

WITWATERSRAND UNIVERSITY

**MANAGEMENT CAMPUS – NORTH LODGE
REFURBISHMENT**

**WORKS INFORMATION
ELECTRICAL – LIGHTING AND SMALL POWER INSTALLATION**

A. THE WORKS

The sub-contract works shall comprise the whole of the labour and all materials necessary to engineer and form a completed installation, and such tests and commissioning as may be required to provide an effective working installation to the satisfaction of the Engineer.

The engineering and management, equipment selection, shop drawings, testing, commissioning and preparation of operating and maintenance manuals and inspections are to be executed in a systematic manner, once programmed, under the Engineer's general supervision and direction. The preparation and submission for approval shall include:

- a) Equipment selection
- b) Shop Drawings
- c) Testing and Commissioning Documentation
- d) Operating and Maintenance Manuals
- e) Inspection Reports/Checklists

B. GENERAL DESCRIPTION OF THE PROJECT

This sub-contract comprises the electrical and associated systems installation as further described in this works information.

The project comprises making safe and stripping out of identified components, refurbishment and new installation of the North Lodge building on the Wits Management Campus, Parktown.

Briefly the electrical work comprises the following:

- Making safe and stripping out identified components of the existing electrical installation.
- COC inspection and necessary remedial work to any of the remaining components of the existing installation as well as the new completed installation.

- Re-route of the existing main feeder cable to the Ground floor DB Board.
- New sleeve access for the ICT supply to the North Lodge.
- A provisional sum allowance has been included in the BOQ for this work.
- New distribution boards as per the single line diagrams
- Electrical and lighting installation refurbishment as per the drawings.
- New Lighting fitting supply and installation.
- Communications and security tray / trunking and conduit infrastructure.

C. DETAILED COMPONENT DESCRIPTION AND SPECIFICATION

i) Cable Trays

General

Cable trays and cable ladders shall be earthed and electrically continuous. They shall be steel and shall be galvanised. Manufacturer's standard accessories shall be used wherever possible. Site fabrication will only be allowed in abnormal circumstances. Cables shall be provided with continuous support.

Installation

The cable tray installation consists of:

- a) Electrical and Security / Communications reticulation cable trays in the service bulkhead within the corridors. The cable tray shall be fixed to the slab soffit at maximum 1200mm centers.
- b) Electrical and Security / Communications reticulation cable trays in passage areas with existing concrete ceilings.
The cable trays shall be suspended from the concrete ceilings on a common suspended support system from the concrete soffit at maximum 1200mm centers.

Cable tray installation shall conform to the following specific requirements:

- All cable trays shall be run at right angles to or parallel with the building grid lines.
- At any point there shall be at least 15% spare usable capacity on the cable trays.
- All cable trays shall be suitable for the mechanical load capacity of the cables.

ii) Sub Mains Low Voltage Cabling

General

Cables shall comply with the following standard specifications as appropriate.

SABS 97
SABS 150
BS 6207

All runs of cables shall be direct without straight-through joints. Any cable lengths shown are for guidance only and no allowances have been made for cutting, draw lengths, etc. Under no circumstances should these figures be used for ordering purposes.

The cabling shall be installed on cable racks fixed to the basement slab soffitt. The cabling shall be neatly strapped onto cable racks with suitable cable ties, and be supported throughout its lengths by the cable rack.

Particular care shall be taken to enable the following:

- The contractor to ensure that during cable laying operations the minimum bending radius is not exceeded.
- Any cable passing through a wall or floor must be enclosed in non-flammable material to prevent the spread of fire.
- Nylon self-locking cables straps may be used for strapping cables on trays. Care shall be taken to line up the straps installed on parallel runs of cables and to ensure that the strapping direction is the same for all cables.
- Stainless steel bandit strapping shall be used, for all external cable installations or any installation exposed to direct sunlight or water.
- All cable terminations shall be made with correctly sized mechanical glands. Straps shall be installed on all cables.

iii) Electrical Connection

The electrical supply to the Main Ground floor distribution boards is existing. The cable is however to be re-routed as measured in the BOQ.

iv) Main LV Switchboard

Not applicable.

v) Sub Distribution Boards

Supply and install new distribution boards as per the DB single line diagrams

New distribution boards

General

Construction

The distribution boards required are listed in the Bill of Quantities and shown on the drawings. They shall be constructed from sheet steel with a minimum thickness of 2mm, and be fitted with hinged doors with means of locking.

