NEW BUILDING FOR NATIONAL NUCLEAR REGULATOR (NNR), CAPE TOWN

TENDER DOCUMENT
ELECTRICAL SUB-CONTRACT

Electrical Specification and Bill of Quantities

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SPECIFICATION

FOR

ELECTRICAL INSTALLATION

SPECIFICATION
FOR
ELECTRICAL INSTALLATION

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PART 1

PROJECT SPECIFICATION FOR ELECTRICAL INSTALLATION

SPECIFICATION

FOR THE PROVISION OF THE

ELECTRICAL SERVICES

FOR

NEW BUILDING FOR NATIONAL NUCLEAR REGULATOR (NNR), CAPE TOWN

NOVEMBER 2017

SUPPLY AND INSTALLATION OF ELECTRICAL SERVICES FOR NNR, CAPE TOWN

PROJECT SPECIFICATION FOR THE SUPPLY AND INSTALLATION OF THE ELECTRICAL SERVICES

DETAIL SPECIFICATION

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1 GENERAL

This project entails the electrical installation for new office for The National Nuclear Regulator, Cape Town..

2 SCOPE OF WORK

The scope of the electrical installation for the new installation in existing building shall comprise:

- Partial decommissioning of any existing electrical installation
- New electrical distribution board;
- Luminaire installation,
- Power distribution,
- Socket outlet installation,
- Installation of wiring ducts and wire ways,
- Labelling and nomenclature on sockets and light switches,
- Fire Detection installation,
- Access Control installation,
- Site supervision ,
- Witnessed testing,
- Production of as-built drawings ,
- Issue of a formal Certificate of Compliance for the new work, and
- 12 months maintenance and guarantee on materials and workmanship

Exclusion:

- MV and HV distribution.

3 SITE CONDITIONS

The electrical Contractor shall make arrangements with the Principal Contractor as far as safe site storage, temporary lights, water and communications on site are concerned. Cellular telephone reception is available on site.

All equipment and materials shall be designed to operate at the following ambient conditions:

Altitude above sea level:	< 150m
Lightning ground flash density:	0.1 (Ng to SANS 10313:2012)
Average ambient air temperature:	25 °C (max)
	10 °C (min)
Extreme air temperature:	41 °C (max)
	-5 °C (min)
Humidity:	47% (avg)
	70 % (max)
Corrosion:	Low
Dust:	Mild

4 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

4.1 The latest edition, including all amendments up to date of quotation of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

- The general conditions of contract shall be as dictated by the principal contract.
- The applicable SABS code of Practice for the Wiring of Premises shall be SANS 10142-1:2003 amendment 8.
- Reference to Occupational Health and Safety Act shall be taken as referring to the Occupational Health and Safety Act 85, 1993 and regulations as amended.
- Equipment used shall originate from Suppliers which have been certified in accordance with SABS ISO 9001 (ISO 9001) or SABS ISO 9002 (ISO 9002) for quality assurance. Copies of certificates of approval shall be provided by the Contractors with their quotation.

The Standard Electrical Specification shall be read in conjunction with the Project Specification

5 CONSTRUCTION PROGRAMME

The Contractor's programme shall be co-ordinated with that of the Principal Contractor. The Contractor shall take note of the accelerated construction programme.

6 QUALITY OF MATERIALS

6.1 All materials used shall be new.

6.2 Material shall be installed as per the Manufacturer's instructions.

6.3 All material shall comply with the relevant SANS specifications.

6.4 All materials shall be unconditionally guaranteed for a minimum period of 12 months.

6.5 The Contractor shall replace any materials that are found to be defective during the 12 months defects liability period. Note that this requirement includes lamp and driver replacement.

6.6 Samples of equipment offered shall be submitted for formal approval by the Engineer prior to procurement.

7 COMPETENCE OF PERSONNEL, WORKMANSHIP AND STAFF

7.1 All work shall be executed and supervised by suitably qualified staff. Only "ACCREDITED PERSONS" shall be permitted to carry out and supervise electrical work on site.

7.2 The Contractor shall at all times have an adequate number of employees available during the construction period to ensure that the electrical work does not delay the construction programme.

7.3 Full time on-site supervision by a qualified Electrician with a Wireman's licence will be required.

8 STORAGE

8.1 The Contractor shall provide adequate and safe storage for all materials. Safe storage space on the construction site can be negotiated with the Principal Contractor.

9 CO-ORDINATION OF SERVICES ON SITE

9.1 The Contractor shall be responsible for the on site co-ordination with the Principal Contractor and other Sub-contractors. The HVAC Sub-contractor will work concurrently with the electrical installation teams. Due allowance shall be made for this liaison and on-site co-ordination in the price.

10 FINISHING AND TIDYING

10.1 Progressive and systematic finishing and tidying will form an essential part of this Contract. On no account will soil, rubble, materials, equipment or unfinished operations be allowed to accumulate in such a manner as to impede the activities of Others. In the event of this occurring, the Client will have the right to withhold payment for as long as may be necessary in respect of the relevant Works in the area(s) concerned, without thereby

prejudicing the rights of Others to institute claims against the Contractor on the grounds of unnecessary obstruction.

