

INTRODUCTION

WHEREAS, the Independent Development Trust (“IDT”) made an Offer of Appointment and the Contractor has accepted such appointment subject to the conditions stipulated in the aforesaid Offer of Appointment Letter, which conditions include signing of the JBCC Agreement, Edition, (hereinafter referred to as “Main Agreement”).

AND WHEREAS, this addendum shall form part of the Main Agreement between the Employer and the Contractor.

1. ADDENDUM TO THE MAIN AGREEMENT

1.1 This Agreement will constitute an Addendum to the Main Agreement as contemplated herein;

1.2 The Terms of Reference, Accepted Proposal or Tender, Standard Conditions of Tender, Special Conditions of Tender and adjusted Priced Bills of Quantities shall form part of the agreement between the Contractor and the Employer;

1.3 This Addendum will be deemed to incorporate, with or without variation, all the provisions of the Main Agreement, unless the context clearly requires otherwise;

1.4 All words and phrases used in this Addendum which are defined in the Main Agreement, will bear the same meaning assigned to them in the Main Agreement; and

1.5 All references in the Main Agreement to “the/this Agreement” itself, will be deemed to be references also to the Main Agreement duly amended by this Addendum.

1.6 Interpretations and Definition

1.6.01 **Financial Implications** shall mean the variation amount over and above the awarded contract sum.

2. SPECIAL CONDITION

If there is any conflict between the contents or any part of this Addendum and the contents or any part of the Main Agreement and other annexures, the content of this Addendum shall prevail.

3. WAIVER OF CONTRACTOR'S LIEN

3.1 The Contractor hereby waives, in favour of the Employer, any lien or right of retention that is or may be held in respect of the Works to be executed on the Site.

3.2 The Employer, as an Organ of State, shall not be required to provide payment guarantees.

4. ASSIGNMENT OF RIGHTS OR OBLIGATIONS

4.1 Neither **party** shall assign or cede rights or obligations without the written consent of the other **party**, which consent shall not be unreasonable withheld.

4.2 Where the Contractor intend to cede any right to monies due or to become due under this agreement as security in favour of a financial institution, a written consent in accordance with clause 4.1 above, shall be obtained from the Employer prior to entering into such cession.

4.3 Any cession entered into without the necessary written consent from the either party, shall be null and void.

4.4 The Employer shall not consent to a cession of monies due or to become due under this agreement as security in favour of a financial institution, unless such financial institution submitted to the IDT a Valid Tax Clearance Certificate, is registered as a credit provider in terms of the National Credit Act and as a vendor in the IDT's Vendor Management System.

5 INTERIM PAYMENT

5.1 The **Employer** shall, in accordance with clause 8.2.3 of the treasury regulation of March 2005, pay to the **Contractor** the amount certified in an interim **payment certificate** within **thirty (30) calendar days** of the date of submission of the **payment certificate**”.

5.2 Default interest, where applicable, shall only be effective after the 30 calendar days of the date of receipt of the interim **payment certificate from the Principal Agent**.

5.3 The Employer shall be entitled to apply a set-off against a legitimate and liquid claim against the Contractor from which a valid invoice has been received.

6 TAX COMPLIANCE MEASURES

6.1 The Contractor hereby grant confirmation that SARS may, on on-going basis during the contract term, disclose the Contractor’s tax compliance status to the employer.

6.2 Should the Contractor appoint a sub-contractor to execute a portion of a work in excess of the threshold (currently 25%) prescribed by the National Treasury, the Contractor must ensure that a sub-contractor is tax compliant and remains tax compliant for the full duration of the contract. The contractor shall obtain a written consent from its sub-contractors confirming that SARS may on on-going basis during the contract term, disclose the sub-contractor’s tax compliance status to the employer.

6.3 The Contractor shall submit a valid tax clearance certificate within 10 working days from the date of expiry of the tax clearance certificate. The Employer reserve the right to demand a valid Tax Clearance Certificate prior to making any payment to the Contractor, should it become aware that the tax clearance certificate has expired.

6.4 Unless the Employer receive a written confirmation that the Contractor has challenged its tax compliance status with SARS, the Employer shall not

process any payment to the Contractor, if 30 days has lapsed since the written notice by the Employer and the Contractor has failed to remedy its tax compliance status.

- 6.5 Employer's non-payment of the Contractor's invoice in accordance with clause 6.4 above shall not absolve the contractor from performing its obligation in terms of the contract.
- 6.6 Unless the Employer receives a written confirmation that the Contractor or sub-Contractor has challenged its tax compliance status with SARS, the Employer shall be entitled to cancel the contract with the Contractor or instruct the Contractor to cancel its contract with the Sub-Contractor.
- 6.7 Where a Contractor is a JV, each party to a JV must be tax compliant and remains tax compliant for the full duration of the contract, failing which, the Employer shall invoke paragraph 6.4 or 6.6 above.

7. APPROVAL OF VARIATION ORDERS

- 7.1 Upon receipt of the Variation Order (VO), the Principal Agent must professionally consider the merits of the Variation Order and make a recommendation to the Employer.
- 7.2 The Principal Agent shall not have the power to approve any deviation or variation which has financial implications on the Employer without the necessary written approval of the Employer, except under emergency circumstances wherein failure to undertake the work may result in loss of life.
- 7.3 The Employer must communicate the approval of a Variation Order in writing to the Principal Agent and the Principal Agent shall, upon receipt of confirmation of the approval of the VO, issue the necessary Contract Instruction to the contractor to undertake the works.
- 7.4 The Contractor shall not commence with any Variation Order Works without the written approval of the Variation Order from the Employer, except under circumstances mentioned in paragraph 7.2 above.

- 7.5 Should the Contractor undertakes the Variation Order Works without the necessary written approval of the Variation Order from the Employer, the Contractor shall be entirely liable for any financial and any related implications and hereby indemnify and hold harmless the Employer from and against any and all claims, actions, damages, liabilities, injuries, costs, fees, expenses, or losses, including and without limitation, reasonable attorney's fees and costs of investigation and litigation, whatsoever which may be incurred by, or for which liability may be asserted against, the Employer arising out of the Contractor's performance or non-performance of unauthorized works, but only to the extent caused by the negligent acts, errors or omissions of the Contractor.
- 7.6 The Contractor shall not accept any instructions from any party, including beneficiary Department, other than the Principal Agent.

8. JOINT VENTURE AGREEMENT

8.1 Should the Joint Venture Agreement be dissolved or any of the JV partner pull out the JV Agreement for any reasons whatsoever, the Employer hereby reserve its right to terminate the contract with immediate effect.

8.2 Should the Employer decide not to terminate the contract upon the dissolution of the JV Agreement and the replacement JV partner does not meet the BBBEE threshold stipulated in the tender document, the IDT shall be entitled to cancel the contract with immediate effect.

8.3 Should the BBBEE status of the Joint Venture be changed to a lower rate than the bidding rate, based on legislation applicable at the closing date of the

8.4 tender, the IDT shall be entitled to cancel the contract.

9. BREACH

9.1 In the event that the contractor: -

- 9.1.1 commits an act of insolvency; or
- 9.1.2 is placed under a provisional or final winding-up or judicial management order; or
- 9.1.3 is placed under or applied for business rescue; or
- 9.1.4 makes an assignment of more than 25% of either its right and/or its obligation for the benefit of the third party without the written consent of the employer; or
- 9.1.5 the Contractor is registered or fails to renew his registration with the CIDB or changes directorship during the course of the project, resulting in the contravention of BBBEE statutory requirement; or
- 9.1.6 fails to satisfy or take steps to have set aside any judgment taken against it within 14 (Fourteen) business days after such judgment has come to its notice,

then the other Employer will be entitled to terminate the Agreement on written notice.

Signed at on this the day of202..

AS WITNESSES:

1. _____

For and on behalf of the **Employer:**
(.....), in his/her
capacity as the -----

2. _____

For and on behalf of the **Employer:**
(.....), in his/her
capacity as the _____
_____.

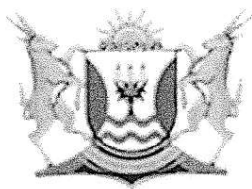
Signed at on this the day of **202...**

AS WITNESSES:

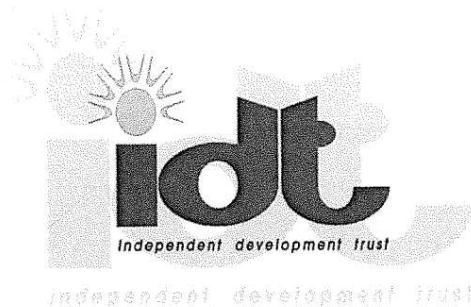
3. _____

4. _____

For and on behalf of the **Contractor:**
.....i
n his/her capacity as
.....,
who hereby confirm that he/she is
duly authorized.



Province of the
EASTERN CAPE
EDUCATION



INDEPENDENT DEVELOPMENT TRUST
BID DOCUMENT
FOR
NTSONKOTHA SENIOR SECONDARY SCHOOL

BID NO.:

PART 2 of 2 BOUND DOCUMENTS
(BOTH documents form part of returnable schedules)

CLIENT:
INDEPENDENT DEVELOPMENT TRUST
Palm Square Business Centre
Silverwood House
Bonza Bay Road
Beacon Bay
EAST LONDON

Tel: 043 711 6000

QUANTITY SURVEYOR:
ROELEVELD QUANTITY SURVEYORS CC
7 Rochester Road
Vincent
EAST LONDON

Tel: 043 721 2232

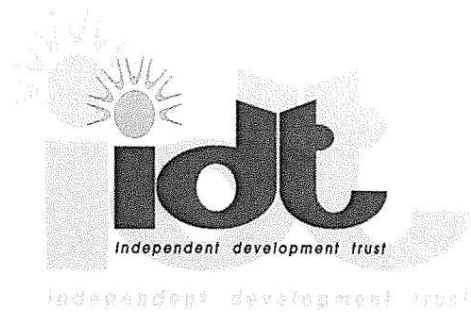
NOVEMBER 2021

NAME OF BIDDER :

CRS NO. :



Province of the
EASTERN CAPE
EDUCATION



INDEPENDENT DEVELOPMENT TRUST

BID DOCUMENT

FOR

NTSONKOTHA SENIOR SECONDARY SCHOOL

PART B – ELECTRICAL INSTALLATION

CLIENT:
INDEPENDENT DEVELOPMENT TRUST
Palm Square Business Centre
Silverwood House
Bonza Bay Road
Beacon Bay
EAST LONDON

Tel: 043 711 6000

QUANTITY SURVEYOR:
ROELEVELD QUANTITY SURVEYORS CC
7 Rochester Road
Vincent
EAST LONDON

Tel: 043 721 2232

NOVEMBER 2021

NAME OF BIDDER :

CRS NO. :

Part B is Consisting of:

- Section 1: Technical Specification**
- Section 2: Standby Generator**
- Section 3: Returnable Schedules**
- Section 4: Pricing Instructions & Bill of Quantities**
- Section 5: Tender Drawings**

Section 1 – Technical Specification

TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

CLAUSE	DESCRIPTION
1	INTRODUCTION & GENERAL
2	SCOPE OF WORK
3	SPECIFICATIONS & STANDARDS
4	SYSTEM LOW VOLTAGE
5	SCHEDULE OF MATERIALS
6	CONTRACT DRAWINGS
7	POWER CABLE SLEEVES
8	NOTICES AND FEES
9	EXISTING SERVICES
10	QUALITY OF MATERIALS
11	BALANCING OF LOAD
12	SUPERVISION
13	WORKMANSHIP
14	SUPPLY OF MATERIAL
15	SAMPLES AND DRAWINGS
16	SWITCHES AND SOCKET OUTLETS
17	LUMINAIRES AND LAMPS
18	SCHEDULE OF LIGHT FITTINGS
19	EARTHING AND BONDING
20	LIGHTNING PROTECTION SYSTEM
21	MOUNTING HEIGHTS
22	WIRING
23	WIREWAYS
24	MEASUREMENT OF QUANTITIES
25	LV DISTRIBUTION BOARDS
26	INSTALLATION GUARANTEE
27	PARTIAL COMPLETION
28	FINAL COMPLETION
29	CABLE TRENCHES
30	TENDER DRAWINGS

ELECTRICAL INSTALLATION DETAILS

1. INTRODUCTION & GENERAL

Should there be any conflict or ambiguity between sections of this enquiry, then the sections will be considered in the following order of priority:-

- Schedule of Quantities
- Detailed Specification
- Drawings

Should the Tenderer notice any inconsistencies between these sections, it is his responsibility to notify the Engineer in order to obtain clarification thereon.

2. SCOPE OF WORK

The main contract is for the construction of two new hostel blocks (Boys and Girls) and kitchen, dining hall and laundry on the site of the existing Ntsonkotha School in Lady Frere.

The underground routes service cables of electrical and telephone is not known and the as-built drawings are not available. The subcontract's responsibility will therefore include looking for the routes of existing services cables. Should the electrical or the main contractor damage any of these services they will be liable and will have to pay for any damages.

