BOOK 1 OF 1

higher education & training
Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

**ORBIT TVET COLLEGE**

# TENDER NO: M02/2023

# SUPPLY AND INSTALLATION OF A SOLAR PV PLANT AT ORBIT TVET COLLEGE – MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE

## REQUEST FOR PROPOSAL DOCUMENT

## JULY 2023

## NAME OF TENDERER: .....

| ISSUED BY: | PRINCIPAL AGENT | ENGINEER: |
|---|---|---|
| **ORBIT TVET COLLEGE**<br>**PRIVATE BAG X1014**<br>**MOGWASE**<br>**0314** | **GPS ARCHITECTS**<br>**P O BOX 11389**<br>**SILVER LAKES**<br>**0054**<br><br>**CONTACT PERSON:**<br>**MR. GIFT PHALATSE SETSHEDI**<br>**012 813 8888** | **EMZANSI ENGINEERING CONSULTANTS**<br>**P O BOX 2323**<br>**WINGATE PARK**<br>**0181**<br><br>**CONTACT PERSON:**<br>**MR AUBREY MACKENZIE**<br>**TEL: 012 345 3383** |

# Table of Contents

# PART 1: NOTICE AND INVITATION TO BID

# SUPPLY AND INSTALLATION OF A SOLAR PV PLANT AT ORBIT TVET COLLEGE – MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE

## 1. COMPULSORY BRIEFING SESSION

A representative will meet prospective tenderers at the date and time as advertised in the Tender Bulletin at the main entrance to the ORBIT TVET College–Mankwe Campus for the Briefing Session. The representative will not be available at any other time.

The ORBIT TVET College – Situated at Mankwe Campus, near Mabele a Podi Prison, Mogwase

**Tender No: M02/2023**

| | |
|---|---|
| **Compulsory Briefing Session Date and Time** | **: 10 August 2023 at 11:00** |
| **Tender Closing Date and Time** | **: 22 August 2023 at 11:00** |

It is estimated that tenderers should have a CIDB contractor grading designation of **3EB PE AND 4EB OR HIGHER**

1.1. ORBIT TVET College is inviting capable and competent service providers for the SUPPLY AND INSTALLATION OF A SOLAR PV PLANT AT ORBIT TVET COLLEGE – MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE

1.2. COMPULSORY BRIEFING SESSION will be held, AS SPECIFIED.

1.3. The tender documents will be issued as from: 28-07-2023 and it must be downloaded/viewed on www.orbitcollege.co.za

1.4. Tender document will be issued at the college on condition that National Treasury website is not functioning/working.

1.5. Tender must be submitted on the tender documentation that is issued by the College.

1.6. **NO LATE TENDERS WILL BE ACCEPTED AFTER THE CLOSING DATE AND TIME OF THIS TENDER.**

1.7. The bid/tender shall be valid and open for acceptance for a period of 90 DAYS from the date of closing of tenders.

Bidders must make sure that original completed bid document is in a sealed envelope, **marked "M02/2023: SUPPLY AND INSTALLATION OF A SOLAR PV PLANT AT ORBIT TVET COLLEGE – MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE**

1.8. " is received and deposited in the tender box on or before 22-08-2023 at 11:00am at the following address:

**SUPPLY CHAIN MANAGER**
**ORBIT TVET COLLEGE –CENTRAL OFFICE**
**CORNER FATIMA BHAYAT AND BOSCH STREET**

**SECURITY GATE (COURIER DOCUMENT MUST BE DROPPED INSIDE THE TENDER BOX AT THE SECURITY GATE NOT AT THE RECEPTION)**
**RUSTENBURG, 0299**

## PART 2: SCOPE OF WORK

The scope of work is as follows:

LV Works - Rustenburg Campus and Administration only.

1. Installation of LV Electrical distribution network (cables, DB's, connection boxes etc.)
2. Installation of Electrical cable and wire ways on walls, in ceilings or concrete surfaces.
3. Infrared scanning of DB's and making good based on report.
4. Co-ordination of works, activities and programme with PV Installer.
5. Tracing of existing cables between DB's as well as wiring circuits that are related to PV supply.
6. Swing of identified cables and wiring circuit from the existing DB to the newly installed PV supply DB.

PV Installations-Rustenburg Campus, Admin as well as Mankwe Campus

1. Assist, enable and co-ordinate with the structural Engineer in the identification of suitable routes for the installation of solar panels on different buildings.
2. Install solar PV panels on identified routes as per specifications.
3. Install the rest of the solar system at positions to be indicated by the Engineer.
4. Install Inventor, combiner PV Main panel, DB, etc. in positions to be indicated by the Engineer.
5. Commissioning entire system as per specification and OEM.
6. Installation of the interconnection cable to the new PV DB.
7. Issue a COC for the completed PV plant.
8. Assist, Plan and Co-ordinate with LV network installer for the interconnection with the New PV DB.
9. Provide 12 months free maintenance for the entire system including PV DB.

## PART 3: APPLICABLE DRAWINGS

The following drawings part of this contract:

1. CENTRAL OFFICE) SUB DB'S-PV2
2. (HALLS) UNIT PV3
3. (LABS –PLUGS) SUB DB'S-PV1
4. (CENTRAL OFFICE ) UNIT PV2
5. (LABS) UNIT PV 1
6. TYPICAL SCHEMATIC OF MV + PV + GEN SUPPLY
7. RUSTENBURG (HALLS) UNIT PV3
8. RUSTENBURG LABS) UNIT PV1
9. RUSTENBURG (CENTRAL OFFICE) SUB DBS PV 2
10. RUSTENBURG (CENTRAL OFFICE) UNIT PV 2
11. RUSTENBURG TYPICAL SCHEMATIC OF LV + PV SUPPLY
12. RUSTENBURG (LABS –PLUGS) SUB DB'S-PV1
13. RUSTENBURG –TYPICAL SOLAR SYSTEM
14. CAMPUS LAYOUTS NO.1 - 7

## PART 4: IMPORTANT PROJECT DATES

| ITEM / ACTIVITY | DATE | TIME |
|---|---|---|
| COMPULSORY CLARIFICATION MEETING | 10-08-2023 | 11h00 am |
| TENDER CLOSE | 22-08-2023 | 11h00 am |

## PART 5: SPECIAL TECHNICAL CONDITIONS TO THE TENDER

MINIMUM CIDB REGISTRATION GRADING REQUIRED: **3EB PE AND 4EB OR HIGHER**

## PART 6: RETURNABLE SCHEDULE

1. RETURNABLE SCHEDULE - EQUIPMENT AND SUPPLIERS
2. RETURNABLE SCHEDULE - PARTICULARS OF ELECTRICAL CONTRACTOR
3. CONTRACT DATA

higher education & training
Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# RETURNABLE SCHEDULE

(To be completed by tenderers and submitted together with the tender form).

**OF**

# PROPOSED EQUIPMENT AND SUPPLIERS

**ELECTRICAL ENGINEERS**
Name: Emzansi Consulting
Tel: (012) 345 3383
Contact Person: Aubrey Mackenzie

# GENERAL

The tenderer must list below any equipment and suppliers he/she intends to use to carry out part(s) of the Works.

The acceptance of this tender shall not be construed as being approval of all or any of the listed equipment or suppliers. Should any or all of the equipment and suppliers not be approved subsequent to the acceptance of the tender, it shall in no way invalidate this tender, and the tendered unit rates for the various items of work shall remain final and binding even in the event of the equipment or supplier not listed below being approved by the Employer.

| ITEM | MAKE OR TYPE | MANUFACTURER/SUPPLIER |
|---|---|---|
| PV Modules | | |
| Inverter | | |
| Combiner boxes | | |
| MCCB's & MCB's | | |
| Metal Work | | |
| PVC,BCEW, XLPE, Copper Clad Steel Conductors | | |

TENDERER'S NAME AND ADDRESS

.....
...

Signature of Tenderer/s

..... Authorised Signatory

.....

TEL NO. ..... DATE: .....

(To be completed by tenderers and submitted together with the tender form).

## PARTICULARS OF ELECTRICAL CONTRACTOR

| | | | |
|---|---|---|---|
| **Project Title:** | | | |
| **Tender no:** | | **Reference no:** | |

| | |
|---|---|
| **Name of Electrical contractor:** | |
| **Address:** | |
| **Electrical Contractor Registration number at the Electrical Contracting Board of SA Attach valid certificate** | |

| | | |
|---|---|---|
| | | |
| **Name of Tenderer** | **Signature of Tenderer/s Authorised Signatory** | **Date** |

## ELECTRICAL ENGINEERS

Name: Emzansi Consulting

Tel: (012) 345 3383

Contact Person: Aubrey Mackenzie

## (EC) CONTRACT DATA- (GCC (2004) 1st EDITION: 2004)

### CONTRACT DATA

| | |
|---|---|
| | **PART 1: DATA PROVIDED BY THE EMPLOYER** |
| | **CONDITIONS OF CONTRACT** |
| | The General Conditions of Contract for Construction Works (2004) [hereinafter referred to as GCC 2004], published by the South African Institution of Civil Engineering, is applicable to this Contract. |
| | **CONTRACT SPECIFIC DATA** |
| | The following contract specific data; amendments; additions; or omissions are applicable to this Contract. |
| **CLAUSES** | **Compulsory Data** |
| 1.1.14 | "Employer" means the TVET ORBIT College |
| 1.2.2 | The addresses of the Employer, where the Employer shall receive notices, are as follows:<br><br>Physical Address:<br>ORBIT TVET COLLEGE – RUSTENBURG CENTRAL OFFICE<br>Fatima Bhayat St, Rustenburg CBD,<br>0299<br><br>Postal Address:<br>ORBIT TVET COLLEGE<br>Private Bag X82096<br>RUSTENBURG,<br>0300 |
| 1.1.15 | The name of the Engineer is: ***EMZANSI CONSULTING ENGINEERS INLAND CC*** |
| 1.2.2 | The address of the Engineer, where the Engineer shall receive notices, are as follows:<br><br>Physical Address:<br>36 JOCHEM STREET<br>WATERKLOOF A/H<br>PRETORIA<br>0181 |

| | |
|---|---|
| | Postal Address:<br>P.O.BOX 2323<br>WINGATE PARK<br>0153<br><br>Telephone: 012 345 4583 |
| 1.1.21 | Not applicable to this Contract |
| 1.1.24 | Omit reference to “telex, telegram, cable, electronic communication” and “or any like communication” |
| 1.1.25 | Add the following Clause 1.1.25<br><br>**“Value of Works” means the value of Works certified by the Engineer as having been satisfactorily executed and shall include the value of the work done, the value of the materials and/or goods and Contract Price Adjustments.** |
| 1.1.26 | “Contract Sum” means the total of Prices provided for in the Agreement made in terms of the Form of Offer and Acceptance. |
| 1.1.27 | “Corrupt Practice” means the offering, giving, receiving, or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution. |
| 1.1.28 | “Fraudulent Practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of any tenderer and includes collusive practice among tenderers (prior to or after the tender submission) designed to establish tender prices at artificial non-competitive levels and to deprive the tenderer or the benefits of free and open competition. |
| 1.6 and 3.8 | The special non-working days are public holidays, Saturdays, and Sundays |

| | |
|---|---|
| 1.6 | The year end break commences on 16 December until the first working Monday of January of the succeeding year. |
| 2.3 | Clause 40.3 – amend to read as follows:<br><br>"…unless such instruction is in writing, duly approved by the Employer, states explicity…"<br><br>Clause 41.1 – amend to read as follows:<br><br>"... said performance has actually taken place and may be extended by the Employer at his discretion." |
| | |
| 7. | Replace the word "**GUARANTEE**" with the word "**SECURITY**" |
| 7.1 | Replace in its entirety with the following:<br><br>The Contractor shall deliver to the Employer within 5 days of the Commencement Date the form of security selected in the Contract Data and any expenditure incurred in doing so shall be borne by the Contractor. |
| 7.2 | Should the Contractor fail to select the security to be provided or should the Contractor fail to provide the Employer with the selected security within 5 days from the Commencement Date, it will be deemed that the Contractor has selected a security in the form of a retention of 10% of the Value of Works (excluding of VAT) |
| 9.1 | Replace in its entirety with the following:<br><br>The Employer will become the owner of the information, documents, advice, recommendation and reports collected, furnished and/or compiled by the Contractor during the course of, and for the purposes of executing this Contract, all of which will be handed over to the Employer on request, but in any event on the termination and/or cancellation of this Contract for whatever reason. The Contractor relinquishes its retention or any other rights to which it may be entitled. |

| | |
|---|---|
| 9.2 | Add the following as 9.2:<br><br>**The copyright of all documents, recommendations and reports compiled by the Contractor during the course of and for the purposes of finalising the Works will vest in the Employer, and may not be reproduced or distributed or made available to any person outside the Employer's service, or to any institution in any way, without the prior written consent of the Employer. The Employer shall have the right to use such material for any other purpose without the approval of, information or payment to the Contractor.** |
| 9.3 | Add the following as 9.3<br><br>The copyright of all electronic aids, software programmes etc. prepared or developed in terms of the Contract shall vest in the Employer, who shall have the right to use such material for any other purpose without the approval of, information or payment to the Contractor. |
| 9.4 | Add the following as 9.4<br><br>In case of the Contractor providing documents, electronic aids, software programmes or like material to the Employer, the development of which has not been at the expense of the Employer, copyright shall not vest in the Employer. The Contractor shall be required to indicate to which documents, electronic aids, software programmes or like material this provision applies. |
| 9.5 | Add the following as 9.5<br><br>The Contractor hereby indemnifies the Employer against any action, claim, damages or legal cost that may be instituted against the Employer on the grounds of an alleged infringement of any copyright or any other intellectual property right in connection with the Works outlined in this Contract. |
| 9.6 | Add the following as 9.6<br><br>All information, documents, recommendations, programmes and reports collected or compiled must be regarded as confidential and may not be communicated or made available to any person outside the Employer's service and may not be published either during the currency of this Contract or after termination thereof without the prior written consent of the Employer. |

| | |
|---|---|
| 10.1 | Replace with the following:<br><br>The Contractor shall, save as may be otherwise provided in the Contract or be legally or physically impossible, commence executing the Works within 5 days calculated from the date the Contractor is given access to and possession of the Site in terms of Clause 11. |
| 11.1.1 | Replace the words “On the Commencement Date” with the words “Within 5 days of the Contractor submitting to the Engineer an acceptable health and safety plan required in terms of the Occupational Health and Safety Act, 1993 (Act 85 of 1993)” |
| 12.2 | The Contractor shall deliver his programme of work within 5 days from date of Site hand-over. |
| 12.3.3 | Amend as follows:<br><br>“Rates of progress for the various parts of the Works taking account, inter alia, of design, procurement, construction, testing, time risk, float, and any other necessary and relevant facts; and” |
| 26.2 | Replace the words “within a reasonable time” with the words “within the time period stipulated by the Engineer in such order…” |
| 28.1 | Add the following at the end thereof<br><br>Such losses or damages may be recovered from the Contractor or by deducting the same from any amounts still due under this Contract or under any other contract presently or hereafter existing between the Employer and the Contractor and for this purpose all these contracts shall be considered one indivisible whole. |
| 35 | Replace in its entirety with the following:<br><br>Unless otherwise stated adequate insurance is the responsibility of the Contractor. The Contractor shall submit the insurance policy to the Employer for approval, if so requested. |
| 35.1 | **Damage to the Works**<br><br>(a) Without in any way limiting the Contractor’s obligations in terms of the Contract, the Contractor shall bear the full risk of damage to and/or destruction of the Works by whatever cause during construction of the Works and hereby indemnifies and holds harmless the Employer against any such damage. The Contractor shall take such precautions and |

| | |
|---|---|
| 35.2 | security measures and other steps for the protection and security of the Works as he may deem necessary.<br><br>(b) The Contractor shall at all times proceed immediately to remove or dispose of any debris arising from damage to or destruction of the Works and to rebuild, restore, replace and/or repair the Works.<br><br>(c) The Employer shall carry the risk of damage to or destruction of the Works and material paid for by the Employer that is the result, whether direct or indirect or proximate or remote, of the excepted risks as set out in Clause 35.2.<br><br>(d) Where the Employer bears the risk in terms of this Contract, the Contractor shall, if requested to do so, reinstate any damage or destroyed portions of the Works and the costs of such reinstatement shall be measured and valued in terms of Clause 44 hereof.<br><br>Injury to Persons or loss of or damage to Properties<br>(a) The Contractor shall be liable for and hereby indemnifies the Employer against any liability, loss, claim or proceeding whether arising in common law or by Statute, consequent upon personal injuries to or the death of any person whomsoever arising out of or in the course of or caused by the execution of the Works unless due to any act or neglect of any person for whose actions the Employer is legally liable. |
| | (b) The Contractor shall be liable for and hereby indemnifies the Employer against any liability, loss, claim or proceeding consequent upon loss of or damage to any moveable, or immovable or personal property or property contiguous to the Site, whether belonging to or under the control of the Employer or any other body or person, arising out of or in the course of or by reason of the execution of the Works unless due to any act or neglect of any person for whose actions the Employer is legally liable.<br><br>The Contractor shall upon receiving an Order in Writing from the Engineer cause the same to be made good in a perfect and workmanlike manner at his own cost and in default thereof the Employer shall be entitled to cause it to be made good and to recover the cost thereof from the Contractor or to deduct the same from amounts due to the Contractor as stated in Sub-Clause 53 (4) hereof.<br><br>(c) The Contractor shall be responsible for the protection and safety of such portions of the premises placed under his control by the Employer for the purpose of executing the Works until the issue of the Certificate of Completion.<br><br>(d) Where the execution of the Works involves the risk of removal of or interference with support to adjoining properties including land or structures or any structures to be altered or added to, the Contractor, shall and will remain adequately insured or insured against the death of or injury to persons or damage to such property consequent on such removal or interference with support until such portion of the Works has been completed. |

| | |
|---|---|
| | (e) The Contractor shall at all times proceed immediately at his own cost to remove or dispose of any debris and to rebuild, restore, replace and/or repair such property and to execute the Works. |
| 35 (A) | **HIGH RISK INSURANCE**<br><br>In the event of the project being executed in a geological area classified as a "High Risk Area", that is an area which is subject to highly unstable subsurface conditions that might result in catastrophic ground movement evident by sinkhole or do line formation the following will apply:<br><br>(1) **Damage to the Works**<br><br>The Contractor shall, from the Commencement Date of the Works until the date of the Certificate of Completion, bear the full risk of and hereby indemnifies and holds harmless the Employer against any damage to and/or destruction of the Works consequent upon a catastrophic ground movement as mentioned above. The Contractor shall take such precautions and security measures and other steps for the protection of the Works as he may deem necessary.<br><br>When instructed to do so by the Engineer, the Contractor shall proceed immediately to remove and/or dispose of any debris arising from damage to or destruction of the Works and to rebuild, restore, replace and/or repair the Works, at the Contractor's own costs. |
| | (2) **Injury to Persons or Loss of or damage to Properties**<br><br>The Contractor shall be liable for and hereby indemnifies and holds harmless the Employer against any liability, loss, claim or proceeding arising at any time during the Contract Period whether arising in common law or by Statute, consequent upon personal injuries to or the death of any person whomsoever resulting from, arising out of or caused by a catastrophic ground movement as mentioned above.<br><br>The Contractor shall be liable for and hereby indemnifies the Employer against any and all liability, loss, claim or proceeding consequent upon loss of or damage to any moveable, or immovable or personal property or |

| | |
|---|---|
| | property contiguous to the Site, whether belonging to or under the control of the Employer or any other body or person whomsoever arising out of or caused by a catastrophic ground movement, as mentioned above, which occurred during the Contract Period.<br><br>(3) It is the responsibility of the Contractor to ensure that he has adequate insurance to cover his risk and liability as mentioned in Clauses 35 (A) (1) and 35 (A) (2) above. Without limiting the Contractor's obligations in terms of the Contract, the Contractor shall, within 21 days of the Commencement Date but before commencement of the Works, submit to the Employer proof of such insurance policy, if requested to do so.<br><br>(4) The Employer shall be entitled to recover any and all losses and/or damages of whatever nature suffered or incurred consequent upon the Contractor's default of his obligations as set out in Clauses 35 (A) (1), 35 (A) (2) and (3). Such losses or damages may be recovered from the Contractor or by deducting the same from any amounts still due under this Contract or under any other contract presently or hereafter existing between the Employer and the Contractor and for this purpose all these contracts shall be considered one indivisible whole. |
| 37.2.2.3 | The maximum percentage allowance to cover the overhead charges is 10%, |
| 40.2 | Add the following to the end of the second paragraph:<br><br>"which costs may be deducted from any payments due to the Contractor in terms of the Contract or any other Contract, now or in the future, existing between the Employer and the Contractor and for this purpose all these contracts shall be considered one indivisible whole." |

| | |
|---|---|
| 42.1 | The Works shall be completed within:<br><br>*3 months at a rate of R1,375.0*<br><br>Or, if completion in portions is required,<br><br>The Works shall be completed for the portions as set out in the Scope of Works for the different portions as follows:<br><br>Portion 1:<br>Mankwe Solar PV Plant – 3 months<br><br>Portion 2:<br>Rustenburg Solar PV Plant – 3 months<br><br>Portion 3:<br>Rustenburg LV Reticulation – 3 months<br><br>Portion 4:<br>Mankwe interconnection delayed start and 2 weeks duration |
| 43.1 | The penalty for failing to complete the Works is R500 per day.<br><br>Or, if the completion in portions is required,<br><br>The penalty for failing to complete:<br><br>Portion 1 of the Works is R ***850.00*** per day<br><br>Portion 2 of the Works is R ***1,050.00*** per day<br><br>Portion 3 of the Works is R ***425.00*** per day<br><br>Portion 4 of the Works is R ***100.00*** per day |

| | |
|---|---|
| 46.2 | Contract Price Adjustment (CPA) will be applicable **Yes** ☐ **No** ☒<br><br>If CPA is applicable, the value of the payment certificates is to be adjusted in accordance with the Contract Price Adjustment Schedule, where:<br><br>The value of "x" is 0.15<br><br>The values of the coefficients are:<br>a= 0.25 (labour)<br>b= 0.3 (contractor's equipment)<br>c= 0.3 (material)<br>d= 0.15 (fuel)<br><br>The values of the coefficients for this contract is:<br>a= 0.35 (labour)<br>b= 0.20 (contractor's equipment)<br>c= 0.35 (material)<br>d= 0.10 (fuel)<br><br>The urban area nearest the Site is ***N/A***<br><br>The base month is ***the month prior to the closing of the tender*** |
| 46.3 | Price adjustments for variations in the costs of special materials are allowed on the following:<br><br>***N/A***<br><br>The basis for price adjustment of special materials is as follows:<br><br>***N/A*** |

| | |
|---|---|
| 47.5 | Add the following Clause 47.5<br><br>If during the time for completion of the Works or any extension thereof abnormal rainfall or wet conditions occurs, then the formula below shall be used to calculate separately the delay for each calendar month or part thereof. It shall be calculated each month during the period referred to in Clause 42.1 as the time for the completion of the Works and any extension time in accordance with Clause 42 that may have been granted by the Employer, or until the issue date of the certificate of practical completion, whichever is the shorter period. The delay calculated for a given month shall be used to determine the interim extension of time granted for the month. At the end of the applicable period referred to above, the aggregate of the monthly delays will be taken into account for the final determination of the total extension of time for the Contract:<br><br>$V = (Nw - Nn) + \frac{(Rw - Rn)}{X}$<br><br>If any value of V is negative and its absolute value exceeds Nn, then V shall be taken as equal to minus Nn.<br><br>The delay for a part of a month shall be calculated by substituting pro-rata values for the variables in the equation. |
| | The symbols shall have the following meanings:<br><br>V = Delays due to rain in calendar days in respect of the calendar month under consideration.<br><br>Nw = Actual number of days during the calendar month on which a rainfall of Y mm or more per day has been recorded<br><br>Rw = Actual rainfall in mm for the calendar month under consideration.<br><br>Nn = Average number of days in the relevant calendar month (as derived from existing rainfall records provided in the project specifications) on which a rainfall of Y mm or more per day has been recorded.<br><br>Rn = Average rainfall in mm for the calendar month, as derived from the rainfall records supplied in the project specifications. |

| | |
|---|---|
| | X = 20, unless otherwise provided in the project specifications.<br><br>Y = 10, unless otherwise provided in the project specifications.<br><br>The total delay that will be taken into account for the determination of the total extension of time for the Contract shall be the algebraic sum of the monthly totals for the period under consideration. But if the grand total is negative, the time for completion shall not be reduced on account of abnormal rainfall. The total extension of time for any calendar month shall not exceed (Nc – Nn) calendar days, where Nc = number of days calendar days in the month under consideration<br><br>The factor (Nw – Nn) shall be considered to represent a fair allowance for variations from the average number of days during which rainfall equals or exceeds Y mm per day.<br><br>The factor (Rw – Rn) ÷ X shall be considered to represent a fair allowance for variations from the average for the number of days during which rainfall does not equal or exceed Y mm per day, but when wet conditions prevent or disrupt work.<br><br>This formula does not take into account any flood damage, which could cause further or concurrent delays and which should be treated separately in so far as extension of time is concerned.<br><br>Accurate rain gaugings shall be taken at a suitable point on the site daily at 08:00 unless otherwise agreed to by the engineer, and the Contractor shall, at his own expense, take all necessary precautions to ensure that the rain gauges cannot be interfered with by unauthorized persons.<br><br>Information regarding existing rainfall records, if available from a suitable rainfall station near the site, will be supplied in the project specifications, together with calculations of rain delays for previous years in accordance with the above formula. The average of these delays will be regarded as normal rain delays which the Contractor shall accommodate in his programme, and for which no extension of time will be considered. |
| 48.3.4 | Replace the word “conclusive” with the words “prima facie” |
| 48.3.6 | Delete |

| | |
|---|---|
| 48.6 | Add the following Clause 48.6<br><br>"If the Employer fails to give his ruling within the period referred to in Clause 48.5, he shall be deemed to have given a ruling dismissing the claim." |
| 49.1.2 | Replace the word "Schedule" with the word "Bill" |
| 49.1.5 | The percentage advance on materials not yet built into the Permanent Works is 85%<br><br>Provided that the Contractor has either produced to the satisfaction of the Engineer documentary evidence of ownership of such materials or has delivered to the Employer an indemnity in a form acceptable to the Employer against any claim to or in respect of such materials by reason of the Contractor's sequestration or liquidation or of any defect in the Contractor's title to the materials |
| 49.3 | Replace with the following:<br><br>Payment of the amounts referred to in Clause 49.1.1, 49.1.2, 49.1.3 and 49.1.4 shall, save to the extent otherwise provided in Clause 49.6, be subject to a retention, if applicable in terms of clause 7.1, by the Employer of an amount (herein after called the "retention money"), being the percentage, stated in Part 2 of the Contract Data of the said amounts due to the Contractor. |
| 49.5 | Replace Clause 49.5 with the following<br><br>In respect of this contract where the Contractor elects a security by means of a 10% retention of the Value of the Works (excl. VAT), 50% of the retention shall be released to the Contractor when the Engineer issues the last Certificate of Completion in terms of clause 51.4. The remaining 50% of the retention shall be released in accordance with the provisions of the conditions of contract and will become due and payable within 14 days of the issue of the last Final Approval Certificate. |
| 49.6 | A Retention Money Guarantee is not permitted. |
| 49.7.2 | Replace the words "prime overdraft rate certified by the Contractor's banker" with the words "interest rate as determined by the Minister of Finance, from time to time, in terms of section 80(1)(b) of the Public Finance Management Act, 1999 (Act No. 1 of 1999), will apply" |

| | |
|---|---|
| 49.11 | Add Clause 49.11 as follows:<br><br>In respect of any amount owed by the Contractor to the Employer, the Contractor shall pay the Employer interest at the rate as determined by the Minister of Finance, from time to time, in terms of section 80(1)(b) of the Public Finance Management Act, 1999 (Act No. 1 of 1999), will apply |
| 50. | Amend the percentage from 15 per cent to 25 per cent in the title, the Clause and in the sideline comment. |
| 52.2 | Amend as follows:<br><br>"…of the Contract or any part thereof, nor of the accuracy of any claim made by the Contractor, nor shall any other certificate exclude …powers of the Engineer and/or the Employer" |
| 53.1 | The Defects Liability Period is 3 months for General Building Rehabilitation and 12 months for new electrical and mechanical equipment. |
| 55.1.10 | Add Clause 55.1.10 as follows:<br><br>"Has engaged in Corrupt or Fraudulent Practices in competing for or in executing the Contract, |
| 56.2.2 | Delete the following words<br><br>"without prejudice to his lien on the Employer's property" |
| 56.3 | Add the following at the end<br><br>After cancellation of the Contract by the Contractor, the Contractor, when requested by the Employer to do so, shall not be entitled to refuse to withdraw from the Works on the grounds of any lien or a right of retention or on the grounds of any right whatsoever. |
| 58.1.3 | Amend as follows:<br><br>"… and the Engineer or Employer, as applicable, or by the Mediator's opinion to the extent that it has become binding in terms of Clause 58.2.6 |

| | |
|---|---|
| 58.2 | Dispute resolution is to be by means of mediation. |
| 58.4 | Disputes are to be referred for final settlement to litigation. |
| 59 | Add the following Clause 59<br><br>“No amendments of this Contract or of any provisions or terms hereof and no waiver or relaxation or suspension of any of the provisions or terms of this Contract shall be of any force or effect unless reduced to writing and signed by both the parties hereto.” |
| | **PART 2: DATA PROVIDED BY THE CONTRACTOR** |
| 1.8 | The name of the Contractor is<br><br>……..……..……<br>(insert the legal name of the Contractor, as well as the Contractor’s registration number, if applicable) |

| | |
|---|---|
| 1.2.2 | The addresses of the Contractor, where the Contractor shall receive notices, are as follows:<br><br>Physical Address:<br>_____<br>_____<br>_____<br><br>Postal Address:<br>_____<br>_____<br>_____<br><br>Facsimile: _____ Telephone:<br>_____ |
| 7.1 | The security to be provided by the Contractor:<br><br>(a) in respect of contracts up to R1 million, the security to be submitted by the Contractor to the Employer will be a retention of 5% of the Value of Works (excluding VAT)<br>(b) in respect of contracts above R1 million, the Contractor will provide, as security, one of the following:<br><br>(1) cash deposit of 10 % of the Contract Sum (excluding VAT)<br><br>variable construction guarantee of 10 % of the Contract Sum (excluding VAT)<br><br>(2) retention of 10% of the Value of Works (excluding VAT)<br><br>(3) cash deposit of 5% of the Contract Sum (excluding. VAT) and a retention of 5% of the Value of Works (excluding. VAT)<br><br>(4) fixed construction guarantee of 5% of the Contract Sum (excluding VAT) and a retention of 5% of the Value of Works (excluding VAT) within 5 days of award of contract<br><br>NB. Guarantees submitted must be issued by either an insurance company duly registered in terms of the Short-Term Insurance Act, 1998 (Act 35 of 1998) or by a bank duly registered in terms of the Banks Act, 1990 (Act 94 of 1990) on the pro-forma referred to above. No alterations or amendments of the wording of the pro-forma will be accepted. |

## PART 7: CONDITIONS FOR COMPLETING BID DOCUMENTS.

**If any of the following bid forms are not completed and signed or not handed in with your proposal on closing date and time, your proposal will be immediately disqualified.**

7.1. SBD 1 – Part 13: Invitation to bid (make sure it is signed)

7.2. SBD 3 – Part 15: Pricing Schedule - if not filled please refer to Annexure or Addendum where price is mentioned.

7.3. SBD 4 – Part 16: Declaration of interest, ensure that it signed

7.4. SBD 6.1 – Part 17: (Preferential Claim Form) must be signed regardless of if points claimed or not ensure that it is signed.

## PART 8: SPECIAL TERMS & CONDITIONS

8.1. It is expected that the appointed bidders must be able to deliver the goods within 30 DAYS from the day of the tender awarded and complete the project within 90 DAYS.

8.2. The service provider must clearly demonstrate the capacity to procure and deliver the items for which they are bidding.

8.3. ORBIT TVET College reserve the right to ask for documentation to prove financial capacity of the bidder.

8.4. Deregistering and blacklisted companies including directors/owners/individuals linked to the company, will not be considered

8.5. Counteroffer by service providers shall not be considered and shall therefore nullify the offer to the company.

8.6. ORBIT TVET College reserve the right to amend the specification before the closing date of the bid or to award the whole or part of the bid to one or more service provider or to cancel the bid in the whole, as well as to adjust the quantities before the financial award is made.

8.7. No Email will be accepted for submission.

8.8. Any means of attempting to influence adjudication process or outcome of adjudication process will result in immediate disqualification of the entire bid

8.9. Enquires should be made in writing.

8.10. All bid submissions must be done in hard copy.

8.11. Delivery of the goods and performance of services shall be made by the supplier in accordance with the time schedule prescribed by the purchaser in the contract.

**Note: Blacklisted companies appearing on the national treasury database are prohibited from conducting business with public entities and will be disqualified.**

# PART 9: STATUTORY NON-TECHNICAL MANDATORY REQUIREMENTS

9.1. Certified CIPC Registration Documentation.

9.2. CSD Report

9.3. Valid TAX COMPLIANCE STATUS Certificate with **PIN.**

9.4. Valid Letter of Good standing with Compensation for Occupational and Injuries Diseases Act (COIDA) Registration Certificate (Sole Proprietor's without employees are expected to submit from the DOL a Tender Letter for a Sole Proprietor).

9.5. **CIDB Grading 3EB PE AND 4EB OR HIGHER.**

9.6. Valid Certified B-BBEE / Sworn Affidavit Certificate (**to qualify for preference points**) on condition that you confirm by completing **SDB 6.1 (Part 17)**.

9.7. Valid proof of business address (**Lease Agreement or Municipal Account).**

9.8. Financial Credibility / bank rating

9.9. Priced Financial Proposal (Bill of Quantities) – Part 22 - fully completed and signed

9.10. Confirmation of Receipt of Addenda to Bid Document. (if applicable)

9.11. Valid Certified copies of the directors' identity document.

9.12. Joint Venture Agreement or Consortium Agreement (if applicable) – Part 20

9.13. Company profile

9.14. Reference letters and/or completion certificates indicating experience in similar projects

9.15. Curriculum Vitae indicating Qualifications and experience

9.16. Plant and Equipment asset register

## PART 10: EVALUATION ON FUNCTIONALITY

**NB: SHOULD YOU FAIL TO SCORE A MINIMUM OF 60 POINTS AND SUBMIT THE BELOW MENTIONED DOCUMENTS ON THE CLOSING DATE YOUR TENDER WILL BE DISQUALIFIED.**

**Table 2. Functionality Criteria**
**Note: No bid will be considered unless 60 points has been achieved for functionality**

| Item | Functionality | | Points |
|---|---|---|---|
| 1 | **Company Experience and Track Record:** Provide project experience demonstrating capability and technical know-how in carrying out works of **similar nature and size.**<br><br>The bidder must submit Proof or previous experience and performance on comparable or similar projects. Bidder to submit completion certificate or appointment letter from the client with contactable references.<br><br>A sliding scale of 5 points **per project** of a similar nature will be used to award points. | | 30 |
| 2 | **Health and Safety:** | | 10 |
| | Qualifications and CV of SHE Officer | 5 Points | |
| | Health and Safety Plan | 5 points | |
| | Indicate number of years of experience<br><br>1 Point will be awarded per year post registration with statutory body. | | |
| 3 | **Key staff experience and capabilities in the Construction Industry (not less than 5 years' experience):** | | 35 |
| | Project Manager / Foreman – qualifications and experience in years.<br><br>Minimum 5 years' experience post registration | 25 points | |
| | | | |
| | Artisans – qualifications and experience in years<br><br>Minimum of 5 years' experience | 5 points | |
| | | | |
| | Electrician – provide qualifications and experience in years **(must be registered with ECB or Department of Labour)**<br><br>Minimum of 5 years' experience post registration | 5 points | |

| | | | |
|---|---|---|---|
| 4 | **Financial Credibility** | | 5 |
| | Provide bank rating/code from a banking institution to justify bank risk:<br><br>1. Bank rating of E 1 Point<br>2. Bank rating of D 2 Points<br>3. Bank rating of C 3 Points<br>4. Bank rating of B 4 Points<br>5. Bank rating of A 5 Points | 5 points | |
| 5 | **Locality** | | 15 |
| | Bojanala District Municipality | 15 points | |
| | Within Northwest Province | 10 points | |
| | Other provinces | 5 points | |
| 6 | **Plant and Equipment:** Contractor to provide an asset register for plant and equipment to indicate the ratio between owned and leased plant for the project. | | 5 |
| Total Points | | | **100** |

## EVALUATION CRITERIA AND METHODOLOGY

### 1. ADMINISTRATIVE COMPLIANCE REQUIREMENTS

**Mandatory Returnable documents**

**(NOTE: Failure to provide the below listed documents *WILL* lead to disqualification)**

| 1. Proof of Attendance of Compulsory Briefing session. | **Comply** | **Do Not Comply** |
|---|---|---|
| | | |
| **Substantiation: The bidder is to indicate whether they have attended the Compulsory Briefing session.** | | |

### 1.1 Essential Returnable documents

**(NOTE: Failure to provide the below listed documents *MAY* lead to disqualification)**

| 2. Fully completed and signed Bidder's Disclosure SBD 4 | **Comply** | **Do Not Comply** |
|---|---|---|
| | | |
| **Substantiation: The bidder must submit and attach to the bid response the signed Bidder's Disclosure`** | | |

| 3. The Service Providers to have to agree with General Conditions of Contract | **Comply** | **Do Not Comply** |
|---|---|---|
| | | |
| **Substantiation: The bidder must submit and attach to the bid response the signed and accepted General Conditions of Contract from National Treasury** | | |

| 4. Preferential Procurement Claim form and copy of the B-BBEE Verification Certificate(s) issued by an authorised body or person or a sworn affidavit prescribed by the B-BBEE Codes of Good Practice. | **Comply** | **Do Not Comply** |
|---|---|---|
| | | |
| **Substantiation: The bidder must submit and attach to the bid response a copy of a valid BBBEE certificate or Sworn Affidavit** | | |

| 5. Submission of original valid Tax Clearance Certificate, a Tax Compliance Status letter (with pin) issued by the South African Revenue Services | **Comply** | **Do Not Comply** |
|---|---|---|
| | | |
| **Substantiation: The bidder must submit and attach to the bid response a copy of a valid certificate or Tax Pin Certificate** | | |

## 1.2 TECHNICAL SUITABILITY: MANDATORY REQUIREMENTS

***Failure to provide the below required information will lead to disqualification***

### *1. Technical Suitability: Mandatory Requirements*

| | | |
|---|---|---|
| Bidders must provide details and registration confirmation with CIDB in terms of the CIDB Act 38 of 2000. Provide proof of grading level **3EB PE AND 4EB OR HIGHER. (as appears on the bid document.** | **Comply** | **Do Not Comply** |
| **Substantiation:** The bidder must provide a proof of CIDB grading level. Failure to provide information will lead to disqualification. | | |

### *2. Technical Suitability: Mandatory Requirements*

| | | |
|---|---|---|
| Bidders must provide at least **three (3) references for a similar project ( project value should be at least R2000 000.00 or above)** not older than 6 years.<br>Bidder must provide proof:<br><br>a). Three (3) copies of completion certificate OR three (3) reference letters for a similar project **(in details of the company letterhead, physical address, contactable person name, company contact number and email address).** | **Comply** | **Do Not Comply** |
| **Substantiation:** The bidder must provide a proof of at least three (3) copies of completion certificates indicating the amongst others the value of the project or at least three (3) reference letters for similar project completed (in details of the company letterhead, physical address, contactable person name, company contact number and email address). Failure to provide information will lead to disqualification. | | |

### *3. Technical Suitability: Mandatory Requirements*

| | | |
|---|---|---|
| The bidder must provide a wireman's licence certificate of the Electrician in your organisation or subcontractor to issue an electrical COC ( certificate of compliance | **Comply** | **Do Not Comply** |
| **Substantiation:** The bidder must provide **a proof of wiremen's licence certificate**. Failure to provide information will lead to disqualification. | | |

### *4. Technical Suitability: Mandatory Requirements*

| | | |
|---|---|---|
| The Project Manager/ Coordinator must be registered with the relevant professional body | **Comply** | **Do Not Comply** |
| **Substantiation:** The bidder must provide **a proof of valid certified certificate from the professional body**. Failure to provide information will lead to disqualification. | | |

# SUPPLY AND INSTALLATION OF A SOLAR PV PLANT AT ORBIT TVET COLLEGE –, MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE

## FORMS TO BE COMPLETED BY THE TENDERER

**CONTENTS**

## 1. LIST OF SUBCONTRACTORS

The Tenderer shall list below the intended subcontractors to be employed by the Tenderer for the various installations listed in this document.

| ITEM | SUBCONTRACTOR'S COMPANY DETAILS | SUBCONTRACTOR'S RESPONSIBILITY | TEL NO<br>FAX NO<br>E-MAIL ADDRESS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

SIGNED ON BEHALF OF TENDERER : .....

## 2 SCHEDULE OF WORK CARRIED OUT BY TENDERER

The Tenderer shall list below the last ten contracts of a similar nature awarded to him. This information is material to the award of the Contract.

| EMPLOYER<br><br>(NAME, TEL NO AND FAX NO) | CONSULTING ENGINEER<br><br>(NAME, TEL NO AND FAX NO) | NATURE OF WORK | VALUE OF WORK | YEAR COM-PLETED |
|---|---|---|---|---|
| | | | | |

SIGNED ON BEHALF OF TENDERER : .....

TVET COLLEGE

# SUPPLY AND INSTALLATION OF A SOLAR PV PLANT AT ORBIT TVET COLLEGE –, MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE

## 3 AUTHORITY FOR SIGNATORY

Signatories for close corporations and companies shall confirm their authority by attaching to this form a duly signed and dated copy of the relevant resolution of their members or their board of directors, as the case may be.

An example for a company is shown below:

"By resolution of the board of directors passed on ..... 20 .....

Mr .....

has been duly authorised to sign all documents in connection with the Tender for Contract No ..... and any Contract which may arise therefrom on behalf of

(BLOCK CAPITALS) .....

.....

.....

SIGNED ON BEHALF OF THE COMPANY : .....

IN HIS CAPACITY AS : .....

DATE : .....

SIGNATURE OF SIGNATORY : .....

AS WITNESSES : 1.....

2..... "

# 4 ADDITIONAL PARTICULARS OF TENDERER

**1. PARTICULARS OF SURETIES**

Since I/we propose to furnish two sureties as security, the following particulars are provided:

1.1 Name of surety……..

Address of surety……..

……Code:……

Banker of surety……

Branch……Tel:……..

1.2 Name of surety……..

Address of surety……..

……Code:……

Banker of surety……

Branch……Tel:……..

**2. BRIDGING FINANCE**

I/we supply the following details on the availability of bridging finance on Tender No……

Name of Bank/Financial Institution…… ….Branch:……...Tel:……

Bridging finance available from Bank/Financial Institution: R……..

**3. PARTICULARS OF COMPANIES**

If the tenderer is a company, a certified copy of the resolution of the board of directors (personally signed by the chairman of the board) authorising the person who signs this tender to do so, as well as to sign any contract resulting from this tender and any other documents and correspondence in connection with this tender and/or contract on behalf of the company, must be submitted with this tender.

**4. PARTICULARS OF THE CLOSED CORPORATION**

If the tenderer is a Close Corporation, certified copies of the founding statement and/or the association agreement must be submitted with the tender.

We, the undersigned members in the Closed Corporation who are dealing as:……

……..

……..

Name of members……

Hereby authorise……

to sign this tender as well as any contract resulting from the tender and any other documents and correspondence in connection with this tender and/or contract on our behalf.
*If there are more than four members, please attach the details on a separate page.*

| Full name of member | Residential address | Signature |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

SIGNATURE…….. DATE…….

**5. PARTICULARS OF THE PARTNERSHIP**

We, the undersigned partners in the business trading as:

……

hereby authorise……
to sign this tender as well as any contract resulting from the tender and any other documents and correspondence in connection with this tender and/or contract on our behalf.
*If there are more than four members, please attach the details on a separate page.*

| Full name of member | Residential address | Signature |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

SIGNATURE…… DATE…….

**6. PARTICULARS OF THE JOINT VENTURE**

We, the undersigned partners to the Joint Venture, having tendered as ……Joint Venture.

……..

hereby authorise……
to sign this tender as well as any contract resulting from the tender and any other documents and correspondence in connection with this tender and/or contract on our behalf.
*If there are more than four members, please attach the details on a separate page.*

| Full name of JV member | Residential address | Signature |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

**SIGNATURE…….. DATE…….**

NOTE:

Please include the following statements / proof of registration in respect of each individual member to the Joint Venture where such entities are closed corporations or registered companies. Resolutions authorising the nominated representative of the Joint Venture to sign tender / contract documentation must also be submitted.

**7. PARTICULARS OF THE ONE-MAN BUSINESS**

I, the undersigned……..

hereby confirm that I am the sole owner of the business trading as:……

SIGNATURE…….. DATE……..

**8. WORK CAPACITY**

8.1 The tenderer is requested to furnish the following particulars. Failure to do so may result in the tender being disregarded.

A.. Skilled artisans employed

| Categories of artisans | Number |
|---|---|
| | |
| | |
| | |
| | |
| | |

B Unskilled employees employed

| Categories of employees | Number |
|---|---|
| | |
| | |
| | |
| | |
| | |

8.2 Give full particulars of:

| Machinery | Plant | Workshops |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

8.3 Particulars of commitments which the tenderer is at present engaged with: Date of completion / Expected date of completion (Complete applicable blocks A & B).

A. STATE INSTITUTIONS

| | Project | Place | Client | Contact Tel. No. | Contract amount | Contract period | Date of commencement | Expected date of completion | Date of completion |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |

B. PRIVATE SECTOR

| Project | | Place | Client | Contact Tel No. | Contract amount | Contract period | Date of commencement | Expected date of completion | Date of completion |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |

SIGNATURE…… DATE……..

## THE ORBIT TVET COLLEGE

## 5. PARTICULARS OF ELECTRICAL CONTRACTOR

TENDER NO: _____ REFERENCE: _____

SERVICE: _____

NAME OF ELECTRICAL CONTRACTOR: _____

ADDRESS: _____

_____

ELECTRICAL CONTRACTOR'S REGISTRATION NUMBER AT THE ELECTRICAL CONTRACTING BOARD OF SA _____

_____ _____

DATE SIGNATURE OF TENDERER

## 6. RECORD OF ADDENDA TO TENDER DOCUMENTS

| | | | |
|---|---|---|---|
| **Project title:** | | | |
| **Tender no:** | | **Reference no:** | |

1. I / We confirm that the following communications received before the submission of this tender offer, amending the tender documents, have been taken into account in this tender offer: *(Attach additional pages if more space is required)*

| | **Date** | **Title or Details** |
|---|---|---|
| **1.** | | |
| **2.** | | |
| **3.** | | |
| **4.** | | |
| **5.** | | |
| **6.** | | |

| | | |
|---|---|---|
| | | |
| Name of Tenderer | Signature | Date |

2. I / We confirm that no communications were received before the submission of this tender offer, amending the tender documents.

| | | |
|---|---|---|
| | | |
| Name of Tenderer | Signature | Date |

## PART 11:PROPER CERTIFICATION OF DOCUMENTS MEANS

11.1. A copy of the original document must be certified with an original certification stamp.

11.2. No certified copies of copies will be accepted

11.3. Certification must be dated, and the date must not be older than three months.

## PART 12:PRICE AND PREFERENTIAL PROCUREMENT

12.1. The tender will be evaluated on an 80/20 basis, where 80 points will be assigned for the lowest price and the 20 points based on the Preferential Procurement Status Level Certificates.

12.2. ORBIT TVET College applies the provision of the Preferential Procurement Policy Framework Act, no 5 of 2000 and Preferential Procurement Regulations, 2017.