Electrical requirements

Boards shall be rated at 400 Volt, fitted with HRC fuses or circuit breakers as specified. Neutral bars shall have sufficient ways to feed all circuits as single phase without bunching cables.

Masking plates of incombustible rigid insulating materials shall be fitted to prevent accidental contact with live metal, while changing fuses or whilst wiring additional circuits.

Fuseways

Fuseways shall comprise HRC fuselinks mounted on carriers rated as shown. All spare fuseways shall be fitted with fuselinks.

Miniature Circuit Breakers

Miniature circuit breakers shall be of the single and three-pole clip-in type and shall be rated for 250 and 400 Volts respectively, and shall have a making and breaking capacity as indicated on the drawing. The breaker contacts shall be non-welding materials and the service life of the breakers shall be at least 20 000 operations both mechanically and electrically when carrying the rated load. All breakers shall be in accordance with SABS and shall have thermal magnetic trips.

Moulded Case Circuit Breakers

Molded case circuit breakers shall comply with SABS 156. Protection shall be thermal/magnetic providing an inverse characteristic for overload conditions and an instantaneous characteristic for fault conditions. Circuit breakers shall afford close excess current protection.

Ganged toggles of single-phase circuit breakers used in three-phase applications are acceptable provided that trip mechanisms are internally linked.

Isolators

The incoming isolating switch shall be of the same manufacture and frame size as the largest mould case circuit breaker in the relevant

distribution board and shall incorporate an operating handle of a different colour to those of the breakers.

Earth Leakage Units

Earth leakage protection units shall incorporate a circuit breaker providing both overcurrent and earth leakage protection.

Contactors

Contactors shall comply with BS 775 and shall have the number of poles and current ratings shown schematically and a cycle duty to suit the purpose for which they are used, or as indicated.

Operating coils for continuous duty, shall be AC operated from the single-phase supply.

Terminals shall be provided for all external connections and details of the point of supply shall be included on the labeling to facilitate isolation.

Time Switches

Time switches shall be electrically wound, mechanical escapement type with a reserve of at least three hours. The drive motor and the contacts shall be electrically separate wired to independent terminals. Each switch shall be separately housed in metal; or hard plastic case with transparent rigid plastic.

Circuit Labeling

A typewritten circuit chart is to be fixed into each distribution board giving details of the load, area served, fuse or MCB size and circuit number. This number is also

Installation

The sub distribution boards shall be located within the building as shown on the drawings.

Particular note shall be taken of the requirement for purpose made steel support brackets / pedestals to be provided for fixing the distribution boards in the combined services risers.

vi) Lighting & Small Power Installation

General

Power & Communication

The internal reticulation from the floor sub-distribution board, and the Data room to service outlet points for the electrical and associated communications and security services will consist mainly of re-using wherever possible existing cast-in / built-in conduit routes to light points, socket outlet points, power skirting etc.

Service Outlets

PASSAGES, CIRCULATION AND ABLUTION AREA

Flush mounted-switched socket outlets are provided in suitable locations for maintenance and cleaning purposes. These outlets are to be installed at 400 above finished floor levels.









OFFICES

The service outlets are to be mounted to floor level perimeter power skirting.

The perimeter power skirting shall be fed via sets of 3x25mm diameter galvanized conduit droppers from the overhead cable tray installation.

Desk mounted workstation socket outlet and data outlets shall be provided in the form of perimeter power skirting mounted outlets as indicated on the drawings.

