC sleeve to provide minimum degree of protection of IP44 or purpose made telescopic joint protected by a PVC sleeve to at least IP44.

Quality

Cut conduit clean and square with axis. Remove any burrs prior to erection.

Site form 90^{o} in conduit wherever practical or use circular or adaptable boxes.

Construct bends and sets cold with a bending machine. Do not apply heat when forming sets or bends.

Use bending tools complying with British Standards appropriate to conduit material.

Ensure no indentation or reduction in cross sectional area occurs during installation.

Use correct tools to assemble conduit. Ensure no toolmarks or damage to components occurs.

Y60.3020 LAYOUT:

Ensure the maximum circuit lengths and groupings of cables indicated are not exceeded.

Conduit sizing

Where dimensions are not indicated select trunking and conduit sizes in accordance with Appendix A of Guidance Note I Selection and Erection published by the IET.

Y60.3030 SPACING:

Install conduit, trunking and equipment clear of other services. Measure distance from external surface of any thermal insulation. Notify instances where minimum clearance cannot be achieved and bond items concerned. Minimum general

spacings between conduits, trunking, equipment and
insulated steam services - 300 mm.
other services excluding steam - 150 mm.
above central heating radiators - 1000 mm.
ensure separation is in accordance with of Guidance Note I Selection and Erection published by the IET.

Y60.3040 CONDENSATION PREVENTION:

Install conduit and trunking systems to ensure internal condensation does not affect operation of associated circuits. Provide drainage points in accordance with BS 7671.
Where conduit passes through external wall between two areas of different ambient temperatures or in other locations likely to cause condensation, install a conduit or adaptable box. After wiring fill box with inert, permanently plastic compound with high insulation value.

Y60.3050A PROTECTION AND REPAIR OF STEEL COMPONENTS:

Paint joints of conduit and minor damages to finish of conduit and trunking immediately after erection or after damage occurs.
Use paint compatible with finish as follows
Galvanized finish, use two coats zinc rich paint.
Black enamelled finish, use two coats of good quality, air drying, black enamel paint.
Remove grease, oil, dirt and rust before applying protective paint.
Notify serious damage and repair or replace as instructed.

Y60.3060 EQUIPMENT CONNECTIONS:

Where surface mounted equipment is installed in conjunction with concealed conduit work, terminate concealed conduit at flush mounted conduit or adaptable box. Drill back of equipment, bush for back entry and mount equipment to conceal back box.
Connect to fixed equipment via conduit box located adjacent to termination point, using either solid or flexible conduit as indicated for final connection to equipment terminations.
Use conduit box as cable change point to facilitate changed wiring locally to adjacent equipment.
Connect trunking to equipment by specially fabricated connectors or by couplers and externally screwed brass bushes.

Y60.3070 CLEANING BEFORE WIRING:

Clean inside of conduits and trunking with swabs immediately before wiring.

Inspect all components and remove any foreign matter, fit temporary plugs to open ends of conduit and trunking to prevent ingress of water and solid material.

Y60.3080A WIRING:

Comply with BS 7671 when wiring installations.
Segregate circuits as indicated.
Ensure draw wires are left within empty conduits for use of specialist installers. Use draw wires comprising nylon tapes with fitted eyelets.
For concealed conduit ensure system is installed to enable re-wiring to be carried out from boxes for fittings or accessories only. Draw-in boxes will only be permitted with prior permission in writing.
Do not use tallow or any other substances to facilitate drawing-in of cables.

Y60.3090 BUILDERS WORK:

Ensure conduit is not concealed until work has been inspected and approved.
Obtain permission before horizontally chasing walls.
Ensure that conduit and fittings buried in concrete or behind plaster are protected against corrosion or electrolytic action prior to rendering.
Ensure conduit concealed in wall chases is covered by plaster and/or rendering to minimum depth of 12 mm.

Y60.4010 DRAW-IN BOXES:

Provide draw-in boxes in conduit at maximum intervals of 10 metres or after bends and/or sets totalling 180 degrees.

Y60.4020 INSTALLATION OF CAST IN OR BURIED CONDUIT:

Ensure cast-in conduits are firmly secured to reinforcing steelwork and that accessory and/or conduit boxes are secured so they do not move during subsequent building operations.
Ensure there is no blockage immediately shuttering is removed.
Check there is no mechanical damage to conduit in floor screed prior to screeding.
Fix securely before screed is poured. Provide temporary protection to conduits until screeds are laid.
Ensure minimum amount of cross-overs occur dependent upon screed depth. Do not install draw boxes in floors.
Do not install conduits
in screeds in areas indicated.
within site blinding.
in main structural slabs unless prior permission in writing is obtained.

Y60.4030 CONDUIT BOXES:

Ensure that wherever conduit boxes are cast in the face of the box is flush with the face of the concrete or plaster. Fit circular conduit boxes with extension rings to ensure a flush face with plaster or concrete or where terminal blocks are to be accommodated.
Ensure fixing holes are countersunk where material thickness allows or use round head screws to prevent damage to cables and remove burrs before cables are drawn in.
Use a minimum of two screw fixing for standard circular conduit boxes and four screws for large conduit boxes and adaptable boxes up to 150 mm x 100 mm.
Use back outlet boxes where surface conduits pass through walls, to outside accessories or lighting points.
Secure switch boxes and socket boxes using countersunk steel screws where provision is made for them or if not use round head screws. Use plug inserts and finally grout in position prior to plastering or screeding.

Y60.4040 FIXING CONDUIT:

Support conduit in accordance with Appendix I of Guidance Note I Selection and Erection published by the IET.
Ensure conduit is not under mechanical stress. Fix conduit boxes independently of conduit. Make allowance for any additional mechanical loading supported by conduit boxes.
Where protection is specified as IP44 or greater ensure fixings of conduit boxes are suitable to maintain degree of protection.
Use following methods of fixing conduit:-

LOCATION	TYPE OF FIXING
Floor screeds.	Saddles or crampets.
Buried in plaster or render.	Crampets or saddles.
Above false ceilings.	Saddles.
Surface.	Saddles.

Y60.4050 FLEXIBLE AND PLIABLE CONDUIT:

Use flexible conduit for final connections to motors, other equipment subject to vibration or adjustment and to thermostats, motorised valves and similar items mounted in pipelines or ducts.
Use sufficient length between equipment and circular through box at end of conduit run (minimum 450 mm) to allow necessary full range of withdrawal, adjustment or movement.
Use solid type adapters to terminate flexible conduit.
Use PVC covered flexible conduit where installed externally, exposed to weather or in any position where ingress of moisture or condensation may occur.

Y60.4060 SCREWED STEEL CONDUIT:

Use materials clean and free from defects, rust, scale and oil. Obtain prior permission in writing for use of materials subject to remedial work before erection. Repair any damage caused by threading, bending or erection by painting with zinc rich paint before any rust occurs.
Ensure length of thread on conduit matches that in conduit couplers, fittings or equipment with no thread exposed after erection except at running couplers.
Ensure conduits butt inside couplers.
Use lubricant when cutting threads.
Use minimum number of running couplings
For running couplings in Class 2 conduit, use coupler and locknut. Paint exposed thread with zinc rich paint.
For running couplings in Class 4 conduit, use three piece conduit unions.

Y60.4080 UNDERGROUND INSTALLATION:

Where buried below ground, use Class 4 conduit. Do not use any buried conduit boxes unless prior permission in writing has been obtained. Wrap conduit with PVC self-adhesive tape, half lapped. Extend taping 150 mm beyond point where conduit leaves ground. Install circular through conduit boxes at the end of the tape. Fill conduit boxes after cable installation with inert, permanently plastic compound with high insulation value, and wrap in PVC self adhesive tape.

Y60.5010 MANUFACTURE OF TRUNKING:

Take measurements on site before producing drawings for manufacture of trunking.

Y60.5020 ACCESS:

Arrange trunking to allow access to wiring. Locate covers on top or sides of trunking if practicable. Arrange access so covers are on a continuous face and cables can be laid in throughout the length of the trunking. Notify where either condition cannot be achieved.

Y60.5030A FIXING TRUNKING:

Ensure trunking is independently fixed and supported from building fabric. Obtain approval for proposed fixings/supports.
Support trunking in accordance with the manufacturers requirements and/or Guidance Note 1 Selection and Erection published by the IET.
Use two fixings minimum per standard length.

Y60.5040A STEEL TRUNKING:

Install steel trunking in accordance with the manufacturers requirements and those of BS 7671.
Use trunking to avoid multiple parallel conduit runs, subject to approval.
Cut trunking clean and square with axis, prepare ends and remove burrs and sharp edges. Ensure inside of trunking is free from anything liable to damage cables either during installation or after covers are fitted.
When trunking is held in a vice, ensure surfaces remain undamaged and components are not warped.
Avoid tool marking or damage to trunking system components.
Do not site fabricate trunking tees, bends, flanges and other accessories. Use only factory made accessories.
Form circular holes over 6 mm diameter in trunking body using correctly sized punch sets. Use twist drill for holes up to 6 mm maximum diameter.
Use only factory formed openings for accessories.
Line unprotected apertures in trunking with PVC or nylon edging strip.
Fit ends of runs with removable blanking plates.
Ensure connections are not made to covers unless indicated or approval obtained.
Provide fixed section of cover projecting 25 mm either side of fabric where trunking passes through wall, floors or ceiling.
Fit cable retaining straps at 500 mm intervals except where cover is on top.

Y61 HV/LV CABLES AND WIRING

Y61.1000 GENERAL

Y61.1010 CABLE MANUFACTURE:

Use new cables, delivered to site with seals intact, manufactured not more than one year prior to delivery, labelled with manufacturer's name, size, description, BS number, classification, length, grade and date of manufacture.

Y61.1020 CABLE CERTIFICATION MARKING:

Mark all types of cables with CENELEC cable certification marking or if included in British Approvals Service for Cables (BASEC) in accordance with BASEC regulations.

Y61.2005 LSOH SHEATHING:

Supply cables with Low Smoke Zero Halogen (LSOH) sheathing, tested in accordance with BS EN 50267 and BS EN 60332.

Y61.2010D STANDARD ORDINARY FLEXIBLE CORDS - MULTI COPPER CORES:

Standard - BS 6500, Tables 12 and 13, and 16; BS 7919 Tables 10 and 14.

Y61.2020E STANDARD POWER SUPPLY CABLES, COPPER CONDUCTORS, LSF SHEATHED AND ARMOURED:

Standard - BS 6724, Tables 4, 6, 8, and 10.
Mechanical protection - Armour.

Y61.2020G STANDARD CABLES FOR CONDUIT AND TRUNKING, COPPER CONDUCTORS, LSF INSULATED:

Standard - BS 7211, Tables 3(a) and 4(a).
Mechanical protection - Conduit and trunking.

Y61.2020J STANDARD FLAT CABLES, 2-CORE OR 3-CORE, COPPER CONDUCTORS WITH OR WITHOUT CPC, LSF INSULATED SHEATHED:

Standard - BS 7211, Table 7.

Y61.2020K STANDARD POWER SUPPLY CABLES, COPPER CONDUCTORS LSF INSULATION, SHEATHED:

Standard - BS 7211, Tables 5 and 6.
Mechanical protection - Unarmoured.

Y61.2020M STANDARD CABLES WITH DEFINITE FIRE PERFORMANCE:

Standard - BS 7629-1 type as shown on drgs/schedules.
Fire performance BS 5839-1 Standard.
Sheath colour - red.
Mechanical protection, as shown on drgs/schedules.

Y61.2020N STANDARD CABLES FOR WALLS, PARTITIONS AND BUILDING VOIDS WHERE PENETRATION BY SHARP OBJECTS IS A HIGH RISK:

Standard - BS 8436.

Y61.2030A STANDARD 3.3 KV, COPPER CONDUCTORS, ARMOURED AND LSF SHEATHED CABLES:

Standard - BS 5467, Tables 14 and 16; BS 6346, Tables 15 and 17; BS 6622, Tables 2 and 3.
Mechanical protection - Armour.

Y61.2030B STANDARD 3.3 KV, COPPER CONDUCTORS, ARMOURED AND LSF SHEATHED CABLES:

Standard - BS 6724, Tables 14 and 16.
Mechanical protection - Armour.

Y61.2030C STANDARD 11 KV, COPPER CONDUCTORS, ARMOURED AND SHEATHED CABLES:

Standard - BS 6622, Tables 4 and 5.
Mechanical protection - Armour.

Y61.2050C PAIRED, SCREENED AND UNARMOURED CONTROL CABLES:

Standard - BS 5308-1, Tables 3, 5 and 9.
Mechanical protection - Unarmoured, Type 1.

Y61.2050G MULTI-CORE UNARMOURED LSF, SHEATHED AUXILIARY CABLES:

Standard - BS 7211, Table 6
Mechanical protection - Unarmoured.

Y61.2080A STANDARD COAXIAL CABLES, FOR BROADCAST RECEIVING:

Standard - BS EN 50117.

Y61.2100A INFORMATION TECHNOLOGY CABLES - STRUCTURED WIRING:

Provide IT cables in accordance with the IT system suppliers specification.
Type of system - Structured cabling; EIA/TIA 568.
Specification - EIA/TIA 568; UTP (EIA/TIA TSB-36).
Termination reference
EIA/TIA 568; RJ45 (EIA/TIA TSB-40).
Cable construction - Multi pair; unshielded (UTP).

Y61.3010A CABLES GLANDS - UNARMOURED CABLES, INDOORS:

Cable type
Flexible; wiring and power; control and auxiliary; and communications.
Standard - BS EN 50262 non-metallic, cable retention, IP54; A1P.
Environment - Indoor.

Y61.3010B CABLES GLANDS - UNARMOURED CABLES, OUTDOORS:

Cable type
Flexible; wiring and power; control and auxiliary; and communications.
Standard - BS EN 50262 non-metallic, cable retention, IP54; A2P.
Environment - Outdoor.

Y61.3010C CABLES GLANDS - ARMOURED CABLES, DRY INDOORS:

Cable type
Wiring and power; and control and auxiliary.
Standard - BS EN 50262 metallic, cable retention Class A, protective connection to earth, IP54.
Environment - Dry indoors.

Y61.3010D CABLE GLANDS - ARMOURED CABLES, INDOORS:

Cable type
Wiring and power; and control and auxiliary.
Standard - BS EN 50262 metallic, cable retention Class A, protective connection to earth, IP54.
Environment - Indoor.

Y61.3010E CABLE GLANDS - ARMOURED CABLES, OUTDOORS:

Cable type
Wiring and power; and control and auxiliary.
Standard - BS EN 50262 metallic, cable retention Class A, protective connection to earth, IP54 with shroud.
Environment - Outdoor.

Y61.3030A VOLTAGE SURGE SUPPRESSORS FOR CABLES:

Provide voltage surge suppressors in accordance with cable and equipment manufacturer's recommendations.

Y61.3050A LSF INSULATING TAPE:

Standard - BS 3924, LSF material.

Y61.3080A CONNECTORS FOR COAXIAL CABLES - BROADCAST RECEIVING:

BS 3041-2 or UHF to BS 3041-12.

Y61.3110A CABLE DUCTS:

Standard
BS 65, DN 90; BS 4660; or NJUG 6, provided by Electricity Supply Company.

Y61.3120A CABLE SLEEVES:

Supply and hand to others for installation non ferrous cable sleeves for incorporation into the structure where cables pass through fire compartment floors and walls.
Packing material
Weak mix mortar; intumescent, plaster or mastic; solid intumescent material; or intumescent granule filled bags.

Y61.3130A CABLE COVERS AND MARKERS:

Material - Recovered plastic, integral tape.
Marking - Electricity or telephone.
Plastic marker tape
Yellow, marked electricity or telephone.

Y61.4010 CABLE INSTALLATION - GENERAL:

Use and install cables only as directed in the appropriate standard or as directed by the manufacturer in writing. Lay cables in one length unless otherwise indicated. Obtain permission from supervising officer for all through joints, and where overall length requirement exceeds practical drum size.
Install cables when ambient temperature is 5^{o}C or greater, using cables stored at or above this temperature for not less than 24 hours.
Use drum stands, drum axles, fair leads, rollers, cable stockings and other equipment as recommended by the cable manufacturer and as appropriate to the method of installation.

Y61.4020 CABLE INSTALLATION IN LOW TEMPERATURES:

Install cables at lower installation temperatures when authorised by manufacturer in a written statement.

Y61.4030 INSTALLATION OF LSF CABLE:

Install LSF cables in accordance with manufacturer's instructions. Ensure ambient temperature is above 5^{o}C. Ensure oversheaths are not damaged by abrasion or scuffing.

Y61.4040 INSTALLATION OF UNARMOURED CABLES:

Install and use unarmoured cable to BS 6004, BS 6007, BS 6500, BS 7211 and BS 7919 in accordance with BS 7540 or the manufacturer's written instructions.

Y61.4050A CABLE TRENCHES:

Ensure that trenches for cables and cable ducts are prepared, backfilled and reinstated.
Supervise all work to cable trenches by others.
Carry out walk over survey of trench route, dig trial hole in any area considered to be potentially difficult. Establish location of any other underground service adjacent to cable route.

Re-plan cable routes after survey and trial holes. Submit report of survey and trial holes.
Carry out any instructed work to adjacent services. Set out cable trenches, excavate trench carefully setting aside any materials required for backfilling or reinstatement.
Minimum cover in cable trenches
HV cables 800mm; LV cables 500mm; communications cables 500mm; all cables 800mm under roadways.
Trench
Common trench for all underground services.
Grade trench bottom to a maximum slope of 1:12.
Clear trench bottom of loose stones and place bedding to full width of trench.
Bedding
Riddled earth 6mm grid for cables; riddled earth 12mm grid for ducts; imported soft sand; or pea shingle, for ducts.
Bedding thickness - 75mm; or 100mm for ducts.
Install cables or ducts. Haunch cables or ducts in bedding material to a minimum depth of 75mm above highest cable or duct.
Cable or duct identification
Warning tape - Yellow with black legend.
Backfill trench using two layers 100mm thick hand rammed. Complete backfilling in layers and reinstate trench.
Backfill material - as excavated from trench.

Y61.4060 CABLE INSTALLATION IN TRENCHES:

Lay cables on newly prepared bedding. Ensure multiple layers of cable are separated vertically by a 50mm layer of hard rammed bedding material.
When using a power winch ensure tension on the cable is taken by element of the cable designed for that purpose, that is armour or conductor cores as appropriate and not plastic sheath, metal sheath or core insulation.
When hand pulling cable ensure no kinks are formed and that flaking, when used, is done in the correct direction.
Do not allow cable to twist during installation. Use swivels to connect pulling bond to cable stocking or equivalent fitting.
Check drum is suitable for jacking before commencing installation. If drum or reel is unsuitable for jacking, flake cable in correct direction in maximum size turns from drum or reel before commencing installation. Use skilled labour to supervise all unreeling, flaking or running of cable from a drum.
Lay cables in the formation shown, ensure spacing is not reduced below that indicated.
Bind trefoil groups at 1m intervals. Bind any associated earth or protective conductor to its cable or trefoil group at 1m intervals.
Ensure installation radii and permanent bending radii are not less than those recommended by the manufacturer.
Do not lay cables to BS 6004, BS 6007, BS 6500, BS 7211 or BS 7919 direct in the ground.

Y61.4070A CABLE DUCTS:

Duct work

Supervise the laying of ducts by others.

Lay ducts in the formation shown, on to newly prepared bedding. Joint ducts in accordance with the manufacturer's instructions.

Ensure that ducts slope no more than 1:60 vertically or 1:30 horizontally.

Ensure that pre-formed duct bends used at ends of duct routes meet the requirements of the cable manufacturer for bending radii.

Construct manholes, draw pits and jointing chambers.

Prove alignment of completed duct run by drawing through a mandrel 7mm diameter less than nominal duct bore for minimum length 250mm. Clean completed duct run by drawing through a circular wire brush 12mm diameter more than nominal duct bore.

Install a draw wire of corrosion resistant material and minimum breaking strength 550N in each empty duct.

Plug and seal all ducts with proprietary duct plugs, on completion.

Y61.4090A CABLE INSTALLATION IN CONDUIT AND TRUNKING:

Install cables so that they are orderly and capable of being withdrawn.

Arrange single core wiring generally using the loop-in method.

Trunking

In vertical trunking provide pin racks at 3m intervals. Use ties at 2m intervals for all wires of the same circuit reference. Mark ties with circuit reference number at 10m intervals.

Conduit

Provide cable clamps in conduit boxes at 10m intervals in vertical conduit.

Allow for full range of movement at building construction movement joints. Make all joints to wiring at terminal blocks in conduit boxes.

Y61.4120A CABLE EMBEDDED INSTALLATION:

Dress cables flat, free from twists, kinks and strain, and align parallel to building elements. When glands and clamps are not required, take sheathing of cables into accessory boxes and equipment and protect against abrasion using grommets or similar sharp edge protection.

Ensure plaster or screed over cable is a minimum of 12mm. Protect embedded cables with metal capping or PVC oval conduit.

Y61.4130A CABLE INSTALLATION - MINERAL INSULATED CABLES:

Straighten and dress cables using methods and tools recommended by cable manufacturer.

Use thermoplastic or LSF sheathed cables in location indicated, and where cables may come into direct contact with any material that may be corrosive to copper.

Do not allow extra length on installed cables to allow for cutting back of moisture

affected ends. Store mineral insulated cables in the form as supplied by manufacturer.

Y61.4140 CABLE INSTALLATION - FLEXIBLE CORDS:

Grip cords securely at connections. Where they do not form an integral part of the connected accessory or equipment, provide separate proprietary cord grips.

Y61.4150A CABLE JOINTING AND TERMINATING GENERALLY:

Ensure all joints and terminations are made by appropriately qualified cable jointers, using jointing materials, components and workmanship recommended by the cable manufacturer and the jointing accessory manufacturer. Install cable glands in accordance with BS 6121-5.

Cold pour resin and heat shrink joints.

Cut all cable ends immediately prior to jointing or terminating. Seal cables left unconnected for more that 24 hours to prevent the ingress of moisture. Seal plastic sheathed cables using proprietary shrink on end caps. Seal lead sheathed cables by a plumbed dressed lead cap with an airspace to allow conductor movement.

Strip cables to bring out the cores and expose conductors, for the minimum length required for connection, to leave no exposed length of conductor after termination. Ensure that strands are not damaged when stripping cable cores. Twist strands together. Do not reduce number of strands. Secure all strands at terminations. Clean armour thoroughly prior to jointing or terminating.

At connections to equipment and switchgear without integral cable clamping terminals, use compression or solder type lugs for bolted terminal connections, of correct bore.

Form all compression connections to components using tools that cannot be released unless the correct degree of compression has been achieved.

Install and inspect compression and mechanical connectors on conductors in accordance with BS 6360 to BS 7609.

Bolt core terminations with lugs to equipment using washers or proprietary shakeproof devices.

Do not bunch more than three cores at clamping terminals or bolted connections. Mark cable conductor phasing, or other core identification, at each end of all cables, and at all joints, maintaining consistency of marking with any existing system. Connect all cores, including multicore cable spare cores, at all joints and terminations. Bond any unused cores or multicore cables to earth at both ends, unless otherwise indicated.

Y61.4180A TERMINATING - MINERAL INSULATED CABLES:

Use terminations in accordance with BS EN 60702-2 and components and materials recommended or supplied by cable manufacturer.

Use seals with maximum temperature rating indicated, stub caps to the largest size available, and drilled caps and headed sleeves for larger sizes.

Use glands of type indicated. At terminations to accessory boxes within a plaster or

render finish, cable clamps fixed to accessory box and firmly gripping cable sheath may be used. Use earth tail seals with sheath grip type accessory boxes.
At equipment not provided with threaded entries secure glands using lock washers and locknuts or brass conduit bush. Use gland shrouds when plastic covered MI cables are used.
Using PVC, PIB or LSF material tape to BS 3924 or BS EN 60454 to match sheath, tape overall gland any bare copper sheath and form seal to cable sheath under all shrouds.
Mark core sleeving with appropriate identification.
Install voltage surge suppressors in accordance with manufacturer's recommendations and surge suppressors to BS 7671, Section 331-01-01.

Y61.4190A CABLE JOINTS - MINERAL INSULATED CABLES:

Joint mineral insulated cables using methods and materials recommended by cable manufacturer. Terminate cables in externally threaded glands using seals with temperature rating indicated. Join conductors using crimped connectors.
Insulate connectors using PVC tape to BS 3924 or BS EN 60454, ensuring good seal to conductor sleeving. Make off glands into either end of internally threaded brass sleeve of correct size. Protect brass sleeve using heat shrink sleeve.

Y61.4210 CABLE SLEEVES:

Pack sleeves with fire resistant material after cable installation.

Y62 BUSBAR TRUNKING

Y62.1000 GENERAL

Y62.1010 BUSBAR SYSTEMS STANDARDS:

Supply and install busbar trunking systems in accordance with BS EN 60439-1, BS EN 60439-2 and in particular the requirements of BS 7671 Requirements for Electrical Installations (The IET Wiring Regulations).

- BS 7671 Amendment 3

Y62.2010A GENERAL PURPOSE BUSBAR EXCEPT WALL/DADO:

System characteristics

Electrical Supply - Voltage between phases 400 volts; frequency 50 Hz.

Rate system to withstand a short circuit fault current of 21 kA.

Short time rating - 0.2 seconds.

Busbar

Use high conductivity busbars and connections.

Material - Copper.

Number of Poles - 3 phase and full size neutral.

Y62.2020A GENERAL PURPOSE STEEL BUSBAR TRUNKING:

Busbar trunking type

Surface; flush; bench or underfloor.

Steel enclosure

Comply with relevant sections of BS 4678.

Apply high standard of finish to busbar trunking. For a painted finish apply a minimum of one coat rust inhibiting primer, one undercoat and two semi-gloss finish coats.

Remove rust and degrease metal prior to application of selected finish. Zinc coated steel is acceptable as anti-rust treatment.

Use rust-proofed (e.g. cadmium plated) screws, bolts, nuts and washers.

Finish - Paint or Stove enamel.

Colour- Manufacturer's standard colour.

Fittings

Use trunking fittings of the same type and manufacture as the busbar trunking. Use screw fixed covers. Use manufacturer's purpose made units at changes of direction.

Supply termination

Provide facilities for the correct termination of supply cable.

Fixings

Provide external fixing brackets at not greater than 2m intervals. In accordance with manufacturer's instructions and recommendations.

Marking

Provide clear marking of busbars and tap-off outlet sockets with phase colours to

enable sequence identification throughout system.

Y62.2040A INTERNAL PROTECTIVE CONDUCTORS:

•Standard BS EN 61534-1.
Provide protective conductor throughout busbar system length to manufacturer's standard.
Busbar pole with tap-off at each socket for wall/dado type with integral socket outlets.
Install protective conductor internally to busbar enclosure.
Bond protective conductor to trunking enclosure using a method in accordance with BS 7430 at 1.2m maximum intervals.
Use high tensile brass bolts and locking nuts.
Complete trunking system before installing the protective conductor.
Ensure the continuity of protective circuits.

Y62.3010 GENERAL:

Install busbar trunking in accordance with manufacturer's instructions and the relevant standards.
Check total length of busbar system required on site prior to manufacture commencing.
Fit covers at end of each run or provide proprietary end boxes.

Y62.3020 BONDING:

Bond between adjacent lengths of busbar trunking with approved mechanical means to maintain conductivity, where two or more parallel runs of busbar trunking occur.
Tighten bolted connections between adjacent lengths of busbars to correct torque setting. Avoid damage to conductors.

Y62.3030 EXPANSION:

Anchor busbars rigidly in a minimum of one position and provide means of absorbing maximum expansion and contraction likely to occur in busbars under normal operating conditions.
Provide expansion joints in each length of run

Y62.3040 LABELS:

Fix identification and warning labels throughout system length.

Y62.3050 FIRE BARRIERS:

Provide barriers of fire-resisting materials within the busbar trunking where vertical runs pass through floors and horizontal runs pass through fire break walls to prevent spread of fire. (BS 7671 Chapter 527).

Y63 SUPPORT COMPONENTS – CABLES

Y63.1000 GENERAL

Y63.1010 APPLICATION:

Cables referred to in this section are only those types that can be installed without further mechanical protection.

Y63.2010A CABLE SUPPORTS AND FINISHES:

Cable supports

Support all cables throughout their length using conduit; or trunking and enclosures; or cable tray; or cable racking; or special support systems; or cleat or clip fixing direct to building fabric as indicated on the drawings/schedules.

Ensure tray, racking and special support systems are continuous and firmly fixed to building fabric. Allow space for additional cables as indicated on the drawings/schedules.

Ensure cable support system allows for spacing in accordance with BS 7671 for the design current of the cable.

Fixings finishes

Ensure finish for all support components, fixings, hangers and accessories is as cable support system or manufacturer's standard.

Y63.2020A CABLE SUPPORT SYSTEM - PERFORATED TRAY:

Type - Flanged or return flanged.

Perforations

Admiralty pattern for light or medium duty; GDCD pattern standard 23; or manufacturer's standard pattern.

Thickness - Manufacturer's standard thickness for type.

Fittings

Use factory made fittings throughout of same material, type, pattern, finish and thickness as cable tray.

Use reducers, inside angles and outside angles as manufacturer's standard.

Use flat bends, equal tees, unequal tees and crosses with corners gusseted.

Join lengths of tray and fittings using manufacturer's standard shouldered ends, fish plates, or couplers, with galvanized or zinc plated slotted domed head `roofing' bolts, nuts, washers and shakeproof washers.

Material

Hot rolled steel galvanized after manufacture to BS EN ISO 1461; or bending and profiling quality hot dipped galvanized steel to BS EN 1026, BS EN 10327 or BS EN 10143.

Finish - Self colour galvanized.

Y63.2020B CABLE SUPPORT SYSTEM - CABLE RACK:

Proprietary system of channel sections with return lip and compatible jointing and fixing accessories
Fittings
Use factory made fittings throughout of same material finish and section as rack, for risers, bends, reducers, tees, crosses and drop outs.
Material
Hot rolled steel galvanized after manufacture to BS EN ISO 1461; or bending and profiling quality hot dipped galvanized steel to BS EN 10326, BS EN 10327 or BS EN 10143.
Finish - Self colour galvanized.

Y63.2020C CABLE SUPPORT SYSTEM - CABLE CLEATS:

One piece or single way pattern or claw pattern or two bolt pattern.
Material
Die cast aluminium alloy; moulded black polyethylene; or nylon.
Finish - Self finish.

Y63.2025A CABLE SUPPORT SYSTEM - PROPRIETARY CABLE TIES:

Two piece cable tray pattern, on cable tray only. Wrap round self locking non releasable pattern on everything except cable trays.

Y63.2025C CABLE SUPPORT SYSTEM - TWO WAY SADDLES:

Bright copper for unsheathed mineral insulated cables. PVC covered bright copper for sheathed mineral insulated cables.

Y63.2025D CABLE SUPPORT SYSTEM - CABLE BASKET:

Proprietary system of wire basket with compatible jointing and fixing accessories.
Fittings
Use factory made fittings throughout of same material finish as basket, for risers, bends, reducers, tees, crosses and drop outs.

Y63.3010 CABLE TRAY INSTALLATION:

Support from building fabric with minimum clearance behind of 20mm. Install fixings at regular intervals to prevent visible sagging when loaded, with maximum spacing 1.2m and 230mm from fittings.
Keep cutting of cable tray to a minimum. Cut along a line of unperforated metal.
Make good finish with zinc rich paint, primer and top coat, or two pack epoxy paste, as appropriate to tray material and finish.

Fit holes cut in tray for passage of cables with grommets, bushes or other lining. Install all bolts, fixings and hangers with threaded portion away from cables.

Y63.3020A CABLE CLEATS, TIES, SADDLES AND CLIPS INSTALLATION:

For cables on horizontal tray use ties for each circuit. Use tie manufacturer's special tensioning tool where available. Crop off tie ends.
For cables on vertical tray use cleats bolted to tray for paper, plastic or elastomeric insulated cables and saddles or clips for mineral insulated cables. Use cleats sized to grip cables firmly without undue pressure or strain on cable, but preventing slipping.
For cables on vertical or horizontal rack use proprietary fixings to rack for paper, plastic or elastomeric insulated cables and saddles or clips for mineral insulated cables. On continuous flat surfaces of wood, plaster, brick etc.

Use polypropylene surface fixing clips with prefixed hardened steel pin for PVC insulated and sheathed cables and sheathed or bright mineral insulated cables. Use round or flat or flat twin pattern as appropriate, manufactured specifically for cable being fixed.

Use one hole 'P' clips or two way saddles of bright copper for unsheathed mineral insulated cable. Use PVC covered for sheathed mineral insulated cables.

Space cleats, ties, saddles and clips

As of Guidance Notes `Selection & Erection' published by the IET.

Y71 LV SWITCHGEAR AND DISTRIBUTION BOARDS

Y71.1000 GENERAL

Y71.1020A 3 PHASE ELECTRICITY SUPPLY:

Ensure all electrical equipment supplied and installed is suitable for 3 phase power supply to BS 7697.

Y71.1020B SINGLE PHASE ELECTRICITY SUPPLY:

Ensure all electrical equipment supplied and installed is suitable for single phase power supply to BS 7697.

Y71.2010A CUBICLE SWITCHBOARD - LV SWITCHGEAR AND CONTROL GEAR ASSEMBLY:

Standard - BS EN 60439-1.
External design - Cubicle type assembly.
Usage - Switchboard.
Conditions of installation - Indoors.
Electrical characteristics
  Rated operational voltage 400V +10% -6%
Service conditions
  Ambient air temperature and altitude as BS EN 60439.

Y71.2010B CUBICLE CONTROL PANEL - LV SWITCHGEAR AND CONTROL GEAR ASSEMBLY:

Standard - BS EN 60439-1.
External design - Cubicle type assembly.
Usage - Control panel.
Conditions of installation - Indoors.
Electrical characteristics
  Rated operational voltage 400V +10% -6%
Service conditions
  Ambient air temperature and altitude as BS EN 60439.

Y71.2010C MULTI-BOX SWITCHBOARD - LV SWITCHGEAR AND CONTROL GEAR ASSEMBLY:

Standard - BS EN 60439-1.
External design - Multi-box type assembly.
Usage - Switchboard.

Conditions of installation - Indoors.
Electrical characteristics
Rated operational voltage 400V +10% -6%
Service conditions
Ambient air temperature and altitude as BS EN 60439.

Y71.2010D MULTI-BOX CONTROL PANEL - LV SWITCHGEAR AND CONTROL GEAR ASSEMBLY:

Standard - BS EN 60439-1.
External design - Multi-box type assembly.
Usage - Control panel.
Conditions of installation - Indoors.
Electrical characteristics
Rated operational voltage 400V +10% -6%
Service conditions
Ambient air temperature and altitude as BS EN 60439.