12.3. The evaluation of 80/20 for Price and BBBEE shall be as follows:

| EVALUATION CRITERIA | | POINTS |
|---|---|---|
| 1. | Price | 80 |
| 2. | Black Economic Empowerment | 10 |
| 3. | Specific Goals | 10 |
| 4. | Total | 100 |

# PART 13: INVITATION TO BID FORM

| **YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE (*NAME OF DEPARTMENT/ PUBLIC ENTITY*)** | | | | | |
|---|---|---|---|---|---|
| BID NUMBER: | **M02/2023** | CLOSING DATE: **22-08-2023** | | CLOSING TIME: | **11H00am** |
| DESCRIPTION | **SUPPLY AND INSTALLATION OF A SOLAR PV PLANT AT ORBIT TVET COLLEGE – MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE** | | | | |
| **BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX SITUATED AT *(STREET ADDRESS)*** | | | | | |
| ORBIT TVET COLLEGE – CENTRAL OFFICE | | | | | |
| CNR FATIMA BHAYAT & BOSCH STREET | | | | | |
| SECURITY GATE INSIDE THE TENDER BOX (NOT AT THE RECEPTION) | | | | | |
| RUSTENBURG, 0299 | | | | | |

| **BIDDING PROCEDURE ENQUIRIES MAY BE DIRECTED TO** | | **TECHNICAL ENQUIRIES MAY BE DIRECTED TO:** | |
|---|---|---|---|
| CONTACT PERSON | **Mr C Chaauke** | CONTACT PERSON | **Mr A Mackenzie** |
| TELEPHONE NUMBER | **014 597 5524** | TELEPHONE NUMBER | **012 345 3383** |
| FACSIMILE NUMBER | **N/A** | FACSIMILE NUMBER | **N/A** |
| E-MAIL ADDRESS | **cchaauke@orbitcollege.co.za** | E-MAIL ADDRESS | **aubrey@emzansi.com** |

| **SUPPLIER INFORMATION** | | | | | |
|---|---|---|---|---|---|
| NAME OF BIDDER | | | | | |
| POSTAL ADDRESS | | | | | |
| STREET ADDRESS | | | | | |
| TELEPHONE NUMBER | CODE | | NUMBER | | |
| CELLPHONE NUMBER | | | | | |
| FACSIMILE NUMBER | CODE | | NUMBER | | |
| E-MAIL ADDRESS | | | | | |
| VAT REGISTRATION NUMBER | | | | | |
| SUPPLIER COMPLIANCE STATUS | TAX COMPLIANCE SYSTEM PIN: | | **OR** | CENTRAL SUPPLIER DATABASE No: | MAAA |

| B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE | TICK APPLICABLE BOX] | B-BBEE STATUS LEVEL SWORN AFFIDAVIT | [TICK APPLICABLE BOX] |
|---|---|---|---|
| | ☐ Yes ☐ No | | ☐ Yes ☐ No |

***[A B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE/ SWORN AFFIDAVIT (FOR EMES & QSEs) MUST BE SUBMITTED IN***

| ***ORDER TO QUALIFY FOR PREFERENCE POINTS FOR B-BBEE]*** | | | |
|---|---|---|---|
| *ARE YOU THE ACCREDITED REPRESENTATIVE IN SOUTH AFRICA FOR THE GOODS /SERVICES /WORKS OFFERED?* | ☐Yes ☐No<br>[IF YES ENCLOSE PROOF] | *ARE YOU A FOREIGN BASED SUPPLIER FOR **THE GOODS /SERVICES /WORKS OFFERED?*** | ☐ Yes ☐ No<br>[IF YES, ANSWER THE QUESTIONNAIRE BELOW] |

| **QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS** | |
|---|---|
| IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)? | ☐ YES ☐ NO |
| DOES THE ENTITY HAVE A BRANCH IN THE RSA? | ☐ YES ☐ NO |
| DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA? | ☐ YES ☐ NO |
| DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA? | ☐ YES ☐ NO |
| IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION? | ☐ YES ☐ NO |

**IF THE ANSWER IS "NO" TO ALL OF THE ABOVE, THEN IT IS NOT A REQUIREMENT TO REGISTER FOR A TAX COMPLIANCE STATUS SYSTEM PIN CODE FROM THE SOUTH AFRICAN REVENUE SERVICE (SARS) AND IF NOT REGISTER AS PER 2.3 BELOW.**

# PART 14:TERMS AND CONDITIONS FOR BIDDING

| 1. BID SUBMISSION: |
|---|
| 1.1. BIDS MUST BE DELIVERED BY THE STIPULATED TIME TO THE CORRECT ADDRESS. LATE BIDS WILL NOT BE ACCEPTED FOR CONSIDERATION. |
| 1.2. **ALL BIDS MUST BE SUBMITTED ON THE OFFICIAL FORMS PROVIDED–(NOT TO BE RE-TYPED) OR IN THE MANNER PRESCRIBED IN THE BID DOCUMENT.** |
| 1.3. THIS BID IS SUBJECT TO THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT, 2000 AND THE PREFERENTIAL PROCUREMENT REGULATIONS, 2017, THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE, ANY OTHER SPECIAL CONDITIONS OF CONTRACT. |
| 1.4. **THE SUCCESSFUL BIDDER WILL BE REQUIRED TO FILL IN AND SIGN A WRITTEN CONTRACT FORM (SBD7).** |
| **2. TAX COMPLIANCE REQUIREMENTS** |
| 2.1 BIDDERS MUST ENSURE COMPLIANCE WITH THEIR TAX OBLIGATIONS. |
| 2.2 BIDDERS ARE REQUIRED TO SUBMIT THEIR UNIQUE PERSONAL IDENTIFICATION NUMBER (PIN) ISSUED BY SARS TO ENABLE THE ORGAN OF STATE TO VERIFY THE TAXPAYER'S PROFILE AND TAX STATUS. |
| 2.3 APPLICATION FOR TAX COMPLIANCE STATUS (TCS) PIN MAY BE MADE VIA E-FILING THROUGH THE SARS WEBSITE WWW.SARS.GOV.ZA. |
| 2.4 BIDDERS MAY ALSO SUBMIT A PRINTED TCS CERTIFICATE TOGETHER WITH THE BID. |
| 2.5 IN BIDS WHERE CONSORTIA / JOINT VENTURES / SUB-CONTRACTORS ARE INVOLVED, EACH PARTY MUST SUBMIT A SEPARATE TCS CERTIFICATE / PIN / CSD NUMBER. |
| 2.6 WHERE NO TCS PIN IS AVAILABLE BUT THE BIDDER IS REGISTERED ON THE CENTRAL SUPPLIER DATABASE (CSD), A CSD NUMBER MUST BE PROVIDED. |
| 2.7 NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE, COMPANIES WITH DIRECTORS WHO ARE PERSONS IN THE SERVICE OF THE STATE, OR CLOSE CORPORATIONS WITH MEMBERS PERSONS IN THE SERVICE OF THE STATE." |

**NB: FAILURE TO PROVIDE / OR COMPLY WITH ANY OF THE ABOVE PARTICULARS MAY RENDER THE BID INVALID.**

Bidder's Name: ……...

Capacity under which this bid is signed: ……..……

(Proof of authority must be submitted e.g., company resolution)

Bidder's Signature: ….……..…….……

Date: ……..……..……

# PART 15:SBD 3.1: PRICING SCHEDULE – FIRM PRICES

15.1. NOTE: ONLY FIRM PRICES WILL BE ACCEPTED. NON-FIRM PRICES (INCLUDING PRICES SUBJECT TO RATES OF EXCHANGE VARIATIONS) WILL NOT BE CONSIDERED

15.2. IN CASES WHERE DIFFERENT DELIVERY POINTS INFLUENCE THE PRICING, A SEPARATE PRICING SCHEDULE MUST BE SUBMITTED FOR EACH DELIVERY POINT

Name of Bidder: ……. Bid Number: …….....

Closing Time: …… Closing Date: ……..……...……...

OFFER TO BE VALID FOR …… DAYS FROM THE CLOSING DATE OF BID.

| ITEM NO. | DESCRIPTION | TOTAL BID PRICE IN RSA CURRENCY INCLUSIVE OF VALUE ADDED TAX |
|---|---|---|
| 1 | SUPPLY AND INSTALLATION OF A SOLAR PV PLANT AT ORBIT TVET COLLEGE – MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE | |
| 1.1 | **TOTAL Excluding VAT** | R |
| 1.2 | **VAT (@ 15%)** | R |
| 1.3 | **TOTAL Including VAT *** | R |

NB * Price quoted must include delivery costs and etc.

Bidder's Name: ……...

Position: …… Bidder's Signature: ……..……

Date: ……...……

# PART 16:SBD 4: BIDDER'S DISCLOSURE

## 1. PURPOSE OF THE FORM

Any person (natural or juristic) may make an offer or offers in terms of this invitation to bid. In line with the principles of transparency, accountability, impartiality, and ethics as enshrined in the Constitution of the Republic of South Africa and further expressed in various pieces of legislation, it is required for the bidder to make this declaration in respect of the details required hereunder.

Where a person/s are listed in the Register for Tender Defaulters and / or the List of Restricted Suppliers, that person will automatically be disqualified from the bid process.

## 2. Bidder's declaration

2.1 Is the bidder, or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest1 in the enterprise, employed by the state? **YES/NO**

2.1.1 If so, furnish particulars of the names, individual identity numbers, and, if applicable, state employee numbers of sole proprietor/ directors / trustees / shareholders / members/ partners or any person having a controlling interest in the enterprise, in table below.

| **Full Name** | **Identity Number** | **Name of State institution** |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

2.2 Do you, or any person connected with the bidder, have a relationship

1 the power, by one person or a group of persons holding the majority of the equity of an enterprise, alternatively, the person/s having the deciding vote or power to influence or to direct the course and decisions of the enterprise.

with any person who is employed by the procuring institution? **YES/NO**

2.2.1 If so, furnish particulars:
……
……

2.3 Does the bidder or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest in the enterprise have any interest in any other related enterprise whether or not they are bidding for this contract? **YES/NO**

2.3.1 If so, furnish particulars:
……
……

## 3 DECLARATION

I, the undersigned, (name)…… in submitting the accompanying bid, do hereby make the following statements that I certify to be true and complete in every respect:

3.1 I have read and I understand the contents of this disclosure;

3.2 I understand that the accompanying bid will be disqualified if this disclosure is found not to be true and complete in every respect;

3.3 The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium2 will not be construed as collusive bidding.

3.4 In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications, prices, including methods, factors or formulas used to calculate prices, market allocation, the intention or decision to submit or not to submit the bid, bidding with the intention not to win the bid and conditions or delivery particulars of the products or services to which this bid invitation relates.

3.4 The terms of the accompanying bid have not been, and will not be, disclosed by the bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.

3.5 There have been no consultations, communications, agreements or arrangements made by the bidder with any official of the procuring

2 Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill and knowledge in an activity for the execution of a contract.

institution in relation to this procurement process prior to and during the bidding process except to provide clarification on the bid submitted where so required by the institution; and the bidder was not involved in the drafting of the specifications or terms of reference for this bid.

3.6 I am aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to bids and contracts, bids that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No 89 of 1998 and or may be reported to the National Prosecuting Authority (NPA) for criminal investigation and or may be restricted from conducting business with the public sector for a period not exceeding ten (10) years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.

I CERTIFY THAT THE INFORMATION FURNISHED IN PARAGRAPHS 1, 2 and 3 ABOVE IS CORRECT.
I ACCEPT THAT THE STATE MAY REJECT THE BID OR ACT AGAINST ME IN TERMS OF PARAGRAPH 6 OF PFMA SCM INSTRUCTION 03 OF 2021/22 ON PREVENTING AND COMBATING ABUSE IN THE SUPPLY CHAIN MANAGEMENT SYSTEM SHOULD THIS DECLARATION PROVE TO BE FALSE.

…… ……
Signature Date

…… ……
Position Name of bidder

# PART 17: SBD 6.1: PREFERENCE POINTS CLAIM FORM

## PREFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL PROCUREMENT REGULATIONS 2017

This preference form must form part of all bids invited. It contains general information and serves as a claim form for preference points for Broad-Based Black Economic Empowerment (B-BBEE) Status Level of Contribution

**NB: BEFORE COMPLETING THIS FORM, BIDDERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF B-BBEE, AS PRESCRIBED IN THE PREFERENTIAL PROCUREMENT REGULATIONS, 2017.**

---

### 1. GENERAL CONDITIONS

1.1 The following preference point systems are applicable to all bids:

- the 80/20 system for requirements with a Rand value of up to R50 000 000 (all applicable taxes included); and
- the 90/10 system for requirements with a Rand value above R50 000 000 (all applicable taxes included).

1.2 Either the 80/20 or 90/10 preference point system will be applicable to this tender (*delete whichever is not applicable for this tender*).

1.3 Pricing Points – will be allocated 80 points
Certificate – 10 points

Specific Goals – 10 points

**TABLE 1:** Specific goals for the tender and points claimed are indicated per the table below.
**(Note to organs of state: Where either the 90/10 or 80/20 preference points system is applicable, corresponding points must also be indicated as such.**

**Note to tenderers: The Tenderer must indicate how the claim points for each preference point system.)**

| The specific goals allocated points in terms of this tender | Number of points allocated (80/20 system) (To be completed by the organ of state) | Number of points claimed (80/20 system) (To be completed by the tenderer) |
|---|---|---|
| **a) Historically Disadvantaged Individuals**<br><br>(Means a South African citizen who, due to the apartheid policy that had been in place, had no franchise in national elections prior to the introduction of the Constitution of the Republic of South Africa, 1983 (Act No. 110 of 1983) or the Constitution of the Republic of South Africa, 1993 (Act No. 200 of 1993) ("The Interim Constitution | 10 | |
| **Women** | **2** | |
| **Disabled** | **1** | |
| **Youth** | **2** | |
| **b) Location:**<br>• Anywhere in North West Province<br>• The bidder to provide proof of residence in a form of electricity bill from any Local Municipality within North West Province | **5** | |

1.4 on the part of a bidder to submit proof of B-BBEE Status level of contributor together with the bid, will be interpreted to mean that preference points for B-BBEE status level of contribution are not claimed.

1.5 The purchaser reserves the right to require of a bidder, either before a bid is adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the purchaser.

## 2. DEFINITIONS

(a) **"B-BBEE"** means broad-based black economic empowerment as defined in section 1 of the Broad-Based Black Economic Empowerment Act;

(b) "**B-BBEE status level of contributor"** means the B-BBEE status of an entity in terms of a code of good practice on black economic empowerment, issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act;

(c) **"bid"** means a written offer in a prescribed or stipulated form in response to an invitation by an organ of state for the provision of goods or services, through price quotations, advertised competitive bidding processes or proposals;

(d) **"Broad-Based Black Economic Empowerment Act"** means the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);

**(e)** **"EME"** means an Exempted Micro Enterprise in terms of a code of good practice on black economic empowerment issued in terms of section 9 (1) of the Broad-Based Black Economic Empowerment Act;

(f) **"functionality"** means the ability of a tenderer to provide goods or services in accordance with specifications as set out in the tender documents.

(g) **"prices"** includes all applicable taxes less all unconditional discounts;

(h) **"proof of B-BBEE status level of contributor"** means:

**1)** B-BBEE Status level certificate issued by an authorized body or person;

**2)** A sworn affidavit as prescribed by the B-BBEE Codes of Good Practice;

**3)** Any other requirement prescribed in terms of the B-BBEE Act;

(i) **"QSE"** means a qualifying small business enterprise in terms of a code of good practice on black economic empowerment issued in terms of section 9 (1) of the Broad-Based Black Economic Empowerment Act;

17.1.

*(j)* **"rand value"** means the total estimated value of a contract in Rand, calculated at the time of bid invitation, and includes all applicable taxes;

## 3. BID DECLARATION

3.1 Bidders who claim points in respect of B-BBEE Status Level of Contribution must complete the following:

**B-BBEE STATUS LEVEL OF CONTRIBUTOR CLAIMED IN TERMS OF PARAGRAPHS 1.4 AND 4.1**

3.2 B-BBEE Status Level of Contributor: . = ……(maximum of 10 or 20 points)

(Points claimed in respect of paragraph 7.1 must be in accordance with the table reflected in paragraph 4.1 and must be substantiated by relevant proof of B-BBEE status level of contributor.

**4. SUB-CONTRACTING**

4.1 Will any portion of the contract be sub-contracted?

(***Tick applicable box***)

| YES | | NO | |
|---|---|---|---|

4.1.1 If yes, indicate:

i) What percentage of the contract will be Subcontracted ..……%
ii) The name of the sub-contractor ..……..
iii) The B-BBEE status level of the sub-contractor .....……..
iv) Whether the sub-contractor is an EME or QSE
***(Tick applicable box***)

| YES | | NO | |
|---|---|---|---|

v) **Specify, by ticking the appropriate box, if subcontracting with an enterprise in terms of Preferential Procurement Regulations,2017:**

| **Designated Group: An EME or QSE which is at last 51% owned by:** | **EME** √ | **QSE** √ |
|---|---|---|
| **Black people** | | |
| **Black people who are youth** | | |
| **Black people who are women** | | |
| **Black people with disabilities** | | |
| **Black people living in rural or underdeveloped areas or townships** | | |
| **Cooperative owned by black people** | | |
| **Black people who are military veterans** | | |
| **OR** | | |
| **Any EME** | | |
| **Any QSE** | | |

## 5. DECLARATION WITH REGARD TO COMPANY/FIRM

5.1 Name of Company/firm: …….

5.2 VAT registration number: ……..……

5.3 Company registration number: ……..……

5.4 TYPE OF COMPANY/ FIRM

- ☐ Partnership/Joint Venture / Consortium
- ☐ One-person business/sole propriety
- ☐ Close corporation
- ☐ Company
- ☐ (Pty) Limited

[TICK APPLICABLE BOX]

5.5 DESCRIBE PRINCIPAL BUSINESS ACTIVITIES

……
……
……
……
……..……..

5.6 COMPANY CLASSIFICATION

- ☐ Manufacturer
- ☐ Supplier
- ☐ Professional service provider
- ☐ Other service providers, e.g. transporter, etc.

[*TICK APPLICABLE BOX*]

5.7 Total number of years the company/firm has been in business: ……

5.8 I/we, the undersigned, who is / are duly authorised to do so on behalf of the company/firm, certify that the points claimed, based on the B-BBE status level of contributor indicated in paragraphs 1.4 and 6.1 of the foregoing certificate, qualifies the company/ firm for the preference(s) shown and I / we acknowledge that:

i) The information furnished is true and correct;

ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form;

iii) In the event of a contract being awarded as a result of points claimed as shown in paragraphs 1.4 and 6.1, the contractor may be required to furnish documentary proof to the satisfaction of the purchaser that the claims are correct;

iv) If the B-BBEE status level of contributor has been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the purchaser may, in addition to any other remedy it may have –

(a) disqualify the person from the bidding process;

(b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;

(c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;

(d) recommend that the bidder or contractor, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, be restricted by the National Treasury from obtaining business from any organ of state for a period not exceeding 10 years, after the *audi alteram partem* (hear the other side) rule has been applied; and

(e) forward the matter for criminal prosecution.

| WITNESSES 1 (Full Name / Signature) | WITNESSES 2 (Full Name / Signature) |
|---|---|
| …… | …… |
| SIGNATURE(S) OF BIDDERS(S) | SIGNATURE(S) OF BIDDERS(S) |
| …… | …… |
| …… | …… |

Date: ……

ADDRESS: ……..

……

# PART 18: GENERAL CONDITIONS OF CONTRACT.

## 1. Definitions

The following terms shall be interpreted as indicated:
1.1 “Closing time” means the date and hour specified in the bidding documents for the receipt of bids.

1.2 “Contract” means the written agreement entered into between the purchaser and the supplier, as recorded in the contract form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

1.3 “Contract price” means the price payable to the supplier under the contract for the full and proper performance of his contractual obligations.

1.4 “Corrupt practice” means the offering, giving, receiving, or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution.
1.5 "Countervailing duties" are imposed in cases where an enterprise abroad is subsidized by its government and encouraged to market its products internationally.

1.6 “Country of origin” means the place where the goods were mined, grown or produced or from which the services are supplied. Goods are produced when, through manufacturing, processing or substantial and major assembly of components, a commercially recognized new product results that is substantially different in basic characteristics or in purpose or utility from its components.

1.7 “Day” means calendar day.

1.8 “Delivery” means delivery in compliance of the conditions of the contract or order.

1.9 “Delivery ex stock” means immediate delivery directly from stock actually on hand.

1.10 “Delivery into consignees store or to his site” means delivered and unloaded in the specified store or depot or on the specified site in compliance with the conditions of the contract or order, the supplier bearing all risks and charges involved until the supplies are so Delivered and a valid receipt is obtained.

1.11 "Dumping" occurs when a private enterprise abroad market its goods on own initiative in the RSA at lower prices than that of the country of origin and which have the potential to harm the local industries in the RSA.

1.12” Force majeure” means an event beyond the control of the supplier and not involving the supplier’s fault or negligence and not foreseeable. Such events may include, but is not restricted to, acts of the purchaser in its sovereign capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.

1.13 “Fraudulent practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of any bidder, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the bidder of the Benefits of free and open competition.

1.14 “GCC” means the General Conditions of Contract.

1.15 “Goods” means all of the equipment, machinery, and/or other materials that the supplier is required to supply to the purchaser under the contract.

1.16 “Imported content” means that portion of the bidding price represented by the cost of components, parts or materials which have been or are still to be imported (whether by the supplier or his subcontractors) and which costs are inclusive of the costs abroad, plus freight and other direct importation costs such as landing costs, dock dues, import duty, sales duty or other similar tax or duty at the South African place of entry as well as transportation and handling charges to the factory in the Republic where the supplies covered by the bid will be Manufactured.

1.17 “Local content” means that portion of the bidding price which is not included in the imported content provided that local manufacture does take place.

1.18 “Manufacture” means the production of products in a factory using Labour, materials, components and machinery and includes other related value-adding activities.

1.19 “Order” means an official written order issued for the supply of goods or works or the rendering of a service.

1.20 “Project site,” where applicable, means the place indicated in bidding Documents.

1.21 “Purchaser” means the organization purchasing the goods.

1.22 “Republic” means the Republic of South Africa.

1.23 “SCC” means the Special Conditions of Contract.

1.24 “Services” means those functional services ancillary to the supply of the goods, such as transportation and any other incidental services, such as installation, commissioning, provision of technical assistance, training, catering, gardening, security, maintenance and other such obligations of the supplier covered under the contract.

1.25 “Written” or “in writing” means handwritten in ink or any form of electronic or mechanical writing.

## 2. Application

2.1 These general conditions are applicable to all bids, contracts and orders including bids for functional and professional services, sales, hiring, letting and the granting or acquiring of rights, but excluding immovable property, unless otherwise indicated in the bidding documents.

2.2 Where applicable, special conditions of contract are also laid down to cover specific supplies, services or works.

2.3 Where such special conditions of contract are in conflict with these general conditions, the special conditions shall apply.

**3. General**

3.1 Unless otherwise indicated in the bidding documents, the purchaser Shall not be liable for any expense incurred in the preparation and Submission of a bid. Where applicable a non-refundable fee for Documents may be charged.

3.2 With certain exceptions, invitations to bid are only published in the Government Tender Bulletin. The Government Tender Bulletin may be obtained directly from the Government Printer, Private Bag X85,Pretoria 0001, or accessed electronically from www.treasury.gov.za

**4. Standards**

4.1 The goods supplied shall conform to the standards mentioned in the Bidding documents and specifications.

**5. Use of contract documents and Information Inspection.**

5.1 The supplier shall not, without the purchaser's prior written consent, disclose the contract, or any provision thereof, or any specification, plan, drawing, pattern, sample, or information furnished by or on behalf of the purchaser in connection therewith, to any person other than a person employed by the supplier in the performance of the contract. Disclosure to any such employed person shall be made in confidence and shall extend only so far as may be necessary for purposes of such performance.

5.2 The supplier shall not, without the purchaser's prior written consent, make use of any document or information mentioned in GCC clause

5.1 Except for purposes of performing the contract.

5.3 Any document, other than the contract itself mentioned in GCC clause

5.1 shall remain the property of the purchaser and shall be returned (all copies) to the purchaser on completion of the supplier's performance under the contract if so required by the purchaser.

5.4 The supplier shall permit the purchaser to inspect the supplier's records relating to the performance of the supplier and to have them audited by auditors appointed by the purchaser, if so required by the purchaser.

## 6. Patent rights

6.1 The supplier shall indemnify the purchaser against all third-party claims of infringement of patent, trademark, or industrial design rights arising from use of the goods or any part thereof by the purchaser.

## 7. Performance Security.

7.1 Within thirty (30) days of receipt of the notification of contract award, the successful bidder shall furnish to the purchaser the performance security of the amount specified in SCC.

7.2 The proceeds of the performance security shall be payable to the purchaser as compensation for any loss resulting from the supplier's failure to complete his obligations under the contract.

7.3 The performance security shall be denominated in the currency of the contract or in a freely convertible currency acceptable to the purchaser and shall be in one of the following forms:
(a) a bank guarantee or an irrevocable letter of credit issued by reputable bank located in the purchaser's country or abroad, acceptable to the purchaser, in the form provided in the bidding documents or another form acceptable to the purchaser; or
(b) a cashier's or certified cheque

7.4 The performance security will be discharged by the purchaser and returned to the supplier not later than thirty (30) days following the date of completion of the supplier's performance obligations under the contract, including any warranty obligations, unless otherwise specified in SCC.

## 8. Inspections, tests and analyses

8.1 All pre-bidding testing will be for the account of the bidder.

8.2 If it is a bid condition that supplies to be produced or services to be rendered should at any stage during production or execution or on completion be subject to inspection, the premises of the bidder or contractor shall be open, at all reasonable hours, for inspection by a representative of the Department or an organization acting on behalf of the Department.

8.3 If there are no inspection requirements indicated in the bidding documents and no mention is made in the contract, but during the contract period it is decided that inspections shall be carried out, the purchaser shall itself make the necessary arrangements, including payment arrangements with the testing authority concerned.

8.4 If the inspections, tests and analyses referred to in clauses 8.2 and 8.3 show the supplies to be in accordance with the contract requirements, the cost of the inspections, tests and analyses shall be defrayed by the purchaser.

8.5 Where the supplies or services referred to in clauses 8.2 and 8.3 do not comply with the contract requirements, irrespective of whether such supplies or services are accepted or not, the cost in connection with these inspections, tests or analyses shall be defrayed by the supplier.

8.6 Supplies and services which are referred to in clauses 8.2 and 8.3 and which do not comply with the contract requirements may be rejected.

8.7 Any contract supplies may on or after delivery be inspected, tested or analysed and may be rejected if found not to comply with the requirements of the contract. Such rejected supplies shall be held at the cost and risk of the supplier who shall, when called upon, remove them immediately at his own cost and forthwith substitute them with supplies which do comply with the requirements of the contract. Failing such removal, the rejected supplies shall be returned at the suppliers cost and risk. Should the supplier fail to provide the substitute supplies forthwith, the purchaser may, without giving the supplier further opportunity to substitute the rejected supplies, purchase such supplies as may be necessary at the expense of the supplier.

8.8 The provisions of clauses 8.4 to 8.7 shall not prejudice the right of the purchaser to cancel the contract on account of a breach of the conditions thereof, or to act in terms of Clause 23 of GCC

**9. Packing**

9.1 The supplier shall provide such packing of the goods as is required to prevent their damage or deterioration during transit to their final destination, as indicated in the contract. The packing shall be sufficient to withstand, without limitation, rough handling during Transit and exposure to extreme temperatures, salt and precipitation during transit, and open storage. Packing, case size and weights shall take into consideration, where appropriate, the remoteness of the goods' final destination and the absence of heavy handling facilities at all points in transit.

9.2 The packing, marking, and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the contract, including additional requirements, if any, specified in SCC, and in any subsequent Instructions ordered by the purchaser.

**10. Delivery and documents**

10.1 Delivery of the goods shall be made by the supplier in accordance with the terms specified in the contract. The details of shipping and/or other documents to be furnished by the supplier are specified in SCC.

10.2 Documents to be submitted by the supplier are specified in SCC.

## 11. Insurance

11.1 The goods supplied under the contract shall be fully insured in a freely convertible currency against loss or damage incidental to manufacture or acquisition, transportation, storage and delivery in the manner specified in the SCC.

## 12. Transportation

12.1 Should a price other than an all-inclusive delivered price be required, this shall be specified in the SCC.

## 13. Incidental Service.

13.1 The supplier may be required to provide any or all of the following services, including additional services, if any, specified in SCC:
(a) Performance or supervision of on-site assembly and/or commissioning of the supplied goods;
(b) Furnishing of tools required for assembly and/or maintenance of the supplied goods;
(c) Furnishing of a detailed operations and maintenance manual for each appropriate unit of the supplied goods;
(d) performance or supervision or maintenance and/or repair of the supplied goods, for a period of time agreed by the parties, provided that this service shall not relieve the supplier of any warranty obligations under this contract; and
(e) Training of the purchaser's personnel, at the supplier's plant and/or on-site, in assembly, start-up, operation, maintenance, and/or repair of the supplied goods.

13.2 Prices charged by the supplier for incidental services, if not included in the contract price for the goods, shall be agreed upon in advance by the parties and shall not exceed the prevailing rates charged to other parties by the supplier for similar services.

## 14. Spare parts

14.1 As specified in SCC, the supplier may be required to provide any or all of the following materials, notifications, and information pertaining to spare parts manufactured or distributed by the supplier:
(a) Such spare parts as the purchaser may elect to purchase from the supplier, provided that this election shall not relieve the supplier of any warranty obligations under the contract; and
(b) in the event of termination of production of the spare parts:
(i) Advance notification to the purchaser of the pending
Termination, in sufficient time to permit the purchaser to procure needed requirements; and

(ii) Following such termination, furnishing at no cost to the purchaser, the blueprints, drawings, and specifications of the spare parts, if requested.

## 15. Warranty

15.1 The supplier warrants that the goods supplied under the contract are new, unused, of the most recent or current models, and that they incorporate all recent improvements in design and materials unless provided otherwise in the contract. The supplier further warrants that all goods supplied under this contract shall have no defect, arising from design, materials, or workmanship (except when the design and/or material is required by the purchaser's specifications) or from any act or omission of the supplier, that may develop under normal use of the supplied goods in the conditions prevailing in the country of final destination.

15.2 This warranty shall remain valid for twelve (12) months after the goods, or any portion thereof as the case may be, have been delivered to and accepted at the final destination indicated in the contract, or for eighteen (18) months after the date of shipment from the port or place of loading in the source country, whichever period concludes earlier, unless specified otherwise in SCC.

15.3 The purchaser shall promptly notify the supplier in writing of any claims arising under this warranty.

15.4 Upon receipt of such notice, the supplier shall, within the period specified in SCC and with all reasonable speed, repair or replace the defective goods or parts thereof, without costs to the purchaser.

15.5 If the supplier, having been notified, fails to remedy the defect(s) within the period specified in SCC, the purchaser may proceed to take such remedial action as may be necessary, at the supplier's risk and expense and without prejudice to any other rights which the purchaser may have against the supplier under the contract.

## 16. Payment

16.1 The method and conditions of payment to be made to the supplier under this contract shall be specified in SCC.

16.2 The supplier shall furnish the purchaser with an invoice accompanied by a copy of the delivery note and upon fulfilment of other obligations stipulated in the contract.

16.3 Payments shall be made promptly by the purchaser, but in no case later Than thirty (30) days after submission of an invoice or claim by the supplier.

16.4 Payment will be made in Rand unless otherwise stipulated in SCC.

## 17. Prices

17.1 Prices charged by the supplier for goods delivered and services performed under the contract shall not vary from the prices quoted by the supplier in his bid, with the exception of any price adjustments authorized in SCC or in the purchaser's request for bid validity Extension, as the case may be.

## 18. Contract Amendments

18.1 No variation in or modification of the terms of the contract shall be made except by written amendment signed by the parties concerned.

## 19. Assignment

19.1 The supplier shall not assign, in whole or in part, its obligations to perform under the contract, except with the purchaser's prior written consent.

## 20. Subcontracts

20.1 The supplier shall notify the purchaser in writing of all subcontracts Awarded under these contracts if not already specified in the bid. Such notification, in the original bid or later, shall not relieve the supplier from any liability or obligation under the contract.

## 21. Delays in the supplier's Performance.

21.1 Delivery of the goods and performance of services shall be made by the supplier in accordance with the time schedule prescribed by the purchaser in the contract.

21.2 If at any time during performance of the contract, the supplier or its subcontractor(s) should encounter conditions impeding timely delivery of the goods and performance of services, the supplier shall promptly notify the purchaser in writing of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the supplier's notice, the purchaser shall evaluate the situation and may at his discretion extend the supplier's time for performance, with or without the imposition of penalties, in which case the extension shall be ratified by the parties by amendment of contract.

21.3 No provision in a contract shall be deemed to prohibit the obtaining of supplies or services from a national department, provincial department, or a local authority.

21.4 The right is reserved to procure outside of the contract small quantities or to have minor essential services executed if an emergency arises, the supplier's point of supply is not situated at or near the place where the supplies are required, or the supplier's services are not readily available.
21.5 Except as provided under GCC Clause 25, a delay by the supplier in the performance of its delivery obligations shall render the supplier liable to the imposition of penalties, pursuant to GCC Clause 22, unless an extension of time is agreed upon pursuant to GCC Clause 21.2 Without the application of penalties.

21.6 Upon any delay beyond the delivery period in the case of supplies contract, the purchaser shall, without cancelling the contract, be entitled to purchase supplies of a similar quality and up to the same quantity in substitution of the goods not supplied in conformity with the contract and to return any goods delivered later at the supplier's expense and risk, or to cancel the contract and buy such goods as may be required to complete the contract and without prejudice to his other rights, be entitled to claim damages from the supplier.

**22. Penalties**

22.1 Subject to GCC Clause 25, if the supplier fails to deliver any or all of the goods or to perform the services within the period(s) specified in the contract, the purchaser shall, without prejudice to its other remedies under the contract, deduct from the contract price, as a penalty, a sum calculated on the delivered price of the delayed goods or unperformed services using the current prime interest rate calculated for each day of the delay until actual delivery or performance. The purchaser may also consider termination of the contract pursuant to GCC Clause 23.

**23. Termination for default**

23.1 The purchaser, without prejudice to any other remedy for breach of contract, by written notice of default sent to the supplier, may terminate this contract in whole or in part:
(a) if the supplier fails to deliver any or all of the goods within the period(s) specified in the contract, or within any extension thereof granted by the purchaser pursuant to GCC Clause 21.2;

(b) If the Supplier fails to perform any other obligation(s) under the contract; or
(c) If the supplier, in the judgment of the purchaser, has engaged in corrupt or fraudulent practices in competing for or in executing the contract.

23.2 In the event the purchaser terminates the contract in whole or in part, the purchaser may procure, upon such terms and in such manner as it deems appropriate, goods, works or services similar to those undelivered, and the supplier shall be liable to the purchaser for any excess costs for such similar goods, works or services. However, the supplier shall Continue performance of the contract to the extent not terminated.

23.3 Where the purchaser terminates the contract in whole or in part, the purchaser may decide to impose a restriction penalty on the supplier by prohibiting such supplier from doing business with the public sector for a period not exceeding 10 years.

23.4 If a purchaser intends imposing a restriction on a supplier or any person associated with the supplier, the supplier will be allowed a time Period of not more than fourteen (14) days to provide reasons why the Envisaged restriction should not be imposed. Should the supplier fail to respond within the stipulated fourteen (14) days the purchaser may regard the intended penalty as not objected against and may impose it on the Supplier?

23.5 Any restriction imposed on any person by the Accounting Officer / Authority will, at the discretion of the Accounting Officer / Authority, also be applicable to any other enterprise or any partner, manager, Director or other person who wholly or partly exercises or exercised or May exercise control over the enterprise of the first-mentioned person, and with which enterprise or person the first-mentioned person, is or was in the opinion of the Accounting Officer / Authority actively associated.

23.6 If a restriction is imposed, the purchaser must, within five (5) working
Days of such imposition, furnish the National Treasury, with the Following information:
(i) The name and address of the supplier and / or person restricted by the
Purchaser;
(ii) The date of commencement of the restriction
(iii) The period of restriction; and
(iv) The reasons for the restriction.
These details will be loaded in the National Treasury's central database
Of suppliers or persons prohibited from doing business with the public Sector.

23.7 If a court of law convicts a person of an offence as contemplated in
Sections 12 or 13 of the Prevention and Combating of Corrupt Activities
Act, No. 12 of 2004, the court may also rule that such person's name be Endorsed on the Register for Tender Defaulters. When a person's name has been endorsed on the Register, the person will be prohibited from doing business with the public sector for a period not less than five years and not more than 10 years. The National Treasury is empowered to determine the period of restriction and each case will be dealt with on its own merits. According to section 32 of the Act the Register must be Opening to the public. The Register can be perused on the National Treasury Website.

## 24. Anti-dumping and countervailing duties and rights

24.1 When, after the date of bid, provisional payments are required, or antidumping or countervailing duties are imposed, or the amount of a provisional payment or anti-dumping or countervailing right is increased in respect of any dumped or subsidized import, the State is Not liable for any amount so required or imposed or for the amount of any such increase. When, after the said date, such a provisional payment is no longer required or any such anti-dumping or countervailing right is abolished, or where the amount of such provisional payment or any such right is reduced, any such favourable difference shall on demand be paid forthwith by the contractor to the State or the State may deduct such amounts from moneys (if any) which may otherwise be due to the contractor in regard to supplies or services which he delivered or rendered, or is to deliver or render in terms of the contract or any other contract or any other amount which may be due to him

## 25. Force Majeure

25.1 Notwithstanding the provisions of GCC Clauses 22 and 23, the Supplier shall not be liable for forfeiture of its performance security, Damages, or termination for default if and to the extent that his delay in Performance or other failure to perform his obligations under the Contract is the result of an event of force majeure.
25.2 If a force majeure situation arises, the supplier shall promptly notify The purchaser in writing of such condition and the cause thereof. Unless otherwise directed by the purchaser in writing, the supplier shall continue to perform its obligations under the contract as far as is Reasonably practical, and shall seek all reasonable alternative means for Performance not prevented by the force majeure event.

## 26. Termination for insolvency

26.1 The purchaser may at any time terminate the contract by giving written notice to the supplier if the supplier becomes bankrupt or otherwise insolvent. In this event, termination will be without compensation to the supplier, provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to the purchaser.

## 27. Settlement of Disputes

27.1 If any dispute or difference of any kind whatsoever arises between the Purchaser and the supplier in connection with or arising out of the Contract, the parties shall make every effort to resolve amicably such Dispute or difference by mutual consultation.
27.2 If, after thirty (30) days, the parties have failed to resolve their dispute or difference by such mutual consultation, then either the purchaser or the supplier may give notice to the other party of his intention to commence with mediation. No mediation in respect of this matter may be commenced unless such notice is given to the other party.

27.3 Should it not be possible to settle a dispute by means of mediation, it may be settled in a South African court of law.

27.4 Mediation proceedings shall be conducted in accordance with the rules of procedure specified in the SCC.

27.5 Notwithstanding any reference to mediation and/or court proceedings herein,
(a) The parties shall continue to perform their respective obligations under the contract unless they otherwise agree; and
(b) The purchaser shall pay the supplier any monies due the supplier.

## 28. Limitation of Liability

28.1 Except in cases of criminal negligence or wilful misconduct, and in the case of infringement pursuant to Clause 6;
(a) the supplier shall not be liable to the purchaser, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the supplier to pay penalties and/or damages to the purchaser; and

(b) The aggregate liability of the supplier to the purchaser, whether under the contract, in tort or otherwise, shall not exceed the total contract price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment.

## 29. Governing Language.

29.1 The contract shall be written in English. All correspondence and other documents pertaining to the contract that is exchanged by the parties shall also be written in English.

## 30. Applicable law

30.1 The contract shall be interpreted in accordance with South African Laws, unless otherwise specified in SCC.

## 31. Notices

31.1 Every written acceptance of a bid shall be posted to the supplier Concerned by registered or certified mail and any other notice to him Shall be posted by ordinary mail to the address furnished in his bid or To the address notified later by him in writing and such posting shall be Deemed to be proper service of such notice
31.2 The time mentioned in the contract documents for performing any act After such aforesaid notice has been given, shall be reckoned from the Date of posting of such notice.

## 32. Taxes and Duties.

32.1 A foreign supplier shall be entirely responsible for all taxes, stamp duties, license fees, and other such levies imposed outside the purchaser's country.
32.2 A local supplier shall be entirely responsible for all taxes, duties, license fees, etc., incurred until delivery of the contracted goods to the purchaser.
32.3 No contract shall be concluded with any bidder whose tax matters are not in order. Prior to the award of a bid the Department must be in possession of a tax clearance certificate, submitted by the bidder. This certificate must be an original issued by the South African Revenue Services.

## 33. National Industrial Participation (NIP) Programme

33.1 The NIP Programme administered by the Department of Trade and Industry shall be applicable to all contracts that are subject to the NIP obligation.

## 34 Prohibition of Restrictive practices

34.1 In terms of section 4 (1) (b) (iii) of the Competition Act No. 89 of 1998, as amended, an agreement between, or concerted practice by, firms, or a decision by an association of firms, is prohibited if it is between parties in a horizontal relationship and if a bidder (s) is / are or a contractor(s) was / were involved in collusive bidding (or bid rigging).

34.2 If a bidder(s) or contractor(s), based on reasonable grounds or evidence obtained by the purchaser, has / have engaged in the restrictive practice referred to above, the purchaser may refer the matter to the Competition Commission for investigation and possible Imposition of administrative penalties as contemplated in the Competition Act No. 89 of 1998.

34.3 If a bidder(s) or contractor(s), has / have been found guilty by the Competition Commission of the restrictive practice referred to above, the purchaser may, in addition and without prejudice to any other remedy provided for, invalidate the bid(s) for such item(s) Offered, and / or terminate the contract in whole or part, and / or restrict the bidder(s) or contractor(s) from conducting business with the public sector for a period not exceeding ten (10) years and / or claim damages from the bidder(s) or contractor(s) concerned.

# PART 19: SPECIAL CONDITIONS FOR CONTRACT (INFORMATION FOR TENDERERS)

# SPECIAL CONDITIONS OF CONTRACT

## 1. GENERAL

- SEALED TENDERS will be received by the Supply Chain Management Unit for:
- **Project: SUPPLY AND INSTALLATION OF A SOLAR PV PLANT AT ORBIT TVET COLLEGE – MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE**

  **TENDER No. M02/2023**
- Tenders shall be submitted in an envelope provided by the service provider not later than 11:00 am (local time) on **22-08-2023**
- Envelopes containing Tenders should be sealed and plainly marked on the outside as to their contents.
- All index and reference numbers in the Tender Documents are given for the convenience of the Contractor and such must be taken only as a general guide to the items referred.
- It must not be assumed that such numbering is the only reference to each item, but the tender documents must be read in detail for each item.
- Tenders received by the Supply Chain Management Division later than the specified closing time will not be accepted and will be returned unopened to the tenderer.

## 2. TENDERERS MAY OBTAIN INTERPRETATION OF TENDER DOCUMENTS

- Should any person contemplating submitting a tender for the proposed Contract require additional information concerning the scope of the work or the manner in which it must be carried out, or should he be in doubt as to the meaning of the Specifications, he may submit a written request to the Supply Chain Management for such additional information or for such interpretation.
- INFORMATION FOR TENDERERS submitting the request will be responsible for its prompt delivery.
- Any information or interpretation for all tenders will not be permitted within 48 hours of closing.
- The Supply Chain Management reserves the right to issue any additional Addenda.
- All Addenda issued during the time of tendering shall be taken into account in preparing the Tender, and in closing the Tender; they shall become a part thereof.
- The College will not be responsible for any verbal instruction given to the service provider during the tendering period.

## 3. PRICES SUBMITTED

- The tender price or prices quoted in the tender shall be in full compensation for all labour, equipment and materials and utility and transportation services necessary to perform and complete all work under the Contract, including all miscellaneous work, whether specifically included in the tender documents or not.
- Any items omitted therefrom which are clearly necessary for the completion of the work shall be considered part of the work, though not directly specified in the Tender Documents.

## 4. INSURANCE

- Insurance requirements shall be in accordance with Provincial Section INSURANCE, PROTECTION AND DAMAGE, as amended in General Conditions of Contract (GCC).

## 5. REQUIREMENTS AT TIME OF TENDERING

- Failure of the tenderer to comply with any of the following shall result in the tender being rejected
  - The tenderer shall submit an original signed and sealed tender documents.
  - The tenderer shall submit the Pricing Schedule issued with the tender document.
- The name and the signature of the person authorized to bind the tenderer shall be inserted in the space provided in the tender document.

## 6. TENDER OPEN FOR ACCEPTANCE

- The tenderer shall keep his tender open for acceptance and irrevocable until 90 days have elapsed from the closing date of the tender or a formal contract is executed based on a tender other than this one.

## 7. NOTIFICATION OF CONTRACT AWARD

- The awarding of the Contract, based on this tender, shall constitute and be an acceptance of this tender, and the College shall notify the successful tenderer of the contract award.

## 8. INFORMAL OR UNBALANCED TENDERS

- In addition to those errors in the tender that shall result in the tender being rejected, as indicated in Clause 9 of the General Conditions of Contract "REQUIREMENTS AT TIME OF TENDERING", tenders which are incomplete, illegible or obscure, or that contain additions not called for, erasures, alterations, errors or irregularities of any kind, or contain prices which appear to be unbalanced as to be likely to adversely affect the College, may be rejected as informal.
- Tenderers who have submitted tenders which have been rejected by the College because of informalities will be notified of the reasons for rejection. When checking tenders, the following procedures shall be used:
    - If the amount tendered for a unit price item does not agree with the extension of the estimated quantity and the tendered unit price, or if the extension has not been made, the unit price shall govern and the total price shall be corrected accordingly.
- If both the unit price and the total price are left blank, then both shall be considered as zero.
- If the unit price is left blank but a total price is shown for the item, the unit price shall be established by dividing the total price by the estimated quantity.
- If the total price is left blank for a lump sum item, it shall be considered as zero.
- If the tender contains an error in addition and/or subtraction and/or transcription, the error shall be corrected and the corrected total contract price shall be governed.

## 9. WITHDRAWAL OF TENDERS

- A tenderer may withdraw his tender at any time up to the official closing time by letter bearing the signature of any person authorized by the tenderer.
- All withdrawn or superseded tenders will be returned unopened.

## 10. ABILITY AND EXPERIENCE OF TENDERERS

In order to help the College in determining the ability of any tenderer, the tenderer shall, within 48 hours after being requested in writing by the Supply Chain Management, furnish evidence satisfactory to the College of the tenderer's experience and familiarity with work of the character specified and his financial ability to prosecute the proposed work properly to completion within the specified time.

- The evidence requested may, without being limited thereto, include the following:
  - The tenderer's performance record with listing of work of a similar character and proportions which he has constructed, giving the name of the owner, date built and construction cost.
  - A tabulation of other work now under contract, giving the location, type, size, required date of completion and the percent of completion to date of each job.
  - An itemized list of the tenderer's equipment available for use on the proposed Contract.
  - A listing of the major parts of the work which are proposed to be sublet.
  - The tenderer's latest financial statement.

## 11. EXCLUSION OF TENDERERS DUE TO POOR PERFORMANCE

- The Unit Manager shall document evidence and advice Supply Chain Management in writing where the performance of a supplier has been unsatisfactory in terms of failure to meet contract specifications, terms and conditions or for Health and Safety violations.

## 12. SINGLE TENDER

- A single tender may be opened and the College reserves the right to accept or reject it.

## 13. WARRANTY

- Warranties shall remain valid for 12 months after the goods have been delivered. Refer to paragraph 15 of GCC.
- The supplier warrants that the goods supplied under this tender are new, unused, of the most recent or current models and that they incorporate all recent improvements in design and materials.
- The supplier further warrants that the goods supplied shall have no defect arising from design, materials, or workmanship or from any act or omission of the supplier that may develop under normal use of the supplied goods.

## 14. PAYMENT

All payments will be effected within 30 days of receipt of an original invoice from the supplier or in the case of progress payments within 30 days after the payment certificate is signed by the project manager.

# PART 20: JOINT VENTURE AGREEMENT

# UPGRADE OF THE MAIN ELECTRICAL RETICULATION AT THE ORBIT TVET COLLEGE - MANKWE CAMPUS

**STANDARD JOINT VENTURE AGREEMENT** (25 pages)

# JOINT VENTURE AGREEMENT

**Between**

_____

**and**

_____

**(herein collectively referred to as the PARTIES)**

**WHEREAS**

**A.** _____ and _____ are desirous of forming a Joint Venture for purposes of joining their resources in order to carry out the

_____ _____

_____

**NOW THEREFORE THE PARTNERS AGREE AS FOLLOWS**:

## 1. INTERPRETATION

In this agreement :

1.1 Clause headings have been inserted for convenience and shall not be used as an aid to its construction.

1.2 Unless the context clearly indicates a contrary intention:

1.2.1 an expression which includes:

1.2.1.1 any gender shall include the other genders;

1.2.1.2 a natural person shall include an artificial person and vice versa.

1.3 The following expressions shall have the meanings shown against each and cognate expressions shall bear corresponding meanings.

1.3.1 "CONTRACT"
means the erection of _____

1.3.2 "DEFAULTING PARTY"
means a party to which a notice has been given specifying breach which is to be remedied within seven (7) days and which does not remedy such breach;

1.3.3 "EFFECTIVE DATE"
means the date of signature by _____ of this agreement;

1.3.4 "EXECUTIVE COMMITTEE"
means that body of persons acting collectively comprising of _____ of _____ and _____ of _____ or their duly appointed representative.

1.3.5 "MANAGEMENT COMMITTEE"
means that body of persons acting collectively comprising one representative from each party.

1.3.6 "PROJECT MANAGER"
means _____ who shall supervise all activities of the Contract and be the responsible person in respect of this Contract.

1.3.7 "QUORUM"
means two persons being one representative of each party.

1.3.8 "SPONSOR"
means _____

1.3.9 "PRINCIPAL / EMPLOYER"
Means THE ORBIT TVET COLLEGE

**CONSTITUTION OF THE JOINT VENTURE**

1.4 The PARTNERS hereby constitute a Joint Venture which, notwithstanding its composition, shall conduct all business under the style "_____" (the "Joint Venture"), which shall commence on the effective date and shall continue in existence until determined as in hereinafter provided.

1.5 The object of the Joint Venture is to jointly execute and complete the Contract, which has been awarded to the _____.

1.6 Nothing herein contained shall be construed as constituting a general partnership or limiting the right of power of a party to carry on its separate business for its sole benefit.

1.7 The parties herein shall be jointly and severally liable towards the Principal and third parties specifically and solely for the obligations of the Joint Venture deriving from and in any way connected with the present agreement and the Contract.

In this regard the legal domicilium of the Joint Venture will be:

_____

_____

1.8 The interest of each party and its liability to contribute to and its respective share in any loss, including capital loss or liability or profit which may result from the operations of the Joint Venture and its interest in all the property acquired and monies received arising out of or in connection with the execution and completion of the Contract shall be:-

2.5.1 _____ ___%

2.5.2 _____ ___%

1.9 The place of business of the Joint Venture shall be at the site of the Contract or such other place as the Management Committee shall decide.

1.10 Save for such powers as the Sponsor necessarily requires to perform its functions in the Management of the Joint Venture, this agreement shall not constitute or be construed as the agent of another.

## 2. DURATION OF THE JOINT VENTURE

2.1 The duration of the Joint Venture shall extend until such time as all the obligations of the Joint Venture in respect of the Contract, if successfully secured, and this agreement have been discharged.

## 3. MANAGEMENT OF THE JOINT VENTURE

3.1 The Management Committee shall be responsible to the Joint Venture for the management of the Contract. It shall decide all questions of principle in the administration of the Contract and shall have all such powers as are normally invested in a Board of Directors, without limiting the generality of the expressions "power", the function and authority of the Management Committee shall be as set out in Clauses 5 and 6.

3.2 The sponsor shall be responsible for the administration of the Joint Venture. The administration entails accounting, bookkeeping, wages and salaries, including the responsibilities detailed in Clause 4.3 below.

3.3 The Sponsor shall be responsible for the cost control system as agreed, all accounting and administrative processes and records including the payment of VAT and R S C levies on behalf of the Joint Venture and the preparation of monthly and quarterly financial reports in respect of the Joint Venture. All such systems, records and reports shall be subject to the approval of the Management Committee.

3.3.1 The Sponsor shall be paid for the above-mentioned tasks a fee of ___% of the contract value.

The fee shall be paid monthly to the Sponsor as and when the Joint Venture is paid by the Principal.

3.3.2 The fee paid to the Sponsor for the aforementioned tasks shall cover all off site costs incurred by the Sponsor in respect of such tasks with the specific exception of printing and stationery costs and data processing costs specifically related to the Contract, which costs shall be reimbursed by the Joint Venture.