The work includes the modification work in the existing buildings.

The Work to be carried out by the Electrical Subcontractor under this Contract comprises mainly the supply and installation of the following, including commissioning:

- (i) LV cabling
- (ii) Power and telephone cable sleeves and manholes from the site boundary
- (iii) Supply and installation of 250kVA Standby Generator
- (iv) LV power and telephone distribution boards
- (v) Cable trays and wireways for lighting, power, telephone, data and security (CCTV) installation
- (vi) Installation of lighting and small power systems
- (vii) Power skirting installation
- (viii) Earthing and bonding
- (ix) Supply and installation of photo-voltaic/solar installation
- (x) Attendance to telephone, intercom (public address system), CCTV installation, intruder alarm and data cabling specialist contractors
- (xi) Performing and submission of test records and certificates
- (xii) Installation of Lightning protection system (LPS)
- (xiii) Test completed installations, issue of Certificates of Compliance for both electrical and the LPS installations
- (xiv) Produce marked as-built drawings to be submitted to the Engineer, these will be required every three months

The description of the Works listed above, is not necessarily complete and shall not limit the work to be carried out by the Electrical Subcontractor under this Contract.

3. SPECIFICATIONS & STANDARDS

The works carried out under this Contract shall be governed by the:

- (i) SANS 10142-1: Wiring Code,
- (ii) Interior Lighting Part 1: Artificial Lighting of Interiors; Part 2: Emergency Lighting – SANS 10114-1
- (iii) Protection against Lightning – Physical Damage to Structures and Life Hazard: SANS 10313: 2008 and in conjunction with the SANS 62305 series
- (iv) The Occupational Health and Safety Act, 1993 (Act 85 of 1993)

4. SYSTEM LOW VOLTAGE

The supply to all the Electrical installation shall be 400/230 Volts, 2 phase, 4 wire, 50 Hertz, Earthed Neutral.

5. SCHEDULE OF MATERIALS

In all instances where schedule of materials are attached or included on the drawings, these schedules are to be regarded as forming part of the specification.

All materials and equipment procured by the Electrical Subcontractor must be made in South Africa. Where this is not possible, the Electrical Subcontractor must provide to the Engineer or Engineer's Representative validating evidence that such material and/or equipment is not available South Africa.

6. CONTRACT DRAWINGS

Drawings must be read in conjunction with this Specification and the Bills of Quantities. Any errors, discrepancies or contradictions found between the Drawings, the Specifications and the Bills of Quantities must be brought to the attention of the Engineer immediately they become evident.

The drawings generally show the scope and extent of the proposed work and shall not be construed as showing every minute detail of the work to be executed.

The position of power points, switches and light points that may be influenced by built-in furniture and equipment must be established on site prior to these items being built in.

Drawings will be issued to site accompanied by drawing issue slips. The drawing issue register reflecting the summary of all previously issued drawings with dates and drawing revisions will be issued at site meetings once a month.

7. POWER CABLE SLEEVES

Where cables cross paved, concrete or tarred surfaces and roadways where cables enter buildings, cables shall be run in Kabelflex PVC sleeves. Any other cable sleeves will not be acceptable.

The ends of all sleeves shall be sealed with a non-hardening watertight compound after the installation of cables. All sleeves intended for future use shall likewise be sealed and provided with nylon ropes for pulling in future cables.

All sleeves shall be laid in at a minimum depth of 600mm below finished road levels. Slow bends approved by the Engineer shall be used where sleeves enter buildings.

8. NOTICES AND FEES

The Contractor shall liaise, issue all notices and make the necessary arrangements with Eskom for power connection.

The Contractor shall give all notices required and pay all necessary fees which may be due to the relevant authorities.

9. EXISTING SERVICES

The Electrical Subcontractor shall be held responsible for damage to any existing services shown on the drawings and/or brought to his attention by the relevant authorities. **The repairs to such the damaged underground services will be to the Electrical Subcontractor's account.**

To avoid damaging existing underground services and existing underground electrical cables that cannot be pointed to him, the Electrical Subcontractor shall supply and use detection equipment for the location of underground services.

10. QUALITY OF MATERIALS

Materials are to comply with the relevant South African National Standards (SANS), or to IEC specifications, where no SANS specifications exist. All materials used shall bear the SABS mark of approval as applicable.

All materials must be of South African manufacture unless this is not possible.

11. BALANCING OF LOAD

The Electrical Subcontractor is required to balance the load as equally as possible over the multiphase supply during the construction period of the Contract.

The Electrical Subcontractor is, then, to return to site at Final Completion to take current readings from all the distribution boards and balance the loads where necessary. This is

to be done with the Engineer or the Engineer's Representative in attendance.

12. SUPERVISION

The work shall, at all times for the duration of the Contract, be carried out under the supervision of a skilled and competent representative of the Electrical Subcontractor, who will be able and be authorized to receive and carry out instructions on behalf of the Electrical Subcontractor. A sufficient number of workmen shall be employed at all times to ensure satisfactory progress of the work.

13. WORKMANSHIP

All inferior work shall, on indication by the Engineer, immediately be removed and rectified by and at the expense of Electrical Subcontractor.

14. SUPPLY OF MATERIAL

The Employer reserves the right to supply material or equipment to the Electrical Subcontractor for installation. The Electrical Subcontractor must arrange for taking delivery of and providing safe storage for such materials or equipment and he/she will be held responsible for all damages to or loss of such materials or equipment while they are in his/her custody. The Electrical Subcontractor will submit the installation rate of such materials or equipment to the Engineer if not included in the priced Bills of Quantities.

15. SAMPLES AND DRAWINGS

- 15.1 The Electrical Subcontractor is required to submit for approval, comment or records, samples of materials upon which his offer is based prior to installation. Any approvals given or comments made shall be on the generality of the scheme and shall not relieve the Electrical Subcontractor of his responsibility to ensure full compliance with all performance, regulatory criteria and latent defects experienced.
- 15.2 Samples forwarded shall remain in the site stores until completion of the Works. The samples will be the last items to be embodied in the installation.
- 15.3 All expenses in connection with the supply and return of the samples shall be borne by the Electrical Subcontractor.

16. SWITCHES AND SOCKET OUTLETS (SSO)

16.1 General

Covers shall be of pressed galvanised powder coated steel of at least 1mm thickness and similar to Clipsal, Crabtree or Lesco and manufactured in accordance with SANS 1084. The Electrical Subcontractor may submit equivalent alternatives to the Engineer for approval.

Light switches and switched socket outlets plates must be provided with earth studs and all light switch boxes shall be connected to the earth conductor.

For uniformity only one make must be installed.

16.2 Light Switches

Light switches shall be of 250 Volts grade and comply with SANS 1085 as amended and bear SABS mark. Light switches shall be rated at 16 Amperes.

Switches which shall be of the single pole, rocker operated type in existing flush mounted 100mm x 50mm x 50mm galvanised boxes.

Light switches exposed to the weather must be of an approved watertight type.

Multigang switches are to be used where more than one light switch is indicated on the drawing.

16.3 Socket Outlets

Switched socket outlets shall comply with SANS 1085 as amended and be rated at 16 Amperes, 250 Volts unless otherwise specified.

Socket outlets shall be of the standard 3-pin shuttered base type and bear SABS mark.

Socket outlets indicated on walls shall be existing flush mounted 100mm x 100mm x 50mm galvanised boxes.

17. LUMINAIRES AND LAMPS

All luminaires to be supplied by the Electrical Subcontractor shall have the approval of the Principal Agent.

Luminaires must be of the type specified in the Schedule of Light Fittings.

17.1 Luminaires

The Electrical Subcontractor shall supply luminaires complete with lamps in separate boxes.

17.2 Installation

The installation and mounting of luminaires must conform to the manufacture's specification that must be obtained by the Electrical Subcontractor.

The Electrical Subcontractor is to note that in the case of board and acoustic tile ceilings i.e., as opposed to concrete slabs, close co-operation with the Principal Contractor is necessary to ensure that as far as possible luminaires are symmetrically positioned with regard to the ceiling pattern. The lay-out of the luminaires as indicated on the drawings

must be adhered to as far as possible, and where this is not possible due to partitioning, etc, the Principal Agent's decision must be sought.

Fluorescent luminaires installed against concrete ceilings shall be screwed to the outlet boxes and in addition 2 x 6mm expansion or other approved type fixing bolts are to be provided. The bolts are to be 3/4 of the length of the luminaires apart.

Fluorescent luminaires to be mounted on board ceilings shall be fixed onto wooden brander and where necessary, additional brander must be provided for this purpose. The fixing screws are to be placed 3/4 of the length of the fitting apart.

Earth conductors must be drawn in with the circuit wiring and connected to the earthing terminal of all fluorescent luminaires as well as other luminaires exposed to the weather.

Bulkhead luminaires are to be screwed directly to the concrete and brick work with approved expansion type of fixing plugs and round head screws. Against board ceilings luminaires shall be secured to the brander or joists by means of two 40mm x No. 8 round head screws.

17.3 Lamps

Lamps to be supplied with luminaires must be from manufacturers listed below. Any other similar lamps may be submitted for approval:

- Wotan, Osram, Phillips, GEC and GE

17.4 Electronic Ballasts

LED modules and drives to be supplied with luminaires must be from manufacturers listed below. Any other similar lamps may be submitted for approval:

- Tridonic
- Vossloh Schwabe
- Osram
- Phillips
- Dali

NOTE: No-name brands and brands of dubious quality and origin are not acceptable.

18. SCHEDULE OF LIGHT FITTINGS

Luminaires and accessories are to be according to this Specification and shall be approved by the Engineer. As a minimum requirement, all luminaires to be installed in this contract shall bear the SABS mark of approval including their components.

Fluorescent luminaires to have cool white for offices and warm white for public spaces.

- Type A: 32W – LED surface mount luminaire with frosted prismatic diffuser. Lascon M6V-32W-LED or equal approved; SABS approval mark.
- Type B: 46W – LED surface mount luminaire with frosted prismatic diffuser. Lascon M6V-46W-LED or equal approved; SABS approval mark.
- Type EX: Single sided LED emergency luminaire with 3 hour maintained, LED charge indication light, Class II electrical protection, integrated clip-on wall mount plate with plug-in terminal block and SABS approval mark.
- Type-R1: Surface mounted or ceiling suspended 3 hour maintained emergency LED exit sign with a Single Sided RUNNING MAN decal, LED charge indication light, Class II electrical protection, integrated clip-on wall mount plate with plug-in terminal block and SABS approval mark.
- Type-R2: Surface mounted or ceiling suspended 3 hour maintained emergency LED exit sign with a Double Sided RUNNING MAN decal, LED charge indication light, Class II electrical protection, integrated clip-on wall mount plate with plug-in terminal block and SABS approval mark.
- Type G: 46W – LED surface mount luminaire with frosted prismatic diffuser. Lascon C10-46W-LED or equal approved and SABS approval mark.
- Type M: 10W LED outdoor decorative wall mounted fluorescent bulkhead, die cast aluminium base, opal non-discolouring high impact acrylic injection moulded diffuser with eyelid, captive washers, captive Allen key screws, the diffuser must be permanently sealed to the aluminium base and must be supplied with a 300mm supply lead, mains connections must be by means of a suitable screw terminal block with a wire clamping contact, the trim ring casting is manufactured from high-pressure die-cast aluminium and is finished in a special multi-stage epoxy powder surface coating IP65 rating and SABS approval;
- Type N: 10W LED outdoor decorative wall mounted fluorescent bulkhead, die cast aluminium base, opal non-discolouring high impact acrylic injection moulded diffuser with eyelid, captive washers, captive Allen key screws, the diffuser must be permanently sealed to the aluminium base and must be supplied with a 300mm supply lead, mains connections must be by means of a suitable screw terminal block with a wire clamping contact, the trim ring casting is manufactured from high-pressure die-cast aluminium and is finished in a special multi-stage epoxy powder surface coating IP65 rating and SABS approval;

- Type S: 26W LED post top area/security/street lighting fluorescent luminaire with high pressure die cast aluminium, base and gear plate, a top cover made of ASA and a high-impact acrylic protector, glare-free light due to the highly efficient white reflector (symmetrical light distribution), M8 stainless steel and anti-corrosion treated grub screws, non-discolouring clear high impact acrylic diffuser, post anodised reflector, galvanised 4m pole, IP65 rating and SABS approval mark
- Type RL: Indoor decorative wall reading light fitting, non-discolouring high impact acrylic injection moulded diffuser, with Class A2 electronic ballasts and SABS approval mark, 1 x 10W LED lamps and SABS approval mark

19. EARTHING AND BONDING

19.1 General

Earthing shall generally be in accordance with:

- (i) SANS 10142-1: Wiring Code,
- (ii) SANS 10198: Part 3 - Earthing System; General Provision
- (iii) Part 12 - Installation of Earthing Systems
- (iv) SANS 1063: Earth Rods Couplers and Clamps
- (v) AMEU Code of Practice for the application of protective multiple earthing to low voltage distribution systems and
- (vi) The OHS Act 85 of 1993.