10.2 Finishing and tidying shall therefore not be left to the end of the Contract, but shall be a continuous operation.

11 EXISTING ELECTRICAL INSTALLATION

11.1 New isolators/circuit breakers shall be installed in the existing distribution board.

12 CABLE INSTALLATION

12.1 All power cables shall have stranded copper conductors, and shall be of the 600/1 000V PVC/SWA/PVC type. Power cables shall comply with SANS 1574 Part 1; 3; 4 & 5.

12.2 All cable terminations shall be done with crimped cable lugs.

13 DISTRIBUTION BOARDS

13.1 New distribution boards shall be as installed as indicated on the drawings.

13.2 No on-site faceplate modifications (cutting) and painting will be permitted. Any modifications and painting shall be done in a factory by a reputable distribution board Manufacturer. Sheet metal work shall be measured on site and manufactured off-site. Tray or bus bar modifications will be allowed on site.

13.3 Where the Contractor deems the DB modifications too substantial for on-site modifications, disconnecting and removing of the entire DB shall be considered by the Engineer. This shall be done and approved in writing by the Engineer on a case-by-case basis.

13.4 Upon completion of the DB modifications, each DB shall be fitted with new labelling as well as an engraved DB rating plate as per SANS 0142-1 Clause 6.6.6.2.

13.5 All new circuit breakers and isolators shall be from the Manufacturer Schneider or approved equivalent.

13.6 Shop drawings shall be submitted to the Engineer for formal approval, before any manufacturing commences. Contractor shall take note of the existing electrical cupboards dimensions and DB sizes and construction type. All new DB's shall match the existing form factors employed on site.

13.7 All distribution boards shall comply with IEC 60439-1 after modification. All DB's must be inspected and accepted by the Engineer in the factory prior to dispatching to site.

13.8 The Engineer will provide the exact wording of the engraved labelling requirements during the factory inspection.

14 LIGHTING INSTALLATION

14.1 Refer to Luminaire Schedule for specifications of luminaires.

14.2 Special care needs to be exercised in transporting and handling of the new luminaires.

14.3 Light switches shall be rated at 16A, similar or approved equal to Crabtree Topaz.

15 POWER OUTLETS

15.1 All socket outlets shall be supplied and installed complete with cradles and white socket outlet metal cover plates for normal power.

15.2 Single and double socket outlets shall each be mounted in a flush-mounted horizontal 100x100x50mm wall box.

15.3 At back-to back socket outlets, galvanized 100x100x50 wall boxes pre-fitted with conduit interconnections, shall be used.

15.4 Where a socket outlet and electronic outlets is shown adjacent to each other on the drawings, preference shall be given to multi-gang wall boxes and surrounds.

15.5 Electronic outlets shall be provided by the Others. All shutters, cover plates, surrounds and wall boxes shall be provided by the Electrical Contractor.

15.6 New underscreed floor boxes shall be installed with 2x16A 3-pin SSO, 1x16A 3-pin slimline SSO, 1x16A dedicated SSO and 2xRJ45 data outlets similar or approved to O-Line.

16 WIRING

16.1 Wiring shall bear the SABS mark and shall be stranded copper or solid copper conductors to match the existing installation. UPS wiring (L&N) shall have a different sheath colour than normal power

16.2 Joints of any kind will not be permitted in wiring. No more than two single or 1 three phase circuit may be drawn into any 20mm conduit.

16.3 All conductors shall be marked by suitable cable markers indicating the circuit (e.g. L1 on both live and neutral conductors) at both ends.

Circuit	Minimum conductor (size)	
	Phase (mm²)	Earth (mm²)
Lighting power supply	2,5 or *4,0* (as stated on the single line diagram)	2,5 bare (normal supply) 4 insulated (UPS/inverter supply)
Dali dimming	1.5	-
Switched socket outlets & Isolators	4,0	2,5 bare
UPS/Inverter switched socket outlets	4,0	4,0 insulated

17 CABLE TRAYS, TRUNKING AND CONDUIT

17.1 Any damage to completed wall, partition or glass finishes will be rectified to the satisfaction of the Principal Contractor, at the Contractor's expense.

17.2 Steel ducts, where required, shall be the hot dip galvanized type complete with elbows, splice connectors, elbows, tees, etc. The sizes shall be as specified on the relevant drawings.

17.3 Surface mounted ducting shall be secured by means of 8 x 40mm "Fischer" anchors with oversize galvanized fender washers.

17.4 Ducts shall only be fitted with purpose made accessories, splices, bends etc.

17.5 All wiring ducts shall be fitted with galvanized steel or powder coated covers after cable installation.

17.6 PVC glue must be used with the indoor PVC conduit installation. Conduit shall bear the SABS mark.

17.7 Galvanized steel conduit shall be employed on external or surface installations and only where approved by the Engineer.

18 EARTHING AND BONDING

18.1 The Electrical Contractor is to ensure that the installations covered in this document are effectively earthed and bonded in accordance with the requirements of the SABS 10313.