3.4 The auditors and/or financial representative of each of the PARTNERS shall be _____ at all reasonable times, access to the records referred to in 4.3 to enable them to verify the monthly, quarterly and annual financial reports.

3.5 The financial year end of the Joint Venture shall be _____.

## 4. CONSTITUTION AND FUNCTION OF THE MANAGEMENT COMMITTEE

4.1 The PARTNERS shall procure the appointment of a Management Committee comprising two (2) members being one representative from each party.

4.2 The Management Committee shall meet at such times as they shall decide being not less than once per calendar month.

4.3 Unless the PARTNERS agree unanimously to some other period, each member of the Management Committee shall receive not less than three (3) days notice of all meetings and of the matters to be discussed there at.

The time and place for meetings shall be determined by the Project Manager, who shall send out notices for the meeting.

4.4 A Quorum for each meeting shall be one representative, or his alternate, of each party. No decision of the Management Committee shall be valid in the absence of a Quorum if no Quorum is present at a meeting of which due notice has been given to all members of the Management Committee, the following provisions shall apply.

4.4.1 The meeting shall stand adjourned to the same place and the same time on the same day of the next week (or if that day is not a business day the first day thereafter)

4.4.2 At such adjourned meeting if the member of the Management Committee previously absent is not present, those present shall be entitled to make valid decisions provided that

4.4.2.1 All members of the Management Committee shall have received prior notice of the adjourned meeting of the Management Committee.

4.4.2.2 The decisions relate only to matters which were set out in the agenda for the first meeting.

4.4.2.3 All members of the Management Committee are immediately notified of any decision taken in terms of this sub-clause.

4.5 The Management Committee shall be presided over by a Chairman who shall be appointed by the Sponsor. At any meeting of the Management Committee the Chairman shall have a deliberative but not a casting vote.

4.6 All decisions of the management committee shall be unanimous by those members attending and entitled to vote.

4.7 Should the Management Committee be unable to reach unanimous agreement at any meeting on any matter on which it deliberates the meeting of the Management Committee shall be adjourned and the matter shall be referred for decision to the Executive Committee.

If the said Executive Committee is unable to resolve the dispute the matter shall be referred to the final decision of any arbitrator to be appointed by the PARTNERS.

4.7.1 If the issue in dispute is primarily a matter of an accounting or financial nature, the dispute shall be referred to the decision of any independent accountant of not less than ten (10) years standing agreed by the PARTNERS and in the absence of agreement appointed by the President for the time being of the Cape Society of Chartered Accountants.

4.7.2 If the matter in issue is primarily a construction matter, it shall be referred to the decision of an arbitrator of not less than ten (10) years standing agreed by the PARTNERS and in the absence of agreement appointed by the President for the time being of the Institute of South African Architects.

4.7.3 If the matter in issue does not fall within the ambit of 5.7.2, the dispute shall be referred to the decision of an advocate of not less than ten (10) years standing agreed by the PARTNERS and in the absence of agreement appointed by the Chairman for the time being of the Cape Bar Council.

4.7.4 The provisions of Clause 19 shall apply to any such reference to arbitration.

4.8 Notwithstanding any reference to arbitration if the subject matter of the dispute is of an urgent and important nature which cannot reasonably await the decision of an arbitrator the reference to arbitration shall not delay or interfere with the progress of the Contract and the Sponsor shall be entitled to decide whether any steps would be taken in regard thereto prior to the decision of the arbitrator.

4.9 All business transacted at the meeting of the Management Committee shall be recorded in a suitable minute book to be kept at such place as the PARTNERS may decide and such minute book shall be at all times available for the inspection of the PARTNERS representatives or their duly authorised agents who shall have the right to take copies thereof or extracts there from. Copies of minutes of meetings shall be circulated to the members of the Management Committee within seven (7) days of the meetings.

## 5. POWERS AND DUTIES OF THE MANAGEMENT COMMITTEE

Without derogating from the generality of the provisions of Clause 4.1 the Management Committee shall have the following powers and duties:

5.1 To appoint a Project Manager to oversee the Contract.

5.2 To decide upon all matters for the submission of claims.

5.3 To determine the manner in which any disputes concerning the Joint Venture and third parties shall be dealt with.

5.4 To decide upon the banking accounts to be opened by the Sponsor in the name of the Joint Venture and the methods of operation of such banking accounts.

5.5 To approve and allocate any additional expenditure not allowed for in the Contract price.

5.6 To receive and consider reports by the Project Manager on the progress of the Contract.

5.7 To approve the form and amount of any bonds or guarantees which the Joint Venture may have to provide.

5.8 To approve the policy relating to conditions of employment of staff.

5.9 To decide all matters in relation to the acquisition, hiring and disposal of plant and equipment.

5.10 To determine the manner in which invoicing to the Joint Venture by the PARTNERS shall be done.

5.11 To give the necessary powers to the Sponsor for the administration and accounts of the Joint Venture.

5.12 To call for Monthly, Quarterly and Annual Financial Statements of the affairs of the Joint Venture.

5.13 Receive and decide upon recommendation of the Sponsor as to the sum or sums to be paid from time to time by the PARTNERS to provide working capital for the Joint Venture.

5.14 To appoint the Auditors.

5.15 To determine the policy to the adopted in respect of major sub-contractors and suppliers.

5.16 To determine the level or resources required and which of the PARTNERS shall provide same.

5.17 To obtain all requisite insurance including but not limited to public liability insurance. Each PARTNER shall be obliged to demonstrate that it is adequately ensured in relation to the Joint Venture, Annexure "A" hereto shall be completed by the PARTNERS and said Annexure shall form part of and be integral to this agreement.

## 6. THE PROJECT MANAGER

6.1 The Management Committee shall appoint a Project Manager who shall be responsible for overseeing the exception of the Contract in accordance with the directives of the Management Committee and in terms of the Contract.

6.2 The Project Manager shall report to the Management Committee and shall represent the Joint Venture in its dealings with the Principal or the agents of the Principal. The Project Manager shall advise the Management Committee on all the matters concerning the Contract.

## 7. JOINT VENTURE PROFITS

7.1 The profits earned by the Joint Venture shall be distributed in accordance with decisions taken by the Executive Committee from time to time. The Executive Committee shall have no power to re-adjust the share of the profits to which a party may be entitled.

7.2 The Executive Committee may in its absolute discretion distribute, advance or loan any surplus funds which may be available at any time to the PARTNERS in proportion to their share in the Joint Venture.

## 8. OTHER PROFITS

8.1 No party shall derive or attempt to derive any profits or financial benefit, either directly or through any legal person in which they have a direct or indirect interest arising from any business transacted by or with the Joint Venture as provided for in Clause 9.2. The PARTNERS agree, however, that a party and its associated or subsidiary companies shall be entitled to enter into sub-contract or supply Contract with the Joint Venture.

8.2 Prior to obtaining the written approval of the management committee referred to in Clause 9.1, which approval shall not be unreasonably withheld, the interest of a party shall be disclosed to the Management Committee which shall thereafter have the right to receive from such party a full disclosure of the nature and extent of such interest.

## 9. CHARGES AND REMUNERATION OF EMPLOYEES

9.1 The cost of employing the Project Manager and all full time employees of the Joint Venture will be a charge to the Joint Venture.

9.2 The cost of Seconded Staff referred to in Clause 14 shall be charged to the Joint Venture and such cost shall include :

9.2.1 The gross remuneration payable to the employee, and

9.2.2 The amount paid in respect of the employer's portion of his pension fund, medical aid society contributions and social security payments, if any, and

9.2.3 That portion of the paid leave to which his service agreement entitles him which his period of secondment to the Joint Venture bears to a calendar year, and

9.2.4 The portion of his annual bonus, if any, which his period of secondment to the Joint Venture in a calendar year bears to a calendar, and

9.2.5 The amount paid to him in respect of his car allowance.

9.3 No charge shall be made by a party in respect of the time spent by its representative (or alternate) on the Management Committee.

## 10. WORKING CAPITAL AND GUARANTEES

10.1 The amount of working capital required by the Joint Venture shall be determined by the Management Committee from time to time.

10.2 (a) It is recorded that the objective of the Joint Venture in respect of working capital is that it shall as far as is possible, be self financing and that any proposals submitted shall bear that objective in mind. To the extent that the Joint Venture is not self financing the PARTNERS will provide any shortfall in working capital in equal shares.

(b) In the event of any of the PARTNERS being unable or unwilling to provide the requisite shortfall, the PARTNER providing the finance at its sole discretion shall be entitled to recover from the other PARTNER the cost of financing the shortfall portion based on the then prevailing prime overdraft interest of financing the shortfall portion based on the then prevailing prime overdraft interest charged by the First National Bank of SA Limited plus __%. A PARTNER's inability or unwillingness to provide working capital shall constitute a material breach of this agreement.

10.3 _____ undertakes to procure from a registered bank or other financial institution all performance, retention or any other guarantees which are required by the Principal. The cost of procuring the aforesaid performance retention and other guarantees shall be done by the Joint Venture.

10.4 All payment claims shall be compiled and submitted to the Joint Venture and all payments due shall be paid to the Joint Venture.

10.5 In the event of the Joint Venture's cashflow being negative, each PARTNER shall provide the Joint Venture with the cash required in order to ensure a positive cashflow. In the event of either of the PARTNERS being unable or unwilling to provide the necessary cash, then the provision of Clause 11.2 (b) shall apply mutatis mutandis.

## 11. PLANT AND EQUIPMENT

11.1 All equipment and plant required by the Joint Venture shall be purchased or hired by the Joint Venture in its own name or in the name of one of the PARTNERS. Plant and equipment hired or purchased shall receive the approval of the Management Committee prior to its acquisition.

11.2 Should plant or equipment be purchased from a party, the purchase price of such plant and equipment shall be agreed between the Management Committee of the Joint Venture and such party prior to the dispatch thereof to the site.

11.3 Should a party hire plant to the Joint Venture, the Management Committee shall agree upon a rate therefore so far as possible which is consistent with prevailing market rates.

11.4 Save in so far as a party may have suitable plant and equipment available for purchase or hire by the Joint Venture upon which the Management Committee has reached agreement on the price or rents thereof, all plant and equipment shall be purchased new or second-hand or hired from third parties.

11.5 On completion of the Contract or as and when any plant and equipment shall no longer be required for the purposes thereof, valuation thereof shall be made by the Management Committee and the PARTNERS shall be advised that such plant and equipment is no longer required, together with the valuation thereof.

The PARTNERS shall be entitled, if they wish, to submit offers for any such plant and equipment. The Management Committee shall at a predetermined time open all such offers. The party which has submitted the highest offer exceeding the valuation placed thereon by the Management Committee shall be entitled to purchase such plant and equipment. If the highest offer shall be less than such valuation, the Management Committee may in its discretion accept the highest of any such offer provided that a party which has sold plant and equipment to the Joint Venture shall, for a period of thirty (30) days after the opening of the offers, have the right to purchase from the Joint Venture such plant and equipment at an amount equivalent to the highest offer to the Management Committee.

11.6 If any plant and equipment no longer required for the purposes of the Contract shall not be disposed of in the manner set out in Clause 12.5, such plant and equipment shall be disposed of in the open market in such manner and at such price and on such terms as the Management Committee shall decide, provided that the PARTNERS shall as far as is practicable, be accorded a priority over third parties in the purchase of such plant and equipment.

11.7 If the manner of disposal decided upon by the Management Committee shall be public auction, the PARTNERS shall not be precluded from attending and bidding at any such public auction.

## 12. STAFF

The PARTNERS agree not to attempt during the currency of this agreement, to entice or influence any person seconded to or employed by or associated with the Joint Venture as the case may be for one (1) year after the termination of this agreement without the written consent of the other parties knowingly to employ any persons previously employed by the party and who has been engaged on or was associated with the Contract.

## 13. SECONDED STAFF AND LABOURERS

13.1 Each party undertakes to make monthly paid staff available to the Joint Venture from time to time for the executing of the Contract. Such staff is hereinafter referred to as Seconded Staff.

13.2 Insofar as is reasonably practicable, the members of Seconded Staff shall be maintained in such a way that each party from time to time be making approximately the same proportionate contribution to the provision of the Seconded Staff as it proportionate participation in the profits of the Joint Venture from time to time.

13.3 The Project Manager, with the approval of the Management Committee and the Management Committee, in its own right, shall have the right to terminate the services of Seconded Staff. Seconded Staff whose services are so terminated shall be removed from the Contract and shall not again be permitted to take part in the execution of the Contract.

13.4 No bonus shall be payable in respect of the Contract without the prior approval of the Management Committee.

13.5 All labour requirements shall be obtained on a sub-contract basis, unless agreed otherwise between the parties.

## 14. DISSOLUTION OF THE JOINT VENTURE

14.1 Should a party be placed in provisional or final liquidation or pass a resolution for voluntary winding up or take steps to be wound up on the grounds of its inability to pay its debts, or compound any of its creditors, or be placed under Judicial Management, Provisional or Final, then – save in those cases where by operation of the law the Joint Venture is automatically dissolved either of the parties shall be entitled without prejudices to any other right of action or claim for damages or for specific performance, to terminate this agreement and to dissolve the Joint Venture upon thirty (30) days notice in writing to the other party and to the employer / principal.

14.2 Whether the Joint Venture is terminated in such circumstances by automatic operation of law, or by notice, the following provisions shall apply:

14.2.1 The interest of the party in default shall be determined by the Auditors.

14.2.2 In determining the value of the interest of the party in default, the auditors shall adopt such methods of valuation as it in its sole discretion considers to be equitable, but subject to the following guidelines:

15.2.2.1 A balance sheet and income statement shall be prepared as at the date of determination by a person nominated for its purpose by the parties not in default and shall thereafter be audited by the Auditors.

15.2.2.2 The net assets revealed in such financial statements shall provide the basis of the valuation of the interest in the Joint Venture of the party in default, provided that the profit and loss account shall take into account the valuation of work in progress at the date of preparation of the financial statement.

15.2.3 The parties not in default shall be obliged to prepare and render an account to the party in default which shall share in all profits accrued to and losses borne by the Joint Venture as at the date of termination in proportion to that party's participation therein as set out in Clause 2.5.

15.2.3.1 The party in default shall and does hereby indemnify the parties not in any default for any losses which it may have sustained or may in the future sustain which arises out of or in connection with the termination of the Joint Venture.

15.2.3.2 The party in default shall not be released from any of its obligations to third persons given in terms of this agreement.

15.2.4 Upon the finalisation of the account referred to in 15.2.3 the party in default shall be liable on demand to pay its proportionate share of any loss sustained by the Joint Venture as at the date of such termination.

15.3 Breach

15.3.1 If a party is of the opinion that another has committed a material breach of the provision of this agreement which shall include but not be limited to poor performance, it shall give written notice thereof to that other party and to the employer / principal. The date of such notice is hereinafter referred to as the "Notice Date". The matter shall thereafter forthwith be referred to the Executive Committee for a decision as to whether such a breach exists.

15.3.2 Should the Executive Committee not be able to reach a decision as to whether a material breach exists, the matter shall be dealt with as a formal dispute between the PARTNERS and shall be referred to arbitration in terms of Clause 19.

15.3.3 If the said Executive Committee or the arbitrator, as the case may be finds that a material breach has been committed, the defaulting party shall remedy such breach within seven (7) days of such finding, failing which the other parties shall have the right, without prejudice to any other remedy that they may have to declare the Joint Venture terminated with the effect from the Notice Date and the provision of Clause 15.2 shall then apply.

## 15. SUB-CONTRACT AND SUPPLY CONTRACT

Any information or knowledge gained by any party shall remain secret and confidential and shall not be disclosed to any prospective or actual sub-contractor or supplier.

## 16. ASSIGNMENT / CESSION

No party shall without prior written consent of the others and of the Employer / Principal cede any of its rights or assign any of its obligations under this agreement to the Contract.

## 17. DISSOLUTION

Upon substantial completion of the Contract the Joint Venture shall

17.1 Cause all plant Equipment material and other property belonging to the Joint Venture to be disposed of as provided in Clause 15 and the proceeds thereof credited to the account of the Joint Venture.

17.2 Cause the final account of accounts to be prepared showing the total net profit earned or the loss incurred by the Joint Venture in connection with the Contract and upon such account or accounts being agreed by the PARTNERS, such total net profit (if any) shall be divided between them in proportion to their respective participation in the Joint Venture and the said bank account or accounts shall thereafter be closed after any outstanding balance therein due to any of the partners has been paid. Nothing herein contained shall prevent interim distribution of profits by agreement between the PARTNERS.

## 18. ARBITRATION PROVISIONS

18.1 Should any dispute or difference arise between the PARTNERS the following procedures shall apply:

18.1.1 A party shall be entitled to give written notice to the other PARTNERS and to the EMPLOYER / PRINCIPAL stating that in its view a dispute or difference or deadlock exists and that it requires the provision of this clause to be put into operation, and the matter shall be referred to arbitration and the further provision hereof shall apply.

18.1.2 The arbitrator shall be an independent suitably qualified person agreed upon between the PARTNERS and appointed in terms of Clause 5.7, and failing agreement shall be a practicing Advocate of not less than ten (10) years standing as such, nominated by the Chairman for the time being of the Cape Bar council.

18.1.3 The arbitration shall be held in _____. In a summary manner, that is on the basis that it shall not be necessary to observe or carry out the usual formalities or procedure (e.g there shall not be any pleadings or discovery) or the strict rules of evidence but otherwise subject to the foregoing under the Provisions of the Arbitration Act No 42 of 1965 of the Republic of South Africa, with the intent that arbitration shall be held immediately with a view to it being completed within twenty one (21) business days after it has been demanded.

18.1.4 The arbitrator shall decide the matter submitted to him according to what he considers just and equitable in the circumstances and therefore the strict rules of law shall not be observed or taken into account by him in arriving at his decision.

18.1.5 Any decision given by the arbitrator shall be final and binding upon the PARTNERS, shall be carried into effect by the PARTNERS and may be made an order of any Court of competent jurisdiction if so desired.

18.2 This clause is separable from the rest of the agreement and shall remain in effect notwithstanding its termination.

## 19. WHOLE AGREEMENT

This document contains all of the terms and conditions of this agreement and no alteration or variation thereof shall be of any effect unless reduced into writing and signed by the PARTNERS.

## 20. ADVERTISEMENTS / CORRESPONDENCE

When the subject matter of any advertisement involves another party or the Joint Venture, such advertisements and publications shall make due reference to and acknowledge the work performed by and the interest of the other PARTNERS in the Contract.

All correspondence and other forms of written communication must reflect the name of all PARTNERS albeit in an abbreviated form.

## 21. DOMICILIA CITANDI EXECUTANDI

21.1 For all purposes concerning this agreement and for the fulfilment thereof, the PARTNERS hereby choose domicilium citandi et executandi which shall be in the Republic of South Africa as follows:-

_____

21.2 All instructions, directions and notices which may be required to be given by a party to any other party shall be addressed to that party's domicilium and shall be deemed to have been received if dispatched by prepaid registered post four (4) days after posing or if delivered by hand on the date of delivery.

**THUS DONE AND SIGNED AT _____ ON THIS _____ DAY OF _____ 2023.**

**AS WITNESSES** For and on behalf of

1. _____ _____

2. _____ _____

**THUS DONE AND SIGNED AT _____ ON THIS _____ DAY OF _____ 2023.**

**AS WITNESSES** For and on behalf of

1. _____ _____

2. _____ _____

# POWER OF ATTORNEY

_____

REGISTRATION NO. _____

**A WRITTEN RESOLUTION PASSED BY THE DIRECTORS OF THE COMPANY ON**

_____ (date)

_____

**RESOLVED THAT**

_____ in his capacity as a _____ of the Company be and is hereby authorised to enter into a Joint Venture Agreement with _____ for the construction of _____ Tender No. _____.

It is further noted that _____ will be jointly and severally liable with _____ for the execution of the contract.

# SPECIAL POWER OF ATTORNEY

_____

REGISTRATION NO. _____

_____

REGISTRATION NO. _____

**A WRITTEN RESOLUTION PASSED BY THE DIRECTORS OF THE JOINT-VENTURE COMPANY ON** _____ (date)

_____

**RESOLVED THAT**

_____ in his capacity as a **MEMBER** of the Joint Venture be and is hereby authorised to sign all contract documents for the _____ _____ Tender No. _____ to the value of R_____ on behalf of the Joint Venture company.

_____

# PART 21: TECHNICAL SPECIFICATIONS

1. HYBRID SOLAR PV PLANT
2. SPECIFICATION SECTION C :ELECTRICAL INSTALLATION WORKS SPECIFICATION
3. TEACHING AND LEARNING 5kW KIT

higher education & training
Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# HYBRID SOLAR PV PLANT SPECIFICATION

# AT

# ORBIT TVET COLLEGE RUSTENBURG

## TABLE OF CONTENTS

## INTRODUCTION

The Client has implemented sustainable energy solutions to offset the energy usage of their depots by using more sustainable energy solutions. This is in accordance with the current W&RSETA strategy plan towards a greener economy to lower the energy demand of the Client owned buildings from the grid.

## 1. SCOPE OF WORK

The document covers only the requirements for the equipment to be used, i.e., solar PV modules. The detailed design of plant, Procurement, Construction, Commissioning is not covered in this document. All works shall be executed as described in the specifications, as well as all other supplies or works as deemed necessary for a complete and functional Solar PV system. The work shall be carried out in compliance with relevant Environmental Requirements.

## 2. NORMATIVE REFERENCES

The following documents contain provisions that, through reference in the text, constitute requirements of this specification. At the time of publication, the editions indicated were valid. All standards and specifications are subject to revision, and parties to agreements based on this specification are encouraged to investigate the possibility of applying the most recent editions of the documents listed below.

- SANS 61215: Design qualification and type test approval (Crystalline)
- SANS 61730: Photovoltaic (PV) module safety qualification
- IEC 61701: Salt mist corrosion testing of photovoltaic modules
- IEC 62716: Ammonia corrosion testing of photovoltaic modules
- IEC 62759-1: Transportation testing pf photovoltaic modules
- Requirements of the W&RSETA

## 3. ABBREVIATIONS

DC- Direct current

EVA- Ethylene vinyl acetate

kWp- Kilowatt peak

PV-Photovoltaic
kW-Kilo watt
STC –Standard test condition
VUCA-Volatility, uncertainty, complexity, and ambiguity
Wp- Watt peak

## 4. REQUIREMENTS

### 4.1 General

This section describes the detailed specifications of the required Solar PV Module for the project. The Contractor is responsible for ensuring that each line item specification is adhered to in the provision of all equipment and material.

The PV Modules specified shall be a low Iron glass laminate using crystalline technology. The glass laminate shall use a high grade EVA laminate material. Preferably, fly lead interconnects shall be used inclusive of an IP65 or IP67 or IP68 junction box rated which includes bypass diode protection. Furthermore, the PV module shall be framed with a sturdy anodized Aluminium frame with easy mounting holes and an earth connection.

### 4.2 PV MODULE

The Photovoltaic (PV) modules shall meet the following minimum requirements:

4.2.1 The module rated peak power shall be ≥ 500 Wp at STC (25°C). The peak power shall be of the manufacturer's name plate data sheets for each individual module

4.2.2 The modules shall be crystalline material with a minimum module efficiency ≥ 17.5%

4.2.3 Crystalline modules shall meet SANS 61215 of class II: Crystalline (mono) PV modules — Design qualification and type approval.

4.2.4 A certificates stating compliance to the relevant standard above shall be submitted

4.2.5 The module shall have a minimum performance guarantee of 80% for the

required design life of 20 years under any prevailing site environmental conditions

4.2.6 Preference shall be given to Bloomberg listed Tier 1 manufacturers or a manufacturers who has 5 years' experience producing at least 150MW PV modules per year. (Tier 1 in this context refers to the Tier 1 list of Bloomberg New). Other manufacturers are however not excluded.

4.2.7 The PV module shall be on the PVEL and PV-Tech score or shall pass their tests in addition to SANS 61215.

4.2.8 The tolerance of the rated output of the PV modules offered shall be -0/+5%

4.2.9 Sample of Flash test reports for modules shall be made available to the Client with the actual certificates of modules installed prior to installation stage

4.2.10 Labelling: each module shall be labelled indicating: Manufacturer, model number, serial number, maximum power point watt rating (Wpeak +/- tolerance), maximum power point current, maximum power point voltage, open circuit voltage and short circuit current of each module and the maximum system voltage.

4.2.11 Each module shall be factory equipped with output cables which are connected in a weather proof junction box. The cables shall be a suitably rated solar cable.

4.2.12 The modules shall be framed with an anodised aluminum frame in such a way as to allow secure fastening to the PV array mounting structure.

4.2.13 All PV modules shall be of the same type, size and age hence interchangeable.

# 5 MATERIAL AND INSTALLATIONS

## 5.1 PV module clamping points

5.1.1 PV modules shall be installed according to the manufactures instruction to avoid damage by an accredited installer.

5.1.2 The mechanical stress test according to SANS 61215, the module shall be mounted as per the manufacturer's and load of 2400 Pa (push and pull 3 times) is applied

5.1.3 Sufficient distance between the modules to avoid needless loads shall apply

5.1.4 Module clamps shall be correctly selected and fit securely on the module frame

## 5.2 Connectors

5.2.1 The solar PV connectors shall be MC4 male and female connector type

## 5.3 Cables

5.3.1 Cables shall be UV-resistant, double insulated, ozone-resistant, temperature resistant, rubber type cable, and equivalent to 4 $mm^2$ to 6 $mm^2$ solar cables

## 5.4 Outside cable laying

5.4.1 Module cables and connectors shall not lie on the roof

5.4.2 UV protection shall be used if cables are exposed directly to the sun

## 5.5 Cable inlet

5.5.1 Cable laying shall be done under consideration of fire protection and existing thermal installation

## 5.6 Inside cable laying

5.6.1 Cables and other components shall be clearly marked

## 5.7 Hooks

5.7.1 Number and position of the hooks shall be determined by structural analysis, rafter spacing and tile dimensions.

5.7.2 Screws shall withstand the loads

## 5.8 Rail Mounting

5.8.1 Rail cutting: preferably on the ground to avoid metal scarf on the roof

5.8.2 A circular saw shall be used as compared to angle grinder

# 6 ROUTINE MAINTENANCE OF PHOTOVOLTAIC MODULES

Maintenance for the Solar PV systems shall be done monthly. This includes cleaning the panels and checking all system components. Any issues raised with system components are brought to awarded contactors' attention and then rectified via a report after site inspection.

Maintenance may be required at a higher rate should the performance of the system dip below the desired outcome.

## 6.1 Constant monitoring

The PV modules shall be constantly monitored, and informed via email if any faults occur. There shall be a 24 hour reaction time to any fault condition.

## 6.2 Monthly checks

Maintenance of the PV modules shall be cleaned monthly to keep the production high and the following maintenance shall be done:

6.2.1 Panel cleaning (cleaned with purely water and micro-fibre brushes)
6.2.2 String test (tested with 1000V multimeter)
6.2.3 Infrared images of electrical connections
6.2.4 Overall system overview (cracks or loose connections etc.)

## 6.3 Annual service

The annual service report shall provide preventative maintenance procedures to ensure the validity of any warranties on the system. It shall comprised mechanical and a portal (any approved/accepted software) report.

### 6.3.1 **Mechanical Inspection**

i) Ensure all penetrations are watertight.
ii) Check for vegetation growth, accumulation & shading.
iii) Confirm safety signage in place as per construction file.
iv) Confirm all electrical enclosures secure, locked and have required signage.
v) Check all conduits/cable trays and ensure secure and in good condition.
vi) Check for corrosion on any enclosures/trays/conduit/structure.
vii) Check for corrosion at all cable entry/exit points to conduit.

6.3.2 **Array/Module inspection:**

i) Check all panels for damage/cracks, water ingress and potential hot spots.
ii) Inspect general condition of roof sheet structure and report any signs of loose connections.
iii) Torque all middle and end clamps to manufacturers specifications using torque wrench or similar.
iv) Check for corrosion on any enclosures structure.
v) Check for signs of animal drops in array.
vi) Check labelling on cable trays and cables in order.

## 6.4 Earthing:

6.4.1 Check that all earthing along trunking/cable trays is present and tight.

6.4.2 Lightning protection: check finials and other protection devices are in good condition

6.4.3 Conduct grounding tests on all earthing points

## 7 TRAINING

7.1 The suppliers shall provide comprehensive training courses on the configuration, installation, operation and maintenance of solar PV system.

7.2 The suppliers shall provide technical support on solar PV system's and equipment queries for the duration of the contract.

7.3 User, Functional & System Support Training

7.3.1 Technical system support training for the Client employees
7.3.2 Training on DQM operations/monitoring/control for the managers/supervisors/data stewards
7.3.3 The service provider shall provide a copy of the training materials and user documentation to the Client in an electronic readable and printable format.

## 8. QUALITY MANAGEMENT

A quality management system shall be set up in order to assure the quality during manufacture, installation, removal, transportation and disposal of scrap material/Waste/E-waste .Guidance on the requirements for a quality management system may be found in the following standards: ISO 9001:2015. The details shall be subject to agreement between the purchaser and supplier.

## 9. HEALTH AND SAFETY

A health and safety plan shall be set up in order to ensure proper management and compliance during manufacture, installation, removal, transportation and disposal of scrap material/Waste/E-waste. Guidance on the requirements of a health and safety plan shall be found in OHSAS 18001:2007/ ISO 45001:2018 standards. The details shall be subject to agreement between the Client and the Supplier.

## 10. ENVIRONMENTAL MANAGEMENT

An environmental management plan shall be set up in order to ensure the proper environmental management and compliance is adhered to during manufacture, installation, removal, transportation and disposal of scrap material/Waste/E-waste. Guidance on the requirements for an environmental management system shall be found in ISO 14001:2015 standards. The details shall be subject to agreement between the Client and the Supplier. This is to ensure that the asset created conforms to environmental standards and the Client Environmental Policy.

## ITEM No. 1 No. ….: PV MODULES: CANDADIAN SOLAR 605W

**Schedule A: Purchaser's specific requirements**

**Schedule B: Guarantees and technical particulars of equipment offered**

| Item No. | Description | Unit | Required | Tendered |
|---|---|---|---|---|
| **1** | **Product information** | | | |
| 1.1 | Manufacturer | | | |
| 1.2 | Product Type | | | |
| **2** | **PV Module Characteristics** | | | |
| 2.1 | PV Module technology | N/A | Crystalline(Mono) | |
| 2.2 | Module rated power (c-si ) | Wp | ≥ 355 Wp / ≥370Wp | |
| 2.3 | Module Efficiency | % | ≥ 17.5% | |
| 2.4 | Temperature coefficient on Pmpp (negative on sign) | - %/°C | ≥ - 0.38%/°C | |
| 2.5 | Nominal Power Tolerances from Manufacturer (used for acceptance to the module) | ± % | 0% ≤ Pnom ≤ +5% (positive tolerance only) | |
| 2.6 | Module Maximum System Voltage | V | 48V | |
| **3** | **Product Warranty and Performance Guarantee** | | | |
| 3.1 | Power output guaranteed during the first year of operation | % | Minimum : 97% | |
| 3.2 | Linear degradation coefficient after year 1 to year 20 | %/year | Maximum degradation of -0.7%/year | |
| 3.3 | Guaranteed output of the nominal power after 10 years | % | Minimum 90% | |
| 3.4 | Guaranteed output of the nominal power after 20 years | % | Minimum 80% | |
| 3.5 | Product Warranty against Manufacturing defects | Years | Minimum 2 | |
| **4** | **Minimum Certificates for acceptance of PV modules** | | | |

| Item No. | Description | Unit | Required | Tendered |
|---|---|---|---|---|
| 4.1 | IEC 61730- Photovoltaic (PV) module safety class II qualification | N/A | Required | |
| 4.2 | IEC 61730-2 Testing requirements for PV modules in order to provide safe electrical and mechanical operation | N/A | Required | |
| 4.3 | SANS 61215 – PV module safety certification | N/A | Required | |
| 4.4 | UL 1703- Fire resistance rating is acceptable | N/A | Required | |
| 4.5 | CE-European conformity if exported | N/A | Required | |
| 4.6 | PV Cycle-recycling approved waste disposal | N/A | Required | |
| 4.7 | ISO 9001:2015/Quality management system | N/A | Required | |
| 4.8 | ISO 14001:2015/Standards for environmental management system | N/A | Required | |
| 4.9 | OHSAS18001:2007/international standard for occupational health and safety | N/A | Required | |
| **5** | **Documentation for evaluation of PV modules** | | | |
| 5.1 | Detailed Technical Specifications | N/A | Required | |
| 5.2 | Limited Product and Peak Power Warranty | N/A | Required | |
| 5.3 | Installation, Operation and Maintenance manual | N/A | Required | |
| 5.4 | Description of the cleaning strategy Instruction | N/A | Required | |
| 5.5 | Recycling strategy | N/A | Required | |
| 5.6 | Flash Test Report | N/A | Required | |
| 5.7 | Potential Induced Degradation (PID) free test report | N/A | Required | |

**DEVIATION SCHEDULE:**

**ITEM No. 1 No. ….: PV Modules 500Wp**

| Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost- effective than that specified by the Client. | | |
|---|---|---|
| **Item No.** | **Sub-clause of?** | **Proposed deviation** |
| | | |

higher education & training
Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# TEACHING AND LEARNING 5kW KIT SPECIFICATION

# AT

# ORBIT TVET COLLEGE MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE

## TEACHING AND LEARNING 5kW KIT

### Introduction

Supply and install a 5kW Mobile Hybrid PV Solar Plant designed specifically for training, teaching, and learning at TVET. This mobile unit is a comprehensive system that incorporates batteries, an inverter, a control panel with diagnostic and communication system, and an energy meter, all securely mounted on a sturdy frame. A mobile frame is manufactured to accommodate multiple solar panels, ensuring optimal energy generation. To enhance mobility, the frame is equipped with durable wheels, allowing easy transportation and positioning of the unit.

The frame, an integral part of the solar plant, is constructed using high-quality mild steel to ensure robustness and longevity. All steel components of the frame must be meticulously coated with a vibrant red powder spray paint, providing an attractive and professional finish while protecting against corrosion and environmental elements.

### General Specification

The General Specification will be the same as that of Solar Plant specified above.

### Particular Specifications

The detailed specifications and instructions are as follows:

### Mobile Steel Frame with Permanently Mounted Panels

The angled steel frame will be engineered to securely mount multiple small solar panels to supply 5kW. The frame shall he made of 4mm thick angle iron and square tubing. It will incorporate sturdy wheels, enabling easy movement and positioning of the mobile solar panel unit. The frame will be manufactured from 4 mm mild steel, chosen for its strength and durability. The dimensions of the frame should be designed to accommodate the specified solar panels and associated components, ensuring a compact and efficient layout.

The frame shall be stable with optimal weight distribution to ensure safe transportation and operation. Angle irons will be utilised to protect the solar panel edges.

A robust and adjustable mounting system that securely holds the solar panels in place will be specified. Implement a design that allows for easy installation and removal of the panels, ensuring flexibility and versatility.

Incorporate mechanisms to ensure proper alignment and angle adjustment of the panels to maximize solar energy capture.

**Wall mounted Battery and Inverter Integration into cabinet**

A steel framed cabinet that allocates appropriate compartments or racks for housing the permanently mounted batteries, combiner, inverter, inverter connection box, energy meter shall be manufactured.

Sufficient space, ventilation, and insulation must be provide in order to ensure safe operation and efficient cooling of the components. It will incorporate protective features to prevent damage from shocks, vibrations, and environmental factors during storage and operation.

All the necessary connectors, wiring channels, and access points to facilitate interconnection and maintenance of the batteries, inverter, and energy meter shall be allowed for. This cabinet will be fixed in an optimal place in the laboratory or workshop.

**Protective coating**

A high-quality red powder spray paint finish shall be specified for applications on all exposed steel components of the frame.

Proper surface preparation, including cleaning, degreasing, and sanding shall performed, to promote proper adhesion of the paint.

A durable and weather-resistant powder coatings with appropriate corrosion resistance properties will be specified.

The specifications will ensure that the correct application technique, including appropriate thickness and curing processes, to achieve a smooth and uniform finish.

**Possible Training, Teaching, and Learning Activities**

The Mobile Hybrid PV Solar Plant will offer a wide range of training, teaching, and learning opportunities for TVET institutions. Here are some of the activities that can be achieved utilizing this unit:

<u>Solar Energy System Installation</u>

Students can learn the process of installing a solar energy system by assembling the mobile unit. They will gain practical experience in mounting solar panels, connecting batteries, installing the inverter, and setting up the energy meter rack. This hands-on activity enhances their understanding of system components and their interconnections.

System Configuration and Maintenance

Trainees can learn how to configure and maintain the hybrid PV solar system within the mobile unit. They will explore the functionalities of the inverter, battery management system, and energy meter. This activity helps develop skills in system troubleshooting, monitoring, and routine maintenance.

Renewable Energy Integration

The mobile unit can be used to demonstrate the integration of renewable energy sources into existing power systems. Trainees can learn how to connect the solar plant to the grid or existing electrical infrastructure, understanding concepts like grid-tie inverters, net metering, and feed-in tariffs.

Energy Efficiency and Load Management

Students can experiment with load management techniques using the mobile unit. They can connect various electrical loads and appliances to the system, learning how to optimize energy consumption and maximize efficiency. This activity promotes awareness of energy-saving practices and load balancing.

Performance Analysis and Monitoring

Trainees can measure and analyze the performance of the solar panels, batteries, and inverter using the energy meter rack. They will learn how to interpret energy production data, evaluate system efficiency, and identify potential issues. This activity fosters skills in data analysis, system optimization, and performance evaluation.

Off-Grid Applications

The mobile unit can be disconnected from the grid to simulate off-grid scenarios. Trainees can learn about standalone solar systems, including battery sizing, charge controller configuration, and load prioritization. They can also explore the design and installation of off-grid power systems for remote locations or emergency situations.

Safety and Regulations

The mobile unit provides an opportunity to educate students about safety protocols and regulations related to solar energy systems. Trainees can learn about electrical safety practices, grounding requirements, and compliance with local codes and standards. This activity instils a strong understanding of safety measures and legal considerations in renewable energy installations.

Troubleshooting and Repairs

Trainees can simulate common issues and faults in the mobile unit and practice troubleshooting techniques. They will develop skills in identifying and rectifying system malfunctions, such as faulty connections, damaged components, or system failures. This hands-on troubleshooting activity enhances problem-solving abilities and fosters practical knowledge of system maintenance and repair.

higher education & training
Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# SECTION C: ELECTRICAL INSTALLATION WORKS SPECIFICATION

# AT

ORBIT TVET College, Rustenburg Campus, North West Province

**ELECTRICAL ENGINEERS**
Name: Emzansi Consulting
Tel: (012) 345 3383
Contact Person: Aubrey Mackenzie

**INDEX** **PAGE NO.**

# 5 SPECIFICATION FOR ELECTRICAL WORK

## PART 1 - GENERAL

## CONTENTS

# 6 PART 1 - GENERAL

## 1 TESTS

After completion of the works and before practical completion is achieved, a full test will be carried out on the installation for a period of sufficient duration to determine the satisfactory working thereof. During this period the installations will be inspected and the Contractor shall make good, to the satisfaction of the Principle Agent/Electrical Engineer or the employer, any defects which may arise.

The Contractor shall provide all instruments and equipment required for testing and any water, power and fuel required for the commissioning and testing of the installations at completion.

## 2 MAINTENANCE OF INSTALLATIONS

With effect from the date of the Practical completion Certificate the Contractor shall at his own expense undertake the regular servicing of the installation during the maintenance period and shall make all adjustments necessary for the correct operation thereof.

If during the said period the installations is not in working order for any reason for which the Contractor is responsible, or if the installations develops defects, he shall immediately upon being notified thereof take steps to remedy the defects and make any necessary adjustments.

Should such stoppages however be so frequent as to become troublesome, or should the installations otherwise prove unsatisfactory during the said period the Contractor shall, if called upon by the Principle Agent/Electrical Engineer or the Employer, at his own expense replace the whole of the installations or such parts thereof as the Principal Agent/Electrical Engineer or the Employer may deem necessary with apparatus specified by the Principal Agent/Electrical Engineer or the Employer.

## 3 REGULATIONS

The installation shall be erected and tested in accordance with the Acts and Regulations as indicated in the scope of works

## 4 SCHEDULE OF FITTINGS

In all instances where schedule of light, socket outlet and power points are attached to or included on the drawings, these schedules are to be regarded as forming part of the specification.

## 5 QUALITY OF MATERIALS

Only materials of first class quality shall be used and all materials shall be subject to the approval of the Employer.

Wherever applicable the material is to comply with the relevant South African Bureau of Standards, specifications, or to IEC Specifications, where no SANS Specifications exist.

Materials wherever possible, must be of South African manufacture.

## 6 CONDUIT AND ACCESSORIES

The type of conduit and accessories required for the service, i.e. whether the conduit and accessories shall be of the screwed type, plain-end type or of the non-metallic type and whether metallic conduit shall be black enamelled or galvanised, is specified in Part 2 of this specification.

Unless other methods of installation are specified for certain circuits, the installation shall be in conduit throughout. No open wiring in roof spaces or elsewhere will be permitted.

The conduit and conduit accessories shall comply fully with the applicable SANS specifications as set out below and the conduit shall bear the mark of approval of the South African Bureau of Standards.

a) Screwed metallic conduit and accessories: SANS 61386-1 and 21.

b) Plain-end metallic conduit and accessories: SANS 61386-1 and 21.

c) Non-metallic conduit and accessories: SANS 61386-1 and 21.

All conduit fittings except couplings, shall be of the inspection type. Where cast metal conduit accessories are used, these shall be of malleable iron. Zinc base fittings will not be allowed.

Bushes used for metallic conduit shall be brass and shall be provided in addition to locknuts at all points where the conduit terminates at switchboards, switch-boxes, draw-boxes, etc.

Draw-boxes are to be provided in accordance with the “Wiring Code” and wherever necessary to facilitate easy wiring.

For light and socket outlet circuits, the conduit used shall have an external diameter of 20mm. In all other instances the sizes of conduit shall be in accordance with the “Wiring Code” for the specified number and size of conductors, unless otherwise directed in part 2 of this specification or indicated on the drawings.

Only one manufactured type of conduit and conduit accessories will be permitted throughout the installation.

Running joints in screwed conduit are to be avoided as far as possible and all conduit systems shall be set or bent to the required angles. The use of normal bends must be kept to a minimum with exception of larger diameter conduits where the use of such bends is essential.

All metallic conduit shall be manufactured of mild steel with a minimum thickness of 1,2mm for plain-end conduit and 1,6mm in respect of screwed conduit.

Under no circumstances will conduit having a wall thickness of less than 1,6mm be allowed in screed laid on top of concrete slabs.

Bending and setting of conduit must be done with special bending apparatus manufactured for the purpose and which are obtainable from the manufacturers of the conduit systems. Damage to conduit resulting from the use of incorrect bending apparatus or methods applied must on indication by the Engineers inspectorate staff, be completely removed and rectified and any wiring already drawn into such damaged conduits must be completely renewed at the Contractor’s expense.

Conduit and conduit accessories used for flame-proof or explosion proof installations and for the suspension of luminaires as well as all load bearing conduit shall in all instances be of the metallic screwed type.

All conduit and accessories used in areas within 50 km of the coast shall be galvanised to SANS 32 and SANS 121.

Tenderers must ensure that general approval of the proposed conduit system to be used is obtained from the local electricity supply authority prior to the submission of their tender. Under no circumstances will consideration be given by the Engineer to any claim submitted by the Contractor, which may result from a lack of knowledge in regard to the supply authority’s requirements.

## 7 CONDUIT IN ROOF SPACES

Conduit in roof spaces shall be installed parallel or at right angles to the roof members and shall be secured at intervals not exceeding 1,5m by means of saddles screwed to the roof timbers.

Nail or crampets will not be allowed.

Where non-metallic conduit has been specified for a particular service, the conduit shall be supported and fixed with saddles with a maximum spacing of 450 mm. The Contractor shall supply and install all additional supporting timbers in the roof space as required.

Under flat roofs, in false ceilings or where there is less than 0,9m of clearance, or should the ceilings be insulated with glass wool or other insulating material, the conduit shall be installed in such a manner as to allow for all wiring to be executed from below the ceilings.

Conduit runs from distribution boards shall, where possible terminate in fabricated sheet steel draw-boxes installed directly above or in close proximity to the boards.

## 8 SURFACE MOUNTED CONDUIT

Wherever possible, the conduit installation is to be concealed in the building work; however, where unavoidable or otherwise specified under Part 2 of the specification, conduit installed on the surface must be plumbed or levelled and only straight lengths shall be used.

The use of inspection bends is to be avoided and instead the conduit shall be set uniformly and inspection coupling used where necessary.

No threads will be permitted to show when the conduit installation is complete, except where running couplings have been employed.

Running couplings are only to be used where unavoidable, and shall be fitted with a sliced couplings as a lock nut.

Conduit is to be run on approved spaced saddles rigidly secured to the walls.

Alternatively, fittings, tees, boxes, couplings etc., are to be cut into the surface to allow the conduit to fit flush against the surface. Conduit is to be bedded into any wall irregularities to avoid gaps between the surface and the conduit.

Crossing of conduits is to be avoided, however, should it be necessary purpose-made metal boxes are to be provided at the junction. The finish of the boxes and positioning shall be in keeping with the general layout.

Where several conduits are installed side by side, they shall be evenly spaced and grouped under one purpose-made saddle.

Distribution boards, draw-boxes, industrial switches and socket outlets etc., shall be neatly recessed into the surface to avoid double sets.

In situations where there are no ceilings the conduits are to be run along the wall plates and the beams.

Painting of surface conduit shall match the colour of the adjacent wall finishes.

Only approved plugging materials such as aluminium inserts, fibre plugs, plastic plugs, etc., and round-head screws shall be used for fixing saddles, switches, socket outlets, etc., to walls, wood plugs and the plugging in joints in brick walls are not acceptable.

## 10 WIRING:

Except where otherwise specified in Part 2 of this specification, wiring shall be carried out in conduit throughout. Only one circuit per conduit will be permitted.

No wiring shall be drawn into conduit until the conduit installation has been completed and all conduit ends provided with bushes. All conduits to be clear of moisture and debris before wiring is commenced.

Unless otherwise specified in Part 2 of this specification or indicated on the service drawings, the wiring of the installation shall be carried out in accordance with the "Wiring Code". Further to the requirements concerning the installation of earth conductors to certain light points as set out in the "Wiring Code", it is a specific requirement of this document that where plain-end metallic conduit or non-metallic conduit has been used, earth conductors must be provided and drawn into the conduit with the main conductors to all points, including all luminaires and switches throughout the installation.

Wiring for lighting circuits is to be carried out with 1,5mm² conductors and a 1,5mm²-earth conductor. For socket outlet circuits the wiring shall comprise 4mm² conductors and a 2,5mm²-earth conductor. In certain instances, as will be directed in Part 2 of this specification, the sizes of the aforementioned conductors may be increased for specified circuits. Sizes of conductors to be drawn into conduit in all other instances, such as feeders to distribution boards, power points etc., shall be as specified elsewhere in this specification or indicated on the drawings. Sizes of conductors not specified must be determined in accordance with the "Wiring Code".

The loop-in system shall be followed throughout, and no joints of any description will be permitted.

The wiring shall be done in PVC insulated 600/1000 V grade cable to SANS 1507.

Where cable ends connect onto switches, luminaires etc., the end strands must be neatly and tightly twisted together and firmly secured. Cutting away of wire strands of any cable will not be allowed.

## 11 SWITCHGEAR

Switchgear, which includes circuit breakers, iron-clad switches, interlocked switch-socket outlet units, contactors, time switches, etc., is to be in accordance with the Quality Specifications which form part of this specification and shall be equal and similar in quality to such brands as may be specified.

For uniform appearance of switchboards, only one approved make of each of the different classes of switchgear mentioned in the Quality Specifications shall be used throughout the installations.

## 12 SWITCHBOARDS

All boards shall be in accordance with the types as specified, be constructed according to the detail or type drawings and must be approved by the Employer before installation.

In all instances where provision is to be made on boards for the supply authority's main switch and/or metering equipment the contractor must ensure that all requirements of the authorities concerned in this respect are met.

Any construction or standard type aboard proposed, as an alternative to that specified must have the prior approval of the Employer.

All busbars, wiring, terminals, etc., are to be adequately insulated and all wiring is to enter the switchgear from the back of the board. The switchgear shall be mounted within the boards to give a flush front panel. Cable and boxes and other ancillary equipment must be provided where required.

Clearly engraved labels are to be mounted on or below every switch. The working of the labels in English, is to be according to the lay-out drawings or as directed by the Electrical Engineer and must be confirmed on site. Flush mounted boards to be installed with the top of the board 2,0m above the finished floor level.

## 13 WORKMANSHIP AND STAFF

Except in the case of electrical installations supplied by a single-phase electricity supply at the point of supply, an accredited person shall exercise general control over all electrical installation work being carried out.

The workmanship shall be of the highest grade and to the satisfaction of the Employer.

All inferior work shall, on indication by the Employer's inspecting officers, immediately be removed and rectified by and at the expense of the Contractor.

## 14 VERIFICATION AND CERTIFICATION OF ELECTRICAL INSTALLATION (CERTIFICATE OF COMPLIANCE AND TEST REPORT

On completion of the service, a certificate of compliance must be issued to the Principal Agent/Electrical Engineer or Employer in terms of the Occupational Health and Safety Act, 1993 (Act 85 of 1993) in the format as set out in SANS 10142-1 & 2.

## PART 2: INSTALLATION DETAILS

**CONTENTS**

## PART 2: INSTALLATION DETAILS

### 1 CABLE SLEEVE PIPES

Where cables cross under roadways, other services and where cables enter buildings, the cables shall be installed in earthenware or high-density polyethylene pipes.

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.

### 2 ELECTRICAL EQUIPMENT

All equipment and fittings supplied must be in accordance with the attached quality specification (Part 3 of this document), suitable for the relevant supply voltage, and frequency and must be approved by the Employers Electrical Engineer.

### 3 DRAWINGS

The drawings generally show the scope and extent of the proposed work and shall not be held 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 must be established on site, prior to these items being built in.

### 4 BALANCING OF LOAD

The Contractor is required to balance the load as equally as possible over the multiphase supply.

### 6 SERVICE CONDITIONS

All plant shall be designed for the climatic conditions appertaining to the service.