Y71.2020A FLOOR STANDING ASSEMBLY CONSTRUCTION:

Enclosure standard - BS EN 62208.
Material of enclosure - Manufacturer's standard.
Terminals for external conductors, main power circuits
Accommodate cross-sectional area of copper cables in accordance with BS EN 60439-1.
Terminals for external conductor, control and auxiliary circuits
Terminal block. Mounting as manufacturer's standard.
Size of neutrals on three phase supplies - Full sized.
Degree of protection to BS EN 60529, IP31 for assembly.
Protection against direct and indirect contact
Manufacturer's standard.
Accessibility for inspection
Arrange for following operations to be performed when assembly is in service and under voltage
Visual inspection of switching devices and other apparatus; settings and indicators of relays and releases; conductor connections and markings.
Adjusting and re-setting of relays, releases and electronic devices.
Replacement of fuse links and indicating lamps.
Fault location by voltage and current measuring.
Accessibility for maintenance
Provide space between functional unit or group and adjacent functional units or groups. Provide retainable fastening means for parts likely to be removed for maintenance.
Removable parts and withdrawable parts as manufacturer's standard.
Internal separation - Form 4.
Input voltage variations for electronic equipment supply - BS EN 60439.
Supply frequency deviation - BS EN 60439.
Mounting - Floor standing.

Y71.2020B WALL MOUNTED ASSEMBLY CONSTRUCTION:

Enclosure standard - BS EN 62208.
Material of enclosure - Manufacturer's standard.
Terminals for external conductors, main power circuits
Accommodate cross-sectional area of copper cables in accordance with BS EN 60439-1.
Terminals for external conductor, control and auxiliary circuits
Terminal block. Mounting as manufacturer's standard.
Size of neutrals on three phase supplies - Full sized.
Degree of protection to BS EN 60529, IP31 for assembly.
Protection against direct and indirect contact
Manufacturer's standard.
Accessibility for inspection
Arrange for following operations to be performed when assembly is in service and under voltage
Visual inspection of switching devices and other apparatus; settings and indicators of relays and releases; conductor connections and markings.
Adjusting and re-setting of relays, releases and electronic devices.
Replacement of fuse links and indicating lamps.
Fault location by voltage and current measuring.
Accessibility for maintenance
Provide space between functional unit or group and adjacent functional units or groups. Provide retainable fastening means for parts likely to be removed for maintenance.
Removable parts and withdrawable parts as manufacturer's standard.
Internal separation - Form 4.
Input voltage variations for electronic equipment supply - BS EN 60439.
Supply frequency deviation - BS EN 60439.
Mounting - Wall mounted.

Y71.2030A ENCLOSURE FINISH:

Apply high standard finish to enclosure and supporting metalwork. Degrease metal and remove rust prior to applying finish.
Comply with paint manufacturer's recommendations regarding preparation, stoving times, temperatures, mixing of finishes, application and coat thickness.
Finish - Manufacturer's standard.
Colour - Manufacturer's standard colour.

Y71.2040A TYPE TESTS:

Provide certificates of verification.

Y71.2060 SITE BUILT ASSEMBLIES:

Ensure that components of site assemblies are part of a proprietary system and type tested as appropriate.
Install assemblies in accordance with manufacturer's drawings and instructions.

Y71.2070 SITE MODIFICATION:

Do not make site alterations unless authorised. Where site modifications to assemblies are authorised make in accordance with manufacturer's certified drawings and instructions. Ensure that modifications made comply with type test certificate obtained for arrangement of components.

Y71.2080A WALL MOUNTED, TOP ENTRY BATTERY CHARGER AND BATTERY UNIT:

Supply a unit for tripping.
Input Supply - 230 V single phase 50 Hz.
DC Output
Voltage - 50 Volt -20% +10%
Operating temperature range - -10ºC - 45ºC.
Charger type - Thyristor or transistor.
Battery type
Lead acid (sealed) or Nickel Cadmium (maintenance free).
Cubicle (sheet steel) - Wall mounted.
Cable entry - Top.
Finish - Manufacturer's standard.
Colour - Manufacturer's standard.
Ventilation - Natural.
Facilities - MCB input protection; float charge.
Battery over-discharge protection
Fuses for battery protection; MCB's for outgoing circuits; automatic selection of boost charge.
Meters
Battery voltage; charging current (dual scale for float and boost); output current.
Lamp indications
Supply on; supply fail (monitor input terminals); floatcharge; boost charge; no charge (when supply is on); battery voltage low; battery voltage high.
Alarms (connected to operate a relay with shrouded 230V3A a.c. or 0.5A d.c. N/C volt free contacts, closed on any alarm, for remote indication circuit)
Supply failed; no charge (when supply is on); battery voltage low; battery voltage high.

Y71.2080B WALL MOUNTED, BOTTOM ENTRY, BATTERY CHARGER AND BATTERY UNIT:

Supply a unit for tripping.

Input Supply - 230 V single phase 50 Hz.
DC Output
Voltage - 50 Volt -20% +10%
Operating temperature range - -10ºC - 45ºC.
Charger type - Thyristor or transistor.
Battery type
Lead acid (sealed) or Nickel Cadmium (maintenance free).
Cubicle (sheet steel) - Wall mounted.
Cable entry - bottom.
Finish - Manufacturer's standard.
Colour - Manufacturer's standard.
Ventilation - Natural.
Facilities - MCB input protection; float charge.
Battery over-discharge protection
Fuses for battery protection; MCB's for outgoing circuits; automatic selection of boost charge.
Meters
Battery voltage; charging current (dual scale for float and boost); output current.
Lamp indications
Supply on; supply fail (monitor input terminals); floatcharge; boost charge; no charge (when supply is on); battery voltage low; battery voltage high.
Alarms (connected to operate a relay with shrouded 230V 3A a.c. or 0.5A d.c. N/C volt free contacts, closed on any alarm, for remote indication circuit)
Supply failed; no charge (when supply is on); battery voltage low; battery voltage high.

Y71.2080C FLOOR STANDING, TOP ENTRY, BATTERY CHARGER AND BATTERY UNIT:

Supply a unit for tripping.
Input Supply - 230 V single phase 50 Hz.
DC Output
Voltage - 50 Volt -20% +10%
Operating temperature range - -10ºC - 45ºC.
Charger type - Thyristor or transistor.
Battery type - Lead acid (sealed) or Nickel Cadmium (maintenance free).
Cubicle (sheet steel) - Floor standing.
Cable entry - Top.
Finish - Manufacturer's standard.
Colour - Manufacturer's standard.
Ventilation - Natural.
Facilities - MCB input protection; float charge.
Battery over-discharge protection
Fuses for battery protection; MCB's for outgoing circuits; automatic selection of boost charge.
Meters
Battery voltage; charging current (dual scale for float and boost); output current.
Lamp indications
Supply on; supply fail (monitor input terminals); float charge; boost charge; no

charge (when supply is on); battery voltage low; battery voltage high.
Alarms (connected to operate a relay with shrouded 230V 3A a.c.or 0.5A d.c. N/C volt free contacts, closed on any alarm, for remote indication circuit)
Supply failed; no charge (when supply is on); battery voltage low; battery voltage high.

Y71.2080D FLOOR STANDING, BOTTOM ENTRY, BATTERY CHARGER AND BATTERY UNIT:

Supply a unit for tripping.
Input Supply - 230 V single phase 50 Hz.
DC Output
Voltage - 50 Volt -20% +10%
Operating temperature range - -10ºC - 45ºC.
Charger type - Thyristor or transistor.
Battery type - Lead acid (sealed) or Nickel Cadmium (maintenance free).
Cubicle (sheet steel) - Floor standing.
Cable entry - bottom.
Finish - Manufacturer's standard.
Colour - Manufacturer's standard.
Ventilation - Natural.
Facilities - MCB input protection; float charge.
Battery over-discharge protection
Fuses for battery protection; MCB's for outgoing circuits; automatic selection of boost charge.
Meters
Battery voltage; charging current (dual scale for float and boost); output current.
Lamp indications
Supply on; supply fail (monitor input terminals); float charge; boost charge; no charge (when supply is on); battery voltage low; battery voltage high.
Alarms (connected to operate a relay with shrouded 230V 3A a.c.or 0.5A d.c. N/C volt free contacts, closed on any alarm, for remote indication circuit)
Supply failed; no charge (when supply is on); battery voltage low; battery voltage high.

Y71.2090A UTILISATION A, WITHDRAWABLE AIR BREAK CIRCUIT BREAKERS:

Provide circuit breakers in accordance with BS EN 60947. Ensure that uninterrupted current rating indicated applies when unit is enclosed and in operating environment at rated operational voltage.
Standard - BS EN 60947-2
Details of equipment - Circuit breaker.
Characteristics of circuit breakers
a.c. Interrupting medium - Air.
Rated and limiting values for the main circuit.
Rated voltage (Volts) - operational, 400.
Rated frequency 50 Hertz.

Circuit breaker Utilisation category - A.
Enclosure degree of protection IP 31.
Circuit breakers and switches
Provide metal clad withdrawable isolating removable type circuit breakers with provision for safe maintenance.
Closing mechanism
Independent manual spring operated.
Provide automatic shutters to cover all live contacts when circuit breaker is isolated, withdrawn or removed from housing.
Provide a padlock to lock circuit breaker in isolated/withdrawn position, and to lock automatic shutters covering live contacts when removed from housing.
Provide moulded case circuit breakers with provision for safe maintenance.

Y71.2090B UTILISATION A, MCCB AIR BREAK CIRCUIT BREAKERS:

Provide circuit breakers in accordance with BS EN 60947. Ensure that uninterrupted current rating indicated applies when unit is enclosed and in operating environment at rated operational voltage.
Standard - BS EN 60947-2
Details of equipment - Circuit breaker.
Characteristics of circuit breakers
a.c. Interrupting medium - Air.
Rated and limiting values for the main circuit.
Rated voltage (Volts) - operational, 400.
Rated frequency 50 Hertz.
Circuit breaker Utilisation category - A.
Enclosure degree of protection IP 31.
Circuit breakers and switches
Provide manual closing air-break circuit breakers, (MCCB).
Closing mechanism
Independent manual spring operated.
Provide automatic shutters to cover all live contacts when circuit breaker is isolated, withdrawn or removed from housing.
Provide a padlock to lock circuit breaker in isolated/withdrawn position, and to lock automatic shutters covering live contacts when removed from housing.
Provide moulded case circuit breakers with provision for safe maintenance.

Y71.2090C UTILISATION B, WITHDRAWABLE AIR BREAK CIRCUIT BREAKERS:

Provide circuit breakers in accordance with BS EN 60947. Ensure that uninterrupted current rating indicated applies when unit is enclosed and in operating environment at rated operational voltage.
Standard - BS EN 60947-2
Details of equipment - Circuit breaker.
Characteristics of circuit breakers

a.c. Interrupting medium - Air.
Rated and limiting values for the main circuit.
Rated voltage (Volts) - operational, 400.
Rated frequency 50 Hertz.
Circuit breaker Utilisation category - B.
Enclosure degree of protection IP 31.
Circuit breakers and switches
Provide metal clad withdrawable isolating removable type circuit breakers with provision for safe maintenance.
Closing mechanism
Independent manual spring operated.
Provide automatic shutters to cover all live contacts when circuit breaker is isolated, withdrawn or removed from housing.
Provide a padlock to lock circuit breaker in isolated/withdrawn position, and to lock automatic shutters covering live contacts when removed from housing.
Provide moulded case circuit breakers with provision for safe maintenance.

Y71.2090D UTILISATION B, MCCB AIR BREAK CIRCUIT BREAKERS:

Provide circuit breakers in accordance with BS EN 60947. Ensure that uninterrupted current rating indicated applies when unit is enclosed and in operating environment at rated operational voltage.
Standard - BS EN 60947-2
Details of equipment - Circuit breaker.
Characteristics of circuit breakers
a.c. Interrupting medium - Air.
Rated and limiting values for the main circuit.
Rated voltage (Volts) - operational, 400.
Rated frequency 50 Hertz.
Circuit breaker Utilisation category - B.
Enclosure degree of protection IP 31.
Circuit breakers and switches
Provide manual closing air-break circuit breakers, (MCCB).
Closing mechanism
Independent manual spring operated.
Provide automatic shutters to cover all live contacts when circuit breaker is isolated, withdrawn or removed from housing.
Provide a padlock to lock circuit breaker in isolated/withdrawn position, and to lock automatic shutters covering live contacts when removed from housing.
Provide moulded case circuit breakers with provision for safe maintenance.

Y71.2100A SWITCH DISCONNECTORS:

Supply switch disconnectors in accordance with BS EN 60947.
Standard - BS EN 60947-3
Details of equipment - Switch-disconnector.
a.c. Interrupting medium - Air.

Rated and limiting values for the main circuit.
Rated voltage (Volts) 230/400.
Rated frequency 50 Hertz.
Utilisation category - AC 23A.
Enclosure degree of protection IP 65.
Fit each switch with facility to padlock in OFF position.
Provide switches with auxiliary contacts as indicated. Where switches isolate final connections between a starter and its motor, fit one set of contacts to open starter coil circuit when switch is opened.

Y71.2100B FUSE COMBINATION UNITS:

Supply fuse combination units in accordance with BS EN 60947. Fit fuse combination units with cartridge fuse links in accordance with BS EN 60269 (BS 88).
Standard - BS EN 60947-3.
Details of equipment - Fuse combination unit.
a.c. Interrupting medium - Air.
Rated and limiting values for the main circuit
Rated voltage (Volts) 230/400.
Rated frequency 50 Hertz.
Utilisation category - AC23A Relay
Enclosure degree of protection IP 31.
Fit removable neutral link in switches controlling circuits with neutral conductor.
Fit solid links in isolating switches.
Fit each switch with facility to padlock in OFF position.
Ensure that withdrawable chassis isolating type switches are provided with fully shrouded fixed contacts or insulated coverplates, to prevent accidental contact with live parts.
Ensure that switches in individual enclosures have an earth terminal, meet the degree of protection for the switchboard and have operating mechanisms interlinked with access door.
Provide switches with auxiliary contacts as indicated. Where switches isolate final connections between a starter and its motor, fit one set of contacts to open starter coil circuit when switch is opened.

Y71.2110A AUTOMATIC RESET PROTECTION DEVICES INTERPOSING RELAYS AND INTER-TRIPPING RELAYS:

Standard - BS EN 61810.
Housing
Flush panel mounting type. House all protection relays, excluding motor protection relays, in draw out cases.
Reset type - Automatic reset type.
Overcurrent tripping device
Provide overcurrent tripping device with overcurrent characteristic similar to a BS 2692 high voltage cartridge fuse, sized to protect the equipment/load.

Y71.2110B MANUAL RESET PROTECTION DEVICES INTERPOSING RELAYS AND INTERTRIPPING RELAYS:

Standard - BS EN 61810.
Housing
Flush panel mounting type. House all protection relays, excluding motor protection relays, in draw out cases.
Reset type - Manual reset type.
Overcurrent tripping device
Provide overcurrent tripping device with overcurrent characteristic similar to a BS 2692 high voltage cartridge fuse, sized to protect the equipment/load.

Y71.2120 VOLTAGE SENSING RELAYS:

Provide single phase inverse time undervoltage type voltage sensing relays to monitor the voltage between respective phases of supply.
Mounting
Supply suitable for flush panel mounting with relay trip indication.
Voltage settings
50-90% in five equal steps with automatic resetting at 105% of voltage setting.
Inverse time characteristics
When voltage increases from zero to rated voltage with time multiplier set at 1.0, set relay resetting times as follows:-

Relay setting %	50	60	70	80	90
Resetting time (secs)	2	4	5	10	12

Y71.2130 TRIP/CLOSE SWITCHES AND CONTROL SELECTOR SWITCHES:

Provide a panel mounted heavy duty, spring return trip/close switch on each circuit breaker fitted with solenoid or motorized spring closing mechanisms.
Ensure contacts have a continuous rating of 10A minimum at between 30V to 250V ac and dc, and make and break duty rating of 30A at 250V ac or dc for a minimum period of 3 secs.
Where remote trip/close control is indicated, supply a panel mounted selector switch to select circuit breaker for local or remote closing. Ensure that selection of remote or local closing does not prevent circuit breaker tripping under operation of local or remote trip switch.

Y71.2140 CURRENT TRANSFORMERS:

Comply with BS EN 60044-1. Provide separate current transformers for each protection device and instrumentation. Ensure current transformers provide appropriate accuracy and are compatible with over current factors, characteristics, performance and VA rating required for satisfactory operation of protection devices, instruments and meters indicated.
Ensure that current transformers are capable of withstanding maximum short time

withstand current of value and duration indicated for assembly.
Provide test links in secondary connections of all current transformers to facilitate testing of instruments, meters and protection devices.

Y71.2150A INSTRUMENTS AND METERS:

Standards
Comply with BS 89 and BS EN 60051-1 for voltmeters, ammeters, watt meters, frequency indicators and power factor indicators.
Comply with BS 7856, BS EN 62053-11, BS EN 62053-22 or BS EN 62053-21 for kWh meters, kVA and kW maximum demand meters and polyphase reactive kVA meters, and BS EN 62053-23 for KVAhr meters.
Protect wiring to voltmeters by separate fuses.
Protect potential coils of watt meters, frequency indicators, power factor indicators and kWh meters, kVA and kW maximum demand meters and polyphase reactive kVA meters by separate fuses.
Supply instruments and meters suitable for flush mounting and type, size and accuracy as indicated.
Ensure that indicating scales for all instruments comply with BS 3693.
Supply so that normal indication is 50% to 75% of full scale deflection.
Completely segregate all instruments in instrument compartments. Panel mount meters on front of instrument compartment.

Y71.2160A ELECTRICAL RECORDING INSTRUMENTS:

Provide electrical recording instruments.
Standard - BS EN 61143.

Y71.2170A INDICATOR LIGHTS:

Supply lamps of same type throughout. Provide indicator lamps with lamp test facility.
Lamps
Supply interchangeable indicators for respective units.
Protect wiring to indicator lamp units by separate cartridge fuses.
Lens Colour in accordance with BS EN 60073.

Y71.2180 LOW VOLTAGE COILS RATING:

Ensure coils for switching relays, contactors and other applications are capable of withstanding inherent voltage drop within system without armature or switching apparatus dropping out of position.

Y71.2190A FRAMEWORK:

Construct framework for supporting electrical equipment from mild steel plate and strip, cold and hot rolled steel sections or slotted angles, in accordance with BS EN 10210 and BS 4345 respectively. Comply with BS EN 1011-2 for metal arc welding.
Finish
Frameworks mounted inside building manufacturer's standard finish.
Frameworks mounted outside building hot dip galvanized to BS EN ISO 1461.
Supply cadmium or zinc electroplated bolts, nuts, washers and screws.

Y71.2200A FUSES:

Supply cartridge fuse links including fuse carrier, bases and associated components that comply with BS EN 60269 (BS 88), fusing factor category gG, unless otherwise indicated.

Y71.2210A DISTRIBUTION BOARDS:

Comply with BS EN 60439-1 or BS EN 60439-3 as appropriate. Make internal separation Form 1 unless otherwise indicated. Make fuseboards fully shrouded. Fit each distribution board with an isolating switch.
Install busbars in same position relative to their fuse carriers or miniature circuit-breakers (MCBs) for each pole. In TPN distribution boards supply neutral busbars with one outgoing terminal for each outgoing circuit.
Provide a multi-terminal earthing bar for circuit protective conductors for both insulated and metal-cased boards, with one terminal for each outgoing circuit. Connect directly to earthing terminal without dependence on exposed conductive parts of enclosure.
Identify each fuseway and MCB way by numbering. Identify each terminal on neutral busbar and earthing bar with its respective fuseway or MCB way.
Where specific ratings are indicated incorporate fuses or MCBs, otherwise leave ways blank for future additions.
Enclosures finish
Finish - Manufacturer's standard.
Colour - Manufacturer's standard colour.

Y71.2220A CONSUMER UNITS:

Comply with BS EN 60439-3. Supply consumer units with minimum degree of protection in accordance with BS EN 60947-1,IP 31.
Provide fuses or miniature circuit-breakers and means of isolation.

Y71.2230A MINIATURE CIRCUIT BREAKERS:

Standard - BS EN 60898-1.

Supply miniature circuit-breakers with voltage and current ratings, type according to instantaneous tripping current, energy limiting class, category of duty and frequency in accordance with BS EN 60898-1.

Y71.2240A RESIDUAL CURRENT DEVICE:

Comply with BS EN 61008. Supply residual current devices (RCCDs) with rated voltage, rated current, rated tripping current, rated tripping time and rated breaking capacity as indicated.
DC component
Ensure dc component does not affect operation.
Overcurrent protection
Fit RCDs with integral overcurrent protection.

Y71.2242 RESIDUAL CURRENT MONITORS:

Supply residual current monitors.
Standard - BS EN 62020.

Y71.2245 COMBINED RESIDUAL CURRENT/OVER CURRENT OPERATED CIRCUIT BREAKERS:

Supply combined residual current/over current operated circuit breakers (RCBOs) in accordance with BS EN 61009.

Y71.2250 CABLE TERMINATIONS:

Ensure that switchgear and distribution boards are provided with facilities to terminate size, number and type of cable indicated. Where necessary use fabricated steel extension boxes for glanding large and multiple cables.
Provide non-ferrous metal glanding plates for single core cable terminations.

Y71.3010 FIXING:

Fix all equipment independently of wiring system. Use cadmium or zinc electroplated bolts, nuts, washers and screws.

Y71.3020 MOUNTING HEIGHT:

Mount single items of equipment 1450mm above finished floor level to centre of equipment, unless otherwise indicated.
Arrange groups of equipment, other than floor mounted assemblies, so that all parts of equipment requiring access for operation or maintenance are at least 500mm and

no more than 2000mm above finished floor level, unless otherwise indicated.

Y71.3030 ACCESS:

Ensure that clearance in front of switchgear and controlgear is not less than 1m, or as indicated.

Y71.3040A MARKING AND DRAWING:

Number terminals, cables and component parts to correspond with manufacturer's certified drawings.

Y71.3050 CABLE TERMINATIONS:

Terminate paper-insulated cable by means of switchboard manufacturer's standard compound filled cable boxes.
Terminate PVC SWA PVC and MICS cables inside enclosure by securing cables to switchboard with glanding plates or glanding brackets; and outside enclosure with glanding plates or fabricated steel extension boxes.

Y71.3060A INSTALLATION AND COMMISSIONING:

Install and commission switchgear and controlgear in accordance with the appropriate standard and the manufacturer's recommendations. Include CT Polarity check in commission tests.

Y72 CONTACTORS AND STARTERS

Y72.1020B INSTALLER FITTED SURGE SUPPRESSORS:

Supply surge suppressors to star connected motors and to all motors subject to star-delta starting to limit peak voltage to 1200 volts. Fitted by installer.

Y72.1030A MANUFACTURER FITTED TRANSIENT SUPPRESSORS:

Supply transient suppressors in the form of resistor and capacitor networks across the starter contactor coils. Fitted by Manufacturer.

Y72.2010A CONTROLGEAR ASSEMBLY:

Standard - BS EN 60439-1.
External design - Cubicle type assembly.
Usage - Control panel, motor control centre or single starter enclosure.
Conditions of installation - Indoors.
Electrical characteristics
Rated operational voltage, 400 V. Rated short-time withstand current, 20 times rated current.
Service conditions - Ambient air temperature and altitude as BS EN 60439.

Y72.2020A ASSEMBLY CONSTRUCTION:

Enclosure standard - BS EN 62208.
Material of enclosure - Manufacturer's standard.
Terminals for external conductors, main power circuits
Accommodate cross-sectional area of copper cables in accordance with BS EN 60439-1, Appendix A.
Terminals for external conductor, control and auxiliary circuits
Terminal block. Mounting - top hat rails (35mm) to BS 5584 (EN 50022).
Size of neutrals on three phase supplies
Full current-carrying capacity of phase conductor.
Degree of protection to BS EN 60529
IP 31 for units installed inside buildings excluding boiler rooms and pump rooms.
IP 55 for units installed in boiler rooms, pump rooms and outside buildings.
Protection against direct and indirect contact as Manufacturer's standard.
Accessibility for inspection
Arrange for following operations to be performed when assembly is in service and under voltage.
Visual inspection of switching devices and other apparatus; settings and indicators of relays and releases; conductor connections and markings.
Adjusting and re-setting of relays, releases and electronic devices.
Replacement of fuselinks and indicating lamps.
Fault location by voltage and current measuring.

Accessibility for maintenance
Provide space between functional unit or group and adjacent functional units or groups. Provide retainable fastening means for parts likely to be removed for maintenance.
Use barrier protected sub-sections for each functional unit or group.
Use compartments for each functional unit or group.
Removable parts and withdrawable parts
Degree of protection of assembly after removal or withdrawal of part as manufacturer's standard.
Internal separation - Manufacturer's standard.
Input voltage variations for electronic equipment supply - BS EN 60439, Section 7.9.1.
Supply frequency deviation - BS EN 60439, Section 7.9.4.
Mounting - Floor standing or wall mounted.

Y72.2030A ENCLOSURE FINISH:

Apply high standard finish to enclosure and supporting metalwork. Degrease metal and remove rust prior to applying finish.
Comply with paint manufacturer's recommendations regarding preparation, stoving times, temperatures, mixing of finishes, application and coat thickness.
Finish - Manufacturer's standard.
Colour - Manufacturer's standard colour.

Y72.2040 SITE MODIFICATION:

Do not make site alterations unless authorised. Where site modifications to assemblies are authorised make in accordance with manufacturer's certified drawings and instructions. Ensure that modifications made comply with type test certificate obtained for arrangement of components.

Y72.2050C CONTINUOUS LV CONTACTORS AND MOTOR STARTERS:

Standard - BS EN 60947-4-1 or BS EN 60947-4-2.
Type of equipment - A.c. mechanical contactor. Interrupting medium, air.
Operating condition.
Method of operation - Electromagnetic.
Method of control - Automatic.
Rated and limiting values for the main circuit.
Rated voltage (Volts) - Operational, 400.
Rated duty - Continuous.
Operational performance.
One rotation direction, with motor stopping between operations.
Control circuits
Electrical - ac; rated frequency (Hertz), 50; rated voltage (Volts), 230.
Co-ordination with short-circuit protective devices - Type1
Enclosure degree of protection to BS EN 60529, IP 31.

Minimum mechanical and electrical endurance
Mechanical 0.3 million; electrical 15,000.
Provide mechanical and electrical interlocks to prevent simultaneous closure of paired contactors.

Y72.2060A CONTROL CIRCUIT DEVICES:

Standard - BS EN 60947-5-1
Type of equipment.
a.c. control circuit device
Manual control switches; emergency stop; control relays; pilot switches; position switches; associated equipment; auxiliary contacts and indicating lamps.
Interrupting medium, Air.
Operating condition.
Method of operation - electromagnetic.
Method of control - automatic.
Rated and limiting values for the main circuit.
Rated voltage (Volts) - operational, 230.
Rated frequency (Hertz), 50.
Contact element classification.
Enclosure degree of protection IP 31.

Y72.2070A ISOLATING SWITCHES:

•Isolation as shown on drawings/schedules
Standard - BS EN 60947-3.
Provide independent manual operation type isolating switches with rated duty, rated operational current and utilization category compatible with contactor.

Y72.2080A CONTROL SELECTOR SWITCHES:

Standard - BS EN 60947-5-1
Provide panel mounting independent manual operation rotary type switch to select local/off/remote control.
Ensure switch rated thermal current, rated operational current, and utilization category are compatible with contactor control circuit characteristics and circuit protection device.

Y72.2090A IN-BUILT PUSH BUTTONS:

Provide panel mounting type push buttons with actuator colours to BS EN 60073.
Standard- BS EN 60947-5-1.
Pattern
Supply flush button type start/on and reset push buttons. Supply mushroom actuator type stop/off push buttons released by turning the actuator.

Ensure rated thermal current, rated operational current and utilization category of push button contacts are compatible with contactor control circuit characteristics and circuit protection device.

Y72.2100A INDICATOR LIGHTS:

Supply lamps of same type throughout. Provide indicator lamps with lamp test facility.
Standard - BS EN 842 and BS EN 60947-5-1.
Details
Supply interchangeable indicators for respective units. Provide neon indicators.
Provide 230V indicator circuits and lamps.
Protect wiring to indicator lamp units by separate cartridge fuses.
Lens colour - In accordance with BS EN 60073.

Y72.2110A CONTACTOR CONTROL RELAYS:

Standard BS EN 60947-5-1, install relays in contactor enclosure.
Relay enclosure protection to BS EN 60529
Compatible with contactor enclosure.

Y72.2120A CONTROL AND INDICATOR LIGHT CIRCUIT FUSES:

Provide in contactor enclosure separate low voltage fuse bases, fuse carriers and cartridge fuses for protection of control circuits and indicator light circuits.
Fuses
Fully shrouded impact resistant moulded plastic fuse bases and carriers in accordance with BS EN 60269 (BS 88). Supply category gG cartridge fuses to BS EN 60269 (BS 88).

Y72.2190B MOTOR CONTROL CENTRE INVERTER MOTOR STARTERS:

Supply inverters to control speed of standard AC Squirrel cage motors.
Inverter type - Digital PWM.
Location - Motor control centre.
Control range - 0.5 to 120 Hz Power factor - 0.95 or better.
Starting current - Not to exceed 1 x FLC.
Characteristics
Ensure acceleration and deceleration ramps are independently adjustable.
Allow connection to a turning motor without braking to a standstill.
Allow connection to a reverse windmilling fan without causing tripping and return fan to correct speed. Ensure inverters require no additional means for starting. Supply inverters that do not require electrical matching to motor. Ensure inverters are capable of running motors in parallel.
EMC characteristics to BS EN 61800.
Mains interruption

Ensure inverter does not cause tripping through a mains interruption of 200 msec.
Protection
Ensure inverter incorporates the following protection to cause electronic shut down without operating circuit protective devices.
Motor phase to phase fault; motor phase to earth fault; overvoltage; undervoltage; inverter overheat; motor overheat; loss of control signal; loss of auxiliary control voltage; current limit.
Inverter controls - Local/remote facility.
Display
Make provision for inverter to display externally, external and internal faults following a failure.
Show 1st, 2nd and 3rd up sequential faults.
Provide digital readout to show output frequency Hz; reference 1 (Hand); reference 2 (Auto); motor current (% or Amps); fault memory.
Provide volt free remote signalling contacts to indicate common fault; running/stopped conditions; healthy/tripped conditions.
Ensure parameters can be set and fault memory interrogated with door closed, and without additional instrumentation.

Y72.2220 CONTROL CIRCUIT TRANSFORMERS:

Provide control circuit transformers to supply power at voltages to suit control components.
Standard
Use transformers in accordance with BS EN 61558-2-9 or BS EN 61558-1 and provide an external label of approved type and size.
Protection - Primary and secondary fuses.

Y72.2230A SWITCHING AND INDICATION:

Provide switches, indicating lamps, instruments and controls of uniform appearance and physically protected.
Switches and indicators
Fit on panel or access doors Stop/Start/Reset push buttons; Auto/Off/Manual control selector switch; run and trip indicator lights.

Y72.2240 AUDIBLE ALARMS:

Ensure that operation of any starter trip lamp, safety circuit lamp or alarm lamp operates a common audible alarm with mute and test facilities and terminals for remote alarm signal.
When an alarm condition has had the audible alarm muted, ensure that terminals for a remote "alarm accepted" light are energised. The audible alarm circuit and terminals for remote alarm signal must still be capable of indicating another fault occurring even though original fault has not been cleared. The test facilities are to test momentarily both the audible alarm and all alarm indicator lamps, whilst the push button is depressed.

Use alarms that interface with a sensor or controller to sense set-point and measured value. Provide adjustable upper and lower limits on face of unit. Provide unit with indicating lamps to show which limit has been exceeded. Provide each unit with connections for remote alarm.

Y72.2250A PROGRAMMABLE LOGIC CONTROLLERS:

Provide programmable logic controllers in accordance with the manufacturer's recommendations and the specified control requirements.
Standard - BS EN 61131.
Provide fuse and isolator for the Programmable Logic Controller. Install PLC with control components.
Programming language standard - BS EN 61131-3

Y72.2260A STARTER AND CONTROL PANEL INTERNAL WIRING:

Standard - BS 6231.
Wiring coding - Random colours and CPC green/yellow.
Control wiring
Segregate control wiring from power circuits. Contain control wiring in ventilated plastic trunking. Identify each end of each wire with a unique number.
Power wiring
Take account of thermal effects of grouping when routing power wiring. Identify each end of each wire with a unique number.

Y72.2270A COMPONENT MOUNTING:

Mount all components of the switchgear and controlgear in accordance with the manufacturer's instructions.
Mount control components on top hat rails (35mm) to BS 5584 (EN 50022).

Y72.2280A CONTROL SYSTEM FUNCTION CHARTS:

Prepare function charts for the control system in accordance with BS EN 60848.
Obtain approval of function chart before design of system hardware or writing control software.
Function chart format - Combined function chart/circuit diagram.

Y73 LUMINAIRES AND LAMPS

Y73.1000 GENERAL

Y73.1010 STANDARDS:

Supply luminaires and lamps to standards as appropriate.

Y73.2005 LAMP EFFICACY:

The system is designed to achieve an average initial circuit of at least 65 lumens/watt for fixed lighting equipment within the building.

Y73.2010A LUMINAIRES - GENERAL PURPOSE:

Standards
Supply luminaires with photometric data in accordance with BS EN 13032-1.
Supply luminaires in accordance with BS 4533 (BS EN 60598).
Classification - To BS EN 60598-1.
Safety Support for Components
Provide secondary support for translucent covers, diffusers and gear trays so they are prevented from falling when their primary fixing is released.
Photometric performance
Ensure luminaires of similar type have same photometric performance as published data within the tolerances defined by BS EN 13032-1.
Electromagnetic compatibility
Ensure luminaires comply with BS EN 61547 for EMC immunity.

Y73.2010B LUMINAIRES - GENERAL PURPOSE WITH SAFETY GLASS:

Standards
Supply luminaires with photometric data in accordance with BS EN 13032-1.
Supply luminaires in accordance with BS 4533 (BS EN 60598).
Classification - To BS EN 60598-1.
Safety
Fit luminaire with cover glass to protect against ultra-violet emission and risk from explosion of lamps.
Safety Support for Components
Provide secondary support for translucent covers, diffusers and gear trays so they are prevented from falling when their primary fixing is released.
Photometric performance
Ensure luminaires of similar type have same photometric performance as published data within the tolerances defined by BS EN 13032-1.
Electromagnetic compatibility
Ensure luminaires comply with BS EN 61547 for EMC immunity.

Y73.2010C LUMINAIRES - SPECIAL APPLICATIONS:

- Emergency lighting
  - 2020A EMERGENCY LIGHTING LUMINAIRES:
    Comply with BS EN 60598-2-22.
    Comply with ICEL:1001. Ensure emergency lighting luminaires are marked with ICEL certification label.
- 2030 EXIT SIGNS:
  Comply with BS 5499-1 & BS 5499-3.
- Hazardous areas
  - 2040A HAZARDOUS AREA LUMINAIRES:
    BS EN 50015; BS EN 50017; BS EN 50020; BS EN 60079-0; BS EN 60079-1; BS EN 60079-14; BS EN 60079-15 or BS EN 60079-25 as appropriate.
    4070 INSTALLATION IN POTENTIALLY EXPLOSIVE ATMOSPHERES:
      Comply with BS EN 60079-14.
- Signs and high voltage installations.
  - 2050A SIGNS AND HIGH VOLTAGE INSTALLATIONS:
    Comply with BS 559 and BS EN 50107-1.
    Neon transformers
      Supply transformers for tubular discharge lamps with no-load output voltage exceeding 1000 V in accordance with BS EN 61050.
  - 4090 SIGNS & HIGH-VOLTAGE INSTALLATION:
    Comply with BS 559 and BS EN 50107-1.