18.2 Wire ways and trays shall be solidly bonded with 6mm nuts and bolts.

19 LABELLING OF CIRCUITS

19.1 All outlets, isolators and light switches shall be labelled with engraved labels on the cover plates. The label shall indicate the supply DB and circuit number (e.g. DB-6-L5).

19.2 Wiring inside the DB shall be Gravoplast or equal and approved alternative, labels.

19.3 All warning labels as per SANS 0142-1 shall be provided including the label regarding cascaded circuit breaker replacements.

20 SITE TESTS AND COMMISSIONING

20.1 The following minimum site tests of the new electrical installation shall be carried out by the Contractor and the results presented to the Engineer:

- Insulation resistance between all conductors and earth
- Insulation resistance between all conductors and neutral
- Insulation resistance between all 3 phase conductors (Separate tests for UPS and normal power circuits)
- Polarity of light switches
- Earth leakage protection on normal power circuits

20.2 After submission of the test results, the Contractor shall notify that the installation is complete, tested and in working order. The Client and/or the Engineer will witness the re-testing of the installation.

21 CERTIFICATE OF COMPLIANCE

21.1 All work covered under this contract, must be executed by a qualified and fully representative person. Only persons registered as an “installation electrician” will be accepted to carry out the installation work.

21.2 Following completion of the contract, the Contractor shall submit to the Engineer a Certificate of Compliance - in terms of present legislation - prior to final payment being processed.

21.3 One Certificate is required per electrical DB completed, and the Certificate shall cover the power supply, DB and all the downstream connected works of the designated distribution board. Two Certificates shall be submitted.

22 AS-BUILT DRAWINGS AND DOCUMENTATION [REQUIRED]

22.1 The Contractor shall prepare as-built drawings of his completed installation – including conduit routes.

22.2 The Contractor shall also prepare a comprehensive set of Operations and Maintenance (O+M) manuals for approval by the Engineer. The following shall be included as a minimum:

- Cover page
- Index
- Contractor contact details
- Call out procedure
- Manuals and Specifications of all the installed equipment
- Installed equipment warrantee details including supplier contact information
- Commissioning data
- Certificates of Compliance
- Operator guides and procedures
- As-built drawings

23 DEFECTS LIABILITY PERIOD

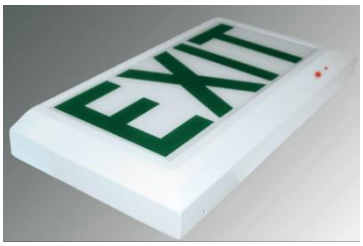
23.1 The equipment and installation supplied under this contract shall be guaranteed for a period of twelve months, or as stated, from date of acceptance by the Engineer in all respects and commissioned for continuous service. The price shall include for the above.

23.2 The defects liability will be for a period of twelve months, calculated from the date of issue of the Certificate of completion by the Engineer.

23.3 Do note that the 12 month maintenance period includes lamp replacement.

SPECIFICATION FOR ELECTRICAL INSTALLATION

SCHEDULE OF LUMINAIRES

TYPE	DESCRIPTION	IMAGES
L1	LED Recessed luminaire to fit into a standard 1200 x 600 exposed T suspended ceiling grid. Luminaire to be complete with micro linear diffuser, electronic control gear and 2.5m of 1.5mm² x 3 core flexible PVC cable (Cabtyre) with a 5 Amp, 3-pin plug top fitted on the other end. Luminaire to be equal to Province Lighting PLED-R5/WH or similar approved.	
L2	LED Surface mounted bulkhead. Luminaire to be complete with polycarbonate diffuser, integrated electronic control gear. Luminaire to be equal to Province Lighting PLED-BH2 or similar approved.	
L3	LED Surface luminaire rated IP65. Luminaire to be complete with high impact polycarbonate diffuser, electronic control gear and stainless steel clips. Luminaire to be equal to Province Lighting PLED-PF2 or similar approved.	
L4 (EXIT)	Emergency LED Signage complete with battery backup and battery charger for 5 hour emergency duration. Luminaire to be equal to Province Lighting PEM7-LED or similar approved.	
L5	Round downlight recessed LED luminaire complete with driver, high performance white optic reflector and 3m cabtyre with 5 Amp plug top. Luminaire to be equal approved to Province Lighting PLED-DS16014.7W	
L6	Adjustable downlight recessed LED luminaire complete with driver, high performance white optic reflector and 3m cabtyre with 5 Amp plug top. Luminaire to be equal approved to Province Lighting PLED-DF14 6.3W	

SPECIFICATION FOR ELECTRICAL INSTALLATION

SCHEDULE OF LUMINAIRES

L1	LED Recessed luminaire to fit into a standard 1600 x 600 exposed T suspended ceiling grid. Luminaire to be complete with micro linear diffuser, electronic control gear and 2.5m of 1.5mm² x 3 core flexible PVC cable (Cabtyre) with a 5 Amp, 3-pin plug top fitted on the other end. Luminaire to be equal to Province Lighting PLED-R5/WH or similar approved.	
SL1	Poletop mounted LED luminaire complete with 3.5m high galvanised steel pole and electronic control gear. Luminaire controlled by daylight switch. Luminaire to be equal to Beka Zela 55W or similar approved.	
SL1	LED linear strip light, rated IP65. Luminaire to be equal to Province Lighting PLED-LFHC or similar approved.	