### 7 EARTHING AND BONDING

The Contractor will be responsible for all earthing and bonding of the building and installation. The earthing and bonding is to be carried out strictly as described in clause 18 of Part 1 of this specification and to the satisfaction of the Employer/s Electrical Engineer.

### 8 MAINTENANCE OF ELECTRICAL SUPPLY

All interruptions of the electrical supply that may be necessary for the execution of the work, will be subject to prior arrangement between the Contractor and the Client and the Employer's Electrical Engineer.

### 9 EXTENT OF WORK

The work covered by this contract comprises the complete electrical installation, in working order, as shown on the drawings and as per this specification, including the supply and installation of all fittings and also the installation of such equipment supplied by the Employer.

### 10 CONDUIT AND WIRING

***Conduit and conduit accessories shall be black enameled/galvanized screwed conduit or black enameled/galvanized plain end conduit in accordance with SANS 61386.***

All conduits, regardless of the system employed, shall be installed strictly as described in the applicable paragraphs of clauses 4 to 8 of Part 1 of the specification. Wiring of the installation shall be carried out as directed in clause 9 part 1 of this specification.

Where plain end conduit is offered all switches and light fittings must be supplied with a permanent earth terminal for the connection of the earth wire.

Lugs held by switch fixing screws or self tapping screws will not be acceptable.

## 11. POWER TRUNKING

The Contractor shall be responsible for the supply and installation of all power trunking complete with corner pieces, end pieces, junction pieces, supply conduits, cover plates and power outlets as specified and indicated on the drawings.

The power trunking must comply with SANS 61084. The Contractor must ensure that the power trunking is installed to satisfaction of the Employer's Electrical Engineer before commencing with the wiring of the power trunking.

## 12 CABLES

The Contractor shall supply and completely install all distribution cables as indicated on the drawings, and listed in the Schedule of Cables.

The storage, transportation, handling and laying of the cables shall be according to first class practice, and the contractor shall have adequate and suitable equipment and labour to ensure that no damage is done to cables during such operations.

The cable-trenches shall be excavated to a depth of 0,9m deep below ground level and shall be 450mm wide for one to three cables, and the width shall be increased where more than three cables are laid together so that the cables may be placed at least two cable diameters apart throughout the run. The bottom of the trench shall be level and clean and the bottom and sites free from rocks or stones liable to cause damage to the cable.

The Contractor must take all necessary precautions to prevent the trenching work being in any way a hazard to the personnel and public and to safeguard all structures, roads, sewage works or other property on the site from any risk of subsidence and damage.

In the trenches the cables shall be laid on a 75mm thick bed of earth and be covered with a 150-mm layer of earth before the trench is filled in.

All joints in underground cables and terminations shall be made either by means of compound filled boxes according to the best established practice by competent cable jointers using first class materials or by means of approved epoxy-resin pressure type jointing kits. Epoxy-resign joints must be made entirely in accordance with the manufacturer's instructions and with materials stipulated in such instructions. Low tension PVCA cables are to be made off with sealing glands and materials designed for this purpose which must be of an approved make. Where cables are cut and not immediately made off, the ends are to be sealed without delay.

The laying of cables shall not be commenced until the trenches have been inspected and approved. The cable shall be removed from the drum in such a way that no twisting, tension or mechanical damage is caused and must be adequately supported at intervals during the whole operation. Particular care must be exercised where it is necessary to draw cables through pipes and ducts to avoid abrasion, elongation or distortion of any kind. The ends of such pipes and ducts shall be sealed to approval after drawing in of the cables.

Backfilling (after bedding) of the trenches is to be carried out with a proper grading of the material to ensure settling without voids, and the material is to be tamped down after the addition of every 150mm. The surface is to be made good as required.

On each completed section of the laid and jointed cable, the insulation resistance shall be tested to approval with an approved "Megger" type instrument of not less that 500 V for low tension cables.

Earth continuity conductors are to be run with all underground cables constituting part of a low tension distribution system. Such continuity conductors are to be stranded bare copper of a cross-sectional area equal to at least half that of one live conductor of the cable, but shall not be less than 4mm² or more than 70mm². A single earth wire may be used as earth continuity conductor for two or more cables run together, branch earth wires being brazed on where required.

## 13. DISTRIBUTION BOARDS

In addition to clause 14 and clause 15 of Part 1 of this specification the following shall also be applicable to switchboards required for this service.

The Contractor shall supply and install the distribution boards as indicated on the drawings and listed in the distribution Board Schedule. All distribution boards shall comply with the quality specification in Part 3 of this specification, and be approved by the Employer's Electrical Engineer.

## PART 3: SCHEDULE OF EQUIPMENT

**CONTENTS**

## 1. SCHEDULE OF CABLES

| FED FROM | FEEDING TO | CONDUCTORS | DESIGNATION | FIXED TO |
|---|---|---|---|---|
| PV Plant | PV DB | 10mm² 4-C PVC/SWA/PVC CU 6mm² BCEW | Labs | Wireways |

## 2. MAXIMUM SPACING OF SUPPORT FOR RESTRAINED CABLES

| Cross-Sectional Area of Cable Conductors (mm²) | MAXIMUM SPACING OF SUPPORTS (CLEATS) (mm) FOR RESTRAINED CABLES | | | |
|---|---|---|---|---|
| | Wire Armoured Cables | | Other than Wire Armoured Cables and Unarmoured Cables | |
| | Horizontal Cable Routes | Vertical Cable Routes | Horizontal Cable Routes | Vertical Cable Routes |
| 1,5 | 450 | 750 | 300 | 400 |
| 2,5 | 450 | 750 | 300 | 400 |
| 4,0 | 600 | 750 | 300 | 400 |
| 6,0 | 600 | 750 | 300 | 400 |
| 10,0 | 750 | 900 | 400 | 450 |
| 16,0 | 750 | 1000 | 400 | 550 |
| 25,0 | 900 | 1000 | 450 | 550 |
| 35,0 | 900 | 1000 | 450 | 550 |
| Bigger than 35,0 | 900 | 1000 | 450 | 550 |

## 3. DEPTH AND WIDTH OF CABLE TRENCHES

| **Cable type** | **Depth below FGL** | **Width** | **Spacing between cables** |
|---|---|---|---|
| MV/HT cables | 1250 mm unless otherwise specified | Fixed at 450 mm unless otherwise specified | 150 mm unless otherwise specified |
| LV cables | 750 mm unless otherwise specified | Fixed at 450 mm unless otherwise specified | 150 mm unless otherwise specified |

## 4. CABLE MARKING AND COLOUR CODING – NEW CABLE INSTALLATIONS

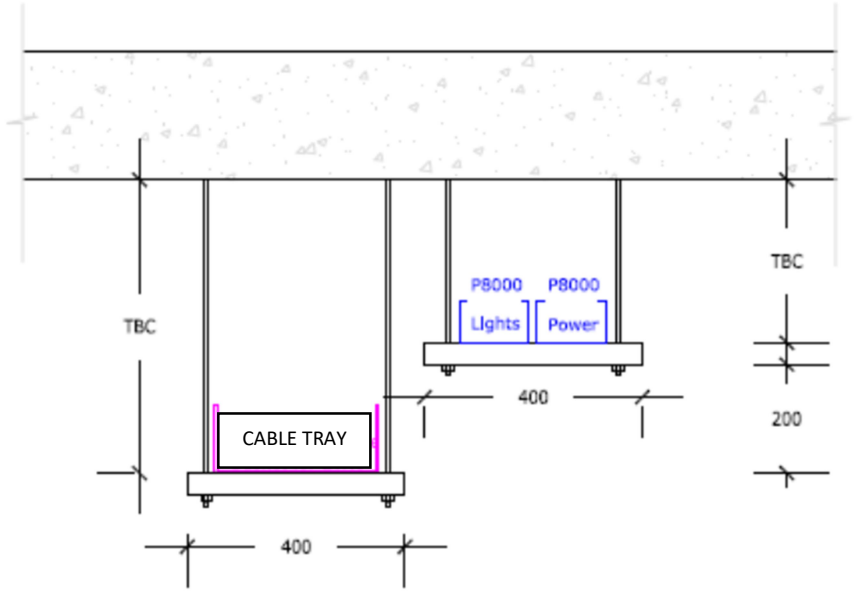
Cable lengths shall be labelled at both ends (terminations), at 5m intervals and both sides of each bend. Inside shafts / ducts at 1.8m above FFL with “Brother Tape” and a clear heat shrink to cover the tape. This label must indicate the size of the cable and from/to where the cable is feeding as per example:

Size of Conductor: 95mm² 4C PVC/SWA/PVC CABLE + 50mm BCEW
The Route: FED FROM MAIN LV PANEL TO DBG NORTH

**Label Colour Coding:**
Non-Essential Power: Black lettering on white background
Essential Power: White lettering on red background
UPS Power: White lettering on blue background

**Label Lettering Height:**
Cable size: 16mm² and <16mm² - 6mm high
Cable size: >16mm² - 9mm high

## 5. CABLE TRAY & TRUNKING INSTALLATION DETAIL




DETAIL FOR CABLE TRAY AND TRUNKING INSTALLATION

## 6. SCHEDULE OF DISTRIBUTION BOARDS

### 6.1 TYPE A

**Specification Requirement**

| Distribution Board – Type A (Plugs) | | |
|---|---|---|
| **Description** | | **Requirement** |
| Applicable Drawing | | OTVET – RB-E10 |
| Supply Voltage | | 415 Vac |
| Current Rating | | 25A |
| Panel Short Circuit Rating | | 5kA |
| Circuit Breaker Type | | CBI/Schneider/ABB or similar and equal to – pre-approved by the Engineer |
| Circuit Breaker Rating (Plugs) | | 20A, 6kA, 240 Vac, 1 Pole, C Curve QF19 |
| Earth Leakage with built in overload protection | | N/A |
| Earth Leakage Rating | | N/A |
| Earth Leakage kA Rating | | N/A |
| Wire Type | | GP Wire |
| Wire Colour | Live | Red/White/Blue |
| | Neutral | Black |
| | Earth | Green and Yellow / BCEW |
| Wire Size | Socket Outlets | 4mm² |
| | Lights | 2.5mm² |
| Panel IP Rating | | IP 42 |
| Panel Material | | Plastic |
| Distribution Board Make | | EUROLUX 24 Way Din Rail Distribution Board, – or similar and equal to c/w neutral bar and earth bar |
| Labels & Signage | | SANS 1042-1 |
| Legend Card | | As detailed in the specification |
| Locking Mechanism | | N/A |
| Panel Access | | Front |
| Cable Entry Location | | Bottom / Top / Side |
| Panel Mounting Location | | Surface Mounted |
| Panel Location | | Indoor |
| Certification | | COC |

**Surge Protection:** Class 1+2/Type 1+2 on the kiosk(s) and class 2 surge protection devices inside the building distribution board shall be installed after the incomer.

### 6.2 TYPE B

**Specification Requirement**

| Distribution Board – Type B (Lights) | | |
|---|---|---|
| **Description** | | **Requirement** |
| Applicable Drawing | | OTVET – RB-E10 |
| Supply Voltage | | 415 Vac |
| Current Rating | | 25A |
| Panel Short Circuit Rating | | 5kA |
| Circuit Breaker Type | | CBI/Schneider/ABB or similar and equal to – pre-approved by the Engineer |
| Circuit Breaker Rating (Lights) | | 10A, 6kA, 240 Vac, 1 Pole, C Curve QF19 |
| Earth Leakage with built in overload protection | | N/A |
| Earth Leakage Rating | | N/A |
| Earth Leakage kA Rating | | N/A |
| Wire Type | | GP Wire |
| Wire Colour | Live | Red/White/Blue |
| | Neutral | Black |
| | Earth | Green and Yellow / BCEW |
| Wire Size | Socket Outlets | 4mm² |
| | Lights | 2.5mm² |
| Panel IP Rating | | IP 42 |
| Panel Material | | Plastic |
| Distribution Board Make | | EUROLUX 24 Way Din Rail Distribution Board, – or similar and equal to c/w neutral bar and earth bar |
| Labels & Signage | | SANS 1042-1 |
| Legend Card | | As detailed in the specification |
| Locking Mechanism | | N/A |
| Panel Access | | Front |
| Cable Entry Location | | Bottom / Top / Side |
| Panel Mounting Location | | Surface Mount |
| Panel Location | | Indoor |
| Certification | | COC |

**Surge Protection:** Class 1+2/Type 1+2 on the kiosk(s) and class 2 surge protection devices inside the building distribution board shall be installed after the incomer.

### 6.3 TYPE C

**Specification Requirement**

| Distribution Board – Type C (Lights & Plugs) | | |
|---|---|---|
| **Description** | | **Requirement** |
| Applicable Drawing | | OTVET – RB-E04 |
| Supply Voltage | | 415 Vac |
| Current Rating | | 25A |
| Panel Short Circuit Rating | | 5kA |
| Circuit Breaker Type | | CBI/Schneider/ABB or similar and equal to – pre-approved by the Engineer |
| Circuit Breaker Rating (Lights) | | 10A – 20A, 6kA, 240 Vac, 1 Pole, C Curve QF19 |
| Earth Leakage with built in overload protection | | N/A |
| Earth Leakage Rating | | N/A |
| Earth Leakage kA Rating | | N/A |
| Wire Type | | GP Wire |
| Wire Colour | Live | Red/White/Blue |
| | Neutral | Black |
| | Earth | Green and Yellow / BCEW |
| Wire Size | Socket Outlets | 4mm² |
| | Lights | 2.5mm² |
| Panel IP Rating | | IP 42 |
| Panel Material | | Plastic |
| Distribution Board Make | | EUROLUX 24 Way Din Rail Distribution Board, – or similar and equal to c/w neutral bar and earth bar |
| Labels & Signage | | SANS 1042-1 |
| Legend Card | | As detailed in the specification |
| Locking Mechanism | | N/A |
| Panel Access | | Front |
| Cable Entry Location | | Bottom / Top / Side |
| Panel Mounting Location | | Surface Mount |
| Panel Location | | Indoor |
| Certification | | COC |

**Surge Protection:** Class 1+2/Type 1+2 on the kiosk(s) and class 2 surge protection devices inside the building distribution board shall be installed after the incomer.

### 6.4 PV PLANT MAIN DB – PV1 (LABS)

**Specification Requirement**

| Distribution Board | |
|---|---|
| **Description** | **Requirement** |
| Applicable Drawing | OTVET – RB-E05 |
| Supply Voltage | 400Vac |
| Current Rating | 80A |
| Panel Short Circuit Rating | 5KA |
| Circuit Breaker Type | CBI/Schneider/ABB or similar and equal to – pre-approved by the Engineer |
| Panel IP Rating | IP 42 |
| Panel Material | As detailed in the specification |
| Panel Painting System Details | As detailed in the specification |
| Labels | As detailed in the specification |
| Legend Card | As detailed in the specification |
| Locking Mechanism | Pad lockable lever locks – 6mm square drive panel locks for face panel |
| Panel Access | Front |
| Cable Entry Location | Bottom |
| Panel Mounting Location | Surface |
| Panel Location | Indoor |
| Certification | COC / Panel Manufacturing / QA |

**Surge Protection:** Class 1+2/Type 1+2 on the kiosk(s) and class 2 surge protection devices inside the building distribution board shall be installed after the incomer.

### 6.5 PV PLANT MAIN DB – PV 2 (CENTRAL OFFICE)

**Specification Requirement**

| Distribution Board | |
|---|---|
| **Description** | **Requirement** |
| Applicable Drawing | OTVET – RB-E05A |
| Supply Voltage | 400Vac |
| Current Rating | 80A |
| Panel Short Circuit Rating | 5KA |
| Circuit Breaker Type | CBI/Schneider/ABB or similar and equal to – pre-approved by the Engineer |
| Panel IP Rating | IP 42 |
| Panel Material | As detailed in the specification |
| Panel Painting System Details | As detailed in the specification |
| Labels | As detailed in the specification |
| Legend Card | As detailed in the specification |
| Locking Mechanism | Pad lockable lever locks – 6mm square drive panel locks for face panel |
| Panel Access | Front |
| Cable Entry Location | Bottom |
| Panel Mounting Location | Surface |
| Panel Location | Indoor |
| Certification | COC / Panel Manufacturing / QA |

**Surge Protection:** Class 1+2/Type 1+2 on the kiosk(s) and class 2 surge protection devices inside the building distribution board shall be installed after the incomer.

### 6.6 PV PLANT MAIN DB – PV 3 (HALLS)

**Specification Requirement**

| Distribution Board | |
|---|---|
| **Description** | **Requirement** |
| Applicable Drawing | OTVET – RB-E05B |
| Supply Voltage | 400Vac |
| Current Rating | 80A |
| Panel Short Circuit Rating | 5KA |
| Circuit Breaker Type | CBI/Schneider/ABB or similar and equal to – pre-approved by the Engineer |
| Panel IP Rating | IP 42 |
| Panel Material | As detailed in the specification |
| Panel Painting System Details | As detailed in the specification |
| Labels | As detailed in the specification |
| Legend Card | As detailed in the specification |
| Locking Mechanism | Pad lockable lever locks – 6mm square drive panel locks for face panel |
| Panel Access | Front |
| Cable Entry Location | Bottom |
| Panel Mounting Location | Surface |
| Panel Location | Indoor |
| Certification | COC / Panel Manufacturing / QA |

**Surge Protection:** Class 1+2/Type 1+2 on the kiosk(s) and class 2 surge protection devices inside the building distribution board shall be installed after the incomer.

## 6.7 COLOUR CODING DISTRIBUTION BOARDS, KIOSKS AND LOW-TENSION SWITCHBOARDS

**All distribution boards, kiosks and low-tension switchboards shall be equipped with lightning protection devices.**

| POWER SOURCE | COLOUR OF DISTRIBUTION BOARD, KIOSK, LOW TENSION SWITCHBOARDS | COLOUR OF FACE PLATE | LABEL TYPE | CONTENTS ON EXTERNAL LABEL | CONTENTS OF INTERNAL LABEL ON FACE PLATE | LETTER SIZE | CABLE MARKING AND COLOUR CODING |
|---|---|---|---|---|---|---|---|
| NON - ESSENTIAL | **Distribution Boards in buildings** be "LIGHT ORANGE", colour B26 of SANS 1091<br><br>**Outdoor Kiosks, and Low-Tension Switchboards** be "DARK ADMIRALTY GREY", colour G12 of SANS 1091. | **Distribution Boards in buildings** White<br><br>**Outdoor Kiosks, and Low-Tension Switchboards** White | Black letters on white Traffolyte label pop riveted to cover / cover plate.<br><br>DB-G1 NE | Distribution Board Number as per example<br><br>DB-G1 NE | Distribution Board Number as per example. DB-G1 NON-ESSENTIAL Indication of Feeder Source, Size of Feeder Cable, Fault Level Rating of Distribution board, Phase rotation direction | Label of Distribution Board: 20 mm<br><br>Label on Face Plate: 20 mm | All cables shall be labelled as detailed in the specification<br><br>DETAIL |
| ESSENTIAL | **Distribution Boards in buildings** be "SIGNAL RED", colour A11 of SANS 1091. | **Distribution Boards in buildings** "SIGNAL RED", colour A11 of SANS 1091. | White letters on red Traffolyte label pop riveted to cover /cover plate.<br><br>DB-G1E NE | Distribution Board Number as per example<br><br>DB-G1E NE | Distribution Board Number as per example. DB-G1 ESSENTIAL Indication of Feeder Source, Size of Feeder Cable, Fault Level Rating of Distribution board, Phase rotation direction | Label of Distribution Board: 20 mm<br><br>Label on Face Plate: 20 mm | All cables shall be labelled as detailed in the specification<br><br>DETAIL |
| UPS / PV SOLAR | **Distribution Boards in buildings** be "DARK VIOLET", colour FO6 of SANS 1091. | **Distribution Boards in buildings** "DARK VIOLET", colour FO6 of SANS 1091. | White letters on blue Traffolyte label pop riveted to cover / cover plate.<br><br>DB-G1U NE | Distribution Board Number as per example<br><br>DB-G1U NE | Distribution Board Number as per example. DB-G1 UPS Indication of Feeder Source, Size of Feeder Cable, Fault Level Rating of Distribution Board, Phase Rotation direction | Label of Distribution Board: 20 mm<br><br>Label on Face Plate: 20 mm | All cables shall be labelled as detailed in the specification<br><br>DETAIL |

### 6.8 LEGEND CARDS

Legend cards, A4 paper size, laminated and covered by removable 2.0mm transparent acrylic plastic ("PERSPEX") or equivalent shall be fitted to the inside of the door of the distribution board or aluminum framed and covered by removable 2.0mm thick transparent acrylic plastic ('PERSPEX') or similar and equal to – pre-approved by the Engineer in any other position where it can conveniently be observed.

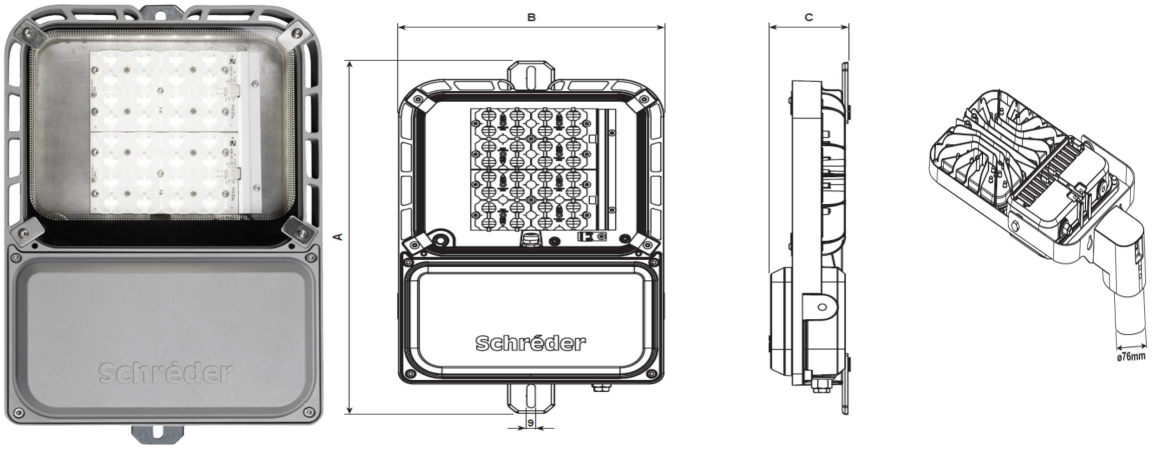
Legend cards shall be as follows but not limited to, for example:

| |
|---|
| **POWER SOURCE: NON-ESSENTIAL SUPPLY / ESSENTIAL SUPPLY / NO-BREAK SUPPLY** |
| **DB NUMBER: DB-G1 NE – FED FROM MAIN LV PANEL – 70mm² 4-C PVC/PVC/SWA/PVC CU CABLE + 35mm COPPER CLAD STEEL EC / BCEW** |
| **COC NUMBER……  DATE OF ISSUE……** |

| Item no | Circuit | Description | Destination |
|---|---|---|---|
| 1 | Main | Main Switch / Local Isolator Switch | |
| 2 | L1 | Lights | Office / Lab No etc. |
| 3 | P1 | Plugs | Office / Lab No etc. |
| 4 | PP1 | Industrial Plug | Office / Lab No etc. |
| 5 | ISO1 | Isolator | Office / Lab No (Equipment ID) |
| 6 | ELU1 | Earth Leakage Unit | Plug Circuits 1, 2, 3 etc. |
| 7 | ELU2 | Earth Leakage Unit | Office / Lab No (Equipment ID) |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## 7. LUMINAIRES

### 7.1 TYPE A - FLOOD LIGHT – 59W – Pole mounting

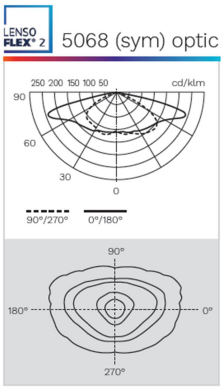
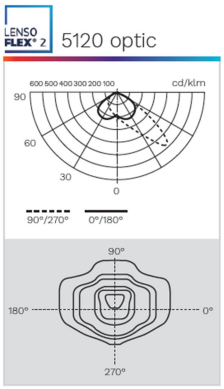
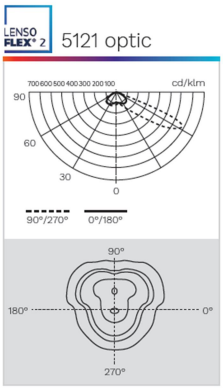
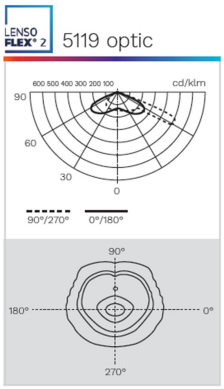



**General Specification**

**Product Description**
The slim and unique design is optimizing the thermal operating environment around the LEDs enabling the long useful lifetime (100 000hrs, L90B10) and low maintenance. This luminaire is designed to accommodate various mounting options, as well as being installed in hazardous areas (Zone 2 & 21/22) and available for emergency lighting applications (MDI). Electronic temperature monitoring prevents overheating of LEDs and power supply within the LED compartment (ThermiX®). To maximize the reliability of the LEDs, the photometric engine and control gear compartment are completely sealed to IP 66. This ensures that the photometric performance is maintained over time.
The LEDNOVA offers flexible combinations of LED arrays, combined with various photometric distributions (LensoFlex2®) and dimming control options to further maximize energy savings and reduce maintenance costs. It is designed for LED light sources between 20W and 81W. Standard finish: Unpainted Aluminum. Painted version available on request.

**Photometry**

| | |
|---|---|
| Light source | LED |
| LED | 2mm² LED |
| Light color | 4000K (Neutral White 740) |
| Color rendering (Ra) | >70 (Neutral White 740) |
| Lumen | 70W – 10235lm |
| Optics | 5068 (sym), 5119, 5120, 5121 |

| | |
|---|---|
| Photometry: |     |

| **Overview** | | **Lifetime Residual Flux @ Tq 25°C (**)** | |
|---|---|---|---|
| Number of LED's | Neutral White (4000K) | 32 LED | @100.000h |
| LED Current: 700mA | Nominal Flux (lm)* | 10235 | 90% |
| | Power Consumption (W) | 70 | |
| LED Current: 1000mA | Nominal Flux (lm)* | - | |
| | Power Consumption (W) | - | |

**Mechanics**

| | |
|---|---|
| Electronic control Gear | Constant Current Driver |
| Materials and finishing | Body – Marine grade high-pressure die-cast aluminum (EN 1706 AC-44300)<br>Protector – Glass or polycarbonate<br>Finish: Unpainted |
| Coating | RAL colours on request |
| Installation | Pole Mount |
| Fixing | Pole Mount – 2 x M8 grub screws |
| Dimensions (LxWxH) in mm | 462 x 283 x 83 |
| Weight (with gear) | 4.8kg |
| Access | Yes |

**Electrical Characteristics**

| | |
|---|---|
| Line Voltage | 230VAC |
| Mains voltage Tolerance (AC) | 198 - 264V<br>Optional: 110–277V (Midi only) |
| Line frequency | 50Hz |
| Electrical Safety Class (IEC) | Class I or II |
| Surge protection | Yes - 10kV/10kA<br>Optional - 20kV/20kA (Midi only) |
| Lighting control | Downward facing daylight switch |

**Power Supply**

| | |
|---|---|
| Power Factor | ≥0.95 |
| Removable | Yes |
| Thermal Safety | Yes |

**Environment**

| | |
|---|---|
| Storage temperature | -40 < T < 45 |
| Enclosure Tightness | IP 66 |
| Enclosure Mechanical Withstand Impact | Glass – IK 07<br>Polycarbonate – IK 10 |
| Enclosure Mechanical Withstand Vibrations | Modified IEC 60068-2-6 |

TECHNICAL INFORMATION

The Tenderer shall include full technical particulars regarding the luminaire offered with the tender.

SABS MARKS

The luminaire bears the SANS 60598-2-5 safety mark.

INGRESS PROTECTION

IP 65 in compliance with SANS 60598. The IP rating is certified by a SABS test report.

## 7.2 TYPE B – Glass Reinforced Polymer (GRP) Composite Poles

(The poles are made of unsaturated polyester resins and reinforced by fiberglass rovings, mats or fabrics. The combination of glass and resin offers additional durability and sturdiness.)

The pole shall be constructed by the filament winding process to achieve optimum results for strength and rigidity. The filament winding process shall be continuously applied with uniform tension onto a rotating mandrel and shall result in a minimum mass glass to resin ratio of 70:30. The surface shall be seamless, smooth and tapered.

The material of the finishing coat shall be a gel coat that shall comply with the requirements of SANS 1749 and shall be applied to a uniform thickness of between 250 and 500 microns. It shall provide a weatherproof, UV resistant, flame resistant and impact strong surface.

A standard pole supporting a luminaire with a wind surface of 0.20m² shall not have a pole top deflection of more than 5% of its height above ground when subjected to a basic wind pressure of 500 Pa. A safety factor of 2.5 times the total maximum wind load shall be applicable.

The pole shall be manufactured in accordance with SANS 1749 under the ISO 9002 quality system.

If an access opening is required, the cut-out shall be covered by an access door cover manufactured from glass filled nylon impregnated in the same colour as that of the surface coat. It shall be secured to the pole by two stainless steel Allen head captive screws into M4 brass inserts embedded in the pole.

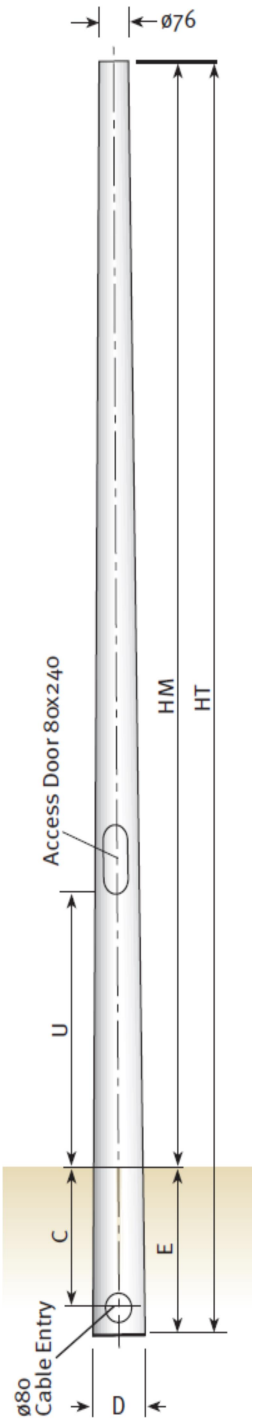
A cable entry with a minimum diameter of 34mm shall be provided at a minimum depth of 400mm below the ground surface.

A hot dipped galvanised gland plate, suitable for gland no. 0 or 1, complete with terminal block and DIN rail for a miniature circuit breaker, shall be provided and shall be mounted to a bolt provided in the access opening.

Poles for direct embedment in the ground shall be provided with a 300x300x1.6mm hot dipped galvanised baseplate complete with 2 x hot dipped galvanised steel hook bolts and nuts. Base mounted poles shall have a hot dipped galvanised flange plate that can be bolted to a foundation which shall be designed to withstand the forces the pole will experience in service.

| | |
|---|---|
| GLANDPLATE ASSEMBLY | Gland plate assembly, Type GP/2/0/E/TB/MCB, consisting of 2 holes 20mm diameter, suitable for Gland No 0 or 1, complete with terminal block, 4-way, 30 Amp and DIN rail for MCB |
| MINIATURE CIRCUITBREAKER | Miniature circuit breaker, 10A/5kA, for total Line starting currents of more than 4A, but not exceeding 8 Amp |
| DETACHABLE BASE PLATE | Hot dipped galvanised, complete with hook bolts and nuts. Base plate assembly, 300*300*6mm |
| COLOUR | Mineral Grey |
| The method for ground installation shall be as follows: | 1) Fill the hole with a 1:6 mix of cement and sifted soil to 200mm below natural ground level and compact every 200mm to 90% AASHTO.<br>2) Fill the rest of the hole with non-chemical active soil and compact to 90% AASHTO. |

### 7.2.1 TYPE B – Glass Reinforced Polymer (GRP) Composite Poles



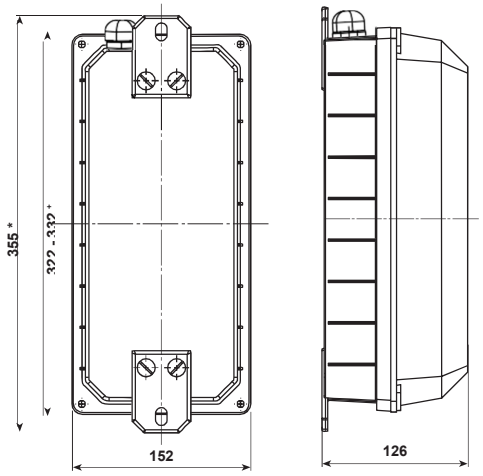

| | |
|---|---|
| HT | Total Length |
| HM | Mounting Height |
| D | Base Diameter |
| C | Depth of cable entry |
| U | Access door height |
| E | Buried depth |

| HT mm | HM mm | D mm | C mm | U mm | E mm |
|---|---|---|---|---|---|
| 4600 | 4000 | 157 | 400 | 2500 | 600 |

**TECHNICAL INFORMATION**

The Tenderer shall include full technical particulars regarding the GRP pole offered with the tender.

## 7.3 TYPE C – PHOTOCELL

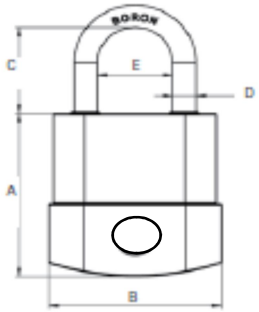




| GENERAL INFORMATION | |
|---|---|
| HOUSING AND FINISH | |
| Housing | Marine grade high-pressure die-cast aluminium (EN 1706 AC-44300) |
| Diffusor | Injection-moulded high-impact acrylic diffuser |
| Housing finish | Telegrey 1 (RAL 7045), Textured finish |
| Tightness level | IP 65 |
| Impact resistance | IK 08 |
| Maintenance | Easily accessible |

**Technical Information**

| |
|---|
| The unit must consist of a photocell, thermal starter and switch |
| The body of this unit must be manufactured from strong material to protect it against tampering, and it must also have good anti-weathering features; it must be capable of withstanding ultra-violet rays and long periods of exposure to the sun. |
| The unit must be installed in such a way that it is not activated by ambient or any other artificial light source. |
| The unit must be pre-set in the factory so that it will switch on at an illumination level of approximately 54 lux and switch off again at 108 Lux. |
| A time delay of at least 15 seconds must be provided for to prevent the switch from being activated by lightning or other brief changes in the illumination level. |
| Built in protection against voltage surges must be provided. |
| IP65 Ingress protection |
| ROHS compliant |
| Supplied with Nema rotalock socket base, wall mounting bracket & sealing gasket. |
| Royce Thompson photocell – similar or equal and approved |

## 12. TYPE A - MAXIMUM SECURITY PROTECTOR WEATHERPROOF PADLOCK





**Technical Specifications**

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| (a) | 47 | 47 | 25 | ø6 | 20 | 28 |
| (b) | 49 | 56 | 28 | ø10 | 22 | 33 |

- Protector Weatherproof padlock with keyhole cover
- Shackle type Open
- Shackle material: Boron
- 5 Pins
- CEN rating: 2
- Tested to EN12320:2012
- Laminated Steel body material, Black PVC, Blister
- Three individual keys shall be provided with each lock and four master keys shall be provided for the entire installation c/w Marangue plastic key tags.

## 13. LEVER ARCH FILE

**Technical Specifications:**

- A4 – 3 Piece Construction
- Transparent Anti-reflective
- Pockets – Front, Spine & Inside
- A4 Multi punched Polypropylene A-Z Divider Set x 2 – 140 Micron
- A4 Polypropylene Pockets – 30 per file

**PART 4: QUALITY SPECIFICATION FOR MATERIALS AND EQUIPMENT OF ELECTRICAL INSTALLATIONS**

**CONTENTS**

## Index

# SECTION C1

## C.1 CONDUIT AND CONDUIT ACCESSORIES

### 1. GENERAL

This section covers the requirements for conduit and conduit accessories for general installations under normal environmental conditions.

The type of conduit and accessories required for the service, i.e. whether the conduit and accessories shall be of the screwed type, plain-end type or of the non-metallic type and whether metallic conduit shall be black enamelled or galvanised, is specified in Part 2 of this specification. Unless other methods of installation are specified for certain circuits, the installation shall be in conduit throughout. No open wiring in roof spaces or elsewhere will be permitted.

The conduit and conduit accessories shall comply fully with the applicable SANS Specifications as set out below and the conduit shall bear the mark of approval of the South African National Standards.

(a) Screwed metallic conduit and accessories: SANS 1065 parts 1 and 2.

(b) Plain-end metallic conduit and accessories: SANS 1065 Parts 1 and 2.

(c) Non-metallic conduit and accessories: SANS 950

Bushes used for metallic conduit shall be brass and shall be provided in addition to lock nuts at all points where the conduit terminates at switchboards, switch-boxes, draw-boxes, etc.

Only one manufacture of conduit and conduit accessories will be permitted throughout the installation.

All metallic conduits shall be manufactured of mild steel with a minimum thickness of 1,2mm for plain-end conduit and 1,6mm in respect of screwed conduit.

### 2. SCREWED CONDUIT

2.1 Conduits shall comply with SANS 1065 and shall bear the SANS mark.

2.2 All conduit shall be heavy gauge, welded or solid drawn, hot-dip galvanised or black enamelled, screwed tube.

2.3 Galvanised conduit shall be hot-dipped inside and outside in accordance with SANS 32 & 121.

2.4 All conduit ends shall be reamed and threaded on both sides and delivered with a coupling at one end and a plastic cap on the other end.

### 3. METAL CONDUIT ACCESSORIES

All metal conduit accessories shall be of malleable cast iron or pressed steel with brass bushes in accordance with SANS 1065. Alloy or pressure cast metal accessories or zinc base alloy fittings are not acceptable. All fittings whether galvanised or black enamelled, shall be fitted with brass screws.

### 4. CIRCULAR TYPE BOXES

4.1 The boxes shall be of the long spout pattern, manufactured of malleable cast iron or pressed steel and stove enamelled jet black or galvanised as required. The two cover fixing holes shall be diametrically opposite each other, drilled and tapped at 50mm centres.

4.2 Junction, draw-in and inspection boxes shall be of adequate size and shall be supplied with heavy gauge metal cover plates.

4.3 Boxes shall comply with SANS 1065.

## 5. SWITCH BOXES AND SOCKET OUTLET BOXES

5.1 All switch boxes and socket outlet boxes shall be manufactured of pressed galvanised steel of at least 1mm thickness. All boxes shall be fitted with the necessary lugs to suit standard flush mounted switches and socket outlets manufactured in accordance with SANS 1085.

5.2 Light switch boxes shall be 100 x 50 x 50mm with two 20mm knockouts on the sides, one 20mm knockout on the top, bottom, side and back.

5.3 Socket outlet boxes shall be 100 x 100 x 50mm with two 20mm knockouts each on the top, bottom, sides and back.

5.4 Switch and socket outlet cover plates shall comply with SANS 1084.

## 6. FLEXIBLE CONDUIT

Flexible steel conduit and adaptors shall comply with BS 731, part 1 where applicable. Flexible conduit shall be of galvanised steel construction and in damp areas of the plastic sheathed galvanised steel type. Flexible conduit shall only be used as specified and shall then be installed in accordance with par. 5.4.4 of SANS 10142.

## 7. PLAIN-END METALLIC CONDUIT

7.1 As an alternative to the threaded conduit, plain-end (unthreaded) metallic conduit with accessories may be used under the conditions stated in the standard specification for "INSTALLATION AND TERMINATION OF CONDUITS AND CONDUIT ACCESSORIES", par. 3 of Section Bl.

7.2 Unthreaded conduit shall be manufactured of mild steel with a minimum thickness of 1,2mm and shall comply with SANS 1065.

7.3 Bending and setting of conduit shall be done with the correct apparatus recommended by the manufacturer of the conduit.

7.4 The Contractor or Supplier shall be responsible for obtaining the approval of local authorities for the use of this system.

7.5 All conduit and accessories used in areas within 50 km of the coast shall be hot-dip galvanised to SANS 32 & 121. In inland areas electro-galvanised or cadmium-plated accessories will be accepted.

## 8. NON-METALLIC CONDUIT

Non-metallic conduit shall comply fully with SANS 950 and shall be installed in accordance with Appendix C of the same specification as well as the standard specification for "INSTALLATION AND TERMINATION OF CONDUITS AND CONDUIT ACCESSORIES", par. 4 of Section Bl.

## 9. EARTH CLAMPS

Earth clamps shall consist of copper strips at least 1,2mm thick and not less than 12mm wide secured with a brass bolt, nut and washer and shall be so constructed that the clamp fit firmly to the conduit without any additional packing.

# SECTION C.2

## C.2 WIRING CHANNELS, UNDERFLOOR DUCTING AND POWER SKIRTING

### 1. WIRING CHANNELS

1.1 GENERAL

1.1.1 The channels shall be manufactured of rolled sheet steel.

1.1.2 The minimum thickness of the sheet steel shall be:

(a) 1,6mm for ribbed channels with a maximum width of 42mm.

(b) 2,5mm for unribbed channels with a maximum width of 42mm.

(c) 1,2mm for channels with a width in excess of 42mm.

1.1.3 The channels shall be finished as follows:

| | |
|---|---|
| (a) In coastal areas (under all installation conditions) | Hot-dip galvanised to SANS 32 & 121 or epoxy powder coated |
| (b) Cast in concrete | Pre-galvanised |
| (c) False ceiling voids | Pre-galvanised |
| (d) Vertical building ducts coated | Hot-dip galvanised to SANS 32 & 121 or epoxy powder |
| (e) Surface mounted in plant rooms, substations, service tunnels, basements | Epoxy powder coated or electro galvanized |
| (f) Damp areas, exposed to weather underground runs in contact with earth | Hot-dip galvanised to SANS 32 & 121 or epoxy powder coated |
| (g) Undercover industrial applications | Hot-dip galvanised to SANS 32 & 121 or epoxy powder coated |

1.1.4 The above-mentioned finishes shall apply unless specified to the contrary or approved - by the Engineer. Hot-dip galvanised ducts shall be co!d galvanised at all joints. sections that have been cut and at places where the galvanising has been damaged. Powder coated ducts shall likewise be touched up at joints, cuts and damaged portions using methods recommended by the manufacturer of the channels.

1.2 COVER PLATES

1.2.1 All channels shall be supplied with cover plates.

1.2.2 Channels up to 127mm wide shall have snap-in cover plates of metal or PVC.

1.2.3 For channels wider than 127mm only metal cover plates shall be used.

1.2.4 The finish of steel cover plates shall be the same as the finish of the channels.

1.3 ACCESSORIES

All accessories i.e. hangers, brackets etc. shall be purpose made and in general have the same finish as the channels.

1.4 Wiring Supports

Wiring supports shall be provided in order to prevent the wires falling out when cover plates are removed.

# SECTION C3

## C.3 CABLE TRAYS AND LADDERS

### 1. METAL CABLE TRAYS

Metal cable trays shall be manufactured from perforated rolled steel. Metal trays manufactured to the following standards shall be used:

| | | |
|---|---|---|
| (a) | Less than 150mm wide | 1,2mm minimum thickness with 12mm minimum return |
| (b) | 150mm to 457mm | 1,2mm minimum thickness with 19mm minimum return |
| (c) | 460mm to 610mm (Heavy duty) | 2,5mm minimum thickness with 76mm return |

### 2. CABLE LADDERS

2.1 Metal cable ladders shall consist of a 76mm high side rail of 2mm minimum thickness. Cross pieces shall be spaced at maximum intervals of 250mm. Where cables of 10mm$^2$ or smaller are installed on cable ladders, the spacing of the cross pieces shall be 125mm. Cables shall be clamped in position by means of purpose-made cable clamps that fit into the cross pieces.

2.2 Cable ladders consisting of slotted metal rails which accommodate plastic or metal cable binding bands may be used in vertical cable runs against walls, etc. These cable ladders will be considered in horizontal cable runs for small cables for communication and control wiring upon the prior approval of the Engineer.

2.3 Purpose made cable trays consisting of 6mm angle iron and 6 x 40mm minimum cross pieces are acceptable in industrial applications. Cross pieces shall be welded in pairs at 250mm maximum centre-to-centre intervals. The pairs shall be spaced approx. 10mm apart to allow cable clamps or metallic binding bands to affix the cables to the tray.

### 3. PLASTIC CABLE TRAYS

Rigid un-plasticine PVC cable trays complying with the following standards may be used if specified in the Detail Technical Specification:

The up stands of trays listed in (a) and (b) shall not be perforated and the top of the up stand shall be smooth. The same cable tray type shall be used in long parallel tray runs.

### 4 FINISHES

Metal cable trays and ladders shall be finished as follows:

| | |
|---|---|
| (a) In coastal areas | Hot-dip galvanised to SANS 32 & 121 or epoxy powder coated |
| (b) False ceiling voids | Electro-galvanised baked enamel power coated |
| (c) Vertical building ducts | Hot-dip galvanised to SANS 32 & 121 or baked enamel epoxy powder coated |
| (d) Plant rooms, substations, service tunnels | Electro-galvanised baked enamel or basements epoxy powder coated |
| (e) Damp areas, exposed to weather | Hot-dip galvanised to SANS 32 & 121 baked enamel or epoxy powder coated |
| (f) Undercover industrial application | Hot-dip galvanised to SANS 32 & 121 or baked enamel epoxy powder coated |

The above-mentioned finishes shall apply unless specified to the contrary in the Detail Technical Specification. Hot-dip galvanised trays and ladders shall be cold galvanised at all joints, sections that have been cut and at places where the galvanising has been damaged. Powder coated or enamel painted trays and ladders shall likewise be touched up at joints, cuts and damaged portions using spray canisters recommended by the manufacturer of the trays and ladders.

## 5. ACCESSORIES

Horizontal and vertical bends, T-junctions and cross connections shall be supplied by the Contractor. The dimensions of these connections shall correspond to the dimensions of the linear sections to which they are connected. The radius of all bends shall be 1m minimum. The inside dimensions of horizontal angles or connections shall be large enough to ensure that tine allowable bending radius of the cables is not exceeded. Sharp angles shall be 45° mitred.

# SECTION C4

## C.4 PVC-INSULATED CABLES 600/1 000 V GRADE

### 1. GENERAL

This section covers the requirements for PVC-insulated cables for general installations under normal environmental conditions.

### 2. CONSTRUCTION

2.1 Cables shall be manufactured in accordance with SANS 1507, shall come only from fresh stocks, and shall be constructed as follows:

(a) Unarmoured cables PVC-insulated/PVC-sheathed

(b) Armoured cablesPVC-insulated/PVC-bedded/armoured/black extruded PVC outer sheath

(c) Single core cables PVC-insulated/unsheathed

2.2 The conductors shall be of high conductivity annealed stranded copper and the cores may be shaped or circular.

2.3 The insulation shall be general purpose PVC, 600/1 000V Grade.

2.4 The bedding shall consist of a continuous impermeable sheath of PVC extruded to fit the core or cores closely and in the case of multi-core cables, to fill the interstices between the cores.

2.5 Where armouring is specified it shall consist of one layer of galvanised steel wire in the case of multi-core cables and nonmagnetic metallic wire in the case of single core cables. Aluminium strip or tape armouring is not acceptable.

2.6 Where specified, an earth continuity conductor shall be provided in the armouring in accordance with SANS 1507.

### 3. PVC-SHEATHED ALUMINIUM-COVERED CABLES

3.1 Aluminium-covered cables shall comprise PVC-insulated copper conductors protected by an aluminium foil tape screen and a PVC sheath.

3.2 Cable ends shall be made off with compression glands fitted with a neoprene ring to seal the end.

3.3 Aluminium sheathed cable shall be installed on surface only using matching saddles installed at suitable intervals to prevent sagging.

3.3 Where exposed to sunlight, the cable shall have a stabilised black outer sheath.

### 4. LENGTHS

Cable shall be manufactured and supplied in one length to the lengths specified unless these lengths exceed a standard drum length in which case a ruling shall be obtained from the Engineer.

### 5. TESTS

At the option of the Engineer, acceptance tests shall be carried out on production runs of the cable in accordance with SANS 1507.

# SECTION C5

## C.5 GLANDS FOR PVC-INSULATED CABLES

1. Glands to be used for terminating PVC/PVC/SWA/PVC cables shall be of the adjustable type.

2. Glands shall be suitable for general purpose 600/1 000 V Grade cable with steel armouring.

3. The glands shall be made of nickel-plated cadmium plated or in coastal area bronze or brass.

4. The glands shall consist of a barrel carrying a cone bush screwed into one end and a nickel-plated brass nipple carrying a nickel-plated brass or a heavy galvanised steel locknut screwed into the other end. The galvanising shall comply with SANS 32 & 121.

5. Non-watertight glands must be easily converted to watertight glands by means of a waterproofing shroud and inner seal kit. On the cable entry side of the barrel a concave groove shall be provided to accommodate the top rim of the waterproofing shroud.

6. The shrouds shall be made of non-deteriorating neoprene or other synthetic rubber, and shall be resistant to water, oil and sunlight. The shrouds shall fit tightly around the glands and cable.

7. Glands shall be provided with ISO threads and shall be suitable for the specified cable sizes.

8. Flameproof glands shall comply with SANS 808, Groups 1, 2a and 2b.

9. Suitable accessories shall be provided with glands to be used on ECC armoured cables to facilitate a bolted lug connection of the earth continuity conductors. Grooves cut into the barrel or cone bush to accommodate the earth continuity conductors are not acceptable.

10. For unarmoured cables the cone bush and compression ring of the gland shall be replaced with a synthetic rubber compression bush and ring to provide the required grip on the outer sheath of the cable.

# SECTION C6

## C.6 WIRING TERMINALS

1. Terminal bodies and screws shall be of non-corrosive metal, enclosed in fire resistant, moulded plastic insulating bodies. Terminal bodies or screws shall not project beyond the insulating material and shall afford suitable protection against accidental contact by personnel and against short circuits and tracking.

2. The construction of the terminal block and mounting rail shall be such as to ensure a firm and positive location of the terminal blocks. It shall be possible to add additional terminal blocks within the terminal sequence without having to disconnect or dismantle the terminal strip. The terminal blocks shall be held in position by means of standard end clamps.