19.2 Trench Earthing

- (i) The trench earth shall be laid alongside and not above cables.
- (ii) All connections shall be by means of crimped lugs and bolted connections.

19.3 Earth Terminal

A readily accessible earthing terminal shall be provided, near the trap door in the ceiling, for the bonding of other services such as a telephone, an audio system, a video, and the like, to the building. Such an earthing terminal shall be bonded to the consumer's earth terminal in the main distribution board by a conductor of at least 6mm² copper or equivalent, and shall be identified by the earth symbol.

NOTE: Providers of services other than the electrical power services should not access the distribution board or other parts of the electrical installation.

20. LIGHTNING PROTECTION SYSTEM

The Electrical Subcontractor shall be responsible for the employment of an accredited specialist sub-contractor to design and install the lightning protection system (LPS). A

provisional sum has been allowed for in the Bill of Quantities for the lightning protection system. The Electrical Subcontractor will be instructed to obtain quotations from specialist LPS sub-contractors who will submit their quotation accompanied by the full analysis and design of the LPS system as directed below.

NOTE: No quotes will be considered without this full analysis and design of the LPS system.

This specialist shall conduct a full survey of the buildings to be protected in order to evaluate the type of lightning protection system to be implemented. This survey must be conducted in accordance with the latest following SANS codes of practice:

- (vii) SANS 10313: Protection against lightning – Physical damage to structures & life hazard.
- (viii) SANS 62305-1: General Principals.
- (ix) SANS 62305-2: Risk management.
- (x) SANS 62305-3: Physical damage to structures & life hazard.
- (xi) SANS 62305-4: Electrical & electronic systems within structures.
- (xii) SANS 1063: Earth rods, couplers & connections.
- (xiii) SANS 10199: The design & installation of earth electrodes.

The LPS specialist shall provide a risk analysis spread sheet to conclude the buildings classification. The risk analysis shall take into account the following criteria.

20.1 Type of structure:

- (i) Construction of walls.
- (ii) Roof construction.
- (iii) Roof covering.
- (iv) Equipment on the roof.

20.2 Contents of the structure:

- (i) Risk of panic.
- (ii) Kind of contents.
- (iii) Value of contents
- (iv) Measures for reduction of damage.

20.3 Consequential losses:

- (i) Danger to the environment.
- (ii) Loss of services to the public.
- (iii) Other consequential losses.

Based on the above results and in conjunction with location and accepted annual frequency of lightning flashes the required protection level must be established. The design methodology (protective angle, grid or rolling sphere) used for the system must be stated and it must be shown with the use of drawings that the building / structure falls within the shielding offered by the LPS.

The LPS specialist shall also provide drawings to indicate the positions of the air termination system and down conductors. Where applicable the down conductors are to be installed in down pipes. Each down conductor should be bonded to the air termination system and be terminated to a 1 200mm copper earth spike in the ground.

The issue of a Certificate of Compliance for the Lightning Protection Systems is compulsory on completion of the installation.

21. MOUNTING HEIGHTS

Unless indicated differently on drawings all boxes must be mounted as follows:
(Measurements to be taken from the finished floor level to underside of a box).

Wall switches, general	: As per existing height. New areas to match
Switched socket outlets	: As per existing height. New areas to match
Outside wall outlets for luminaires	: As per existing height. New areas to match
Stove isolators and pushbuttons	: 1 200mm
On-tap hot water dispenser isolators	: 2 000mm

22. WIRING

Lighting and Power wiring in conduit and channel wireways shall comprise 600/1000V single core PVC insulated copper wire sized in accordance with the distribution board schematics. Conductor outer sheaths shall be of the following colours:-

- Phase Conductors : red, white, blue
- Neutral : black
- Earth : green or yellow/green

Conductors shall not be drawn into conduit until the conduit installation has been completed and all conduit ends are provided with bushes, dried out and cleaned, etc.

The loop-in system shall be followed through out, and no joints of any description will be permitted. The earth wire must be continuous and can be common in the same conduit. If cut, the earth wire must be ferruled with a spigot type ferrule.

The following sizes of PVC insulated stranded copper conductors must be used:

- (i) Light fittings : 1,5mm²
- (ii) Socket outlets : 2,5mm²
- (iii) Mechanical equipment isolators : 2,5mm²
- (iv) Solar water heaters isolators : 2,5mm²

Bare copper earth continuity conductor must be drawn into wireways with the "live" conductors and connected to the earth pin of the socket outlet and earth terminal block

at the respective Switch Board.

23. WIREWAYS

23.1 Wiring Channels

Wiring channels, wherever indicated on the drawings, shall be medium duty of Cabstrut, Cooper B-Line or similar manufacture and shall be complete with corner pieces, end pieces, junction pieces, supply conduits and cover plates as specified and indicated on the drawings. Note that Nylon or plastic nuts or fasteners will not be accepted.

The channels shall be manufactured of rolled sheet steel and hot-dip galvanised to SANS 763.

Channels shall be cold galvanised at all joints, sections that have been cut and at places where the galvanising has been damaged.

23.2 Conduit and Conduit Accessories

Unless indicated differently on the drawings conduit and conduit accessories shall be PVC to SANS 950.

Draw-boxes and bonding trays are to be provided in accordance with the "Wiring Code" and wherever necessary to facilitate easy wiring. Draw boxes are not measured separately in the Bill of Quantities. The Electrical Subcontractor must therefore include the cost of draw boxes and bonding trays in the conduit rates

23.2.1 Installation

A maximum of 2 plug circuits or 3 light circuits per 20mm diameter conduits will be permitted. Therefore, before conduit installation care must be taken to work out from the construction drawings the number of circuits required in any section.

24. MEASUREMENT OF QUANTITIES

For construction and installations, the Electrical Subcontractor shall take quantities from the latest available revised construction drawings and physically measure cable routes on site before ordering.

Quantities in the Bills of Quantities must not be used for ordering.

25. LV DISTRIBUTION BOARDS

Distribution boards must be manufactured and wired by a specialist distribution board manufacturer who is a member of the Electrical Contractor Association. Readymade boards purchased from hardware shops and wholesalers and wired by the contractor are not acceptable.

25.1 Distribution Boards Layout

- (i) The layout shall be such that three phase and single phase sections are mechanically and electrically separated.
- Single phase sections of three phase boards shall be arranged in three horizontal parallel rows, directly above on another and in the phase sequence L1 - L2 - L3 from top to bottom.
- (ii) Lighting and power circuits shall be separated by a dummy space and along the horizontal rows. Extra space for future circuits shall be allowed for at the right hand side of each lighting and power row, in the ratio of one spare space for each four lighting or power circuit installed (25%). A minimum of one space shall be allowed to each lighting and power row. Dummy covers are to be provided over spare spaces. Similar provision for future circuits shall be made on the bus-bars, neutral and earth bars.
- (iii) Any part of the distribution board metal work shall be electrically continuous and a suitable stud shall be provided for the earthing of the enclosure.
- (iv) An earth bar must be provided in the bottom of the distribution boards for the connection of earth conductors for other services.

25.2 Marking and Labelling

- (i) The distribution boards shall be fitted with identification labels engraved with the reference logos indicated on the wiring diagrams. The labels shall be affixed to the front of the panels or in a similar prominent position, by drive screws or other approved method.

DB's label shall indicate the following information:

- DB name eg, "SDB-G"
- Where it is fed from and the cable and earthwire sizes e.g., "Fed from MBD-G with 35mm² 4-core SWA ECC cable"

- (ii) Each individual item of equipment installed in the panels shall be identified by a label engraved with the corresponding diagram reference.

Note: Self-adhesive tape labels, such as Brother™ labelling machines will not be considered suitable for this purpose.

- (iii) Each wiring termination of contactors, timers, shunt trip coils, etc shall be fitted with a concentric wire marker marked with unique numbers and indicated on the DB as-built schematic diagram. Clip-on and stick-on cable markers will not be considered suitable for this purpose.
- (iv) Where an outgoing terminal block is provided, each individual terminal shall be marked with unique numbers and indicated on the DB as-built schematic diagram.
- (v) Purpose made labels shall describe the various sections or functions of the panels, to facilitate the identification of the equipment and relate it to the

diagrams.

25.3 Drawing Pocket

Each distribution board must be provided with A4 size pockets, fixed on the inside of doors to store two A1 size drawings which will be folded into A4 size.

25.4 Equipment

Unless otherwise stated on the drawings, the following minimum specification shall be assumed for equipment to be installed in the panels:-

Moulded Case Breakers (MCB)	SABS Class 15 kA
Miniature Circuit Breaker (mccb)	SABS Class 6 kA

25.5 Shop Drawings

Prior to manufacture the Electrical Contractor will be required to submit to the Engineer for approval, factory shop drawings for each distribution board. No request for relaxation of this requirement shall be entertained. The drawings must, at least, indicate the following information:

- Outside distribution dimensions,
- Notes giving detailed description of components and equipment in each board,
- General arrangement of installed equipment,
- Schematic wiring diagrams with fault levels,
- List of equipment to be installed; details to include rating, make and type number,
- Distribution board labels,
- Circuit breaker and isolator label names, as per schematic diagram,
- Project name,
- Drawings number,
- Size of legend card slot.

25.6 Steel Cages

All external distribution boards shall have lockable hot dipped galvanised steel cages. These shall be 1000mm x 800mm x 300mm(D) and shall be painted (colour to be decided by the architect).

26. INSTALLATION GUARANTEE

The whole installation shall be guaranteed for the period stated in Contractor Data from the date of Practical Completion.

25 PRATICAL COMPLETION

Practical completion shall take place only after the whole installation has been accepted by the Engineer and;

- (a) All damage that may have been done by the Electrical Contractor or other parties in the process of the installation has been repaired and made good
- (b) All tests of the general building's electrical installation has been done and tests results have been submitted to the Engineer,
- (c) The completed Certificate of Compliance for Electrical installation have been submitted to the Engineer,
- (d) The completed Certificate of Compliance for Lightning Protection System installation have been submitted to the Engineer,
- (e) All equipment guarantees, if any, have been submitted to the Engineer,
- (f) Correct As-Built drawings have been submitted and accepted by the Engineer,
- (g) The building has been cleared of all debris and electrical waste materials and left in a neat and tidy condition,
- (h) All three phases have been balanced and witnessed by the Engineer. This may require the Electrical Contractor to return to site when the building is occupied to take current measurements and rebalance phases.

26 FINAL COMPLETION

Final Completion shall be taken on expiration of the maintenance period which is stated in the Contract Data calculated from the date of taking the Practical Completion.

The final payment will not be approved without the submission of all the above information under 26 and accepted by the Engineer.

27 CABLE TRENCHES

Prior to payment of final retention monies, all cable trenches shall be checked for settling and repaired as necessary.

28 TENDER DRAWINGS

The following tender drawings are attached to this document

1312-T-E-100	Site Plan: Electrical Services Sleeve & Cable Reticulation	A3
1312-T-E-100L	Site Plan: Area Lighting	A3
1312-T-E-101	Dormitory Block (Girls): Lighting Layout	A3
1312-T-E-102	Dormitory Block (Girls): Power Layout	A3
1312-T-E-103	Dormitory Block (Boys): Lighting Layout	A3
1312-T-E-104	Dormitory Block (Boys): Power Layout	A3
1312-T-E-105	Kitchen and Dining Hall: Lighting Layout	A3
1312-T-E-106	Kitchen and Dining Hall: Power Layout	A3
1312-T-E-107	Service Buildings and Workshop: Lighting Layout	A3
1312-T-E-108	Service Buildings and Workshop: Power Layout	A3
1312-T-E-109	Dormitory Block: Lightning Protection Layout	A3
1312-T-E-110	Service Buildings and Workshop: Lightning Protection Layout	A3
1312-T-E-111	Dormitory Block (Girls): Trunking and Wireways Layout	A3
1312-T-E-112	Dormitory Block (Boys): Trunking and Wireways Layout	A3
1312-T-E-113	Kitchen and Dining Hall: Trunking and Wireways Layout	A3
1312-T-E-300	Single Line Diagram: Power Reticulation Block Diagram	A3
1312-T-E-301	Single Line Diagrams: DB-S	A3
1312-T-E-302	Single Line Diagrams: MDB-B1, DB-B1/1 & DB-B1/2	A3
1312-T-E-303	Single Line Diagrams: MDB-B2, DB-B2/1 & DB-B2/2	A3
1312-T-E-304	Single Line Diagrams: MDB-G1, DB-G1/1 & DB-G1/2	A3
1312-T-E-305	Single Line Diagrams: MDB-G2, DB-G2/1 & DB-G2/3	A3
1312-T-E-306	Single Line Diagrams: DB-K, DB-L & DB-H	A3
1312-T-E-307	Single Line Diagrams: EDK-1, EDK-2, EDK-3 & DB-W	A3