PART 2

STANDARD SPECIFICATIONS FOR ELECTRICAL INSTALLATION

PART 2

STANDARD SPECIFICATION FOR ELECTRICAL INSTALLATIONS

GENERAL REQUIREMENTS

The following Standard Specifications shall generally apply to all the equipment and materials proposed on this Contract. However, there are specific requirements in certain sections of these documents which pertain to particular items of electrical equipment and materials. These Particular Specifications shall supersede the Standard Specifications.

E.1 SCOPE OF WORK

This contract includes the design, manufacture, supply, delivery, off-loading, installation, testing, commissioning and maintenance during the defects liability period and final handing-over in proper working order of the complete electrical installation as described in all the constituent parts of this document which shall include the following:

- All LV switchgear including distribution boards.
- All wiring, wireways and cable racks and trays.
- Lighting and small power.
- Power outlets.
- Earthing and Lightning Protection.

The services shall include for all plant and materials as specified in the specifications and bills of quantities.

E.2 ELECTRICITY SUPPLY

The Contractor shall deliver the installation in such a manner that it complies with all the requirements regarding voltage, current and frequency and with any other requirements which may be imposed by the Client.

All interruptions of the connection of the bulk electrical supply that may be necessary for the execution of the work, will be subject to prior arrangement between the electrical Contractor and the Electrical Department of City of Cape Town.

E.3 GENERAL

E.3.1 *Standard Technical Specification*

This Standard Technical Specification specifies the standard of workmanship and quality of material for the services installation further described in the Project Specification, the Drawings and Schedules, and if applicable, in the Schedules of Quantities.

This Standard Specification must be read in conjunction with the Project Specification, which qualifies and amplifies this Standard Specification. In the event of conflict, the Project Specification shall take preference over this Standard Specification.

E.3.2 *Tender Documents*

Upon receiving a tender document, the Tenderers must ensure that all pages and drawings are included. Should any page or drawing be missing, or any doubt or obscurities arise about the meaning of any section of any part of the set of documents, or should any obvious error be apparent, the Tenderers shall immediately inform the Engineer for amendment or clarification. Where a Tenderer's entry in a schedule conflicts with the document prepared by the Engineer, the Tenderer shall comply with the document prepared by the Engineer and the conflicting entry shall be invalid.

All information and prices must be submitted with the tender. No price negotiations will be entered into after submission of a tender.

Where this tender document is written in the form of instructions, such instructions are addressed to the Contractor.

E.3.3 *Definitions*

3.3.1 *"Main Contractor"*, *"Building Contractor"*, or *"Builder"* shall mean the Principal Contractor, if such exists as stated in the Project Specification.

3.3.2 *"Contractor"* shall mean the contractor or subcontractor, as applicable, appointed in terms of this document.

3.3.3 *"Contract"* shall mean the contract or subcontract as applicable in terms of this document.

3.3.4 *"Extra low voltage"* shall mean voltages of 50 V or less.

3.3.5 *"Low voltage"* shall mean voltages not exceeding 1 000 V.

3.3.6 *"Medium voltage"* shall mean voltages above 1 000 V and not exceeding 22 000V.

3.3.7 *"Isolator"* shall mean *"switch-disconnector"*.

3.3.8 *"Main Switch"* shall mean *"main disconnector"* or *"local disconnector"*, as applicable.

3.3.9 *"Supply"* shall mean purchase, procure, acquire, store off site as necessary, deliver to site and off-load, position, stack and store on site.

3.3.10 *"Install"* shall mean set out, erect, mount, align, fix, connect, adjust, test and commission and hand over in proper working order.

3.3.11 *"Provide"* shall mean supply and install.
3.3.12 *"Installation"* shall mean the services covered by this document.

3.3.13 *"Approved"* shall mean acceptable to the Employer in the sole opinion of the Engineer.

3.3.14 *"Document"* shall mean this document which may include Requirements for Tendering, Form of Tender, Conditions of Contract, Technical Specifications, Schedules, Schedules of Quantities and Drawings.

3.3.15 The use of the triple asterisk "***" is intended as a prompt for the specifier only, and does not infer an intention to cross-referencing.

E.4 COMPLIANCE WITH REGULATIONS AND STANDARDS

4.1 The services installation shall comply with the latest revisions and amendments of the following :

4.1.1 The Contractor has to operate strictly in accordance with the Occupational Health and Safety Act, 1993 (Act No 85 of 1993) and the regulations as amended in its entirety and it is expected of him to:

- Ensure the safe operation and safety of all people on site and to strive for a proper management and clean and safe site.

- Register himself and sub-contractors in terms of the Compensation for Occupational Injuries and Diseases Act (Act No 130 of 1993) and to issue a copy thereof to the Employer.

4.1.2 The Employer, his employees or any of his agents do not accept any responsibility and/or liability of any kind in terms of the clauses and/of prescriptions of the Occupational Health and Safety Act for the Works or any part thereof.