WITS MANAGEMENT CAMPUS - North Lodge Refurbishment

SYMBOL	TYPE	DESCRIPTION/CATALOGUE	PICTURE	AREAS USED
	LIGHT SWITCH	CRABTREE CLASSIC - WHITE		All areas
	SOCKET OUTLET Single or double	CRABTREE CLASSIC - WHITE		All areas
	FLUSH FLOOR BOX SOCKET OUTLET & DATA OUTLET	CABSTRUT 3UA FLUSH FLOOR BOX		Seminar room Boardroom Reception
	POWER SKIRTING	O-LINE MULTISKIRT, MS2 - 2 COMPARTMENT POWER SKIRTING - BLACK		Offices
	POWER SKIRTING Socket outlets, isolators etc.	Power skirting mounted socket outlets, heater isolators etc.		Offices
	WALL CLUSTER SERVICE OUTLET	CABSTRUT PARTITION BOX		Offices
	OCCUPANCY SENSOR/ LIGHT SWITCH	Dual Technology sensor with manual ON-OFF control		Offices
	OCCUPANCY SENSOR Ceiling mounted			Circulation areas Offices

vii) Lighting

The existing 5amp lighting reticulation within the ceiling void is to be re-used as far as possible to supply the new 600x600 recessed lay-in light fittings.

Additional 5amp points can be installed as per the ceiling void drawing where additional plug-in points may be required.

General Illumination

The following principles will form the basis of the lighting installation.

Ceiling mounted recessed 600x600 T5 OR LED Panel lights will be used in lecture room and open area

These lights shall be recessed within the suspended 600 x 600 ceiling panels.

Emergency Lighting

Emergency lighting consists of normal luminaries and special exit signs fitted with integral battery packs and strategically located within the building. This is to prevent total darkness in the event of a mains power failure.

Control

All normal power internal lighting is locally controlled from light switches and / or Occupancy sensors.

Timer control override will control all normal internal lighting after hours.

Passages and toilets will also be motion sensor switched as part of the overall energy efficiency strategy.

Installation

Method of Mounting and Fixing

In areas non-accessible concrete slab or plastered ceilings, the light fittings shall be of the suspended surface mounted type or specially built in as indicated on the contract drawings.

The fittings shall, where possible, be secured direct to the circular conduit box installation, which shall be finished flush with the underside of the concrete slab or plastered ceiling.

In case of fluorescent light fittings, a second fixing shall be made direct to the concrete slab or ceiling support structures. Where these structures are not available a second circular conduit box shall be provided by use of a vertical conduit dropper secured to a domed conduit box fixed to the underside of the floor slab.

Lighting Circuits and Fitting Connections

Light fittings in areas non-accessible concrete slab or plastered ceiling shall be connected directly at the fitting connection provided by the manufacturer.

All light fittings in areas of accessible ceilings are to be connected to the circuit via a 5A plug top and socket.

Lighting circuits in general shall be wired by means 2,5mm² conductor drawn into trunking/conduit.

viii) Luminaires

The supply of the luminaires is covered by a P.C. Sum.

The sub-contractor shall allow in the Bill of Quantities for the installation of all luminaires

The sub-contractor shall allow for purchasing on instructions, taking delivery, storage on site and moving the fittings from storage to their required floor positions in this tender.

The exact type and manufacture of the luminaires will be advised during the construction stage.