Section 2 – Standby Generator

SPECIFICATION - STANDBY GENERATOR

Contents

1.0	GENERAL.....	1
2.0	SITE CONDITIONS	1
3.0	OUTPUT AND VOLTAGE	1
4.0	CONSTRUCTION.....	1
5.0	OPERATION.....	2
6.0	ENGINE	2
6.1	GENERAL.....	2
6.2	RATING	2
6.3	DERATING	3
6.4	STARTING AND STOPPING	3
6.5	STARTER BATTERY	3
6.6	COOLING	3
6.7	LUBRICATION.....	3
6.8	FUEL PUMP	4
6.9	FUEL TANK.....	4
6.10	GOVERNOR.....	4
6.11	FLYWHEEL	4
6.12	EXHAUST SILENCER.....	4
6.13	ACCESSORIES.....	4
7.0	ALTERNATOR.....	4
7.1	REGULATION	5
7.2	PERFORMANCE.....	5
7.3	COUPLING	5
8.0	SWITCHBOARD	5
8.1	CONSTRUCTION.....	5
8.2	PROTECTION AND ALARM DEVICES	6
8.3	GENERATOR CONTROLLER	7
8.3.1	Design.....	7
8.3.2	Communication Interface.....	7
8.3.3	Control Selector	8
8.3.4	Protections, Alarm and Status Indications.....	8
8.3.5	Functions	8
8.4	MANUAL STARTING.....	10
8.5	BATTERY CHARGING EQUIPMENT	10

8.6	SWITCHBOARD DISPLAYS	11
8.7	MARKINGS.....	11
8.8	EARTHING	11
8.9	OPERATIONAL SELECTOR SWITCH	11
8.10	AUTOMATIC CHANGE-OVER SYSTEM.....	11
8.10.1	Generator set Controller in AUTO mode:	11
8.11	START DELAY	12
8.12	STOP DELAY	12
9.0	PLANT AND EQUIPMENT GUARANTEES	12
10.0	FIRST 12 MONTHS MAINTENANCE PERIOD.....	12
11.0	TESTS	14
12.0	SPARES, MANUALS AND RECORD DRAWINGS	14
13.0	ENCLOSURE / CANOPY	14
13.1	GENERAL.....	14
13.2	DESIGN	15
13.3	ROOF.....	15
13.4	LIGHT FITTINGS.....	15
13.5	PROVISIONS AND STORAGE	15
13.6	POWER POINT	15
13.7	NOTICES	15
14.0	SCHEDULE SCHEDULES OF GENERATOR TECHNICAL INFORMATION	17

1.0 GENERAL

This specification covers the supply, delivery, installation on site and commissioning of a **250kVA** outdoor sound attenuated diesel powered standby generator including a fuel tank to run the generator for **12 hours**.

Full particulars, performance curves and illustrations of the equipment offered, must be submitted with the quotation.

The generator set must be prime painted then finished with two coats of enamel paint.

The schedule of information which is attached to this Specification must be completed and submitted with the quotation.

This tender shall include 2 sets of SABS approved ear muffs.

NB: *All engine, alternator and control panel parts must be readily available in South Africa. A letter confirming this must be submitted with the tender.*

2.0 SITE CONDITIONS

- Location : Ntsonkotha School, Lady Frere
- Latitude : 31°41'49.50" S
- Longitude : 27°1'58.44" E
- Maximum High temperature : 34 C db
- Minimum Low temperature : 0 C db

3.0 OUTPUT AND VOLTAGE

The standby generator shall be able to accept a 60% the emergency step load in 10 seconds after being starting. The remaining 40% must be accepted 5 seconds later, i.e. 100% load shall be accepted within 15 seconds.

The set shall have an output as follows

- (a) No load voltage : 400/230 Volt
- (b) Frequency : 50Hz
- (c) Fault Level : 25kA

4.0 CONSTRUCTION

The engine and alternator of the set shall be built together on a hot dip galvanised sled base framework on anti-vibration mountings. A 2000 litre double skin diesel tank must be built below generator engine if possible to minimize the space. A drip tray must be fitted under the engine or diesel tank if attached to the engine. The tray must be large enough to catch a drip from any part of the diesel tank and must be removable.

5.0 **OPERATION**

The set shall be fully automatic.

It must disconnect the mains power supply and start in case of any one or more of the following conditions occur;

- (a) Any of the three mains power supply phases fails
- (b) Any of the three mains power supply phases drifts outside set voltage tolerances
- (c) The mains power supply frequency drifts outside set frequency tolerances

In addition it shall be possible to manually start and stop the set by means of push buttons on the switchboard.

The automatic control shall make provision for three consecutive starting attempts. Thereafter the set must be switched off, and the start failure relay on the switchboard must give a visible and audible indication of the fault.

To prevent the alternator being electrically connected to the mains supply when the mains supply is on and vice versa, a safe and fail proof system of suitable interlocked contactors shall be supplied and fitted to the changeover switchboard.

6.0 **ENGINE**

6.1 GENERAL

The engine must comply with the requirements laid down in BS 5514 and must be of the atomised injection, compression ignition type, running at a speed not exceeding 1500 r.p.m. The engine must be amply rated for the required electrical output of the set, when running under the site conditions. The starting period for either manual or automatic switching-on until the taking over by the generator set, in one step, of a load equal to the specified site electrical output, shall not exceed 15 seconds. This must be guaranteed by the Tenderer.

Curves furnished by the engine makers, showing the output of the engine offered against the speed, for both intermittent and continuous operation as well as fuel consumption curves when the engine is used for electric generation, must be submitted with the Tender.

Only the following engines are acceptable:

- Caterpillar
- Volvo
- Perkins
- Cummings
- Mitsubishi

6.2 RATING

The set shall be capable of delivering the specified output continuously under the site conditions, without overheating.

6.3 DERATING

The derating of the engine for site conditions shall be strictly in accordance with BS5514 of 1997 as amended to date. Any other methods of derating must have the approval of the Employer and must be motivated in detail. Such derating must be guaranteed in writing and proved on site tests.

Therefore the engine capacity will be determined by the requirement to output 250kVA from the alternator for specified site conditions.

6.4 STARTING AND STOPPING

The engine shall be fitted with an electric starter motor and be easily started from cold, without the use of any special ignition devices, under summer as well as winter conditions.

Tenderers must state what arrangements are provided to ensure easy starting in cold weather. Full details of this equipment must be submitted. In the case of water-cooled engines, any electrical heaters shall be thermostatically controlled. The electrical circuit for such heaters shall be taken from the control panel, and must be protected by a suitable circuit breaker.

6.5 STARTER BATTERY

The set must be supplied with a fully charged battery similar to DELCO. The battery must have sufficient capacity to provide the starting torque stipulated by the engine makers. The battery capacity shall be capable of providing three consecutive start attempts from cold and thereafter a fourth attempt under manual control of not less than 20 seconds duration each. The battery must be of the heavy-duty "low maintenance" type, housed in a suitable battery box and guaranteed for 24 months.

6.6 COOLING

The engine may be either air-cooled or water-cooled. In the case of water-cooling, a built-on heavy duty, tropical type pressurized radiator must be fitted.

For either method of cooling, protection must be provided against running at excessive temperatures. The operation of this protective device must give a visual and audible indication on the switchboard. Water-cooled engines shall in addition be fitted with a low water cut-out switch, installed in the radiator to switch the set off in the event of a loss of coolant. The protection shall operate in the same way as the other cut-out switches (e.g. low oil pressure). All air ducts for the cooling of the engine are to be allowed for. The air shall not re-circulate in the enclosure and an air duct shall be supplied from the cooling fan cowling/radiator face to the air outlet louvers in enclosure wall / attenuator.

6.7 LUBRICATION

Lubrication of the main bearings and other important moving parts shall be by forced feed system. An automatic low oil pressure cut-out must be fitted, operating the stop solenoid on the engine and giving a visible and audible indication on the switchboard.

6.8 FUEL PUMP

The fuel injection equipment must be suitable for operation with the commercial brands of diesel fuel normally available in South Africa.

6.9 FUEL TANK

A fuel tank shall have sufficient capacity for a generator set to run the engine of full load for a minimum period of 12 hours.

6.10 GOVERNOR

The speed of the engine shall be controlled by a governor in accordance with class A2 of BS 5514 of 1977 if not otherwise specified.

The permanent speed variation between no load and full load shall not exceed 4.5% of the nominal engine speed and the temporary speed variation shall not exceed 10%. External facilities must be provided on the engine; to adjust the nominal speed setting by $\pm 5\%$ at all loads between zero and rated load.

6.11 FLYWHEEL

A suitable flywheel must be fitted, so that lights fed from the set will be free from any visible flicker.

A cyclic irregularity of the set must be within the limit laid down in BS 5514 of 1977.

6.12 EXHAUST SILENCER

It is essential to keep the noise level as low as possible. An effective exhaust silencing system of a super residential type must be provided.

The exhaust pipe shall be installed in such a way that the expelled exhaust fumes will not cause discomfort to the public. The exhaust pipe must be flexibly connected to the engine to take up vibrations transmitted from the engine, which may cause breakage. The exhaust piping and silencer shall be lagged to reduce the heat and noise transmission into the enclosure and shall be protected against the ingress of driving rain at 45° to the horizontal.

6.13 ACCESSORIES

The engine must be supplied complete with all accessories, air and oil filters, 3 instruction manuals, spare parts lists, the first fill of lubricating oils, etc.

7.0 ALTERNATOR

The alternator shall be of the self-excited brush less type, with enclosed ventilated drip-proof housing and must be capable of supplying the specified output continuously with a temperature rise not exceeding the limits laid down in BS 5000 for rotor and stator windings.

The alternator shall be capable of delivering an output of 110% of the specified output, for one hour in any period of 12 hours consecutive running.

Both windings must be fully impregnated for tropical climate and must have oil resisting finishing varnish.

7.1 REGULATION

The alternator must preferably be self-regulated without the utilization of solid-state elements. The inherent voltage regulation must not exceed plus or minus 5% of the nominal voltage specified, at all loads with the power factor between unity and 0,8 lagging and within the driving speed variations of 4,5% between no-load and full load.

7.2 PERFORMANCE

The excitation system shall be designed to promote rapid voltage recovery following the sudden application of the full load. The voltage shall recover to within 5% of the steady state within 300 milliseconds following the application of full load and the transient voltage dip shall not exceed 18%.

7.3 COUPLING

The engine and alternator must be directly coupled by means of a high quality flexible coupling, of equal quality and performance to the "HOLSET" type.

8.0 SWITCHBOARD

A free standing automatic mains fail panel incorporate all the standard equipment for the control and protection of the generating set and battery charging must be positioned directly behind the set.

The motorised automatic change-over switch must be accommodated inside the mains fail panel.

The switchboard must conform to the specification as set out in the following paragraphs.

8.1 CONSTRUCTION

The switchboard shall be a totally enclosed, and mounted inside the generator enclosure.

All equipment, connections and terminals shall be easily accessible from the front. The front panels may be either hinged or removable and fixed with studs and chromium-plated cap nuts. Self-tapping screws shall not be used in the construction of the board.

All push buttons, pilot lights, control switches, instrument and control fuses, shall be mounted on hinged panels with control wires in flexible looms.

The steelwork of the boards must be thoroughly de-rusted, primed with zinc chromate and finished with two coats of signal red quality enamel, or a baked powder epoxy coating.

Suitably rated terminals must be provided for all main circuits and the control and protection circuits. Where cable lugs are used, these shall be crimped onto the

cable stands. Screw terminals shall be of the type to prevent spreading of cable strands. All terminals shall be clearly marked.

For the control wiring, each wire shall be fitted with a cable or wire marker of approved type and numbering of these markers must be shown on the wiring diagram of the switchboards. Control wiring shall be run in PVC trunking as far as possible. The trunking shall be properly fixed to the switchboard steelwork. Adhesives shall not be acceptable for the fixing of trunking or wire looms to the steelwork.

The automatic control and protection equipment shall be mounted on a separate easily replaceable small panel with printed circuits. The equipment shall mainly be the "solid state" type. After mounting the equipment on the panel, the rear of this panel shall be sealed with epoxy-resin. However, other proven control systems may also be considered, but must be described in detail.

All equipment on the switchboard, such as Subcontractor s, isolators, busbars, etc., shall have ample current carrying capacity to handle at least 110% of the full load alternator current specified.

8.2 PROTECTION AND ALARM DEVICES

A switchboard shall be equipped with protection and alarm devices as described below.

A circuit breaker and an adjustable current limiting protection relay must be installed, for protection of the alternator. The protection relay shall be of the type with inverse time characteristics.

Protection must be provided for overload, high engine temperature, low lubricating oil pressure, over speed, start-failure and low water level.

Individual relays with reset pushes are required, to give a visible signal and stop the engine when any of the protective devices operate. In the case of manual operation of a standby set, it shall not be possible to restart the engine by pushing the re-set.

The indicators and re-set push-buttons must be marked in English only.