3. It shall be possible to intermix terminals of various sizes, i.e. for different sizes of conductors, whilst utilising the same mounting rail. Where smaller terminal blocks occur adjacent to larger terminal blocks, suitable shielding barriers shall be inserted to cover the terminals that might otherwise be exposed.

4. The terminal bodies and clamping screws shall be so constructed as to ensure that conductors are not nicked or severed when the clamping screws are tightened. Screws shall not come in direct contact with the conductors.

5. Terminals shall be sized and rated to match the conductors that are connected to them.

6. Each terminal block shall have provision for clip-in numbering or labelling strips to be installed, together with protective, clear caps over the sheets.

# SECTION C7

## C.7 SWITCHBOARDS (UP TO 1 KV)

## 1. GENERAL

### 1.1 SCOPE

This section covers the manufacturing and testing of flush mounted, surface mounted and floor standing switchboards for general installations in normal environmental conditions and for system voltages up to 1 kV.

### 1.2 SIZE

All switchboards shall be of ample size to accommodate the specified switchgear and provide space for future switchgear. For every 4 (or part of 4) 5kA circuit-breakers on a switchboard, space for an additional 5kA circuit breaker shall be allowed unless future space requirements are dearly specified. For circuit breakers above 5kA, this factor shall be 15%. The clearance between adjoining switchgear openings shall be as specified in par. 6.2.

### 1.3 EXTERNAL DIMENSIONS

The maximum allowable height of free standing switchboards is 2,2m. Cubicle type boards may be up to 2,4m high if they can be fully dismantled into individual cubicles. Where, due to space restrictions, a board exceeds 2,4m in height, equipment not normally requiring access, shall be installed in the top section, enabling equipment normally requiring access to be installed lower down in the board. All other specified external dimensions for switchboards shall be strictly adhered to. If the clearances specified in par. 6.2 cannot be adhered to as a result of restricting external dimensions, the Contractor shall obtain the approval of the Engineer before manufacturing the switchboards.

### 1.4 MOISTURE AND VERMIN

All switchboards shall be rendered moisture proof and vermin proof and shall be adequately ventilated. Refer to par. 4.10 and 4.11.

### 1.5 LOAD BALANCE

The load shall be balanced as equally as possible across multiphase supplies.

## 2. CONSTRUCTION OF FLUSH MOUNTED SWITCHBOARDS

### 2.1 STANDARD

Flush mounted switchboards shall comply fully with SANS 1765. Unless the depths of the switchboards are specified, the depths shall be determined in accordance with par. 6.

### 2.2 EXPANDED METAL

Where switchboards are to be built into 115mm thick walls, expanded metal shall be spot-welded to the rear of the bonding trays. The expanded metal shall protrude at least 75mm on each tray side to prevent plaster from cracking.

### 2.3 KNOCK-OUTS

Knock-outs shall be provided in the top and bottom ends of each switchboard tray to allow for the installation of conduits for the specified and future circuits. Knock-outs shall be provided for an equal number of 20mm and 25mm dia. conduits.

2.4 PANEL

Front panels shall have machine punched slots for housing the specified and future flush mounted switchgear. The distance between the inside of the closed doors and the panel shall not be less than 20mm. No equipment may be mounted on the panel unless the panel is permanently hinged to the switchboard frame.

2.5 FIXING OF FRONT PANELS

The front panel shall be secured to the architrave frame by means of 6mm studs and chromium-plated hexagonal domed nuts, hank nuts or captive fasteners. Alternatively the panel may be secured to the architrave frame by means of two pins at the bottom and a latch or lock at the top of the panel. Self-tapping screws will not be allowed. All front panels shall be provided with a minimum of one chrome plated handle.

2.6 DOOR HANDLES AND CATCHES

Switchboard doors shall be equipped with handles and catches. Locks shall only be provided when specified. In all cases where lockable doors are required and in all cases where the switchboard doors are higher or wider than 450mm, handles consisting of a push-button-and-handle combination with spring loaded catch or rotary handle-and-catch combination shall be installed. Switchboard doors smaller than 450mm in height and width may be equipped with spring loaded flush mounted ring type latches. Square key operated catches are not acceptable unless specified.

## 3. CONSTRUCTION OF SURFACE MOUNTED SWITCHBOARDS

3.1 STANDARD

Surface mounted switchboards shall comply with SANS 1765.

3.2 SWITCHBOARD TRAY

Surface mounted switchboards shall be equipped with a 1,6mm minimum sheet steel reinforced tray suitably braced and stiffened to carry the chassis, door and equipment. Lugs to secure the switchboard to a vertical surface shall be provided.

3.3 CONSTRUCTION

All joints shall be welded or securely bolted. The tray shall be square and neatly finished without protrusions. The front tray sides shall be rounded with an edge of at least 20mm to accommodate flush doors.

3.4 CHASSIS

A sheet steel chassis for the mounting of equipment shall be bolted to the tray and shall comply with the requirements of par. 6.1 and 6.3.

3.5 FRONT PANEL AND DOOR

The front panel and door shall comply with par. 2.4 to 2.6 above. Doors shall fit flush in the tray when closed.

3.6 DIMENSIONS

Unless the depth of the switchboards is specified, the dimensions shall be determined in accordance with the requirements of par. 6.2 and 6.3.

## 4. CONSTRUCTION OF FREE STANDING SWITCH BOARDS

### 4.1 FRAMEWORK

A metal framework for free standing switchboards shall be manufactured from angle iron. channel iron or 2mm minimum folded metal. A solid U-channel base frame, sufficiently braced to support all equipment and span floor trenches and access holes shall be provided. Switchboards shall be of cubicle design with 2mm side panels forming divisions between cubicles. The maximum allowable cubicle width is 1,5m. (Refer also to par. 4.7). Joints shall be non-continuously butt-welded. Welds shall be ground smooth and the joint wiped with plumber's metal in order to provide a smooth finish. Switchboards wider than 2m shall be fitted with screwed eye-bolts attached to the framework to facilitate loading and transportation of the board.

### 4.2 REAR AND SIDE PANELS

The rear panels shall be removable and shall be manufactured from 2mm minimum sheet steel. The panels shall have returned edges which are recessed in the frame or which fit over lips on the switchboard frame. The panels shall be secured to the frame by means of studs and chromium-plated hexagonal domed brass nuts or hank nuts or captive fasteners equal or similar to "DZUS" or "CAMLOC". Where switchboards are intended for installation in vertical building ducts or against walls, the rear and side panels may consist of a single folded sheet which is either bolted or welded to the frame or which forms part of the folded metal frame.

### 4.3 FRONT PANELS

4.3.1 The front panels of floor standing switchboards shall preferably be hinged except where flush mounted equipment prevents this. Alternatively, panels shall be secured by means of the methods described in par. 2.5. The panels shall be arranged in multi-tiered fashion to allow for the logical grouping of equipment in accordance with par. 6.

4.3.2 The hinged front panels shall have a dished appearance with 20mm upturns which fit over a lip on the switchboard frame. Alternatively the hinged panels shall have folded edges and shall be fitted flush or slightly recessed in the switchboard frame. The latter method shall be used where doors are required. (Also refer to par. 4.6). Corners shall be welded and smoothed.

4.3.3 The panels shall be of 2mm minimum sheet steel with machine punched slots to allow for the flush mounting of instrumentation, switchgear toggles and operating handles. A minimum clearance of 50mm shall be maintained between the rear of equipment mounted on the panels (taking into account terminals or other projections) and the frame and chassis of the switchboard. Separate panels shall preferably be provided for the mounting of instrumentation and for covering flush mounted switchgear. Enclosed switchgear with front panels e.g. combination fuse-switch units, may be flush mounted in the board in lieu of separate hinged panels.

4.3.4 Hinged panels shall be suitably braced and stiffened to carry the weight of flush mounted equipment and to prevent warping.

4.3.5 Hinged panels with flush mounted equipment and panels higher than 600mm shall be supported by hinges of adequate strength to ensure smooth and reliable operation. 16mm pedestal or similar heavy duty hinges with single fixing bolts may be used on panels smaller than 600mm. On the larger panels long pedestal type hinges with two fixing bolts per hinge are preferred. Piano hinges are not acceptable for this application.

4.3.6 A tubular chromium-plated handle shall be fitted on each panel. The handle may be omitted if "DZUS" or "CAMLOC" fasteners are used.

4.3.7 Blanking plates shall be fitted over slots intended for future equipment. These plates shall be fixed in a manner which does not require the drilling of holes through the front panel. Dummy circuit-breakers may be fitted where applicable.

4.3.8 Front panels containing live equipment such as instrumentation or control switches, shall be bonded to the switchboard frame with a braided copper earth trap with an equivalent cross-sectional area of at least 4mm$^2$.

4.4 SECURING OF FRONT PANELS

Hinged panels shall be secured in position by means of square key operated non-ferrous fasteners designed to draw the panels closed or similar quick-release fasteners. Self-tapping screws are not acceptable. Where non-hinged removable panels are specified, they shall be secured in position by means of 6mm studs and hexagonal chromed brass dome nuts and washers or hank nuts. Non-hinged removable panels may alternatively be secured in position by means of two pins at the bottom and a latch or lock at the top.

4.5 CHASSIS

A suitably braced chassis for the mounting of switchgear and equipment shall be firmly secured to the frame of the switchboard. The chassis shall be designed so that the switchgear can be installed in accordance with par. 6. Circuit-breakers and isolating switches which are not of the moulded-case air-break type and the insulators of busbars for ratings of 200 A and more may be secured directly to the framework.

4.6 DOORS

(a) Doors need only be provided when specified. Doors shall be arranged in multi-tiered fashion to allow for the logical grouping of equipment in accordance with par. 6.

(b) Doors shall have a dished appearance with a minimum of 20mm upturns which fit over a lip on the switchboard frame or shall fit flush in the switchboard frame. Corners shall be welded and smoothed.

(c) Doors shall be of aluminium sheet steel with machine punched slots to allow for the flush mounting of instrumentation, control and protection equipment. Switchgear shall be flush mounted in the front panels behind the doors unless specified to the contrary. A minimum clearance of 50mm shall be allowed between the rear of equipment mounted on doors (including terminals and projections) and the frame, front panel and chassis.

(d) Doors shall be suitably braced and stiffened to carry the weight of the equipment and to prevent warping.

(e) Hinges for doors shall be provided as described in par. 4.3.5. At least three hinges shall be provided on doors higher than 1,2m.

(f) Doors shall be fitted with handles consisting of a pushbutton-and-handle combination with springloaded catch or a rotary handle-and-catch combination. Flush mounted ring type handles or square key operated latches are not acceptable. The same key shall fit all locks on the switchboard in cases where locks are required.

(g) Doors shall be fitted with hypalon or neoprene seals.

(h) Doors containing any electrical equipment shall be bonded to the switchboard frame with a braided copper earth w re with an equivalent cross-sectional area of at least 4mm$^2$.

4.7 SECTIONS

For ease of transportation and to facilitate access to the allocated accommodation, switchboards may be dismantled into cubicles or sections. Each section shall be rigidly manufactured to ensure that damage to the switchgear will not occur during transportation and handling. Where required, switchboards shall have temporary wood or steel bracing to protect switchgear and facilitate handling.

4.8 GROUPING OF SWITCHGEAR

The switchgear shall be logically arranged and grouped as described in par. 6. Depending upon the number and size of components, a common front panel may be installed over one or more groups of equipment. All equipment shall be installed in accordance with the requirements of par. 6.

4.9 CABLE GLAND PLATE

A cable gland plate shall be installed across the full width of each power cubicle at a minimum height of 300mm above the bottom of the switchboard to house the cable glands. A Steel cable channel or other approved support shall be provided to carry the weight of the cable and remove mechanical stress from the cable glands. A minimum distance as required by the bending radius of outgoing cables shall be provided between the lowest terminals of major equipment and the gland plate.

4.10 VENTILATION

Switchboards shall be property ventilated, especially cubicles containing contactors, transformers, motor starters, lighting dimmers and other heat producing equipment. Louvres shall be fitted to provide adequate upward or cross ventilation. All louvres shall be vermin proofed with 1,5mm brass mesh or perforated steel plate internally spot welded over the louvres. The internal ambient temperature shall not exceed 40ºC.

4.11 VERMIN PROOFING

Free standing boards shall be protected against vermin, especially from below, where cables have to pass through the gland plate, rubber grommets shall be provided and enough non-hardening compound shall be delivered with the board so that these holes can be sealed properly after installation of the cables.

## 5. CONSTRUCTION OF MAIN LOW TENSION SWITCHBOARDS

Main low tension switchboards and sub-main low tension switchboards heavily equipped shall comply with par. 4.1 to 4.11 as well as the following exceptions or additions:

(a) These boards shall be fully extensible with removable busbar cover plates in the side panels.

(b) Doors shall not be supplied unless specifically called for.

(c) Switchgear and equipment shall be installed in accordance with the requirements of par. 6.

(d) Provision for metering equipment shall be made in accordance with requirements of local authorities where applicable.

## 6. MOUNTING OF EQUIPMENT

6.1 The mounting of equipment shall comply with SANS 1765 where applicable. Equipment to be mounted on the chassis shall be mounted by bolts, washers and nuts or by bolts screwed into tapped holes in the chassis plate. In the latter case the minimum thickness of the chassis plate shall be 2,5mm. The latter method shall not be used where boards will be subject to vibration or mechanical shocks. Self-tapping screws will not be accepted.

6.2 SPACE REQUIREMENTS

In designing the switchboards the following requirements shall be strictly adhered to:-

(a) A minimum of 50mm between any piece of equipment and the frame or internal partitioning. This minimum space is required on all sides of the equipment. In the case of a single row of single-pole circuit-breakers the spacing on one side row may be reduced to 25mm if the incoming side of the circuit-breakers is busbar connected.

(a) A minimum of 75mm between horizontal rows of equipment. The maximum outside dimensions of equipment shall be considered.

(c) Circuit-breakers up to a fault rating of 10 kA may be installed adjacent to each other. For higher ratings a minimum of 40mm shall be allowed between circuit-breakers or isolators.

(d) Sufficient space shall be provided for wiring allowing for the appropriate bending radius.

(e) Space for future equipment shall be allowed as described in par. 1.2.

6.3 MOUNTING OF CHASSIS

The chassis of flush mounted and smaller surface mounted boards shall be mounted in accordance with SANS 1765. For all free standing switchboards and surface mounted switchboards where the main switch rating exceeds 100 A (triple-pole), space for wiring shall be provided between the chassis and tray. This space shall be adequate to install the supply cable behind the chassis and terminate on the main switch without sharp bends in the cable cores.

6.4 GROUPING OF EQUIPMENT

6.4.1 Equipment shall be arranged and grouped in logical fashion as follows:

(a) Main switch - to be installed either at the top or bottom of the board.

(b) Short circuit protection equipment - fuse gear or fuse-switches.

(c) Change-over contactors or other contactors controlling the supply.

(d) Motor supplies.

(e) Fuse-switches for outgoing circuits.

(f) Other circuits and equipment.

6.4.2 Where a portion of the equipment on the switchboard is supplied from a standby power source, the change-over contactor and the associated equipment shall be grouped in a separate compartment.

6.4.3 Where earth leakage units are required, the associated circuit-breakers shall be installed adjacent to the unit.

6.5 MOUNTING OF CIRCUIT-BREAKERS

All moulded-case circuit-breakers shall be flush mounted with only the toggles protruding. Miniature circuit-breakers may be installed in clip-in trays mounted on the frame. All other circuit-breakers shall be bolted to the chassis. Special provision shall be made for large main switches when designing the framework. Care shall be exercised that the rear studs of circuit-breakers are properly insulated from the steel chassis. Where necessary, insulating material shall be installed between the rear studs and the chassis. Circuit-breakers shall be installed so that the toggles are in the up position when "ON" and down when "OFF".

6.6 INSTRUMENTATION

All metering instruments shall be flush mounted in the front panel or door. The rear terminals of instruments mounted on doors shall be covered with an insulating material to prevent accidental contact. Current transformers for metering shall be mounted so that the rating plate is clearly visible. Fuses for instrumentation shall be mounted in an easily accessible position and clearly marked.

6.7 MOUNTING OF FUSES

6.7.1 Fuse holders shall be mounted semi-recessed in the front panel so that fuses can readily be changed without removing the front panel. Busbar mounted fuses for instrumentation shall be used as far as possible.

6.7.2 Where equipment requiring fuses is specified on a board (fuse switches etc), a ruling shall be obtained from the Engineer on the quantity of spare fuses to be provided.

6.8 EQUIPMENT IN MAIN BOARDS

Equipment in main low tension switchboards and sub-main boards shall be grouped in individual compartments. Equipment shall be installed as follows:

6.8.1 Rack-out type air circuit-breakers shall be mounted in the bottom section, flush behind the panel with the handle only protruding. If this is not possible, the panel shall be omitted and the air circuit-breakers installed behind a door.

6.8.2 If the main switch is a moulded-case circuit-breaker or isolator it shall be flush mounted.

6.8.3 Contactors controlling the supply shall be installed behind separate front panels.

6.8.4 All metering, protection and indicating equipment shall be clearly visible from the front of the board. Current transformer ratios and multiplication factors shall be clearly marked. Where doors are specified the equipment shall be installed flush in the doors and covered as described in par. 6.6.

6.8.5 All circuit-breakers and fuses (with the exception of fuse-switches) may be grouped together behind one or more panels as described in par. 4.8.

6.8.6 Fuses or fuse-switches providing back-up protection for circuit breakers, shall be grouped with the associated circuit-breakers. Exposed surfaces effuse-switches shall be of the same finish and colour as the rest of the board where practical.

6. 9 STANDBY SUPPLIES

6.9.1 Where standby power from a diesel-generator set or other sources is available and has to be connected to some of the equipment on a switchboard, the switchboard shall be divided into separate sections with sheet metal divisions to isolate standby power and mains power sections.

6.9.2 Standby and normal supply shall each have its own incoming isolator or circuit-breaker.

6.9.3 The two sections of the switchboard shall be labelled "ESSENTIAL" and "NON-ESSENTIAL" respectively.

6.9.4 The front panels of standby and no-break supply sections shall be painted in distinctive colours as follows:

| | | | |
|---|---|---|---|
| (a) | Normal supply | "LIGHT ORANGE", | colour B26 of SANS 1091 |
| (b) | Standby power | "SIGNAL RED", | colour All of SANS 1091 |
| (c) | No-break supply | "DARK VIOLET", | colour F06 or |
| | | "OLIVE GREEN". | colour H05 of SANS 1091 |

## 7. BUSBARS IN SWITCHBOARDS

7.1 APPLICATION

7.1.1 Busbars shall be manufactured of solid drawn high conductivity copper with a rectangular cross-section in accordance with SANS 1473, SANS 1195 and BS 159 and BS 1433, where applicable.

7.1.2 Although SANS 1473 refers only to overhead or rising busbars, busbars in switchboards shall comply with applicable sections of this specification especially as far as insulation and clearance values, creepage distance, joints, insulation resistance, dielectric strength, deflection test, absorption resistance and rated short time withstand current are concerned.

7.1.3 Busbars shall be supplied for the following applications:

(a) Distribution of supply voltage.

(b) Connection of equipment with ratings exceeding the current rating of 70mm$^2$ conductors (par. 8.6).

(c) Connection of outgoing circuits with current ratings in excess of that allowed for 70mm$^2$ conductors (par. 7.8).

(d) Collector bars for parallel cables (par. 8.1).

(e) Connection bars for neutral conductors (par. 7.9).

(f) Earth busbars (par. 7.10).

(g) Connections to miniature circuit-breakers (par. 8.6).

7.2 SEE PART C15 FOR FURTHER DETAILS.

## 8. WIRING

8.1 CABLING

Cables connected to incoming or outgoing circuits shall be terminated on the gland plate supplied for this purpose. (Refer to par. 4.9). Power cables up to and including 70mm$^2$ may terminate on clamp type terminals where the clamping screws are not in direct contact with the conductor. Connection to the equipment can then be made with cables that are similarly connected to the clamp terminal. All power cables larger than 70mm$^2$ terminate on busbars that are connected to the associated equipment. Parallel incoming or outgoing cables shall be connected to a collector busbar without crossing the conductors.

8.2 TERMINAL STRIPS

External wiring for low voltage, control, interlocking, alarm, measuring and DC circuits shall terminate on numbered wiring terminals complying with the standard specification for "WIRING TERMINALS", Section C9. The correct terminal size as recommended by the manufacturer for each conductor to be connected shall be used throughout. The terminal numbers shall appear on the wiring diagrams of the switchboard. Terminals for power wiring shall be separated from other terminals. Terminals for internal wiring shall not be interposed with terminals for external circuits. All connections to terminals shall be identified as described in par. 8.8. Where switchboards consist of separate sections, the control wiring passing between sections shall be terminated on strips in each section so that control wiring can be readily re-instated when reassembling the board.

8.3 CURRENT RATINGS

The current rating of conductors for the internal wiring shall be sufficient for the maximum continuous current that can occur in the circuit. This value shall be determined from the circuit-breaker or fuse protection of the circuit.

**TABLE 17.3**

**CURRENT RATING FOR INTERN**

| Nominal cross-Section $mm^2$ | CONDUCTOR RATING (A) | | | | |
|---|---|---|---|---|---|
| | Number of conductors in bunch | | | | |
| | 1 | 2-3 | 4-5 | 6-9 | 10 and more |
| 2,5 | 28 | 25 | 22 | 19 | 16 |
| 4 | 37 | 33 | 30 | 26 | 22 |
| 6 | 47 | 42 | 38 | 33 | 28 |
| 10 | 64 | 54 | 51 | 44 | 38 |
| 16 | 85 | 76 | 68 | 59 | 51 |
| 25 | 112 | 101 | 89 | 78 | 67 |
| 35 | 138 | 124 | 110 | 96 | 88 |
| 50 | 172 | 154 | 137 | 120 | 103 |
| 70 | 213 | 191 | 170 | 149 | 127 |

The above table shall be applied for ambient temperatures up to 30ºC. (Refer to table 41.2 in VDE 0100). For higher ambient temperatures the values shall be derated as prescribed by SANS 10142. Table 10.

8.4 INTERNAL WIRING

(a) Standard 600/1 000 V grade PVC-insulated stranded annealed copper conductors to SANS 1507 shall be employed for the internal power wiring of switchboards. The smallest conductor size to be used for power wiring in switchboards shall be 2.5$mm^2$. Flexible cord of minimum size 1,0$mm^2$ may be used for control wiring.

(b) Where heat generating equipment is present and the internal temperature of the board is likely to exceed 50°C, silicon-rubber insulated stranded conductors shall be used.

(c) Wiring shall be arranged in horizontal and vertical rows and shall be bound with suitable plastic straps or installed in PVC wiring channels. Under no circumstances may PVC adhesive tape be used for the bunching of conductors or for the colour identification of conductors.

(d) Bunched conductors shall be neatly formed to present a uniform appearance without twisting or crossing the conductors. Conductors leaving the harnesses shall be so arranged that they are adjacent to the chassis.

(e) Conductors to hinged panels and doors shall be secured on both the door and the frame and shall be looped between the two points. The loop shall be arranged to produce a twisting motion when the door is opened or closed. A flexible protection sleeve shall be installed over the conductors.

(f) Where wiring channels are used, they shall be installed horizontally and vertically. Under no circumstances may power and control circuit wiring be installed in the same wiring channels. Channel shall not be more than 40% full.

(g) All wiring between different Panels within the same switchboard shall be installed in wiring channels.

(h) Grommets shall be installed in each hole in the metalvvork through which conductors pass.

(i) All wiring shall be installed away from terminals, clamps or other current carrying parts. Wiring shall also be kept away from exposed metal edges or shall be protected where they cross metal edges protected where they cross metal edges.

(k) Conductors may be jointed at equipment terminals or numbered terminal strips only. No other connections are allowed.

(l) Where conductors change direction, smooth bends shall be formed with a radius of at least 5 times the outside diameter of the conductor or harness.

(m) Where screened cables are specified, the screening shall be earthed in the switchboard or control board only unless clearly specified to the contrary, Screened cables entering control boxes through pressed knock-outs, shall terminate in compression glands. Conductors shall as far as possible remain inside the screening at terminations. Where conductors have to separate from the screen, the braiding shall be separated and the conductors drawn through the braid without damaging the braiding. The conductors shall then be connected to their respective terminals and the screening smoothed and connected to the earth terminal.

(n) Where neutral connections are looped between the terminals of instruments, it is essential that the two conductor ends be inserted into a common lug or ferrule and are crimped or soldered together in order that the neutral connection is not broken when the conductors are removed from one of the instruments.

(o) Wiring should as far as possible be confined to the front portions of switchboards for ease of access. This requirement is important for wiring between smaller circuit-breakers and the associated main circuit-breaker as well as the wiring from circuit-breakers to lighting and socket-outlet circuits.

(p) A maximum of two conductors will be allowed per equipment terminal. Where more conductors must be connected to the same equipment terminal (e.g. a main circuit-breaker feeding other circuit-breakers), stub busbars shall be provided for the various conductors. Refer also to par. 8.6.

8. 5 LOAD END CONNECTIONS

The supply end connections to all equipment shall under all circumstances be at the top and the load end connections at the bottom.

8.6 WIRING TO CIRCUIT-BREAKERS

Equipment with a rating exceeding the current rating of 70mm$^2$ conductors shall be connected by means of busbars to the main busbars. Looped connections may only be installed for a maximum of two outgoing circuits. Where there are more than two outgoing circuits, busbars shall be used and equipment connected individually to the busbars. Where miniature circuit-breakers are mounted in continuous rows and supplied by busbars connected to each MCB. each busbar shall be supplied by a separate conductor. This conductor shall be connected to the busbar by means of a separate lug and not via an MCB terminal.

8.7 CONDUCTOR TERMINATIONS

Conductors connected to terminals complying with the standard specification for "WIRING TERMINALS". Section C9, need not be soldered or ferruled. Connections to circuit-breakers, isolators or contactors shall be made by one of the following methods:

(a) A ferrule of the correct size,

(b) soldering the end of the conductor, or

(c) winding a conductor strand tightly around the end to totally cover the end.

All conductors terminating on meters, fuse holders and other equipment with screwed terminals shall be fitted with lugs. The lugs shall be soldered or crimped to the end of the conductor. The correct amount of insulation shall be stripped from the end to fit into the terminal. Strands may not be cut from the end of

the conductor.

8.8 IDENTIFICATION

8.8.1 The colour of the conductors for all 220/250 V circuits shall correspond to the colour of the supply phase for that circuit. Neutral conductors shall be black.

8.8.2 All other conductors in the board, supplying control circuits, etc. shall be coded in colours other than those specified above. A colour code shall be devised for each board and the colour code shall be shown on the wiring diagrams.

8.8.3 All conductors that terminate at wiring terminals and all conductors used for the internal wiring of the switchboard, shall further be identified at both ends by means of durable cable marking ferrules. PVC or other tape is not acceptable.

8.8.4 The numbers on the markers shall be shown on the wiring diagrams.

## 9. PAINT FINISH

Metal components of the framework, panels and chassis shall be painted in accordance with the "STANDARD PAINT SPECIFICATION".

## 10. LABELLING

10.1 Care shall be taken to ensure that all equipment is fully labelled and that accurate descriptions and safety warning notices appear in both official languages.

10.2 MATERIAL

Engraved plastic or ivory sandwiched strips shall be used throughout. The strips shall bear white lettering on a black background for normal labels and red letters on a white or yellow background for danger notices.

10.3 MAIN SWITCHBOARDS

Main switchboards and sub-main switchboards shall be supplied with the following bilingual labels:

(a) Number and allocation of switchboard. Example:

CONTROL BOARD A4

BEHEERBORDA4

Lettering: at least 10 mm high prominent position. Label on the outside in a prominent position.

(b) Designation of busbar sections. Example:

BUSBAR SECTION 2

GELEISTAMSEKSIE2

Lettering: at least 10mm high. Label on the outside in a prominent position.

(c) Designation of all switchgear including circuit-breakers, isolators, contactors, etc. If the current rating of circuit-breakers is not clearly marked on the equipment, the value shall be indicated on the engraved label. Example:

SUPPLY TO BOARD C3 TOEVOER NA BORD C3

PUMP SUPPLY
POMPTOEVOER

Letters at least 5mm high. Label on the outside of the switchboard.

(d) All other equipment including meters, instruments, indicator lights, switches, push-buttons, circuit-breakers, fuses, contactors, control relays, protection relays, etc. shall be identified. The function of the equipment and circuits shall be clearly indicated. The main switch shall be labelled as such and designated:

"SWITCH OFF IN CASE OF EMERGENCY"
"SKAKEL AF IN NOODGEVAL"

Flush mounted equipment within doors or front panels shall be identified with labels fixed to the doors or front panels respectively. The labels for equipment installed behind panels, shall be fixed to the chassis close to the equipment. If this equipment is positioned too close together to accommodate descriptive engraved labels, the equipment may be identified by a code or number on an engraved label which shall be fixed close to the equipment. The code number shall be identified on a legend card which shall be installed on the switchboard behind a plastic or other protective cover.

10.4 OTHER SWITCHBOARDS

All equipment on switchboards shall be identified with the necessary bilingual labels.The circuit numbers shall appear at grouped single-pole circuit-breakers. The circuit numbers shall correspond to the circuit numbers on the final installation drawings. The above-mentioned circuits shall be identified on a legend card, which shall be installed on the inside of the switchboard door, or in any other position where it can conveniently be observed. All fuses, including instrument fuses, shall have labels stating function, fuse rating and duty or type where applicable. All other equipment shall be identified separately and their functions shall be clearly indicated.

10.5 FIXING OF LABELS

10.5.1 Labels shall not be fixed to components or trunking but to doors, panels, chassis or other permanent structures of the switchboard.

10.5.2 Engraved strips shall be secured to facilitate a neat alteration of the designation of the labels. Sufficient fixing points shall be provided to prevent labels from warping. Labels in slotted holders shall be secured in position to prevent unauthorised removal. Labels may be secured by the use of brass bolts and nuts, self-tapping screws, slotted label holders or pop-rivets.

## 11 TESTS

11.1 The Engineer shall be notified when the mechanical construction of the switchboard, i.e. frame, panels and base frame, is complete in order that it may be inspected at the factory.

11.2 Function tests of all equipment, control and interlocking circuits shall be conducted to the satisfaction of the Engineer. Testing equipment and facilities including instruments, dummy loads and additional switchgear and cables shall be provided by the Contractor at no extra cost. The Engineer shall be notified in writing two weeks in advance of any test to be conducted, to allow its representative to be present at such tests. A complete report on the tests shall be handed to the Engineer.

## 12. DRAWINGS

12.1 DRAWINGS FOR APPROVAL

A set of three prints of the shop drawings for the switchboards shall be submitted to the Engineer for approval before the boards are manufactured. The following information shall be presented:

(a) A complete wiring diagram of the equipment on the boards.

(b) A complete layout of the arrangement of the switchboards indicating all equipment dimensions and the construction of the boards. The positions and method of fixing and sizes of busbars shall be shown.

(c) All labelling information in both the official languages on a separate sheet.

(d) The make, catalogue number and capacity of all equipment such as isolators, circuit-breakers, fuses, contactors, etc.

The approval of drawings shall not relieve the Contractor of his responsibility to the client to supply the switchboards according to the requirements of this Specification.

12.2 FINAL DRAWINGS

A complete set of "as-built" transparent drawings of all switchboards shall be submitted to the Engineer within two weeks after delivery of the boards. The following information shall be presented:

(a) Item (a) to (d) of the previous paragraph.

(b) Terminal strip numbers, numbers and colours of conductors connected to the terminal strips and numbers and colours of the conductors utilised for the internal wiring.

(c) A separate schedule of all equipment.

12.3 MANUALS

Three sets of manuals for all specified main and sub-main switchboards shall be supplied to the Engineer at no extra cost. These manuals shall include the following information:

(a) Complete information on the operation of the equipment.

(b) Complete information for maintenance of the equipment.

(c) Brochures and ordering information.

(d) A complete equipment list indicating quantities and relevant catalogue numbers.

12.4 COMPLETION

The supply contract shall be regarded as incomplete until all tests have been conducted successfully and all drawings and manuals have been handed to the Engineer.

# SECTION C8

## C.8 INDICATOR LIGHTS

1. Indicator lights shall be of neon, incandescent (filament) or LED types. Lamp voltages shall suit the supply or control voltage. Lamps shall be derated for continuous duty by using economy resistors or using input voltages at least 20% lower than the rated lamp voltages.

2. Where LED's are used as indicators on main supply voltages a suitable current limiting capacitor and reverse voltage protection diode shall be used. For low AC or DC voltages (+ 24 V) a current limiting resistor will suffice.

3. Indicator lights shall comply with BS 1050 where applicable.

4. Indicator lights shall be suitable for installation in switchboard panels and doors and shall consist of interchangeable lenses, lamp base, suitably rated and accessible terminals and a chromed screw-on retaining ring or other suitable means to secure the units.

5. It shall be possible to replace lamps from the front of the panel without the use of tools.

6. Surface mounted indicator lights shall be housed in purpose-made boxes with suitable cover plates.

7. Indicator lights shall be equipped with standard removable legend plates. Alternatively, the function shall be clearly indicated by means of labels or by engraving on the lenses.

8. All indicator lights for a specific application or switchboard shall be from the range of one manufacturer and shall preferably be of the same size and shall use the same lamp types.

9. The following are the preferred colours for indicator lights:

(a) RED : Abnormal state.

(b) YELLOW : Attention or caution, (or amber)

(c) GREEN : Ready for operation.

(d) WHITE : Circuit live or circuit operating (or clear) normally

(e) BLUE : Any function not covered by the above colours.

# SECTION C9

## C.9 CONTACTORS

1. Contactors shall be of the open or totally enclosed, triple- or double-pole, electromechanically operated, air-break type suitable for 380/433 V or 220/250 V supplies.

2. Contactors shall have the following characteristics:

(a) Enclosed coil easily replaceable.

(b) A permanent air gap in the magnetic circuit to prevent sticky operation.

(c) Provision for quick and simple inspection of contacts.

(d) Clearly marked main and auxiliary terminals.

3. All parts shall be accessible from the front.

4. Contactors which are not located in switchboards shall be housed in enclosures which comply with IP 54 of IEC 144.

5. The current rating of the contactor shall be as specified for the circuit with a switching duty in accordance with IEC 158-1, utilisation category ACI for lighting and power circuits and utilisation category AC3 for motor starting.

6. In addition to the required current carrying capacity and switching duty of a contactor, the contactor chosen for a particular application shall be rated for the maximum through fault current allowed by the back-up protection devices at the point where the contactor is installed. Careful co-ordination of short circuit devices shall take place.

7. All laminations of the magnetic system of the contactor shall be tightly clamped. Noisy contactors will not be accepted.

8. Non-current-carrying metallic parts shall be solidly interconnected and a common screwed earth terminal shall be provided. The contactor shall be earthed to the switchboard earth bar.

9. Latched contactors shall be provided with a trip coil and a closing coil. The contactor shall remain closed after de-energising the closing coil and shall only trip on energising the trip coil.

10. Contactor operating coils shall have a voltage rating as required by the control circuitry and shall have limits of operation and temperature rise as specified in Clause 7.5 and Table IV of IEC 158-1. Latched contactors shall be capable of being tripped at 50% of the rated coil voltage.

11. Contactors for normal/standby changeover circuits shall be electrically and mechanically interlocked. Contactors in star-delta starters shall be electrically interlocked.

12. Contactors with provision to add auxiliary contacts and convert auxiliary contacts on site are preferred. Contactors with permanently fixed auxiliary contacts shall have at least 1 x N/0 and 1 x N/C spare auxiliary contacts in addition to the contacts specified or control purposes and in addition to contacts required for self-holding operations or economy resistances. Where the number of auxiliary contacts required is greater than the number of contacts that can be accommodated on the contactor, an auxiliary relay or additional contactor shall be provided to supply the additional contacts.

13. It shall be possible to replace main contacts without disconnecting wiring.

14. Auxiliary contacts shall be capable of making, carrying continuously and breaking 6A at 230V AC, unity power factor for contactors used on 380-433/220-250 V systems.

15. Auxiliary contact functions required e.g. "lazy" contacts late-make, late-break, make-before-break, etc. shall be inherent in the contact design. Under no circumstances may these functions be improvised by bending contacts, loading contacts, etc. These functions shall be available in all contactors.

16. Spare auxiliary contacts shall be wired to numbered terminal strips in the switchboard and shall appear on the switchboard drawings.

17. All contactors on a specific project shall be from a standard range of one single manufacturer, unless specified to the contrary.

# SECTION C10

## C.10 INDOOR SURGE ARRESTORS

1. Surge arrestors shall comply with the requirements of SANS 61643 or VDE 0675.

2. Surge arrestors shall be suitable for installation at altitudes of up to 1800m above sea level.

3. The unit shall be contained within a thermoplastic or cast resin housing and all internal components shall be fully sealed in.

4. The unit shall be supplied complete with a galvanised steel mounting bracket for convenient mounting onto the metalwork or tray of a switchboard.

5. Alternatively, the unit shall be of the type which can be mounted into the clip-tray of a switchboard.

6. Surge arrestors shall be provided in all cases where a switchboard is supplied directly from an overhead line.

7. In other cases, surge arrestors, if required, will be specified in the Detail Technical Specification.

# SECTION C11

## C.11 STANDARD PAINT SPECIFICATION

### 1. FINISH REQUIRED

Metalwork of electrical equipment such as switchboards, equipment enclosures, sheet steel luminaire components, purpose-made boxes, etc. shall be finished with a high quality paint applied according to the best available method. Baked enamel, electrostatically applied powder coating or similar proven methods shall be used.

### 2. CORROSION RESISTANCE

Painted metal shall be corrosion resistant for a period of at least 168 hours when tested in accordance with SANS 166.

### 3. EDGES

Care shall be taken to ensure that all edges and comers are properly covered.

### 4. SURFACE PREPARATION

Surface preparation shall comply with SANS 10064. Prior to painting, all metal parts shall be thoroughly cleaned of rust. mill scale, grease and foreign matter to a continuous metallic finish. Sand or shot blasting or acid pickling and washing shall be employed for this purpose.

### 5. BAKED ENAMEL FINISH

5.1 Immediately after cleaning all surfaces shall be covered by a rust inhibiting, tough unbroken metal-phosphate film and then thoroughly dried.

5.2 Within forty eight (48) hours after phosphatising, a passivating layer consisting of a high quality zinc chromate primer shall be applied, followed by two coats of high quality alkyd-based baked enamel.

5.3 The enamel finish on metal luminaire components shall comply with SANS 783, Type III.

5.4 Other metal parts e.g. switchboard panels, etc., shall comply with SANS 783, Type IV with a minimum paint thickness after painting of 0,06mm. In coastal areas, the dry film thickness shall be increased to at least 0,1mm.

5.5 The paint shall have an impact resistance of 5,65 J on cold-rolled steel plate and a scratch resistance of 2kg

### 6. POWDER COATED FINISH (NOT TO BE USED LESS THAN 50KM FROM SEASIDE)

6.1 Immediately after cleaning the metal parts shall be pre-heated and then covered by a microstructure paint powder applied electrostatically.

6.1 The paint shall be baked on and shall harden within 10 minutes at a temperature of 190°C.

6.3 The minimum paint thickness after baking shall be 0,05mm. The dry film thickness shall be increased in coastal areas. The paint cover shall have an impact resistance of 5,65 J on cold-rolled steel plate and a scratch resistance of 2kg.

### 7. TOUCH-UP PAINT

In the case of switchboards and larger equipment enclosures, a tin of matching touch-up paint

not smaller than 1 litre shall be provided.

## 8. COLOURS

8.1 The colour of HV switchboards and HV switchgear enclosures shall be "DARK ADMIRALTY GREY", colour G12 of SANS 1091.

8.2 The colour of LV switchboards and equipment enclosures in buildings shall be "LIGHT ORANGE", colour B26 of SANS 1091 as recommended in SANS 10140, Part II unless specified to the contrary.

8.3 The colour of LV distribution kiosks and miniature substations shall be "AVOCADO GREEN", colour C17 or "LIGHT STONE", colour C37 of SANS 1091.

8.4 The standby power section of LV switchboards in buildings shall be coloured "SIGNAL RED", colour All of SANS 1091.

8.3 Switchboards for No-Break Power Supplies or sections of switchboards containing No-break power supplies, shall be coloured "DARK VIOLET", colour F06 or "OLIVE GREEN" colour H05 of SANS 1091.

# PART 22: BILL OF QUANTITIES

**ORBIT TVET COLLEGE - MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE**

**PREAMBLES**

| ITEM NO | | DESCRIPTION |
|---|---|---|
| SP1.1 | | **ELECTRICAL WORK** |
| | | **PREAMBLES** |
| | | For preambles refer to the following Specifications: |
| | 1 | Section C: Electrical Installation Works Specification |
| | 2 | Specification for Supply, Delivery, Installation, Testing and Commissioning of Type B miniature sub-stations |
| SP1.2 | | **SUPPLEMENTARY PREAMBLES** |
| | | **Meaning of words** |
| | 1 | Wherever the words "user client" or "government" are used in the preambles it shall be deemed to mean "employer" |
| | 2 | Wherever the words "main contractor", "building contractor", "sub-contractor", "electrical contractor" or "civil, structural, electrical and building contractor" are used in the preambles it shall be deemed to mean "contractor" |
| | 3 | Wherever the word "department" is used in the preambles it shall be deemed to mean "Electrical Engineer" |
| | 4 | Wherever the words "engineer", "consultant", "consulting engineer" or "chief electrical engineer" are used in the preambles it shall be deemed to mean "Electrical Engineer" |
| | 5 | All associated costs involved in bringing each miniature substaion to full operational status |
| | 6 | Wherever the words "tender documents" are used in the preambles it shall be deemed to mean "procurement documents" |
| | 7 | Wherever the words "contract documents" are used in the preambles it shall be deemed to mean "agreement" |

| | | |
|---|---|---|
| | 8 | Wherever the words "contract works" are used in the preambles it shall be deemed to mean "works"<br><br>The word “approve” means approval by the Departments Electrical engineer or representative |
| | 9 | Specifications, drawings, etc<br><br>Bidders are referred to the abovementioned specifications and the drawings hereafter referred to, prepared by Emzansi Consulting Engineers and issued with these bills of quantities, for the full descriptions of the following items which are to be read and priced in conjunction with the said specifications and drawings<br><br>Should any part of the drawing not be clearly intelligible to the bidder he shall, before submitting his bid, obtain clarification in writing from the Electrical Engineer |
| | 10 | Firm of specialists<br><br>All the work described in this section shall be executed by a firm of specialists. The installation shall be carried out entirely by this approved firm's own personnel and shall not in any way be sub-let |
| | 11 | Descriptions and pricing<br><br>Unless otherwise stated the description of each item shall be deemed to include manufacturing, conveying and delivering, unloading, storing, unpacking, hoisting, rigging, setting, fitting and fixing in position, cutting, waste, patterns, templates, plant, temporary works, return of packings, connecting, testing, commissioning, establishment charges, profit and other obligations arising out of the agreement<br><br>The amount priced in the rate column is to be divided into the two categories provided namely Supply and Install<br><br>Unless otherwise stated, all measurements are net, in accordance with the drawings, and no allowance has been made for wastage.<br><br>commissions to third parties, etc, where applicable. The foregoing items, as well as the Contractor's handling, financing and profit mark-up is not to be separately detailed, and must be included in the rates. |

| | | |
|---|---|---|
| | 12 | Proprietary items<br><br>Prices are to be based on the specific products/articles specified. The bidders attention is drawn to the fact that any other product of equal quality may be used subject to the written approval of the engineer being obtained prior to the closing date for submission of tenders<br><br>Items, materials or methods to be used specified by trade names or catalogue numbers are only an indication of the quality required. Items, materials or methods of similar quality may be used with prior approval from the engineer<br><br>Where equipment is specified by name, the tenderer must price on this basis. Alternatives may be offered by tenderers but the use of which is subject to written approval by the Engineer |
| | 13 | Old Materials<br><br>Old materials resulting from the alterations and demolitions are to be removed from the site unless otherwise specified<br><br>Old materials become the property of the Contractor unless otherwise specified. |
| | 13 | Temporary Coverings, Screens etc.<br><br>The Contractor will be held responsible for any damage to property or goods in the existing buildings due to his not having taken adequate precautions and all damage caused is to be made good at his own expense. He must allow for providing all necessary plastic or wood framed screens, partitions, tarpaulins, barriers, etc. to protect the work and prevent any nuisance from dust as may be required or directed |
| | 14 | Setting Out<br><br>All dimensions affecting work in the existing buildings are to be taken on the site and the Contractor will be responsible for taking the correct sizes of all new work, these sizes given in this Bill are approximate. |
| | 15 | Notices<br><br>Special care is to be exercised not to interfere unnecessarily with any electrical or telephone installations that may be met with and due notice is to be given to the engineer when any disconnections or removal of wires, fittings, etc., are necessary and the Contractor is to afford every facility to the electricians carrying out this work |

| | | |
|---|---|---|
| SP1.3 | | **GENERAL NOTES** |
| | 1 | This Bill of Quantities forms part of, and must be read in conjunction with the complete specifications and must be submitted, duly completed, on the closing date of tenders. |
| | 2 | Tenderers must complete the Bill of Quantities and detail the unit rate and total amount of each item<br><br>The "Total" shall constitute the tender price for adjudication.<br><br>Tenderers are advised to check their item extension and total additions as arithmetical errors occurring in the priced Bill of Quantities cannot be concidered as having an effect on the tender amount. |
| | 3 | No alteration, erasure or addition is to be made in the text of the Bill of Quantities. Should any altrations, erasure or addition be made it wiil not be recognised but the original wording of the Bill of Quantities will be adhered to.<br><br>The Engineer will check the completed Bill of Quantities and reserves the right to adjust any individual price and to rectify any discrepancy whilst the total tender price remains unaltered. |
| | 4 | 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 re-measurement on site after completion of the service and ajustments will be made according to the unit rates given in the Bill.<br><br>In the event of discrepancies between the drawings, specifications and Bill of Quantities the Engineer shall decide whether the work executed shall be re-measured on site or whether re-measureme shall be effected from the working drawings only. |
| | 5 | The Bill of Quantities is to be used for pricing and financial purposes only. The drawings take precedence over particular (project) specification but should be used in conjunction with these specifications. The Project Specification take precedence over quility specifications and the Bill of Quantities.<br><br>**Note**<br><br>Checking of Cable and Overhead Conductor Lengths. Not withstanding the fact that lengths of cables and overhead conductors, as given in the Bill 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 nett route length of the cables and overhead lines concerned. installed in accordance with the specification. However, the onus is on the Contractor to prove compliance with the specification. |

| | | |
|---|---|---|
| | 6 | The BOQ is to be regarded as fixed and will not be adjusted for variations in the final contract value or contract period. |
| | 7 | Unit prices for the same items in different Bills shall in all cases be the same, and in the case of differences, the Engineer reserves the right to change such unit prices when the completed list is checked, without adjusting the tender price. |
| | 8 | The total for each page of each Bill is to be carried forward to the collection page at the end of each Bill. |
| | 9 | P.C., Provisional and Contingency allowances, items and sums shall be expended as directed by the Engineer, and any balance remaining shall be deducted from the amount of the contract sum. Tenderers may not regard any unspent monies as forming part of the final contact value. |
| | 10 | Variation work, as well as the items described above, shall be measured as executed, and paid for according to unit prices in the Bill of Quantities. Where unit prices are not available, the work shall be priced, in conjunction with the Engineer, at current rates. |
| | 11 | Unless otherwise specified in the Bill of Quantities, all items are to be priced on the basis of supply, delivery, offload, installation, connection, rigging, testing and commissioning.<br><br>All prices are to be EXCLUSIVE OF V.A.T but inclusive of import duties, surcharges, commissions to third parties, etc., where applicable. The foregoing items, as well as the Contractor's handling, financing and profit mark-up, is not to be separately detailed, and must be included in the cost rates. |
| | 12 | Unless otherwise stated, all measurements are net, in accordance with the drawings, and no allowance has been made for wastage. |
| | 13 | The Employer reserves the right to increase or decrease the extent of the contract works, without restraint, on total value of variations issued relavant to any particular itemn the Bill of Quantities, by issuing written variation instructions to omit or add, as may be required, the supply and/or installation of any item of equipment or work, whether in the Bill of Quantities or not, and without affecting the unit rates indicated in the Bill of Quantities or Preliminary and General items. |
| | 14 | In the event that Tenderers disagree with the measured quantities the tender should be qualified accordingly, listing the items and quantities in question. |
| | 15 | The unit prices quoted in the Bill of Quantities must include for small installation materials such as nuts, bolts, nails, saddles, screws etc. as are required for the satisfactory complete installation in accordance with the specification. |

| | | |
|---|---|---|
| | 16 | Unless otherwise stated in the Bill, the unit cost rates shall be based on the following:<br><br>The rate for luminaires and accessories shall include for connection of the wiring thereto. |
| | 17 | All measurements are based on the most economical route lengths without any allowance for wastage, threading, jointing or slack. |
| | 18 | It should be noted that, notwithstanding anything to the contrary, any items completed or listed in the Bill of Quantities by the Tenderer will be taken into account, and will be subject to re-measurement, and will be regarded as a Bill of Quantities item. |
| | 19 | Items, materials or methods to be used specified by trade names or catalogue numbers are only an indication of the quality required. Items, materials or methods of similar quality may be used with prior approval from the Engineer |
| | 20 | Where equipment is specified by name, the tenderer must price on this basis. Alternatives may be offered by tenderers but the use of which is subject to written approval by the Engineer. |
| | 21 | Where demolition work is to be carried out, the removal of powerskirting, coduits, cable trays, conductors, luminaires etc. is deemed to be part thereof. |
| | 22 | The Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) (OHS Act), which is administered by the Chief Inspector of Occupational Health and Safety of the Department of Labour, requires that electrical installations comply with the requirements of SANS 10142-1. It also requires that a registered person, as defined (master installation electrician, installation electrician or electrical tester for single phase), will issue a Certificate of Compliance for an electrical installation in line with the requirements set out in SANS 10142-1 |
| | 23 | The Contractor shall have at least one installation electrician in full time employment assigned permanently to this project. |

| | | |
|---|---|---|
| SP1.4 | | MEASURING AND PAYMENT PRINCIPLES |
| | 1 | The basic principles of measurement and payment for cable trench excavations is that the rate bidded for excavations covers the cost of excavations, the re-use of excavated material for back filling and the removal of all surplus material along the trench routes to the nearest dumping site |
| | 2 | The rate for the laying of the cable covers the cost of the handling and placing of the cable in the approved trench, as well as any other costs concerning the laying of the cables. |
| | 3 | Trench excavations for cables, etc. is measured volume wise, but can be measured according to length. Except when differently stated in the project specification or differently demanded, the depth will be measured from the ground level, along the centre line of the trench, down to the bottom of the specified bottom layer. The ground level is that which was formed after mass ground works was completed, measuring the excavated level or the backfilled level, except where another execution sequence is demanded. |
| | 4 | The source of the approved back fill material and the bottom layer is the contractors own responsibility. He is free to use approved material excavated from the side of the trench or other excavations on site, providing such material meats the applicable requirements. He is also free to buy one or both the materials from commercial sources or to excavate along the cable route at his own cost. Additional and separate payment for the backfill of over-excavations and the removal of surplus materials or any other unforeseen works will only be made if such works was specified by the Engineer. |
| | 5 | All rates shall allow for fault finding and commissioning procedures as well as include making, aiming, conveying, importing, delivering, unloading, storing, unpacking, hoisting, setting, fitting and fixing in position, cutting and waste, plant, temporary works and profit. All equipment and materials shall be new. |
| | 6 | The rates shall include all permanent labelling and numbering on all switchgear, cables and equipment. The labelling shall be made from Trafolite (black writing on white background) as detailed in the general technical specification. All ends of cables shall be labelled. |
| | 7 | The Contractor shall be responsible for obtaining the Engineer's signature accepting any measurements and payment claims by no later than one week before the payment claim is to be submitted for payment. |

| | | |
|---|---|---|
| SP 1.5 | | INTERIM PAYMENT |
| | 1 | Material **OFF** Site<br><br>The inclusion of materials and goods stored off site in the amount authorised for payment shall be at the sole discretion of the principal agent and such inclusion shall only be considered upon the provision, by the contractor, of an approved guarantee issued by a registered commercial bank. |
| | 2 | Material **ON** Site<br><br>Payment for Materials **on** Site (MOS), with written Engineer approval, may be claimed for billed items purchased by the contractor and stored securely on site, provided the contractor submit delivery notes of material on site and invoices for the materials supplied by the suppliers. The contractor may only claim 80% of the full invoiced amount of MOS submitted by the supplier, provided that the total claimed MOS for each billed item does not exceed 80% of the full amount allowed for each billed item in the pricing schedule.<br><br>Although MOS may be claimed, the MOS will remain the contractor's responsibility until project completion and hand-over to the Employer, thereafter the defect liability period is effective, thus any damage, vandalism, theft, etc. of materials will be the contractor's responsibility to replace and repair at the contractor's own expense.<br><br>The Contractor must also provide the following:<br>1) Proof of insurance<br>2) Proof of security measures taken<br><br>Storage<br>1) Items should be stored in a separate container that is demarked, 'property of TVET' |