Standards
Supply luminaires with photometric data in accordance with BS EN 13032-1.
Supply luminaires in accordance with BS 4533 (BS EN 60598).
Classification - To BS EN 60598-1.
Electromagnetic compatibility
Ensure luminaires comply with BS EN 61547 for EMC immunity.

Y73.2020A EMERGENCY LIGHTING LUMINAIRES:

Comply with BS EN 60598-2-22.
Comply with ICEL:1001. Ensure emergency lighting luminaires are marked with ICEL certification label.

Y73.2030 EXIT SIGNS:

Comply with BS 5499-1 & BS 5499-3.

Y73.2040A HAZARDOUS AREA LUMINAIRES:

BS EN 50015; BS EN 50017; BS EN 50020; BS EN 60079-0; BS EN 60079-1; BS EN 60079-14; BS EN 60079-15 or BS EN 60079-25 as appropriate.

Y73.2060A LAMPHOLDERS - GENERALLY:

Lamp caps - BS EN 60061-1.
Lamp holders - BS EN 60061-2.
Lampholders with enhanced safety features - BS 7895.
Bayonet lampholders - BS EN 61184.
Lampholders for tubular fluorescent lamps and starter holders - BS EN 60400.
Edison screw lampholders - BS EN 60238.
Interchangeability
Ensure lampholders in luminaires of similar type and rating are identical.
Earthing
Ensure metal lampholders incorporate an earthing terminal.

Y73.2070 LAMPHOLDERS - TUNGSTEN FITTINGS:

Use following lampholders for tungsten filament lamps unless indicated otherwise.

Lamp	Lampholder
up to 150 W	bayonet B22d
200 W	Edison screw E27 2A
300 W	Edison screw 16A

Shade rings
Provide a shade carrier ring for separately mounted lampholders for GLS tungsten filament lamps.
Polarity of Edison Screw Lampholders
Ensure phase conductor is connected to centre contact.

Y73.2080A LAMPHOLDERS - MOUNTING:

Securely mount lampholder in luminaire when it is sole support for lamp.
Cord grip
Provide integral cord grip type when lampholders are suspended by cord.
Conduit Mounted
When mounted directly to conduit system use backplate lampholder for conduit box.

Y73.2090A CONTROL GEAR AND COMPONENTS:

Compatibility
Ensure control gear and components are suitable for lamp type, wattage and starting characteristics. Obtain from manufacturers written confirmation of compatibility.

Y73.2095 CIRCUIT LOSSES:

Use high frequency ballasts to ensure the installed circuit load does not exceed 3 W/m^2/ 100 lux.

Y73.2100A FLUORESCENT LAMP BALLASTS AND STARTERS:

Ballasts
BS EN 61347-2-8 and BS EN 60921.
BS EN 61347-2-4, BS EN 61347-2-5, BS EN 61347-2-6 & BS EN 61347-2-7 and BS EN 60925 for d.c.supplied electronic ballasts.
BS EN 61347-2-3 and BS EN 60929 for fluorescent lamps to BS EN 60081 and BS EN 60901.
Supply thermal protectors for ballasts for tubular fluorescent lamps to BS EN 60730-2-3.
Starters - BS EN 61347-2-1 and BS EN 60927.
Use low distortion type.

Y73.2110A DISCHARGE LAMP BALLASTS AND STARTERS:

Ballasts - BS EN 61347-2-9 and BS EN 60923.
Starters - BS EN 61347-2-1 and BS EN 60927.

Y73.2120A CAPACITORS:

Use capacitors in accordance with BS EN 61048 and BS EN 61049 in tubular fluorescent, high pressure mercury and low pressure sodium vapour discharge lamp circuits.

Y73.2130 SUPPLY TERMINALS:

Use screw terminals for supply cables and circuit protective conductors, sized to terminate up to three 2.5mm^2 conductors. Provide separate terminal blocks for each incoming circuit, with marking to identify each circuit.

Y73.2140 FUSE:

Include a fuse holder and BS 1362 fuse in each incoming circuit phase connection.

Y73.2150 INTERFERENCE:

Comply with BS EN 55015.

Y73.2160 REMOTE GEAR:

Locate control gear in separate lockable cabinet of sheet steel with same degree of protection and finish specified for luminaire. Comply with manufacturer's

recommendations for maximum cable length between gear and lamp.

Y73.2165 TYPES OF HIGH EFFICIENCY LAMP FOR NON-DAY LIT AREAS:

Light source	Type
High pressure sodium	All ratings above 70W
Metal halide	All ratings above 70W
Tubular fluorescent	All 26mm diameter (T) lamps and 16mm (T5) lamps rated above 11W, provided with low loss or high frequency control gear. 38mm diameter (T12) linear fluorescent lamps 2400mm in length
Compact fluorescent	All ratings above 26W

Y73.2170A TUNGSTEN FILAMENT LAMPS:

Comply with BS EN 60064, BS EN 60432-1 and BS EN 60630. Supply electronic step-down converters for filament lamps to BS EN 61047 and BS EN 61347-2-2. Comply with BS EN 61549 for double capped and ELV lamps.

Y73.2180A FLUORESCENT LAMPS:

Internationally specified tubular fluorescent lamps to BS EN 60081.
UK tubular fluorescent lamps to BS 1853-2.
Single capped fluorescent lamps to BS EN 60901 and BS EN 61199.
Double capped fluorescent lamps to BS EN 60081 and BS EN 61195.
Self ballasted lamps to BS EN 60969 and BS EN 60968.

Y73.2185A TUNGSTEN HALOGEN LAMPS:

Comply with BS EN 60432-2 or BS EN 60357.

Y73.2190 HIGH PRESSURE MERCURY VAPOUR LAMPS:

Comply with BS EN 60188 and BS EN 62035.

Y73.2195 METAL HALIDE LAMPS:

Comply with BS EN 62035 where appropriate.

Y73.2200 HIGH PRESSURE SODIUM VAPOUR LAMPS:

Comply with BS EN 62035.

Y73.2210 LOW PRESSURE SODIUM VAPOUR LAMPS:
Comply with BS EN 60192 and BS EN 62035.

Y73.2230 LAMP MANUFACTURER:

Ensure that lamps of each type are from same manufacturer.

Y73.2240A SUPPORT SYSTEM - CONDUIT:

Use not less than 20mm conduit of same type as main conduit system.
Material - steel.

Y73.2250A SUPPORT SYSTEM - ROD:

Use continuously threaded rods with matching washers and nuts.
Diameter - 6mm.
Material - Cadmium plated steel.

Y73.2260A SUPPORT SYSTEM - CHAIN:

Use cadmium plated steel chain with load carrying capacity of not less than twice weight of complete luminaire.

Y73.2270A SUPPORT SYSTEM - FLEXIBLE CORD:

Use size and type as indicated.
Confirm temperature rating is suitable for operating temperature of luminaire or lampholder. Confirm that cord is adequate for mass to be supported.

Y73.2280A SUPPORT SYSTEM - WALL BRACKETS:

Provide wall brackets. Confirm wall brackets are suitable for supporting luminaire.

Y73.2290 SUPPORT SYSTEM - BALL AND SOCKET:

- Installation

  4160 SUSPENSION:

  Suspend luminaires at height indicated. Ensure suspensions hang vertically unless otherwise indicated.

  4200 SUSPENSION BY BALL AND SOCKET:

Install cable through ball and socket connected to conduit box.

- Height

Provide ball and socket as top support, complete with cover fixed to circular conduit box.

Y73.2295 SUPPORT SYSTEM - WIRE ROPE:

- Installation

4160 SUSPENSION:

Suspend luminaires at height indicated. Ensure suspensions hang vertically unless otherwise indicated.

Y73.2300A STEEL COLUMNS AND BOLLARDS:

- Finish as shown on drawings/schedules

Standards - BS EN 40-2 and BS EN 40-5.
Material - Steel.
Bracket - Match column.
Earthing

Include earthing terminal fixed within service compartment.

Column base plate - Standard.

Y73.2300C ALUMINIUM COLUMNS AND BOLLARDS:

Standards - BS EN 40-2 and BS EN 40-6.
Material - Aluminium.
Bracket - Match column.
Earthing

Include earthing terminal fixed within service compartment.

Column base plate - Standard.

Y73.3010A TRACK LIGHTING:

- Class, poles and current rates as indicated on drawings/schedules

Where indicated provide track for fixing fittings in accordance with BS EN 60570.

Y73.3020 INTEGRAL PHOTO-CELLS:

Incorporate integral photo-cell on luminaire where indicated.

Y73.3030A AIR HANDLING LUMINAIRES:

Provide assembly of luminaire and exhaust air device or luminaire and supply air device to meet design requirements for illumination and air flow. Ensure assembly

can be integrated into a false ceiling, flush mounted.
Diffuser
Allow for the path of exhaust air in the diffuser.
Exhaust air outlet
Provide an outlet for the air via a series of circular openings in top of assembly casing.
Supply air diffuser
Supply the air diffuser as a component of the assembly.
Fixing
Ensure the fixing is capable of carrying the weight of the whole assembly.

Y73.4010 ORIENTATION:

Install luminaires in positions indicated, and in horizontal plane unless otherwise indicated.

Y73.4020 CLEANLINESS:

Ensure luminaires are clean and grease free on handover.

Y73.4030 INSTALLATION OF RECESSED FITTINGS:

Install luminaires flush with finished ceiling level.

Y73.4040A INSTALLATION OF SEMI-RECESSED FITTINGS:

Install luminaires as manufacturer's detail.

Y73.4050 INSTALLATION OF WALL MOUNTED FITTINGS:

Install luminaires at height indicated.

Y73.4060 MATERIAL OF SUPPORTING SURFACE:

Ensure classification of luminaires is appropriate. Do not mount luminaires on readily flammable surfaces.

Y73.4100 INSTALLATION OF EXTRA LOW VOLTAGE TUNGSTEN HALOGEN LAMPS:

Use same wattage lamp on luminaires fed from common transformer. Supply each luminaire on common transformer by separate cable of same cross-sectional area.

Y73.4110 SUPPORT

Ensure support is adequate for weight of luminaires.
Number
Provide the following minimum number of supports for each luminaire longer than 600mm.

Luminaire width (mm)	Minimum number of supports
Up to and including 300	2
Over 300	4

Y73.4120 SUPPORT FROM CONDUIT:

Where luminaire is supported from conduit provide a conduit box forming an integral part of conduit system at each point of suspension. Ensure suspensions are vertical. Where conduit enters luminaire use back-nuts and washers to secure luminaire body to conduit support. Provide tube with corrosion resistance equal to conduit system. Do not support luminaires directly from conduit boxes made from non-metal or heat sensitive materials, where the temperature of the material may exceed 60^{o}C or the mass suspended exceeds 3kg.

Y73.4130 SUPPORT FROM TRUNKING:

Where luminaire is supported from trunking use proprietary clamps or brackets appropriate to the luminaire and trunking.
Do not support luminaires directly from trunking made from non-metal or heat sensitive materials, where the temperature of the material may exceed 60^{o}C or the mass suspended exceeds 3kg.

Y73.4140A SUPPORT BY DIRECT FIXING:

Refer to fixing methods, use luminaire supporting coupler to BS 7001 or follow manufacturer's recommendations.

Y73.4150A SUPPORT IN SUSPENDED CEILING:

Support luminaires directly from building fabric.

Y73.4160 SUSPENSION:

Suspend luminaires at height indicated. Ensure suspensions hang vertically unless otherwise indicated.

Y73.4170 SUSPENSION BY ROD:

Use washers, nut and lock-nut at top and bottom of rod. Paint cut ends with calcium plumbate primer or zinc rich paint.

Y73.4180 SUSPENSION BY CHAIN:

Use hook cover for suspension from circular conduit box. For connection to luminaires use luminaire manufacturer's own chain hook, but if not available use hook with standard screw threaded body to be secured to luminaire body with nuts and washers. Where indicated use captive hooks.

Y73.4190 SUSPENSION BY FLEXIBLE CORD:

Suspend cord from ceiling rose.

Y73.4200 SUSPENSION BY BALL AND SOCKET:

Install cable through ball and socket connected to conduit box.

Y73.4210A COLUMNS AND BOLLARDS:

Location - Confirm location before excavation.
Bases - Install bases in accordance with bollard or column manufacturer's instructions.
Mounting
Mount column or bollard on base as recommended by manufacturer.
Ensure columns and bollards are vertical unless otherwise indicated.
Earthing
Install circuit protective conductor to connect luminaire to earthing terminal in service compartment; size circuit protective conductor same as live conductors.
Bond accessible metal parts of column or bollard to earthing terminal.

Y73.4220 CONNECTIONS TO LUMINAIRES

Cable Protection
Use appropriate size of grommet where cables enter through hole in luminaire body.
Earthing
Ensure that the earthing terminal of Class 1 luminaires is connected to the conduit protective conductor of the supply circuit.
Loose Wiring
Clip or tie back with suitable proprietary devices loose wiring within luminaire, at 300mm intervals.

Y73.4230A CONNECTIONS TO LUMINAIRES - DIRECT TO CONDUIT - TERMINAL BOX:

Terminate circuit wiring in terminal block within supporting conduit box. Use flexible cord from terminal block to luminaire.

Y73.4230B CONNECTIONS TO LUMINAIRES - DIRECT TO CONDUIT - AT LUMINAIRE:

Terminate circuit wiring at supply terminals of luminaire. Take all conductors through same cable entry into luminaire.

Y73.4240B CONNECTIONS TO LUMINAIRES - DIRECT TO TRUNKING - AT LUMINAIRE:

Terminate circuit wiring at supply terminals of luminaire. Take all conductors through same cable entry into luminaire.

Y73.4260A CONNECTIONS TO LUMINAIRES - RECESSED FITTINGS - PLUG AND SOCKET:

Where luminaires are recessed in a suspended ceiling, terminate circuit wiring at plug and socket to BS 546, located not more than 500mm from the access through the ceiling. Use flexible cord from plug of ceiling rose to supply terminals of luminaire.

Y73.4270 CONNECTIONS TO LUMINAIRES - CONDUIT SUSPENSION:

Terminate circuit wiring in terminal block within supporting conduit box. Use flexible cable from terminal block to luminaire, installed within tube.

Y73.4280 CONNECTIONS TO LUMINAIRES - ROD OR CHAIN SUSPENSION:

Terminate circuit wiring in terminal block within supporting conduit box. Use flexible cord from terminal block to luminaire and clip cable to one of the rods or chains, do not weave cable through links of the chain.

Y73.4290 CONNECTIONS TO LUMINAIRES - MICS CABLE:

Fix cable gland to luminaire and continue conductors to supply terminals of luminaire.

Y73.4300A SEPARATE LIGHTING SWITCHES ON DIFFERENT PHASES:

Install lighting switches on different phases at least 2m apart.

Y73.4300B PHASE BARRIER LIGHTING SWITCHES ON DIFFERENT PHASES:

When lighting switches on different phases are in a common box, use phase barrier switches in accordance with BS 7671.

Y74 ACCESSORIES FOR ELECTRICAL SERVICES

Y74.1000 GENERAL:

Y74.1010 APPLICATION:

Supply fixed electrical wiring accessories for use with fixed and portable peripheral equipment using either power or signalling cables.

Y74.1020 SAMPLES:

Where indicated submit samples of proposed materials and equipment for approval before work is started. Label each sample with name, catalogue number and services in connection with item.

Y74.2010A ACCESSORIES COMMON REQUIREMENTS - WHITE PLASTIC PLATES, FLUSH INSTALLATION:

Area of installation - Interior.
Enclosure pattern - Flush.
Accessory mounting
  Adjustable steel grid for grid switches or direct to enclosure for all other accessories.
Enclosure material- Pressed steel.
Enclosure finish - Galvanized.
Coverplate finish, all accessories to match
  Moulded plastic, colour - white.
Coverplate pattern - Overlapping; with architrave where indicated.
Ancillaries
  Earthing terminal integral within switch box.
  Neon indicator with red lens, illuminated in "ON" position, for connection units.
  Switch rocker bar colour - white.
  Operating keys for key operated switches, minimum number 2.
  Fuses to BS 1362.
  Blank inserts for spare ways on grid switches.
Marking
  Method - engraving. Mark front plate to indicate equipment served on connection units.
Conduit and cable entries
  Knockouts side, top and rear.
Cable termination - Manufacturer's standard.

Y74.2010B ACCESSORIES COMMON REQUIREMENTS - MATT FINISH METAL PLATES, FLUSH INSTALLATION:

Area of installation - Interior.
Enclosure pattern - Flush.
Accessory mounting
Adjustable steel grid for grid switches or direct to enclosure for all other accessories.
Enclosure material - Pressed steel.
Enclosure finish - Galvanized.
Coverplate finish, all accessories to match
Brass with matt chrome surface.
Coverplate pattern - Overlapping; with architrave where indicated.
Ancillaries
Earthing terminal integral within switch box.
Neon indicator with red lens, illuminated in "ON" position, for connection units.
Switch rocker bar colour as indicated.
Operating keys for key operated switches, minimum number 2.
Fuses to BS 1362.
Blank inserts for spare ways on grid switches.
Marking
Method - engraving. Mark front plate to indicate equipment served on connection units.
Conduit and cable entries
Knockouts side, top and rear.
Cable termination - Manufacturer's standard.

Y74.2010C ACCESSORIES COMMON REQUIREMENTS - WHITE PLASTIC PLATES, EMBEDDED CABLES, SURFACE INSTALLATION:

Area of installation - Interior.
Enclosure pattern - Surface.
Accessory mounting - Direct to enclosure.
Enclosure material - White moulded plastic.
Coverplate finish, all accessories to match
Moulded plastic, colour - white.
Coverplate pattern - Surface type.
Ancillaries
Earthing terminal integral within switch box.
Neon indicator with red lens, illuminated in "ON" position, for connection units.
Switch rocker bar colour as indicated.
Operating keys for key operated switches, minimum number 2.
Fuses to BS 1362.
Marking
Method - engraving. Mark front plate to indicate equipment served on connection units.
Conduit and cable entries
Knockouts side, top and rear.
Cable termination - Manufacturer's standard.

Y74.2010D ACCESSORIES COMMON REQUIREMENTS - METAL CLAD PLATES, SURFACE STEEL CONDUIT INSTALLATION:

Area of installation - Interior.
Enclosure pattern - Surface.
Accessory mounting - Direct to enclosure.
Enclosure material
Pressed steel or cast iron.
Enclosure finish
As conduit system or galvanized.
Coverplate finish, all accessories to match
Metal clad.
Coverplate pattern - Surface type.
Ancillaries
Earthing terminal integral within switch box.
Neon indicator with red lens, illuminated in "ON" position, for connection units.
Switch rocker bar colour as indicated.
Operating keys for key operated switches, minimum number 2.
Fuses to BS 1362.
Marking
Method - engraving. Mark front plate to indicate equipment served on connection units.
Conduit and cable entries
Threaded entries, top, bottom or side to suit conduit system.
Cable termination - Manufacturer's standard.

Y74.2010E ACCESSORIES COMMON REQUIREMENTS - SURFACE, STEEL CONDUIT, WEATHERPROOF INSTALLATION:

Area of installation - Exterior.
Enclosure pattern - Surface and weatherproof.
Accessory mounting - Direct to enclosure.
Enclosure material - Cast iron.
Enclosure finish - As conduit system or galvanized.
Coverplate finish, all accessories to match
As enclosure.
Coverplate pattern - Surface type.
Ancillaries
Earthing terminal integral within switch box.
Neon indicator with red lens, illuminated in "ON" position, for connection units.
Screwed weathering cap and chain for socket outlets.
Operating keys for key operated switches, minimum number 2.
Fuses to BS 1362.
Marking
Method - engraving. Mark front plate to indicate equipment served on connection units.
Conduit and cable entries

Threaded entries, top, bottom or side to suit conduit system.
Cable termination - Manufacturer's standard.

Y74.2010F ACCESSORIES COMMON REQUIREMENTS - SURFACE, PLASTIC, WEATHERPROOF INSTALLATION:

Area of installation - Exterior.
Enclosure degree of protection to BS EN 60529, IP 54.
Enclosure pattern - Surface and weatherproof.
Accessory mounting - Direct to enclosure.
Enclosure material - Impact resistant plastic.
Enclosure finish - Natural or self coloured.
Coverplate finish, all accessories to match
Moulded plastic, colour as indicated.
Coverplate pattern - Surface type.
Ancillaries
Earthing terminal integral within switch box.
Neon indicator with red lens, illuminated in "ON" position, for connection units.
Protective shrouds to rocker bars.
Screwed weathering cap and chain for socket outlets.
Switch rocker bar colour as indicated.
Operating keys for key operated switches, minimum number 2.
Fuses to BS 1362.
Conduit and cable entries
Threaded entries to suit cable/conduit system.
Cable termination - Manufacturer's standard.

Y74.2010G ACCESSORIES COMMON REQUIREMENTS - BRONZE FINISH METAL PLATES, FLUSH INSTALLATION:

Area of installation - Interior.
Enclosure pattern - Flush.
Accessory mounting
Adjustable steel grid for grid switches or direct to enclosure for all other accessories.
Enclosure material - Pressed steel.
Enclosure finish - Galvanized.
Coverplate finish, all accessories to match
Brass with BMA/bronze surface.
Coverplate pattern - Overlapping; with architrave where indicated.
Ancillaries
Earthing terminal integral within switch box.
Neon indicator with red lens, illuminated in "ON" position, for connection units.
Switch rocker bar colour as indicated.
Operating keys for key operated switches, minimum number 2.
Fuses to BS 1362.
Blank inserts for spare ways on grid switches.
Marking

Method - engraving. Mark front plate to indicate equipment served on connection units.
Conduit and cable entries
Knockouts side, top and rear.
Cable termination - Manufacturer's standard.

Y74.2020A INTERIOR LIGHTING SWITCHES - GENERAL PURPOSE MOULDED PLASTIC:

Standard - BS EN 60669-1, enclosure box to BS 4662.
Switch type - Rocker bar - moulded plastic.
Rating - 5A or 15A.
Gangs as indicated.
Switch mechanism - Snap action microgap.
Pole configurations
Single pole, double pole, 2 way or intermediate as indicated.

Y74.2020B INTERIOR LIGHTING SWITCHES - GRID MOULDED PLASTIC:

Standard - BS EN 60669-1, enclosure box to BS 4662.
Switch type - Rocker bar - moulded plastic.
Rating - 5A or 15A.
Switch mechanism - Snap action microgap.
Pole configurations
Single pole, 1 way, 2 way or intermediate as indicated.

Y74.2020C INTERIOR LIGHTING SWITCHES - PULL CORD:

Standard - BS EN 60669-1, enclosure box to BS 4662.
Switch type - Cord to BS EN 61058-2-1.
Rating - 5A.Pole configurations - Single pole.

Y74.2020D INTERIOR LIGHTING SWITCHES - GENERAL PURPOSE SECRET KEY:

Standard - BS EN 60669-1, enclosure box to BS 4662.
Switch type - Rocker bar - secret key.
Rating - 5A or 15A.
Gangs as indicated.
Switch mechanism - Snap action microgap.
Pole configurations - Single pole, double pole, 2 way or intermediate as indicated.

Y74.2020F INTERIOR LIGHTING SWITCHES - GRID SECRET KEY:

Standard - BS EN 60669-1, enclosure box to BS 4662.

Switch type - Rocker bar - secret key.
Rating - 5A or 15A.
Switch mechanism - Snap action microgap.
Pole configurations - Single pole, 1 way, 2 way or intermediate as indicated.

Y74.2030A EXTERIOR LIGHTING SWITCHES - METAL CLAD ROTARY:

Standard - BS EN 60669-1, enclosure box to BS 4662.
Switch type - Rotary disc or lever operating through sealing gland.
Rating - 5A.
Gangs as indicated.
Action - Two position.
Pole configurations as indicated.

Y74.2030B EXTERIOR LIGHTING SWITCHES - SEALED ROCKER BAR:

Standard - BS EN 60669-1, enclosure box to BS 4662.
Switch type - Rocker bar with sealed in plastic membrane.
Rating - 5A.
Gangs as indicated.
Action - Two position.
Pole configurations as indicated.

Y74.2040B TIME SWITCHES - 7 DAY:

Wire timer and switch circuits to separate terminals.
Standard - BS EN 60730-2-7.
Time switch type
  Quartz stabilized solid state 50 hour nickel cadmium battery backup.
Contacts duty - Inductive.
Contacts rating - 15A.
Special programme facilities
  Number of "ON" and "OFF" operations - 4
Programme repeat cycle - 7 day.

Y74.2060A LAMPHOLDERS - BC TYPE:

Standard - BS EN 61184.
Lampholder type - Bayonet clip - B22.
Fixing - Bracket - straight or angle, or suspension as indicated.
Finish - Manufacturer's standard.
Material - Heat resistant moulded plastic.
Ancillaries
  Cord grip, lampshade ring or protective lampshade ring as indicated.

Y74.2060B LAMPHOLDERS - ES TYPE:

Standard - BS EN 60238.
Lampholder type - Edison screw - E27.
Fixing - Bracket - straight or angle, or suspension as indicated.
Finish - Manufacturer's standard.
Material - Heat resistant moulded plastic.
Ancillaries
Cord grip, lampshade ring or protective lampshade ring as indicated.

Y74.2070A ISOLATING SWITCHES - BS EN 60669-1:

Provide isolating switches for fixed appliances.
Utilization category as indicated.
Making capacity as indicated.
Standard - BS EN 60669-1, enclosure box to BS 4662.
Switch type - Rocker bar.
Rating as indicated.
Pole configuration - DP, three pole or TPN as indicated.

Y74.2070B ISOLATING SWITCHES - BS EN 60947-3:

Provide isolating switches for fixed appliances.
Utilization category as indicated.
Making capacity as indicated.
Standard - Enclosure box to BS 4662, BS EN 60947-3.
Switch type - Rocker bar.
Rating as indicated.
Pole configuration - DP, three pole or TPN as indicated.

Y74.2080A FUSE CONNECTION UNITS - SWITCHED:

Standard - BS 1363-4, enclosure box to BS 4662 and switched.
Unit type - Rocker bar - plastic.
Pole configuration - DP.
Ancillaries
Cord outlet or cord grip and fuse as indicated.

Y74.2080B FUSE CONNECTION UNITS - UNSWITCHED:

Standard - BS 1363-4, enclosure box to BS 4662 and unswitched.
Pole configuration - DP.
Ancillaries
Cord outlet or cord grip and fuse as indicated.
Lockable fuse carrier.

Y74.2090A SOCKET-OUTLETS - SINGLE, SWITCHED:

Standard - 13A socket-outlet to BS 1363, enclosure box to BS 4662.
Switching - Switched.
Switch type - Rocker bar - plastic.
Rating - 13A.
Ancillaries
Plug tops 25% of number of sockets, fused as indicated.
Gangs - 1

Y74.2090B SOCKET-OUTLETS - SINGLE WITH INTEGRAL RCD, SWITCHED:

Standard - Enclosure box to BS 4662, BS 7288.
Switching - Switched
Switch type - Rocker bar - plastic.
Rating - 13A.
Ancillaries
RCD, BS 7288. Mains failure trip, sensitivity as indicated. Plug tops 25% of number of sockets, fused as indicated.
Gangs - 1

Y74.2090C SOCKET-OUTLETS - DOUBLE SWITCHED:

Standard - 13A socket-outlet to BS 1363, enclosure box to BS 4662.
Switching - Switched
Switch type - Rocker bar - plastic.
Rating - 13A.
Ancillaries
Plug tops 25% of number of sockets, fused as indicated.
Gangs – 2

Y74.2090D SOCKET-OUTLETS - SINGLE, UNSWITCHED:

Standard - 13A socket-outlet to BS 1363, enclosure box to BS 4662.
Switching - Unswitched.
Rating - 13A.
Gangs - 1

Y74.2090E SOCKET-OUTLETS - SINGLE WITH INTEGRAL RCD, UNSWITCHED:

Standard - Enclosure box to BS 4662, BS 7288.
Switching - Unswitched.
Rating - 13A.
Ancillaries
RCD, BS 7288. Mains failure trip, sensitivity as indicated.
Gangs - 1

Y74.2130A TELEPHONE AND DATA OUTLET SOCKETS - GENERAL PURPOSE:

Standard
For jack socket to BS 6312-2.1 and enclosure box to BS 4662.
Size - Standard.
Circuit configurations as indicated.

Y74.2140A TELEPHONE CORD OUTLETS - GENERAL PURPOSE:

Standard - BABT approved.
Circuit configurations - Single or twin as indicated.

Y74.2190A SHAVER POINTS - BATHROOM AND WASHROOM USE:

Provide shaver points, internally switched by plug insertion.
Standard
BS EN 61558-2-9, BS EN 61558-1 and BS EN 61558-2-23, enclosure box to BS 4662.
Rating - 20VA.
Components
Double wound single phase transformer 240/240V and 110V to BS EN 61558-2-9, BS EN 61558-1 and BS EN 61558-2-23.
Internal overload protection.
Marking - Input and output voltages and "SHAVERS ONLY".

Y74.2200A INDICATOR LAMPS - GENERAL PURPOSE NEON:

Lamp - Neon.
Lamp rating - 230V supply.
Lens cover - Moulded plastic.
Lens colour - BS EN 60073.
Lens retaining rings - Moulded plastic.

Y74.3010 EARTHING:

Ensure metal framework of equipment is bonded to main earth point. Ensure that cable CPC's are connected to earth bar.
Provide earth CPC between earth lug on metal box and accessory casing except where accessory is encased in plastic.

Y74.3020 PROTECTION:

Ensure there is no physical or electrical damage to accessories when they are

removed from their packaging and during installation.
Provide masking covers for surface mounted accessories to protect surface from paint.
Where accessories are flush mounted install front plate after painting is finished.

Y74.3030 FIXING:

Align accessories horizontally and vertically. Where accessories are grouped, mount horizontally in line and parallel to each other and equidistant.
Fix cover plates to boxes with brass fixing screws.

Y74.3040 MEASURING MOUNTING HEIGHTS:

Take measurement for position of electrical accessories to the centre line of equipment from either finished floor or worktop. Where specified height coincides with top of tiling, leave a clear gap of 50mm above tiling.
Mount equipment below a worktop 100mm below underside of worktop.

Y74.3050 STANDARD ACCESSORIES MOUNTING HEIGHTS:

Accessory	Location	Height (mm)
Lighting switch		1200
Socket outlet	General	450
	Kitchen	1000
	Above worktop	200
Shaver socket outlet		1000
Fused connection unit	General	450
	Above worktop	200
Fused connection unit controlling		
Radiator heater, wall		1800
Radiator heater, focal point		450
Tubular heater		450
Clock		1900
Cooker control unit	Above worktop	200
Cooker connection unit		600
Safety isolating transformer		1200
Room thermostat		1400
Telephone outlet		450
Radio/TV outlet		450
Push button		1200
Fire alarm manual call point		1200
Bell or buzzer		2000
Visible alarm indicator		2000

In car parks and garages comply with appropriate petroleum regulation for mounting heights of socket outlets.

Y74.3070 ACCESSORIES MOUNTING HEIGHTS:

Provide switches and socket outlets for lighting and other equipment in habitable rooms at appropriate heights between 450mm and 1200mm from finished floor level, in accordance with Building Regulations Approved Document M and BS 8300.

Y80 EARTHING AND BONDING COMPONENTS

Y80.1000 GENERAL

Y80.1010 MATERIALS GENERALLY:

Use materials and installations methods in accordance with BS 6651, BS 7671, BS 7430, Electricity, Safety, Quality and Supply Regulations and Local Electricity Supply Authority Requirements as appropriate.

Y80.2040B ROD EARTH ELECTRODES FOR SYSTEM EARTHING:

Standard - BS 7430.
Form - rod with female thread each end.
Dimensions
Rod Diameter - 15 mm - nominal.
Rod Length - 2.4m (2 x 1.2) minimum.
Earth electrode couplings
Use high strength driving cap in contact with driven rod and couplings of compatible material fully enclosing the rod threads.
Interconnect electrodes using bare copper tape 25mm x 6mm.
Earth electrodes in drawpits
Provide concrete cover, permanently labelled, for electrodes installed through cable drawpit bases.
Main earth conductor connection
Connect main earth conductor to first electrode using heavy duty purpose made silicon aluminium bronze body conductor clamp and high tensile phosphor bronze bolt.
Material, minimum size as BS 7430 Table 4 - Copper.
Accessories
Rod to tape clamp. Sized to suit earth rod and connector.

Y80.2040D BUILDING OR STRUCTURAL ELEMENT EARTH ELECTRODES FOR SYSTEM EARTHING:

Standard - BS 7430.
Form - Building or structural element.
Earth electrode couplings
Use high strength driving cap in contact with driven rod and couplings of compatible material fully enclosing the rod threads.
Interconnect electrodes using bare copper tape 25mm x 6mm.
Earth electrodes in drawpits
Provide concrete cover, permanently labelled, for electrodes installed through cable drawpit bases.
Main earth conductor connection
Connect main earth conductor to first electrode using heavy duty purpose made silicon aluminium bronze body conductor clamp and high tensile phosphor bronze

bolt.
Material, minimum size as BS 7430 Table 4 - Copper.
Accessories
Rod to tape clamp. Sized to suit earth rod and connector.

Y80.2060A EARTH ELECTRODE CLAMPS:

Connect tape to electrode head using heavy duty purpose made silicon aluminium bronze body connector clamps or leaded gunmetal body connector clamps, and high tensile phosphor bronze bolts to BS EN 12163.

Y80.2070A EARTH ELECTRODE INSPECTION FACILITIES:

Provide enclosure for each connection between earth conductor and associated earth electrode system. Install so that top is flush with finished ground or floor level. Ensure enclosure provides adequate access for testing purposes. Provide pit details for builders work.
Labelling - Wording, Earth.

Y80.2090A MAIN EQUIPOTENTIAL BONDS:

Provide main equipotential bonds in accordance with BS 7430 and BS 7671.
Material - Insulated cable, single core to BS 6004.
Use no joints in main equipotential bonds.

Y80.2100A SUPPLEMENTARY EQUIPOTENTIAL BONDS:

Provide supplementary equipotential bonds to BS 7430 and BS 7671. Joints not allowed in these bonds.
Material - Insulated cable, single core to BS 6004.

Y80.2110A CIRCUIT PROTECTIVE CONDUCTORS:

Material
Insulated cable, single core to BS 6004 as indicated; metallic screwed conduits (excluding flexible); metallic trunking with tinned copper links; armouring and/or metallic sheathing of armoured cables or integral conductor of multi-core cable.
Size
Provide protective conductors sized in accordance with BS 7671 (IET Regulations) 543-01-03 and Tables 54.2, 54.3, 54.4, 54.5 and 54.6 or provide protective conductors sized in accordance with BS 7671 (IET Regulations) 543-01-04 and Table 54.7.

Y80.2120 EARTHING CLAMPS:

Use clamps complying with BS 951, for bonding pipes and lead sheathed cables.

Y80.2130A EARTH BUSBARS:

Material
Manufacture earth busbars from hard drawn, tinned, high conductivity copper bar.
Substation Earth busbar
75 x 13mm cross section 600mm minimum length.
Main Earth Terminal busbar
25 x 6 mm minimum for incoming live conductor not exceeding 50mm and 50 x 6 mm minimum for incoming live conductor over 50mm^2.