Wits Management Campus - North Lodge

LIGHT FITTING SCHEDULE - Revision 1

SYMBOL	TYPE / DETAIL	QTY	DESCRIPTION/CATALOGUE	PICTURE	AREAS USED
A	SURFACE FLUORESCENT Lamp Type & Colour Trim/Body Colour Control Gear	8	Surface mounted fluorescent luminaire 2X 54W T5, Cool white White ECG, warm start		General store rooms Service rooms Plant rooms
AE	As type A		As type A, but c/w 1hour battery in maintained mode		Emergency
B	SURFACE LINEAR Lamp Type & Colour Trim/Body Colour Control Gear	0	Suspended Linear LED, Regent Mini-Linear 14W/M LED, Neutral -4000K, 2000mm White with opaque diffuser Integral driver		Passages
BE	As type B		As type B, but c/w 1hour battery in maintained mode		Emergency
C	SUSPENDED LINEAR LED Lamp Type & Colour Trim/Body Colour Control Gear	10	Suspended Linear LED, Regent Mini-Linear 14W/M LED, Neutral -4000K, 2400mm White with opaque diffuser Integral driver		Offices
D	SUSPENDED LINEAR LED Lamp Type & Colour Trim/Body Colour Control Gear	6	Suspended Linear LED, Regent Mini-Linear 14W/M LED, Neutral -4000K, 3000mm White with opaque diffuser Integral driver		Offices Boardroom
F	SUSPENDED LINEAR LED Lamp Type & Colour Trim/Body Colour Control Gear	1	Suspended Linear LED, Regent Mini-Linear 14W/M LED, Neutral -4000K, 5000mm White with opaque diffuser Integral driver		Seminar room
FE	Emergency	0	As type F, but c/w integral battery for 1 hour operation		
G	VAPOUR PROOF FLUORESCENT Lamp Type & Colour Trim/Body Colour Control Gear	0	Vapour proof fluorescent - LED Lamps 2x 25W LED Lamps - 4000K Grey ECG, warm start		Not Required
I	WALL BULKHEAD LIGHT Lamp Type & Colour Trim/Body Colour Control Gear	11	Wall mounted bulkhead light - Regent Giza Plateau 2X 18W PL, neutral white Black with Opal diffuser ECG		External wall lights
IE	WALL BULKHEAD LIGHT	0	As type I, but c/w integral EM battery pack for 1 hour in the maintained mode		
J1	RECESSED LED DOWN LIGHTER Lamp Type & Colour Trim/Body Colour Control Gear	35	Recessed LED down lighter, 4.5W LED - Polo Soft 4.5W LED, 4000K White Including driver		Bathrooms Offices
K	BULKHEAD LIGHT Lamp Type & Colour Trim/Body Colour Control Gear	6	Services duct bulkhead light 1x 18W PL Black with Opal diffuser ECG		Service ducts Stores
L	EXIT SIGN Lamp Type & Colour Trim/Body Colour Control Gear	0	ILLUMINATED EXIT SIGN - Cosine Developments 2W LED, CD_LED_EXIT White body, green picture and inscription Integral driver		Not Required

Aftek Consulting

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D. DRAWINGS

Description	Drawing No.
Electrical symbols	E-001
Ground floor-Electrical Layout	E-100
Ground floor-Lighting Layout	E-300
Ground floor-Security Layout	E-600
First floor –Electrical Layout	E-101
First floor-Lighting Layout	E-301
First floor-Security Layout	E-601
Second floor-Electrical Layout	E-102
Second floor-Lighting Layout	E-302
Second floor-Security Layout	E-602
Single Line Diagram for DB-G	E-700
Single Line Diagram for DB-1F	E-701
Single Line Diagram for DB-2F	E-702

E. PROGRAMME PLANNING AND CO-ORDINATION

- i) Materials shall be stored in areas allocated by the main contractor. Stored material shall be safely stacked and shall not overload floor construction.

Security and protection against damage of store materials shall remain the responsibility of the sub-contractor.

- ii) Equipment shall be installed so as to be readily accessible for operation, maintenance and repair.
- iii) The Sub-contractor shall supply and erect all brackets required for fixing cables or conduit or for supporting items of equipment. All brackets and support steelwork shall be protected against corrosion before the erection of any other equipment onto them.

The welding of brackets or supports to structural steelwork is not permitted unless specific approval has been given.

- iv) The sub contractor is to include in his works planning and costing for the necessary scaffolding/ lift equipment for working in double volume areas.

- v) Related work by others :

Main Contractor

- Making good all chasing.
- All holes in slabs and walls including holes for electrical recessed outlets. (Ceiling holes by electrical Sub-contractor).
- Fire proofing of all ducts, sleeves as required.