"OVERLOAD"	"TEMPERATURE HIGH"	"OIL PRESSURE LOW"
"OVERSPEED"	"START FAILURE"	"LOW WATER LEVEL"

In addition two relays with reset push-buttons must be fitted giving an audible and visible signal, when:

- a) The fuel level in the service tank is low. The reset push button of this relay must be marked "FUEL LOW".

In addition, an extra low-level fuel sensor must be provided. At this level the engine must stop to prevent air entering the fuel system.

- b) The battery charger failed. The reset push-button of this relay must be marked "CHARGER FAIL".

All relays must operate an alarm hooter. A push-button must be installed in the hooter circuit to stop the audible signal, but the fault indicating light on the control panel must remain lit until the fault has been rectified. An on/off switch is not

acceptable. After the hooter has been stopped, it must be reset automatically, ready for a further alarm.

The hooter must be of the continuous duty and low consumption type. Both hooter and protection circuits must operate from the battery.

Potential free contacts from the alarm relay must be brought down to terminals for remote indication of alarm conditions.

A test push-button must be provided to test all indicator lamps.

8.3 GENERATOR CONTROLLER

8.3.1 Design

- (a) The controller shall be similar or equal to the Deepsea or Lovato RGAM42 modular generator controller. No other controllers shall be acceptable.
- (b) The controller shall be manufactured with all its functions and supplied in one box with plug in termination blocks for easy installation and replacement.
- (c) The control circuit shall be designed by using fully approved electronic programmable logic controllers. Preference will be given to local manufactured programmed control circuits.
- (d) The controller shall be equipped with a GSM cellphone-type modem. This modem shall allow remote access to the Genset Controller where the status of the plant can be remotely monitored via the cellphone network and an IBM-compatible computer equipped with a telephone modem and the necessary Lovato software. The system must also be programmed to output various status and alarm conditions by means of SMS messages to any number of designated cell phones.

8.3.2 Communication Interface

- (a) The controller will have a standard RS 232/485 or Ethernet interface suitable for TCP I/P transport medium.
- (b) All communication including configuration management shall be done through this port. The use of external program adaptors etc. will not be acceptable.
- (c) The controller shall incorporate the following functions:
 - (i) Mains sensing
 - (ii) Alternator output-voltage sensing
 - (iii) Alternator over-frequency sensing
 - (iv) Control of processor unit (self-diagnostics)
 - (v) Alarms/Status indications.
 - (vi) Control selector and operation

8.3.3 Control Selector

A 4-position control-selector on the controller shall be provided to facilitate the following modes of operation:

- OFF** : Generator switched off
- MANUAL** : Mains bypassed: Generator shall not take load
- AUTO** : Generator takes load on mains failure
- TEST** : Generator takes load on mains failure

8.3.4 Protections, Alarm and Status Indications

- (a) Provision shall be made for an acoustic as well as visual alarm device.
- (b) A red flashing beacon (electronic strobe light) shall be installed on the outside of the generator set enclosure.
- (c) This alarm device/s shall be powered from the plant's 12V starter battery.
- (d) The audible alarm shall be a low-powered electronic device, in order to prevent the starter battery from being discharged when an alarm condition has been activated.

The audible alarm shall be muted automatically after 120 seconds, but the flashing beacon (electronic strobe light) shall remain activated until the RESET function has been operated at the Genset Controller.

- (e) The "common" alarm function shall be activated when any alarm condition is activated.
- (f) Alarm status indications shall be provided on the Genset Controller. The controller shall contain a HELP menu included in the software, which will provide basic guidance in the event of any monitored alarm functions being activated.
- (g) The Genset Controller documentation shall to be provided with the generator set.

8.3.5 Functions

- (a) At least the following front Panel Indicators shall be provided

Condition	Alarm	Shutdown
High Temperature	√	√
Low Oil Pressure	√	√
Overspeed	√	√
Underspeed	√	√
Manual/Test Mode		
Heater Fault	√	
Low Fuel	√	

No Fuel	√	√
Low Water	√	√
<u>Condition</u>	<u>Alarm</u>	<u>Shutdown</u>
Modem Remote Start		
Start Fail	√	√
Manual Start		
Emergency Stop	√	√
Mains Phase Rotation Fault	√	
High Mains Volts	√	
Low Mains Volts	√	
Mains On		
Mains On Load		
Alternator On		
Alternator On Load		
Alternator Phase Rotation Fault	√	√
High Alternator Volts	√	√
Low Alternator Volts	√	√
Battery Volts Fault	√	
Alternator Charge Fault	√	
Control System On		

(b) Logging of Events

All events relating to the status of the generator set shall be logged with date and time in a non-volatile memory (which can retain information for a period of 6 months in the absence of power to the controller) and the user shall be able to obtain a hard copy on site. Logging of the following events with date and time shall be programmed

- Buffer erased
- Mains on load
- Unit switched ON
- Unit switched OFF
- Low Fuel Level
- Alternator on load
- Alternator off
- Start attempts = 01
- Start attempts = 02

- Start attempts = 03
- Mains phase low
- Unit Mode = Auto
- Manual Stop
- Manual Start
- Unit Mode = Manual
- Alt. Phase 1 min Volts
- Alt. Phase 2 min Volts
- Alt. Phase 3 min Volts
- Alt. Phase 1 max Volts
- Alt. Phase 2 max Volts
- Alt. Phase 3 max Volts
- Alt. Phase 1 min Amps
- Alt. Phase 2 min Amps
- Alt. Phase 3 min Amps
- Alt. Phase 1 max Amps
- Alt. Phase 2 max Amps
- Alt. Phase 3 max Amps

(c) User Programmable

The controller shall be user programmable on site via a menu system with clear prompts for the required data.

(d) Control System DC Supply Voltage

The control system must be able to operate with a minimum DC supply voltage of 4 Volts (without making use of either an internal or an external auxiliary battery) to allow cranking and starting under conditions of low battery capacity.

8.4 MANUAL STARTING

The switchboard shall be equipped with two push-buttons marked "START" and "STOP" for manual starting and stopping of the set.

8.5 BATTERY CHARGING EQUIPMENT

The switchboard shall be equipped with battery charging equipment.

The charger shall operate automatically in accordance with the state of the battery and shall generally consist of an air-cooled transformer, a full wave solid-state rectifier, and the necessary automatic control equipment of the constant voltage system.

The charger must be fed from the mains. An engine driven alternator must also be provided for charging the battery while the set is operational. Failure of this alternator must also activate the battery charger failure circuit.

8.6 SWITCHBOARD DISPLAYS

All readings Voltage, Amps (instantaneous, average and maximum), Frequency, kW, kVA, kVAr frequency, etc must be displayed on the controller panel.

8.7 MARKINGS

All labels, markings or instructions on the switchgear shall be in English only.

8.8 EARTHING

An earth bar must be fitted in the switchboard, to which all non-current carrying metal parts shall be bonded.

The neutral point of the alternator must be solidly connected to this bar by means of a removable link labelled "EARTH". Suitable terminals must be provided on the earth bar for connection of up to three earth conductors, which will be supplied and installed by others.

8.9 OPERATIONAL SELECTOR SWITCH

A four-position selector switch must be provided on the switchboard marked "AUTO", "MANUAL", "TEST", and "OFF".

With the selector on "AUTO", the set shall automatically start and stop, according to the mains supply being available or not.

With the selector on "TEST", it shall only be possible to start and stop the set with the push buttons, but the running set shall not be switched to the load.

With the selector on "MANUAL", the set must take the load when started with the push-button, but it must not be possible to switch the set on to the mains, or the mains onto the running set.

With the selector on "OFF", the set shall be completely disconnected from the automatic controls, for cleaning and maintenance of the engine.

8.10 AUTOMATIC CHANGE-OVER SYSTEM

A motorised 24-pole fully automatic changeover system must be provided to isolate the mains supply from two sources and connect the standby set to the outgoing feeder in case of a mains failure and reverse this procedure on return of the mains.

The contactors for this system must be interlocked in a safe and fail proof way to prevent the alternator from being switched onto the mains or vice versa.

8.10.1 Generator set Controller in AUTO mode:

- (a) In the event of a mains failure, the plant must start up after a 3 second delay. This delay shall be introduced to prevent spurious starting of the genset caused by mains supply transients.

- (b) During starting and run-up, engine oil pressure, and alternator output voltage and frequency monitoring, shall be blocked for a controlled period of time.
- (c) Once the blocking is released and the various operating parameters confirmed as correct, the control system must signal the remote NORMAL supply changeover contactor to open, followed by a closing command for the remote STANDBY supply changeover contactor.
- (d) The plant shall now provide power to the essential power loads.
- (e) After the mains supply has been restored, the plant must remain on load for a further 60 seconds, after which time it must cause the STANDBY supply changeover contactor to open, followed 2 seconds later by the closing of the NORMAL supply changeover and remote DB mounted contactors.
- (f) Mains power is now restored to the essential and non-essential power loads.
- (g) The plant shall now continue to run for a further 3 minutes in order to stabilize the engine and turbocharger temperatures before stopping, thereby avoiding thermal stresses on the engine.
- (h) Should the mains fail during the 3 minute cool-down cycle, the system must cause an immediate changeover to STANDBY power, while resetting the cool-down cycle. After the mains have been restored, changeover back to NORMAL supply and shutdown procedures must be re-initiated as described above.

8.11 START DELAY

Starting shall be automatic in event of a mains failure. A 0-15s adjustable, start delay timer shall be provided to prevent start-up on power dips or very short interruptions.

8.12 STOP DELAY

A stop delay with timer is required for the set, to keep the set on load for an adjustable period of one to sixty seconds (0 – 6s) after the return of the mains supply, before changing back to the supply. An additional timer shall keep the set running for a further adjustable cooling period of 5 to 10 minutes at no-load before stopping.

9.0 PLANT AND EQUIPMENT GUARANTEES

The generator plant (genset set and all associated equipment) will be guaranteed for twelve (12) months irrespective of the running hours recorded on the hour meter. All the equipment supplied with it will guaranteed for twelve (12) months from the date of Practical Completion and written guarantees must be submitted on completion.

10.0 FIRST 12 MONTHS MAINTENANCE PERIOD

The Sub-contractor shall be responsible for the service and maintenance of the generator plant for a period of twelve months after the Practical Completion has taken place.

If during this period the plant is not in working order, or not working satisfactorily owing to faulty material, design or workmanship, the Subcontractor will be notified and immediate steps shall be taken by him to rectify the defects and/or replace the affected parts on site at his own expense.

The Subcontractor shall maintain the plant in good working condition for the full twelfth month period to the final delivery of the installation. However, should the Subcontractor fail to hand over the plant in good working order on the expiry of the specified twelfth months, the Subcontractor shall be responsible for further monthly maintenance until final delivery is taken.

During this period the Subcontractor will undertake to arrange that the plant be inspected at least once per month by a qualified member of his staff who shall: -

- (a) Report to the Officer-in-charge, keeping the maintenance records, and enter into a log book the date of the visit, the tests carried out, the adjustments made, and any further details that may be required.
- (b) Grease and oil moving parts, where necessary.
- (c) Check the air filter and, when necessary, clean the filter and replace filter oil.
- (d) Check the lubricating oil and top-up when necessary.
- (e) After the plant has run one oil change for the number of hours stipulated by the manufacturers, drain the sump and refill with fresh lubricating oil. The reading of the hour meter on the switchboard will be taken to establish the number of hours run by the plant.

Under this heading only the cost of the actual oil used, shall be charged as an extra on the monthly account.

- (f) Clean the lubricating oil filter and/or replace the filter element at intervals recommended by the engine manufacturer, the cost of a new filter element to be charged as an extra on the monthly account.
- (g) Check and when necessary adjust the valve settings and the fuel injection equipment.
- (h) Check the battery and top-up the electrolyte when necessary.
- (i) Test-run the plant for 0,5 hour and check the automatic starting with simulated faults on the mains, the proper working of all parts, including the electrical gear the protective devices with fault indicators, the changeover equipment and the battery charger. Make the necessary adjustments.
- (j) Report to the Officer-in-charge on any parts that become unserviceable through fair wear and tear, or damaged by causes beyond the control of the Subcontractor.

The Subcontractor shall immediately submit a detailed quotation for the repair or replacement of such parts to the Officer-in-charge.

- (k) Advise the Officer-in-charge when it has become necessary to de-carbonise the engine and submit a quotation for this service.
- (l) Top up the water of the radiator, if applicable.
- (m) Clean the plant and its components.

11.0 TESTS

The following tests are to be carried out:

- a) At the supplier's premises, before the generating set will be delivered to site. The Engineer or the alternative Representative of the Employer will be present during the test to satisfy themselves that the generator set complies with the specification and delivers the specified output. The Engineer must be timeously advised of the date of this test.
- b) After completion of the works and before first delivery is taken, a full test will be carried out on the electrical installation on site for a period of sufficient duration to determine the satisfactory working thereof. During this period the installation will be inspected and the Subcontractor shall make good, to the satisfaction of the Engineer, any defects which may arise.
- c) The Subcontractor shall provide all instruments and equipment required for testing and any water, power and fuel required for the commissioning and testing of the installation at completion.
- d) Test reports of both tests as specified under (a) and (b) are to be submitted to the Engineer.