Y80.2140 TEST LINKS:

Provide two test links, in connections between main earth conductors and earth busbar. Fabricate each from two additional sections of earth busbar. Mount one section on stand-off insulators matching earth busbar; use remaining section as removable test link. Secure 12mm high tensile brass studs to fixed sections of busbar and drill corresponding clearance holes in test links and provide brass washers, nuts and locking devices to secure frame/neutral earthing and test links.

Y80.2150 LUGS/TAGS:

Provide lugs or tags to enable connection of bonding conductors to equipment earth terminals.

Y80.2160 PROTECTIVE CABLE TERMINATIONS:

For bolted connections use crimp type lugs compressed by automatic tool to achieve correct pressure and crimp depth.

Y80.2170 PROTECTIVE CONDUCTOR WARNING NOTICES/LABELS:

Provide a permanent label durably marked in letters 4.75mm minimum height "SAFETY ELECTRICAL CONNECTION - DO NOT REMOVE", in visible position, at each bonding conductor connection to extraneous conductive parts.

Y80.2180 MAIN EARTH CONDUCTOR - WARNING TAPES:

Provide green/yellow PVC tapes labelled "EARTHING CONDUCTOR" over complete external lengths of main earth conductors at 300mm depth below finished ground.

Y80.2190 EARTH BAR LABEL:

Label earth bar "SAFETY ELECTRICAL CONNECTION - DO NOT REMOVE" with wall mounted laminated plastic tablet engraved in 10mm high red letters on white ground.

Y80.3010 CLEAN EARTH DISTRIBUTION:

Install clean earth distribution in double insulated cables from earth electrodes to equipment points. Mount all busbars with insulators and separate from other earthing systems.

Y80.3020 DISSIMILAR METALS:

Ensure, where dissimilar metals are used for system, that purpose made jointing materials are used such that corrosion and deterioration of the electrical connection are not caused. Ensure bonding connections to other metal parts of building are electrolytically compatible with those metal parts. Use the guidance given in BS 7430 Table 8 when bonding dissimilar materials.

Y80.3030A COPPER TAPE JOINTS:

Provide waterproof protection at joints subject to moisture.
Joint copper tapes by brazing, using zinc-free brazing metal with melting point at least 600^{o}C or thermic welding.

Y80.3030B ALUMINIUM TAPE JOINTS:

Provide waterproof protection at joints subject to moisture.
Joint aluminium tapes by welding to BS EN 1011-4.

Y80.3040 STRANDED CONDUCTOR JOINTS:

Provide waterproof protection at joints subject to moisture.
Joint copper stranded conductors with compression joints to BS EN 61284.

Y80.3050A PROTECTIVE CABLE TERMINATIONS:

For bolted connections use crimp type lugs compressed by automatic tool to achieve correct pressure and crimp depth.
Make connections between tape and equipment using high tensile grade brass bolts with brass nuts, washers and locking devices. Use phosphor bronze bolts, nuts and

washers where connections are liable to corrosion.

Y80.3060A EARTH ELECTRODES:

Location

Locate electrodes not less than 2m distant from building/structure protected, and away from telecommunication and pilot cables and metallic fences.

Driving

Drive rods vertically into ground with purpose designed electric hammer. (Where impenetrable strata encountered at shallow depth, drive at 30^{o} to horizontal).

Depth of rod

2.4m minimum below finished ground surface.

Depth of Electrode heads

Locate electrode heads just below ground level.

Spacing

Where electrodes are installed in a group ensure minimum distance between electrodes is twice depth of rods. Where rods for clean earth are installed ensure distance from any other system rods is six times depth of clean rods.

Tape Depth

Install interconnecting or electrode tape 750mm below finished ground level, rising vertically at each electrode.

Connect groups of electrodes to main earth conductor via bolted link in inspection pit as BS 7430 for test purposes.

Y81 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES:

Y81.1000 GENERAL

Y81.1010 INSPECTION AND TEST PROCEDURE:

Comply with BS 7671 Requirements for Electrical Installations (the IET Wiring Regulations), IET Guidance Notes Number 3 Inspection & Testing and other British Standards as appropriate.

Y81.1020 SUPPLY CHARACTERISTICS:

Obtain information called for in BS 7671 about supply characteristics from Supplier, other than where to be measured as part of testing procedure.

Y81.1030 DESIGN INFORMATION:

Obtain all design assumptions, calculations and any other information to enable compliance with BS 7671 to be verified.

Y81.2010A INCORPORATED EQUIPMENT CHARACTERISTICS:

Obtain and use information from manufacturers of equipment provided.
Use information provided, for equipment supplied by others and incorporated into installation.

Y81.2020A PROSPECTIVE SHORT CIRCUIT CURRENT:

Determine values of I_P by measurement, unless other means are indicated.
Determine I_P at all necessary points within installation to confirm correct equipment selections.
Obtain from supply undertaker written confirmation of maximum and minimum values of I_P at origin of installation. Adjust subsequent measured values of I_P accordingly.

Y81.2030A INITIAL VERIFICATION:

Carry out detailed inspection to verify the requirements of BS 7671, in the order given in clause for New Installation or Altered or Added Installation as appropriate.

Y81.2040A TEST EQUIPMENT AND CONSUMABLES:

Provide test equipment and consumables to complete tests satisfactorily, and to retest any failed installations following corrective measures.

Test equipment quality assurance requirements to BS EN ISO 10012.

Y81.2050A TESTING

Carry out in the same order as published the tests required by BS 7671, for New Installation or Altered or Added Installation as appropriate.

Y81.2060A CONTINUITY OF PROTECTIVE CONDUCTORS:

Confirm continuity. Use ac source or dc source.

Y81.2070A EARTH FAULT LOOP IMPEDANCE:

Use 25 A test current. Measure and record source impedance (Z_E).
If alternative LV supply arrangements are available, measure Z_S when using supply with highest impedance.
Measure Z_S with main equipotential bonding conductors connected. Do not summate values of several parts of each loop.

Y81.2080 SETTINGS AND ADJUSTMENTS:

Confirm characteristics and settings of protective devices are within maximum and minimum specified tripping times. Check correct operation of devices. Confirm interlocks and sequences operate safely and as indicated.

Y81.2090A STANDBY GENERATORS:

Perform works tests on standby generators and provide test certificates. Comply with BS 5000-3 and BS 5000-11 or BS EN 60034-3 as appropriate.

Y81.2100A HV AND LV TRANSFORMERS:

Perform works tests on HV and LV switchgear in accordance with BS EN 60298 and BS EN 60439-1, as appropriate, and provide test certificates.

Y81.2110A HV POWER TRANSFORMERS:

Perform works tests on HV power transformers in accordance with BS EN 60076-3, BS EN 60076-4 and BS EN 60076-5. Provide test certificates.
Perform all routine tests.

Y81.2120A FIRE DETECTION AND ALARM INSTALLATIONS:

Carry out site testing and inspection and provide test certificates for fire detection

and alarm systems in accordance with BS 5839-1.

Y81.2120E EMERGENCY LIGHTING INSTALLATIONS:

Carry out site testing and inspection and provide test certificates for emergency lighting installations in accordance with BS 5266 and BS EN 50172.

Y81.2130 CALIBRATION:

Provide current certificates of calibration for all instruments used during test procedures. Record particular instrument identity on record sheets.

Y81.2140A CERTIFICATION AND REPORTING:

Complete and hand over to the Client a Completion and Inspection Certificate to BS 7671 for New Installation or Altered or Added Installation as appropriate.

Y81.2150A INSTALLATION CERTIFICATES:

Provide installation certificates for electrical installations in accordance with BS 7671 (IET Regulations).
Record details of departures from BS 7671 (IET Wiring Regulations) on certificate.
Provide copies of calculations justifying departure from BS 7671 (IET Wiring Regulations) and attach to certificates.

Y81.2160 RECORDS:

Record all results and instrument readings on approved Record Sheets and hand over to the client two copies for each inspection and test.

Y81.3010 CONDUCTIVE PARTS:

Test conductive parts simultaneously accessible with exposed conductive parts of extraneous conductive parts. Establish that they are either not an extraneous conductive part, or that they are reliably connected by metal to main equipotential bonding.

Confirm conductive parts which are not extraneous conductive parts are separated from earth by an impedance greater than 50,000 ohms. Confirm other conductive parts are bonded to equipotential zone earthbar by an impedance not exceeding 0.1 ohms.

Y81.3020 PHASE SEQUENCE:

Check and confirm correct polarity of all conductors in all circuits.

Y81.3030A HIGH VOLTAGE TESTS:

Conduct high voltage tests for equipment indicated. Comply with BS 923-1, BS EN 61180 and BS EN 60060-2. Comply with BS EN 61180.

Y81.3040A LV BURIED CABLES:

Test continuity and insulation of buried cables immediately after back-filling. Test continuity and insulation of buried cables prior to handover.

Y81.3050 CONDUIT, TRUNKING AND DUCTING:

Test and confirm electrical continuity before installing cables.

Y82 IDENTIFICATION - ELECTRICAL

Y82.1000 GENERAL

Y82.2010A LABELS AND NOTICES:

Apply identification labels and notices in accordance with BS 7671 (IET Wiring Regulations), to all electrical cables plant and equipment including components of mechanical systems.
BS 7671.
Identification of protective devices.
Diagrams, charts or tables to comply with Clause 514-09.
Warning notices, voltages in excess of 250 volts.
Periodic inspection and test notices.
Residual current device notices.
Earth electrode safety electrical connection label.
Bonding conductor connector point to extraneous conductive parts label.
Earth free local equipotential bonding areas warning notice.
Electrical separation areas warning notice.
Outdoor equipment socket outlet notice.

Y82.2020A MATERIALS:

Use materials for labels and notices with a predicted life equal to or greater than the design life of the electrical cables, plant, equipment or installation to which it refers.
External
Signwritten, or stencil in paint compatible with surface.
Colour - Background, plant standard finish. Lettering, white.
Internal
Engraved thermosetting plastic laminate.
Colour - Background, white or red. Lettering, red or white.

Y82.2030A FIXING - INTERNAL:

Fix labels and notices using materials compatible with label or notice and surface to which it is fixed by screws into tapped hole or bolted complete with washer nut and locking device.

Y82.2040A ARRANGEMENT:

Obtain approval prior to manufacture, with regard to style, colour, lettering, size and position of all labels and notices.
Provide sample showing style, colour, lettering and size, for approval.

Y82.2050A LETTERING AND SIZE OF LABELS AND NOTICES:

Ensure that all lettering and symbols comply with the requirements laid out in BS 7671 (IET Wiring Regulations), and BS 5499. Use BS 5499-1 for height of lettering where not otherwise indicated. Ensure labels and notices of adequate size for the lettering required, and allow a minimum margin around all lettering of one line space vertically and two letter spacing horizontally.
Font - Helvetica Medium.
Size - BS 5499-1 or 5mm minimum high letters.

Y82.2060A CONDUCTOR ARRANGEMENT:

Arrange circuit polarity so that phases read in phase rotation order followed by the neutral, if any, from top to bottom in horizontal conductor layouts and left to right in vertical conductor layouts. Ensure flat horizontal arrays have leading phase to the left and neutral to the right from left to right when viewed from supply point. Arrange phase or live pole of two wire apparatus at top or left hand and neutral and earth both at bottom or right hand side. In all cases, ensure conductor arrangements defined are when viewed from front face of all equipment and terminating facilities. Apply identification markers in accordance with BS 7671 (IET Wiring Regulations), Clause 514 to all conductor termination points.
BS 7671 Amendment 2.

Y82.2070A SAFETY SIGNS:

•Details of supplementary or text signs to BS 5499-5 as indicated on drawing
Label all electrical plant and equipment using safety sign 8.A.0044 of BS 5499-5 where voltages above ELV exist.
Provide supplementary or text signs complying with BS 5499-5 with each safety sign 8.A.0044 as indicated.
Label all electrical plant and equipment with the labels specified in the appropriate British Standards for that plant or equipment.
Identify each substation and main switchroom with safety sign 8.A.0044 to BS 5499-5 with supplementary signs to BS 5499-5, notices and signs required by BS 5499-5 for any fire extinguishing system and notice giving details of,

- Name of the Substation or switchroom
- The presence of Medium and Low Voltages.
- Administrative instructions for access.
- Location and method of contacting controlling authority.
- Actions to be taken in an emergency.

Y82.2080A PLANT AND EQUIPMENT LABELS:

Fit labels on all items of plant, equipment, switches, etc., include the following information: service controlled, circuit reference, voltage, type of supply and phase etc., circuit protection type and rating.

Y82.2090 MAINTENANCE NOTICES:

Equipment
Fix notices giving warning of, and instructions on, any special maintenance procedures to plant and equipment.

Y82.2100 COLOUR CORRECTED LIGHT FITTINGS:

Fix a warning or identification disc to light fittings containing colour corrected fluorescent tubes or other colour corrected light sources to ensure that maintenance staff install the correct lamps.

Y82.2110A MOTORS AND STARTERS LABELS:

Fit identification labels to all motors, starters and starter panels. Ensure positive identification of respective motors and starters. Provide motors with non-corrodible labels attached adjacent to each bearing giving details of the lubricant to be used. Mark direction of normal rotation on motor casing. Provide labels to identify motor equipment fitted with surge suppressors and thermistors stating that insulation test voltages must not be applied to thermistors and thermistor control units. Ensure labelling is compatible with schematic and wiring diagrams, and complies with BS EN 60034-8.

Y82.2120A ENGRAVED ACCESSORY PLATES:

Engrave switchplates, spur units, pushes and special plates for bed head units, call systems, fire alarms, etc. Use 6mm high letters with engraving coloured red.

Y82.2130A SWITCHGEAR:

Fit labels on switchgear as required by BS 7671 and BS EN 60439 to indicate duty of unit, its voltage, phase and current rating, protective device rating size of conductor involved, and all other necessary details.
Use an agreed serial coding system, provide at the switch a key to the coding system. BS 7671.

Y82.2140 DISTRIBUTION BOARDS:

On each distribution board identify every outgoing way with a renewable circuit chart in a transparent plastic envelope permanently fitted inside distribution board cover. Clearly indicate in typed script, circuit identification number, cable size, fuse or circuit breaker rating and a description of item supplied and area supplied by circuit.

Y82.2150A SCHEMATIC DIAGRAMS:

Provide a purpose made schematic diagram permanently fixed showing the connections of the equipment and plant.
Locations and materials as indicated in contract preliminaries.

Y82.2160A SPECIAL PURPOSE EARTHING:

Fit labels to special purpose earthing conductors and connection points, describing their purposes and any instructions necessary for their operation and maintenance.
IT equipment "Clean Earths".
Telecommunications functional earths.

Y82.2170A INDICATOR LAMPS AND PUSH BUTTONS FOR POWER SYSTEMS:

Use indicator lamp and push button colours in accordance with BS EN 60073.
Indicator lamp
Red, danger or alarm; yellow, caution; green, safety.
Push buttons
Red, emergency action; red, stop or off; yellow, intervention; green, start or on.
Illuminated push buttons - Type A.

Y82.2180A CONDUIT AND TRUNKING COLOUR CODING:

In areas of mechanical plant or voids accommodating mechanical services, or where otherwise indicated, identify electrical conduits and ducts in accordance with BS 1710. Apply colour orange to BS 4800 by painting on service as a band over 150mm or applying an adhesive tape type wrap around services over a length of 150mm. Place identification colours at bulkheads, wall penetrations and any other place where identification is necessary.

Y82.2190A CABLE IDENTIFICATION:

Provide all cables, other than final sub-circuit wiring enclosed in conduits or trunking, with labels fixed at each end of cable either side of wall and floor penetrations at approximately 12m intervals at convenient inspection points by means of non-releasable plastic straps, minimum width 4mm.
Ensure labels show the reference number of cable.

Y82.2200A TERMINAL MARKING AND CONDUCTOR IDENTIFICATION:

Provide for switchgear and control gear elements whose terminals are marked in accordance with BS 5472 (EN 50005) and BS 6272 (EN 50042). Use a unique reference to identify each element in the switchgear or control gear. Mark on or adjacent to each element its reference. Identify each terminal for connection to external wiring or cabling using a reference system complying with BS EN 60445 based on the element reference and the appropriate element terminal reference. BS 7671.

Adjacent to terminals.

Use lettered or numbered ferrules or sleeves to BS 3858 to mark each auxiliary conductor or control cable core with the identity of the terminal to which it is connected and the reference of plant or equipment to which it is connected and the identity of the terminal at the remote end. Ensure that main circuit conductors are identified in accordance with BS 7671 (IET Wiring Regulations). Ensure that all identification of terminals and conductors is recorded and included on record drawings and in operation and maintenance documentation.

Y82.2210A UNDERGROUND CABLE IDENTIFICATION:

Identify external underground cable routes by means of approved markers along their length at distances not exceeding 50m and where a change of direction occurs on such routes. Provide cables markers with a brass plate or impress concrete to clearly indicate the reference of group of cables or reference number of cable and operating voltage of cable. Provide key to any reference system used at switchgear. Mark and protect direct buried cables with plastic tape yellow printed black "DANGER ELECTRIC CABLES" elsewhere.

Y82.2220A CABLE CONDUCTOR COLOUR CODING:

Identify cable conductors in accordance with BS 7671 (IET Wiring Regulations), note that a lighting sub-circuit switch wire is a phase conductor in a single phase circuit. BS 7671.

All single phase final sub-circuit phase wiring coded Brown.

Y82.2230 CABLE JOINTING AND TERMINATION:

Connect all cables in the installation so that the correct sequence of phase rotation is

maintained throughout. Where straight through joints are approved joint medium voltage conductors as they lie, ensuring their complete length is phased out on completion. Ensure connections at terminations of MV cables are made in the correct phase rotation and ensure cable conductor termination marking if any, complies with this phase sequence. Where straight through joints are approved on low voltage cables, whether power cables or control or auxiliary cables, joint conductors strictly in accordance with their colour or numeric coding. Where such joints are approved on mineral insulated or other non-coded conductor cables, identify each core at the joint and make the joint core to core.

Y82.2260A ADDITIONAL SAFETY SIGNS:

Provide at locations shown or as appropriate safety signs to BS 5499 with colours and dimensions as of BS 5499-1.

- Application
  For main switch and electrical plant room access doors. BS 5499-5, complete with supplementary signs as shown.
  6.C.0019. 6.A.002, with supplementary sign "Authorised persons only". 7.A.022
- Application
  For use with permit to work systems, BS 5499-5, complete with supplementary signs as shown.
  6.C.0021. Printed on rigid plastic, with hanging loop, with supplementary wording "Do not operate. Work in progress".
- Application
  For use at each emergency stop. BS 5499-5, complete with supplementary signs as shown.
  9.B.0097. With supplementary sign "Emergency stop push-button".

Y90 FIXING TO BUILDING FABRIC

Y90.1000 GENERAL

Y90.1010 PREPARATION:

Mark-out, set-out and firmly fix all equipment, components and necessary brackets and supports.

Y90.1020 MANUFACTURER'S DRAWINGS:

Use manufacturer's drawings and templates for purposes of marking and setting out.

Y90.1030 FIXINGS:

Ensure structure and fixings are suitable for items to be fixed.

Y90.1040 LOADING DETAILS:

Provide loading details for all fixing types.

Y90.1050 BUILDING-IN BY OTHERS:

Provide all necessary assistance to enable any item of building-in type to be built in by others.

Y90.1060 SIZE OF FIXING:

Use largest size of bolt, screw or other fixing permitted by diameter of hole in item to be fixed.

Y90.1070 GREASING OF FIXINGS:

Ensure all bolts, screws or other fixings used are greased or lubricated in accordance with manufacturer's instructions.

Y90.2010 STANDARDS:

Ensure that fixings such as expanding anchors are tested for tensile loading in accordance with BS 5080-1.

Y90.2020 PLUGS:

Use plugs of suitable size and length for fixings. Use plastic, fibrous or soft metal non-deteriorating plugs to suit application. Do not use wood plugs.
Ensure that when screw is in place, threaded length is in plug. Ensure plugs used for screw fixing are set-in to correct depth prior to final tightening.

Y90.2030 SCREWS:

Use screws to BS 1210. Generally use sherardized steel wood screws for fixing to concrete, brickwork or blockwork.
In damp or exposed situations use greased brass wood screws.

Y90.2040 CAST-IN FIXINGS:

Where cast-in fixings are permitted, mark out and set fixings in accordance with manufacturer's instructions.

Y90.2050 SHOT FIRED FIXINGS:

Obtain approval prior to using shot fired type fixings.

Y90.2060 SELF ADHESIVE FIXINGS:

Obtain approval prior to using self adhesive type fixings.

Y90.2070 PROPRIETARY CHANNEL INSERTS:

Provide proprietary channel inserts for casting in where indicated.

Y90.2080 NON-PENETRATIVE SUPPORT SYSTEMS FOR ROOF MOUNTED EQUIPMENT:

- Manufacturer and reference
  - Or approved equivalent

Obtain approval prior to using non-penetrative support systems for roof mounted equipment.

Y90.3010 DRILLING:

Drill holes squarely. Use drills of requisite size and depth, and appropriate to fabric. Do not flame-cut holes in metal work.

Y90.3020 PROPRIETARY FIXINGS:

Comply with manufacturer's instructions for all fixings.

Y90.3030 FIXING TO REINFORCED CONCRETE:

Take precautions to avoid fixing through reinforcement.

Y90.3040 FIXING TO BRICKWORK:

Do not fix to unsound material or mortar between brickwork courses.

Y90.3050 FIXING TO TIMBER RAILS:

Fix equipment, brackets and supports by drilling hole through timber rail and fixing with bolt, back plate, washer and loose nut.

Y90.3060A FIXING TO HOLLOW STUD/TILE/BLOCK WALLS:

Fix equipment, brackets and supports where there is access at rear of wall, by drilling hole through wall and fixing with bolt, back-plate, washer and loose nut.
Fix equipment, brackets and supports where there is no access at rear of wall, drill hole and use screw anchor type fixing or gravity type toggle fixing.

Y90.3070A FIXING TO CONCRETE, BRICKWORK OR BLOCKWORK:

Fix equipment, brackets and supports using wood screws in plugs.
Drill holes and fix using steel bolts of grouted bolt type or expanding bolt type fixing.

Y90.3080A FIXING TO METALWORK:

Fix equipment, brackets and supports by drilling holes and fixing using set screws or bolts complete with washers, shakeproof washers and loose nuts.

Y90.3090A FIXING TO STRUCTURAL STEELWORK AND CONCRETE STRUCTURES:

Provide manufacturer's information on recommended fixing. Obtain approval for any fixing to structure steel work and concrete structures.
Generally use proprietary fixings to structural steelwork and concrete structures.
Obtain approval to cut holes in structural steelwork or concrete structures or weld to

structural steelwork.

Y91 OFF-SITE PAINTING AND ANTI-CORROSION TREATMENT

Y91.1000 GENERAL:

Y91.1010 GENERAL REQUIREMENTS:

Where particular methods of finish and painting are not specified, ensure following requirements are met.
Protect all metal work, plant, equipment, pipelines, ductlines, ancillaries, brackets and supports against corrosion and oxidization.
Provide ferrous metals, machined or otherwise with protective coatings at manufacturer's works.
Ensure all items requiring on-site decorative finishes are provided primed to suit base material and required finish.

Y91.1020 DAMAGED FINISHES:

Following delivery to site, storage on site and installation make good any damage to finishes, by cleaning, degreasing and re-furbishing.

Y91.2010A PAINT MATERIALS:

Use the following materials as appropriate
Solvent borne priming paint to BS 7956 for bare woodwork.
Red Oxide priming paint for bare iron and steelwork.
Zinc Chromate priming paint for bare ferrous and non-ferrous metals.
Calcium Plumbate priming paint to BS 3698 for galvanized steel or composite wood/metal components.
Undercoating paint for previously primed or painted surfaces before the application of finishing coats.
Gloss finishing paint for previously primed or painted/undercoated surfaces.
Epoxy resin paint for specialist coatings requiring resistance to acids, alkalis, oils, solvents, abrasion or high humidity.
Aluminium paint to BS 388 for structural steelwork, storage vessels, heated metallic surfaces and similar applications where moisture and heat resistant properties are required.
Cold galvanizing paint for making good damage to previously galvanized surfaces and protection to galvanized materials modified during installation.
Zinc-rich metallic to BS 4652 for bare iron and steelwork where electrical conductivity has to be assured.
Black tar-based paint to BS 1070 for moisture resistant protection to metal surfaces where decorating appearance is not important.
Bitumen based coatings for cold application to BS 3416 protection to iron and steel, particularly pipelines and fittings for use in contact with potable water.
Bitumen based coatings for cold application to BS 6949 not to be used in contact with potable water.

Y91.2020 PAINT QUALITY:

Ensure paints used are of quality and type to suit application and that:-
primers have good adhesion, covering power, rust-inhibiting and grain filling properties.
gloss finishing paints are of machine finish grade having high adhesion and high resistance to solvents, mineral oils, cutting oils, detergents, chipping and impact damage.

Y91.2030 HEAT RESISTANT PAINT:

Use heat resistant paints for applications to surfaces over 80^{o}C.

Y91.3010 GENERAL:

Ensure paints are applied in accordance with manufacturer's instructions and to BS 6150.

Y91.3020 WEATHER AND OTHER CONDITIONS:

Do not apply paints where weather, temperature, humidity or other conditions may have a damaging effect upon finish or paint.

Y91.3030A CLEANING AND PREPARING STEEL SURFACES FOR PAINTING:

Ensure metal surfaces are thoroughly cleaned, all mill and weld scale removed and finally degreased. Clean steel surfaces in accordance with BS EN ISO 8503 and prepare surfaces for painting in accordance with BS EN ISO 4618-3.

Y91.3030B CLEANING AND PREPARING SURFACES FOR PAINTING:

Ensure metal surfaces are thoroughly cleaned, all mill and weld scale removed and finally degreased.
Prepare surfaces for painting in accordance with BS EN ISO 4618-3.

Y91.3040 APPLICATION OFF-SITE:

Wherever possible ensure paint finishes applied by component manufacturers are spray applied.

Y91.3050 APPLICATION:

Apply paint evenly and ensure finish shows no excessive brush marks, grinning, runs, sagging, ropiness or other application defects.

Y91.3060 COLD GALVANIZING:

Repair damage to galvanized components due to installation process, i.e. following cutting, drilling or welding, by applying 2 no. substantial coats of cold galvanizing paint.

Y91.3070 PROTECTION OF BRIGHT MACHINE PARTS:

Apply a protective coating to all bright machined parts before dispatch from works.
Do not remove protective coatings unless required for installation, testing or commissioning purposes and in such cases reinstate upon completion.
Repair any damaged protective coating or bright machined part, or where necessary replace damaged component.
Use and apply metal coatings in accordance with manufacturer's instructions.
Complete where possible all welding, drilling, bending and other work before metal coating.

APPENDIX A - SCHEDULE OF DRAWINGS

The following drawings show the extent of the works and shall be termed 'The Contract Drawings'.

1629-ES-101	BASEMENT FLOOR PLAN ELECTRICAL SERVICES LAYOUT
1629-ES-102	GROUND FLOOR PLAN ELECTRICAL SERVICES LAYOUT
1629-ES-103	FIRST FLOOR PLAN ELECTRICAL SERVICES LAYOUT
1629-ES-104	SECOND FLOOR PLAN ELECTRICAL SERVICES LAYOUT
1629-ES105	THIRD FLOOR PLAN ELECTRICAL SERVICES LAYOUT
1629-ES-106	FOURTH FLOOR PLAN ELECTRICAL SERVICES LAYOUT
1629-ES-201	BASEMENT TO THIRD FLOOR ELECTRICAL SERVICES IN KITCHEN AND TEA POINT

APPENDIX B - TENDER SUMMARY

TENDER SUMMARY

UNIVERSITY COLLEGE LONDON
JOHN ADAMS HALL
FLOORS 1 TO 4, PART GROUND FLOOR AND BASEMENT
KITCHEN REFURBISHMENT
SUMMER WORKS 2017

FOWLER MARTIN
CHARTERED BUILDING SERVICES ENGINEERS

ELECTRICAL SERVICES

1	Site Specific Works Costs	£
2	Removal of Redundant Systems	£
3	LV Distribution modifications and additions	£
4	Containment Systems	£
5	Supply and installation of General Lighting	£
6	Supply and installation of Emergency Lighting	£
7	Small Power modifications and additions	£
8	Fire Alarm Systems modifications	£
9	Fire Alarm System temporary modifications	£
10	Earthing and Bonding	£
11	External Gardens Works	£
12	Spot Items	£
13	Testing and Commissioning	£
14	Provision of Record Information	£
15	Sub-Total	£
16	Add 1/39th for MCD	£
17	TOTAL (Excluding V.A.T.)	£

Note: £5,000.00 will be withheld pending provision of Operating and Maintenance Instruction Manuals and 'as installed' drawings.

Contractor: ……

Address: ……

Signed: ……

(Name in capitals)……

Date: ……

Contractor:.....Initials:.....

APPENDIX C - PERMIT TO ENTER/WORK PROCEDURES

APPENDIX C

PERMIT TO ENTER/WORK PROCEDURES

Permit Types

B	KEY ISSUE (PLANT ROOM, ROOF ACCESS ETC.)	To authorise the issue of keys for entry to rooms/areas controlled by EFD
C	INSTRUCTION TO DISCONNECT	Instruction to electrician/engineer to disconnect plant/equipment/systems/area and to provide confirmation of the disconnection before work on the plant/equipment/systems/area takes place.
D	ENTER RESTRICTED AREAS	To authorise the entry into restricted areas under the control of UCL departments e.g. laboratories, and BSU.
E	CONFINED SPACE	To authorise work in a confined space. This permit requires confirmation of the isolation of electrical/mechanical systems air monitoring and rescue equipment.
F	HOT WORK	To authorise hot work. This permit requires specified safety checks to be carried out by the person carrying out the hot work.
G	WORK ON SPECIFIC SYSTEMS	To authorise work on a specific system (plant or equipment). This permit requires confirmation of isolation or safety checks of electrical and mechanical systems.
H	LABORATORY CLEARANCE CERTIFICATE	Laboratory Clearance Certificates are for the use of Project Officers/Managers to obtain, from the occupying department, confirmation of laboratory clearance or adequate safety control measures before the area is handed over to a contractor.

EFD PERMIT ISSUE SYSTEM

Contractors should report to the EFD Customer Services Centre for permit issue or collection.

In some instances the contractor will be instructed to report to a Maintenance Manager to arrange a permit issue.

Contractors must comply with the requirements of the permit.

NB. Where a contractor is a Principal Contractor under the definitions of the CDM regulations the Principal Contractor may operate the Hot Work permit system.

Customer Service Centre – Location

UCL Estates
Customer Service Centre
Foster Court
London
WC1E 7HB

NOTES ON PERMIT USE

Before starting work the contractor must carry out any checks required by the permit and satisfy themselves that area is safe to work, and then sign the permit on acceptance of the work area.

The contractor must obtain the signature of other persons that may be specified on the permit before starting work.

The Contractor is expected to adopt good working practice, comply with UCL Safety Rules for Contractors and to follow any safety requirements specified on the permit.

Permits must be displayed at the place of work

Once the work is finished permits must be returned to the Customer Services Centre for closure.

NB. A fine of £100 will be made for the non-return of keys issued with a permit.

Sample permits follow:

UCL ESTATES & FACILITIES DIVISION

PERMIT B: KEY ISSUE FOR EFD CONTROLLED AREAS

Part A. Project Officer / Authorising Officer

Project Officer		Permit. No.	
Building / UGC No.		Job No.	
Room No. or area			
Task / System			
Contractor Company			

The contractor/UCL Maint. staff is authorised to draw keys and enter the EFD controlled area (Plant Rooms, Roofs etc.) specified above.
This Permit is issued for the work specified above to be carried out on or between the following dates

Permit valid from:		Permit valid to:	

Issuing Officer		Issue date	

To be signed by contractor/UCL Maint. at time of issue

Name (Block Letters) Include company if different from above	Signature	Date

Part B. Contractor/UCL Maint. Staff: on acceptance.

At the work area and before starting work the contractor must read the following requirements and sign below:

If a specific work permit (e.g. Hot Work or Work on a Specific System) is required for the designated task it must be in place before starting work

Before starting work the contractor should satisfy themselves that the area is safe to work and report any problems or defects to the Project Officer.

The contractor must abide by "UCL Safety Rules for Contractors" when carrying out the work.

I have read, understood and agree to abide by the above requirements

Name (Block Letters)	Signature

Part C. Contractor/UCL Maint. Staff: on completion

I have completed the above task. The area is in a safe and tidy condition.
I have returned all keys issued with this Permit to the Estates & Facilities Help desk.

Name (Block Letters)	Signature

This Permit and any keys drawn with this permit, must be returned to the Estates & Facilities Help Desk for closure

The following keys were issued with this Permit	

Part D. UCL Estates & Facilities Section: To Close this Permit

Estates & Facilities Help Desk Signature	Date	
		A copy may be retained by the contractor as receipt of closure

KEYS MUST BE RETURNED TO THE CUSTOMER SERVICES CENTRE
BY 17:15 ON FRIDAY OF THE WEEK OF ISSUE

UCL ESTATES & FACILITIES DIVISION	UCL

PERMIT C: INSTRUCTION TO DISCONNECT ELECTRICAL/
MECHANICAL EQUIPMENT OR INSTALLATION

Part A. Project Officer / Authorising Officer

Project Officer		Permit. No.	
Building / UGC No.		Job No.	
Room No. or area			
Task / System			
Contractor Company			

This Permit is issued for the work specified above to be carried out on or between the following dates

Permit valid from:		Permit valid to:	
Issuing Officer		Issue date	

Part B. Contractor/UCL Maint.Staff: on acceptance

The Contractor must read the following requirements and sign below:

The named contractor/UCL Maint. staff is instructed to disconnect the equipment/instillation identified above and ensure that the disconnected equipment/instillation does not present a risk to those working in the area.

Work must be carried out in accordance with the "UCL Safety Rules for Contractors".

Any problems or defects are to be reported to the Project Officer who originated this instruction.

I have read and understood the requirements above.

Name (Block Letters) Include company if different from above	Signature	Date

Part C. Contractor/UCL Maint.Staff: after disconnection

Once the disconnection work has been carried out the contractor/UCL Maint. Staff must sign this section

I have disconnected and isolated the equipment/installation identified in Part A, in accordance with the instructions of the Project Officer and the "UCL Safety Rules for Contractors". Warning notices have been posted where appropriate.

Name (Block Letters)	Signature	Date

Use this space to supply any additional information about the disconnection or conditions that apply:

When complete this Permit must be returned to the Project Officer / Authorising Officer who issued the instruction

Part D. UCL Estates & Facilities Section: To Close this Permit

The Project Officer / Authorising Officer who issued the instruction should sign below and close this permit on the Permit Issue Database system.

Estates & Facilities Signature	Date	A copy may be retained by the contractor as receipt of closure.

UCL ESTATES & FACILITIES DIVISION

PERMIT D: TO WORK / ENTER RESTRICTED AREAS

Part A. Project Officer / Authorising Officer

Project Officer		Permit. No.	
Building / UGC No.		Job No.	
Room No. or area			
Task / System			
Contractor Company			

This Permit is issued for the work specified above to be carried out on or between the following dates

Permit valid from:		Permit valid to:	
Issuing Officer		Issue date	

To be signed by contractor at time of issue

Name (Block Letters) Include company if different from above	Signature	Date

Part B. Client Department — To be completed by a person designated by the client department

The laboratory */ Biological Services Unit is safe to work in */ safe to work under the following conditions (*/ delete as appropriate)

Signature: Date:

Where the work necessitates the closure of the whole (or large area) of a laboratory that is to be handed over to the control of the contractor an E&F Laboratory Clearance Certificate will be required.

