SECTION 4

LOW CURRENT SYSTEMS INSTALLATIONS

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16-23 GENERAL CONDITIONS AND REQUIREMENTS

16-23-1 General

This division of the specification shall be read in conjunction with division "I" (General Conditions and Requirements), and it calls for the complete installation of low current systems as detailed in the following sub-divisions and or as shown on the drawing.

All equipment and/or accessories not specifically mintioned in the specification or shown on the drawings but which are necessary for the proper operation of the various systems must be included.

Nothing in this division of the specification shall void any of the requirements of the conditions of contract or the particular conditions of contract.

All work shall be carried out in a neat, workmanlike and efficient manner in accordance with the requirements of the specification and so that their true meaning and intent are fulfilled.
It shall be clearly understood that the specification. Bill of Quantities and the drawings ate complementary documents intended for the selection of equipment of highest quality having the general and specific characteristics as detailed in the Tender Documents.

In view of the great importance attached to the above requirement for quality equipment and components, their characteristics, installation details, ease of operation and maintenance ate not, in the opinion of the Engineer, in compliance with the Tender Documents they will not be accepted.

16-23-2 Scope of Work

The scope of work outlined below cover the supply and installation of material and equipment as described under this division of the specification or as shown on the drawings, including all other associated work such as supporting structure, building, ancillary work, attendance and the like.

16-23-3 Work Under the Contract

Without restricting the generality of the foregoing, the low current systems installations covered under this division of the specification shall include the supply and installation of the following:-

- the telephone system, including but not restricted to telephones, conduits, boxes, telephone cables, telephone terminal cabinets, main telephone outlet distribution cabinets and telephone outlets
- fire Detection and alarm system
- public address system
- voice alarm system
- emergency applications
- security system
- control of other systems
- testing of the installations at taking over

- shop drawings, technical literature, instruction manuals and 'as- built' drawings.
- loose equipment spares and accessories as detailed in the specification and the Bill of Quantities to be delivered into the stores of the Employer.

16-23-4 Wok not Covered by this Section

The following electrical work is not covered by this division of the specification:-

230 volts, single phase or 400 volts 3 phase, 50 Hz, AC supply as required to main incoming power terminals of each system hereafter referred to as 'LV' This supplies covered by and other section of the specification.

16-23-5 Regulations and standards

In addition to the "Regulations" all low current systems shall comply with the requirements of the Local Authority having jurisdiction and with which the Contractor shall acquaint himself.

All equipment and material supplied for the works shall be manufactured in compliance with the requirements of this specification.

16-23-6 General Design Conditions

All equipment shall be capable of normal operation for indefinite periods with variations of ± 10 per cent from the nominal 230 Vmains.

Components, relays, contacts, cables, etc. shall be designed and derated for a continues and the trouble free service under the climatic conditions of 45'C and 90 per cent relative humidity.

Each system or piece of equipment shall be the latest standard product of a single manufacturer. Should the system contain components of another manufacture these shall be of standard design and replacement and must be available locally from the system supplier.

The contractor shall ensure that the equipment is manufactured to accept the available power supply.

Working voltage above 60 volts will not be approved on low current systems.

16-23-7 Equipment Installation

All equipment shall be factory assembled, wired and tested. If subsequently the equipment is disassembled for transportation certification of the factory test by the manufacturer must be provided by the Contractor.

All installation and maintenance shall be performed by skilled personnel specialised in the particular field of the system and who are in the permanent employ of the authorised dealer or manufacturer.

All equipment shall be of modular, preferably plug-in dead front construction and shall be installed so as to cover all facilities required at the time of installation and be capable of expansion without obsoleting any equipment initially initially installed.

All power supply units for low current systems which are fed from the LV supply shall be independently fused on the live conductor and bear a front panel mains indicator light, on/off switch and standard cartridge type fuse holder.

A permanent inscription shall indicate the fuse rating. A blow fuse indicator lamp shall be fitted when the fuse is not fitted with an indicator.

All racked equipment shall be installed in free standing cabinets with lockable doors at the back for inspection and maintenance. All consoles or cabinets shall be mounted in such a way that at least one meter of free space is available behind them for this purpose unless otherwise approved by the Engineer.

Heat limits as specified by the manufacturer shall under no circumstances be exceeded and louvers and vents shall b provided were necessary as recommended by the equipment supplier.

All relays shall be mounted in units of the plug in type and positive locking devices shall be provided.

All sensitive elements and relays shall be dust proof covers and these shall be easily removable for servicing purposes.