**ORBIT TVET COLLEGE - SUPPLY AND INSTALLATION OF A PV PLANT AT MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE**

**ELECTRICAL INSTALLATIONS - SCHEDULE OF REMEASURABLE QUANTITIES**

**SCHEDULE: SOLAR INSTALLATIONS - PRELIMINARY AND GENERAL**

| ITEM NO | | DESCRIPTION | UNIT | QUAN-TITY | SUPPLY | | INSTALL | | TOTAL (R) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | RATE | AMOUNT | RATE | AMOUNT | |
| PG 1 | | **RUSTENBURG CAMPUS AND CENTRAL OFFICE** | | | | | | | |
| | | **PRELIMINARY AND GENERAL - SANS 1200 A & B** | | | | | | | |
| PG1.1 | | **FIXED-CHARGE ITEMS** | | | | | | | |
| | 1 | Contractual Requirements | Sum | 1 | | | | | |
| PG1.2 | | **SITE ESTABLISHMENT** | | | | | | | |
| | 1 | Camp and fencing | Sum | 1 | | | | | |
| | 2 | Offices and storage sheds | Sum | 1 | | | | | |
| | 3 | Office Equipment | Sum | 1 | | | | | |
| | 4 | Ablution and latrine facilities | Sum | 1 | | | | | |
| | 5 | Remove site establishment on completion and remove all rubbish, foundations, concrete bases, dirt oil spillage, etc, and leave site in condition as found. | Item | Included | | | | | |
| | 6 | Tools, equipment, plant hire and testing gear/meters as necessary. | Sum | 1 | | | | | |
| | 7 | Water supplies, electric power and communications | Sum | 1 | | | | | |
| | 8 | Contract nameboard (One only) | Sum | 1 | | | | | |
| PG1.3 | | **Other Fixed-Charged Items** | | | | | | | |
| | 1 | Provision for OH&S requirements as specified, such as, but not limited to: Safety officer payment, safety training, HIV awareness, medicals, health and safety plan, administration, etc. | Sum | 1 | | | | | |
| | 2 | Provision for Environmental Management Plan requirements | Sum | 1 | | | | | |
| | 3 | Site Instruction Book: Instructions issued on site are to be recorded in triplicate in a site instruction book which is to be maintained on site by the contractor | Sum | 1 | | | | | |
| | 4 | Cost for compliance with Main Contractor's preliminary and general items | Item | Included | | | | | |
| | 5 | Contractual requirements as specified, i.e guarantees, insurance, sureties, company overheads, financing of retention, etc. | Sum | 1 | | | | | |
| | 6 | Contract Engineer, administration, supervision, running costs, programming and management. | Sum | 1 | | | | | |
| | 7 | Maintain and operate site establishment. | Item | Included | | | | | |
| | 8 | Maintenance and guarantee of the complete installation including fitting, material and workmanship for a period of twelve months from date of practical completion and handover | Sum | 1 | | | | | |
| | 9 | Other items not included in the foregoing and required by the Contractor are to be listed and priced below. | Sum | 1 | included | | | | |
| PG1.4 | | **Provision of Community Liaison Officer** | | | | | | | |
| | 1 | Remuneration of CLO (based on R 6000/month incl. cellphone allowance of R150) month | Prov Sum | 1 | 60,000 | 60,000 | | | 60,000.00 |
| | 2 | Charges for profit on 1 above | % | | | | | | |
| | | **P&G'S - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **P&G'S - Brought Forward** | | | | | | | |
| PG1.5<br><br>PG1.5.1 | | **TIME-RELATED ITEMS**<br><br>**Temporary works and plant** | | | | | | | |
| | 1 | The contractor will, throughout the entire contract period be responsible for the proper and adequate protection of all workers and visitors on the site from injury and damage resulting from the works and for the proper security of the site at all times. Furthermore, the contractor must allow for all necessary temporary hoardings, hoardings with gantries, fans, safety screens, barriers, access gates, covered gangways, walkways, overhead protection against falling objects and materials, security fences, etc. for the enclosure of the works and elements thereof for the protection of the public and others as required by prevailing bylaws, the Construction Regulations 2014 issued in terms of Occupational Health and Safety Act 1993, any other Laws and Regulations and/or demanded by his own site requirements. Allowance must furthermore be made for periodic adjustment of any enclosure or protection and for their eventual removal. | Sum | 1 | | | | | |
| | | | | | | | | | |
| | 2 | All site establishment, offices and storage of materials will be strictly limited to the area demarcated which must be suitably fenced with 1,8m high 'Bonnox' fencing covered with shade cloth to the satisfaction of the Principal Agent. The contractor shall be responsible for keeping such areas in a clean, sanitary and orderly condition. | Item | 1 | | | | | |
| | | | | | | | | | |
| | 3 | The office accommodation for meetings is to be adequately sized and equipped with a sound working table and chairs to accommodate at least eight (8) people for site meetings. The room is to be well vented with air-conditioning and fitted with two large white boards and pin boards with markers and erasers. Two plug points to be provided within the room. The access area around the offices and the toilets shall be surfaced with clean crushed stone, which shall be well drained, kept free from mud and maintained throughout the contract period. The office accommodation shall be located within Contractors Site Area. | Sum | 1 | | | | | |
| | | | | | | | | | |
| | 4 | The contractor shall allow for the proper maintenance and regular cleaning of the meeting room and offices during the contract period to ensure clean usable facilities at all times and shall clear away and make good on completion. | Sum | 1 | | | | | |
| | | | | | | | | | |
| | 5 | The contractor shall re-instate/ rehabilitate the area used for site establishment the Contractors dedicated site/yard area as well as the access road from the entrance to the Contractors dedicated site/ yard area | Sum | 1 | | | | | |
| PG1.6 | | **Operate and maintain facilities on site:** | | | | | | | |
| | 1 | Facilities for Engineer | Sum | 1 | | | | | |
| PG1.7 | | **Facilities for Contractor for duration of construction.** | | | | | | | |
| | 1 | Offices and storage sheds | Sum | 1 | | | | | |
| | | | | | | | | | |
| | 2 | Ablution and latrine facilities | Sum | 1 | | | | | |
| | | | | | | | | | |
| | 3 | Tools and equipment | Sum | 1 | | | | | |
| | | | | | | | | | |
| | 4 | Water supplies, electric power and communications | Sum | 1 | | | | | |
| | | | | | | | | | |
| | | **P&G'S - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **P&G'S - Brought Forward** | | | | | | | |
| PG1.8 | | **INSTALLATION / SHOP DRAWINGS AND SAMPLES - for the complete installation as detailed in the specification** | Sum | 1 | | | | | |
| | | The term 'shop drawings' shall mean drawings, layout drawings, diagrams, illustrations, schedules, performance charts, brochures, operating manuals and other data which are prepared by the Contractor or any Sub-Contractor, manufacturer, supplier or distributor and which illustrate the specified portion of the work. The Contractor shall ensure that all shop drawings required for the Works in terms of this Contract, all Selected/Nominated Sub-Contracts and/or any Electrical Engineers instruction, are prepared and submitted timeously in accordance with the following procedure:<br><br>A) Three prints of shop drawings of all fabricated work, working or setting out drawings, shop details and schedules shall be submitted to the Principal Agent, for approval. Such work shall not be carried out until such approval has been given.<br><br>B) Shop drawings shall be submitted to the Electrical Engineer for approval at least two weeks prior to the date on which such approval is required in order to comply with the Contract Programme.<br><br>C) All submissions shall be prepared in accordance with the Contract drawings and specifications and/or any Electrical EngineerS instructions and any deviation shall be specifically highlighted in writing, with a detailed explanation of the reason for such deviation, together with any cost and/or time implications. Delays in approval of shop drawings due to non-compliance with drawings, specifications and/or Principal Agents instructions shall not constitute grounds for any claims for delay, extension of time and the like.<br><br>D) When the Electrical Engineer advises that shop drawings have been approved, the original transparencies of such drawings shall immediately be submitted to the Electrical Engineer so that the Electrical Engineers signature of approval may be appended thereto. Thereafter, four prints of the approved shop drawings, setting out drawings and schedules shall be furnished to the electrical Engineer and the contractor shall transfer the same to 3 sets of CDs or DVDs in PDF and/or DWG format. The manuals shall be neatly prepared, in type written and/or printed format, indexed, with appropriate dividers between each section to facilitate ready reference. All documentation shall be presented in the English language. The drawings will be filed using 70mm Lever Arch Files (x 3) as detailed in the specification. As many prints of the approved shop drawings and schedules as required shall also be furnished to the Works. No work shall be performed in accordance with drawings and/or catalogues not signed with the Electrical Engineers approval.<br><br>E) The Contractor, Sub-Contractor or Supplier, as the case may be, shall be responsible for ensuring that all dimensions affecting shop drawings conform to the dimensions of built work.<br><br>F) The Electrical Engineers approval of shop drawings or samples is limited to checking conformity with specification and shall not relieve the Contractor, Sub-Contractor or Supplier of his responsibility for design, erection or installation fit, nor does it vary his contractual or delictual obligations and liabilities<br><br>G) Should the Contractor, Sub-Contractor or Supplier be of the opinion that corrections to shop drawings made by the Electrical Engineer constitute a change to the scope of work, then he shall immediately advise the Electrical Engineer in writing of this, together with the cost and/or programme implications thereof.<br><br>H) The Contractor/Manufacturer/Supplier will be required to supply equipment layout and detailed drawings for all mechanical, electrical and instrumentation equipment as well as pictures of serial plates where applicable.<br><br>I) If special foundations/plinths are required for equipment, detail foundation drawings must be provided by the Contractor. Foundation drawings shall show the concrete strength and reinforcing requirements together with any holding down bolt details.<br><br>J) All equipment shall be fully dimensioned showing all fixing details, cable entry positions and other details and dimensions that may be required for designing the building or foundations.<br><br>K) Electrical and instrumentation drawings shall consist of detail circuit and wiring diagrams, overall schematic diagrams, and equipment layout and equipment details.<br><br>L) The drawings should also contain the voltage, power, current, resistance and other component values. | | | | | | | |
| | | **P&G'S - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **P&G'S - Brought Forward** | | | | | | | |
| PG1.9 | | **"UP-TO-DATE AS-BUILT DRAWINGS" for the complete electrical installation as detailed in the specification**<br><br>A suitable CAD package shall be used for the drawings. Exact positions of cables and all electrical services installed shall be clearly shown.<br><br>As-built drawings must be submitted for the complete electrical installation and of all workshop drawings submitted during the contract period, unless written that the Engineer has granted exemption.<br><br>After approval of the draft drawings, the contractor shall issue 3 paper sets A1 size of final approved drawings and shall transfer the same to 3 sets of CDs or DVDs in PDF and DWG format. The manuals shall be neatly prepared, in type written and/or printed format, indexed, with appropriate dividers between each section to facilitate ready reference. All documentation shall be presented in the English language. The drawings will be filed using 70mm Lever Arch Files (x 3) as detailed in the specification.<br><br>***Submission and approval of submitted as-built drawings is a prerequisite for issuing of a Certificate of Practical / Partial Practical Completion of the installation (handover of the installation).***<br><br>**Drawing Requirements and Standards**<br><br>All drawings shall be suitable for microfilming and comply with the following standards:<br><br>1) SANS Code of Practice 0111;<br>2) BS 308; and<br>3) All drawings shall be in English.<br><br>Drawing symbols used shall be clearly defined and consistently used. Symbols shall be standardised and generally used such as BS, DIN or IEC symbols. The Contractor's own concoction of symbols, where standardised symbols exist, will not be accepted | Sum | 1 | | | | | |
| PG1.10 | | **CERTIFICATE OF COMPLIANCE, TEST REPORT FOR ALL ELECTRICAL INSTALLATIONS AND MV INSTALLATION SAFETY REPORTS TO SANS 10142-1-2 (LATEST ADDITION) BY AN ACCREDITED PERSON for the complete electrical Installation as per scope of work**<br><br>**CERTIFICATE OF COMPLIANCE:** On completion of an electrical installation, the contractor shall complete the Certificate of Compliance for each electrical Installation in the form of Annexure 1 as described in the in the latest addition of the Occupational Health and Safety Act, Act no. 85 of 1993, and obtainable from the Electrical Conformance Board of SA. **No installation (electrical / mechanical) can be commissioned without a valid COC.** This form must be handed to the Engineer or its representative. CoC Numbers and dates of issue shall be attached to distribution boards (DB's) by means of "BROTHER TAPE". Each DB will be issued with it's own COC.<br><br>**TEST REPORT FOR ALL ELECTRICAL INSTALLATIONS:** On completion of an electrical installation, the contractor shall complete the Test Report for all Electrical Installations in the form as described in the latest addition of SANS 10142-1 and obtainable from the Electrical Conformance Board of SA. - Main Building per floor - other buildings per building. Test reports should be accompanied by annex pages for circuits, earth continuity, wiring diagrams and photographs. Medical and hazardous user locations require additional test reports.<br><br>**MV SAFETY REPORT:** On completion of an MV electrical installation, the contractor shall complete the MV Safety Report in the form as described in the latest addition of SANS 10142-2 and obtainable from the Electrical Conformance Board of SA.<br><br>After approval of the COC's, the contractor shall issue the original plus 3 paper sets of final approved COC's and shall transfer the same to 3 sets of CDs or DVDs in PDF format. The manuals shall be neatly prepared, in type written and/or printed format, indexed, with appropriate dividers between each section to facilitate ready reference. All documentation shall be presented in the English language. The manuals will be filed using 70mm Lever Arch Files (x 8) as detailed in the specification.<br><br>***Submission and approval of submitted Certificates of Compliance, Test Certificates and MV Safety Reports is a prerequisite for issuing of a Certificate of Practical / Partial Practical Completion of the installation (handover of the installation).*** | Sum | 1 | | | | | |
| | | **P&G'S - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **P&G'S - Brought Forward** | | | | | | | |
| PG1.11 | | **INSTALLATION TESTS for the complete electrical Installation as per scope of work as detailed in the specification** | Sum | 1 | | | | | |
| | | Tests as stipulated in the " Occupational Health and Safety Act no. 85 of 1993, as amended, and in the "Code of Practice for the Wiring of Premises" SANS 10142 (as amended), must be done. These test report forms must be filled in fully and correctly in ink, signed by the installation electrician and handed to the Engineer or its representative.<br><br>Tests must be conducted on site per phase / installation complete, unless written the Engineer to the contrary grants permission. The tests must include a full-load test for an adequate period to ensure the satisfactory working of the installation. If negative test results are obtained, faults must be rectified and tests again done.<br><br>All tests shall be carried out in conjunction with and to the satisfaction of the Supply Authority and in the presence of the Engineer or his representative. The contractor shall make all arrangements for testing and inspection, the costs thereof being included in the Bid Price.<br><br>Each length of cable shall be tested for insulation and polarity by means of a 2000 Volt Megger for LV and 22kV low frequency tester on 11kV cables designed for that purpose. In the case of underground cables this shall be done before back filling. In addition, the earth-loop impedance of each conductor earth electrode shall be measured. The earth resistance shall be tested by means of an approved instrument.<br><br>"Danger" notices shall be displayed at remote ends of cables under test.<br><br>The contractor shall ensure that the installation is completed in every respect and that there are no major defects prior to notifying the Engineer (in writing) for a first delivery inspection. The Engineer will accept zero minor defects during the final inspection. Should the number of defects be exceeded at the final inspection then the Engineer will terminate that inspection and request that the contractor arrange an additional final inspection.<br><br>The Contractor is required to balance the load as equally as possible over the multiphase supply.<br><br>After approval of the reports, the contractor shall issue the original plus 3 paper sets of final approved reports and shall transfer the same to 3 sets of CDs or DVDs in PDF format. The manuals shall be neatly prepared, in type written and/or printed format, indexed, with appropriate dividers between each section to facilitate ready reference. All documentation shall be presented in the English language. The manuals will be filed using 70mm Lever Arch Files (x 3) as detailed in the specification.<br><br>***Submission and approval of submitted Installation Test Certificates is a prerequisite for issuing of a Certificate of Practical / Partial Practical Completion of the installation (handover of the installation).*** | | | | | | | |
| | | **P&G'S - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **P&G'S - Brought Forward** | | | | | | | |
| PG1.12 | | **COMPILATION OF MAINTENANCE, OPERATIONAL AND TECHNICAL MANUALS for the complete electrical installation as detailed in the specification** | Sum | 1 | | | | | |
| | | This manual shall contain the detailed descriptions of all switchgear and control equipment in motor control panels, distribution boards, UPS equipment, emergency power diesel generator sets, battery chargers, power factor correction equipment, etc. i.e. all proprietary assemblies, shall be provided to assist the user personnel of the Employer with advanced knowledge of the equipment for short, medium and long term maintenance- and operations of the plant and the works. Three hard and three soft copies each including filing using white 70mm Lever Arch type files as specified.<br><br>The descriptions must be complete in all respects and the Contractor shall also ensure that these manuals are prepared in such a manner that, in the opinion of the Engineer, a competent and qualified technician can trace any fault, identify any defective component, replace it with the correct spare part/s and follow, without difficulty, the exact function of every component.<br><br>To this end, care must be exercised to correlate the text with the circuit diagrams, to relate the diagrams one with another and to provide a simple method of diagnosis and test to be used wherever breakdowns occur. The manuals shall also include block diagrams giving the layout of equipment as well as a description of the function and operation of every unit in the system.<br><br>After approval of the draft manuals the contractor shall issue 3 paper sets of final approved operating and maintenance manuals and shall transfer the same to 3 sets of CDs or DVDs in PDF and/or DWG format. The manuals shall be neatly prepared, in type written and/or printed format, indexed, with appropriate dividers between each section to facilitate ready reference. All documentation shall be presented in the English language. The manuals will be filed using 70mm Lever Arch Files (x 3) as detailed in the specification.<br><br>One set of manuals for each installation shall be printed in A4 hard copy format, ring bounded with a transparent clear front and back cover and placed inside the logbook holders provided inside each plantroom. COC's, Test reports, Safety reports, etc. shall form part of these manuals<br><br>Operating and Maintenance Manuals shall be submitted to the Engineer for approval and to demonstrate compliance with the Contract Documents.<br><br>***Submission and approval of submitted Maintenance, Operational and technical Manuals is a prerequisite for issuing of a Certificate of Practical / Partial Practical Completion of the installation (handover of the installation).*** | | | | | | | |
| PG1.13 | | **WARRANTEES FOR MATERIAL AND WORKMANSHIP for the complete electrical in stallion as detailed in the specifications** | Sum | 1 | | | | | |
| | | The warranty shall state that workmanship, materials and installation are warranted for a specific period from the date of practical / partial practical completion and that any defects that may arise during the specified period shall be made good at the expense of the entity supplying the materials and / or doing the work, upon written notice to do so.<br><br>Original plus three copies of certificates shall be submitted to the Engineer for approval and to demonstrate compliance with the Contract Documents. The certificates will be filed using 70mm Lever Arch Files (x 3) as detailed in the specification.<br><br>***Submission and approval of Warrantees for Material and Workmanship certificates shall be a prerequisite for issuing of a Certificate of Practical / Partial Practical Completion of the installation (handover of the installation).*** | | | | | | | |
| | | **P&G'S - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **P&G'S - Brought Forward** | | | | | | | |
| PG1.14 | | **STAFF TRAINING for the complete electrical installation as detailed in the specification**<br><br>Training / familiarization regarding operation & maintenance of the equipment / systems at site shall be given by the contractor to the end users staff.<br><br>The Contractor shall be responsible for the training of the Client's site staff after the commissioning has been completed. The site staff shall receive enough instruction to ensure that they are fully conversant with the equipment concerned. The operating manuals shall be used during training. Upon completion of the training exercise the contractor is to obtain the client's representative's written acceptance of this handover tuition, thus acknowledging his complete understanding of the operational procedures for this installation. Site staff shall be instructed on:<br><br>a) The general operating method of the plant;<br>b) Starting and stopping instructions;<br>c) Stopping the plant in an emergency and warning against restarting after an emergency;<br>d) Positions and normal setting of control equipment;<br>e) Safety measures;<br>f) Operational checks on gauges, indicator lights, etc.<br>g) Name, address and telephone number of competent person responsible for the maintenance of the plant.<br><br>Training sessions shall be documented and the original plus three sets of documents shall be submitted with the handover documents for reference.<br><br>2 x Separate training sessions shall be conducted on instruction from the Engineer and documented for each portion of works<br><br>***Staff Training shall be a prerequisite for issuing of a Certificate of Practical / Partial Practical Completion of the installation (handover of the installation).*** | Sum | 1 | | | | | |
| | | **Rustenburg P&G's - Total Carried to Summary Page** | | | | | | | |

**ORBIT TVET COLLEGE - SUPPLY AND INSTALLATION OF A PV PLANT AT MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE**

**ELECTRICAL INSTALLATIONS - SCHEDULE OF REMEASURABLE QUANTITIES**

**SCHEDULE: SOLAR INSTALLATIONS - PRELIMINARY AND GENERAL**

| ITEM NO | | DESCRIPTION | UNIT | QUAN-TITY | SUPPLY | | INSTALL | | TOTAL (R) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | RATE | AMOUNT | RATE | AMOUNT | |
| PG 1 | | **MANKWE CAMPUS**<br>**PRELIMINARY AND GENERAL - SANS 1200 A & B** | | | | | | | |
| PG1.1 | | **FIXED-CHARGE ITEMS** | | | | | | | |
| | 1 | Contractual Requirements | Sum | 1 | | | | | |
| PG1.2 | | **SITE ESTABLISHMENT** | | | | | | | |
| | 1 | Camp and fencing | Sum | 1 | | | | | |
| | 2 | Offices and storage sheds | Sum | 1 | | | | | |
| | 3 | Office Equipment | Sum | 1 | | | | | |
| | 4 | Ablution and latrine facilities | Sum | 1 | | | | | |
| | 5 | Remove site establishment on completion and remove all rubbish, foundations, concrete bases, dirt oil spillage, etc, and leave site in condition as found. | Item | Included | | | | | |
| | 6 | Tools, equipment, plant hire and testing gear/meters as necessary. | Sum | 1 | | | | | |
| | 7 | Water supplies, electric power and communications | Sum | 1 | | | | | |
| | 8 | Contract nameboard (One only) | Sum | 1 | | | | | |
| PG1.3 | | **Other Fixed-Charged Items** | | | | | | | |
| | 1 | Provision for OH&S requirements as specified, such as, but not limited to: Safety officer payment, safety training, HIV awareness, medicals, health and safety plan, administration, etc. | Sum | 1 | | | | | |
| | 2 | Provision for Environmental Management Plan requirements | Sum | 1 | | | | | |
| | 3 | Site Instruction Book: Instructions issued on site are to be recorded in triplicate in a site instruction book which is to be maintained on site by the contractor | Sum | 1 | | | | | |
| | 4 | Cost for compliance with Main Contractor's preliminary and general items | Item | Included | | | | | |
| | 5 | Contractual requirements as specified, i.e guarantees, insurance, sureties, company overheads, financing of retention, etc. | Sum | 1 | | | | | |
| | 6 | Contract Engineer, administration, supervision, running costs, programming and management. | Sum | 1 | | | | | |
| | 7 | Maintain and operate site establishment. | Item | Included | | | | | |
| | 8 | Maintenance and guarantee of the complete installation including fitting, material and workmanship for a period of twelve months from date of practical completion and handover | Sum | 1 | | | | | |
| | 9 | Other items not included in the foregoing and required by the Contractor are to be listed and priced below. | Sum | 1 | included | | | | |
| PG1.4 | | **Provision of Community Liaison Officer** | | | | | | | |
| | 1 | Remuneration of CLO (based on R 6000/month incl. cellphone allowance of R150) month | Prov Sum | 1 | 60,000 | 60,000 | | | 60,000.00 |
| | 2 | Charges for profit on 1 above | % | | | | | | |
| | | **P&G'S - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **P&G'S - Brought Forward** | | | | | | | |
| PG1.5<br><br>PG1.5.1 | | **TIME-RELATED ITEMS**<br><br>**Temporary works and plant** | | | | | | | |
| | 1 | The contractor will, throughout the entire contract period be responsible for the proper and adequate protection of all workers and visitors on the site from injury and damage resulting from the works and for the proper security of the site at all times. Furthermore, the contractor must allow for all necessary temporary hoardings, hoardings with gantries, fans, safety screens, barriers, access gates, covered gangways, walkways, overhead protection against falling objects and materials, security fences, etc. for the enclosure of the works and elements thereof for the protection of the public and others as required by prevailing bylaws, the Construction Regulations 2014 issued in terms of Occupational Health and Safety Act 1993, any other Laws and Regulations and/or demanded by his own site requirements. Allowance must furthermore be made for periodic adjustment of any enclosure or protection and for their eventual removal. | Sum | 1 | | | | | |
| | | | | | | | | | |
| | 2 | All site establishment, offices and storage of materials will be strictly limited to the area demarcated which must be suitably fenced with 1,8m high 'Bonnox' fencing covered with shade cloth to the satisfaction of the Principal Agent. The contractor shall be responsible for keeping such areas in a clean, sanitary and orderly condition. | Item | 1 | | | | | |
| | | | | | | | | | |
| | 3 | The office accommodation for meetings is to be adequately sized and equipped with a sound working table and chairs to accommodate at least eight (8) people for site meetings. The room is to be well vented with air-conditioning and fitted with two large white boards and pin boards with markers and erasers. Two plug points to be provided within the room. The access area around the offices and the toilets shall be surfaced with clean crushed stone, which shall be well drained, kept free from mud and maintained throughout the contract period. The office accommodation shall be located within Contractors Site Area. | Sum | 1 | | | | | |
| | | | | | | | | | |
| | 4 | The contractor shall allow for the proper maintenance and regular cleaning of the meeting room and offices during the contract period to ensure clean usable facilities at all times and shall clear away and make good on completion. | Sum | 1 | | | | | |
| | | | | | | | | | |
| | 5 | The contractor shall re-instate/ rehabilitate the area used for site establishment the Contractors dedicated site/yard area as well as the access road from the entrance to the Contractors dedicated site/ yard area | Sum | 1 | | | | | |
| PG1.6 | | **Operate and maintain facilities on site:** | | | | | | | |
| | 1 | Facilities for Engineer | Sum | 1 | | | | | |
| PG1.7 | | **Facilities for Contractor for duration of construction.** | | | | | | | |
| | 1 | Offices and storage sheds | Sum | 1 | | | | | |
| | | | | | | | | | |
| | 2 | Ablution and latrine facilities | Sum | 1 | | | | | |
| | | | | | | | | | |
| | 3 | Tools and equipment | Sum | 1 | | | | | |
| | | | | | | | | | |
| | 4 | Water supplies, electric power and communications | Sum | 1 | | | | | |
| | | | | | | | | | |
| | | **P&G'S - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **P&G'S - Brought Forward** | | | | | | | |
| PG1.8 | | **INSTALLATION / SHOP DRAWINGS AND SAMPLES - for the complete installation as detailed in the specification** | Sum | 1 | | | | | |
| | | The term 'shop drawings' shall mean drawings, layout drawings, diagrams, illustrations, schedules, performance charts, brochures, operating manuals and other data which are prepared by the Contractor or any Sub-Contractor, manufacturer, supplier or distributor and which illustrate the specified portion of the work. The Contractor shall ensure that all shop drawings required for the Works in terms of this Contract, all Selected/Nominated Sub-Contracts and/or any Electrical Engineers instruction, are prepared and submitted timeously in accordance with the following procedure:<br><br>A) Three prints of shop drawings of all fabricated work, working or setting out drawings, shop details and schedules shall be submitted to the Principal Agent, for approval. Such work shall not be carried out until such approval has been given.<br><br>B) Shop drawings shall be submitted to the Electrical Engineer for approval at least two weeks prior to the date on which such approval is required in order to comply with the Contract Programme.<br><br>C) All submissions shall be prepared in accordance with the Contract drawings and specifications and/or any Electrical EngineerS instructions and any deviation shall be specifically highlighted in writing, with a detailed explanation of the reason for such deviation, together with any cost and/or time implications. Delays in approval of shop drawings due to non-compliance with drawings, specifications and/or Principal Agents instructions shall not constitute grounds for any claims for delay, extension of time and the like.<br><br>D) When the Electrical Engineer advises that shop drawings have been approved, the original transparencies of such drawings shall immediately be submitted to the Electrical Engineer so that the Electrical Engineers signature of approval may be appended thereto. Thereafter, four prints of the approved shop drawings, setting out drawings and schedules shall be furnished to the electrical Engineer and the contractor shall transfer the same to 3 sets of CDs or DVDs in PDF and/or DWG format. The manuals shall be neatly prepared, in type written and/or printed format, indexed, with appropriate dividers between each section to facilitate ready reference. All documentation shall be presented in the English language. The drawings will be filed using 70mm Lever Arch Files (x 3) as detailed in the specification. As many prints of the approved shop drawings and schedules as required shall also be furnished to the Works. No work shall be performed in accordance with drawings and/or catalogues not signed with the Electrical Engineers approval.<br><br>E) The Contractor, Sub-Contractor or Supplier, as the case may be, shall be responsible for ensuring that all dimensions affecting shop drawings conform to the dimensions of built work.<br><br>F) The Electrical Engineers approval of shop drawings or samples is limited to checking conformity with specification and shall not relieve the Contractor, Sub-Contractor or Supplier of his responsibility for design, erection or installation fit, nor does it vary his contractual or delictual obligations and liabilities<br><br>G) Should the Contractor, Sub-Contractor or Supplier be of the opinion that corrections to shop drawings made by the Electrical Engineer constitute a change to the scope of work, then he shall immediately advise the Electrical Engineer in writing of this, together with the cost and/or programme implications thereof.<br><br>H) The Contractor/Manufacturer/Supplier will be required to supply equipment layout and detailed drawings for all mechanical, electrical and instrumentation equipment as well as pictures of serial plates where applicable.<br><br>I) If special foundations/plinths are required for equipment, detail foundation drawings must be provided by the Contractor. Foundation drawings shall show the concrete strength and reinforcing requirements together with any holding down bolt details.<br><br>J) All equipment shall be fully dimensioned showing all fixing details, cable entry positions and other details and dimensions that may be required for designing the building or foundations.<br><br>K) Electrical and instrumentation drawings shall consist of detail circuit and wiring diagrams, overall schematic diagrams, and equipment layout and equipment details.<br><br>L) The drawings should also contain the voltage, power, current, resistance and other component values. | | | | | | | |
| | | **P&G'S - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **P&G'S - Brought Forward** | | | | | | | |
| PG1.9 | | **"UP-TO-DATE AS-BUILT DRAWINGS" for the complete electrical installation as detailed in the specification** | Sum | 1 | | | | | |
| | | A suitable CAD package shall be used for the drawings. Exact positions of cables and all electrical services installed shall be clearly shown.<br><br>As-built drawings must be submitted for the complete electrical installation and of all workshop drawings submitted during the contract period, unless written that the Engineer has granted exemption.<br><br>After approval of the draft drawings, the contractor shall issue 3 paper sets A1 size of final approved drawings and shall transfer the same to 3 sets of CDs or DVDs in PDF and DWG format. The manuals shall be neatly prepared, in type written and/or printed format, indexed, with appropriate dividers between each section to facilitate ready reference. All documentation shall be presented in the English language. The drawings will be filed using 70mm Lever Arch Files (x 3) as detailed in the specification.<br><br>***Submission and approval of submitted as-built drawings is a prerequisite for issuing of a Certificate of Practical / Partial Practical Completion of the installation (handover of the installation).***<br><br>**Drawing Requirements and Standards**<br><br>All drawings shall be suitable for microfilming and comply with the following standards:<br><br>1) SANS Code of Practice 0111;<br>2) BS 308; and<br>3) All drawings shall be in English.<br><br>Drawing symbols used shall be clearly defined and consistently used. Symbols shall be standardised and generally used such as BS, DIN or IEC symbols. The Contractor's own concoction of symbols, where standardised symbols exist, will not be accepted | | | | | | | |
| PG1.10 | | **CERTIFICATE OF COMPLIANCE, TEST REPORT FOR ALL ELECTRICAL INSTALLATIONS AND MV INSTALLATION SAFETY REPORTS TO SANS 10142-1-2 (LATEST ADDITION) BY AN ACCREDITED PERSON for the complete electrical Installation as per scope of work** | Sum | 1 | | | | | |
| | | **CERTIFICATE OF COMPLIANCE:** On completion of an electrical installation, the contractor shall complete the Certificate of Compliance for each electrical Installation in the form of Annexure 1 as described in the in the latest addition of the Occupational Health and Safety Act, Act no. 85 of 1993, and obtainable from the Electrical Conformance Board of SA. **No installation (electrical / mechanical) can be commissioned without a valid COC.** This form must be handed to the Engineer or its representative. CoC Numbers and dates of issue shall be attached to distribution boards (DB's) by means of "BROTHER TAPE". Each DB will be issued with it's own COC.<br><br>**TEST REPORT FOR ALL ELECTRICAL INSTALLATIONS:** On completion of an electrical installation, the contractor shall complete the Test Report for all Electrical Installations in the form as described in the latest addition of SANS 10142-1 and obtainable from the Electrical Conformance Board of SA. - Main Building per floor - other buildings per building. Test reports should be accompanied by annex pages for circuits, earth continuity, wiring diagrams and photographs. Medical and hazardous user locations require additional test reports.<br><br>**MV SAFETY REPORT:** On completion of an MV electrical installation, the contractor shall complete the MV Safety Report in the form as described in the latest addition of SANS 10142-2 and obtainable from the Electrical Conformance Board of SA.<br><br>After approval of the COC's, the contractor shall issue the original plus 3 paper sets of final approved COC's and shall transfer the same to 3 sets of CDs or DVDs in PDF format. The manuals shall be neatly prepared, in type written and/or printed format, indexed, with appropriate dividers between each section to facilitate ready reference. All documentation shall be presented in the English language. The manuals will be filed using 70mm Lever Arch Files (x 8) as detailed in the specification.<br><br>***Submission and approval of submitted Certificates of Compliance, Test Certificates and MV Safety Reports is a prerequisite for issuing of a Certificate of Practical / Partial Practical Completion of the installation (handover of the installation).*** | | | | | | | |
| | | **P&G'S - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **P&G'S - Brought Forward** | | | | | | | |
| PG1.11 | | **INSTALLATION TESTS for the complete electrical Installation as per scope of work as detailed in the specification** | Sum | 1 | | | | | |
| | | Tests as stipulated in the " Occupational Health and Safety Act no. 85 of 1993, as amended, and in the "Code of Practice for the Wiring of Premises" SANS 10142 (as amended), must be done. These test report forms must be filled in fully and correctly in ink, signed by the installation electrician and handed to the Engineer or its representative.<br><br>Tests must be conducted on site per phase / installation complete, unless written the Engineer to the contrary grants permission. The tests must include a full-load test for an adequate period to ensure the satisfactory working of the installation. If negative test results are obtained, faults must be rectified and tests again done.<br><br>All tests shall be carried out in conjunction with and to the satisfaction of the Supply Authority and in the presence of the Engineer or his representative. The contractor shall make all arrangements for testing and inspection, the costs thereof being included in the Bid Price.<br><br>Each length of cable shall be tested for insulation and polarity by means of a 2000 Volt Megger for LV and 22kV low frequency tester on 11kV cables designed for that purpose. In the case of underground cables this shall be done before back filling. In addition, the earth-loop impedance of each conductor earth electrode shall be measured. The earth resistance shall be tested by means of an approved instrument.<br><br>"Danger" notices shall be displayed at remote ends of cables under test.<br><br>The contractor shall ensure that the installation is completed in every respect and that there are no major defects prior to notifying the Engineer (in writing) for a first delivery inspection. The Engineer will accept zero minor defects during the final inspection. Should the number of defects be exceeded at the final inspection then the Engineer will terminate that inspection and request that the contractor arrange an additional final inspection.<br><br>The Contractor is required to balance the load as equally as possible over the multiphase supply.<br><br>After approval of the reports, the contractor shall issue the original plus 3 paper sets of final approved reports and shall transfer the same to 3 sets of CDs or DVDs in PDF format. The manuals shall be neatly prepared, in type written and/or printed format, indexed, with appropriate dividers between each section to facilitate ready reference. All documentation shall be presented in the English language. The manuals will be filed using 70mm Lever Arch Files (x 3) as detailed in the specification.<br><br>***Submission and approval of submitted Installation Test Certificates is a prerequisite for issuing of a Certificate of Practical / Partial Practical Completion of the installation (handover of the installation).*** | | | | | | | |
| | | **P&G'S - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **P&G'S - Brought Forward** | | | | | | | |
| PG1.12 | | **COMPILATION OF MAINTENANCE, OPERATIONAL AND TECHNICAL MANUALS for the complete electrical installation as detailed in the specification** | Sum | 1 | | | | | |
| | | This manual shall contain the detailed descriptions of all switchgear and control equipment in motor control panels, distribution boards, UPS equipment, emergency power diesel generator sets, battery chargers, power factor correction equipment, etc. i.e. all proprietary assemblies, shall be provided to assist the user personnel of the Employer with advanced knowledge of the equipment for short, medium and long term maintenance- and operations of the plant and the works. Three hard and three soft copies each including filing using white 70mm Lever Arch type files as specified.<br><br>The descriptions must be complete in all respects and the Contractor shall also ensure that these manuals are prepared in such a manner that, in the opinion of the Engineer, a competent and qualified technician can trace any fault, identify any defective component, replace it with the correct spare part/s and follow, without difficulty, the exact function of every component.<br><br>To this end, care must be exercised to correlate the text with the circuit diagrams, to relate the diagrams one with another and to provide a simple method of diagnosis and test to be used wherever breakdowns occur. The manuals shall also include block diagrams giving the layout of equipment as well as a description of the function and operation of every unit in the system.<br><br>After approval of the draft manuals the contractor shall issue 3 paper sets of final approved operating and maintenance manuals and shall transfer the same to 3 sets of CDs or DVDs in PDF and/or DWG format. The manuals shall be neatly prepared, in type written and/or printed format, indexed, with appropriate dividers between each section to facilitate ready reference. All documentation shall be presented in the English language. The manuals will be filed using 70mm Lever Arch Files (x 3) as detailed in the specification.<br><br>One set of manuals for each installation shall be printed in A4 hard copy format, ring bounded with a transparent clear front and back cover and placed inside the logbook holders provided inside each plantroom. COC's, Test reports, Safety reports, etc. shall form part of these manuals<br><br>Operating and Maintenance Manuals shall be submitted to the Engineer for approval and to demonstrate compliance with the Contract Documents.<br><br>***Submission and approval of submitted Maintenance, Operational and technical Manuals is a prerequisite for issuing of a Certificate of Practical / Partial Practical Completion of the installation (handover of the installation).*** | | | | | | | |
| PG1.13 | | **WARRANTEES FOR MATERIAL AND WORKMANSHIP for the complete electrical in stallion as detailed in the specifications** | Sum | 1 | | | | | |
| | | The warranty shall state that workmanship, materials and installation are warranted for a specific period from the date of practical / partial practical completion and that any defects that may arise during the specified period shall be made good at the expense of the entity supplying the materials and / or doing the work, upon written notice to do so.<br><br>Original plus three copies of certificates shall be submitted to the Engineer for approval and to demonstrate compliance with the Contract Documents. The certificates will be filed using 70mm Lever Arch Files (x 3) as detailed in the specification.<br><br>***Submission and approval of Warrantees for Material and Workmanship certificates shall be a prerequisite for issuing of a Certificate of Practical / Partial Practical Completion of the installation (handover of the installation).*** | | | | | | | |
| | | **P&G'S - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **P&G'S - Brought Forward** | | | | | | | |
| PG1.14 | | **STAFF TRAINING for the complete electrical installation as detailed in the specification**<br><br>Training / familiarization regarding operation & maintenance of the equipment / systems at site shall be given by the contractor to the end users staff.<br><br>The Contractor shall be responsible for the training of the Client's site staff after the commissioning has been completed. The site staff shall receive enough instruction to ensure that they are fully conversant with the equipment concerned. The operating manuals shall be used during training. Upon completion of the training exercise the contractor is to obtain the client's representative's written acceptance of this handover tuition, thus acknowledging his complete understanding of the operational procedures for this installation. Site staff shall be instructed on:<br><br>a) The general operating method of the plant;<br>b) Starting and stopping instructions;<br>c) Stopping the plant in an emergency and warning against restarting after an emergency;<br>d) Positions and normal setting of control equipment;<br>e) Safety measures;<br>f) Operational checks on gauges, indicator lights, etc.<br>g) Name, address and telephone number of competent person responsible for the maintenance of the plant.<br><br>Training sessions shall be documented and the original plus three sets of documents shall be submitted with the handover documents for reference.<br><br>2 x Separate training sessions shall be conducted on instruction from the Engineer and documented for each portion of works<br><br>***Staff Training shall be a prerequisite for issuing of a Certificate of Practical / Partial Practical Completion of the installation (handover of the installation).*** | Sum | 1 | | | | | |
| | | **Mankwe P&G's - Total Carried to Summary Page** | | | | | | | |

**ORBIT TVET COLLEGE - SUPPLY AND INSTALLATION OF A PV PLANT AT MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE**