4.1.3 If the Employer or the Engineer or their representatives stop the work because it is unsafe in their opinion, the Contractor shall not have the right to any claims in this regard.

4.1.4 The Contractor is fully responsible and/or liable for any act and/or action of his employees and/or equipment that operate or that are used on site. The contractor shall liaise with the Employer if he should, for whatever reason, be unable to perform in terms of the stipulations of the said act.

4.1.5 The Contractor has to appoint in writing a capable person, which complies with the Occupational Health and Safety Act, 1993 (Act No 85 of 1993) General Safety Regulation 11.1, to act as a capable person, and a copy of such an appointment has to be delivered to the Employer. This appointed capable person has to accept the appointment in writing and it has to be clearly indicated in his letter of appointment.

4.1.6 The Electrical Contractor shall register with the Department of Labour as required by the Occupational Health and Safety Act 85/1993.

4.1.7 The South African Bureau of Standards South African National Standard, the Wiring of Premises, SANS 10142-1 and SANS 10142-2, referred to herein as the "Wiring Code" with the latest amendments.

4.1.8 The local supply authority regulations and by-laws and any regulations of the Supplier of Electricity.

4.1.9 The Local Fire Department Regulations.

4.1.10 The applicable regulations of Telkom.

4.1.11 The application of the National Building Regulations as amended.

4.1.12 The standard Regulations of any Government Department or other statutory body where applicable.

4.1.13 Protection classifications (IP) will be according to SANS 60529.

4.2 No claims for extras arising from failure of the Contractor to comply with any of the regulations and standards listed above will be considered.

4.3 Where conflict appears to exist between any of the regulations and standards listed above and the specification, refer such conflict to the Engineer in writing for his ruling.

4.4 Immediately after receipt of official appointment as Contractor, and at any time thereafter as may be necessary, the Contractor shall notify all relevant authorities, pay fees and take any other steps which may be required or prescribed to execute the contract works.

4.5 The Contractor shall copy related correspondence to Engineer who shall be kept informed at all times. This shall not, however, release the Contractor of his responsibilities.

4.6 Provide, in both official languages, notices and warning signs required by statutory or regulatory requirements.

E.5 STANDARD SPECIFICATIONS

All equipment and materials shall conform to the relevant SANS, SANS IEC, NRS, or IEC Specifications and the latest revisions thereof, where applicable. Reference shall be made to the list of normative references in SANS 10142-1.

E.6 BUILDER'S WORK

6.1 No building work i.e. building-in brickwork, concrete work, ducts, sleeves and openings, etc. is envisaged for this project.

E.7 DRAWINGS, MANUALS, LITERATURE, TUITION, SPARES AND TOOLS

7.1 The Engineers drawings covering the various sections of the installation are listed in the schedule of drawings. The working drawings of the Contract shall, however, consist of the following, where applicable:

7.1.1 The Engineer's drawings;

7.1.2 The Engineer's drawings of the other disciplines, as applicable.

7.1.3 The drawings of other services installations that is relevant for coordination and installation.

7.1.4 The installation drawings of other contractors and subcontractors where applicable.

7.2 Unless otherwise specified, three sets of the Engineer's drawings will be issued to the Contractor for construction purposes. Any further copies may be purchased from the Engineer.

7.3 The contractor shall submit four copies (or as required in the Project Specification***) of shop drawings to the Engineer for examination and to demonstrate compliance with the Contract. Shop drawings shall include drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are prepared by the Contractor, Manufacturer, Supplier or Distributor and which illustrate some portion of the work.

The Engineer's examination of shop drawings or samples shall not relieve the Contractor of responsibility for any deviation from the requirements of this Contract unless the Contractor has informed the Engineer in writing of such deviations at the time of submission of shop drawings or samples and the Engineer has given written approval for the specific deviation, nor shall the Engineer's examination relieve the Contractor of responsibility for errors or omissions in the shop drawings or samples or for responsibility for erection or installation fit.

7.4 The Contractor shall submit to the Engineer four copies (or as required in the Project Specification***) marked-up structural drawings, or other drawings, showing changes and/or additional requirements to be made in the structure in order to accommodate equipment installed under this Contract.

7.5 The Contractor will not be allowed to rely on the Engineer for as-installed information which he may have compiled, to produce record drawings.

7.6 Drawings to be entitled “Record” shall bear the signature of the Contractor, or his authorized representative, and the date.

7.7 The Contractor shall obtain from the Engineer, if available, a set of computer disks containing the Engineers' drawings, which have been drawn on a PC based CAD system for the preparation of record drawings to be provided by the Contractor. One set of paper prints of the record drawings shall be provided for verification by the Engineer. The computer disks containing the record drawings shall be provided upon completion of the contract. Otherwise the Engineer will issue a set of Engineer's drawings to the Contractor at completion of the installation. The Contractor shall mark these drawing to indicate the record of the installation.

7.8 A set of final layout and schematic record drawings shall be provided in a purpose made holder inside the door of each distribution board and motor control centre, or where no doors are fitted, to the front plate of the cabinet. The frame shall be adequately sized to receive the equivalent of two A1 size drawing folded to a nominal size of A4.