All relays and transformers shall be designed to withstand 500 volts AC breakdown test voltage between winding and core and between winding and winding.

All electronic circuitry shall be the solid state type.

All items of solid state equipment shall under any normal conditions of operation be capable of withstanding any surges which might be produced by sudden re-establishment of mains or standby supplies after a power failure.

All solid state equipment shall be fully protected against failure of output stages due to open circuit, short circuit or mismatch.

All indicator lights other than LV pilot lamps shall be light emitting diodes.

16-23-8 Wiring

The wiring of each system shall be completely segregated from that of any other system and from LV wiring. If it is necessary to run ELV and LV wiring for a system in the same conduit the ELV wiring shall be insulted to the same standard as the LV wiring.

Wires and cables for ELV systems shall be PVC insulated and PVC sheathed, unless otherwise indicated in the corresponding system specification.

Conductors shall be copper, thoroughly tinned, of cross section as indicated in the specification or on the drawings or otherwise as recommended by the manufacturer.

Insulation of conductors shall be colored in accordance with standard established practice, so that identification is possible. Color coding shall be consistent throughout each system.

No jointing spicing or tapping of ELV system conductors is permitted in cable runs. This shall be carried out at terminal boxes, main equipment barrier strips, etc.,

Wiring connections shall be made on solderless screw type terminals of high insulating black phenolic material with non-ferrous screws and straps in easily accessible boxes to allow easy sectionalisation and checking of the system both for maintenance and repair, Conductors shall be fitted with copper sleeves or spade clips for connection to terminals.

Unless otherwise called for on the drawings the wring system shall be pulled inside PVC conduits in accordance with the requirements of sub-division 'Conduits', 'Ducts, Trunking and Related Accessories'.

All wring shall not be run near hot water pipes or boilers and shall be protected from physical damage. As far as possible wiring shall be run parallel with or shall not cross LV supply cables. Should this be impracticable a minimum clearance of 50 mm shall be given.

LV wiring shall be installed in accordance with the preceding sub-divisions, of the Electrical Installations.

16-23-9 Labelling

All controls, push buttons, switches, etc. likely to be operated by personnel in the course of their normal duties shall be permanently labelled by engraving or by means of plastic plates as described in system description Inscriptions shall be in English.

All cabinets and boxes shall bear clear external marking of their function and the areas covered.

16-23-10 Equipment Data/Shop Drawings

The equipment data to be provided by the Contractor prior to ordering any equipment covered by this section shall include but not necessarily be limited to:

Full and derailed description of the operation of the system and of all facilities provided.

List of all components comprised in the system with a schematic diagram drawn specially for the proposed installation for the words.

Manufacturers catalogues detailing all components of the system and giving technical characteristics, dimensions etc.
The Contractor's shop/construction drawings for installations covered by this sub-division

Shall include but not necessarily be limited to:

- Detailed wiring diagrams for all the system, including internal wiring of Individual components.
- Actual wiring layout and cable routing, with indication of actual positions of all outlets, boxes, devices, etc.,
- Equipment layout at central station, with elevation, plans, dimensions, indication of weights, cooling and ventilation requirements.

16-23-11 Spares

The Contractor shall supply a complete set of spares required for normal operation of the system for two years, and the cost is deemed to be included in the Tender Price, in addition to what is covered in the Bills of Quantities.

Spares shall include parts subjected to normal wear and tear during operation, and replacement parts required to be kept in stores to remedy possible breakage or failure.

The spare parts shall be as listed in the standard spare parts list of the manufacturer, or shall be accordance with the recommendations of the manufacturer for a system installed at the particular locality of the works.

The Contractor shall also submit the list of supplied spares with reference number and unit price of each item.

Each part shall be properly wrapped nd identified.

16-23-12 Telephone System

This section includes the supply installation testing and commissioning as electronic private automatic exchange box complete with MDF and operator console, the wires cover the conduits cables outlet covers and termination boxes which they have to comply with lated standards the PABX has to be fully electronic digital with stand backup battery to run the PABX for a period of not less than 8 hours in case of main power supply failure, the contractor has to submit full technical dates for the system for the Engineer's approval.

16-23-13 Fire Detection and Alarm System

General

The system and its components shall comply wit BS 5839,BS 5445,BS 5588 and BS 6266 as appropriate and shall have local Civil Defence approval. The installation shall additionally comply with the IEE Wiring Regulation (BS 7671).

It shall be possible to expand and modify systems in stages at a later date with the minimum changes and without disturbing existing modules.