Part C. Contractor/UCL Maint. Staff: on acceptance of work area

The contractor/UCL Maint. staff should be satisfied that the area is safe to work and report any defects to the Project Officer.

I accept the work area, am able to carry out the designated task and will abide by the "UCL Safety Rules for Contractors"

Name (Block Letters)	Signature

Part D. Contractor/UCL Maint. Staff: on completion

I have completed the above task and notified the UCL Project Officer. The area is in a safe and tidy condition.
I have returned all keys issued with this Permit to the Estates & Facilities Help desk.

Name (Block Letters)	Signature

This Permit should be returned to the Estates & Facilities Help Desk for closure

The following keys were issued with this Permit	

Part E. UCL Estates & Facilities Section: To Close this Permit

Estates & Facilities Help Desk Signature	Date	
		A copy may be retained by the contractor as receipt of cancellation

UCL ESTATES & FACILITIES DIVISION

PERMIT E: TO ENTER A CONFINED SPACE

Part A. Project Officer / Authorising Officer

Project Officer		Permit. No.	
Building / UGC No.		Job No.	
Room No. or area			
Task / System			
Contractor Company			

This Permit is issued for the work specified above to be carried out on or between the following dates

Permit valid from:		Permit valid to:	
Issuing Officer		Issue date	

To be signed by contractor at time of issue

Name (Block Letters) Include company if different from above	Signature	Date

Part B. Electrical Supervisor I have isolated and locked off all Electrical Services on the above system

Name (Block Letters)	Signature	Date

Part C. Mechanical Supervisor I have isolated and locked off all Mechanical Services on the above system

Name (Block Letters)	Signature	Date

Part D. Safety Manager I have tested the air in the confined space, identified above, for oxygen level, SO_2 and flammable gases.

The above-mentioned area is safe to work in */ safe to work under the following conditions. (*/ delete as appropriate)

Name (Block Letters)	Signature	Date

Part E. Contractor/UCL Maint. Staff: on acceptance.. The contractor/UCL Maint. Staff should only accept the task after sections B, C, & D have been signed

The contractor/UCL Maint. staff should be satisfied that the area is safe to work and report any defects to the Project Officer.

I accept the work area, am able to carry out the designated task and will abide by the "UCL Safety Rules for Contractors"

Name (Block Letters)	Signature

Part F. Contractor/UCL Maint. Staff: on completion. I have completed the above-mentioned task. The area is in a safe and tidy condition. I have returned all keys to the E&F Help desk and notified the Project Officer.

Name (Block Letters)	Signature	Date

This Permit should be returned to the Estates & Facilities Help Desk for closure

The following Keys were issued with this Permit

Part G. UCL Estates & Facilities Section: To Close this Permit

Estates & Facilities Help Desk Signature	Date

A copy may be retained by the contractor as receipt of closure.

UCL ESTATES & FACILITIES DIVISION

Part A. Project Officer / Authorising Officer

PERMIT G: WORK ON A SPECIFIC SYSTEM

Project Officer		Permit. No.	
Building / UGC No.		Job No.	
Room No. or area			
Task / System			
Contractor Company			

This Permit is issued for the work specified above to be carried out on or between the following dates

Permit valid from:		Permit valid to:	
Issuing Officer		Issue date	

To be signed by contractor at time of issue

Name (Block Letters) Include company if different from above	Signature	Date

Part B. System Manager — To be completed by the Manager (departmental or E&F) of the specific system

The system is ready and safe for electrical and mechanical isolation

Name (Block Letters)	Signature	Date

Valid from (date & time)		Valid to (date & time)	

Part C. Electrical Supervisor / Project Electrician

I have isolated and locked off all Electrical Services to the above-mentioned system. Warning notices have been posted and the necessary safety barriers positioned. The above-mentioned system is safe to work on */ safe to work on under the following conditions (*/ delete as appropriate)

Name (Block Letters)	Signature	Date

Part D. Mechanical Supervisor / Project Engineer

I have isolated and locked off all Mechanical Services to the above-mentioned system. Warning notices have been posted and the necessary safety barriers positioned. The above-mentioned system is safe to work on */ safe to work on under the following conditions (*/ delete as appropriate)

Name (Block Letters)	Signature	Date

Part E. Contractor/UCL Maint. Staff: on acceptance

I accept the work area and will carry out the task in accordance with "UCL Safety Rules for Contractors"..

Name (Block Letters)	Signature	Date

Part F. Contractor/UCL Maint. Staff: on completion

I have completed the above-mentioned task. The area is in a safe and tidy condition. I have returned all keys and notified the Project Officer.

Name (Block Letters)	Signature	Date

This Permit should be returned to the Estates & Facilities Help Desk for closure

The following Keys were issued with this Permit

Part G. UCL Estates & Facilities Section: To Close this Permit

Estates & Facilities Help Desk Signature	Date

A copy may be retained by the contractor as receipt of closure

UCL ESTATES & FACILITIES DIVISION

LABORATORY SAFETY CLEARANCE CERTIFICATE (Permit H)

Building:

Floor: Room(s

Occupying

Date for commencement of

Please fill in all the boxes with a tick if actioned or N/A if not applicable.

HAZARD		EXPECTED ACTION	CHECKED
1.0 MICROBIOLOGICAL CONTAMINATION			
1.1	General surfaces of benches, walls and floors	All hard surfaces to be disinfected by spraying or wiping	
1.2	Sinks and drainage	Washed down with disinfectant and flushed for half an hour and traps cleaned out	
1.3	Microbiological Storage areas	All stores to be cleared and disinfected or (mobile stores) removed from the area	
1.4	Microbiological Safety Cabinets	Cabinets and ductwork to be fumigated and where possible removed from the area	
1.5	Containment Level 3 Laboratories	Whole room(s) to be fumigated	
2.0 RADIOACTIVE CONTAMINATION			
2.1	General surfaces of benches, walls and floors	All hard surfaces to be monitored and found clear of contamination	
2.2	Sinks and drainage	All sinks free from radiation and scintillation fluids and flushed for half an hour and traps cleaned out	
2.3	Radioactive sources	All removed from area	

Use the following to check and comment on the clearance or control of hazards in the laboratory.

FUME CUPBOARDS		**COMMENTS AND DETAILS**
l)	Have hazardous substances likely to leave a residue been used in the cabinet over the last 2 years? (in particular the use of perchloric acid) Please list!	
ll)	Have hazardous substances likely to leave a residue been used in the cabinet or flue over a longer period of time	
lll)	Has the Fume Cupboard been cleared of residual hazardous substances?	
HAZARDOUS SUBSTANCE STORAGE		
l)	Has the work area been cleared of all hazardous substances?	
ll)	Have all hazardous substance spillages been cleaned up?	
SINKS AND WASTE WATER DISPOSAL		
l)	Have the sinks been flushed through with running water continuously for a minimum of ½ hour?	
ll)	Is there any residual radiation or scintillation fluid left in sinks or drainage stacks?	
lll)	Have the traps immediately under the sinks or drip cups been cleaned out and made clear of obstructions? Eg Mercury, phenol, glass and sharps.	
LABORATORY BENCHES GENERALLY		
l)	Have benches been decontaminated and cleared of hazardous substances and sharps?	
ADDITIONAL PROVISIONS		
Have you:		
l	Removed all hazard signs:- including those on freezers, drawers, cupboards?	
ll	Isolated all departmental hazard warnings - i.e laser warning lights?	
lll	Removed all sharps and waste sharps containers?	
lV	Removed all chemical containers, glassware and general rubbish?	
V	Disposed of all unwanted Equipment eg. Centrifuges, freezers, stills and apparatus?	
Vl	Removed all unwanted furniture eg. stools, bins?	
Vll	Removed all cleaning and disinfection materials?	

On completion of all Safety and hazard checks the Head of Department or Department Safety Officer is required to sign the following statement. "The above laboratory has been checked as thoroughly as is reasonably practicable and is free from hazards generated by this department".

Signatory		Laboratory Manager / Supervisor
You should pass this certificate to your Departmental Safety Officer for information and comment. Signed		Departmental Safety Officer

On completion of the above certificate will the signatory please return to the Project Officer, Estates & Facilities by the date indicated:

Project Officer _____ Date to be returned _____

FAILURE TO RETURN THE CERTIFICATE BY THE ABOVE DATE MAY INVOLVE THE COLLEGE IN EXTRA EXPENSE WHICH MAY BE LEVIED AGAINST YOUR DEPARTMENT.

APPENDIX D – PLANT/EQUIPMENT REFERENCE NUMBER REQUEST FORM

University College London - Data Collection Template

Controlled Copy Version 3 - Issued 15th October 2013

Assessment date (eg '01-Jan-2013)	Building Name	Building Number e.g. - 001 and EXT_001 for external assets	Floor	Room Number	Existing EQ Number	New EQ Number	(I) FAMIS_EQUIP. PARENT	FAMIS_EQUIP. ASSET_CLASS_CODE	(J) FAMIS_EQUIP. KEYWORD	(H) FAMIS_EQUIP. TYPE	Element and/or System	Sub-Element	Component	Reference	Full Description (64)	Manufacturer	"Other" Manufacturer	Model No.	Manufacturer Part Number	Serial No.	Replacement Cost (£)	Manufacturer Anticipated Life	No. Off	Year of Installation	Specification	Condition Ranking	Life Exp	Priority	Photo I/D (Building Number then three digit sequential number) e.g. 001 - E001 and 001 M001	Comments
								#N/A	#N/A	#N/A					-															
								#N/A	#N/A	#N/A					-															
								#N/A	#N/A	#N/A					-															
								#N/A	#N/A	#N/A					-															
								#N/A	#N/A	#N/A					-															
								#N/A	#N/A	#N/A					-															
								#N/A	#N/A	#N/A					-															
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Condition and Remaining Life Rules

Condition Code	Description	Definition
A	New	Within first 12 months of installation
B	Servicable	Operating within normal conditions, requires infrequent repairs, spares readily available
C	Major Repair	Requires major repair to bring up to normal operating condition
D	Replace	Replacement of the asset is advised, is broken / not working or not performing it's intended job
X	Unknown	Access to asset restricted

Field Heading	Input Type	Notes
Assessment date (eg '01-Jan-2013)	Free text	Enter the data the Survey was carried out. This need to be in the following format as the character "/" cannot be uploaded to FAMIS. The date format to be used is "12-Jul-2013"
Building Name	Free text	Enter the building Name here. This is not need in the Famis upload but is necessary As a QA check that the correct Building number has been entered.
Building Number e.g. - 001	Free text	The building number should be inputted as a three digit figure. For building 1 there should be preceeding zero's. E.g building 1 is 001
Floor	**Dropdown**	**This is not a free text field and the relevent floor should be picked from the dropdown menu.**
Room Number	Free text	Enter the room number as indicated on the CAD drawings, **IF NO drawing are avilable then DO NOT SURVEY**
Existing EQ Number	Free text	Enter the existing EQ number
New EQ Number	Free text	If this is new or the EQ number is not present then a new number is to be allocated
(I) FAMIS_EQUIP. PARENT	Free text	Enter the assert parent EQ number here
FAMIS_EQUIP. ASSET_CLASS_CODE	**Auto**	**This field is Auto Pupulated**
(J) FAMIS_EQUIP. KEYWORD	**Auto**	**This field is Auto Pupulated**
(H) FAMIS_EQUIP. TYPE	**Auto**	**This field is Auto Pupulated**
Element and/or System	**Dropdown**	**Choose from the dorpdown list the appropriate Element/System**
Sub-Element	**Dropdown**	**Choose from the dropdown list the appropriate Sub-Element/System**
Component	**Dropdown**	**Coose from the dropdown list the relevent component**
Reference	Free text	Enter here the System the asset is associated with. i.e Boiler is on Heating system 1. or if you have three boilers then just enter Nr 1.
Full Description (64)	**Auto**	**This is an auto populated field generated from the Component and the reference fields**
Manufacturer	**Dropdown**	**Choose the manufacturer from the drop down list. If the manufacturer you require is NOT in the list then select "OTHER" and then enter the details in the specification column.**
Manufacturer "Other"	Free text	**If the manufacturer is not available in the Manufacturer field then use this field**
Model No.	Free text	Enter the model name or number if available
Manufacturer Part Number	Free text	Enter Manufacturer Part Number if available
Serial No.	Free text	Enter Serial Number if avalable
Replacement Cost (£)	Free text	Enter estimated cost of replacement. Just Enter this as a number with NO £ sign or Commas. The cell is preformatted
Manufacturer Anticipated Life	Free text	Enter the manufacturers Anticipated life if available suggest use CIBSE Guide M
No. Off (Quantity)	Free text	Enter the quantity of the assets if grouped together
Year of Installation	**Dropdown**	**From the dropdown select year of installation. If this is not available then estimate approximate year. This curently goes back to 1950.**
Specification	Free text	This is free text and should contain any additional information about the asset if not already collected in other fields. Typically this will be capacity, output rating,
Condition Ranking	**Dropdown**	**From the Dropdown select the appropriate condition code. (see rules above)**
Life Exp	**Dropdown**	**Select the expected replacement time frame from the dropdown selection**
Photo I/D (Building Number then three digit sequentional number) e.g. 001 - 001	Free text	Two formats have been suggested here building number then the photo id or Photo ID is prefixed with the relevant discipline (as done previously) instead of just a number eg. 001 - E001 / 001 - M001.
Comments	Free text	Any additional comments about the asset, particularly around immediate health and safety issues or defects/repairs urgently required

UCL

Asset survey Protocol

Description	Method of Collation
BMS Headend	One asset per item (Desk Top PC)
Water Detector System	One asset per item
BMS Outstation	One asset per item
Pneumatic Controls	One asset per System
Control Panel	One asset per item
BMS supervisor	One asset per item
Motor Control Centre (MMC)	One asset per item (Panel controlling Multiple motors)
Distribution Boards	One asset per item / Riser
Trace Heating	One asset per system
Power Distribution Unit (PDU)	One asset per item
Electricity Meter	One asset per item (Sub Meters only)
Lightning Protection	One asset per system
LV Switchgear	One asset per item
Earthing	One asset per system
Busbar System	One asset per system
UPS System Rotary Hybrid	One asset per item
UPS System Static Inverter	One asset per item
Motor Generator Set	One asset per item
Auto Transfer Switch	One asset pet item (auto Changeover Switch)
PF (Power Factor Correction)	One asset per item
HV Switchgear	One asset per item
HV/LV Transformer	One asset per item
Fixed Workshop Tools	One asset per item
Battery System	One asset per item
Fixed Electrical Appliances	One asset per building or for large buildings one per floor.
Electrical Hygiene Disposal	One asset per item
Underfloor Electric Heater	One asset per system
Fire Alarms & Ancillaries	One asset per system
Sprinklers	One asset per system
Booster Pumps	One asset per item
Hose reels	One asset per item
Smoke Sampler (Vesda)	One asset per item
Hydrants	One asset per system
Dry Risers	One asset per system
Gas Meter	One asset per item
Gas Space Heaters	One asset per item
Gas Booster Pumps	One asset per item
Gas Safety Shut of Equipment	One asset per item
LPG Installation	One asset per system
Gas Water Heater	One asset per item
Generator	One asset per item
Generator Panel	One asset per item
Fuel Tank & System	One asset per system
Boiler LTHW	One asset per item
Pumps	One asset per item
Chillers	One asset per item
Pressurisation Units	One asset per item
Fan Coil Units	One asset per item
Radiators	One asset per system.
Door Curtain Heaters	One asset per item
Split A/C units	One asset per item
Windows A/C Units	One asset per item
Pressurisation Fans	One asset per item
Air Handling Unit	One asset per item
Extract Fans	One asset per item
Supply Fans	One asset per item
Fire Dampers	One asset per item
Cooling Towers	One asset per item
Fuel Tanks	One asset per item
Flues	One asset per item
Unit Heaters	One asset per item
Expansion Tanks	One asset per item
Humidifiers	One asset per item
Heat Pumps	One asset per item
Buffer Tanks	One asset per item
Plate Heat Exchangers	One asset per item
Temperature Recorders	One asset per building.
Steam Boilers	One asset per item
Pressure Reducing Valve	One asset per system
Steam Traps	One asset per system
Shell & Tube Heat Exchanger	One asset per item
VAV Boxes	One asset per building or for large Building One asset per floor.
Induction Units	One asset per building or for large Building One asset per floor.
Filters	One asset per building or for large Building One asset per floor.
Heat recovery Equipment	One asset per item
Ductwork Systems General	One asset per system
Incinerator	One asset per item
Drainage System	One asset per system
Water Mains	One asset per system
Gas Mains	One asset per system
Fire Mains	One asset per item
Autoclaves	One asset per item
Fume Cupboards	One asset per item
General Lighting	One asset per building or for large Building One asset per floor.
Emergency Lighting	One asset per building or for large Building One asset per floor.
External Lighting	One asset per installation
Security Lighting	One asset per installation
Lighting Control System	One asset per system
LTHW/MTHW Heating Pipework	One asset per system this will include all Valves.
Chilled Water Pipework	One asset per building or for large Building One asset per floor.
Condenser Water Pipework	One asset per building or for large Building One asset per floor.
Refrigerant Pipework	One asset per building or for large Building One asset per floor.
Cold Water Mains Pipework	One asset per building or for large Building One asset per floor.
Dom. Hot Water Service Pipework	One asset per building or for large Building One asset per floor.
Cold water Down Service Pipework	One asset per building or for large Building One asset per floor.
Boosted Cold Water Main	One asset per building or for large Building One asset per floor.
Compressed Air Pipework	One asset per building or for large Building One asset per floor.
Gas Pipework	One asset per building or for large Building One asset per floor.
Fuel Oil Pipework	One asset per building or for large Building One asset per floor.
Cold Water Tanks	One asset per item
Electric Water Heaters	One asset per item
Domestic Pumps	One asset per item
Calorifiers	One asset per item
Sump Pumps	One asset per item
Shower Units	One asset per item
Internal Sewage & Drainage (Soil)	One asset per system
Water Saving Devices	One asset per building.
Water Softeners	One asset per item
Water Treatment	One asset per item

System Group	System and / or Element	Sub-Element	Component	UOM NRM	Estimated Useful Life (EUL)	Maintain Schedule	SFG20 Task Description	Applicable
2.5 EXTERNAL WALLS (EWAL)	2.5.6 Façade access / cleaning systems	2.5.6.M.1 Window / façade cleaning cradles	Window / façade cleaning cradles	nr		NCT - RCS	NON CORE TASK - ROOF CLEANING SYSTEM	Y
		2.5.6.M.2 Combined façade/roof cleaning system	Combined façade/roof cleaning system	nr		NCT - RCS	NON CORE TASK - ROOF CLEANING SYSTEM	Y
2.6 WINDOWS AND EXTERNAL DOORS (WIN & EDR)	2.6.2 External doors	2.6.2.M.1 External doors (ED)	Pedestrian Auto Doors - Folding	nr		NCT - AD	NON CORE TASK - AUTO DOORS	Y
			Pedestrian Doors - Auto Sliding	nr		NCT - AD	NON CORE TASK - AUTO DOORS	Y
			Pedestrian Doors - Auto Swing	nr		NCT - AD	NON CORE TASK - AUTO DOORS	Y
		2.6.2.M.2 Revolving doors	Pedestrian Doors - Revolving	nr		NCT - AD	NON CORE TASK - AUTO DOORS	Y
		2.6.2.M.4 Roller / sliding shutter	Roller Shutter Doors - Electric	nr		NCT - RSD	NON CORE TASK - ROLLER / SLIDING SHUTTER	Y
			Roller Shutter Doors - Manual	nr		NCT - RSD	NON CORE TASK - ROLLER / SLIDING SHUTTER	Y
4.1 FITTINGS, FURNISHINGS AND EQUIPMENT (FFE)	4.1.6 Non-mechanical and electrical equipment (NMEE	4.1.6.M.2 Non-mechanical and electrical equipment (NMEE	Ladders and the like	nr		NMEE PI	NON-MECHANICAL AND ELECTRICAL EQUIPMENT - PLANNED INSPECTION	Y
5.1 SANITARY INSTALLATIONS	5.1.1 Sanitary Appliances	5.1.1.M.1 Sanitary appliances	Cistern (WC/Urinal) - Abestos	nr	20	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
			Cistern (WC/Urinal) - Cast Iron	nr	40	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
			Cistern (WC/Urinal) - Ceramic	nr	20	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
			Cistern (WC/Urinal) - Galvanised Metal	nr	40	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
			Cistern (WC/Urinal) - Hidden/Recessed	nr	20	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
			Cistern (WC/Urinal) - Mild Steel	nr	40	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
			Cistern (WC/Urinal) - Plastic	nr	20	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
			Sink - Cast iron and stainless steel	nr	40	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
			Sink - Vitreous china/ /fireclay/ uPVC	nr	20	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
			Urinal - Cast iron and stainless steel	nr	40	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
			Urinal - Vitreous china/ /fireclay/ uPVC	nr	20	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
			WC - Cast iron and stainless steel	nr	40	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
			WC - Vitreous china/ /fireclay/ uPVC	nr	20	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
			WHB - Cast iron and stainless steel	nr	40	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
			WHB - Vitreous china/ /fireclay/ uPVC	nr	20	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
		5.1.1.M.2 Showers	Shower tray - Cast iron and stainless steel	nr	40	51-01	SHOWERS	Y
			Shower tray - Vitreous china/ /fireclay/ uPVC	nr	20	51-01	SHOWERS	Y
		5.1.1.M.3 Shower units	Chemical Spills / Drench Shower	nr	25	51-01	SHOWERS	Y
			Shower unit – including shower head and hose	nr	5	51-01	SHOWERS	Y
		5.1.1.M.4 Shower booster pump	Shower Booster Pump	nr	20	51-02	SHOWERS BOOSTER PUMPS	Y
		5.1.1.M.5 Shower valve	Shower Mixer & Head	nr	15	61-05	SHOWER VALVES	Y
		5.1.1.M.6 Drinking fountain	Drinking fountain	nr	10	48-09	DRINKING FOUNTAINS	Y
			Mains Water Dispenser	nr	10	48-09	DRINKING FOUNTAINS	Y
		5.1.1.M.7 Tap and outlet fitting	Taps and waste fittings	nr	20	61-02	TAP AND OUTLET FITTINGS	Y
		5.1.1.M.8 Water saving device	Cistermiser/Water Saver	nr	20	48-08	SANITARY AND WASTE WATER PLUMBING - WATER SAVING DEVICES and METERS	Y
		5.1.1.M.9 Control and sensors	PIR - Auto Flush	nr	8	50-09	OCCUPANCY and LIGHT SENSORS	Y
			PIR - Auto Tap	nr	8	50-09	OCCUPANCY and LIGHT SENSORS	Y
	5.1.2 Sanitary Ancillaries	5.1.2.M.1 Shower cubicles	Shower cubicles, including shower curtains and rails	nr	NLC	NCT	NON CORE TASK	Y
		5.1.2.M.2 Curtain rail / Screen	Bath/ shower curtain rails, screens and the like	nr	NLC	NCT	NON CORE TASK	Y
		5.1.2.M.3 Grab / support rail	Grab/ support rails	nr	NLC	NCT	NON CORE TASK	Y
		5.1.2.M.4 Towel rail	Towel rails and holders - (not connected to a heating or hot water supply installation).	nr	NLC	NCT	NON CORE TASK	Y
		5.1.2.M.5 Hand dryer	Hand Dryers	nr	5	48-11	HAND DRYERS	Y
		5.1.2.M.6 Paper towel dispensers	Paper towel dispensers	nr	5	48-12	PAPER TOWEL DISPENSERS - ELECTRIC OPERATED	Y
		5.1.2.M.7 Sanitary Incinerators	Incinerator - Sanitary Towel Disposal	nr	15	05-46	SANITARY INCINERATOR	Y
		5.1.2.M.8 Macerators	Macerator - Sanitary	nr	10	48-02	MACERATORS	Y
			Macerator - Sewage	nr	10	48-02	MACERATORS	Y
		5.1.2.M.9 Other Sanitary fittings	IPS Panel	nr	15	NCT	NON CORE TASK	Y
			PIR - Scent Dispersal	nr	8	50-09	OCCUPANCY and LIGHT SENSORS	Y
			Scent Dispersal Unit	nr	25	NCT	NON CORE TASK	Y
5.2 SERVICES EQUIPMENT	5.2.1 Services equipment	5.2.1.M.1 Catering Equipment	Absorption chillers - Water Cooled	nr	15	NCT	NON CORE TASK	Y
			Auto Dispense Font	nr	8	NCT	NON CORE TASK	Y
			Bake-Off - Electric	nr	15	NCT	NON CORE TASK	Y
			Bake-Off - Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Beverage Machine	nr	8	NCT	NON CORE TASK	Y
			Boiling Pans - Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Bratt Pan - Electric	nr	15	NCT	NON CORE TASK	Y
			Bratt Pan - Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Catering Burner Range	nr	15	NCT	NON CORE TASK	Y
			Catering Equipment - General (Electric)	nr	15	NCT	NON CORE TASK	Y
			Chargrill	nr	15	NCT	NON CORE TASK	Y
			Cutter	nr	15	NCT	NON CORE TASK	Y
			Dishwasher	nr	15	NCT	NON CORE TASK	Y
			Dryer	nr	15	NCT	NON CORE TASK	Y
			Dryer Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Fryer	nr	15	NCT	NON CORE TASK	Y
			Fryer Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Griddle	nr	15	NCT	NON CORE TASK	Y
			Griddle Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Grill	nr	15	NCT	NON CORE TASK	Y
			Grinder	nr	15	NCT	NON CORE TASK	Y
			Heated Food Trolley	nr	8	NCT	NON CORE TASK	Y
			Hot Plate	nr	15	NCT	NON CORE TASK	Y
			Hot Tap	nr	8	NCT	NON CORE TASK	Y
			Ice Maker	nr	15	34-01	ICE MAKING MACHINES	Y
			Induction Hob	nr	15	NCT	NON CORE TASK	Y
			Induction Hob Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Insect Killer	nr	8	NCT	NON CORE TASK	Y
			Juice Dispenser	nr	8	NCT	NON CORE TASK	Y
			Microwave	nr	15	NCT	NON CORE TASK	Y
			Mincer	nr	15	NCT	NON CORE TASK	Y
			Mixer	nr	15	NCT	NON CORE TASK	Y
			Oven - Boilerless	nr	15	NCT	NON CORE TASK	Y
			Oven - Boilerless Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Oven - Combination	nr	15	NCT	NON CORE TASK	Y
			Oven - Combination Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Oven - Convection	nr	15	NCT	NON CORE TASK	Y
			Oven - Convection Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Oven - Fan Assisted	nr	15	NCT	NON CORE TASK	Y
			Oven - Fan Assisted Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Pastry Roller/Dough Divides	nr	15	NCT	NON CORE TASK	Y
			Peeler	nr	15	NCT	NON CORE TASK	Y
			Plate Warmer	nr	15	NCT	NON CORE TASK	Y
			Pot Wash	nr	15	NCT	NON CORE TASK	Y
			Pressure Steamer	nr	15	NCT	NON CORE TASK	Y
			Processor	nr	15	NCT	NON CORE TASK	Y
			Salamander	nr	15	NCT	NON CORE TASK	Y
			Salamander Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Sink - Stainless Steel	nr	40	NCT	NON CORE TASK	Y
			Slicer	nr	15	NCT	NON CORE TASK	Y
			Tilting Kettle	nr	15	NCT	NON CORE TASK	Y
			Tilting Kettle Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Toaster	nr	15	NCT	NON CORE TASK	Y
			Vegetable Preparation Unit	nr	15	NCT	NON CORE TASK	Y
			Waste Disposal Unit	nr	15	NCT	NON CORE TASK	Y
			Water Boiler - Electric	nr	15	NCT	NON CORE TASK	Y
			Water Boiler - Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
		5.2.1.M.2 Food Storage equipment	Bainemarie - Electric	nr	15	NCT	NON CORE TASK	Y
			Bainemarie - Gas	nr	15	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Chilled Display Cabinet	nr	15	10-02	REFRIGERATED DISPLAY CABINETS	Y
			Chilled Drinks Cabinet	nr	15	10-02	REFRIGERATED DISPLAY CABINETS	Y
			Chilled Servery Unit	nr	15	10-02	REFRIGERATED DISPLAY CABINETS	Y
			Freezer - Chest	nr	15	NCT	NON CORE TASK	Y
			Freezer - Under Counter	nr	15	NCT	NON CORE TASK	Y
			Freezer - Upright	nr	15	NCT	NON CORE TASK	Y
			Freezer - Walk In	nr	15	10-01	COLD ROOMS	Y
			Fridge - Under Counter	nr	15	NCT	NON CORE TASK	Y
			Fridge - Upright	nr	15	NCT	NON CORE TASK	Y
			Fridge - Walk In	nr	15	10-01	COLD ROOMS	Y