12.0 SPARES, MANUALS AND RECORD DRAWINGS

All necessary catalogues and nearest availability of spare parts shall be detailed in the offer.

On completion the Subcontractor shall submit to the Engineer a set of

- (a) Operation,
- (b) maintenance manuals,
- (c) record drawings,
- (d) first batch of service spares and
- (e) full diesel fuel tanks (all).

13.0 ENCLOSURE / CANOPY (NOT APPLICABLE)

13.1 GENERAL

- (a) The set will be installed inside a sound attenuated 3CR12 stainless steel purpose built enclosure. Trox sound attenuators and louvres to suit must be fitted to both ends and both sides must be fitted with acoustic doors for access purposes. The inside of the container must be lagged with "Quash" type acoustic material and the standard aluminium chequer plate floor and lights etc. must be installed over the engine and in front of the switchboard.
- (b) The enclosure shall allow easy access to the engine, alternator, radiator filler cap and switchboard for maintenance purposes.
- (c) The door hinges and locking bars shall be of a heavy-duty type and be manufactured of an alloy or corrosion resistant material.

- (d) The diesel fuel level indicator and alternator rating plate shall be clearly visible with the doors open.
- (e) The silencer exhaust must be mounted within the enclosure.
- (f) Rubber seals on doors.

13.2 DESIGN

- (a) The enclosure shall be designed to be weather-proof and sound proofed. Rivets or self-tapping screws will under no circumstances be allowed for fixing the various sections of the enclosure. Only corrosion resistance nuts and bolts are acceptable.
- (b) The starter battery shall be housed in an insulated compartment with forced air flow when the engine is running. It should be provided with easy access for maintenance and removal.

13.3 ROOF

The roof of the enclosure shall be constructed for proper drainage of water with a pitch of not less than 7 degrees.

13.4 LIGHT FITTINGS

- (a) A LED light fitting and its associated on/off door switch shall be provided inside the enclosure for illumination of the control panel and the inside of the enclosure.
- (b) The power for the lamp shall be obtained from the starter battery.

13.5 PROVISIONS AND STORAGE

Provide the following suitably sized:

- (a) Readily accessible Carbon dioxide fire extinguisher
- (b) Storage box for service spares and a pair of ear muffs.

13.6 POWER POINT

A 16 Ampere switched socket outlet (SSO) shall be provided in the externally mounted terminal box or suitable accessible position and protected from rain. The SSO must be accessible without the use of tools. The power supply shall be taken from the mains side of the switchboard and protected by a 20A, 30mA earth leakage.

13.7 NOTICES

- (a) Notices in English as stipulated in the latest amendment of the Occupational Health and Safety Act 85/1993 shall be installed in the generator enclosure.
- (b) Notices shall be in accordance with SANS 1186-1:2008 Symbolic Safety Signs Part 1
- (c) All notices shall be of the metal engraved type with a minimum metal thickness of 1 mm. The words shall be in red lettering on a white background.
- (d) The lettering shall be embossed and the colouring shall not fade in sunlight

- (e) The contents of these notices are summarised below.
 - (i) A notice prohibiting unauthorised entry prohibited
 - (ii) A notice prohibiting unauthorised handling of or interfering with electrical apparatus
- (f) Notices (e) (i) must be installed outside next to the entrance of the generator enclosure and (e) (ii) to be inside the generator enclosure.
- (g) In the generator enclosure, a clearly legible and indelible warning notice must be mounted in a conspicuous position. The notice shall be made of a non-corrodible and non-deteriorating material, preferable plastic, and must read as follows:

**DANGER: THIS ENGINE WILL START WITHOUT NOTICE. TURN
SELECTOR SWITCH ON CONTROL BOARD TO "OFF"
BEFORE WORKING ON THE PLANT.**

14.0 SCHEDULE SCHEDULES OF GENERATOR TECHNICAL INFORMATION

A. ENGINE

NO	ITEM	REMARKS
1.	Manufacturer's Name	
2.	Country of Origin	
3.	Manufacturer's model No. and year of manufacture	
4.	Continuous sea level rating after allowing for ancillary equipment : In kW	
5.	Percentage de-rating for site conditions, in accordance with BS 551.4 a) For altitude..... b) For temperature... c) For humidity..... d) Total de-rating.....	
6.	Net output on site in kW	
7.	Nominal speed in r.p.m.	
8.	Number of cylinders	
9.	Swept volume in litres	
10.	Compression ratio	
11.	Fuel consumption of the complete generating set on site of alternator output at in l/h: a) Full load..... b) $\frac{3}{4}$ load..... c) $\frac{1}{2}$ load..... NOTE : A tolerance of 5% shall be allowed above the stated value of fuel consumption.	
12.	Make of fuel injection system.	
13.	Capacity of fuel tank in litres a) Primary..... b) Bulk.....	
14.	Method of reading tank fuel level, with electromechanical or electronic gauge? a) Primary tank..... b) Bulk tank.....	
15.	Where is the fuel gauge situated? a) Primary tank..... b) Bulk	

NO	ITEM tank.....	REMARKS
16.	Is water trap fitted in the fuel line system?	
17.	Is diesel fuel conditioner provided for the bulk fuel tank?	
18.	Is electric pump for filling the fuel tank included?	
19.	Is manual pump for filling the fuel tank included?	
20.	Method of cooling	
21.	Type of radiator, if water-cooled	
22.	Type of heater for warming cylinder heads, if required	
23.	Capacity of heater in kW, if required	
24.	Method of protection against high temperature	
25.	Method of protection against low oil pressure	
26.	Type of governor	
27.	Speed variation in %	
	a) Temporary..... b) Permanent.....	
28.	Minimum time required for as assumption of full load after starting in seconds	
29.	Recommended interval in running hours for :	
	a) Lubricating oil change.....	
	b) Oil filter element change.....	
	c) Decarbonising.....	
30.	Are all accessories and ducting of the radiator included?	
31.	Is engine naturally aspirated or turbocharged?	
32.	Are performance curves attached?	
33.	Noise level inside the generator enclosure in dBA	N/A
34.	Noise level at 5 000mm from the closed enclosure in dBA	
	a) Engine exhaust outlet.....	
	b) Hot air discharge louvre.....	
35.	Is engine exhaust system as specified?	
36.	% Load acceptance to BS 5514, Part 4, with 10% transient speed drop	

B. ALTERNATOR

NO	ITEM	REMARKS
1.	Maker's name	
2.	Country of Origin	
3.	Maker's Model No and year of manufacture	
4.	Type of enclosure	
5.	Nominal speed in r.p.m.	
6.	Number of bearings	
7.	Terminal voltage	
8.	Sea level rating kVA at 0,8 power factor	
9.	De-rating for site conditions	
10.	Input required in kW	
11.	Method of excitation	
12.	Efficiency at 0,8 power factor and : a) Full load..... b) $\frac{3}{4}$ load..... c) $\frac{1}{2}$ load.....	
13.	Maximum permanent voltage variation in %	
14.	Transient voltage dip on full load	
15.	Voltage recovery on full load application in milliseconds	
16.	Is alternator brushless?	
17.	Class of insulation of windings	
18.	Is alternator suitable for tropical conditions?	
19.	Symmetrical short circuit current at terminals in Amperes	
20.	Type of Coupling between engine and alternator	
21.	Is the alternator protected against a) Overload..... b) System faults..... c) Overvoltage..... d) Stator/Rotor winding temperature..... e) Internal generator faults.....	

C. SWITCHBOARD

NO	ITEM	REMARKS
1.	Maker's Name	
2.	Country of Origin	
3.	Is it free standing or mounted on the set?	
4.	Finish and colour	
5.	Ratio of current transformers	
6.	Make of the main circuit breaker	
7.	Rating of circuit breaker in Amps and fault level in kA	
8.	State the SA or international standard to which all circuit breakers conform	
9.	Setting range of overload trips	
10.	Setting range of instantaneous trips	
11.	Make of motorised change-over equipment	
12.	Rating of change-over equipment in Amps	
13.	T State the SA or international standard to which all circuit breakers conform	
14.	Are auxiliary contacts available on the motorised change-over equipment?	
15.	Make of Controller	
16.	Make and type of rectifier for battery charger	
17.	Is battery charger automatically selected for boost / float?	
18.	Maker's name for the alarm siren	
19.	Is the alarm siren of the continuous duty type?	
20.	Are potential free contacts from the alarm relay brought down to terminals for remote indication of alarm conditions?	
21.	If the manufacture of switchboard/control panel to be sub-let state name and address of specialist manufacturer?	

D. BATTERY

NO	ITEM	REMARKS
1.	Maker's Name	
2.	Country of Origin	
3.	Type of battery	
4.	Voltage of battery	
5.	Number of cells	
6.	Capacity in cold crank in Ah	
7.	Battery warranty period in months	

E. DIMENSIONS

NO	ITEM	REMARKS
1.	Overall dimensions of set including the switchboard and the enclosure in mm	
2.	Overall wet mass of the set including the switchboard and the enclosure in kg	
3.	Overall dimensions of the bulk tank including the fuel conditioner.	

F. SPARE PARTS AND MAINTENANCE FACILITIES

NO	ITEM	REMARKS
1.	Are engine and alternator spares available in the Eastern Cape?	
2.	Where are these spares held in stock?	
3.	What facilities exist in the Eastern Cape for the servicing of the equipment offered?	
4.	Where are these facilities available?	

G. GENERATOR ENCLOSURE (NOT APPLICABLE)

NO	DESCRIPTION	
1.	Construction material and thickness (submit proof)	
2.	Finish and colour	
3.	Number of access doors	
4.	Make and type of heavy duty door hinges	
5.	Sound attenuation material	
6.	Exhaust silencer mounted within the enclosure or external?	
7.	Method of sealing doors	
8.	Type of corrosion resistant fasteners	
9.	Roof pitch	
10.	Make and type of light fitting	
11.	Easily accessible 16 Amp switched socket outlet provided?	
12.	Facility provided for the storage of ear muffs	
13.	State notices provided:	

H. DEVIATION FROM THE SPECIFICATION AS AN ALTERNATIVE (STATE BRIEFLY)

NO	DESCRIPTION

.....
Signature

.....
Date

.....
Position

.....
Name of Tenderer

Section 3 – Returnable Schedules

RETURNABLE SCHEDULES

TABLE OF CONTENTS

ITEM	DESCRIPTION
RS.1	FINANCIAL DETAILS
RS.2	REGISTRATION AS ELECTRICAL CONTRACTOR
RS.3	DETAILS OF INSTALLATION ELECTRICIAN
RS.4	SCHEDULE OF WORK CARRIED OUT BY TENDERER
RS.5	PROPOSED KEY PERSONNEL
RS.6	SCHEDULE OF PROPOSED SUB-CONTRACTORS
RS.7	SCHEDULE OF PLANT AND EQUIPMENT
RS.8	SCHEDULE OF MATERIALS OFFERED
RS.9	SCHEDULE OF CONTRACTOR'S TESTING EQUIPMENT

RS.1 FINANCIAL DETAILS

Name of Bank or Financial Institution where Account is kept:

.....

Branch Name

Bank Contact Person.....

Branch Code

Account number

Name under which account is operated:

NOTE;

Tenders cannot be adjudicated without the above information and failure on the part of tenderers to declare the information, thus causing delays to the adjudication to the, may result in their tender being disqualified.

.....
NAME OF TENDERER

.....
TENDERER'S SIGNATURE

.....
DATE

RS.2 REGISTRATION AS AN ELECTRICAL CONTRACTOR

The Tenderer must be registered as an Electrical Contractor with the Electrical Contracting Board of South Africa and must also be registered with the Workmen's Compensation Commissioner and the Unemployment Insurance Commissioner to qualify for this tender.

Tenderers must complete the following questionnaire and submit it with this tender.

- a) Has the company been registered with the Electrical Contracting Board of South Africa YES/NO

Registration No:.....

Date of issue:.....

- b) Has the company been registered with the Department of Manpower?

- i) Registered for Workmen's Compensation for Occupational Injuries and Diseases Act YES/NO

Registration No:.....

Date of issue:

- ii) The Unemployment Insurance Commissioner YES/NO

Registration No :

Date of issue:

I/We certify that the above information is correct

Signature :

Name of Signatory :

Name of Firm Represented :

Address :

.....

.....

Date :

NOTE: IN TERMS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT ELECTRICAL INSTALLATIONS REGULATIONS FAILURE TO COMPLY WITH THIS CLAUSE OF THE SPECIFICATION MAY RESULT IN DISQUALIFICATION AND REJECTION OF THE TENDER.

RS.3 DETAILS OF INSTALLATION ELECTRICIAN

I/We certify that is a registered installation electrician in terms of the Occupational Health and Safety Act (Act 85 1994) and is permanently employed by my/our company trading as:

.....