The complete system shall be of the standard confessional type.

End of Section

SECTION 5

OUTDOOR LIGHTING INSTALLATION

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SECTION 5

OUTDOOR LIGHTING INSTALLATIONS

16-26 DESCRIPTION OF THE WORK

16-26-1 General

Division "I" of this specification is applicable and must be referred to where appropriate.

The work shall consist of the complete outdoor lighting installation and the corresponding LV power supply to be furnished and installed as described and specified hereinafter, on the drawings and as in the Bill of Quantities.

16-26-2 Scope of Work

without restricting the generality of the foregoing, the installation covered under this section of thee Specifications shall include the supply, delivery to site, storage, installation and putting into satisfactory operation of the following:-

- Lighting Luminaries for the out door spaces, lobbies, water features, terraces, gardens, etc
- Street and footpath lighting Luminaries with lamps, control gear, outlets, junction boxes, internal wiring and the like.
- Lighting panels for outdoor lighting of the footpaths, strrets andd landscaped areas together with all Luminaries and cabling.
- Earthing system.
- Necessary Civil Works such as foundations and making good any impaired surface or grade finish and transportation of excess earth.
- Calculations, preparation of 'shop' and 'as-built' drawings, equipment data, technical literature, instruction manuals, samples and the like.
- Labelling of all equipment.
- Spares and detailed in the Bill of Quantities to be delivered into the stores of the Employer.
- Testing of installation at handover upon completion of the work.
- Supply, installation and connection of feeder cables to panels source from the nearest power supply.
- Connection of the remote control switching cable to L.V power supply point in the main L.V room.

16-27 GENERAL CONDOTIONS AND TECHNICAL REQUIREMENTS

The relevant items of Division "II" of this Specification are applicable in the works covered by this division.

All work shall be carried out in a neat, workmanlike and efficient manner in accordance with the requirements of the specifications so that their true meaning and intent are fulfilled.

It shall be clearly understood that the specification and the drawings are complementary documents intended for the selection of equipment having the general specific characteristics as detailed in the documents.

Unless otherwise specifically stated, the installation shall be left complete, tested and ready for operation in all respects and fully integrated and co-ordinated with all other construction works.

16-27-2 General Basic Design Conditions

Unless otherwise stated, all luminaries designed for external use shall be constructed to minimum classification of IP 44 and be Class I.

The electricity to the lighting panels for outdoor landscape and footpaths etc., shall be made available at 400/230 V declared volts (unless otherwise stated in the drawings), three phase, four wire 50 Hz, with solidly earthed neutral from the LV supply point as shown on the drawings.

The lighting loads shall be evenly balanced across the three phases in accordance with the drawigns.

Unless otherwise stated, all equipment shall be designed and derated for continuous and trouble free service under 55'C maximum ambient temperature, 100 per cent relative humidity and maximum sun radiation temperature reaching 89'C, with a high content of ultra violet rays.

The equipment shall be able to withstand full load operation exposed to sun, corrosive agents, vermin and the like. Unless otherwise indicated or specified at low voltage equipment shall be of the 600/1000 volt class.

The component parts of each electrical system or piece of equipment shall be the latest standard product of a single manufacturer to provide operation and performance in accordance with the general design intent of the specification Where the use of components by different manufacturers is permitted such components must be of standard designs and dimensions and be fully interchangable.

16-27-3 Calculations

The Contractor shall submit to the Engineer for approval before ordering equipment, luminaire construction details and photometric performance characteristics certified by an approved laboratory, togther with supporting documentation of illumination levels and uniformities calculations and luminaire settings to prove compliance of the proposed installations with the Lighting Design.

16-28 INSTRUCTION MANUALS

Before the commencement of the tests on completion, the Contractor shall provide the necessary draft documents for the operation and maintenance of the complete outdoor lighting installation covered by the Contract to enable the Employer to operate, maintain, dismantle, reassemble and adjust all parts of the work.

The final documents shall be in the form of manuals of which six copies hall be supplied to the Employer by the Contractor within one month of the above tests. They shall describe the above mentioned installation and shall be divided into sections as follows:

- Single line diagram of the complete network.
- Control, protection and circuit diagrams for all equipment.
- Setting up, commissioning and operating instructions.

- Trouble shooting procedures.
- Maintenance instructions including schedules for preventive maintenance.
- Complete recommended spares list including manufacturer's name, catalogue numbers and prices.
- Name of manufacturer's local authorised representatives and service agent.

16-29 FIXTURES SCHEDULES

The Contractor's attention is drawn to the selected lighting Luminaries shown in the Legends.