System Group	System and / or Element	Sub-Element	Component	UOM NRM	Estimated Useful Life (EUL)	Maintain Schedule	SFG20 Task Description	Applicable
			Hot Cupboard - Electric	nr	15	NCT	NON CORE TASK	Y
			Hot Cupboard - Gas	nr	20	NCT - Gas Safe Check	NCT - Gas Safe Check	Y
			Hot Display Cabin	nr	15	NCT	NON CORE TASK	Y
			Refrigeration equipment	nr	15	NCT	NON CORE TASK	Y
			Servery Counters - Chill Well	nr	15	10-02	REFRIGERATED DISPLAY CABINETS	Y
5.3 DISPOSAL INSTALLATIONS	5.3.1 Foul drainage above ground	5.3.1.M.1 Waste pipework	Grease Traps	nr	20	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
		5.3.1.M.1	Soil & Vent Pipe - Aluminium	m2	35	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
		5.3.1.M.1	Soil & Vent Pipe - Asbestos	m2	NLC	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
		5.3.1.M.1	Soil & Vent Pipe - Cast Iron	m2	40	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
		5.3.1.M.1	Soil & Vent Pipe - Copper	m2	35	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
		5.3.1.M.1	Soil & Vent Pipe - UPVC	m2	20	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
		5.3.1.M.1	Waste Water Pipework - Cast Iron	m2	40	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
		5.3.1.M.1	Waste Water Pipework - Copper	m2	40	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
		5.3.1.M.1	Waste Water Pipework - Plastic	m2	30	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
		5.3.1.M.1	Discharge stacks - Cast Iron	m2	20	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
		5.3.1.M.1	Discharge stacks - Copper	m2	30	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
		5.3.1.M.1	Discharge stacks - Plastic	m2	40	48-05	SANITARY APPLIANCES, WASTE WATER PLUMBING and DRAINS	Y
		5.3.1.M.1 Pipeline assemblies	Pipeline assemblies - PVC	nr	20	NCT - 5.3.1	NCT - PIPE ASSEMBLIES	Y
		5.3.1.M.1	Pipeline assemblies - Plastic	nr	30	NCT - 5.3.1	NCT - PIPE ASSEMBLIES	Y
		5.3.1.M.1	Pipeline assemblies - Cast Iron	nr	40	NCT - 5.3.1	NCT - PIPE ASSEMBLIES	Y
		5.3.1.M.1 Floor channels / gratings	Floor channels / gratings - PVC	nr	20	NCT - 5.3.1	NCT - FLOOR CHANNELS / GRATINGS	Y
		5.3.1.M.1	Floor channels / gratings - Plastic	nr	30	NCT - 5.3.1	NCT - FLOOR CHANNELS / GRATINGS	Y
		5.3.1.M.1	Floor channels / gratings - Cast Iron	nr	40	NCT - 5.3.1	NCT - FLOOR CHANNELS / GRATINGS	Y
		5.3.1.M.4 Sump Pump	Sump Pump	nr	10	45-10	SUMP PUMPS: EXTENDED SHAFT	Y
		5.3.1.M.5 Sundry items	Sewage Ejector Pump	nr	15	45-07	SEWAGE OR DRAINAGE PUMPS SUBMERSIBLE	Y
	5.3.2 Chemical, toxic and industrial liquid waste drainage	5.3.2.M.1 Pipelines and fittings	Pipework - Glass	nr	10	NCT	NCT - PIPELINES AND FITTINGS (CHEMICAL, TOXIC WASTE)	Y
			Pipework - uPVC	nr	20	NCT	NCT - PIPELINES AND FITTINGS (CHEMICAL, TOXIC WASTE)	Y
			Pipework - Plastic	nr	30	NCT	NCT - PIPELINES AND FITTINGS (CHEMICAL, TOXIC WASTE)	Y
			Pipework - Cast Iron	nr	40	NCT	NCT - PIPELINES AND FITTINGS (CHEMICAL, TOXIC WASTE)	Y
		5.3.2.M.2 Traps, access points and rodding eyes	Traps - Glass	nr	10	NCT	NCT - TRAPS (CHEMICAL, TOXIC WASTE)	Y
			Traps - uPVC	nr	20	NCT	NCT - TRAPS (CHEMICAL, TOXIC WASTE)	Y
			Traps - Plastic	nr	30	NCT	NCT - TRAPS (CHEMICAL, TOXIC WASTE)	Y
			Traps - Cast Iron	nr	40	NCT	NCT - TRAPS (CHEMICAL, TOXIC WASTE)	Y
		5.3.2.M.3 Gullies	Gullies - Glass	nr	10	NCT	NCT - GULLIES (CHEMICAL, TOXIC WASTE)	Y
			Gullies - uPVC	nr	20	NCT	NCT - GULLIES (CHEMICAL, TOXIC WASTE)	Y
			Gullies - Plastic	nr	30	NCT	NCT - GULLIES (CHEMICAL, TOXIC WASTE)	Y
			Gullies - Cast Iron	nr	40	NCT	NCT - GULLIES (CHEMICAL, TOXIC WASTE)	Y
		5.3.2.M.4 Tanks	Chemical Storage Tank	nr	10	NCT	NON CORE TASK	Y
		5.3.2.M.5 Settlement tanks	Septic Tank	nr	10	NCT	NON CORE TASK	Y
		5.3.2.M.6 Effluent treatment plant	Sewage Treatment Works	nr	10	71-02	SEWAGE TREATMENT WORKS - PACKAGE SYSTEMS	Y
		5.3.2.M.7 Dosing equipment	Dosing equipment	nr	10	65-10 & 65-14	CHEMICAL DOSING	Y
		5.3.2.M.8 Steriliser	Sterilisation equipment	nr	10	NCT	NCT	Y
		5.3.2.M.10 Thermal insulation	Thermal insulation	m^2	30	35-01	THERMAL INSULATION	Y
		5.3.2.M.11 Control components	Control components located externally	nr	10	NCT	NCT	Y
		5.3.2.M.12 Monitoring equipment	Monitoring equipment locate externally	nr	10	NCT	NCT	Y
	5.3.3 Refuse Disposal	5.3.3.M.1 Refuse collection and disposal equipment	Compactor	nr	10	NCT	NON CORE TASK	Y
			Bailing Machine	nr	25	NCT	NON CORE TASK	Y
			Refuse collection equipment	nr	25	NCT	NCT	Y
			Paper Shredders - Commercial	nr	15	NCT	NCT	Y
			Paper Shredders - Industrial	nr	20	NCT	NCT	Y
		5.3.3.M.2 Incineration plant and ancillaries	Incinerator - Gas or Oil Fired Furnaces	nr	20	05-41	GAS INCINERATOR	Y
		5.3.3.M.3 Safety devices	Emergency Shut Off button	nr	10	14-18	EMERGENCY STOP BUTTONS	Y
5.4 WATER INSTALLATIONS	5.4.1 Mains water supply	5.4.1.M.1 Pipelines and fittings	Pipework - Mains - Copper	m2	45	40-01	PIPEWORK SYSTEMS - General	Y
			Pipework - Mains - Plastic	m2	20	40-01	PIPEWORK SYSTEMS - General	Y
			Pipework - Mains - Steel	m2	35	40-01	PIPEWORK SYSTEMS - General	Y
			Pipework - Mains - Steel galvanised	m2	35	40-01	PIPEWORK SYSTEMS - General	Y
		5.4.1.M.2 Valves	Valves - gate	nr	25	61-01	VALVES	Y
			Valves - float operated valve	nr	15	61-01 part	VALVES	Y
			Valves - automatic control	nr	15	62-01	VALVES	Y
			Rotary valves - shoe or slipper	nr	20	62-02	TAP AND OUTLET FITTINGS	Y
			Butterfly and ball valves	nr	25	62-03	SERVICE VALVES	Y
		5.4.1.M.3 Meters	Meter - Water	nr/m2	NLC	48-08	SANITARY AND WASTE WATER PLUMBING - WATER SAVING DEVICES and METERS	Y
		5.4.1.M.4 Rising main to storage tanks	Rising main	nr	25	40-17	WATER MAINS - ABOVE GROUND	Y
		5.4.1.M.4 Thermal insulation	Thermal insulation.	m^2	30	35-01	THERMAL INSULATION	Y
		5.4.1.M.5 Trace heating	Trace Heating	m2	20	40-03	PIPEWORK SYSTEMS-TRACE HEATING	Y
	5.4.2 Cold water distribution	5.4.2.M.1 Pipelines and fittings	Expansion Bellows - Flue Dilution	TBD	TBD	TBD	TO BE DECIDED	Y
			Expansion Bellows - Rubber	TBD	TBD	TBD	TO BE DECIDED	Y
			Expansion Bellows - Steel	TBD	TBD	TBD	TO BE DECIDED	Y
			Pipework - Cold Water - Copper	m2	45	40-01	PIPEWORK SYSTEMS - General	Y
			Pipework - Cold Water - Plastic	m2	20	40-01	PIPEWORK SYSTEMS - General	Y
			Pipework - Cold Water - Steel	m2	35	40-01	PIPEWORK SYSTEMS - General	Y
			Pipework - Cold Water - Steel galvanised	m2	35	40-01	PIPEWORK SYSTEMS - General	Y
		5.4.2.M.2 Valves	Valves - Check	nr	25	61-01	VALVES	Y
			Valves - gate	nr	25	61-01	VALVES	Y
			Valves - Strainers	nr	25	61-01	VALVES	Y
			Valves - Thermostatic Mixer	nr	15	61-04	COMBINATION TAP ASSEMBLIES, MIXING VALVES/TAPS	Y
		5.4.2.M.3 Water saving devices	Water saving devices	nr	NLC	48-08	SANITARY AND WASTE WATER PLUMBING - WATER SAVING DEVICES and METERS	Y
		5.4.2.M.4 Taps	Taps - Service valve	nr	15	61-03	SERVICE VALVES	Y
		5.4.2.M.5 Pumps	Pumps - Floor mounted	nr	20	45-02	CIRCULATING PUMPS-general	Y
			Pumps - Floor mounted Twin Head	nr	20	45-02	CIRCULATING PUMPS-general	Y
			Pumps - Accelerator pipe mounted	nr	10	45-02	CIRCULATING PUMPS-general	Y
			Pumps - Domestic	nr	10	45-11	DOMESTIC HOT WATER ACCELERATORS	Y
			Pumps - HWS circulator	nr	20	45-02	CIRCULATING PUMPS-general	Y
		5.4.2.M.6 Pressurisation expansion units	Pressurisation Unit	nr	20	32-12	EXPANSION VESSELS	Y
		5.4.2.M.7 Pressure booster sets	Domestic Booster set	nr	15	45-12	WATER PUMPING PRESSURE BOOSTING SETS	Y
			MCWS Booster set	nr	15	45-12	WATER PUMPING PRESSURE BOOSTING SETS	Y
		5.4.2.M.8 Tanks	Purified Water Tank	nr	20	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
			Water Storage Tanks - Fibreglass	nr	20	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
			Water Storage Tanks - Galvanised Metal	nr	15	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
			Water Storage Tanks - GRP	nr	20	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
			Water Storage Tanks - Polypropylene	nr	20	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
			Water Tank Potable - Fibreglass	nr	20	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
			Water Tank Potable - Galvanised Metal	nr	15	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
			Water Tank Potable - GRP	nr	20	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
			Water Tank Potable - Polypropylene	nr	20	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
		5.4.2.M.9 Trace heating	Trace Heating	m2	20	40-03	PIPEWORK SYSTEMS-TRACE HEATING	Y
		5.4.2.M.10 Instrumentation and controls	Control Panel - Cold Water Services	nr	10	14-11	MULTI-INPUT CONTROLLERS	Y
		5.4.2.M.11 Thermal insulation	Thermal insulation	m2	30	35-01	THERMAL INSULATION	Y
		5.4.2.M.12 Rainwater harvesting systems	Rainwater Harvesting System	m2	30	40-01, 56-02	PIPEWORK SYSTEMS - General	Y
		5.4.2.M.13 Grey water collection systems	Grey Water Collection System	m2	30	40-01, 56-02	PIPEWORK SYSTEMS - General	Y
	5.4.3 Hot water distribution	5.4.3.M.1 Pipelines and fittings	Expansion Bellows - Flue Dilution	TBD	TBD	TBD	TO BE DECIDED	Y
			Expansion Bellows - Rubber	TBD	TBD	TBD	TO BE DECIDED	Y
			Expansion Bellows - Steel	TBD	TBD	TBD	TO BE DECIDED	Y
			Pipework - DHWS	m2	25	32-02	HOT WATER SERVICES general	Y
			Pipework - DHWS - Copper	m2	45	32-02	HOT WATER SERVICES general	Y
			Pipework - DHWS - Plastic	m2	15	32-02	HOT WATER SERVICES general	Y
			Pipework - DHWS - steel galvanised	m2	25	32-02	HOT WATER SERVICES general	Y
			Plant Room Pipework	m2	35	32-02	HOT WATER SERVICES general	Y
		5.4.3.M.2 Valves	Valves - Check	nr	25	61-01	VALVES	Y
			Valves - gate	nr	25	61-01	VALVES	Y
			Valves - Strainers	nr	25	61-01	VALVES	Y
			Valves - Thermostatic Mixer	nr	15	61-04	COMBINATION TAP ASSEMBLIES, MIXING VALVES/TAPS	Y
		5.4.3.M.3 Water saving devices	Water saving devices	nr	NLC	48-08	SANITARY AND WASTE WATER PLUMBING - WATER SAVING DEVICES and METERS	Y
		5.4.3.M.4 Taps	Taps - Service valve	nr	15	61-03	SERVICE VALVES	Y
		5.4.3.M.5 Pumps	Pumps - Floor mounted	nr	20	45-02	CIRCULATING PUMPS-general	Y
			Pumps - Floor mounted Twin Head	nr	20	45-02	CIRCULATING PUMPS-general	Y
			Pumps - Accelerator pipe mounted	nr	10	45-02	CIRCULATING PUMPS-general	Y
			Pumps - Domestic	nr	10	45-11	DOMESTIC HOT WATER ACCELERATORS	Y
			Pumps - HWS circulator	nr	20	45-02	CIRCULATING PUMPS-general	Y
		5.4.3.M.6 Heat exchangers	Plate Heat Exchanger	nr	15	29-06	PLATE HEAT EXCHANGERS	Y

System Group	System and / or Element	Sub-Element	Component	UOM NRM	Estimated Useful Life (EUL)	Maintain Schedule	SFG20 Task Description	Applicable
			Shell & Tube Heat Exchanger	nr	25	29-01	HEAT EXCHANGERS - COILS	Y
		5.4.3.M.7 Storage cylinders and calorifiers	Hot Water Calorifier - Indirect	nr	20	32-05	CALORIFIERS HEATED BY LTHW	Y
			Hot Water Calorifier - Storage	nr	20	32-05	CALORIFIERS HEATED BY LTHW	Y
			Hot water cylinders – domestic type	nr	NLC	32-09	HOT WATER CYLINDERS	Y
			Non Storage Calorifier	nr	20	32-05	CALORIFIERS HEATED BY LTHW	Y
			Unvented Storage Heater	nr	15	32-11	THERMAL STORAGE CYLINDER (individual dwellings for DHWS)	Y
		5.4.3.M.8 Trace heating	Trace Heating	m2	10	40-03	PIPEWORK SYSTEMS-TRACE HEATING	Y
		5.4.3.M.10 Immersion heaters	HW cylinder with immersion heater	nr	NLC	32-09	HOT WATER CYLINDERS	Y
		5.4.3.M.11 Expansion tank	Insulated Combination Units	nr	25	32-09	HOT WATER CYLINDERS	Y
		5.4.3.M.12 Water softeners	Chemical Dosing pot	nr	NLC	65-06	FILTRATION and CONDITIONING - POINT OF USE	Y
			Chemical Dosing Systems	nr	NLC	65-05	FILTRATION, CONDITIONING and pH CORRECTION - central plant	Y
			Computerised Water Conditioner	nr	20	65-04	SPECIAL WATER TREATMENT SYSTEMS	Y
			De-Alkalisation Plant	nr	15	65-04	SPECIAL WATER TREATMENT SYSTEMS	Y
			De-Alkalisation Plant	nr	20	65-04	SPECIAL WATER TREATMENT SYSTEMS	Y
			Demineralisation Plant	nr	20	65-04	SPECIAL WATER TREATMENT SYSTEMS	Y
			Electrolytic Chlorine Ion Generation	nr	20	65-04	SPECIAL WATER TREATMENT SYSTEMS	Y
			In-Line Water Filter	nr	15	65-04	SPECIAL WATER TREATMENT SYSTEMS	Y
			Ionisation Softener - Comercial	nr	30	65-02	ION EXCHANGE PLANT - BASE EXCHANGE SOFTENING - commercial	Y
			Ionisation Softener - Domestic	nr	20	65-03	ION EXCHANGE PLANT - BASE EXCHANGE SOFTENING - domestic (capacity usually below 50 litres)	Y
			Reverse osmosis softener	nr	NLC	65-07	REVERSE OSMOSIS	Y
			UV Water Treatment	nr	15	65-08	ULTRA VIOLET DISINFECTION UNIT	Y
			Water Conditioner - Magnetic	nr	20	65-04	SPECIAL WATER TREATMENT SYSTEMS	Y
			Water Purification Unit (Lab)	nr	15	65-04	SPECIAL WATER TREATMENT SYSTEMS	Y
		5.4.3.M.13 Instrumentation and controls	Indicator and displays	nr	10	14-12	INDICATORS AND DISPLAYS	Y
		5.4.3.M.14 Thermal insulation	Thermal insulation	m^2	30	35-01	THERMAL INSULATION	Y
	5.4.4 Local Hot Water	5.4.4.M.1 Instant water heaters	Refreshment point water dispensers	nr	8	32-15	PACKAGED ELECTRIC WATER HEATERS-cistern type (non drinks)	Y
		5.4.4.M.1	Water Heater - Gas Fired	nr	15	32-13	DIRECT FIRED WATER HEATERS	Y
		5.4.4.M.1 Instantaneous under sink, multipoint and over sink units	Water Heater - Electric	nr	12	32-14	INSTANTANEOUS ELECTRIC WATER HEATERS (non drinks type)	Y
	5.4.5 Steam and condensate distribution	5.4.5.M.1 Pipelines and fittings	Expansion Bellows - Flue Dilution	TBD	TBD	TBD	TO BE DECIDED	Y
			Expansion Bellows - Rubber	TBD	TBD	TBD	TO BE DECIDED	Y
			Expansion Bellows - Steel	TBD	TBD	TBD	TO BE DECIDED	Y
			Steam Pipework	m2	30	40-11	STEAM SERVICES	Y
		5.4.5.M.2 Valves	Pressure Release Valves	nr	20	62-07	SEAT VALVES	Y
		5.4.5.M.3 Steam reduction stations	Steam reduction stations - Mild Steel	m^2	20	40-11	STEAM SERVICES	Y
			Steam reduction stations - Steel, galvanised	m^2	35	40-11	STEAM SERVICES	Y
		5.4.5.M.4 Condensate receivers	Condensate receivers and storage tanks	nr	12	NCT	NCT	Y
		5.4.5.M.5 Condensate pump sets	Condensate Pump	nr	20	45-03	CENTRIFUGAL PUMPS	Y
		5.4.5.M.6 Steam connection outlets	Taps and outlet fittings	nr	20	61-02	TAP AND OUTLET FITTINGS	Y
		5.4.5.M.7 Taps	Taps - Service valve	nr	15	61-03	SERVICE VALVES	Y
		5.4.5.M.8 Heat exchangers	Plate Heat Exchanger	nr	15	29-07	WATER TO WATER PLATE HEAT EXCHANGERS	Y
		5.4.5.M.9 Steam Calorifier	Steam Calorifier - Copper	nr	25	32-06	HOT WATER CALORIFIERS HEATED BY MTHW, HTHW or STEAM	Y
			Steam Calorifier - Mild Steel	nr	20	32-06	HOT WATER CALORIFIERS HEATED BY MTHW, HTHW or STEAM	Y
		5.4.5.M.10 Instrumentation and controls	Indicator and displays	nr	10	14-12	INDICATORS AND DISPLAYS	Y
		5.4.5.M.11 Thermal insulation	Thermal insulation	m^2	30	35-01	THERMAL INSULATION	Y
5.5 HEAT SOURCE	5.5.1 Heat Source	5.5.1.M.1 Boiler – biomass	Biomass - Conveyor	nr	20	05-38	BIOMASS BOILER	Y
			Biomass - Hopper	nr	20	05-38	BIOMASS BOILER	Y
			Boiler Unit - Bio Mass	nr	20	05-38	BIOMASS BOILER	Y
		5.5.1.M.2 Boiler - gas/oil	Boiler Unit - Atmospheric gas burner, boiler, free standing boiler - (domestic type)	nr	15	05-03	ATMOSPHERIC GAS BURNER - FREE STANDING BOILER	Y
			Boiler Unit - Atmospheric gas burner – condensing boiler - (domestic type)	nr	20	05-04	ATMOSPHERIC GAS BURNER - CONDENSING BOILER	Y
			Boiler Unit - Gas fired boiler - shell type, water tube & sectional units MTHW	nr	25	05-03	ATMOSPHERIC GAS BURNER - FREE STANDING BOILER	Y
			Boiler Unit - Gas fired boiler - shell type, water tube & sectional units LTHW	nr	25	05-23	BOILERS LTHW UP TO 95ºC	Y
			Boiler Unit - Blown gas burner - condensing boiler	nr	15	05-10	BLOWN GAS BURNER CONDENSING BOILER	Y
			Boiler Unit - Blown gas burner - modular boiler	nr	15	05-11	BLOWN GAS BURNER MODULAR BOILER	Y
			Boiler Unit - Forced draught gas burner condensing boiler	nr	15	05-12	FORCED DRAUGHT GAS CONDENSING BOILER	Y
			Boiler Unit - Forced draught (pressure jet) oil condensing boiler	nr	15	05-13	FORCED DRAUGHT [PRESSURE JET] OIL CONDENSING BOILER	Y
			Boiler Unit - Gas fired boiler – MTHW up to 120OC	nr	20	05-14	BOILERS MTHW UP TO 120o C	Y
			Boiler Unit - Gas fired boiler – LTHW up to 95OC	nr	20	05-23	BOILERS LTHW UP TO 95ºC	Y
			Boiler Unit - Atmospheric gas burner – small and/or wall hung	nr	10	05-28	ATMOSPHERIC GAS BURNER BOILER - SMALL AND/OR WALL HUNG FOR DOMESTIC/LIGHT COMMERCIAL INSTALLATION	Y
			Boiler Unit - Combination atmospheric burner gas boiler	nr	10	05-29	COMBINATION ATMOSPHERIC BURNER GAS BOILER	Y
			Boiler Unit - Atmospheric gas burner/ condensing combination boiler	nr	20	05-30	ATMOSPHERIC GAS BURNER/CONDENSING COMBINATION BOILER	Y
			Boiler Unit - Atmospheric gas burners	nr	20	07-01	ATMOSPHERIC GAS BURNERS	Y
			Boiler Unit - Blown gas burner	nr	15	07-02	BLOWN GAS BURNER	Y
			Boiler Unit - Forced draught gas burner	nr	15	07-03	FORCED DRAUGHT GAS BURNER	Y
			Boiler Unit - Forced draught (pressure jet) oil burner	nr	15	07-05	FORCED DRAUGHT [PRESSURE JET] OIL BURNER	Y
			Boiler Unit - Light oil vaporising pot burner	nr	15	07-06	LIGHT OIL VAPORISING POT BURNER	Y
			Boiler Unit - Gas/ oil burners - dual fuel	nr	15	07-07	GAS/OIL BURNERS - Dual fuel	Y
		5.5.1.M.3 Boiler – coal fired	Coal fired coal distribution equipment - Bunkers and conveyors	nr	20	05-05	COAL FIRED BOILERS Bunkers and Conveyors.	Y
			Coal fired boilers - ash storage handling and feed mechanisms, automatic	nr	15	05-06	COAL FIRED BOILERS - Coal storage handling and feed mechanisms, automatic ash removal (where fitted)	Y
			Coal feed mechanisms - under feed stokers	nr	15	05-07	COAL FEED MECHANISMS - Under feed stokers	Y
			Coal feed mechanisms - chain gate stokers	nr	15	05-08	COAL FEED MECHANISMS - Chain grate stokers	Y
			Ash handling system	nr	15	05-09	ASH HANDLING SYSTEM	Y
			Solid fuel burners	nr	15	05-08 & 05-27	COAL FEED MECHANISMS - Chain grate stokers	Y
			Coal fired boiler plant and ancillary items	nr	20	05-06 to 05-09	COAL FIRED BOILERS - Coal storage handling and feed mechanisms, automatic ash removal (where fitted)	Y
		5.5.1.M.4 Boiler – electric	Boiler Unit - Electrode mthw / lthw	nr	15	05-21, 05-22	ELECTRIC BOILERS	Y
			Boiler Unit - Electrode Steam / hthw	nr	15	05-21, 05-22	ELECTRIC BOILERS	Y
		5.5.1.M.5 Packaged steam generators	Packaged Steam Generators	nr	25	05-34	PACKAGED STEAM GENERATORS	Y
			Packaged steam generator – electric	nr	25	05-35	PAKAGED STEAM GENERATORS - ELECTRIC	Y
			Boiler super heater	nr	25	05-37	BOILER SUPERHEATER	Y
			Flash steam vessel	nr	25	40-12	FLASH STEAM VESSEL	Y
		5.5.1.M.6 Boiler - wood pellet	Boiler Unit - Wood Pellet	nr	10	05-27	WASTE AND WOOD BURNING APPLIANCES (including boilers) - BOILER (if fitted)	Y
			Fire and safety circuits	nr	12	05-25	WASTE AND WOOD BURNING APPLIANCES (including boilers) - Fire And Boiler Safety Circuits	Y
			Combustion chamber	nr	10	05-26	WASTE AND WOOD BURNING APPLIANCES (including boilers) - Combustion Chamber	Y
		5.5.1.M.7 Central (combined) heat and power (CHP) boiler plant	CHP Plant	nr	15	43-02	POWER GENERATION--STAND-BY GENERATOR	Y
		5.5.1.M.8 Heat pumps	Heat pumps	nr	TBD	(45-01 to 45-06)	PUMPS - General	Y
		5.5.1.M.9 Ground source heating	Ground Source Heat Pump	nr	20	NCT	NON CORE TASK	Y
		5.5.1.M.10 Pumps, valves	Pressure Reducing Valves	nr	15	40-15	PRESSURE REDUCING VALVES	Y
			Pressure Release Valves	nr	20	62-07	SEAT VALVES	Y
		5.5.1.M.11 Non-storage calorifiers	Step down/non-storage calorifiers	nr	25	32-07	HOT WATER SUPPLY CALORIFIERS	Y
		5.5.1.M.12 Solar thermal panels	Solar Panels - Hot Water	nr	25	53-01	SOLAR HOT WATER PANELS and similar COLLECTING DEVICES	Y
		5.5.1.M.13 Other heat sources	Other heat sources - Air source heating	nr	15	NCT	NCT	Y
		5.5.1.M.14 Tanks	F&E Closed Storage Tank - Copper	nr	45	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
			F&E Closed Storage Tank - Fibreglass	nr	25	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
			F&E Closed Storage Tank - Polypropylene	nr	25	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
			F&E Closed Storage Tank - Steel	nr	30	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
		5.5.1.M.16 Instrumentation and controls	Control Panel - Heat Pump	nr	10	14-07	UNIT CONTROLLERS AND SENSOR CONTROLLERS	Y
			Control Panel - Heating System	nr	10	05-15	MULTIPLE BOILERS - sequence controls	Y
			Fuel/Shut off (Thermal Link/Weight)	nr	15	05-24	BOILERS - FIRE AND SAFETY CIRCUITS	Y
			Gas Detection	nr	10	23-15,50-11, 82-01	GAS DETECTOR SENSORS	Y
			Time clock	nr	10	14-08	CONTROLLER TIMERS	Y
			Emergency Shut Off button - Boiler	nr	10	14-18	EMERGENCY STOP BUTTONS	Y
			Emergency Shut Off button - Radient Heater	nr	10	14-18	EMERGENCY STOP BUTTONS	Y
		5.5.1.M.17 Burner	Force Draft Burner to Boiler	nr	15	07-03	FORCED DRAUGHT GAS BURNER	Y
			Force Draft Burner to Radiant Heater	nr	15	07-03	FORCED DRAUGHT GAS BURNER	Y
		5.5.1.M.18 Gantries	Gantries	nr	30	NCT	NCT	Y
		5.5.1.M.19 Flue system	Flue - Domestic Through Wall	nr	20	24-01	FLUES (all combustible fuels)	Y
			Flue - Mild Steel	nr	15	24-01	FLUES (all combustible fuels)	Y
			Flue - Stainless Steel	nr	30	24-01	FLUES (all combustible fuels)	Y
5.6 SPACE HEATING & AIR CONDITIONING	5.6.1 Central Heating	5.6.1.M.1 Pipelines and fittings	Pipework - Heating System (copper)	m2	45	40-01	PIPEWORK SYSTEMS - General	Y
		5.6.1.M.2 Pipelines and fittings	Bellows flexible - Rubber	TBD	TBD	TBD	TO BE DECIDED	Y
		5.6.1.M.2	Bellows flexible - Stee	TBD	TBD	TBD	TO BE DECIDED	Y
		5.6.1.M.2	Expansion Bellows - Flue Dilution	TBD	TBD	TBD	TO BE DECIDED	Y
		5.6.1.M.2	Expansion Bellows - Rubber	TBD	TBD	TBD	TO BE DECIDED	Y
		5.6.1.M.2	Expansion Bellows - Steel	TBD	TBD	TBD	TO BE DECIDED	Y
		5.6.1.M.2	Pipework - Heating System (Plastic)	m2	20	40-01	PIPEWORK SYSTEMS - General	Y
		5.6.1.M.2	Pipework - Heating System (steel galv)	m2	35	40-01	PIPEWORK SYSTEMS - General	Y
		5.6.1.M.2	Pipework - Heating System (steel)	m2	35	40-01	PIPEWORK SYSTEMS - General	Y
		5.6.1.M.3 Heat emitters	Fan Convector - Electric	m2	15	28-01	HEAT EMITTERS	Y
			Fan Convector - Hot Water	m2	15	28-01	HEAT EMITTERS	Y
			Natural convector	m2	20	28-01	HEAT EMITTERS	Y
			Natural convectors - electric	m2	20	28-01	HEAT EMITTERS	Y

System Group	System and / or Element	Sub-Element	Component	UOM NRM	Estimated Useful Life (EUL)	Maintain Schedule	SFG20 Task Description	Applicable
			Natural convectors - water	m2	20	28-01	HEAT EMITTERS	Y
			Radiator - Aluminium	m2	20	28-01	HEAT EMITTERS	Y
			Radiator - Cast Iron	m2	25	28-01	HEAT EMITTERS	Y
			Radiator - Steel	m2	20	28-01	HEAT EMITTERS	Y
			Space Unit Heater - Steam / Hot Water	m2	15	28-01	HEAT EMITTERS	Y
			Radiant strip heater systems - Steam and hot water	m2	20	28-01 or 28-03	HEAT EMITTERS	Y
			Radiant strip heater systems - Electric	m2	10	28-01	HEAT EMITTERS	Y
		5.6.1.M.4 Under-floor heating	Under Floor Heating - Steel pipes	m2	25	63-01	UNDERFLOOR HEATING including VEHICLE ACCESS RAMPS	Y
			Under Floor Heating - Electric	m2	20	63-01	UNDERFLOOR HEATING including VEHICLE ACCESS RAMPS	Y
			Under Floor Heating - plastic pipes	m2	30	63-01	UNDERFLOOR HEATING including VEHICLE ACCESS RAMPS	Y
		5.6.1.M.5 Heated ceiling panels	Heated Ceiling Panel	m2	20	28-01	HEAT EMITTERS	Y
		5.6.1.M.6 Warm air heating	Warm air heating	m2	20	03-01	AIR HANDLING UNITS - general	Y
		5.6.1.M.7 Convection systems	Gas Space Unit Heater	m2	10	28-04	GAS FIRED NATURAL AND FAN ASSISTED HEATERS - Conventional and Balanced Flue.	Y
			Convection systems (CS)	m2	20	28-01	HEAT EMITTERS	Y
		5.6.1.M.8 Cable heating systems	Cable heating systems	m2	20	40-03	PIPEWORK SYSTEMS-TRACE HEATING	Y
		5.6.1.M.9 Plenum air heating system	Plenum air heating system	m2	35	03-01	AIR HANDLING UNITS - general	Y
		5.6.1.M.10 Off-peak heating system	Off-peak heating system	m2	10	28-01	HEAT EMITTERS	Y
		5.6.1.M.11 Heated towel rails	Heated towel rail	nr	20	28-01	HEAT EMITTERS	Y
		5.6.1.M.12 Valves and fittings	Commissioning Valves	nr	15	62-06, 90-01	PRESSURE CONTROL VALVES	Y
			Dirt Separators	nr	TBD	TBD	TO BE DECIDED	Y
			Valves - Check	nr	25	61-01	VALVES	Y
			Valves - gate	nr	25	61-01	VALVES	Y
			Valves - Strainers	nr	25	61-01	VALVES	Y
			Valves - Thermostatic Mixer	nr	15	61-04	COMBINATION TAP ASSEMBLIES, MIXING VALVES/TAPS	Y
		5.6.1.M.13 Ductwork	Ductwork - Flexible	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
			Ductwork - Galvanised	m2	40	16-02	DUCTWORK SYSTEM - GENERAL	Y
			Ductwork - Plastic	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
		5.6.1.M.14 Grilles and diffusers	External louvres - Anodised Aluminium	nr	25	26-02	LOUVRES, BIRD AND INSECT SCREENS	Y
			External louvres - Steel Painted	nr	20	26-02	LOUVRES, BIRD AND INSECT SCREENS	Y
			Grilles and diffusers - Aluminium	nr	25	26-01	GRILLES AND DIFFUSERS	Y
			Grilles and diffusers - Painted Metal	nr	30	26-01	GRILLES AND DIFFUSERS	Y
			Slot Diffusers	nr	20	26-01	GRILLES AND DIFFUSERS	Y
		5.6.1.M.15 Plate recuperator	Heat Exchanger - Air to Air	m2	20	29-03	PLATE RECUPERATOR	Y
			Plate recuperator	nr	20	29-03	PLATE RECUPERATOR	Y
		5.6.1.M.16 Thermal wheel	Thermal Wheel	nr	15	29-04	THERMAL WHEELS - ROTARY HEAT REGENERATORS	Y
		5.6.1.M.17 Duct heater battery - electric	Duct heater battery - electric	nr	10	29-01, 29-02	HEAT EXCHANGERS - COILS	Y
		5.6.1.M.19 Instrumentation and controls	Instrumentation and control components	nr	10	14-12	INDICATORS AND DISPLAYS	Y
		5.6.1.M.20 Thermal insulation	Thermal insulation	m^2	30	35-01	THERMAL INSULATION	Y
	5.6.2 Local Heating	5.6.2.M.1 Room heaters or fires	Down Flow Heater	nr	8	29-02	ELECTRIC/AIR HEATER	Y
			Gas Radiant Heater	nr	10	28-03, 28-07	GAS RADIANT TUBE HEATERS	Y
			Space Unit Heater - Electrical Storage	nr	8	29-02	ELECTRIC/AIR HEATER	Y
			Space Unit Heater - Gas / Electric	nr	10	28-02	GAS FIRED CERAMIC PLAQUE INFRA RED HEATERS	Y
			Space Unit Heater - Oil	nr	15	05-46	OIL FIRED SPACE HEATERS	Y
			Space Unit Heater- Electrical Cont Flow	nr	8	29-02	ELECTRIC/AIR HEATER	Y
			Tubular Heaters	nr	8	29-02	ELECTRIC/AIR HEATER	Y
			Gas Fire	nr	8	28-05	GAS FIRES	Y
		5.6.2.M.2 Chimneys and flues	Flue - Domestic Through Wall	nr	20	24-01	FLUES (all combustible fuels)	Y
			Flue - Mild Steel	nr	15	24-01	FLUES (all combustible fuels)	Y
			Flue - Stainless Steel	nr	30	24-01	FLUES (all combustible fuels)	Y
		5.6.2.M.3 Instrumentation and controls	Controller - Underfloor Heating	nr	10	14-07	UNIT CONTROLLERS AND SENSOR CONTROLLERS	Y
	5.6.3 Central Cooling	5.6.3.M.1 Chilled beams	Chilled Beams	m2	20	59-08	CHILLED BEAM	Y
			Chilled Beams Ceiling Panel	m2	20	59-08	CHILLED BEAM	Y
		5.6.3.M.2 Fan coil units	Fan Coil Units	m2	20	59-06	TERMINAL UNITS - FAN COIL	Y
		5.6.3.M.3 VAV cooling system	Expansion Bellows - Flue Dilution	TBD	TBD	TBD	TO BE DECIDED	Y
			VAV terminal units (box type) - With Silencer	m2	15	59-01	TERMINAL UNITS VAV - self powered	Y
			VAV terminal units (box type) - With Silencer and Heat Coil	m2	15	59-01	TERMINAL UNITS VAV - self powered	Y
			VAV terminal units (box type) - Fan Assisted with Silencer	m2	15	59-01	TERMINAL UNITS VAV - self powered	Y
			Refrigeration evaporators	m2	20	19-01	REFRIGERATION EVAPORATORS	Y
			DX split systems – with gas, electric or hot water heaters	m2	20	54-02	REFRIGERATION EVAPORATORS	Y
			Split systems /heat pumps - air cooled with direct expansion evaporator	m2	20	54-03	REFRIGERATION EVAPORATORS	Y
			Evaporators – shell and tube	m2	20	19-01	REFRIGERATION EVAPORATORS	Y
		5.6.3.M.4 VRV systems	Variable refrigerant volume (VRV) systems	m2	20	NCT	NON CORE TASK	Y
		5.6.3.M.5 Chillers	Chillers - Air Cooled	nr	15	05-31	AIR TO WATER HEAT PUMP	Y
			Chillers - Water Cooled	nr	15	05-32	WATER TO WATER HEAT PUMP	Y
			Close Control AC Condenser	nr	20	13-01	CONDENSERS - water cooled	Y
			Condensor Unit Evaporative	nr	20	13-01	CONDENSERS - water cooled	Y
			Dry Cooler - Epoxy	nr	20	30-03	DRY COOLERS	Y
			Dry Cooler - Galvanised	nr	20	30-03	DRY COOLERS	Y
			Dry Cooler - Plastic Coated	nr	20	30-03	DRY COOLERS	Y
			Packaged Chiller units - Air Cooled	nr	20	09-02	PACKAGED CHILLER UNITS	Y
			Packaged Chiller units - Water Cooled	nr	20	09-02	PACKAGED CHILLER UNITS	Y
			Packaged Chiller units - Absorption type	nr	25	09-03	LITHIUM BROMIDE/WATER ABSORPTION CHILLERS	Y
			Gas fired absorption chillers	nr	25	09-04	GAS FIRED ABSORPTION CHILLER UP TO 18 KW COOLING CAPACITY	Y
			Condensers - water cooled	nr	20	13-01	CONDENSERS - water cooled	Y
			Condensers - air cooled	nr	20	13-02	CONDENSER - air cooled	Y
		5.6.3.M.6 Central refrigeration plant	Central refrigeration plant	nr	20	Add	(blank)	Y
		5.6.3.M.7 Cooling towers	Cooling Tower - Epoxy Treated	nr	15	30-02	COOLING TOWERS - Precautions against Legionnaires disease (legionella pneumophila)	Y
			Cooling Tower - Galvanised Metal	nr	12	30-02	COOLING TOWERS - Precautions against Legionnaires disease (legionella pneumophila)	Y
			Cooling Tower - Non Stainless Steel	nr	25	30-02	COOLING TOWERS - Precautions against Legionnaires disease (legionella pneumophila)	Y
			Cooling Tower - Plastic Coated Metal	nr	20	30-02	COOLING TOWERS - Precautions against Legionnaires disease (legionella pneumophila)	Y
			Cooling Tower - Plastic construction	nr	20	30-02	COOLING TOWERS - Precautions against Legionnaires disease (legionella pneumophila)	Y
			Cooling Tower - Stainless steel	nr	30	30-02	COOLING TOWERS - Precautions against Legionnaires disease (legionella pneumophila)	Y
			Free cooling adiabatic cooler system	nr	20	65-12, 77-01	ADIABATIC COOLING SYSTEMS	Y
		5.6.3.M.8 Pipelines and fittings	Expansion Bellows - Rubber	TBD	TBD	TBD	TO BE DECIDED	Y
			Expansion Bellows - Steel	TBD	TBD	TBD	TO BE DECIDED	Y
			Pipework - Aircon/Chilled beam (Steel Gal)	m2	35	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Aircon/Chilled beam (Copper)	m2	45	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Aircon/Chilled beam (Plastic)	m2	20	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Aircon/Chilled beam (Steel)	m2	35	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Aircon/Fan coil (Copper)	m2	45	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Aircon/Fan coil (Plastic)	m2	20	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Aircon/Fan coil (Steel Gal)	m2	35	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Aircon/Fan coil (Steel)	m2	35	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Refrigeration Plant (Steel Gal)	m2	30	40-01	PIPEWORK SYSTEMS - General	Y
			Pipework - Refrigeration Plant (Copper)	m2	30	40-01	PIPEWORK SYSTEMS - General	Y
			Pipework - Refrigeration Plant (Plastic)	m2	30	40-01	PIPEWORK SYSTEMS - General	Y
			Pipework - Refrigeration Plant (Steel)	m2	30	40-01	PIPEWORK SYSTEMS - General	Y
			Plant Room Pipework	m2	35	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
		5.6.3.M.9 Cold and treated water feeds	Cold and treated water feeds	m2	20	40-01	PIPEWORK SYSTEMS - General	Y
		5.6.3.M.10 Valves	Valves - Check	nr	25	61-01	VALVES	Y
			Valves - gate	nr	25	61-01	VALVES	Y
			Valves - Strainers	nr	25	61-01	VALVES	Y
			Valves - Thermostatic Mixer	nr	15	61-04	COMBINATION TAP ASSEMBLIES, MIXING VALVES/TAPS	Y
		5.6.3.M.11 Pumps	Pumps - Floor mounted	nr	20	45-02	CIRCULATING PUMPS-general	Y
			Pumps - Floor mounted Twin Head	nr	20	45-02	CIRCULATING PUMPS-general	Y
			Pumps - Accelerator pipe mounted	nr	10	45-02	CIRCULATING PUMPS-general	Y
			Pumps - Domestic	nr	10	45-11	DOMESTIC HOT WATER ACCELERATORS	Y
			Pumps - HWS circulator	nr	20	45-02	CIRCULATING PUMPS-general	Y
			Heat pump - Air to water (Rev. cycle chillers, e.g. Air source heat pump)	nr	15	05-31	AIR TO WATER HEAT PUMP	Y
			Heat pump - Water to water (Rev cycle chillers e.g. water source heat pump)	nr	15	05-32	WATER TO WATER HEAT PUMP	Y
			Pump - Brine to water (Rev. cycle chillers e.g. brine source heat pump)	nr	15	05-33	BRINE TO WATER HEAT PUMP	Y
		5.6.3.M.12 Distribution ductwork and fittings	Ductwork - Flexible	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
			Ductwork - Galvanised	m2	40	16-02	DUCTWORK SYSTEM - GENERAL	Y
			Ductwork - Plastic	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
		5.6.3.M.13 Grilles, and diffusers	External louvres - Aluminium	nr	25	26-02	LOUVRES, BIRD AND INSECT SCREENS	Y
			External louvres - Steel Painted	nr	20	26-02	LOUVRES, BIRD AND INSECT SCREENS	Y
			Grilles and diffusers - Aluminium	nr	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
			Grilles and diffusers - Painted Metal	nr	30	26-01	GRILLES AND DIFFUSERS	Y
			Slot Diffusers	nr	20	26-01	GRILLES AND DIFFUSERS	Y
		5.6.3.M.14 Air handling units	Air Handling Unit - DX - external	nr	15	03-01	AIR HANDLING UNITS - general	Y