- All setting out points and levels.
- Marking up and provision of openings in slabs.

HVAC Sub-contractor

- All control wiring for HVAC equipment.
- Connection of HVAC unit (double pole isolators provided by electrical Sub-contractor).
- Supply of all fans including their required overload protection. Connection from isolator to protection equipment (Isolator provided by electrical Sub-contractor adjacent to fans).

Plumbing Sub-contractor

- Supply and installation of all geysers or boilers. (Isolator and connecting up to geysers by electrical Sub-contractor).

vi) Shop drawings and sample submission

Prior to the common comment of any work on site, the Sub-contractor shall provide shop drawings / samples to the following requirements:

SPECIFICATION AND DRAWINGS

Engineer's Drawings and Specifications

The drawings prepared by the Consulting Engineer show general layout of all equipment and distribution systems complete with schematic arrangements. These, together with the specification, give sufficient information to enable the Sub-contractor to estimate the cost and to determine how the system must be installed, tested, inspected, operated service and maintained.

These drawings are not dimensioned installation drawings, and cannot be used as construction/shop drawings. Location dimensions shown are only indicative of the routes and zones in which the service must be installed.

SUBMISSION

Submission for approval will consist of the following activities executed by the Sub-contractor.

The Sub-contractor shall review, stamp, date and sign to signify his approval all shop drawings and samples required by the Sub-contractor documents.

By submitting drawings and samples, the Sub-contractor represents that he has determined and verified all site measurements, site

instruction criteria, materials, catalogue numbers and similar data, or will do so, and that he has checked and co-ordinate each

Contractor's drawing and sample with the requirements of Works and of the Sub-contractors documents.

The Sub-contractor shall make any corrections required by the Architect and shall re-submit the drawings or new samples until approved.

F. SAMPLES AND MOCK-UPS

i) The following samples are to be approved prior to manufacture:

- All light fittings
- Services outlet cluster
- Cable tray & lighting track.
- Colour samples of all accessories.

ii) The following standard accessories are to be approved prior to installation:

- Light switches / Lighting control points

G. TESTING AND COMMISSIONING

Procedures shall include the following:

- Checking of all safety features of equipment by simulation and abnormal conditions.
- Setting of protective devices to stop operation of equipment at overload or abnormal conditions.
- Checking of performance of equipment and systems by simulation through the range of maximum to minimum operating conditions.

After physical completion has been reported and all defects made good, "switch-on" shall take place and the above checkout procedures shall be carried out.

H. COMPLETION OF SUB-CONTRACT WORKS

Completion of works will occur after the following procedure has been certified by the Architect as having been carried out in accordance with the specification.

- Physical completion has been reported to the Architect by the Sub-contractor, and all defects made good.
- “Switch-on” has taken place.
- Commissioning and testing has taken place as specified and test results have been witnessed (where required), recorded and approved by the Architect.
- One set of “as built” drawings, on plastic foil has been furnished to the Architect. These shall comprise the “Shop Drawings” as specified in Clause 1.03 above, embodying all equipment.
- The number of copies specified below of indexed loose leaf manuals containing complete Operating and maintenance Instructions have been furnished to the Architect.

I. MAINTENANCE

General

The Sub-contractor shall furnish free of charge all maintenance on the entire sub-contract works for a period of 12 months handover. Maintenance shall include systematic examination and adjustment of equipment at least once a month.

The Sub-contractor shall in the course of such maintenance or on call during the maintenance period, repair or replace defective parts if required, and shall use only genuine standard parts produced by manufacturer of the original part. Renewals or repairs resulting from misuse or fair wear and tear, however, shall not be made expense of the Sub-contractor.

Specified spares shall not be used during this period.

The maintenance and guarantee includes the supply and replacement of discharge lamps and ballast's, but excludes incandescent lamps.