The name of manufacturers stated in the above mentioned Legend are considered as representing the minimum level of standard and the Contractor must adhere to it.

Alternatives may be submitted for consideration and approval of the engineer whose decision is deemed to be binding on the Contractor and final and no claim shall be considered by the Employer for reasons such as rejection of alternatives proposed by the Contractor.

16-30 TECHNICAL SPECIFICATION OF EQUIPMNT

Refer to Landscape technical specifications.

16-30-1 Control Gear

Notwithstanding the lighting control requirements stated in Appendix number (2), the control gear shall be of the plug-in type for operation at 230 volts, 50 Hz, power factor compensated to at least 0.9 Ballasts shall be of a type specifically designed for the particular make of lamps selected. Lamps shall be able to start with at least plus or minus 10% of the voltage value and continue in normal operation with dips attaining 20% for four seconds.

Ignitor shall be of the approved type and of the same manufacturer as of the control gear.

Compensation shall be such as to ensure that there is no great increase in operating current during starting. The control gear losses shall not exceed 10% of the nominal lamp wattage. A device shall be provided for suppression of radio and television interference.

16-30-2 Constructional Requirements and Installation of Equipment

16-30-2-1 Earthing

Earthing system shall be in full compliance with the requirements of the Regulations and the specifications.

All exposed non-current carrying metallic parts of columns, panels, Luminaries, cable armour, foot and underpass lighting shall be earthed. Series earthing of one piece of equipment to another shall not be permitted
Earthing installation shall consist of:

Earthing of each column by the armour of the cable. The final column in each circuit cable run shall be connected to the earth pit as shown on the drawings.

Earthing wires shall not be less than 2.5 mm2 and connected to the earth terminal inside fuse junction boxes of coulmns or the underpass lighting fixture.

16-30-3 Testing and Labelling

16-30-3-1 Testing

Testing and inspection of the installation shall be carried out in accordance with the Regulations and Standards listed in the documents after completion of the work to prove compliance with the specification. The tests will be carried out in the presence of and to the satisfaction of the Engineer.

Manufacturer's test certification for appropriate equipment shall be handed to the Engineer prior to th site testing being carried out.

All results of the tests on site shall be recorded and signed by all witnessing parties.

Subsequently, three copies of all such documents shall be submitted to the Engineer.

Prior notice shall be given to the Engineer of proposed tests together with a list of equipment to be used. In particular the Contractor shall submit his proposals for measuring the illumination levels and for calculating the average levels as specified.

Al tests, including where applicable, insulation tests, continuity tests, effectiveness of earthing, measuring of earth electrode resistance shall be carried out under the responsibility of the Contractor.

The Contractor shall be responsible for al costs involved in testing and commissioning and shall retest at his own expense any item that fails. No repeat test shall be carried out until the cause has been established and rectification of the failure has been carried out.

The Contractor shall include the following tests to be carried out on sit.

Light panels (LCP) tests
Insulation resistant tests
Phasing out of polarity check

Operation and protection gear tests
Visual inspection – the Contractor shall include for carrying out the following
Tests in addition to those previously called for:

- Condition of equipment and quality of the workmanship
- Level, perpendicularity and alignment of the columns and luminaries
- Actual characteristics of equipment measurement of insulation resistance insulation resistance tests on the various LV circuits, shall be performed after insulation, in accordance with approved standards to determine the adequacy of insulation between phases, neutral and earth (lamps shall be removed during these tests where applicable)

Resistance tests of the earthing of all metallic frames and earthing conductor and pits.

The Contractor shall obtain approval from the Engineer after completion of all test for authorisation of connection of the Employer supply to the installation.

Also the following operational tests must be performed:

- Normal functioning of all lamps
- Operational tests on all switchgear and power equipment including recording the voltage at the terminals of each ballast on the final column in each circuit
- Performance tests after 100 hours of normal functioning.

16-30-3-2 Labelling

All items of equipment shall be adequately and clearly labelled.

Lighting columns shall be fitted with Traffolite or similar labels to give black lettering on a white background of sufficient size to be visible from a passing vehicle. These labels shall be attached to the columns by mans of stainless steel must and bolts positioned just above the access doors. The columns shall be identified in accordance with the coding and locations shown on the drawings.

All accessories ssuch as local switches, switch-fuses isolators used for the control of equipment, lighting fittings, etc. shall carry engraved identification pates to indicate the circuit number and phaes to which accessory is connected as shown on the drawings.

End of Section