System Group	System and / or Element	Sub-Element	Component	UOM NRM	Estimated Useful Life (EUL)	Maintain Schedule	SFG20 Task Description	Applicable
			Air Handling Unit - DX - internal	nr	20	03-01	AIR HANDLING UNITS - general	Y
			Air Handling Unit - externally located	nr	15	03-01	AIR HANDLING UNITS - general	Y
			Air Handling Unit - internally located	nr	20	03-01	AIR HANDLING UNITS - general	Y
			Belt drives	nr	NLC	04-01	BELT DRIVES	Y
		5.6.3.M.15 Emission units	Emission units	nr	15	20-03,29-02	FANS -CENTRIFUGAL	Y
		5.6.3.M.16 Instrumentation and controls	Control Panel - Cooling Plant	nr	10	14-11	MULTI-INPUT CONTROLLERS	Y
		5.6.3.M.17 Thermal insulation	Thermal insulation	m2	30	35-01	THERMAL INSULATION	Y
		5.6.3.M.18 Sundry items	Expansion Bellows - Flue Dilution	TBD	TBD	TBD	TO BE DECIDED	Y
	5.6.4 Local Cooling	5.6.4.M.1 Local cooling units	Dry Cooler - Epoxy	nr	25	30-03	DRY COOLERS	Y
			Dry Cooler - Galvanised	nr	25	30-03	DRY COOLERS	Y
			Dry Cooler - Plastic Coated	nr	25	30-03	DRY COOLERS	Y
			High Density CO2 Air Conditioning	nr	25	59-06	TERMINAL UNITS - FAN COIL	Y
		5.6.4.M.2 Pipelines and fittings	Pipework - Cooling System (copper)	m2	45	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Cooling System closed (steel galv)	m2	35	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Cooling System open (steel galv)	m2	25	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Cooling System (Plastic)	m2	20	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
		5.6.4.M.3 Valves	Valves - Check	nr	25	61-01	VALVES	Y
			Valves - gate	nr	25	61-01	VALVES	Y
			Valves - Strainers	nr	25	61-01	VALVES	Y
			Valves - Thermostatic Mixer	nr	15	61-04	COMBINATION TAP ASSEMBLIES, MIXING VALVES/TAPS	Y
		5.6.4.M.4 Ductwork and fittings	Ductwork - Flexible	nr	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
			Ductwork - Galvanised	nr	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
			Ductwork - Plastic	nr	40	16-02	DUCTWORK SYSTEM - GENERAL	Y
		5.6.4.M.5 Grilles, diffusers fans	Grilles and diffusers - Aluminium	nr	15	26-01	GRILLES AND DIFFUSERS	Y
			Grilles and diffusers - Painted Metal	nr	15	26-01	GRILLES AND DIFFUSERS	Y
			Slot Diffusers	nr	20	26-01	GRILLES AND DIFFUSERS	Y
		5.6.4.M.6 Instrumentation and controls	Controller - Air Conditioning	nr	10	14-07	UNIT CONTROLLERS AND SENSOR CONTROLLERS	Y
	5.6.5 Central heating and cooling	5.6.5.M.1 Fan coil units1	Fan coil units1	m2	20	59-06	TERMINAL UNITS - FAN COIL	Y
		5.6.5.M.2 VAV systems	VAV Boxes - Fan Assisted with Silencer	m2	15	59-01	TERMINAL UNITS VAV - self powered	Y
			VAV Boxes - With Silencer	m2	15	59-01	TERMINAL UNITS VAV - self powered	Y
			VAV Boxes - With Silencer and Heat Coil	m2	15	59-01	TERMINAL UNITS VAV - self powered	Y
		5.6.5.M.3 Reverse cycle heat pump systems	Reverse cycle heat pump systems	m2	TBD	TBD	TBD	Y
		5.6.5.M.4 Chillers	Absorption chillers	nr	25	09-03, 09-04	LITHIUM BROMIDE/WATER ABSORPTION CHILLERS	Y
			Vapour compression chillers	nr	20	12-01, 12-02, 12-03	COMPRESSORS REFRIGERATION - Reciprocal - (includes hermetic, semi-hermetic and open)	Y
			Solar thermal absorption chillers	nr	25	32-17	TBD	Y
		5.6.5.M.5 Pipelines and fittings	Expansion Bellows - Flue Dilution	TBD	TBD	TBD	TO BE DECIDED	Y
			Expansion Bellows - Rubber	TBD	TBD	TBD	TO BE DECIDED	Y
			Expansion Bellows - Steel	TBD	TBD	TBD	TO BE DECIDED	Y
			Pipework - Central heating and cooling System (copper)	m2	45	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Central heating and cooling System closed (steel galv)	m2	35	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Central heating and cooling System open (steel galv)	m2	25	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Central heating and cooling System (Plastic)	m2	20	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
		5.6.5.M.6 Valves	Valves - Check	nr	25	61-01	VALVES	Y
			Valves - gate	nr	25	61-01	VALVES	Y
			Valves - Strainers	nr	25	61-01	VALVES	Y
			Valves - Thermostatic Mixer	nr	15	61-04	COMBINATION TAP ASSEMBLIES, MIXING VALVES/TAPS	Y
		5.6.5.M.7 Pumps	Pumps - Floor mounted	nr	20	45-02	CIRCULATING PUMPS-general	Y
			Pumps - Floor mounted Twin Head	nr	20	45-02	CIRCULATING PUMPS-general	Y
			Pumps - Accelerator pipe mounted	nr	10	45-02	CIRCULATING PUMPS-general	Y
			Pumps - Domestic	nr	10	45-11	DOMESTIC HOT WATER ACCELERATORS	Y
			Pumps - HWS circulator	nr	20	45-02	CIRCULATING PUMPS-general	Y
		5.6.5.M.8 Distribution ductwork and fittings	Ductwork - Flexible	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
			Ductwork - Galvanised	m2	40	16-02	DUCTWORK SYSTEM - GENERAL	Y
			Ductwork - Plastic	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
		5.6.5.M.9 Grilles, diffusers, fans, filters	Grilles and diffusers - Aluminium	nr	15	26-01	GRILLES AND DIFFUSERS	Y
			Grilles and diffusers - Painted Metal	nr	30	26-01	GRILLES AND DIFFUSERS	Y
			Slot Diffusers	nr	20	26-01	GRILLES AND DIFFUSERS	Y
		5.6.5.M.10 Air handling units	Air Handling Unit - DX - external	nr	15	03-01	AIR HANDLING UNITS - general	Y
			Air Handling Unit - DX - internal	nr	20	03-01	AIR HANDLING UNITS - general	Y
			Air Handling Unit - externally located	nr	15	03-01	AIR HANDLING UNITS - general	Y
			Air Handling Unit - internally located	nr	20	03-01	AIR HANDLING UNITS - general	Y
		5.6.5.M.11 Fan coil units2	Fan Coil Units	nr	25	59-06	TERMINAL UNITS - FAN COIL	Y
		5.6.5.M.13 Instrumentation and controls	Control Panel	nr	10	14-11	MULTI-INPUT CONTROLLERS	Y
		5.6.5.M.14 Thermal insulation	Thermal insulation	m2	30	35-01	THERMAL INSULATION	Y
	5.6.6 Local heating and cooling	5.6.6.M.1 Local heating and cooling	Split Comfort Cooling - Indoor Unit	nr	15	54-02	DX SPLIT SYSTEMS - with gas, electric or hot water heaters	Y
		5.6.6.M.2 Pipelines and fittings	Pipework - Local heating and cooling System (copper)	m2	45	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Local heating and cooling System closed (steel galv)	m2	35	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Local heating and cooling System open (steel galv)	m2	25	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
			Pipework - Local heating and cooling System (Plastic)	m2	20	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
		5.6.6.M.3 Valves	Valves - Check	nr	25	61-01	VALVES	Y
			Valves - gate	nr	25	61-01	VALVES	Y
			Valves - Strainers	nr	25	61-01	VALVES	Y
			Valves - Thermostatic Mixer	nr	15	61-04	COMBINATION TAP ASSEMBLIES, MIXING VALVES/TAPS	Y
		5.6.6.M.4 Pumps	Pumps - Floor mounted Twin Head	nr	20	45-02	CIRCULATING PUMPS-general	Y
			Pumps - Accelerator pipe mounted	nr	10	45-02	CIRCULATING PUMPS-general	Y
			Pumps - HWS circulator	nr	20	45-02	CIRCULATING PUMPS-general	Y
		5.6.6.M.5 Ductwork, fittings and ancillaries	Ductwork - Flexible	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
			Ductwork - Galvanised	m2	40	16-02	DUCTWORK SYSTEM - GENERAL	Y
			Ductwork - Plastic	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
		5.6.6.M.6 Grilles, diffusers, fans, filters	Grilles and diffusers - Aluminium	nr	15	26-01	GRILLES AND DIFFUSERS	Y
			Grilles and diffusers - Painted Metal	nr	30	26-01	GRILLES AND DIFFUSERS	Y
			Slot Diffusers	nr	20	26-01	GRILLES AND DIFFUSERS	Y
		5.6.6.M.8 Instrumentation and controls	Control Panel	nr	10	14-11	MULTI-INPUT CONTROLLERS	Y
		5.6.6.M.9 Thermal insulation	Thermal insulation	m2	30	35-01	THERMAL INSULATION	Y
	5.6.7 Central air conditioning	5.6.7.M.2 Air conditioning systems	VAV Boxes - Fan Assisted with Silencer	m2	15	59-01	TERMINAL UNITS VAV - self powered	Y
			VAV Boxes - With Silencer	m2	15	59-01	TERMINAL UNITS VAV - self powered	Y
			VAV Boxes - With Silencer and Heat Coil	m2	15	59-01	TERMINAL UNITS VAV - self powered	Y
			Dual-duct air induction conditioning systems	m2	40	03-01, 16-02	AIR HANDLING UNITS - general	Y
			Multi-zone conditioning systems	m2	40	03-01	AIR HANDLING UNITS - general	Y
			Induction air conditioning systems	nr	40	TBD	TBD	Y
			Hybrid air conditioning systems	nr	40	TBD	TBD	Y
		5.6.7.M.2 TBD	Coils - Galvanised for Heating	m2	12	03-01	AIR HANDLING UNITS - general	Y
		5.6.7.M.2 TBD	Coils - In Duct Unit	m2	10	16-02	DUCTWORK SYSTEM - GENERAL	Y
		5.6.7.M.2 TBD	Dehumidifier	nr	15	Add Task	ADD TASK	Y
		5.6.7.M.2 TBD	Fins - Aluminium for Cooling	m2	15	03-01	AIR HANDLING UNITS - general	Y
		5.6.7.M.2 TBD	Fins - Aluminium for Heating	m2	15	03-01	AIR HANDLING UNITS - general	Y
		5.6.7.M.2 TBD	Fins - Copper for Cooling	m2	25	03-01	AIR HANDLING UNITS - general	Y
		5.6.7.M.2 TBD	Fins - Copper for Heating	m2	25	03-01	AIR HANDLING UNITS - general	Y
		5.6.7.M.2 TBD	Humidifiers - Electrode Bottle	nr	10	33-03	ELECTRODE BOILER HUMIDIFIER	Y
		5.6.7.M.2 TBD	Humidifiers - Pan type	nr	10	33-03	ELECTRODE BOILER HUMIDIFIER	Y
		5.6.7.M.2 TBD	Humidifiers - Spinning Disk	nr	10	33-03	ELECTRODE BOILER HUMIDIFIER	Y
		5.6.7.M.2 TBD	Humidifiers - Spray type	nr	10	33-08	SPRAY HUMIDIFIER	Y
		5.6.7.M.2 TBD	Humidifiers - Steam Direct	nr	8	33-02	HUMIDIFIER - Direct steam injection type.	Y
		5.6.7.M.2 TBD	Humidifiers - Steam Electric Generated	nr	8	33-02	HUMIDIFIER - Direct steam injection type.	Y
		5.6.7.M.2 TBD	Humidifiers - Ultrasonic	nr	10	33-05	HUMIDIFIERS- Ultra sonic	Y
		5.6.7.M.2 TBD	Spray cooler coils	m2	15	03-01	AIR HANDLING UNITS - general	Y
		5.6.7.M.4 Air handling units	Air Handling Unit - DX - external	nr	15	03-01	AIR HANDLING UNITS - general	Y
			Air Handling Unit - DX - internal	nr	20	03-01	AIR HANDLING UNITS - general	Y
			Air Handling Unit - externally located	nr	15	03-01	AIR HANDLING UNITS - general	Y
			Air Handling Unit - internally located	nr	20	03-01	AIR HANDLING UNITS - general	Y
		5.6.7.M.5 Terminal units/emitters	Fan Coil Units	nr	20	59-06	TERMINAL UNITS - FAN COIL	Y
			Induction Units	nr	20	59-05	TERMINAL UNITS - INDUCTION UNITS	Y
		5.6.7.M.9 Ductwork and fittings	Ductwork - Flexible	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
			Ductwork - Galvanised	m2	40	16-02	DUCTWORK SYSTEM - GENERAL	Y
			Ductwork - Plastic	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
		5.6.7.M.10 Grilles, diffusers, fans, filters	External louvres - Aluminium	nr	15	26-02	LOUVRES, BIRD AND INSECT SCREENS	Y
			External louvres - Steel Painted	nr	20	26-02	LOUVRES, BIRD AND INSECT SCREENS	Y
			Grilles and diffusers - Aluminium	nr	25	26-01	GRILLES AND DIFFUSERS	Y
			Grilles and diffusers - Painted Metal	nr	30	26-01	GRILLES AND DIFFUSERS	Y
			Slot Diffusers	nr	20	26-01	GRILLES AND DIFFUSERS	Y

System Group	System and / or Element		Sub-Element	Component	UOM NRM	Estimated Useful Life (EUL)	Maintain Schedule	SFG20 Task Description	Applicable
		5.6.7.M.11	Instrumentation and controls	Controller - Air Conditioning	nr	10	14-11	MULTI-INPUT CONTROLLERS	Y
		5.6.7.M.12	Thermal insulation	Thermal insulation	m2	30	35-01	THERMAL INSULATION	Y
		5.6.7.M.1	Plenum air heating systems	Plenum air heating systems	m2	Building Life	03-01	AIR HANDLING UNITS - general	Y
		5.6.7.M.3	Chillers	Chillers - Lithium bromide water/ absorption chillers	nr	25	09-03	LITHIUM BROMIDE/WATER ABSORPTION CHILLERS	Y
				Chillers - Gas fired absorption chillers up to 18 kW cooling capacity	nr	25	09-04	GAS FIRED ABSORPTION CHILLER UP TO 18 KW COOLING CAPACITY	Y
				Chillers - Compressor refrigeration - reciprocating	nr	20	12-01	COMPRESSORS REFRIGERATION - Reciprocal - (includes hermetic, semi-hermetic and open)	Y
				Chillers - Compressor - screw	nr	20	12-02	COMPRESSOR - SCREW	Y
				Chillers - Compressor - screw	nr	25	12-02	COMPRESSOR - SCREW	Y
				Chillers - Compressors refrigeration - centrifugal using R123/134a	nr	20	12-03	COMPRESSORS REFRIGERATION - CENTRIFUGAL	Y
				Chillers - Solar thermal absorption chillers	nr	25	32-17	TBD	Y
		5.6.7.M.6	Pipelines and fittings	Plant Room Pipework	m2	25	40-01 40,02	PIPEWORK SYSTEMS - General	Y
		5.6.7.M.7	Valves	Valves - Check	nr	25	61-01	VALVES	Y
				Valves - gate	nr	25	61-01	VALVES	Y
				Valves - Strainers	nr	25	61-01	VALVES	Y
				Valves - Thermostatic Mixer	nr	15	61-04	COMBINATION TAP ASSEMBLIES, MIXING VALVES/TAPS	Y
		5.6.7.M.8	Pumps	Pumps - Floor mounted	nr	20	45-02	CIRCULATING PUMPS-general	Y
				Pumps - Floor mounted Twin Head	nr	20	45-02	CIRCULATING PUMPS-general	Y
				Pumps - Accelerator pipe mounted	nr	10	45-02	CIRCULATING PUMPS-general	Y
				Pumps - Domestic	nr	10	45-11	DOMESTIC HOT WATER ACCELERATORS	Y
				Pumps - HWS circulator	nr	20	45-02	CIRCULATING PUMPS-general	Y
	5.6.8 Local air conditioning	5.6.8.M.1	Air conditioning units	Close Control AC Condenser	nr	15	47-01	ROOM AIR CONDITIONERS	Y
				Unitary A/C / CRAC Unit (DX Type)	nr	15	47-01	ROOM AIR CONDITIONERS	Y
				Split System - Heat Pump	nr	15	54-03	SPLIT SYSTEMS/ HEATPUMPS – air-cooled with direct expansion evaporator (DX)	Y
				Separate clean room air conditioner	nr	20	NCT - 5.6.8.2	NCT - Separate clean room air conditioner	Y
		5.6.8.M.4	Pumps	Pumps - Floor mounted	nr	20	45-02	CIRCULATING PUMPS-general	Y
				Pumps - Floor mounted Twin Head	nr	20	45-02	CIRCULATING PUMPS-general	Y
				Pumps - Accelerator pipe mounted	nr	10	45-02	CIRCULATING PUMPS-general	Y
				Pumps - Domestic	nr	10	45-11	DOMESTIC HOT WATER ACCELERATORS	Y
				Pumps - HWS circulator	nr	20	45-02	CIRCULATING PUMPS-general	Y
		5.6.8.M.5	Ductwork, fittings and ancillaries	Ductwork - Flexible	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
				Ductwork - Galvanised	m2	40	16-02	DUCTWORK SYSTEM - GENERAL	Y
				Ductwork - Plastic	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
		5.6.8.M.6	Grilles, diffusers, fans, filters	Grilles and diffusers - Aluminium	nr	15	26-01	GRILLES AND DIFFUSERS	Y
				Grilles and diffusers - Painted Metal	nr	30	26-01	GRILLES AND DIFFUSERS	Y
				Slot Diffusers	nr	20	26-01	GRILLES AND DIFFUSERS	Y
		5.6.6.M.2	Pipelines and fittings	Pipework - Local air conditioning System (copper)	m2	45	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
		5.6.6.M.2		Pipework - Local air conditioning System closed (steel galv)	m2	35	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
		5.6.6.M.2		Pipework - Local air conditioning System open (steel galv)	m2	25	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
		5.6.6.M.2		Pipework - Local air conditioning System (Plastic)	m2	20	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
		5.6.6.M.3	Valves	Valves - Check	nr	25	61-01	VALVES	Y
		5.6.6.M.3		Valves - gate	nr	25	61-01	VALVES	Y
		5.6.6.M.3		Valves - Strainers	nr	25	61-01	VALVES	Y
		5.6.6.M.3		Valves - Thermostatic Mixer	nr	15	61-04	COMBINATION TAP ASSEMBLIES, MIXING VALVES/TAPS	Y
		5.6.6.M.7	Instrumentation and controls	Control Panel	nr	10	14-11	MULTI-INPUT CONTROLLERS	Y
		5.6.6.M.8	Thermal insulation	Thermal insulation	m2	30	35-01	THERMAL INSULATION	Y
		5.6.6.M.9	Air curtains	Air curtains	nr	15	20-03, 29-02	FANS -CENTRIFUGAL	Y
5.7 VENTILATION SYSTEMS	5.7.1 Central ventilation	5.7.1.M.1	Air extract systems	Air Handling Unit - external (extract)	nr	15	20-08	FANS-EXTRACT - including fire/smoke extracts units	Y
				Air Handling Unit - internal (extract)	nr	20	20-08	FANS-EXTRACT - including fire/smoke extracts units	Y
		5.7.1.M.2	Air supply and extract systems	Air Handling Unit - external (supply and extract)	nr	15	20-02	FANS - VENTILATING - general	Y
				Air Handling Unit - internal (supply and extract)	nr	20	20-02	FANS - VENTILATING - general	Y
		5.7.1.M.3	Extract unit/terminal units	Extract unit/terminal units	nr	40	20-02	FANS - VENTILATING - general	Y
		5.7.1.M.4	Fan units	Fan - 2 Stage Axial	nr	15	20-04	FANS- AXIAL	Y
				Fan - Axial	nr	15	20-04	FANS- AXIAL	Y
				Fan - Extract	nr	15	20-08	FANS-EXTRACT - including fire/smoke extracts units	Y
				Fan - Flue Dilution	nr	20	20-02	FANS - VENTILATING - general	Y
				Fan - Roof Mounted	nr	15	20-02	FANS - VENTILATING - general	Y
				Fan - Smoke Extract	nr	15	20-08	FANS-EXTRACT - including fire/smoke extracts units	Y
				Fan - Toilet Extract	nr	15	20-08	FANS-EXTRACT - including fire/smoke extracts units	Y
		5.7.1.M.5	Pipelines and fittings	Pipework - Central ventilation System (copper)	m2	45	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
				Pipework - Central ventilation System (steel galv)	m2	25	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
				Pipework - Central ventilation System (steel galv)	m2	35	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
				Pipework - Central ventilation System (Plastic)	m2	20	40-01, 40-02	PIPEWORK SYSTEMS - General	Y
		5.7.1.M.6	Grilles, diffusers, fans, filters	External louvres - Aluminium	nr	25	26-02	LOUVRES, BIRD AND INSECT SCREENS	Y
				External louvres - Steel Painted	nr	20	26-02	LOUVRES, BIRD AND INSECT SCREENS	Y
				Grilles and diffusers - Aluminium	nr	25	26-01	GRILLES AND DIFFUSERS	Y
				Grilles and diffusers - Painted Metal	nr	30	26-01	GRILLES AND DIFFUSERS	Y
				Slot Diffusers	nr	20	26-01	GRILLES AND DIFFUSERS	Y
		5.7.1.M.7	Ductwork, and fittings	Ductwork - Flexible	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
				Ductwork - Galvanised	m2	40	16-02	DUCTWORK SYSTEM - GENERAL	Y
				Ductwork - Plastic	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
		5.7.1.M.8	Valves	Valves - Check	nr	25	61-01	VALVES	Y
				Valves - gate	nr	25	61-01	VALVES	Y
				Valves - Strainers	nr	25	61-01	VALVES	Y
				Valves - Thermostatic Mixer	nr	15	61-04	COMBINATION TAP ASSEMBLIES, MIXING VALVES/TAPS	Y
		5.7.1.M.9	Pumps	Pumps - Floor mounted	nr	20	45-02	CIRCULATING PUMPS-general	Y
				Pumps - Floor mounted Twin Head	nr	20	45-02	CIRCULATING PUMPS-general	Y
				Pumps - Accelerator pipe mounted	nr	10	45-02	CIRCULATING PUMPS-general	Y
				Pumps - Domestic	nr	15	45-01	PUMPS - General	Y
				Pumps - HWS circulator	nr	20	45-02	CIRCULATING PUMPS-general	Y
		5.7.1.M.10	Instrumentation and controls	Time clock	nr	10	14-08	CONTROLLER TIMERS	Y
	5.7.2 Local and special ventilation	5.7.2.M.1	Extract Fans	Fan - Extract	nr	15	20-08	FANS-EXTRACT - including fire/smoke extracts units	Y
				Fan - Toilet Extract	nr	15	20-08	FANS-EXTRACT - including fire/smoke extracts units	Y
		5.7.2.M.2	Kitchen ventilation	Kitchen Hood extract	nr	NLC	20-08	FANS-EXTRACT - including fire/smoke extracts units	Y
		5.7.2.M.3	Safety cabinet and fume cupboard extracts	Downflow Cabinet	nr	15	20-02	FANS - VENTILATING - general	Y
		5.7.2.M.4	Fume extracts	Fume Cupboard	nr	15	20-08	FANS-EXTRACT - including fire/smoke extracts units	Y
		5.7.2.M.5	Dust collection	Dust Collection Unit	nr	15	64-04	MOBILE DUST SEPARATOR FOR SPOT EXTRACTION	Y
		5.7.2.M.6	Anaesthetic gas extract	Anaesthetic gas extract	nr	15	NCT	NCT	Y
		5.7.2.M.7	Cyclone systems	Cyclone systems	nr	15	NCT	NCT	Y
		5.7.2.M.8	Fans	Fan - 2 Stage Axial	nr	15	20-04	FANS- AXIAL	Y
				Fan - Axial	nr	15	20-04	FANS- AXIAL	Y
		5.7.2.M.9	Rotating ventilators	Rotating Ventilators	nr	20	20-05	FANS - PROPELLER	Y
		5.7.2.M.10	Fans	Fan - Roof Mounted	nr	15	20-02	FANS - VENTILATING - general	Y
		5.7.2.M.11	Car Park Ventilation	Vehicle Exhaust	nr	20	64-06	VEHICLE EXHAUST RAIL SYSTEM	Y
				Local car exhaust ventilation	nr	15	64-03	SPRING RECOIL HOSE REEL	Y
		5.7.2.M.12	Ductwork, and fittings	Ductwork - Flexible	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
				Ductwork - Galvanised	m2	40	16-02	DUCTWORK SYSTEM - GENERAL	Y
				Ductwork - Plastic	m2	15	16-02	DUCTWORK SYSTEM - GENERAL	Y
		5.7.2.M.13	Grilles, diffusers, fans, filters	Grilles and diffusers - Aluminium	nr	15	26-01	GRILLES AND DIFFUSERS	Y
				Grilles and diffusers - Painted Metal	nr	30	26-01	GRILLES AND DIFFUSERS	Y
				Slot Diffusers	nr	20	26-01	GRILLES AND DIFFUSERS	Y
		5.7.2.M.14	Instrumentation and controls	Controller - Ventilation	nr	10	14-07	UNIT CONTROLLERS AND SENSOR CONTROLLERS	Y
				PIR - Fan	nr	8	50-09	OCCUPANCY and LIGHT SENSORS	Y
	5.7.3 Smoke extract / control	5.7.3.M.1	Automatic smoke extract systems	Ductwork Smoke Dampers - Interated	m2	30	52-02	SMOKE RELIEF - Natural smoke and heat exhaust ventilators	Y
				Ductwork Smoke Dampers - Stand Alone	m2	30	52-02	SMOKE RELIEF - Natural smoke and heat exhaust ventilators	Y
				Fan - Smoke Extract	m2	15	20-08	FANS-EXTRACT - including fire/smoke extracts units	Y
				Smoke / Fire Curtain	m2	20	52-04	SMOKE CURTAINS	Y
				Smoke Relief Ventilators	m2	30	52-02	SMOKE RELIEF - Natural smoke and heat exhaust ventilators	Y
				Smoke Relief Ventilators - Powered	m2	30	52-03	SMOKE RELIEF - Powered smoke and heat exhaust ventilators	Y
		5.7.3.M.2	Automatic smoke compartmentalisation systems	Automatic smoke compartmentalisation systems	nr	20	20-08	FANS-EXTRACT - including fire/smoke extracts units	Y
		5.7.3.M.3	Fans	Fan units	nr	40	20-02	FANS - VENTILATING - general	Y
		5.7.3.M.4	Ductwork and fittings	Ductwork and fittings	nr	15	20-02	FANS - VENTILATING - general	Y
		5.7.3.M.5	Grilles, diffusers, fans, filters	Grilles and diffusers - Aluminium	nr	15	26-01	GRILLES AND DIFFUSERS	Y
				Grilles and diffusers - Painted Metal	nr	30	26-01	GRILLES AND DIFFUSERS	Y
		5.7.3.M.7	Instrumentation and controls	Instrumentation and control components	nr	10	14-07	UNIT CONTROLLERS AND SENSOR CONTROLLERS	Y
5.8 ELECTRICAL INSTALLATIONS	5.8.1 Electrical mains and sub-mains distribution	5.8.1.M.1	LV Distribution	Consumer Units	m2	20	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
				Distributed Amplifier Unit	m2	20	44-05	POWER DISTRIBUTION UNIT (PDU)	Y
				Inverter	m2	15	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
				LV Panel	m2	20	44-02	MAIN SWITCH PANEL AT SUPPLY INTAKE	Y
				PFC & MD Transformer	m2	20	44-03	MAXIMUM DEMAND and POWER FACTOR CORRECTION	Y
				Power Distribution Unit	m2	20	44-05	POWER DISTRIBUTION UNIT (PDU)	Y