For main boards, supply schematic drawings in aluminium picture frame with Perspex and sealed rear backing suitable for mounting against the substation wall.

7.9 The Contractor shall submit to the Engineer four (or quantity as specified in the Project Specification***) manuals bound between hard covers including the following :-

(1) Dimensioned drawings of the layout of the equipment and systems.
(2) Wiring diagrams cross referred to the drawings described above, and to the Engineer's layout and schematic drawings.

(3) All Test Certificates for tests done at the factories and on the site.

(4) System and equipment descriptions.

(5) Operating instructions.
(6) Maintenance, adjustment and calibration instructions with preventive maintenance schedule and fault-finding procedures.

(7) Spare parts list with names and address of component suppliers and price list of all components and a list of recommended spare components to be kept in stock.

The Contractor shall submit two preliminary copies of the manual to the Engineer for scrutiny.

7.10 The Contractor shall provide thorough tuition of the Employer's staff in the operating and maintenance of the contract works.

7.11 When specified in the project specification*** the contractor shall allow in his price for the provision of two sets of photographs and slides to be taken on monthly basis, for the duration of the contract, of all the areas and equipment where the contractor is involved. The photographs shall be properly dated with comments e.g. access to substation not possible etc. One set of the photographs and slides shall be handed each month to the Engineers' Representative at the site meetings. These photographs may be used for the evaluation of claims.

7.12 The Contractor shall provide a complete set of tools associated with equipment offered per substation.

7.13 The installation shall not be accepted until the manuals have been approved by the Engineer and handed over to the Employer.

E.8 INSPECTION, TESTS AND COMMISSIONING

8.1 On completion of erection and installation on site the Contractor shall perform all the tests that may be required by the Engineer in his presence to ensure that the works are ready for handing over and putting into regular use.

8.2 Near completion, inspect and test the services installation in accordance with the Wiring Code, the Regulations of the Supplier of Electricity and the Occupational

Health and Safety Act 85/1993. Record test results on printed test sheets and submit to the Engineer.

8.3 Testing of the electrical installation shall be in accordance with the Project Specification, but shall include the following:

- Ensure correct polarity, phase rotation and balance load between the phases. Verify polarity and phase identification.
- Continuity and resistance of earth conductor including all bonding conductors.
- Continuity of ring circuit.
- Earth electrode resistance.
- Insulating resistance.
- Earth fault loop impedance test.
- Operation of earth leakage protection devices and circuit breakers.

8.4 After inspection and testing, timeously arrange for any inspection and test by the Supplier of Electricity if required, and assist as necessary the Inspector of the Supplier of Electricity by providing access, tools, instruments and attendance.

8.5 Replace any portion of the services installation that does not comply with the Wiring Code or the Specification. Such replacement shall be done at the Contractor's expense.

8.6 Submit a "Certificate of Compliance by an accredited person" Annexure 1 in terms of the Occupational Health and Safety Act 85/1993, Electrical Installation Regulation, to the Client and forward a copy to the Engineer.

8.7 Carry out additional special tests as required by the Engineer and provide the required test equipment.

8.8 Timeously advise the Engineer of all inspections and tests as the Engineer reserves the right to witness such inspections and tests.

8.9 Provide access, tools, instruments and attendance, to assist the Engineer who may perform verification tests at any time.

8.10 The Engineer shall have the power at any time to examine any part of the Works or materials intended for use in or on the Works either on site, or at the place of manufacture or storage.

8.11 On completion of the works, the Contractor shall submit four indexed volumes of all test certificates to the Engineer for tests done at factories and on site. (Test certificates to be included in the manuals).

8.12 The contractor shall be responsible to calculate all relay settings. The settings shall be submitted to the Engineer for approval at least 2 weeks before the commissioning of the works commences. The settings shall be substantiated by calculation sheets and graphs where applicable.

8.13 The contractor shall check that all protection relays and overload devices are properly set to protect equipment such as motors, cables and capacitors etc., before the system is energized or any motors are switched on. Where overload devices are overrated or the ranges of relays insufficient to protect equipment, the Engineer shall be informed and the equipment shall not be energized.

8.14 INSPECTIONS, TESTS AND COMMISSIONING WITH REFERENCE TO MATERIAL AND EQUIPMENT

8.14.1 Factory Tests and Inspections

The manufacturer shall perform all routine tests in the factory as described by SANS, IEC and/or BSS as well as the manufacturers own standard routine tests on all materials, equipment and auxiliary equipment. Type tests shall be performed as described in the relevant equipment specifications.

The Contractor shall submit a list of tests and inspections to be performed on the equipment for approval.

The Contractor shall perform any additional standard tests that may be required by the Engineer.

The Engineer shall indicate which tests shall be witnessed by a representative of the Employer and the Engineer.

The Contractor shall submit four copies of the test certificates with the test results of all the tests performed to the Engineer not later than the delivery date of the equipment.

8.14.2 Site Tests

On completion of erection and installation on site the contractor shall perform all the tests that may be required to ensure that the Works are ready for handing over and putting into regular use.

Contractors shall provide their own test equipment which shall be of accepted standards.

The contractor shall submit a list of tests and inspections to be performed on the equipment for approval.