I/We further certify that the abovementioned person will be appointed as the responsible person in charge of the installation, which person shall personally supervise the whole of the electrical works as tendered for from inception to completion inclusive of signing all commencement/completion/ cost certificates necessary as part of the Works.

I/We further certify that I/We am/are fully aware of the provisions of the Occupational Health and Safety Act (Act 85 1994), and that my/our company is trading as a registered electrical contracting organisation.

**SIGNATURE OF
TENDERER**

.....

**SIGNATURE OF
INSTALLATION
ELECTRICIAN**

.....

**REGISTRATION
NUMBER OF
INSTALLATION
ELECTRICIAN**

.....

DATE

.....

COMPANY STAMP

NOTE

It is an offence to employ a registered single-phase installation electrician on a poly-phase installation and it may be necessary to submit a certified copy of the licence of the person to be employed on any poly-phase project.

RS.4.1 SCHEDULE OF WORK CARRIED OUT BY TENDERER

The Tenderer shall list below the last five Electrical engineering contracts nature awarded to him from **CIDB Grade 5EB (R6,5 mil) and above**. This information is material to the award of the Contract.

EMPLOYER (Name, Tel No and Fax No)	CONSULTING ENGINEER (Name, Tel No and Fax No)	NATURE OF WORK	VALUE OF WORK	YEAR OF COMPLETION

SIGNATURE:
(of person authorised to sign on behalf of the Tenderer)

DATE:

RS.4.2 SCHEDULE OF WORK CARRIED OUT BY TENDERER

The Tenderer shall list below the last five Electrical engineering contracts nature awarded to him from **CIDB Grade 1EB (R 650k) to Grade 4EB (R 4 mil)**. This information is material to the award of the Contract.

EMPLOYER (Name, Tel No and Fax No)	CONSULTING ENGINEER (Name, Tel No and Fax No)	NATURE OF WORK	VALUE OF WORK	YEAR OF COMPLETION

SIGNATURE:
(of person authorised to sign on behalf of the Tenderer)

DATE:

RS2.5 PROPOSED KEY PERSONNEL

The Tenderer shall list below the key personnel (including first nominee and the second choice alternate), whom he proposes to employ on the contract should his offer be accepted, both at his headquarters and on the Site, to direct and for the execution of the work, together with their qualifications, experience, positions held and their nationalities.

DESIGNATION	NAME AND NATIONALITY OF: (i) NOMINEE (ii) ALTERNATE	SUMMARY OF QUALIFICATIONS, EXPERIENCE AND PRESENT OCCUPATION
<u>HEAD OFFICE</u> Partner/Director		
Project manager		
Other key staff (give designation)		
<u>SITE OFFICE</u> Site Agent		
Site Engineer		
Construction supervisor (Give designation)		
Other key staff (give designation)		

SIGNATURE:
(of person authorised to sign on behalf of the Tenderer)

DATE:

RS.6 SCHEDULE OF PROPOSED SUB-CONTRACTORS

We notify you that it is our intention to employ the following Subcontractors for work in this contract.

If we are awarded a contract we agree that this notification does not change the requirement for us to submit the names of proposed Subcontractors in accordance with requirements in the contract for such appointments. If there are no such requirements in the contract, then your written acceptance of this list shall be binding between us.

We confirm that all subcontractors who are contracted to construct a house are registered as home builders with the National Home Builders Registration Council.

	Name and address of proposed Subcontractor	Nature and extent of work	Previous experience with Subcontractor.
1.			
2.			
3.			
4.			
5.			

RS.7 SCHEDULE OF PLANT AND EQUIPMENT

The following are lists of major items of relevant equipment that I/we presently own or lease and will have available for this contract or will acquire or hire for this contract if my/our tender is accepted.

(a) Details of major equipment that is owned by and immediately available for this contract.

Quantity	Description, size, capacity, etc.

Attach additional pages if more space is required.

(b) Details of major equipment that will be hired, or acquired for this contract if my/our tender is acceptable.

Quantity	Description, size, capacity, etc.

Attach additional pages if more space is required.

.....
NAME OF TENDERER

.....
TENDERER'S SIGNATURE

.....
DATE

RS.8 SCHEDULE OF MATERIALS OFFERED

The Tenderer must complete the following schedules and submit them with the priced Bill of Quantities.

The schedules will be scrutinized by the Engineer and should any material offered not comply with the requirements contained in the specification, the Electrical Sub-Contractor will be required to supply material in accordance with the contract at no additional cost.

NB : Only one manufacturer's name to be inserted for each item.

Item	Material	Make or trade name	Country of Origin
1.	Distribution boards		
2.	Circuit breakers 1P, 2P, 3P		
3.	On load isolators without trips		
4.	Contactors 1P, 2P, 3P		
5.	Earth leakage relays		
6.	Daylight sensitive switch		
7.	Conduit		
8.	Conduit boxes		
9.	Power skirting		
10.	Wiring channels		
11.	Surface all weather isolators		
12.	Flush and surface indoor isolators		
13.	Channel mounted indoor isolators		
14.	16A power skirting mounted socket outlets		
15.	16A flush switched socket outlets		
16.	16A surface switched socket outlets		
17.	5A unswitched socket outlets		
18.	Occupancy Sensors		
19.	PVC SWA ECC cable		
20.	Cable glands		
21.	Luminaires		
21.1	Type A		
21.2	Type B		
21.3	Type EX		
21.4	Type R1		
21.5	Type R2		
21.6	Type G		
21.7	Type M		

Item	Material	Make or trade name	Country of Origin
21.8	Type N		
21.9	Type RL		
22	Occupancy Sensor		
23	Photo-voltaic installation		

NOTE : Tenderers are to note that under no circumstances may materials be installed other than offered in the above materials schedule, which has been approved and accepted by the Contractor.

Should the successful tenderer wish to supply materials other than those originally offered, prior written approval must be obtained from the Contractor before any orders are placed.

.....
NAME OF TENDERER

.....
TENDERER'S SIGNATURE

.....
DATE

COMPANY STAMP:

RS.9 SCHEDULE OF CONTRACTOR'S TESTING EQUIPMENT

Item	Test	Equipment
1.	Insulation Resistance	
2.	Earth Continuity	
3.	Polarity	
4.	Earth Leakage Protection	
5.	Other: (Specify)...	

SIGNATURE:
(of person authorised to sign on behalf of the Tenderer)

DATE:

Section 4 – Pricing Instructions & Bill of Quantities

PRICING SCHEDULES & BILL OF QUANTITIES

TABLE OF CONTENTS

Clause	DESCRIPTION
4.1	Pricing Instructions
4.2	Bill of Quantities

4.1 – Pricing Instruction

3.1 PRICING INSTRUCTIONS

- 1 These Bills of Quantities contain pages numbered in the consecutive order. The Tenderer is required to check the numbers of pages and should any page be found to be missing, or in duplicate, or if any reproduction is indistinct, or if any ambiguity arises as to the meaning of any item or description, or if these Bills of Quantities contain any obvious errors, then the Tenderer must immediately inform the Engineer and have the same rectified or explained, as the case may be. No claim will afterwards be considered where the Tenderer has failed to comply with these instructions.
- 2 The units of measurement described in the Bills of Quantities are metric units. Abbreviations used in these Bills of Quantities are as follows:

%	=	percent
h	=	hour
km	=	kilometre
kW	=	kilowatt
mm	=	millimeter
m	=	metre
m ²	=	square metre
m ³	=	cubic metre
No.	=	number
Prov sum	=	Provisional sum
R/only	=	Rate only
Sum	=	lump sum
W/day	=	Work day
- 3 Unless otherwise stated, items are measured net in accordance with the drawings, and no allowance is made for waste.
- 4 The prices and rates in these Bills of Quantities are fully inclusive prices for the work described under the items. Such prices and rates cover all costs and expenses that may be required in and for the execution of the work described in accordance with the provisions of the Scope of Work, and shall cover the cost of all general risks, liabilities, and obligations set forth or implied in the Contract Data, as well as overhead charges and profit. These prices will be used as a basis for assessment of payment for additional work that may have to be carried out.
- 5 It will be assumed that prices included in these Bills of Quantities are based on Acts, Ordinances, Regulations, By-laws, International Standards and National Standards that were published 28 days before the closing date for tenders. (Refer to www.stanza.org.za or www.iso.org for information on standards)
- 6 Where the Scope of Work requires detailed drawings and designs or other information to be provided, all costs associated therewith are deemed to have been provided for and included in the unit rates and sum amount tendered such items
- 7 An item against which no price is entered will be considered to be covered by the other prices or rates in the Bills of Quantities. A single lump sum will apply should a number of items be grouped together for pricing purposes.
- 8 The quantities set out in these Bills of Quantities are approximate and do not necessarily represent the actual amount of work to be done. The quantities of work accepted and certified for payment will be used for determining payments due and not the quantities given in the Bills of Quantities.

- 9 Reasonable compensation will be received where no pay item appears in respect of work required in the Bills of Quantities in terms of the Contract and which is not covered in any other pay item.
- 10 The short descriptions of the items of payment given in these Bills of Quantities are only for the purposes of identifying the items. More details regarding the extent of the work entailed under each item appear in the Scope of Work.
- 11 Those parts of the contract to be constructed using labour-intensive methods have been marked in the Bills of Quantities with the letters LI in a separate column filled in against every item so designated. The works, or parts of the works so designated are to be constructed using labour-intensive methods only. The use of plant to provide such works, other than plant specifically provided for in the scope of work, is a variation to the contract. The items marked with the letters LI are not necessarily an exhaustive list of all the activities which must be done by hand, and this clause does not over-ride any of the requirements in the generic labour intensive specification in the Scope of Works.
- 12 Payment for items which are designated to be constructed labour-intensively (either in this schedule or in the Scope of Works) will not be made unless they are constructed using labour-intensive methods. Any unauthorised use of plant to carry out work which was to be done labour-intensively will not be condoned and any works so constructed will not be certified for payment.
- 13 The responsibility for the accuracy of the quantities written into the Bill remains with the person who prepared the Bill. The Tenderer shall be relieved of responsibility of measuring quantities at the tender stage, and the tender sum submitted shall be in respect of the quantities set out in the Bills, although he will be required to make his assessment of items such as brackets, fixing, etc., from details stated in the Bills and shall include in the item prices for such small installation materials as are required for the complete installation in accordance with the Specification.
- 14 The Bills of Quantities are not to be used for ordering purposes. Any orders placed by the Contractor on the basis of these Bills of Quantities shall be at his own risk.

The quantities given in the Bill for cable, cable markers, earth wire laid with cable and excavations cannot be regarded as exact and are subject to measurement on site after completion of the service and adjustments will be made according to the unit rates given in the Bill.

Notwithstanding the fact that the lengths of cables as given in the Bills of Quantities have been measured from scaled drawings, the contractor shall check such lengths on site before ordering the cable, as he will not be paid for excess cable after the completion of the service. Any allowance for off-cuts shall be made in the unit rates. The final measurements shall be based on the net route length of the cables concerned.

- 15 All items described as "Provisional" shall be measured as executed and paid for according to prices in the Bills of Quantities and any unexpended amounts shall be deducted from the amount of the contract sum. No work for which "Provisional" items are provided shall be commenced without written instructions from the Engineer.
- 16 Materials encountered in the excavations for cable trenches, lighting standard and bollard holes generally shall, unless special provision to the contrary is made hereinafter, be classified as follows:-
- a) 'Hard rock' shall mean any excavation requiring the use of explosives.
 - b) 'Soft rock' shall mean any excavation which necessitates the use of pneumatic tools.
 - c) 'Ordinary material' shall mean all pickable material.

In the event of any dispute regarding the classification of material, the Engineer's decision in

this connection shall be final.

Should the Contractor consider that any material encountered in the excavations is 'hard rock' or 'soft rock', he shall immediately notify the Engineer in writing. Failing such notification the excavation shall be assumed to be in 'ordinary material' and shall be measured and valued accordingly. Wherever practicable all excavation in ground other than 'hard rock' and/or 'soft rock' shall be carried out first after which levels will be taken of the exposed 'hard rock' and/or 'soft rock' and agreed upon by the Engineer and the Contractor.

Where the Contractor encounters a combination of 'hard rock' and/or 'soft rock' simultaneously in a section of trench and employs explosives or pneumatic tools to remove all the various types of materials in that section of trench, the use of these methods of removal will in no way influence the Engineer's classification of the materials.