Operating and Maintenance Manuals

The Sub-contractor shall supply three (3) comprehensively indexed Operating and Maintenance Manuals, bound in loose leaf plastic covers.

The manuals shall be arranged in two parts:

- PART I - SYSTEMS OPERATION
- PART II - EQUIPMENT

PART I - SYSTEMS OPERATION

This part. described the system in the building, their operation, trouble shooting and corrective actin, and monitoring and logging by means of text, graphics, table, flow charts, etc.

The content of this manual shall be arranged in accordance with the following main index sub-heading and meet the requirements stated for each sub-heading.

INDEX SUB-HEADING	REQUIREMENTS
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Description of the Electrical system in Buildings

Overall electrical main and Sub main distribution systems.

In the form of a master single line diagram showing how the total electrical system is:

- a) High voltage distribution
- b) main low voltage distribution
- c) Sub-distribution
- d) Emergency Power Supply

The master drawings serve as Master Index for locating detailed information on the Operation Manual.

Physical location of the electrical sub-systems and distribution systems in the buildings.

As installed drawings – A3 size B

Electrical System Operating Instructions

Normal Daily Operating Instructions

In a form of a flow diagram acting as a checklist for Operator's Manual actions and observations for each sub-system requiring manual/automatic switching.

Abnormal / Emergency Automatic / Manual Operation

In the form of a decision flow diagram showing the Actions of the operator in detail depending on the various possible sub-systems or equipment malfunctioning and/or failure.

Electrical System Trouble Shooting Instructions

a) In the form of a "complaint" / "probable cause" / "action" table for each sub-station arranged in sequence from the lowest order to most complex order.

b) Register of complaints and action taken by operator.

Electrical Systems Recording and Reporting Procedures

In the form of the standard logging and report form for each sub-system, on Which all "normal Operating conditions" are Listed against which Actual sub-system Performance must be Monitored.

PART II – EQUIPMENT

The following checklist shall be used in indexing and sequencing the manufactures information and results of final test data.

a) Descriptive Literature

- i) Catalogue cuts, brochures or shop drawings.
- ii) Dimensional drawing and “as built” drawings.
- iii) Materials of construction.
- iv) Parts Designation.

Operating Characteristics

- i) Performance tables, charts or curves and marked operating point or points.
- ii) Voltage, current and fault limitations.
- iii) Safety devises and settings.

Operating Instructions

- i) Pre-start checklist.
- ii) Switching and start-up procedure.
- iii) Inspection during operation.
- iv) Adjustment and regulation.
- v) Testing.
- vi) Detection signals.

Inspection Instructions and Procedures

- i) Normal and abnormal operating voltages, currents and fault levels.
- ii) Schedule and manner of operation.
- iii) Detection signals.

Maintenance Instructions and Procedures

- i) Schedule of routine maintenance.
- ii) Procedure.
- iii) Trouble shooting charts.

Part Lists

Spare Lists

- i) Essential spares to be stored by building owner.
- ii) Distributor spares.

Supplier Data

Maintenance and Service Contracts

J. EMPTY CONDUIT INSTALLATION

All conduits shall be provided with steel draw wires and all boxes shall be flush mounted complete with blank covers.

In general, conduits shall be steel, 25mm in diameter unless otherwise shown on the relevant drawings.

K. MAINS EARTHING AND LIGHTNING PROTECTION

The lightning protection system of the building is deemed to be existing. Repairs are required to the roof termination system. A provisional sum allowance has been allowed for this work.

The Electrical Sub-Contractor shall be responsible for all installation earthing and associated COC testing as required by SANS 101042.

L. OCCUPATIONAL HEALTH AND SAFETY

The tenderer is required to pay careful attention to the requirements of the OHS Act and to make all the necessary costing provisions to fulfil the requirements of the Act in respect of Training as well as construction safety planning, materials and resources.

The necessary allowances should be priced in the item provided in the Preliminaries and General Bill.

The successful contractor will furthermore be required to sign an acknowledgement of their responsibility in this regard upon appointment.