**ELECTRICAL INSTALLATIONS - SCHEDULE OF REMEASURABLE QUANTITIES**

**SCHEDULE NO E1: ELECTRICAL INSTALLATIONS - SOLAR INSTALLATION (PV)**

| ITEM NO | | DESCRIPTION | UNIT | QUAN-TITY | SUPPLY | | INSTALL | | TOTAL (R) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | RATE | AMOUNT | RATE | AMOUNT | |
| | | **RUSTENBURG** | | | | | | | |
| E1 | | **ELECTRICAL DISTRIBUTION: SOLAR** | | | | | | | |
| | | PREAMBLES | | | | | | | |
| | | NOTE: Tenderers are advised to study SECTION C: ELECTRICAL INSTALLATION WORKS SPECIFICATION before pricing this portion | | | | | | | |
| | | SUPPLEMENTARY PREAMBLES | | | | | | | |
| | | All interruptions of the electrical supply that may be necessary for the execution of the work will be subject to prior arrangement (signed Access to an Installation Certificate) between the Contractor, the Engineer and the User Client. | | | | | | | |
| | | The selection of plant / material / equipment should be submitted with relevant manufactures data to the Engineer for approval before any installation takes place. The cost of replacing any plant / material / equipment ordered prior to approval obtained shall be borne by the contractor. | | | | | | | |
| | | The removal and replacement of materials and/or workmanship that does not conform to specification or drawings shall not constitute grounds for an extension of the construction period nor for an adjustment to the contract sum | | | | | | | |
| | | Any reference to trade names in the Bills of Quantities shall deem to mean "or similar and equal to" - pre-approved by the Engineer. | | | | | | | |
| | | Before pricing this section, the Contractor shall thoroughly acquaint himself with the work involved and shall verify on site all measurements necessary for proper installation work. | | | | | | | |
| | | The Price Schedules shall not be used for ordering purposes. The Contractor shall check the lengths of cables on site before ordering any of the cables. | | | | | | | |
| | | Prices shall be deemed to include: | | | | | | | |
| | | Installation / shop drawings<br>Factory Acceptance Testing<br>Packaging and transport of all equipment to site, offloading and rigging at site, spreader beams, lifting slings, etc.<br>Temporary site works, dismantling, demolition, damage prevention measures, repairs and making good<br>Tooling of all description<br>Integral earthing mechanism, CT's, overload protection, infrared testing prior to commissioning, commissioning of goods, test reports (COC's, Test Reports, MV Installation Safety Reports), preparation of detailed O&M manuals, handing over of documents, etc.<br>Warning notices and signage (no stick-on notices/signage will be allowed) as per SANS and OHS specifications<br>Everything necessary for the execution and complete installation of the work in accordance with the description.<br>All associated costs involved in bringing the minisubs, etc. to full operational status | | | | | | | |
| E1.1 | | **Decommissioning testing and commissioning of the complete PV installation as specified** | | | | | | | |
| | | SUPPLEMENTARY PREAMBLES | | | | | | | |
| | | Prices shall be deemed to include: | | | | | | | |
| | | The number of electrical installations (from local point of supply) that are energised with electrical circuit installations fully completed and tested and all necessary test results and test certificates submitted. | | | | | | | |
| | | In addition, all testing is to be included in the rate, which will include cable pressure and insulation testing, voltage drop, full load, fault level, loop impedance and earth testing. | | | | | | | |
| | 1 | Decommissioning, testing and commissioning | Lot | 1 | | | | | |
| | | | | | | | | | |
| | | **E1 - Electrical Distribution - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **E1 - Electrical Distribution - Brought Forward** | | | | | | | |
| E1.2 | | **LV DISTRIBUTION BOARDS & POWER DISTRIBUTION CUBICLES (KIOSKS) - as detailed in the specification / Single Line Diagrams (SLD's)**<br><br>SUPPLEMENTARY PREAMBLES<br><br>Descriptions<br><br>The contractor is to verify the sizes of Distribution Boards on site prior of placing an order<br><br>Prices shall be deemed to include:<br><br>Descriptions of LV distribution panels shall be deemed to include busbars, jumpers, neutral bars, internal wiring and connections, space for future equipment, blanking and the like, circuit identification markers, control gear, labels, circuit legend cards, working drawings, signs and notices as per OHS Act, etc.<br><br>All associated costs involved in bringing each panel to full operational status<br><br>For the dismantling, removal from site and safe disposal of any type of distribution board no longer required | | | | | | | |
| E1.2.1 | | **LOW VOLTAGE DISTRIBUTION BOARDS - as detailed in the specifications** | | | | | | | |
| | 1 | DB - Type A (Plugs) | No | 10 | | | | | |
| | | | | | | | | | |
| | 2 | DB - Type B (Lights) | No | 6 | | | | | |
| | | | | | | | | | |
| | 3 | DB - Type C (Lights & Plugs) | No | 8 | | | | | |
| | | | | | | | | | |
| | 4 | PV1 - PV Plant Main DB (Labs) | No | 1 | | | | | |
| | | | | | | | | | |
| | 5 | PV2 - PV Plant Main DB (Central Office) | No | 1 | | | | | |
| | | | | | | | | | |
| | 6 | PV3 - PV Plant Main DB (Halls) | No | 1 | | | | | |
| E1.3 | | **INFRARED (SCANNING) THERMOGRAPHY SURVEYS of the complete electrical installation as per scope of work** | | | | | | | |
| E1.3.1 | | **Carry out surveys on each piece of LV equipment for initial inspection and submit a comprehensive report to the Engineer - DB's and Kiosks** | | | | | | | |
| | 1 | DB's - Labs | No | 12 | | | | | |
| | | | | | | | | | |
| | 2 | DB's - Central Office | No | 4 | | | | | |
| | | | | | | | | | |
| | 3 | DB's - Halls | No | 5 | | | | | |
| E1.3.2 | | **Carry out surveys on each piece of LV equipment for final inspection and submit a comprehensive report to the Engineer - DB's and Kiosks** | | | | | | | |
| | 1 | DB's - Labs | No | 12 | | | | | |
| | | | | | | | | | |
| | 2 | DB's - Central Office | No | 4 | | | | | |
| | | | | | | | | | |
| | 3 | DB's - Halls | No | 5 | | | | | |
| | | | | | | | | | |
| | | **E1 - Electrical Distribution - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **E1 - Electrical Distribution - Brought Forward** | | | | | | | |
| E1.4 | | **LABELLING OF ALL TYPES OF EXISTING DISTRIBUTION BOARDS - as detailed in the specification**<br><br>SUPPLEMENTARY PREAMBLES<br><br>Provision of labels<br><br>Labels shall be provided as specified identifying each switchboard and each outgoing circuit, including all equipment on inside and outside of the switchboards indicating functions and ratings<br><br>All equipment on switchboards shall be identified with the necessary labels. The circuit numbers shall correspond to the circuit numbers on the final installation drawings. The above-mentioned circuits shall be identified on a legend card (A4) as detailed in the specification, laminated and covered by removable 2.0mm thick transparent acrylic plastic ('PERSPEX') or equivalent and shall be installed on the inside of the door/s of the boards or cubicles or in any other position, pre-approved by the Engineer where it can conveniently be observed.<br><br>Prices are deemed to include:<br><br>For labels and the fixing thereof<br><br>For the dismantling, removal from site and safe disposal of any type of label/s no longer required | | | | | | | |
| E1.4.1 | | **Labelling** | | | | | | | |
| | 1 | LV Panels | No | 27 | | | | | |
| E1.5 | | **SERVICE OF EXISTING PLANT AND EQUIPMENT of the complete electrical installation as per scope of work.**<br><br>SUPPLEMENTARY PREAMBLES<br><br>Prices shall be deemed to include:<br><br>The servicing of plant and equipment includes, cleaning of switchgear and panels, replacing blank covers, replacing missing panel bolts and nuts, locking mechanisms, replacing of panel covers, repairing / replacing of faulty terminations, signs and notices as per the OHS Act, etc. | | | | | | | |
| | 1 | DB's - Labs | No | 12 | | | | | |
| | | | | | | | | | |
| | 2 | DB's - Central Office | No | 3 | | | | | |
| | | | | | | | | | |
| | 3 | DB's - Halls | No | 5 | | | | | |
| E1.6 | | **Distribution**<br><br>SUPPLEMENTARY PREAMBLES<br><br>Prices shall be deemed to include:<br><br>Each piece of equipment supplied, installed, tested & commissioned c/w labels as detailed in the specification | | | | | | | |
| E1.6.1 | | **Miniature Circuit Breakers (MCB's) - SANS 556-1 - IEC 60947-2 - c/w standard accessories, bridge bars (Copper Nickel Plated), din rails, etc.** | | | | | | | |
| | 1 | 10A - 6kA - 240 Vac curve 1 (slow) single pole to protect lighting circuits | No | 5 | | | | | |
| | | | | | | | | | |
| | 3 | 20A - 6kA - 240 Vac curve 1 (slow) single pole to protect electrical circuits | No | 5 | | | | | |
| | | | | | | | | | |
| | | **E1 - Electrical Distribution - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **E1 - Electrical Distribution - Brought Forward** | | | | | | | |
| E1.7 | | **ELECTRICAL LV SUPPLY CABLES - SANS 150 & 1507**<br><br>SUPPLEMENTARY PREAMBLES<br><br>All MV, HT & LV underground / surface cables shall be stranded copper-core, 600/1000 Volt grade, multi-cored, PVC insulated, PVC covered, wire armoured and PVC encased (PVC/SWA/PVC) unless otherwise specified<br><br>No joints are allowed in distribution cables, accept where it is specifically authorised. The low voltage cable in a continuous cable run must be of one size, except where a change in cable size is necessary, in which case the change must be approved by the Engineer.<br><br>Mounting positions shall be verified on site and/or as per layout as shown in the documents<br><br>Prices shall be deemed to include<br><br>Conductors supplied & installed in any of the following positions<br><br>a) Laid in trenches, trench boxes<br>b) Drawn into ducts / shafts, sleeves, conduits, etc.<br><br>c) Surface mount horizontal / vertical on cable ladders / trays, etc<br><br>The conductor length, any type & size in meters supplied & installed c/w suitable clamps (cleats / Q clamps) consisting of adjustable metal wings spaced at intervals as detailed in the specification, draw wires / ropes, holes and finishes through structures, labelling as detailed in the specification, etc.<br><br>Termination of cable ends (of armoured copper cable) onto switchgear or distribution boards. The rate shall include all labour and material for making off of cable ends, c/w non-corrodible metal compression glands. Glands shall be complete with earthing ferrules, locknuts, bushes and shrouds.<br><br>BCEW and PVC Terminations shall include all the lugs and insulating material needed to complete the termination, including exothermic welding, glands/clamps for securing the cable.<br><br>Cable marking and colour coding as detailed in the specification<br><br>All associated costs involved in bringing each conductor length installed to full operational status<br><br>All associated costs for the dismantling, removal from site and safe disposal of any type / size conductor & associated materials no longer required | | | | | | | |
| E1.7.1 | | **PVC insulated PVC bedded SWA PVC CU sheathed cables. SANS 1507-3.** | | | | | | | |
| E1.7.1.1 | | **10mm² 4-core PVC/SWA/PVC Cu** | | | | | | | |
| | 1 | 10mm² 4-core PVC/SWA/PVC Cu | m | 100 | | | | | |
| | | | | | | | | | |
| | 2 | 10mm² 4-core PVC/SWA/PVC Cu terminations | No | 60 | | | | | |
| | | | | | | | | | |
| | 3 | 6mm² BCEW | m | 100 | | | | | |
| | | | | | | | | | |
| | 4 | 6mm² BCEW terminations | No | 60 | | | | | |
| | | | | | | | | | |
| | | **E1 - Electrical Distribution - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **E1 - Electrical Distribution - Brought Forward** | | | | | | | |
| E1.8<br><br>E1.8.1 | | **High conductivity annealed stranded copper conductors to SANS 1411 Part 1. Insulated with PVC and skin coloured in plain colours to SANS 1411 Part 2. Cable is manufactured to SANS 1507 Part 2. 600 / 1000V**<br><br>**Single Core Low Friction General Purpose Cable**<br><br>The loop-in system shall be followed throughout, and no joints of any description will be permitted.<br><br>SUPPLEMENTARY PREAMBLES<br><br>Prices shall be deemed to include:<br><br>The conductor length, any type / size in meters drawn into conduit, trunking, power skirting, surface mounted, under plaster, in hollow walls, in open roof spaces, etc. c/w terminations, draw wires, etc.<br><br>BCEW and PVC Terminations shall include all the lugs and insulating material needed to complete the termination, including exothermic welding, glands/clamps for securing the cable.<br><br>The dismantling, removal from site and safe disposal of any type / size conductor & associated materials no longer required | | | | | | | |
| | 1 | 2.5mm² PVC | m | 25 | | | | | |
| | | | | | | | | | |
| | 2 | 2.5 mm² Stranded BCEW | m | 25 | | | | | |
| | | | | | | | | | |
| | 3 | 4mm² PVC | m | 25 | | | | | |
| | | | | | | | | | |
| | 4 | 2.5 mm² Stranded BCEW | m | 25 | | | | | |
| | | | | | | | | | |
| | 5 | 6mm² PVC | m | 25 | | | | | |
| | | | | | | | | | |
| | 6 | 4mm² Stranded BCEW | m | 25 | | | | | |
| | | | | | | | | | |
| | | **E1 - Electrical Distribution - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **E1 - Electrical Distribution - Brought Forward** | | | | | | | |
| E1.9 | | **INSTALLATION AND TERMINATION OF CONDUITS AND CONDUIT ACCESSORIES - as detailed in the specifications**<br><br>SUPPLEMENTARY PREAMBLES<br><br>Mounting positions shall be verified on site and / or as per layout as shown in the documents<br><br>**CONDUIT IN ROOF SPACES**<br><br>Where non-metallic conduit has been specified for a particular service, the conduit shall be supported and fixed with saddles with a maximum spacing of 450 mm. The Contractor shall supply and install all additional supporting timbers in the roof space as required.<br><br>Conduits<br><br>Conduits shall be of the "Looping System"<br><br>Prices shall be deemed to include:<br><br>The unit of measure shall be the length of conduit supplied and installed; inclusive in the rate is draw wire in the conduit, testing of the conduit for blockages and all necessary accessories, slow 90° bends, couplings, adaptors, connectors, lock nuts, joints, elbow-joints, heavy duty conduit hospital saddles, anchor bolts, threading, conduit terminations, round boxes, PVC bonding fluid, holes and finishes through structures, etc.<br><br>Fixing shall be in any of the following positions:<br><br>a) In open roof spaces<br>b) Surface mounted against walls, concrete slabs etc<br>c) in wall chases<br>d) cast in concrete<br>e) In power skirting<br><br>The dismantling, removal from site and safe disposal of any type of conduit & associated materials no longer required | | | | | | | |
| E1.9.1 | | **Galvanised Steel Conduit - SANS ISO 1461:1999** | | | | | | | |
| | 1 | 20mm | m | 100 | | | | | |
| | | | | | | | | | |
| | 2 | 20mm - Type KEU (KOPEX) flexible metallic | m | 6 | | | | | |
| | | | | | | | | | |
| | 3 | 60mm Ø round box Galv 20mm entries (1/2/3/4 way) | No | 8 | | | | | |
| | | | | | | | | | |
| | 4 | 25mm | m | 40 | | | | | |
| | | | | | | | | | |
| | 5 | 25mm - Type KEU (KOPEX) flexible metallic | m | 5 | | | | | |
| | | | | | | | | | |
| | 6 | 60mm Ø round box Galv 25mm entries (1/2/3/4 way) | No | 6 | | | | | |
| E1.9.2 | | **PVC Conduit - SANS 61386-2** | | | | | | | |
| | 1 | 20mm | m | 60 | | | | | |
| | 2 | 20mm - flexible | m | 10 | | | | | |
| | 3 | 60mm Ø round box PVC 20mm entries (1/2/3/4 way) | No | 12 | | | | | |
| | 4 | Socket class conduit box - round - 50mm - white | No | 2 | | | | | |
| | 5 | 25mm | m | 30 | | | | | |
| | 6 | 25mm - flexible | m | 6 | | | | | |
| | 7 | 60mm Ø round box PVC 25mm entries (1/2/3/4 way) | No | 8 | | | | | |
| | 8 | Socket class conduit box - round - 50mm - white | No | 4 | | | | | |
| E1.9.3 | | **Utility Junction Box** | | | | | | | |
| | 1 | Suitable for 4 Way connections - 80mm | No | 2 | | | | | |
| E1.9.4 | | **TECHNOPOLYMER Surface-mounting watertight Junction Boxes complete with smooth walls, plain screwed lids etc. IP 55** | | | | | | | |
| | 1 | 100 x 100 x 50mm | No | 1 | | | | | |
| | | | | | | | | | |
| | 2 | 150 x 110 x 70mm | No | 1 | | | | | |
| | | | | | | | | | |
| | 3 | 120 x 80 x 50 mm | No | 1 | | | | | |
| | | | | | | | | | |
| | | **E1 - Electrical Distribution - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **E1 - Electrical Distribution - Brought Forward** | | | | | | | |
| E1.10 | | **GALVANISED CHANNELS AND CABLE LADDERS / TRAYS**<br><br>SUPPLEMENTARY PREAMBLES<br><br>Mounting positions shall be verified on and / or as per layout shown in the documents<br><br>Prices shall be deemed to include:<br><br>All additional supporting timbers in the roof spaces as required.<br><br>The unit of measure shall be the length of cable trays supplied and installed. Fixing shall be in any of the following positions:<br><br>a) in open roof spaces suspended from soffits/trusses<br>b) surface mounted against brick/concrete walls/soffits<br><br>Standard accessories, fixing, M10 threaded rods and drop in anchors, splice sets, fasteners, couplers, hangers, holes and finishes through structures, shield anchors, Q clamps, P1000 Unistrut cable tray supports (supports spaced at 1000mm apart), strut nuts, coated with cold galvanising at all joints, sections that have been cut and at places where the galvanising has been damaged etc.<br><br>For the dismantling, removal from site and safe disposal of any type of cable tray, ladder, duct & associated material no longer required | | | | | | | |
| E1.10.1 | | **MCT Medium Duty Perforated Cable Trays & Accessories Material: Mild Steel to BS 1449-1:1991: Hot Dipped Galvanised to SANS 121:2011/ISO 1461:2009 - Trapeze installation - as detailed in the specification** | | | | | | | |
| | 1 | MCT 229mm Cable Tray Straight | m | 60 | | | | | |
| | | | | | | | | | |
| | 1 | MCT 229mm 90° Horizontal Bend - (R450) | No | 4 | | | | | |
| | | | | | | | | | |
| | 2 | MCT 229mm 90° Internal Bend (R450) | No | 4 | | | | | |
| | | | | | | | | | |
| | 3 | MCT 229mm 90° External Bend (R450) | No | 2 | | | | | |
| | | | | | | | | | |
| | 4 | MCT 229mm Equal Tee (R450) | No | 1 | | | | | |
| | | | | | | | | | |
| | 5 | MCT 229 Equal 4Way (R450) | No | 1 | | | | | |
| | | | | | | | | | |
| | 6 | P2335 (P1000) Channel hanger complete | No | 0 | | | | | |
| E1.10.2 | | **Wiring Duct and Accessories - Galv Steel - SANS 3537:1996 Grade Z275 - as detailed in the specification** | | | | | | | |
| | 1 | P8000 (76 x 76 x 0.8mm x 3m) straight duct c/w covers | m | 30 | | | | | |
| | | | | | | | | | |
| | 2 | P8000 Std splice | No | 0 | | | | | |
| | | | | | | | | | |
| | 3 | 4.0mm x 10mm Alum/Steel Blind Rivets | Lot | 1 | | | | | |
| | | | | | | | | | |
| | 4 | P8000 End cap | No | 4 | | | | | |
| | | | | | | | | | |
| | 5 | P8000 STD 90° Horizontal, Internal, External Elbow | No | 4 | | | | | |
| | | | | | | | | | |
| | 6 | P8000 STD Tee piece | No | 1 | | | | | |
| | | | | | | | | | |
| | 7 | P8000 STD 4Way piece | No | 1 | | | | | |
| | | | | | | | | | |
| | 9 | P8335 (P8000) Channel Hanger c/w Bolts & Nuts | No | 30 | | | | | |
| E1.11 | | **Core Drilling**<br><br>SUPPLEMENTARY PREAMBLES<br><br>Drilling positions shall be verified on site and/or as per lay out shown in the documents<br><br>Prices for core drilling is average for installation in any of the following positions including water supply, finishes through structures, etc.<br><br>a) through brick walls - 110 to 230mm thickness<br>b) through re-enforced concrete - 110 to 330mm thickness | | | | | | | |
| | 1 | 75mm Ø holes | No | 4 | | | | | |
| | | | | | | | | | |
| | 2 | 100mm ø holes | No | 4 | | | | | |
| | | | | | | | | | |
| | 3 | 150mm ø holes | No | 1 | | | | | |
| | | | | | | | | | |
| | | **E1 - Electrical Distribution - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **E1 - Electrical Distribution - Brought Forward** | | | | | | | |
| E1.12<br><br>E1.12.1 | | **PADLOCKS - as detailed in the specifications - Yale / Union - or similar and equal to - pre-approved by the Engineer**<br><br>**Padlocks - Tested to SANS 12320:2012**<br><br>SUPPLEMENTARY PREAMBLES<br><br>Prices shall be deemed to include:<br><br>The dismantling, removal from site and safe disposal of any type of lock no longer required | | | | | | | |
| | 1 | Type A (a) Padlocks | No | 6 | | | | | |
| E1.13<br><br>E1.13.1 | | **LUMINAIRES FOR INTERIOR & EXTERIOR APPLICATIONS AS SPECIFIED**<br><br>SUPPLEMENTARY PREAMBLES<br><br>Descriptions<br><br>Luminaires shall conform to SANS 10098-1-2 or IEC equivalent and shall bear the SANS 60598-2-3 and SANS 60598-2-5 safety mark and be approved by the Employers Electrical Engineer<br><br>The luminaire shall be manufactured by an ISO 9002 accredited company.<br><br>The luminaire company shall be a SANS Marked Bearing Company.<br><br>The IP rating is certified by a SABS test report<br><br>Mounting positions shall be verified on site and/or as per layout as shown in the documents.<br><br>Luminaires and luminaire accessories to be installed in any of the following positions including all fixing materials, hangers, supports, bolts and nuts, terminations, accessories etc.<br><br>a) fixed to draw boxes<br>b) hangers and supports<br>c) suspended<br>d) surface / recess mount etc.<br>e) Cut outs and aluminium frames etc.<br>f) surface mounted against walls<br>g) pole top mounted<br><br>Prices shall be deemed to include for:<br><br>Each luminaire supplied, installed, commissioned and aimed by the Contractor.<br><br>All associated costs involved in bringing each luminaire to full operational status<br><br>Labelling of circuits feeding each luminair as well photo cells, updated legend cards and re-issue of COC's.<br><br>**Luminaires as specified - Beka or similar and equal to - pre-approved by the Engineer** | | | | | | | |
| | 1 | TYPE A - FLOOD LIGHT – 59W – Pole mounted bracket | No | 3 | | | | | |
| | | | | | | | | | |
| | 2 | Type B: Straight GRP pole as specified including excavations, backfilling and compacting | No | 3 | | | | | |
| | | | | | | | | | |
| | 3 | Type C: Photocell 230V AC to control the contactor as specified. To be housed within an empty bulkhead fitting as specified. Royce Thompson photocell - similar or equal and approved | No | 3 | | | | | |
| E1.14 | | **Ancillary items - on instruction from the Engineer** | | | | | | | |
| | 1 | Repairs to existing external lights (Provisional amount) | Item | 1 | | | | | |
| | | | | | | | | | |
| | 2 | Handling fee + Profit and Attendance (Item E1.23.1) | % | | | | | | |
| | | | | | | | | | |
| | | **E1 - Electrical Distribution - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **E1 - Electrical Distribution - Brought Forward** | | | | | | | |
| E1.15 | | **TRENCHING AND EARTHWORKS**<br><br>**Excavation of all material for trenches, backfill, compaction and removal of excess material.**<br><br>SUPPLEMENTARY PREAMBLES<br><br>Existing services:<br><br>There are a number of existing services within the site boundaries, none of these are shown on the drawings. The contractor is not relieved of the responsibility of locating all existing services prior to construction. There are existing water, storm water, telephone, communications and electrical services on the site. Work is to be carried out without any disruption to existing services, this includes instances where newly constructed services are to be connected to existing 'live' services.<br><br>Nature of ground<br><br>The nature of the ground is assumed to be gravel, therefor "earth", but possibly interspersed with "soft rock" or "hard rock"<br><br>Excavations<br><br>No claim for "soft" or "hard rock" excavations will be entertained unless the contractor has timeously notified the Engineer thereof prior to backfilling<br><br>General<br><br>The contractor will be held responsible for damage to any existing services brought to his attention by the relevant authorities and shall be responsible for the cost of repairs.<br><br>The Contractor must take all necessary precautions to prevent the trenching work being in any way a hazard to the personnel and students and to safeguard all structures, roads, sewage works or other property on the site from any risk of subsidence and damage.<br><br>The contractor shall not commence with backfilling of trenches without prior notification of the Electrical Engineer so that the cable installation may be inspected. Should the contractor fail to give a timeous notification, the trenches shall be re-opened at the Contractor's cost.<br><br>Foundations and excavations should be kept water free and the contractor must supply all pumps etc. that may be necessary for clearing out water.<br><br>On completion, the surface shall be made good to match the surrounding area. In cases of roadways or paved areas the excavations shall be consolidated to the original density of the surrounding material and the surface finish reinstated<br><br>No cable is to be laid before the cable trench is approved and the soil qualification of the excavation is agreed upon by the Contractor and Engineer.<br><br>Prices are deemed to include:<br><br>The volumes of the cable sleeves, cable ways and cable trench excavations calculated according to the length and depth as shown on the drawings or to the bottom of the specified bedding, whichever is the largest and to the minimum base width specified<br><br>The basic principles of measurement and payment for cable trench excavations is that the rate bidded for excavations covers the cost of surveying and setting out of the works, marking of cable routes using white lime , excavations, the re-use of excavated material for back filling, sifting of local soil for bedding of the cables (a 6mm grid shall be used during the sifting process), compaction and the removal of all surplus material along the trench routes and dumped off site. All excavations performed by the Contractor must be barricaded at all times in accordance with Part 11 of the Construction Regulations. All open cable trenches will be marked & protected as prescribed in the OSH Act. No trees will be removed. Plants and rubbish which are found on the cable route shall be removed by the Contractor and shall be dumped at an approved dumping site. | | | | | | | |
| | | **E1 - Electrical Distribution - Carried Forward** | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **E1 - Electrical Distribution - Brought Forward** | | | | | | | |
| E1.15.1 | | **Hand pickable soil (soft soil)** | | | | | | | |
| | 1 | LV trenching to be 750mm deep. The maximum width of a trench shall be fixed at 450mm. | $m^3$ | 30 | | | | | |
| E1.15.2 | | **Machine excavation (soft rock)** | | | | | | | |
| | 1 | MV trenching to be 1200 mm deep. The maximum width of a trench shall be fixed at 450mm. | $m^3$ | 6 | | | | | |
| E1.15.3 | | **Hard rock (blasting)** | | | | | | | |
| | 1 | LV trenching to be 1200 mm deep. The maximum width of a trench shall be fixed at 450mm. | $m^3$ | 2 | | | | | |
| E1.15.4 | | **Back filling and compacting** | | | | | | | |
| | 1 | Backfilling every 150mm compacted to 90% AASHTO. | $m^3$ | 39 | | | | | |
| E1.15.5 | | **Import soil for bedding of cables** | | | | | | | |
| | 1 | Bedding 150mm above and below the cable as well as cover the width of the trench (maximum of 450mm). | $m^3$ | 5 | | | | | |
| | | | | | | | | | |
| | | **E1 - Electrical Distribution - Carried to Summary Page** | | | | | | | |

**ORBIT TVET COLLEGE - SUPPLY AND INSTALLATION OF A PV PLANT AT MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE**

| ITEM NO | DESCRIPTION | UNIT | QTY | SUPPLY | | INSTALL | | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | | | | RATE | AMOUNT (A) | RATE | AMOUNT (B) | (A+B) |
| | **MANKWE CAMPUS** | | | | | | | |
| **S1.** | **PV MAJOR EQUIPMENT AND SYSTEMS** | | | | | | | |
| 1.1 | **PV MODULES: CANDADIAN SOLAR 605W** | | | | | | | |
| 1.1.1 | Supply and install complete PV module: Canadaian Solar super high power mono PERC, 605W | No. | 100 | | | | | |
| 1.1.2 | PV String Optimizer | No. | 3 | | | | | |
| 1.2 | **INVERTERS - DEYE 16kW** | | | | | | | |
| 1.2.1 | Supply, delivery, storing on site, installation, testing and commissioning, handing-over and free maintenance during the defects liability period. | No. | 4 | | | | | |
| 1.2.2 | Supply and install Inverter connection box, mild steel, busbars and all accessories included as per the drawing and specifications. | Lot | | | | | | |
| 1.3 | **COMBINER BOXES - 3I-30** | | | | | | | |
| 1.3.1 | Supply and install combiner boxes, size 6 | No. | 24 | | | | | |
| 1.4 | **AC DISTRIBUTION BOARDS AND JUNCTION BOXES** | | | | | | | |
| 1.4.1 | Supply and install AC distribution boards and junction boxes compete with switchgear, metering and accessories | No. | 2 | | | | | |
| 1.5 | **CABLE INSTALLATION AND TERMINATION** | | | | | | | |
| 1.5.1 | Supply and install CableS and termination accessories including rack, conduits and electrical fittings. | Lot | | | | | | |
| 1.6 | **AC, DC AND PV CABLING** | | | | | | | |
| 1.6.1 | Supply and install AC Cables, 10sqm and size 30 | No. | 120 | | | | | |
| 1.6.2 | Supply and install DCBT Cable, INV-BAT and size 2 x 10m | No. | 30 | | | | | |
| 1.6.3 | Supply and install PV Cable Strings | No. | 1,192 | | | | | |
| 1.7 | **CONTROL AND MONITORING SYSTEM INCLUDING APP** | | | | | | | |
| 1.7.1 | Supply and install a control and monitoring system including App | No. | 1 | | | | | |
| 1.8 | **SYSTEM EARTHING** | | | | | | | |
| 1.8.1 | Supply and install system earthing | Lot | | | | | | |
| 1.9 | **LIGHTNING PROTECTION SYSTEM** | | | | | | | |
| 1.9.1 | Lightning protection system to be installed in converter connection box above | Lot | | | | | | |
| | **S1: Solar - Carried Forward** | | | | | | | |

**ORBIT TVET COLLEGE - SUPPLY AND INSTALLATION OF A PV PLANT AT MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE**

| ITEM NO | DESCRIPTION | UNIT | QTY | SUPPLY | | INSTALL | | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | | | | RATE | AMOUNT (A) | RATE | AMOUNT (B) | (A+B) |
| | **S1: Solar - Brought Forward** | | | | | | | |
| 1.10 | **PV MODULE MOUNTING STRUCTURES - ROOF MOUNTED** | | | | | | | |
| 1.10.1 | Supply and install IBR PV module mounting structures, Size 5 | No. | 24 | | | | | |
| 1.10.2 | Special Tilt Bracket | No. | - | | | | | |
| 1.11 | **PV MODULE MOUNTING STRUCTURES - BATTERIES COMPLETE WITH STRUCTURE** | | | | | | | |
| 1.11.1 | Supply and install Lithium Ion, 48V Battery, 8.7kWh complete with mounting structures | No. | 6 | | | | | |
| 1.11.2 | Battery monitoring system | No. | 6 | | | | | |
| 1.12 | **REMOTE MONITORING SYSTEM - GROUND MOUNTED** | | | | | | | |
| 1.12.1 | Supply and install Remote Monitoring System complete with accessories and licences. | Lot | | | | | | |
| 1.13 | **12 MONTH MAINTENANCE PLAN** | | | | | | | |
| 1.13.1 | Provide a 12 month maintenance plan | Lot | | | | | | |
| 1.14 | **ROOF STRICTURAL INTEGRITY ANALYSIS AND REPORT** | | | | | | | |
| 1.14.1 | 10 X Roofs to be analysed by Structural Engineer with focus on integrity of the IBR and its suporting structures. E.g roof trusses | Lot | | | | | | |
| 1.15 | **MAKE GOOD ON ROOF** | | | | | | | |
| 1.15.1 | Make good , treat and seal all roof openings created by the installation. Roof seals and treatment must be guaranteed for 10 years. | Lot | | | | | | |
| 1.16 | **TEACHING AND LEARNING COMPLETE SOLAR KIT** | | | | | | | |
| 2.16.1 | Supply and install a complete hybrid 5kW domestic PV Plant (single phase) complete with meter, battery, monitoring unit and app for training as per the specification. The inverter will be Sunsynk. The PV Panels shall be small enough to be installed on a mobile frame (2kW) and the battery shall be as per specification (2kW). | Lot | | | | | | |
| 2.16.2 | Supply Steel cabinets as per specification | Lot | | | | | | |
| 2.16.3 | Provide steel frame on wheels to support 2kVA solar panels. | No. | 1 | | | | | |
| | **S1: Solar - Carried To Summary Page** | | | | | | | |

**ORBIT TVET COLLEGE - SUPPLY AND INSTALLATION OF A PV PLANT AT MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE**

| ITEM NO | DESCRIPTION | UNIT | QTY | SUPPLY | | INSTALL | | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | | | | RATE | AMOUNT (A) | RATE | AMOUNT (B) | (A+B) |
| | **RUSTENBURG CAMPUS** | | | | | | | |
| **S2.** | **PV MAJOR EQUIPMENT AND SYSTEMS** | | | | | | | |
| 2.1 | **PV MODULES: CANDADIAN SOLAR 605W** | | | | | | | |
| 2.1.1 | Supply and install complete PV module: Canadaian Solar super high power mono PERC, 605W | No. | 75 | | | | | |
| 2.1.2 | PV String Optimizer | No. | 3 | | | | | |
| 2.2 | **INVERTERS - DEYE 16kW** | | | | | | | |
| 2.2.1 | Supply, delivery, storing on site, installation, testing and commissioning, handing-over and free maintenance during the defects liability period. | No. | 3 | | | | | |
| 2.2.2 | Supply and install Inverter connection box, mild steel, busbars and all accessories included as per the drawing and specifications. | Lot | | | | | | |
| 2.3 | **COMBINER BOXES - 3I-30** | | | | | | | |
| 2.3.1 | Supply and install combiner boxes, size 6 | No. | 18 | | | | | |
| 2.4 | **AC DISTRIBUTION BOARDS AND JUNCTION BOXES** | | | | | | | |
| 1.4.1 | Supply and install AC distribution boards and junction boxes compete with switchgear, metering and accessories | No. | 2 | | | | | |
| 2.5 | **CABLE INSTALLATION AND TERMINATION** | | | | | | | |
| 2.5.1 | Supply and install CableS and termination accessories including rack, conduits and electrical fittings. | Lot | | | | | | |
| 2.6 | **AC, DC AND PV CABLING** | | | | | | | |
| 2.6.1 | Supply and install AC Cables, 10sqm and size 30 | No. | 90 | | | | | |
| 2.6.2 | Supply and install DCBT Cable, INV-BAT and size 2 x 10m | No. | 23 | | | | | |
| 2.6.3 | Supply and install PV Cable Strings | No. | 894 | | | | | |
| 2.7 | **CONTROL AND MONITORING SYSTEM INCLUDING APP** | | | | | | | |
| 2.7.1 | Supply and install a control and monitoring system including App | No. | 1 | | | | | |
| 2.8 | **SYSTEM EARTHING** | | | | | | | |
| 2.8.1 | Supply and install system earthing | Lot | | | | | | |
| 2.9 | **LIGHTNING PROTECTION SYSTEM** | | | | | | | |
| 2.9.1 | Lightning protection system to be installed in converter connection box above. | Lot | | | | | | |
| | **S2: Solar - Carried Forward** | | | | | | | |

**ORBIT TVET COLLEGE - SUPPLY AND INSTALLATION OF A PV PLANT AT MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE**

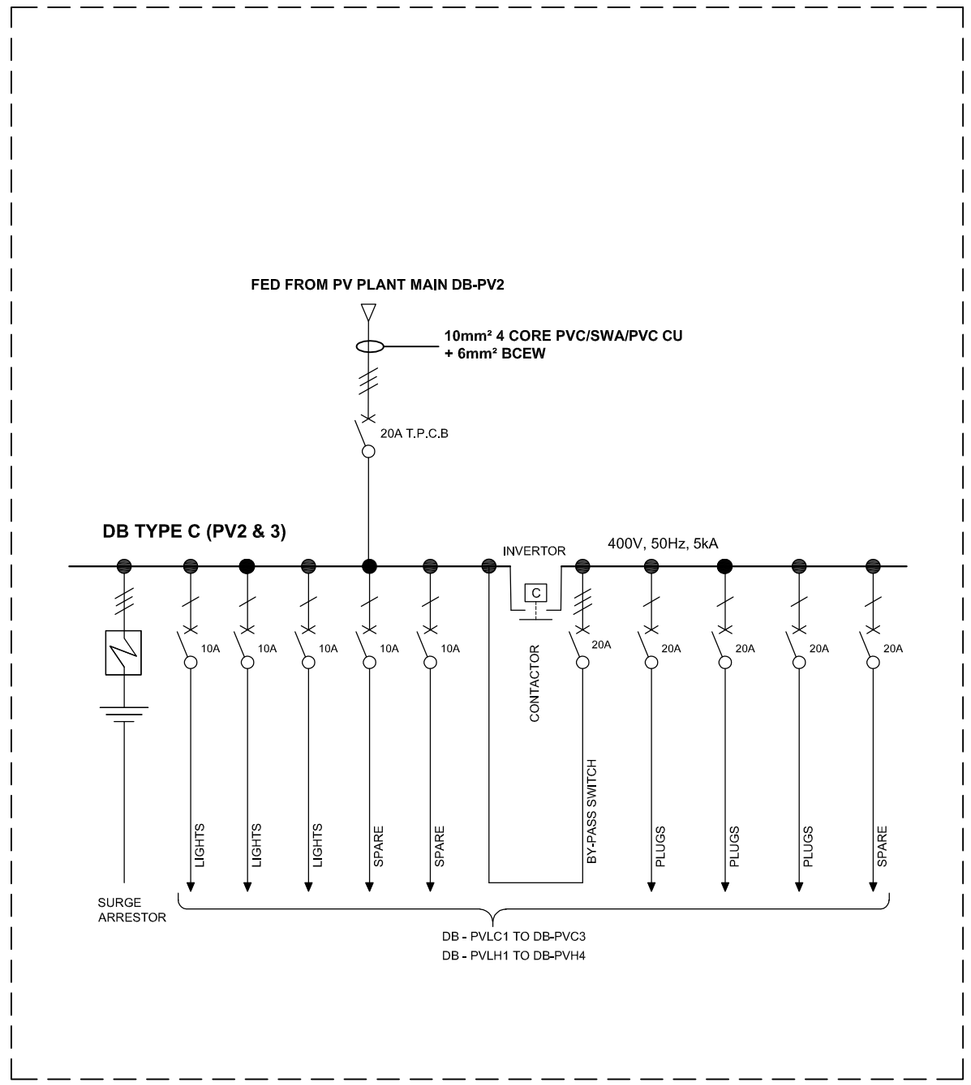
| ITEM NO | DESCRIPTION | UNIT | QTY | SUPPLY | | INSTALL | | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | | | | RATE | AMOUNT (A) | RATE | AMOUNT (B) | (A+B) |
| | **S2: Solar - Brought Forward** | | | | | | | |
| 2.10 | **PV MODULE MOUNTING STRUCTURES - ROOF MOUNTED** | | | | | | | |
| 2.10.1 | Supply and install IBR PV module mounting structures, Size 5 | No. | 18 | | | | | |
| 2.10.2 | Special Tilt Bracket | No. | - | | | | | |
| 2.11 | **PV MODULE MOUNTING STRUCTURES - BATTERIES COMPLETE WITH STRUCTURE** | | | | | | | |
| 2.11.1 | Supply and install Lithium Ion, 48V Battery, 8.7kWh complete with mounting structures | No. | 5 | | | | | |
| 2.11.2 | Battery monitoring system | No. | 5 | | | | | |
| 2.12 | **REMOTE MONITORING SYSTEM - GROUND MOUNTED** | | | | | | | |
| 2.12.1 | Supply and install Remote Monitoring System complete with accessories and licences. | Lot | | | | | | |
| 2.13 | **12 MONTH MAINTENANCE PLAN** | | | | | | | |
| 2.13.1 | Provide a 12 month maintenance plan | Lot | | | | | | |
| 2.14 | **ROOF STRICTURAL INTEGRITY ANALYSIS AND REPORT** | | | | | | | |
| 2.14.1 | 10 X Roofs to be analysed by Structural Engineer with focus on integrity of the IBR and its suporting structures. E.g roof trusses | Lot | | | | | | |
| 2.15 | **MAKE GOOD ON ROOF** | | | | | | | |
| 2.15.1 | Make good , treat and seal all roof openings created by the installation. Roof seals and treatment must be guaranteed for 10 years. | Lot | | | | | | |
| 2.16 | **TEACHING AND LEARNING COMPLETE SOLAR KIT** | | | | | | | |
| 2.16.1 | Supply and install a complete hybrid 5kW domestic PV Plant (single phase) complete with meter, battery, monitoring unit and app for training as per the specification. The inverter will be Sunsynk. The PV Panels shall be small enough to be installed on a mobile frame (2kW) and the battery shall be as per specification (2kW). | Lot | | | | | | |
| 2.16.2 | Supply Steel cabinets as per specification | Lot | | | | | | |
| 2.16.3 | Provide steel frame on wheels to support 2kVA solar panels. | No. | 1 | | | | | |
| | **S2: Solar - Carried To Summary Page** | | | | | | | |

**ORBIT TVET COLLEGE - MANKWE CAMPUS, RUSTENBURG CAMPUS AND CENTRAL OFFICE**

**SUMMARY OF SCHEDULE OF REMEASURABLE QUANTITIES - ELECTRICAL DISTRIBUTION: SOLAR**

| | | |
|---|---|---|
| SCHEDULE NO PG 1 | INSTALLATION: RUSTENBURG CAMPUS PRELIMINARIES | |
| SCHEDULE NO PG 2 | INSTALLATION: MANKWE CAMPUS PRELIMINARIES | |
| SCHEDULE NO E1 | INSTALLATIONS: RUSTENBURG CAMPUS ELECTRICAL DISTRIBUTION | |
| SCHEDULE NO S1 | INSTALLATIONS: MANKWE CAMPUS SOLAR | |
| SCHEDULE NO S2 | INSTALLATIONS: RUSTENBURG CAMPUS SOLAR | |
| | **SUB-TOTAL (Excl. VAT)** | |
| | CONTINGENCIES @ 2.5% | |
| **TOTAL OF SCHEDULE OF REMEASURABLE QUANTITIES CARRIED TO PRICING SCHEDULE** | | |

## PART 23: DRAWINGS




**INSTALLATION AND MANUFACTURERS NOTES**

1. EARTH LEAKAGE UNITS: ALL EARTH LEAKAGE UNITS WITH OVERLOAD PROTECTION
2. MCB's: ALL MINIATURE CIRCUIT BREAKERS QF 19 (CURVE 1)
3. ALL DIMENSIONS AND LEVELS ARE TO BE VERIFIED ON SITE PRIOR COMMENCING SETTING OUT, WORKSHOP DRAWINGS OR CONSTRUCTION THEREOF
4. DISCREPANCIES , ERRORS AND OMISSIONS ARE TO BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY THEY BECOME EVIDENT
5. FIGURED DIMENSIONS ONLY TO BE USED. DRAWINGS ARE NOT TO SCALE
6. SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE AND INSTALLATION
7. LABELING AND COLOUR CODING: AS DETAILED IN THE SPECIFICATION
8. LEGEND CARDS: AS DETAILED IN THE SPECIFICATION
9. SPECIFICATION REQUIREMENTS: AS DETAILED IN THE SPECIFICATION
10. ALLOW FOR MINIMUM 25% SPARE SPACE
11. ALLOW FOR CASCADING

| RESPONSIBLE PROFESSIONAL | | | |
|---|---|---|---|
| DATE | NAME | SIGNATURE | PR NUMBER |
| 24/07/2023 | A.MACKENZIE,Pr.Eng | | 950495 |

| No. | DATE | DESCRIPTION | SIGN |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

LEGEND

EARTH LEAKAGE WITH OVERLOAD PROTECTION (ELU)

CIRCUIT BREAKER (A)

CURVE 1 CIRCUIT BREAKER (A)

PHOTO CELL

CONTACT (C)

client

ORBIT TVET COLLEGE

consultant

emzansi CONSULTING

Tel: (012) 345 3383 Fax: (012) 345 4583

discipline: ELECTRICAL

service

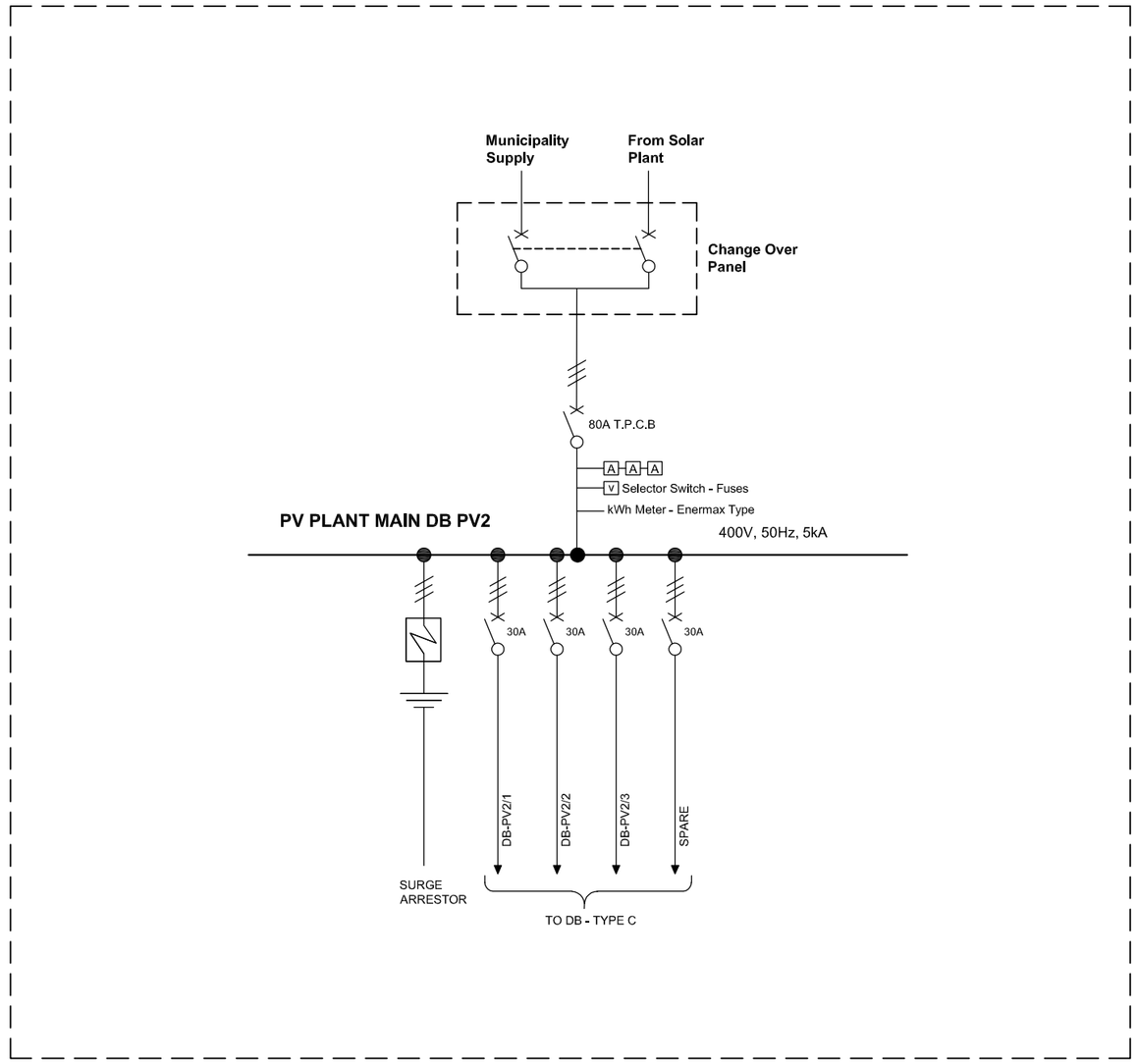
MANKWE

WCS number: .

drawing title: SINGLE LINE DIAGRAM LAYOUT: (CENTRAL OFFICE) SUB DB'S-PV2

| | |
|---|---|
| ref.no. . | designed B.E |
| scale N.T.S | drawn K.N |
| date 2023-07-24 | checked A.M |

Drawing number: OTVET - E04




**INSTALLATION AND MANUFACTURERS NOTES**

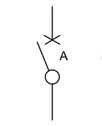
1. EARTH LEAKAGE UNITS: ALL EARTH LEAKAGE UNITS WITH OVERLOAD PROTECTION
2. MCB's: ALL MINIATURE CIRCUIT BREAKERS QF 19 (CURVE 1)
3. ALL DIMENSIONS AND LEVELS ARE TO BE VERIFIED ON SITE PRIOR COMMENCING SETTING OUT, WORKSHOP DRAWINGS OR CONSTRUCTION THEREOF
4. DISCREPANCIES , ERRORS AND OMISSIONS ARE TO BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY THEY BECOME EVIDENT
5. FIGURED DIMENSIONS ONLY TO BE USED. DRAWINGS ARE NOT TO SCALE
6. SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE AND INSTALLATION
7. LABELING AND COLOUR CODING: AS DETAILED IN THE SPECIFICATION
8. LEGEND CARDS: AS DETAILED IN THE SPECIFICATION
9. SPECIFICATION REQUIREMENTS: AS DETAILED IN THE SPECIFICATION
10. ALLOW FOR MINIMUM 25% SPARE SPACE
11. ALLOW FOR CASCADING

| RESPONSIBLE PROFESSIONAL | | | |
|---|---|---|---|
| DATE | NAME | SIGNATURE | PR NUMBER |
| 24/07/2023 | A.MACKENZIE,Pr.Eng | | 950495 |

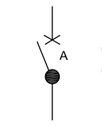
| No. | DATE | DESCRIPTION | SIGN |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

LEGEND


EARTH LEAKAGE WITH OVERLOAD PROTECTION




CIRCUIT BREAKER




CURVE 1 CIRCUIT BREAKER

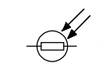
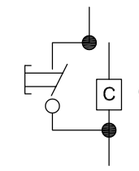


PHOTO CELL




CONTACT

client

ORBIT TVET COLLEGE

consultant

emzansi CONSULTING

Tel: (012) 345 3383 Fax: (012) 345 4583

discipline: ELECTRICAL

service

MANKWE

WCS number: .

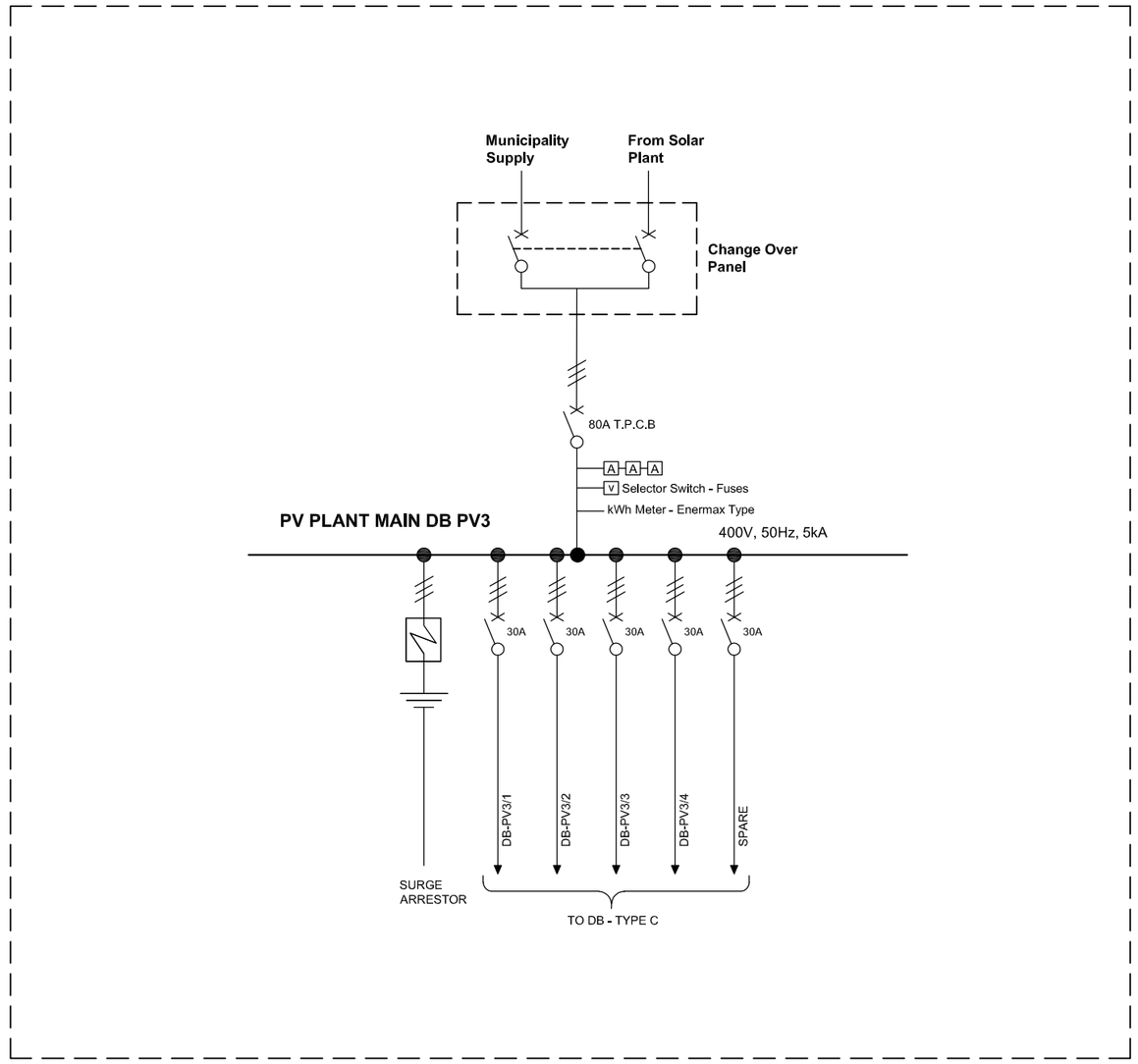
drawing title

SINGLE LINE DIAGRAM LAYOUT: (CENTRAL OFFICE) UNIT PV2

| | |
|---|---|
| ref.no. . | designed B.E |
| scale N.T.S | drawn K.N |
| date 2023-07-24 | checked A.M |

Drawing number

OTVET - E05A



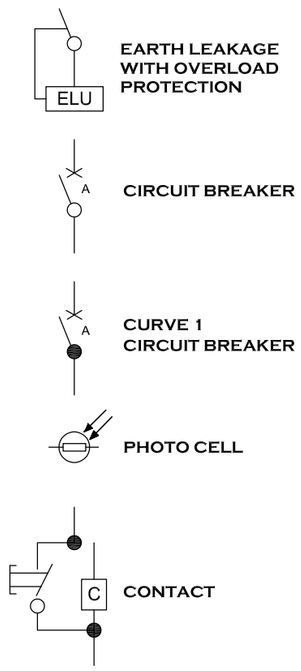

**INSTALLATION AND MANUFACTURERS NOTES**

1. EARTH LEAKAGE UNITS: ALL EARTH LEAKAGE UNITS WITH OVERLOAD PROTECTION
2. MCB's: ALL MINIATURE CIRCUIT BREAKERS QF 19 (CURVE 1)
3. ALL DIMENSIONS AND LEVELS ARE TO BE VERIFIED ON SITE PRIOR COMMENCING SETTING OUT, WORKSHOP DRAWINGS OR CONSTRUCTION THEREOF
4. DISCREPANCIES , ERRORS AND OMISSIONS ARE TO BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY THEY BECOME EVIDENT
5. FIGURED DIMENSIONS ONLY TO BE USED. DRAWINGS ARE NOT TO SCALE
6. SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE AND INSTALLATION
7. LABELING AND COLOUR CODING: AS DETAILED IN THE SPECIFICATION
8. LEGEND CARDS: AS DETAILED IN THE SPECIFICATION
9. SPECIFICATION REQUIREMENTS: AS DETAILED IN THE SPECIFICATION
10. ALLOW FOR MINIMUM 25% SPARE SPACE
11. ALLOW FOR CASCADING

| RESPONSIBLE PROFESSIONAL | | | |
|---|---|---|---|
| DATE | NAME | SIGNATURE | PR NUMBER |
| 24/07/2023 | A.MACKENZIE,Pr.Eng | | 950495 |

| No. | DATE | DESCRIPTION | SIGN |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

LEGEND




client

ORBIT TVET COLLEGE

consultant

emzansi CONSULTING

Tel: (012) 345 3383 Fax: (012) 345 4583

discipline: ELECTRICAL

service

MANKWE

WCS number: .