System Group	System and / or Element	Sub-Element	Component	UOM NRM	Estimated Useful Life (EUL)	Maintain Schedule	SFG20 Task Description	Applicable
			Voltage Optimisation Unit	m2	20	44-03	MAXIMUM DEMAND and POWER FACTOR CORRECTION	Y
			Distribution boards	m2	20	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
			Final circuits and outlets	m2	20	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
			Circuit breakers	m2	20	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
		5.8.1.M.2 HV Main Incomer and Panel	HV Main Incomer / Panel	m2	30	44-02, 44-08	MAIN SWITCH PANEL AT SUPPLY INTAKE	Y
		5.8.1.M.3 Distribution Board	Distribution Boards	m2	20	44-07	DISTRIBUTION BOARDS	Y
		5.8.1.M.4 Mains Cabling	Mains Cabling	m2	35	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
			Sub-Mains Distribution Wiring - mineral insulated	m2	35	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
			Sub-Mains Distribution Wiring - thermoplastic	m2	35	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
			Sub-Mains Distribution Wiring - thermosetting	m2	35	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
		5.8.1.M.5 Conduits and trunking	Conduits and trunking	m2	30-35	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
		5.8.1.M.6 Busbar trunking	Busbar Chamber	m2	35	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
			Busbar trunking	m2	35	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
			Mains Busbar	m2	35	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
		5.8.1.M.7 Transformers	110v Transformer	nr	30	70-07	CAST RESIN TRANSFORMER	Y
			Transformer (Dry type)	nr	30	70-07	CAST RESIN TRANSFORMER	Y
			Transformer (Oil Type)	nr	30	70-06	FLUID FILLED TRANSFORMER	Y
		5.8.1.M.8 Feeder Pillar	Feed Pillar	nr	30	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
		5.8.1.M.9 Electricity Monitoring System	Electricity Monitoring System	item	TBD	TBD	TO BE DECIDED	Y
		5.8.1.M.9 Surge Protection	Surge Protection	item	TBD	TBD	TO BE DECIDED	Y
		5.8.1.M.9	Hazardous area (Electrics) - Flame proof equipment	item	20	27-01 & 27-02	Hazardous areas - FLAME PROOF EQUIPMENT	Y
		5.8.1.M.9	Hazardous area (Electrics) – Lighting	item	15	27-01 & 27-03	Hazardous areas - LIGHTING	Y
	5.8.2 Power Installations	5.8.1.M.1 LV Distribution	Power Supply Unit	m2	20	TBD	TO BE DECIDED	Y
		5.8.2.M.1 General LV power installations	General LV power installations	m2	25	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
		5.8.2.M.2 Extra LV supply installations	Extra LV supply installations	m2	25	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
		5.8.2.M.3 DC installations	DC installations	m2	25	NCT	NCT	Y
		5.8.2.M.4 Distribution Board	Distribution boards -20yrs	m2	20	44-07	DISTRIBUTION BOARDS	Y
			LV main switchgear - 30 yrs;	m2	30	44-02	MAIN SWITCH PANEL AT SUPPLY INTAKE	Y
		5.8.2.M.5 UPS System	Reciprocating Engine	nr	20	NCT	POWER DISTRIBUTION UNIT (PDU)	Y
			Turbine Engine	nr	20	NCT	NON CORE TASK	Y
			UPS - Battery / Inverter	nr	20	43-03	BATTERIES - LEAD ACID - unsealed	Y
			UPS Inverter	nr	20	43-05	UNINTERRUPTIBLE POWER SUPPLIES	Y
			UPS - Batteries - Sealed	nr	5	43-04	BATTERY CHARGING EQUIPMENT	Y
			UPS - Capacitors	nr	5	43-05	BATTERIES - LEAD ACID - unsealed	Y
			UPS Diesel (DRUPS)	nr	20	NCT	NON CORE TASK	Y
		5.8.2.M.6 Cables and wiring	Cables and wiring - Armoured cables and conduits	m2	35	44-04	ARMOURED CABLES AND CONDUITS	Y
			Cables and wiring - Ring main / sub-circuits - general	m2	20	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
			Cables and wiring - Ring main/ sub-circuits - spur outlets	m2	15	44-08 part	ELECTRICAL INSTALLATION - GENERALLY	Y
			Cables and wiring - Three phase circuits - Power outlets	m2	15	44-09	THREE PHASE CIRCUITS	Y
		5.8.2.M.8 socket outlets	Fuse switches - Single phase	nr	15	44-10	ISOLATORS/STARTERS/FUSESWITCHES	Y
			Fuse switches - Three phase	nr	15	44-10	ISOLATORS/STARTERS/FUSESWITCHES	Y
			LV Protection System - MCB	nr	15	44-10	ISOLATORS/STARTERS/FUSESWITCHES	Y
			LV Protection System - MCCB	nr	15	44-10	ISOLATORS/STARTERS/FUSESWITCHES	Y
			LV Protection System - RCB	nr	15	44-10	ISOLATORS/STARTERS/FUSESWITCHES	Y
			LV Protection System - RCD / RCCB	nr	15	44-10	ISOLATORS/STARTERS/FUSESWITCHES	Y
			LV Protection System - SSOs	nr	15	44-10	ISOLATORS/STARTERS/FUSESWITCHES	Y
		5.8.2.M.10 Sundry items	Emergency Shut Off button - Electrical Equip	nr	10	14-18	EMERGENCY STOP BUTTONS	Y
		5.8.2.M.11 PAT testing	PAT testing	nr	1	42-01	PORTABLE APPLIANCE TESTING (PAT)	Y
		5.8.2.M.12 Fixed wiring test	Fixed wiring test	%	5	44-08	ELECTRICAL INSTALLATION - GENERALLY	Y
	5.8.3 Lighting installations	5.8.3.M.1 Light fittings - general	Light fittings Ext - Bulkhead	m2	15	36-04	EXTERNAL LIGHTING including ILLUMINATED SIGNS	Y
			Light fittings Int - Batten Fluorescent	m2	20	36-03	LIGHTING FITTINGS including LUMINAIRES general	Y
			Light fittings Int - Domestic	m2	20	36-03	LIGHTING FITTINGS including LUMINAIRES general	Y
			Light fittings Int - Fluorescent	m2	20	36-03	LIGHTING FITTINGS including LUMINAIRES general	Y
			Light fittings Int - High Bay Sodium	m2	20	36-03	LIGHTING FITTINGS including LUMINAIRES general	Y
			Light fittings Int - Modular Fluorescent	m2	20	36-03	LIGHTING FITTINGS including LUMINAIRES general	Y
			Light fittings Int - Office modular	m2	20	36-03	LIGHTING FITTINGS including LUMINAIRES general	Y
			Light fittings Int - Tungsten	m2	20	36-03	LIGHTING FITTINGS including LUMINAIRES general	Y
			Light fittings Int - Vapour Sealed	m2	20	36-03	LIGHTING FITTINGS including LUMINAIRES general	Y
			Light fittings Int - Workshop/low spec	m2	20	36-03	LIGHTING FITTINGS including LUMINAIRES general	Y
			Light fittings Internal - Halogen	m2	20	36-03	LIGHTING FITTINGS including LUMINAIRES general	Y
		5.8.3.M.2 Emergency lighting	Emergency Lighting -	M2/nr	25	37-01	EMERGENCY LIGHTING self contained	Y
			Emergency Lighting - Bulkhead	M2/nr	25	37-01	EMERGENCY LIGHTING self contained	Y
			Emergency Lighting - Office	M2/nr	25	37-02	EMERGENCY LIGHTING externally powered	Y
			Emergency Lighting - Workshop	M2/nr	25	37-02	EMERGENCY LIGHTING externally powered	Y
			Light fittings Ext - Bulk - emergency	M2/nr	25	37-01	EMERGENCY LIGHTING self contained	Y
		5.8.3.M.3 External lighting	Light fittings Ext - Floodlight	m2	15	36-04	EXTERNAL LIGHTING including ILLUMINATED SIGNS	Y
		5.8.3.M.4 Distribution boards	LV switchgear and Distribution boards	m2	25-30	44-07	DISTRIBUTION BOARDS	Y
		5.8.3.M.5 Cables and wiring	Lighting Distribution Wiring	m2	15-20	44-04	ARMOURED CABLES AND CONDUITS	Y
		5.8.3.M.6 Conduits and cable trunking	Conduits and cable trunking	m2	25-30	44-04	ARMOURED CABLES AND CONDUITS	Y
		5.8.3.M.7 Light fittings	Fittings to lighting points	nr	10	36-03	LIGHTING FITTINGS including LUMINAIRES general	Y
		5.8.3.M.8 Lighting Switches	Lighting Switches	nr	10	36-02	LIGHTING-SWITCHES-INTERNAL AND EXTERNAL	Y
		5.8.3.M.9 Luminaires / lamps	Luminaires / lamps	M2/nr	TBD	36-01	INTRODUCTORY PROCEDURES	Y
		5.8.3.M.10 Lighting control equipment	PIR - Lighting	nr	8	50-09	OCCUPANCY and LIGHT SENSORS	Y
			Time clock	nr	10	14-08	CONTROLLER TIMERS	Y
	5.8.4 Specialist lighting installations	5.8.4.M.1 Illuminated display signs	Illuminated Signage	nr	20	36-04	EXTERNAL LIGHTING including ILLUMINATED SIGNS	Y
		5.8.4.M.2 Studio Lighting	Specialist lighting - Studio	m2	20	NCT	NON CORE TASK	Y
		5.8.4.M.3 Auditorium lighting	Specialist lighting - Auditorium	m2	20	NCT	NON CORE TASK	Y
		5.8.4.M.4 Arena lighting	Specialist lighting - Arena	m2	15	NCT	NON CORE TASK	Y
		5.8.4.M.5 Operating theatre and other specialist lighting	Specialist lighting - Infra Red	m2	20	NCT	NON CORE TASK	Y
			Specialist lighting - Operating Theatres	m2	20	NCT	NON CORE TASK	Y
			Specialist lighting - Other	m2	20	NCT	NON CORE TASK	Y
		5.8.4.M.6 Distribution boards	LV switchgear and Distribution boards	m2	25-30	44-07	DISTRIBUTION BOARDS	Y
		5.8.4.M.7 Cables and wiring	Lighting Distribution Wiring	m2	15-20	44-04	ARMOURED CABLES AND CONDUITS	Y
		5.8.4.M.8 Conduits and cable trunking	Conduits and cable trunking	m2	25-30	44-04	ARMOURED CABLES AND CONDUITS	Y
		5.8.4.M.9 Light fittings	Fittings to lighting points	nr	10	36-03	LIGHTING FITTINGS including LUMINAIRES general	Y
		5.8.4.M.10 Lighting Switches	Lighting Switches	nr	10	36-02	LIGHTING-SWITCHES-INTERNAL AND EXTERNAL	Y
		5.8.4.M.11 Luminaires / lamps	Luminaires / lamps	m2	TBD	36-01	INTRODUCTORY PROCEDURES	Y
		5.8.4.M.12 Lighting gantries	Lighting gantries	nr	TBD	NCT	NCT	Y
		5.8.4.M.13 Lighting control equipment	Lighting control equipment	nr	10	14-08	CONTROLLER TIMERS	Y
	5.8.5 Local electricity generation systems	5.8.5.1.M.1 Stand by generator	Batteries - Sealed	nr	5	43-03	BATTERIES - LEAD ACID - unsealed	Y
			Batteries - Unsealed	nr	20	43-03	BATTERIES - LEAD ACID - unsealed	Y
			Battery Charger	nr	20	43-04	BATTERY CHARGING EQUIPMENT	Y
			Closed Transfer Switch (LTM)	nr	NLC	NCT	NCT	Y
			Control Panel - Electrical Generator	nr	10	14-11	MULTI-INPUT CONTROLLERS	Y
			Open Transfer Switch (ATS)	nr	20	43-02	POWER GENERATION--STAND-BY GENERATOR	Y
			Standby Generator	nr	30	43-02	POWER GENERATION--STAND-BY GENERATOR	Y
			Generator portable	nr	30	43-02	POWER GENERATION--STAND-BY GENERATOR	Y
		5.8.5.1.M.2 Ancillary components	Ancillary components	nr	15-20	44-04	ARMOURED CABLES AND CONDUITS	Y
		5.8.5.5.M.2 Photovoltaic devices	Solar Panel - Photovoltaic	nr	25	43-06	PHOTOVOLTAIC DEVICES, INCLUDING CELLS, PANELS, MODULES AND THE LIKE	Y
		5.8.5.4.M.7 Sundry items	Battery Monitoring Equip.	nr	20	43-03	BATTERIES - LEAD ACID - unsealed	Y
			Battery Monitoring Equip.	nr	20	43-03	BATTERIES - LEAD ACID - unsealed	Y
	5.8.6 Earthing and bonding systems	5.8.6.M.1 Earthing and bonding cables	Earthing Bonding - Major	m2	30	44-06	EARTHING	Y
		5.8.6.M.2 Lightning Conductor and Earth	Earthing and bonding components - protective conductors	m2	30	Part of 44-06	EARTHING	Y
			Earthing and bonding components - earth clamps and tapes	m2	NLC	Part of 44-06	EARTHING	Y
			Earthing and bonding components - clean earth bars	m2	NLC	Part of 44-06	EARTHING	Y
			Earthing and bonding components - earth electrodes	m2	30	Part of 44-06	EARTHING	Y
			Earthing and bonding components - earthing bus bars	m2	30	Part of 44-06	EARTHING	Y
			Earthing and bonding components - earthing rod covers and boxed	m2	30	Part of 44-06	EARTHING	Y
			Earthing and bonding components - equipotential bonding	m2	NLC	Part of 44-06	EARTHING	Y
5.9 FUEL INSTALLATIONS	5.9.1 Fuel storage	5.9.1.M.1 Fuel systems	Fuel systems - Biomas	nr	30	56-05	STORAGE TANKS - OIL	Y
			Fuel systems - Oil	nr	30	56-05	STORAGE TANKS - OIL	Y
			Fuel systems - Diesel	nr	30	56-05	STORAGE TANKS - OIL	Y
			Fuel systems - LPG	nr	30	56-04	STORAGE TANKS - LIQUEFIED PETROLEUM GAS (LPG)	Y
		5.9.1.M.2 Fuel storage tanks	Oil Storage Tank - Mild Steel	nr	30	56-05	STORAGE TANKS - OIL	Y
			Oil Storage Tank - Plastic	nr	30	56-05	STORAGE TANKS - OIL	Y
			Oil fuel handling plant	nr	15	NCT	NCT	Y
			Diesel storage system	nr	30	NCT	NCT	Y
	5.9.2 Fuel distribution systems	5.9.2.M.2 Pipelines and fittings	Gas Pipework	m2	30	40-10	PIPEWORK FOR LOW PRESSURE NATURAL GAS, LIQUEFIED PETROLEUM GAS (LPG) OR OIL	Y
			Oil Pipework	m2	30	40-10	PIPEWORK FOR LOW PRESSURE NATURAL GAS, LIQUEFIED PETROLEUM GAS (LPG) OR OIL	Y
		5.9.2.M.3 Pumps	Oil Pump	nr	20	45-01	PUMPS - General	Y

System Group	System and / or Element	Sub-Element	Component	UOM NRM	Estimated Useful Life (EUL)	Maintain Schedule	SFG20 Task Description	Applicable
		5.9.2.M.3	Rotary Hand pump	nr	20	45-05	ROTARY HAND PUMPS	Y
		5.9.2.M.3 Valves	Fuel Valves - Check	nr	25	61-01	VALVES	Y
		5.9.2.M.3	Fuel Valves - Gate	nr	25	61-01	VALVES	Y
		5.9.2.M.4 Gas distribution components	Gas Booster Set	m2	20	05-39	GAS BOOSTER SETS	Y
			Meter - Fuel	m2	20	NCT	NON CORE TASK	Y
			Regulator / Gas Valves	nr	30	05-40	GAS GOVERNOR OR GAS REGULATOR	Y
		5.9.2.M.5 Terminal control equipment	Terminal control equipment	m2	10	NCT	NO PPM	Y
		5.9.2.M.6 Thermal insulation	Thermal insulation	m2	30	35-01	THERMAL INSULATION	Y
		5.9.2.M.7 Monitoring equipment	Monitoring equipment.	m2	10	NCT	NO PPM	Y
5.10 LIFT & CONVEYOR INSTALLATIONS	5.10.1 Lifts and enclosed hoists	5.10.1.M.1 Lifts	Lifts - Electric Traction	nr	20	NCT	NON CORE TASK	Y
			Lifts - Hydraulic	nr	15	NCT	NON CORE TASK	Y
			Lifts - Pulley	nr	15	NCT	NON CORE TASK	Y
		5.10.1.M.2 Fire fighting lifts	Lifts - Fire Fighters	nr	20	NCT	NON CORE TASK	Y
		5.10.1.M.3 Wall climbing lifts	Lifts - Wall Climbing	nr	20	NCT	NON CORE TASK	Y
		5.10.1.M.4 Gantries	Atrium Gantry	nr	30	NCT	NON CORE TASK	Y
		5.10.1.M.5 Lift Controls	Controller - Lift	nr	20	NCT	NON CORE TASK - CONTROLLER LIFT	Y
			Emergency Shut Off - Lift	nr	10	88-01	New Task	Y
		5.10.1.M.6 Hoists	Dumb Waiter	nr	20	NCT - 5.10.1.6	NON CORE TASK - DUMB WAITER	Y
			Complete hoist installation	nr	20	NCT - 5.10.1.7	NON CORE TASK - COMPLETE HOIST INSTALLATION	Y
		5.10.1.M.7 Lift Controls	Controller - Lift	nr	20	NCT	NON CORE TASK	Y
		5.10.1.M.8 Sundry items	Lift Motor	nr	15	39-01	MOTORS- DRIVE ELEMENTS	Y
	5.10.2 Escalators	5.10.2.M.1 Escalator	Escalator	nr	30	NCT	NON CORE TASK	Y
		5.10.2.M.2 Ancillary components	Ancillary components - Under step lighting	nr	20	NCT	NON CORE TASK	Y
			Ancillary components - Under handrail lighting	nr	20	NCT	NON CORE TASK	Y
			Ancillary components - Balustrades	nr	20	NCT	NON CORE TASK	Y
			Ancillary components - Cladding (to sides and soffits)	nr	20	NCT	NON CORE TASK	Y
			Ancillary components - Chairs	nr	20	NCT	NON CORE TASK	Y
		5.10.2.M.3 Escalator Controls	Controls and electrical works	nr	20	NCT	NON CORE TASK	Y
	5.10.3 Moving Pavements	5.10.3.M.3 Stair lifts	Stair lifts	nr	20	NCT	NON CORE TASK	Y
		5.10.3.M.4 Escalator Controls	Controls and electrical works	nr	20	NCT	NON CORE TASK	Y
	5.10.4 Powered stair lifts	5.10.4.M.1 Stair lifts	Lifts - Wheelchair	nr	20	NCT	NON CORE TASK	Y
			Stair Lift	nr	20	NCT	NON CORE TASK	Y
		5.10.4.M.2 Stair-lift Controls	Controls and electrical works	nr	20	NCT	NON CORE TASK	Y
	5.10.5 Conveyors	5.10.5.M.1 Conveyor systems	Conveyor systems	nr	20	NCT	NON CORE TASK	Y
		5.10.5.M.2 Specialist conveyor systems	Specialist systems	nr	20	NCT	NON CORE TASK	Y
		5.10.5.M.3 Controls components	Controls and electrical works	nr	20	NCT	NON CORE TASK	Y
	5.10.6 Dock levellers and scissor lifts	5.10.6.M.1 Dock levellers	Loading Platforms	nr	25	NCT	NON CORE TASK	Y
		5.10.6.M.2 Scissor lifts	Scissor Lift	nr	25	NCT	NON CORE TASK	Y
		5.10.6.M.3 Dock Leveller Controls	Controls and electrical works	nr	20	NCT	NON CORE TASK	Y
	5.10.7 Cranes and unenclosed hoists	5.10.7.M.3 Unenclosed Hoists and Cradles	Fork Lift	nr	20	NCT	NON CORE TASK	Y
			Hoists & Cradles	nr	30	NCT	NON CORE TASK	Y
			Lifting Beam	nr	20	NCT	NON CORE TASK	Y
			Pallet Truck	nr	20	NCT	NON CORE TASK	Y
		5.10.7.M.4 Hoist controls	Controls and electrical works	nr	20	NCT	NON CORE TASK	Y
	5.10.10 Other transport systems	5.10.10.M.1 Paternoster lifts	Paternoster lifts	nr	20	NCT	NON CORE TASK	Y
		5.10.10.M.2 Hoists for moving people with disability	Hoists for moving people with disability	nr	20	NCT	NON CORE TASK	Y
		5.10.10.M.3 Other transport systems	Other transport systems	nr	20	NCT	NON CORE TASK	Y
		5.10.10.M.4 Control components	Control components	nr	20	NCT	NON CORE TASK	Y
5.11 FIRE & LIGHTNING PROTECTION	5.11.1 Fire fighting systems	5.11.1.M.1 Fire Hose reels	Hose Reel Booster set	nr	20	23-02	HOSE REELS PRESSURE BOOSTING SETS	Y
			Hose Reels	nr	15	23-03	HOSE REELS - Static or Swinging	Y
		5.11.1.M.2 Dry riser	Dry Riser (incl Landing Valves)	nr	25	23-04	RISING FIRE MAINS and HYDRANTS	Y
		5.11.1.M.3 Wet riser	Wet Riser incl Landing Valves	nr	20	23-04	RISING FIRE MAINS and HYDRANTS	Y
		5.11.1.M.4 Pipelines and fittings	Pipelines and fittings	m^2	20	40-01	PIPEWORK SYSTEMS - General	Y
			Pipelines and fittings - Pressure measurement sensor	m^2	10	50-02	PRESSURE MEASUREMENT SENSORS - static and differential	Y
		5.11.1.M.5 Thermal insulation	Thermal insulation	m^2	20	35-01	THERMAL INSULATION	Y
		5.11.1.M.6 Control components	Control components	nr	20	14-12	INDICATORS AND DISPLAYS	Y
		5.11.1.M.7 Fire and smoke protection curtains	Fire and smoke protection curtains	m^2	20	NCT	NON CORE TASK	Y
	5.11.2 Fire suppression systems	5.11.1.M.1 Fire Hose reels	Sprinkler Booster set	nr	20	23-14	SPRINKLER SYSTEMS	Y
		5.11.1.M.1	Sprinkler System - Alternate	m2	25	23-14	SPRINKLER SYSTEMS	Y
		5.11.2.M.1 Sprinkler system	Kitchen Hood Fire Supression	nr	20	23-16	KITCHEN HOOD FIRE SUPPRESSION	Y
			Sprinkler System - Wet	m2	25	23-14	SPRINKLER SYSTEMS	Y
		5.11.2.M.2 Deluge system	Sprinkler System - Deluge	m2	20	23-14	SPRINKLER SYSTEMS	Y
		5.11.2.M.3 Gas Fire Fighting Injection	Gas Injection System	m2	15	23-05	Gas Extinguishing systems	Y
		5.11.2.M.4 Foam Dispensing Fire Fighting System	Foam Dispensing System	m2	15	23-07	EXPANSION FOAM SYSTEMS	Y
		5.11.2.M.5 Pipelines and fittings	Pipelines and fittings	nr	20	40-01	PIPEWORK SYSTEMS - General	Y
		5.11.2.M.6 Tanks	Water Storage Tanks - Fibreglass	nr	25	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
			Water Storage Tanks - Galvanised Metal	nr	25	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
			Water Storage Tanks - GRP	nr	25	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
			Water Storage Tanks - Polypropylene	nr	25	56-02	COLD WATER STORAGE TANKS and CISTERNS	Y
		5.11.2.M.7 Thermal insulation	Thermal insulation	m^2	20	35-01	THERMAL INSULATION	Y
		5.11.2.M.8 Control components	Control components	nr	20	14-12	INDICATORS AND DISPLAYS	Y
	5.11.3 Lightning protection	5.11.3.M.1 Lightning protection	Lightning protection and other tape based systems	m2	60	38-01	LIGHTNING CONDUCTOR AND EARTH	Y
			Lightning conductor & earth protection	m2	30	38-01	LIGHTNING CONDUCTOR AND EARTH	Y
			Finials.	m2	30	38-01	LIGHTNING CONDUCTOR AND EARTH	Y
			Conductor tapes.	m2	30	38-01	LIGHTNING CONDUCTOR AND EARTH	Y
			Grounding/ earthing	m2	30	38-01	LIGHTNING CONDUCTOR AND EARTH	Y
5.12 COMMUNICATION, SECURITY & CONTROL INSTALLATIONS	5.12.1 Communication systems	5.12.1.M.1 Telecommunication systems	General communication and PA systems	m2	10	NCT	NON CORE TASK	Y
		5.12.1.M.2 Data transmission systems	Computer networking, modems etc	m2	10	NCT	NON CORE TASK	Y
			Multiplexes data terminals	m2	10	NCT	NON CORE TASK	Y
			data bus systems	m2	10	NCT	NON CORE TASK	Y
		5.12.1.M.3 Paging and emergency call systems	Deaf Alerter	m2	5	NCT	NON CORE TASK	Y
			Disabled Alarm - Refuge	m2	10	NCT	NON CORE TASK	Y
			Disabled Alarm - Toilet	m2	10	NCT	NON CORE TASK	Y
			Aerials, radio and paging equipment	m2	5	NCT	NON CORE TASK	Y
			Emergency call buttons, pull cords etc	m2	5	NCT	NON CORE TASK	Y
			Personal Receivers	m2	5	NCT	NON CORE TASK	Y
		5.12.1.M.4 Public Address System	Hearing Loop Systems - Induction Type	m2	10	NCT	NON CORE TASK	Y
			Hearing Loop Systems - Infra Red Type	m2	10	NCT	NON CORE TASK	Y
			Public Address System	m2	20	11-01	COMMUNICATIONS - PUBLIC ADDRESS SYSTEMS	Y
			Background noise systems	m2	10	NCT	NON CORE TASK	Y
			Microphones, amplifiers and speakers	m2	10	NCT	NON CORE TASK	Y
			Indicator boards	m2	10	NCT	NON CORE TASK	Y
		5.12.1.M.5 Radio systems	Radio systems	m2	10	NCT	NON CORE TASK	Y
		5.12.1.M.6 Projection systems	Cinematographic Equipment	nr	10	NCT	NON CORE TASK	Y
			Rolling Ticker Tape Display	nr	10	NCT	NON CORE TASK	Y
			Fixed and portable projectors	nr	10	NCT	NON CORE TASK	Y
			Screens & back projection equipment	nr	10	NCT	NON CORE TASK	Y
			Sound equipment	nr	10	NCT	NON CORE TASK	Y
		5.12.1.M.7 Fire detection and alarm systems	Fire Alarm Local Display Warning Panel	m2	15	22-01, 22-02	FIRE ALARM SYSTEM	Y
			Fire Alarm Panel	m2	15	22-01, 22-02	FIRE ALARM SYSTEM	Y
			Fire Alarm Repeater Panel	m2	15	22-01, 22-02	FIRE ALARM SYSTEM	Y
			Fire Alarm Wiring	m2	15	22-01, 22-02	FIRE ALARM SYSTEM	Y
			Carbon Dioxide Sensor	m2	15	22-01, 22-02	FIRE ALARM SYSTEM	Y
		5.12.1.M.8 Smoke detection	Heat Detectors	m2	10	50-10	SMOKE DETECTORS	Y
			PIR - Intruder	nr	8	50-09	OCCUPANCY and LIGHT SENSORS	Y
			Smoke Detector - Infrared Beam	m2	10	50-10	SMOKE DETECTORS	Y
			Smoke Detectors	m2	10	50-10	SMOKE DETECTORS	Y
		5.12.1.M.9 Liquid detection alarms	Leak Detection	m2	10	NCT	NON CORE TASK	Y
		5.12.1.M.10 Clock	Clock	nr	15	NCT	NON CORE TASK	Y
		5.12.1.M.11 Radios	Radios	m2	NLC	NCT	NON CORE TASK	Y
		5.12.1.M.12 Television systems	Aerial and Dish	m2	10	NCT	NON CORE TASK	Y
		5.12.1.M.14 Other communication systems	Batteries - Unsealed	m2	5	43-03	BATTERIES - LEAD ACID - unsealed	Y
			Battery Charger	m2	20	43-04	BATTERY CHARGING EQUIPMENT	Y
			Lone Working System	m2	15	NCT	NON CORE TASK	Y
			Radios	m2	10	NCT	NON CORE TASK	Y
			TV Monitors	m2	NLC	NCT	NON CORE TASK	Y
	5.12.2 Security systems	5.12.2.M.1 Surveillance equipment	Security Cameras - PTZ	nr/m2	15	NCT	NON CORE TASK	Y
			Security Cameras - PTZ Dome	nr/m2	15	NCT	NON CORE TASK	Y
			Security Cameras - Static	nr/m2	15	NCT	NON CORE TASK	Y
			Security Cameras - Static Dome	nr/m2	15	NCT	NON CORE TASK	Y

System Group	System and / or Element	Sub-Element	Component	UOM NRM	Estimated Useful Life (EUL)	Maintain Schedule	SFG20 Task Description	Applicable
			Surveillance equipment (e.g. CCTV)	nr/m2	15	NCT	NON CORE TASK	Y
		5.12.2.M.2 Security detection equipment	Electric Locking	nr/m2	10	NCT	NON CORE TASK	Y
			Intruder Alarm	nr/m2	15	NCT	NON CORE TASK	Y
			Metal Detector Portal	nr/m2	10	NCT	NON CORE TASK	Y
			Panic Alarm	nr/m2	15	NCT	NON CORE TASK	Y
			RedCARE' system or similar	nr/m2	15	NCT	NON CORE TASK	Y
			Security detection equipment	nr/m2	10	NCT	NON CORE TASK	Y
			X Ray Machine	nr/m2	10	NCT	NON CORE TASK	Y
		5.12.2.M.3 Security alarm equipment	Tamper Alarms	nr/m2	15	NCT	NON CORE TASK	Y
		5.12.2.M.4 Access Control systems	Access Control - Fob or Card	nr	15	NCT	NON CORE TASK	Y
			Access Control - Keypad	nr	15	NCT	NON CORE TASK	Y
		5.12.2.M.5 Burglar and security alarms	Burglar and security alarms	nr	15	NCT	NON CORE TASK	Y
		5.12.2.M.6 Door entry systems	Access Control - Video Comm	nr	15	NCT	NON CORE TASK	Y
			Intercom	nr	10	NCT	NON CORE TASK	Y
		5.12.2.M.7 Security lights and lighting systems	Security Lighting	nr/m2	20	NCT	NON CORE TASK	Y
	5.12.3 Central control / building management systems	5.12.3.M.1 Control Panels	Control Panels	m2	15	14-02, 14-16	CONTROL PANELS - electrical services (excluding electrical controllers and pneumatic relays)	Y
		5.12.3.M.2 BMS Central operating station systems	BMS - Central operating station	m2	5	06-03	BUILDING MANAGEMENT SYSTEMS - Central Operator Station	Y
			BMS - Automatic Lighting Control System	m2	5	06-03	BUILDING MANAGEMENT SYSTEMS - Central Operator Station	Y
			BMS - Communications	m2	25	06-04	BUILDING MANAGEMENT SYSTEMS - COMMUNICATIONS	Y
			BMS - Software functions.	m2	5	06-06	BUILDING MANAGEMENT SYSTEMS - SOFTWARE FUNCTIONS	Y
			BMS - Sensors	m2	10	06-05	BUILDING MAINTENANCE SYSTEMS - OUTSTATIONS	Y
			BMS - Actuators	m2	5	06-05	BUILDING MAINTENANCE SYSTEMS - OUTSTATIONS	Y
		5.12.3.M.4 Controlling terminal units and switches	Plant Controller	item	5	14-07	UNIT CONTROLLERS AND SENSOR CONTROLLERS	Y
		5.12.3.M.5 Control cabling and containment	Control cabling and containment	item	10	06-03, 06-06	BUILDING MANAGEMENT SYSTEMS - Central Operator Station	Y
		5.12.3.M.6 Compressed air and vacuum operating controls	Compressed air and vacuum operating controls	item	30	06-03, 06-06	BUILDING MANAGEMENT SYSTEMS - Central Operator Station	Y
5.13 SPECIALIST INSTALLATIONS	5.13.1 Specialist piped supply systems	5.13.1.M.1 Medical and laboratory gas supply systems	Nitrogen Generator	nr/m2	30	NCT	NON CORE TASK	Y
		5.13.1.M.2 Centralised vacuum cleaning systems	Centralised vacuum cleaning systems	nr/m2	20	NCT	NON CORE TASK	Y
		5.13.1.M.3 Treated water systems	Treated water systems	nr/m2	NLC	NCT	NON CORE TASK	Y
		5.13.1.M.5 Compressed air systems	Inter Cooler/After Cooler - Pnuematics	nr/m2	20	NCT	NON CORE TASK	Y
		5.13.1.M.6 Vacuum systems	Vacuum systems	nr/m2	20	60-02	VACUUM TUBES - cash handling	Y
		5.13.1.M.7 Other specialist piped supply systems	Other specialist piped supply systems	nr/m2	NLC	NCT	NON CORE TASK	Y
		5.13.1.M.8 Pipelines ancillaries and fittings	Pneumatic Pipework	m2	25	NCT	NON CORE TASK	Y
		5.13.1.M.9 Air duct lines, duct line ancillaries and fittings	Air duct lines, duct line ancillaries and fittings	nr/m2	25	NCT	NON CORE TASK	Y
		5.13.1.M.10 Thermal insulation	Thermal insulation	nr/m2	30	35-01	THERMAL INSULATION	Y
		5.13.1.M.11 Silencers and acoustic treatment	Silencers and acoustic treatment.	nr/m2	25	NCT	NON CORE TASK	Y
		5.13.1.M.12 Control components	Control components	nr	20	NCT	NON CORE TASK	Y
	5.13.2 Specialist refrigeration systems	5.13.2.M.1 Cold rooms	Cold rooms	nr/m2	15	NCT	NON CORE TASK	Y
		5.13.2.M.2 Ice pads	Ice pads	nr/m2	15	34-01	ICE MAKING MACHINES	Y
		5.13.2.M.3 Other specialist refrigeration systems	Fridge - Laboratory	nr/m2	15	NCT	NON CORE TASK	Y
			Ice Storage Tank	nr/m2	15	56-03	ICE STORAGE SYSTEMS	Y
			Ultra Low Temp (Lab) Freezer	nr/m2	15	NCT	NON CORE TASK	Y
	5.13.4 Specialist electrical/ electronic systems	5.13.4.M.3 Television aerial and satellite systems	Television aerial and satellite systems	nr/m²	15	NCT	NON CORE TASK	Y
		5.13.4.M.5 Multi-room audio and video	Multi room audio and video	nr/m²	NLC	NCT	NON CORE TASK	Y
		5.13.4.M.6 Automated curtains and blinds	Automated curtains and blinds	nr/m²	NLC	NCT	NON CORE TASK	Y
		5.13.4.M.7 Other specialist electrical and electronic systems	Autoclave	nr/m²	15	NCT	NON CORE TASK	Y
			Incubators	nr/m²	15	NCT	NON CORE TASK	Y
			Oven - Laboratory	nr/m²	15	NCT	NON CORE TASK	Y
			Steriliser	nr/m²	15	NCT	NON CORE TASK	Y
	5.13.5 Water features	5.13.5.M.1 Water features	Water features	nr/m²	15	25-01, 25-02	FOUNTAINS - ORNAMENTAL	Y
		5.13.5.M.2 Water filtration equipment	Pond Filter	nr/m²	15	25-01, 25-02	FOUNTAINS - ORNAMENTAL	Y
		5.13.5.M.3 Nutrient treatment and equipment	Nutrient treatment and equipment	nr/m²	15	NCT	NON CORE TASK	Y
		5.13.5.M.4 Control components	Control components	nr	15	14-07	UNIT CONTROLLERS AND SENSOR CONTROLLERS	Y
8.4 FENCING, RAILINGS AND WALLS (FRW)	8.4.2 Walls and Screens	8.4.2.M.4 Security gates	Security gates and gate posts	nr		FRW PI	FENCING, RAILINGS AND WALLS - PLANNED INSPECTION	Y
8.6 EXTERNAL DRAINAGE (ED)	8.6.1 Surface water and foul water drainage	8.6.1.M.1 Surface water and foul water drainage (SWFWD)	Interceptors - Petrol and Oil	nr		48-03	INTERCEPTORS - Petrol and Oil	Y

APPENDIX E - COMMISSIONING WITNESSING SCHEDULE

Our Ref: SH-1629-TC-001
Date: 09 March 2017
Version: 1.0

UCL JOHN ADAMS HALL
FLOORS 1 TO 4, PART GROUND FLOOR AND BASEMENT REFURBISHMENT
SUMMER WORKS 2017
COMMISSIONING WITNESSING SCHEDULE

System	Test required	Extent to be Witnessed	Objective	Witnessing Status/Comments
LIFE SAFETY SYSTEMS				
Emergency lighting	Full battery endurance	100%	Maintained design illuminance levels for 3 hours.	
Emergency lighting	Mains failure	100%	Automatic changeover to emergency mode.	
Emergency lighting	Status monitoring	25%	Demonstrate communication of individual luminaires via control panel and prove status report and correct location.	
Emergency lighting	Self-test address recognition	25%	Demonstrate fault free status by monitoring through clients remote head end PC and complete graphics.	
Fire alarm	Detector in fire mode	25%	Activate first stage alarm.	
Fire alarm	Detector in fault mode	25%	1. Demonstrate device in fault has recognition by indication on control panel. 2. LED flash on device.	

System	Test required	Extent to be Witnessed	Objective	Witnessing Status/Comments
Fire alarm	Manual call point in fault	4 No.	1. Demonstrate device in fault has recognition by indication on control panel. 2. LED flash on device.	
Fire alarm	Main Plant interfaces	100%	Shutdown on first stage fire.	
Fire alarm	Sounder pressure level to internal areas	100%	Demonstrate the sound levels meet the design.	
ELECTRICAL SERVICES				
General wiring systems lighting	Circuit impedance	20% of lighting circuits	As BS7617 recommendation.	
General wiring systems lighting	Insulation resistance	20% of lighting circuits	As BS7617 recommendation.	
General wiring systems lighting	Measured earth loop impedance (dead test)	20% of lighting circuits	As BS7617 recommendation.	
General wiring systems power	Circuit impedance	20% of small power circuits	As BS7617 recommendation.	
General wiring systems power	Insulation resistance	20% of small power circuits	As BS7617 recommendation.	

System	Test required	Extent to be Witnessed	Objective	Witnessing Status/Comments
General wiring systems power	Measured earth loop impedance (dead test)	20% of small power circuits	As BS7617 recommendation.	
Lighting control system	Functional test	50%	1. Demonstrate automatic control of the lighting forced by presence detection. 2. Demonstrate automatic control of lighting forced by switch.	
Lighting control system	Illuminance level	50%	Verify correct illuminance level on working plane/task area.	
Energy Sub-metering	Functional test	100%	Demonstrate functional circuit metering at riser position.	
Energy Sub-metering	Remote monitoring	100%	Demonstrate system is reporting back to head end PC and graphics have been updated to reflect installation amendments.	
MECHANICAL SERVICES				
General ventilation	Air balance	20%	As design requirements.	
Toilets Ventilation	Air Balance	100%	As design requirements.	
Heating	Water balance	20%	As design requirements.	

System	Test required	Extent to be Witnessed	Objective	Witnessing Status/Comments
Controls	Prove operating and network connection	40%	Prove operation and interfaces with lighting controls. Demonstrate graphics. Demonstrate all systems operate in accordance with Des Ops. Demonstrate point to point for field device.	
Domestic water risk assessment	Compliance with Regulations and Specification	By external consultant	Compliance with regulations.	
Domestic Water	Chlorination	N/A	Compliance with regulations.	
Domestic Water	TMV Operation	100%	Outlet temperatures.	
Domestic Water	HWS balance and CWS.	100%	Outlet temperatures comply with L8.	
Heating	Boiler operation and sequencing of plant.	100%	As design requirements.	

APPENDIX F – INTERSERVE CERTIFICATE