The contractor shall perform any additional standard test that may be required by the Engineer.

All the tests shall be witnessed by a representative of the Employer and the Engineer.

Four copies of site test certificates shall be submitted to the Engineer within 7 days after completion of each test.

8.14.3 Arrangements for Witnessing Tests

The contractor shall make arrangements with the Engineer for tests to be witnessed.

Timeous (at least two weeks, or as specified in the Project Specification***) notice shall be given to avoid undue delays in the completion of tests.

Arrangements for tests on site shall be made only after the contractor have pre-commissioned the equipment and satisfied himself that it is in running order.

E.9 FIRE EXTINGUISHERS, FIRST AID KITS, DANGER AND INSTRUCTION SIGNS FOR SUBSTATIONS

9.1 FIRE EXTINGUISHERS

9.1.1 Unless otherwise specified, 5 kg type fire extinguishers or nearest standard sizes offered by manufacturers, shall be supplied for substation building.

9.1.2 Fire extinguishers shall be of the CO2 type or of a type approved for the fighting of fires where electrical apparatus and oil fires are involved.

9.1.3 Unless otherwise specified, fire extinguishers shall be provided as follows :

(1) High voltage switchrooms : One extinguisher per 30 m² of floor area.
(2) Low voltage rooms : One per room.
(3) Transformer rooms : One per transformer.

9.1.4 Fire extinguishers shall be mounted on suitable wall mounted brackets.

9.1.5 Fire extinguishers shall be installed next to exit doors wherever possible.

9.2 FIRST AID KITS

9.2.1 Industrial type first aid kits as supplied by St Johns Ambulance or the South African First Aid Society, shall be provided for substation buildings.

9.2.2 The first aid kit shall be housed in a suitable metal box with internal trays and a metal lid.

9.2.3 The first aid kit shall be mounted on a suitable wall mounted shelf next to the substation main exit door.

9.2.4 One first aid kit shall be provided for every substation building.

9.3 DANGER SIGNS AND NOTICES

9.3.1 All outside doors of all substations and all substation yard entrance gates shall be provided with a sign showing a lightning strike.

9.3.2 Suitable notices prohibiting unauthorized persons from entering premises shall be provided on all doors and gates of substation buildings and yards.

9.3.3 The following notices shall be provided and mounted against walls inside substation buildings:

(1) A notice prohibiting unauthorized persons from handling or interfering with electrical apparatus.

(2) A notice containing directions as to resuscitation of persons suffering from the effects of electrical shock.

(3) A notice containing directions as to procedure in case of fire.

9.3.4 One set of notices called for above shall be provided and installed for each substation building.

9.3.5. The notices shall be displayed at a prominent position inside the building.

9.3.6 The notices shall be made from suitable plastic with engraved lettering.

E200.10 NAMEBOARDS

10.1 When specified in the project specification, nameboards shall be supplied, delivered and erected by the Contractor. The Engineer will indicate the dimensions and the specification of the nameboards to the Contractor.

PART 4

TECHNICAL DATA SHEETS FOR ELECTRICAL INSTALLATION

PART 4

TECHNICAL DATA SHEETS FOR ELECTRICAL INSTALLATIONS

Contents

1. LOW VOLTAGE DISTRIBUTION BOARDS

ITEM	DESCRIPTION	PARTICULARS
1.1	**GENERAL**	
1.1.1	Manufacturer	
1.1.2	Type of construction of board	
1.1.3	In accordance with specification Yes / No	
1.2	**CIRCUIT BREAKERS**	
1.2.1	Manufacturer	
1.2.2	Type	
1.2.3	In accordance with specification Yes / No	
1.3	**ISOLATORS**	
1.3.1	Manufacturer	
1.3.2	Type	
1.3.3	In accordance with specification Yes / No	
1.4	**EARTH LEAKAGE UNITS**	
1.4.1	Manufacturer	
1.4.2	Type	
1.4.3	In accordance with specification Yes / No	
1.5	**SURGE ARRESTORS**	
1.5.1	Manufacturer	
1.5.2	Type	
1.5.3	In accordance with specification Yes / No	
1.6	**TIME SWITCHES**	
1.6.1	Manufacturer	
1.6.2	Type	
1.6.3	In accordance with specification Yes / No	
1.7	**CONTACTORS**	
1.7.1	Manufacturer	
1.7.2	Type	
1.7.3	In accordance with specification Yes / No	

1.8	**POWER METERS**	
1.8.1	Manufacturer	
1.8.2	Type	
1.8.3	In accordance with specification Yes / No	
1.9	**AMMETERS**	
1.9.1	Manufacturer	
1.9.2	Type	
1.9.3	In accordance with specification Yes / No	
1.10	**VOLTMETERS**	
1.10.1	Manufacturer	
1.10.2	Type	
1.10.3	In accordance with specification Yes / No	
1.11	**CURRENT TRANSFORMERS**	
1.11.1	Manufacturer	
1.11.2	Type	
1.11.3	In accordance with specification Yes / No	