4.2 - Bill of Quantities

**NTSONKOTHA SCHOOL HOSTELS IN LADY FRERE
ELECTRICAL INSTALLATION**

ITEM	DESCRIPTION	UNIT	RATE			AMOUNT
			Fixed	Value Related	Time Related	
1.0	<u>BILL NO. 1 : PRELIMINARY & GENERAL</u>					
1.1	Establish on Site and provision of buildings and materials storage facilities including de-establishment of site, cleaning and tidying up after completion of contract	Sum				
1.2	Provision of Electricity and Water	Sum				
1.3	Provision of Toilet Facilities	Sum				
1.4	Contract Works Insurances	Sum				
1.5	Public Liability Insurance	Sum				
1.6	Construction Guarantee / Security	Sum				
1.7	All OHSA Requirements including safety equipment and clothing	Sum				
1.8	Compliance with Construction Regulations	Sum				
1.9	Compliance with Health and Safety Act	Sum				
1.10	Tools and Equipment	Sum				
1.11	Contract Management and supervision of the Works including attendance of site meetings	Sum				
1.12	Liaison with Eskom for power connection after issue of a COC.	Sum				
Carried Forward to Price Summary Page: Bill No. 1						

NTSONKOTHA SCHOOL HOSTELS IN LADY FRERE

ELECTRICAL INSTALLATION

NB

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ITEM	DESCRIPTION	RATE				AMOUNT
		UNIT	QNTY	SUPPLY	INSTALL	
2.0	<u>BILL NO. 2 : STANDBY GENERATOR</u>					
2.1	250kVA indoor standby diesel generator set as specified complete with a <u>12 hour</u> full load running fuel tank.	No	1			
2.2	Electrically operated fuel pump mounted inside the generator enclosure complete with hoses suitable for all diesel fuels available in South Africa.	No.	1			
2.3	Set of SABS approved ear muffs to be kept in a storage box inside the generator room including a storage box.	No.	2			
2.4	First tank full of diesel fuel (all tanks) and full lubrication oil sump.	No.	1			
2.5	Set of service and operation manuals, record drawings and diagrams.	Set	3			
2.6	Money provision to fly the Engineer from the East London Airport to the supplier's factory/workshop (if outside of the Eastern Cape) to inspect and witness the testing of the first completed unit.	Sum	1			
2.7	Test and commission standby generator in the assembler's workshop and submit tests	Sum	1	----		
2.8	Run-Test the generator on site for thirty (30) minutes and do final onsite adjustments	Sum	1	----		
2.9	Assist the DoE & DPWI with the procurement and registration of a data SIM card to be installed in the generator cell phone modem.	Sum	1	----		
2.10	Provide Training to personnel (to be identified by the DoE & DPWI) on the Operation of the Generator set.	Set	3		----	
2.11	First 12 months guarantee maintenance	Sum	1	----		
Carried Forward to Price Summary Page: Bill No. 2						

NTSONKOTHA SCHOOL HOSTELS IN LADY FRERE

ELECTRICAL INSTALLATION

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ITEM	DESCRIPTION			RATE		AMOUNT
		UNIT	QNTY	SUPPLY	INSTALL	
3.0	<u>BILL NO. 3 : DISTRIBUTION BOARDS</u>					
	NOTE: All installed equipment to be SABS approved and bear the SABS or IEC performance mark.					
3.1	Indoor distribution boards <u>with cascaded protection</u> as specified and shown on the drawings.					
	Location 1					
3.1.1	DB-H	No	1			
3.1.2	DB-K	No	1			
3.1.3	DB-L	No	1			
3.1.4	DB-W	No	1			
3.1.5	DB-S (MAIN LOW VOLTAGE PANEL)	No	1			
	Location 3					
3.1.6	MDB-B1	No	1			
3.1.7	DB-B1/1	No	1			
3.1.8	DB-B1/2	No	1			
3.1.9	MDB-B2	No	1			
3.1.10	DB-B2/1	No	1			
3.1.11	DB-B2/2	No	1			
	Location 2					
3.1.12	MDB-G1	No	1			
3.1.13	DB-G1/1	No	1			
3.1.14	DB-G1/2	No	1			
3.1.15	MDB-G2	No	1			
3.1.16	DB-G2/1	No	1			
3.1.17	DB-G2/2	No	1			
	Location 1					
3.2	Outdoor Electrical Distribution Kiosk: EDK-1 with 3CR12 enclosure	No.	1			
3.3	Outdoor Electrical Distribution Kiosk: EDK-2 with 3CR12 enclosure	No.	1			
3.4	Outdoor Electrical Distribution Kiosk: EDK-3 with 3CR12 enclosure	No.	1			
Carried Forward to next Page						

NTSONKOTHA SCHOOL HOSTELS IN LADY FRERE**ELECTRICAL INSTALLATION****NB**

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ITEM	DESCRIPTION			RATE		
		UNIT	QNTY	SUPPLY	INSTALL	AMOUNT
Brought Forward from Previous Page						
3.5	<u>Distribution Board Equipment</u> The rates below will be used to add or omit relevant equipment into or out of distribution boards including installation and connection onto DB busbars. All equipment to have a SABS or IEC stamp.					
3.5.1	10A to 20A 6kA SP circuit breaker (Curve-1)	No.	1			Rate Only
3.5.2	10A to 20A 6kA SP circuit breaker (Curve-2)	No.	1			Rate Only
3.5.3	25A 6kA SP circuit breaker (Curve-1)	No.	1			Rate Only
3.5.4	25A to 32A 6kA TP circuit breaker (Curve-1)	No.	1			Rate Only
3.5.5	20A to 25A 6kA SP circuit breaker (Curve-2)	No.	1			Rate Only
3.5.6	25A - 32A 6kA TP circuit breaker (Curve-2)	No.	1			Rate Only
3.5.7	63A to 80A 10kA TP circuit breaker (Curve-1)	No.	1			Rate Only
3.5.8	63A to 80A 10kA TP circuit breaker (Curve-2)	No.	1			Rate Only
3.5.9	100A, 10kA TP circuit breaker	No.	1			Rate Only
Carried Forward to Price Summary Page: Bill No. 3						

NTSONKOTHA SCHOOL HOSTELS IN LADY FRERE

ELECTRICAL INSTALLATION

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ITEM	DESCRIPTION			RATE		AMOUNT
		UNIT	QNTY	SUPPLY	INSTALL	
4.0	<u>BILL NO. 4: MAINS CABLING & SUB-MAINS WIRING</u>					
4.1	<u>Trenching for Cables</u>					
	Trenching of cable trenches 600mm deep x 400mm wide (for LV) and 800mm deep x 400mm wide (for MV) including backfill and compacting.					
4.1.1	Earth					
4.1.2	Soft rock EXTRA OVER - earth	m ³	250			
4.1.3	Hard rock EXTRA OVER - earth	m ³	8			
4.1.4	Lay sifted material (sifted from site material) for bedding and backfilling of cables	m ³	8			
4.1.5	Lay imported sand for bedding and backfilling of cables if site sifted material is insufficient (proof required)	m ³	250			
4.1.6	Danger cable marker tape 150mm wide 800 gauge thick run in parallel 200mm above cable	m	4000			
4.1.7	Drawn into spare sleeves 1mm thick, 800kg breaking strain Optex pull tape.	m	1200			
4.1.8	250mm High truncated pyramid cable route marker with stainless steel insert engraved with the cable details eg, "LV 25mm ² 4C CABLE". installed to protrude 150mm above ground and every 35m along and at the cable route direction change.	No.	120			
4.20	Cable sleeves					
	Heavy duty or flexible (Kabelflex) PVC cable sleeve laid in open trench including cutting and joining					
	NOTE: Spare sleeves for future use to be sealed at both ends					
4.2.1	110mm diameter	m	550			
4.2.2	75mm diameter	m	120			
4.2.3	32mm diameter	m	850			
4.2.4	5mm Nylon draw string in spare cable sleeves	m	1520			
4.2.5	90 degrees slow bends for 110mm sleeve	No.	56			
4.2.6	90 degrees slow bends for 75mm sleeve	No.	26			
4.2.7	90 degrees slow bends for 32mm sleeve	No.	260			
Carried Forward to next Page						

NTSONKOTHA SCHOOL HOSTELS IN LADY FRERE

ELECTRICAL INSTALLATION

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ITEM	DESCRIPTION	RATE				AMOUNT
		UNIT	QNTY	SUPPLY	INSTALL	
Brought Forward from Previous Page						
4.3	<u>Cable Trays and Ladders (Hot Dip Galvanised)</u> Complete including splices clamps, hold down saddles and suspension materials.					
4.3.1	114mm wide	m	1500			
4.3.1.1	Tee Piece	No.	22			
4.3.1.2	90 degree bend (Riser/Dropper)	No.	14			
4.3.1.3	Internal Bend	No.	40			
4.3.1.4	Crossover Radiused	No.	10			
4.3.2	305mm wide	m	40			
4.3.2.1	Tee Piece	No.	4			
4.3.2.2	90 degree bend (Riser/Dropper)	No.	4			
4.3.2.3	Internal Bend	No.	2			
4.3.2.4	Crossover Radiused	No.	4			
4.3.3	610mm wide	m	25			
4.3.3.1	Tee Piece	No.	4			
4.3.3.2	90 degree bend (Riser/Dropper)	No.	2			
4.3.3.3	Internal Bend	No.	2			
4.3.3.4	Crossover Radiused	No.	2			
4.4	<u>Cables</u> Multicore PVCSWAEECC cable with stranded copper conductors to SANS 1507-3 drawn into cable sleeves, installed on cable trays/ladders or laid in open trenches and ducts					
4.4.1	150mm² 4 Core	m	120			
4.4.2	120mm² 4 Core	m	85			
4.4.3	95mm² 4 Core	m	250			
4.4.4	70mm² x 4 Core	m	120			
4.4.5	50mm² x 4 Core	m	102			
4.4.6	35mm² x 4 Core	m	450			
4.4.7	25mm² x 4 Core	m	480			
4.4.8	16mm² x 4 Core	m	1500			
4.4.9	4mm² x 4 Core	m	850			
4.5	<u>Terminations</u> Termination includes preparing the cable for					
4.5.1	150mm² 4 Core	No.	6			
4.5.2	120mm² 4 Core	No.	2			
4.5.3	95mm² 4 Core	No.	6			
4.5.4	70mm² x 4 Core	No.	8			
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ITEM	DESCRIPTION	RATE				AMOUNT
		UNIT	QNTY	SUPPLY	INSTALL	
Brought Forward from Previous Page						
4.5.5	50mm² x 4 Core	No.	8			
4.5.6	35mm² x 4 Core	No.	16			
4.5.7	25mm² x 4 Core	No.	40			
4.5.8	16mm² x 4 Core	No.	60			
4.5.9	4mm² x 4 Core	No.	36			
4.6	<u>Cables Numbering</u>					
	Number cables on both ends with numbering beads or non-corroding straps to indicate their connection points	Sum	1	-----		
4.7	<u>Power Manholes</u>					
	Double skin brick 1200mm deep manhole with maverick cover with the following minimum inside dimensions:					
4.7.1	inside dimensions: 450mmL x 450mmW	No.	4			
4.7.1	inside dimensions: 600mmL x 600mmW	No.	2			
4.7.2	inside dimensions: 900mmL x 900mmW	No.	2			
4.8	Core drilling of 110mm diameter hole through a 330mm thick reinforced concrete slab	No.	45			
4.9	4mm thick checkered Hot Dip Galvanised Cable Duct Cover Plate including bends, bracing and supporting structure.	m	55			
Carried Forward to Price Summary Page: Bill No. 4						

NTSONKOTHA SCHOOL HOSTELS IN LADY FRERE

ELECTRICAL INSTALLATION

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ITEM	DESCRIPTION	UNIT	QNTY	RATE		AMOUNT
				SUPPLY	INSTALL	
5.0	<u>BILL NO. 5 : GENERAL LIGHTING</u>					
5.1	<u>Conduit</u>					
	PVC (SANS 950) conduit chased into brickwork, cast into concrete or fixed onto trusses including cutting, bending, saddles, bushes, etc.					
5.1.1	20mm conduit :					
	Location 1	m	4625			
	Location 2	m	6940			
	Location 3	m	6940			
5.2	<u>Conduit Boxes</u>					
5.2.1	PVC round box for 20mm conduit, back or side entry for 1, 2, 3 or 4-way chased into brickwork, cast into concrete or fixed onto trusses including couplings bushescover plates and fixing materials					
	Location 1	No.	281			
	Location 2	No.	422			
	Location 3	No.	422			
5.2.2	Galvanised steel, 100 x 50 x 50mm box for 20mm conduit built into brickwork or cast in concrete. (cover plates measured elsewhere)					
	Location 1	No.	144			
	Location 2	No.	215			
	Location 3	No.	215			
5.3	<u>Equipment and Control Gear</u>					
	16 Amp single lever, one way flush mounted rocker type switch with coverplate					
5.3.1	1-Lever, 1-way					
	Location 1	No.	129			
	Location 2	No.	194			
	Location 3	No.	194			
5.3.2	1-Lever, 2-way					
	Location 1	No.	3			
	Location 2	No.	4			
	Location 3	No.	4			
5.3.3	2-Lever, 1-way					
	Location 1	No.	4			
	Location 2	No.	6			
	Location 3	No.	6			
5.3.4	3-Lever, 1-way					
	Location 1	No.	2			
	Location 2	No.	45			
	Location 3	No.	45			
Carried Forward to next Page						