2. LOW VOLTAGE CABLES

ITEM	DESCRIPTION	PARTICULARS
2.1	**POWER CABLES (PVCPVCSWAPVC)**	
2.1.1	Manufacturer	
2.1.2	Type of cable	
2.1.3	Rated voltage	
2.1.4	Specification to which cable is manufactured	
2.1.5	In accordance with specification Yes / No	
2.2	**EARTHING CONDUCTORS**	
2.2.1	Manufacturer	
2.2.2	Type of cable	
2.2.3	Rated voltage	
2.2.4	Specification to which cable is manufactured	
2.2.5	In accordance with specification Yes / No	

3. CABLE SUPPORT SYSTEMS

ITEM	DESCRIPTION	PARTICULARS
3.1	**CABLE LADDER**	
3.1.1	Manufacturer	
3.1.2	Type	
3.1.3	In accordance with specification Yes / No	
3.2	**CABLE TRAY (WELDED WIRE MESH)**	
3.2.1	Manufacturer	
3.2.2	Type	
3.2.3	In accordance with specification Yes / No	
3.3	**CABLE TRAY (PERFORATED)**	
3.3.1	Manufacturer	
3.3.2	Type	
3.3.3	In accordance with specification Yes / No	
3.4	**UNISTRUT**	
3.4.1	Manufacturer	
3.4.2	Type	
3.4.3	In accordance with specification Yes / No	
3.5	**POWERSKIRTING**	
3.5.1	Manufacturer	
3.5.2	Type	
3.5.3	In accordance with specification Yes / No	

4. LUMINAIRES

ITEM	DESCRIPTION	SPECIFIED
4.1	**LUMINAIRES**	
4.1.1	**Type L1**	
4.1.1.1	Manufacturer	Province Lighting
4.1.1.2	Type	As per luminaire schedule
4.1.1.3	SABS Approved	Yes
4.1.1.4	In accordance with specification Yes / No	
4.1.2	**Type L2**	
4.1.2.1	Manufacturer	Province Lighting
4.1.2.2	Type	As per luminaire schedule
4.1.2.3	SABS Approved	Yes
4.1.2.4	In accordance with specification Yes / No	
4.1.3	**Type L3**	
4.1.3.1	Manufacturer	Province Lighting
4.1.3.2	Type	As per luminaire schedule
4.1.3.3	SABS Approved	Yes
4.1.3.4	In accordance with specification Yes / No	
4.1.3	**Type L4 (Exit Sign)**	
4.1.3.1	Manufacturer	Province Lighting
4.1.3.2	Type	As per luminaire schedule
4.1.3.3	SABS Approved	Yes
4.1.3.4	In accordance with specification Yes / No	
4.1.3	**Type L5**	
4.1.3.1	Manufacturer	Province Lighting
4.1.3.2	Type	As per luminaire schedule
4.1.3.3	SABS Approved	Yes
4.1.3.4	In accordance with specification Yes / No	
4.1.3	**Type L6**	
4.1.3.1	Manufacturer	Province Lighting
4.1.3.2	Type	As per luminaire schedule
4.1.3.3	SABS Approved	Yes

4.1.3.4	In accordance with specification Yes / No	
4.1.3	**Type L7**	
4.1.3.1	Manufacturer	Province Lighting
4.1.3.2	Type	As per luminaire schedule
4.1.3.3	SABS Approved	Yes
4.1.3.4	In accordance with specification Yes / No	
4.1.3	**Type SL1**	
4.1.3.1	Manufacturer	Beka Lighting
4.1.3.2	Type	As per luminaire schedule
4.1.3.3	SABS Approved	Yes
4.1.3.4	In accordance with specification Yes / No	
4.1.3	**Type SL2**	
4.1.3.1	Manufacturer	Province Lighting
4.1.3.2	Type	As per luminaire schedule
4.1.3.3	SABS Approved	Yes
4.1.3.4	In accordance with specification Yes / No	

5. SWITCHES AND SOCKET OUTLETS

ITEM	DESCRIPTION	SPECIFIED
5.1	**LIGHT SWITCHES**	
5.1.1	Manufacturer	
5.1.2	Type	
5.1.3	Rating	16Amp, 250Volt
5.1.4	Material of cover plate	Steel
5.1.5	Colour of cover plate	White
5.1.6	SABS Approved	Yes
5.1.7	In accordance with specification Yes / No	
5.2	**SWITCH SOCKET OUTLET**	
5.3.1	Manufacturer	
5.3.2	Type	
5.3.3	Rating	16Amp, 250Volt
5.3.4	SABS Approved	Yes
5.3.5	In accordance with specification Yes / No	

PART 5

SCHEDULE OF ELECTRICAL DRAWINGS

DRAWING SCHEDULE **Rev.A**

ELECTRICAL INSTALLATION

ELECTRICAL DRAWINGS	
Lighting Layout – Ground Floor	mcw012-100
Lighting Layout – First Floor	mcw012-101
External Lighting Layout – Site plan	mcw012-102
Small Power Layout – Ground Floor	mcw012-200
Small Power Layout – First Floor	mcw012-201
Sleeve Layout – Site plan	mcw012-202
Wireway Layout – Ground Floor	mcw012-300
Wireway Layout – First Floor	mcw012-301