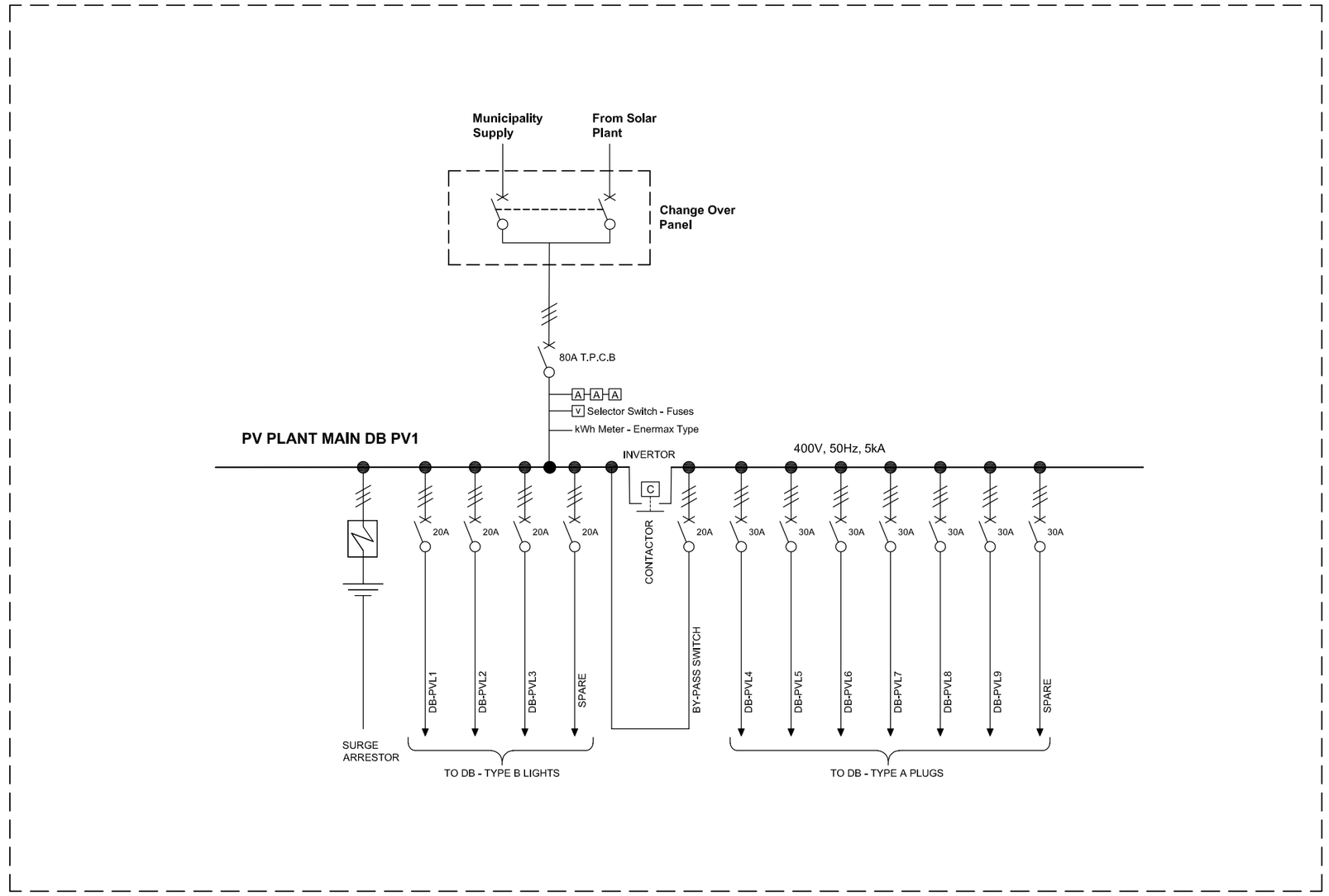
drawing title

SINGLE LINE DIAGRAM LAYOUT: (HALLS) UNIT PV3

| | |
|---|---|
| ref.no. . | designed B.E |
| scale N.T.S | drawn K.N |
| date 2023-07-24 | checked A.M |

Drawing number

OTVET - E05B



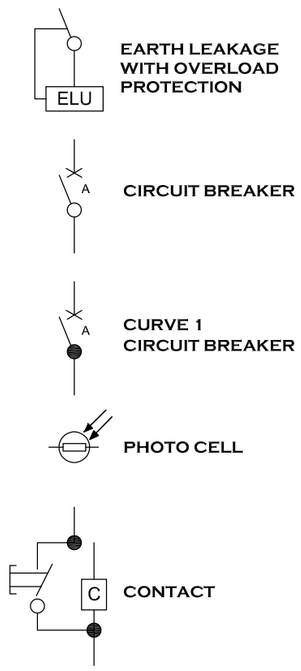

**INSTALLATION AND MANUFACTURERS NOTES**

1. EARTH LEAKAGE UNITS: ALL EARTH LEAKAGE UNITS WITH OVERLOAD PROTECTION
2. MCB's: ALL MINIATURE CIRCUIT BREAKERS QF 19 (CURVE 1)
3. ALL DIMENSIONS AND LEVELS ARE TO BE VERIFIED ON SITE PRIOR COMMENCING SETTING OUT, WORKSHOP DRAWINGS OR CONSTRUCTION THEREOF
4. DISCREPANCIES , ERRORS AND OMISSIONS ARE TO BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY THEY BECOME EVIDENT
5. FIGURED DIMENSIONS ONLY TO BE USED. DRAWINGS ARE NOT TO SCALE
6. SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE AND INSTALLATION
7. LABELING AND COLOUR CODING: AS DETAILED IN THE SPECIFICATION
8. LEGEND CARDS: AS DETAILED IN THE SPECIFICATION
9. SPECIFICATION REQUIREMENTS: AS DETAILED IN THE SPECIFICATION
10. ALLOW FOR MINIMUM 25% SPARE SPACE
11. ALLOW FOR CASCADING

| RESPONSIBLE PROFESSIONAL | | | |
|---|---|---|---|
| DATE | NAME | SIGNATURE | PR NUMBER |
| 24/07/2023 | A.MACKENZIE,Pr.Eng | | 950495 |

| No. | DATE | DESCRIPTION | SIGN |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

LEGEND




client

ORBIT TVET COLLEGE

consultant

emzansi CONSULTING

Tel: (012) 345 3383 Fax: (012) 345 4583

discipline: ELECTRICAL

service

MANKWE

WCS number: .

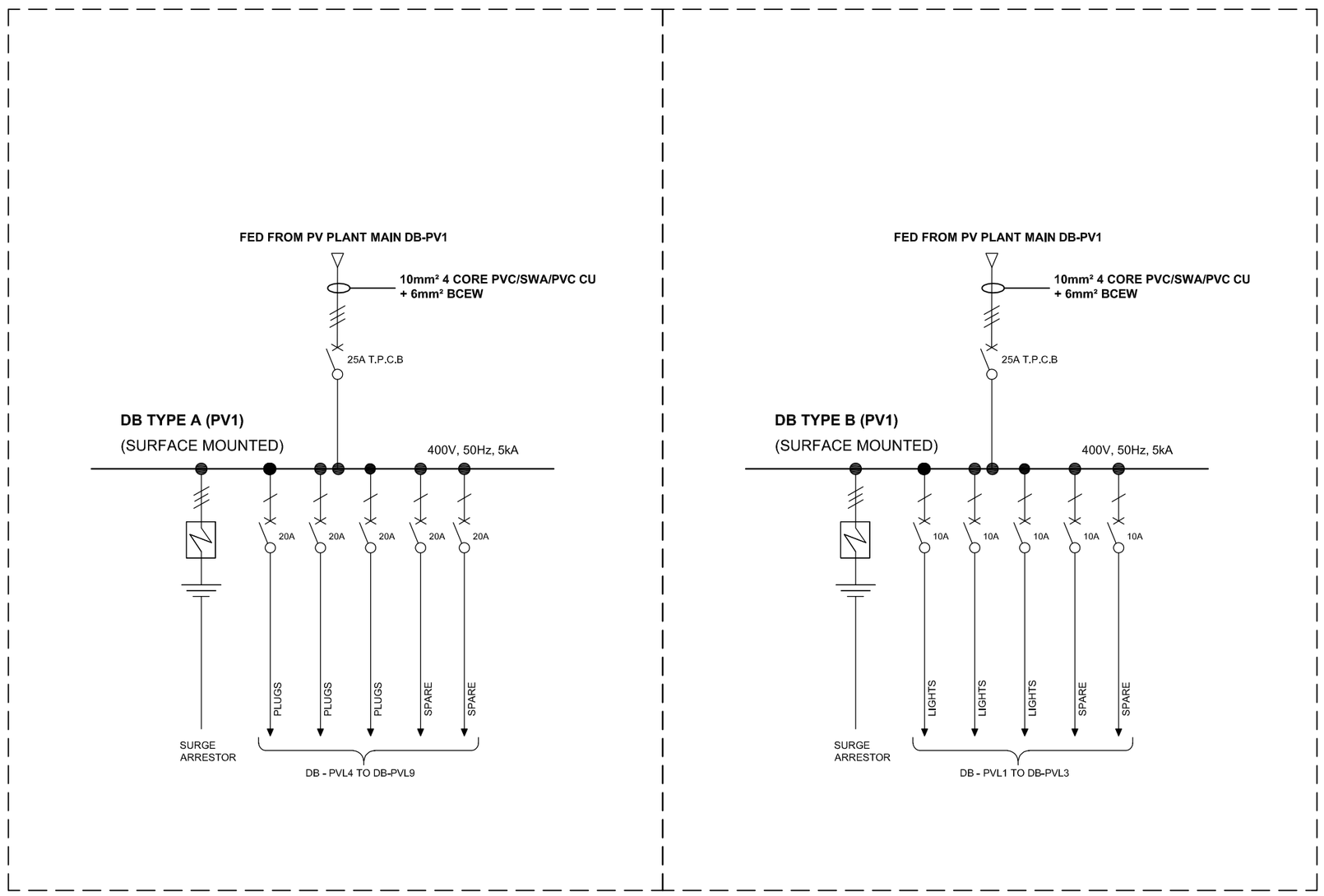
drawing title

SINGLE LINE DIAGRAM LAYOUT: (LABS) UNIT PV1

| | |
|---|---|
| ref.no. . | designed B.E |
| scale N.T.S | drawn K.N |
| date 2023-07-24 | checked A.M |

Drawing number

OTVET - E05



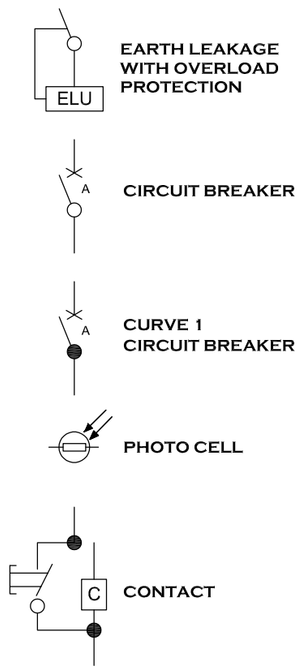

**INSTALLATION AND MANUFACTURERS NOTES**

1. EARTH LEAKAGE UNITS: ALL EARTH LEAKAGE UNITS WITH OVERLOAD PROTECTION
2. MCB's: ALL MINIATURE CIRCUIT BREAKERS OF 19 (CURVE 1)
3. ALL DIMENSIONS AND LEVELS ARE TO BE VERIFIED ON SITE PRIOR COMMENCING SETTING OUT, WORKSHOP DRAWINGS OR CONSTRUCTION THEREOF
4. DISCREPANCIES , ERRORS AND OMISSIONS ARE TO BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY THEY BECOME EVIDENT
5. FIGURED DIMENSIONS ONLY TO BE USED. DRAWINGS ARE NOT TO SCALE
6. SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE AND INSTALLATION
7. LABELING AND COLOUR CODING: AS DETAILED IN THE SPECIFICATION
8. LEGEND CARDS: AS DETAILED IN THE SPECIFICATION
9. SPECIFICATION REQUIREMENTS: AS DETAILED IN THE SPECIFICATION
10. ALLOW FOR MINIMUM 25% SPARE SPACE
11. ALLOW FOR CASCADING

| RESPONSIBLE PROFESSIONAL | | | |
|---|---|---|---|
| DATE | NAME | SIGNATURE | PR NUMBER |
| 24/07/2023 | A.MACKENZIE,Pr.Eng | | 950495 |

| No. | DATE | DESCRIPTION | SIGN |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

LEGEND




client

ORBIT TVET COLLEGE

consultant

emzansi CONSULTING

Tel: (012) 345 3383 Fax: (012) 345 4583

discipline: ELECTRICAL

service

MANKWE

WCS number: .

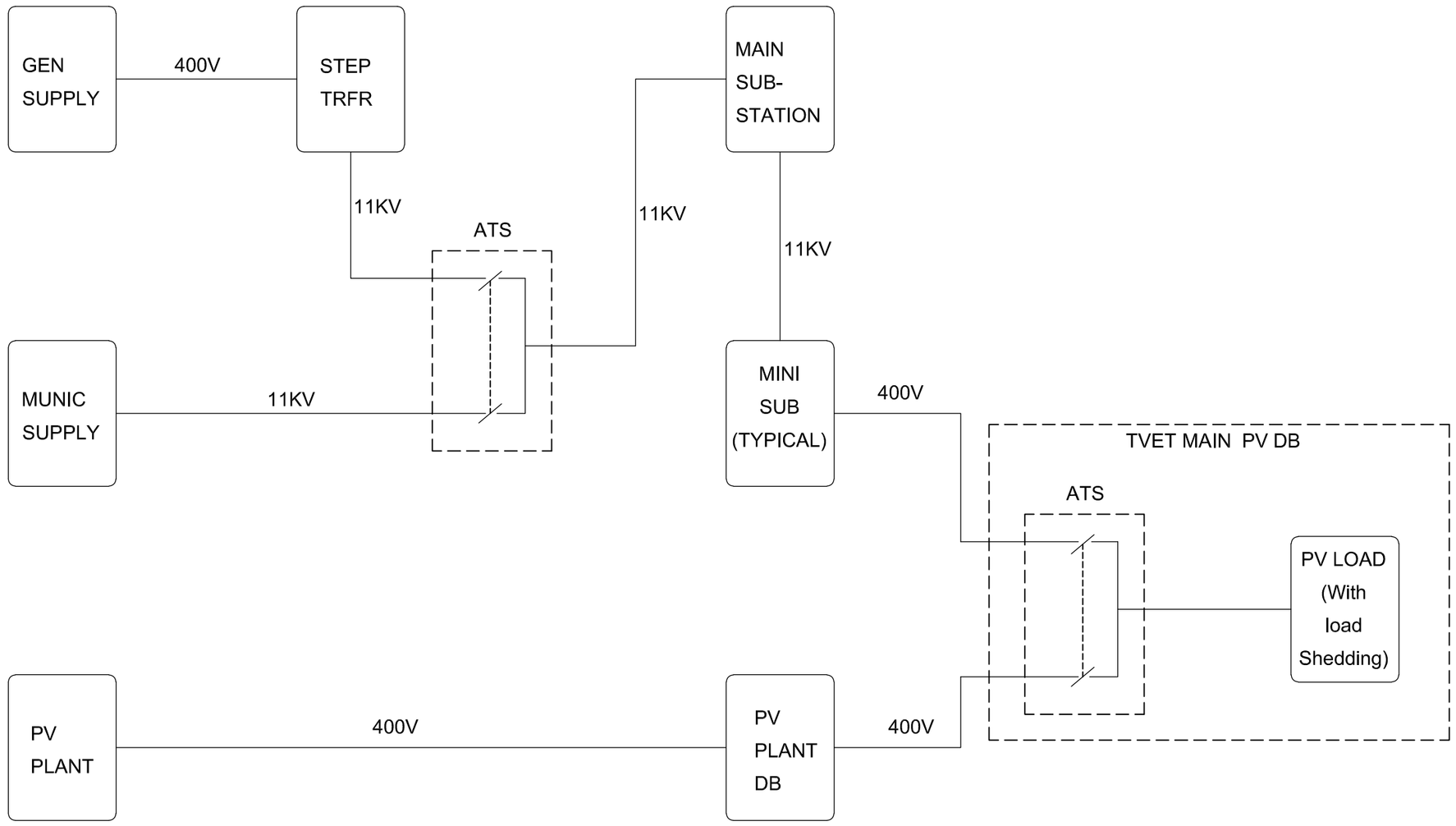
drawing title

SINGLE LINE DIAGRAM
LAYOUT: (LABS-PLUGS)
SUB DB'S-PV1

| | |
|---|---|
| ref.no. . | designed B.E |
| scale N.T.S | drawn K.N |
| date 2023-07-24 | checked A.M |

Drawing number

OTVET - E10




| No. | DATE | DESCRIPTION | SIGN |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

LEGEND

CLIENT

ORBIT TVET COLLEGE

consultant

emzansi CONSULTING

Tel: (012) 345 3383 Fax: (012) 345 4583

discipline

ELECTRICAL

service

Mankwe

WCS number

.

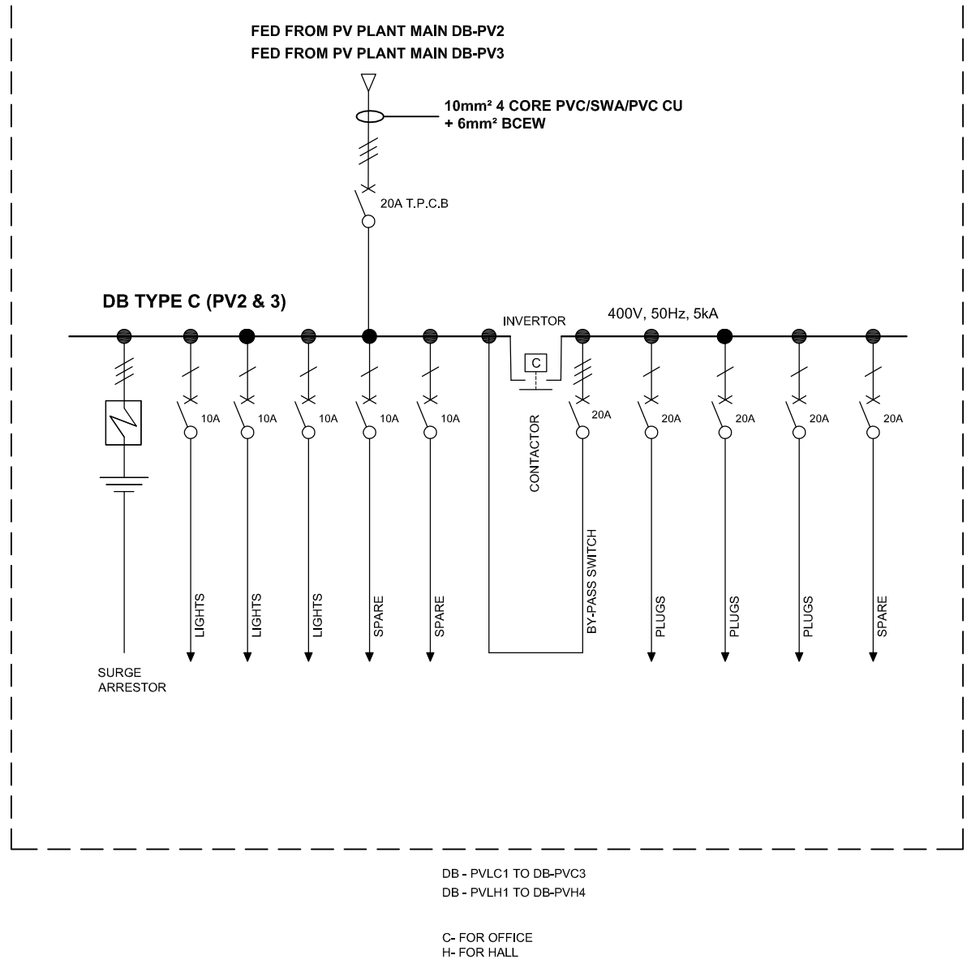
drawing title

TYPICAL SCHEMATIC OF MV + PV + GEN SUPPLY

| | |
|---|---|
| ref.no. . | designed A.M |
| scale N.T.S | drawn K.N |
| date 2023-07-09 | checked A.M |

Drawing number

OTVET - E03




**INSTALLATION AND MANUFACTURERS NOTES**

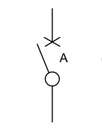
1. EARTH LEAKAGE UNITS: ALL EARTH LEAKAGE UNITS WITH OVERLOAD PROTECTION
2. MCB's: ALL MINIATURE CIRCUIT BREAKERS QF 19 (CURVE 1)
3. ALL DIMENSIONS AND LEVELS ARE TO BE VERIFIED ON SITE PRIOR COMMENCING SETTING OUT, WORKSHOP DRAWINGS OR CONSTRUCTION THEREOF
4. DISCREPANCIES , ERRORS AND OMISSIONS ARE TO BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY THEY BECOME EVIDENT
5. FIGURED DIMENSIONS ONLY TO BE USED. DRAWINGS ARE NOT TO SCALE
6. SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE AND INSTALLATION
7. LABELING AND COLOUR CODING: AS DETAILED IN THE SPECIFICATION
8. LEGEND CARDS: AS DETAILED IN THE SPECIFICATION
9. SPECIFICATION REQUIREMENTS: AS DETAILED IN THE SPECIFICATION
10. ALLOW FOR MINIMUM 25% SPARE SPACE
11. ALLOW FOR CASCADING

| RESPONSIBLE PROFESSIONAL | | | |
|---|---|---|---|
| DATE | NAME | SIGNATURE | PR NUMBER |
| 25/07/2023 | A.MACKENZIE,Pr.Eng | | 950495 |

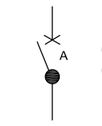
| No. | DATE | DESCRIPTION | SIGN |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

LEGEND


EARTH LEAKAGE WITH OVERLOAD PROTECTION




CIRCUIT BREAKER




CURVE 1 CIRCUIT BREAKER

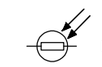
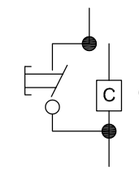


PHOTO CELL




CONTACT

client

ORBIT TVET COLLEGE

consultant

emzansi CONSULTING

Tel: (012) 345 3383 Fax: (012) 345 4583

discipline: ELECTRICAL

service

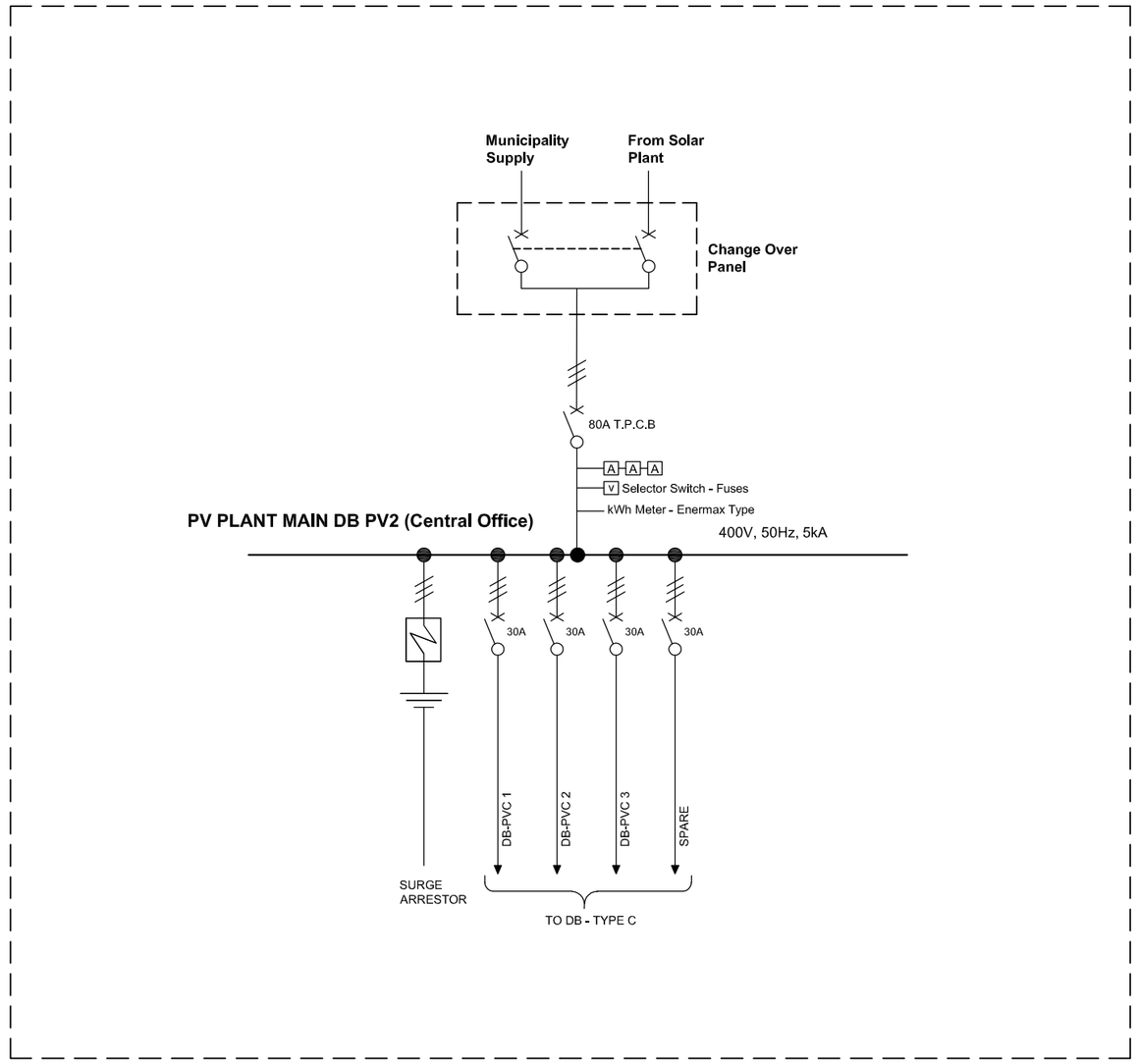
RUSTENBURG

WCS number: .

drawing title: SINGLE LINE DIAGRAM LAYOUT: (CENTRAL OFFICE) SUB DB'S-PV2

| | |
|---|---|
| ref.no. . | designed B.E |
| scale N.T.S | drawn K.N |
| date 2023-07-25 | checked A.M |

Drawing number: OTVET - RB-E04




**INSTALLATION AND MANUFACTURERS NOTES**

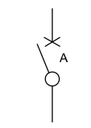
1. EARTH LEAKAGE UNITS: ALL EARTH LEAKAGE UNITS WITH OVERLOAD PROTECTION
2. MCB's: ALL MINIATURE CIRCUIT BREAKERS QF 19 (CURVE 1)
3. ALL DIMENSIONS AND LEVELS ARE TO BE VERIFIED ON SITE PRIOR COMMENCING SETTING OUT, WORKSHOP DRAWINGS OR CONSTRUCTION THEREOF
4. DISCREPANCIES , ERRORS AND OMISSIONS ARE TO BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY THEY BECOME EVIDENT
5. FIGURED DIMENSIONS ONLY TO BE USED. DRAWINGS ARE NOT TO SCALE
6. SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE AND INSTALLATION
7. LABELING AND COLOUR CODING: AS DETAILED IN THE SPECIFICATION
8. LEGEND CARDS: AS DETAILED IN THE SPECIFICATION
9. SPECIFICATION REQUIREMENTS: AS DETAILED IN THE SPECIFICATION
10. ALLOW FOR MINIMUM 25% SPARE SPACE
11. ALLOW FOR CASCADING

| RESPONSIBLE PROFESSIONAL | | | |
|---|---|---|---|
| DATE | NAME | SIGNATURE | PR NUMBER |
| 25/07/2023 | A.MACKENZIE,Pr.Eng | | 950495 |

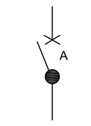
| No. | DATE | DESCRIPTION | SIGN |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

LEGEND


EARTH LEAKAGE WITH OVERLOAD PROTECTION

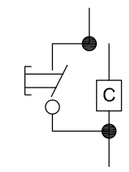



CIRCUIT BREAKER




CURVE 1 CIRCUIT BREAKER

PHOTO CELL




CONTACT

client

ORBIT TVET COLLEGE

consultant

emzansi CONSULTING

Tel: (012) 345 3383 Fax: (012) 345 4583

discipline: ELECTRICAL

service

RUSTENBURG

WCS number: .

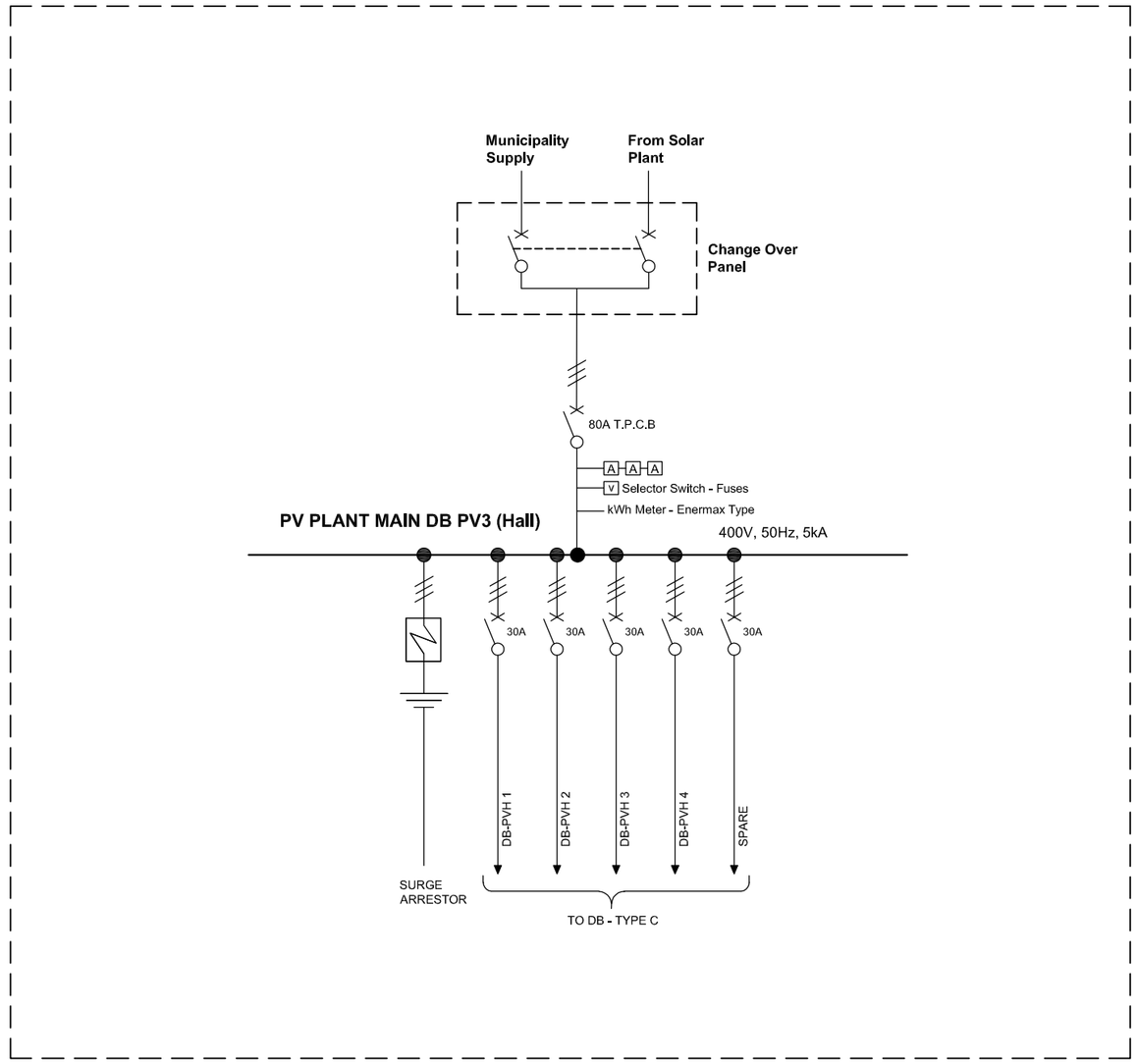
drawing title

SINGLE LINE DIAGRAM LAYOUT: (CENTRAL OFFICE) UNIT PV2

| | |
|---|---|
| ref.no. . | designed B.E |
| scale N.T.S | drawn K.N |
| date 2023-07-25 | checked A.M |

Drawing number

OTVET - RB-E05A



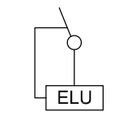

**INSTALLATION AND MANUFACTURERS NOTES**

1. EARTH LEAKAGE UNITS: ALL EARTH LEAKAGE UNITS WITH OVERLOAD PROTECTION
2. MCB's: ALL MINIATURE CIRCUIT BREAKERS QF 19 (CURVE 1)
3. ALL DIMENSIONS AND LEVELS ARE TO BE VERIFIED ON SITE PRIOR COMMENCING SETTING OUT, WORKSHOP DRAWINGS OR CONSTRUCTION THEREOF
4. DISCREPANCIES , ERRORS AND OMISSIONS ARE TO BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY THEY BECOME EVIDENT
5. FIGURED DIMENSIONS ONLY TO BE USED. DRAWINGS ARE NOT TO SCALE
6. SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE AND INSTALLATION
7. LABELING AND COLOUR CODING: AS DETAILED IN THE SPECIFICATION
8. LEGEND CARDS: AS DETAILED IN THE SPECIFICATION
9. SPECIFICATION REQUIREMENTS: AS DETAILED IN THE SPECIFICATION
10. ALLOW FOR MINIMUM 25% SPARE SPACE
11. ALLOW FOR CASCADING

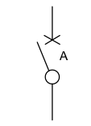
| RESPONSIBLE PROFESSIONAL | | | |
|---|---|---|---|
| DATE | NAME | SIGNATURE | PR NUMBER |
| 25/07/2023 | A.MACKENZIE,Pr.Eng | | 950495 |

| No. | DATE | DESCRIPTION | SIGN |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

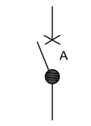
LEGEND




EARTH LEAKAGE WITH OVERLOAD PROTECTION

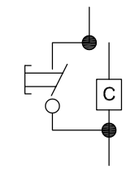



CIRCUIT BREAKER




CURVE 1 CIRCUIT BREAKER

PHOTO CELL




CONTACT

client

ORBIT TVET COLLEGE

consultant

emzansi CONSULTING

Tel: (012) 345 3383 Fax: (012) 345 4583

discipline: ELECTRICAL

service

RUSTENBURG

WCS number: .

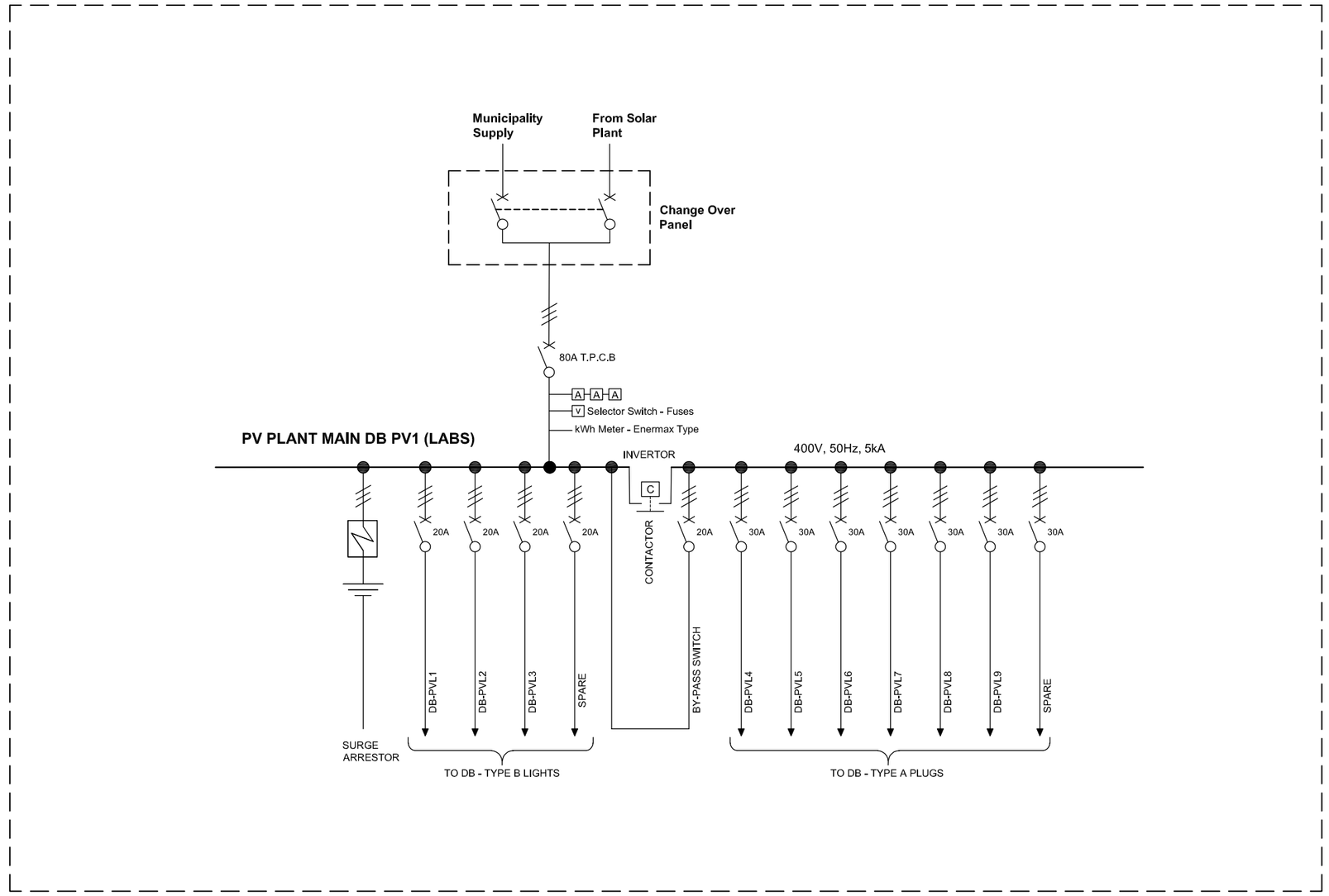
drawing title

SINGLE LINE DIAGRAM LAYOUT: (HALLS) UNIT PV3

| | |
|---|---|
| ref.no. . | designed B.E |
| scale N.T.S | drawn K.N |
| date 2023-07-25 | checked A.M |

Drawing number

OTVET - RB-E05B



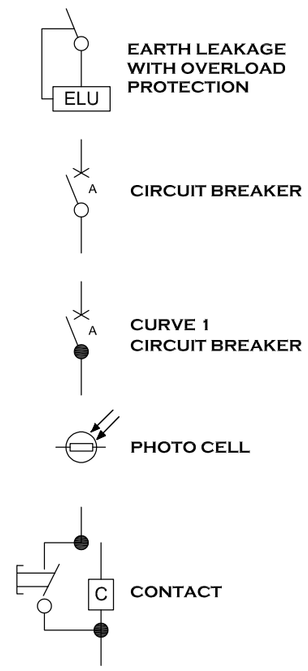

**INSTALLATION AND MANUFACTURERS NOTES**

1. EARTH LEAKAGE UNITS: ALL EARTH LEAKAGE UNITS WITH OVERLOAD PROTECTION
2. MCB's: ALL MINIATURE CIRCUIT BREAKERS QF 19 (CURVE 1)
3. ALL DIMENSIONS AND LEVELS ARE TO BE VERIFIED ON SITE PRIOR COMMENCING SETTING OUT, WORKSHOP DRAWINGS OR CONSTRUCTION THEREOF
4. DISCREPANCIES , ERRORS AND OMISSIONS ARE TO BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY THEY BECOME EVIDENT
5. FIGURED DIMENSIONS ONLY TO BE USED. DRAWINGS ARE NOT TO SCALE
6. SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE AND INSTALLATION
7. LABELING AND COLOUR CODING: AS DETAILED IN THE SPECIFICATION
8. LEGEND CARDS: AS DETAILED IN THE SPECIFICATION
9. SPECIFICATION REQUIREMENTS: AS DETAILED IN THE SPECIFICATION
10. ALLOW FOR MINIMUM 25% SPARE SPACE
11. ALLOW FOR CASCADING

| RESPONSIBLE PROFESSIONAL | | | |
|---|---|---|---|
| DATE | NAME | SIGNATURE | PR NUMBER |
| 25/07/2023 | A.MACKENZIE,Pr.Eng | | 950495 |

| No. | DATE | DESCRIPTION | SIGN |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

LEGEND




client

ORBIT TVET COLLEGE

consultant

emzansi CONSULTING

Tel: (012) 345 3383 Fax: (012) 345 4583

discipline: ELECTRICAL

service

RUSTENBURG

WCS number: .

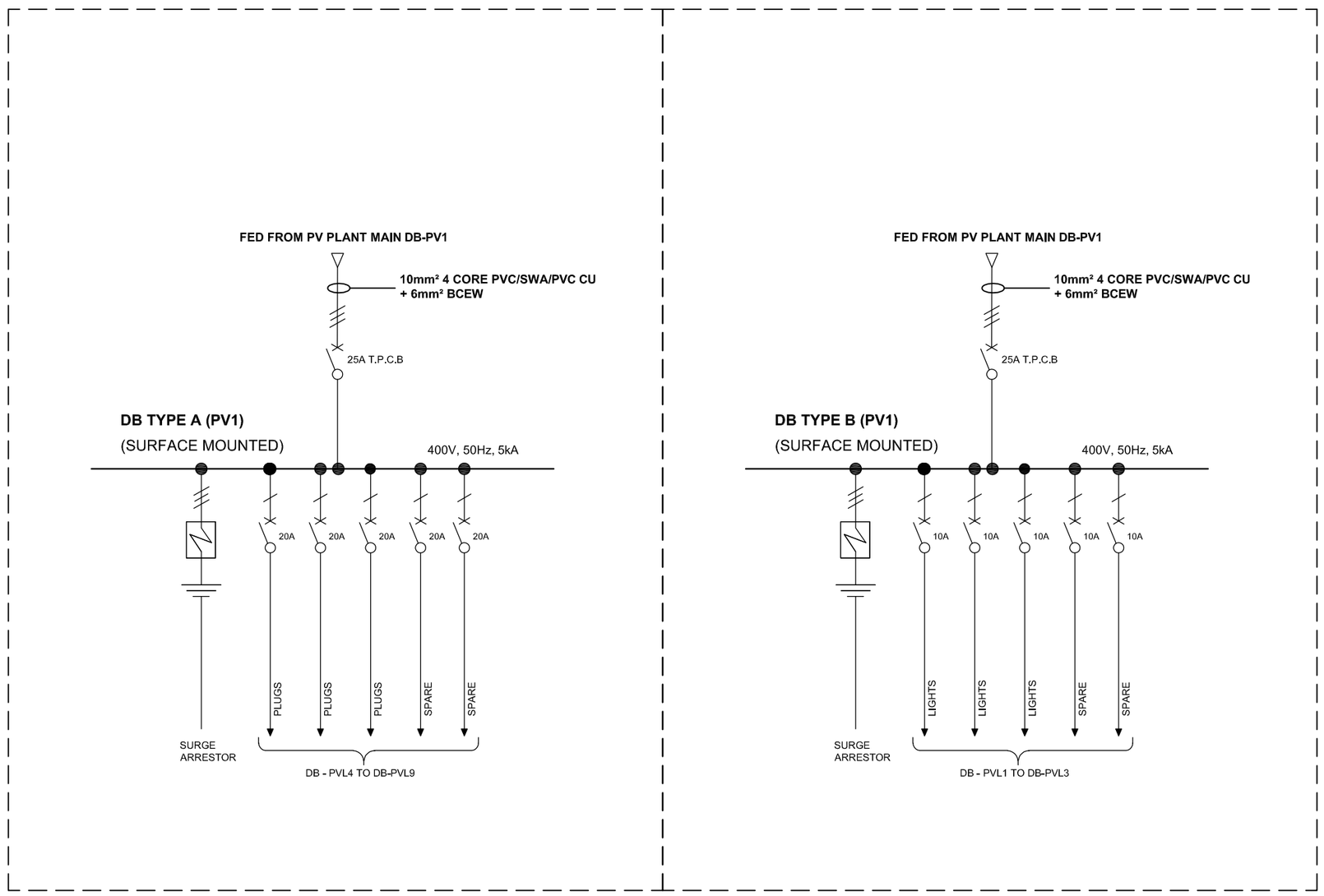
drawing title

SINGLE LINE DIAGRAM LAYOUT: (LABS) UNIT PV1

| | |
|---|---|
| ref.no. . | designed B.E |
| scale N.T.S | drawn K.N |
| date 2023-07-25 | checked A.M |

Drawing number

OTVET - RB-E05




**INSTALLATION AND MANUFACTURERS NOTES**

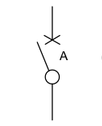
1. EARTH LEAKAGE UNITS: ALL EARTH LEAKAGE UNITS WITH OVERLOAD PROTECTION
2. MCB's: ALL MINIATURE CIRCUIT BREAKERS OF 19 (CURVE 1)
3. ALL DIMENSIONS AND LEVELS ARE TO BE VERIFIED ON SITE PRIOR COMMENCING SETTING OUT, WORKSHOP DRAWINGS OR CONSTRUCTION THEREOF
4. DISCREPANCIES , ERRORS AND OMISSIONS ARE TO BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY THEY BECOME EVIDENT
5. FIGURED DIMENSIONS ONLY TO BE USED. DRAWINGS ARE NOT TO SCALE
6. SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE AND INSTALLATION
7. LABELING AND COLOUR CODING: AS DETAILED IN THE SPECIFICATION
8. LEGEND CARDS: AS DETAILED IN THE SPECIFICATION
9. SPECIFICATION REQUIREMENTS: AS DETAILED IN THE SPECIFICATION
10. ALLOW FOR MINIMUM 25% SPARE SPACE
11. ALLOW FOR CASCADING

| RESPONSIBLE PROFESSIONAL | | | |
|---|---|---|---|
| DATE | NAME | SIGNATURE | PR NUMBER |
| 25/07/2023 | A.MACKENZIE,Pr.Eng | | 950495 |

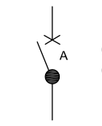
| No. | DATE | DESCRIPTION | SIGN |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

LEGEND

EARTH LEAKAGE WITH OVERLOAD PROTECTION



CIRCUIT BREAKER



CURVE 1 CIRCUIT BREAKER

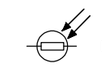
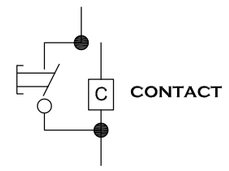


PHOTO CELL



CONTACT

client

ORBIT TVET COLLEGE

consultant

emzansi CONSULTING

Tel: (012) 345 3383 Fax: (012) 345 4583

discipline: ELECTRICAL

service

RUSTENBURG

WCS number: .

drawing title

SINGLE LINE DIAGRAM
LAYOUT: (LABS-PLUGS)
SUB DB'S-PV1

ref.no. . designed B.E

scale N.T.S drawn K.N

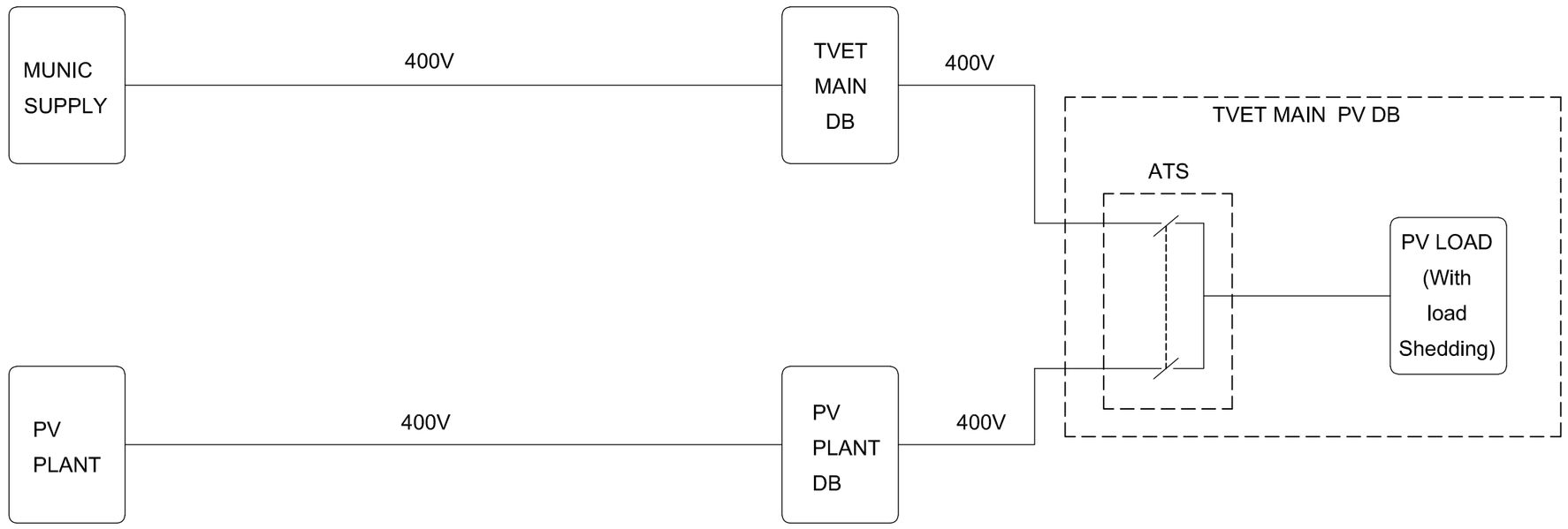
date 2023-07-25 checked A.M

Drawing number

OTVET - RB-E10

| No. | DATE | DESCRIPTION | SIGN |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

LEGEND




CLIENT

ORBIT TVET COLLEGE

consultant

emzansi CONSULTING

Tel: (012) 345 3383 Fax: (012) 345 4583

discipline

ELECTRICAL

service

Rustenburg

WCS number

.

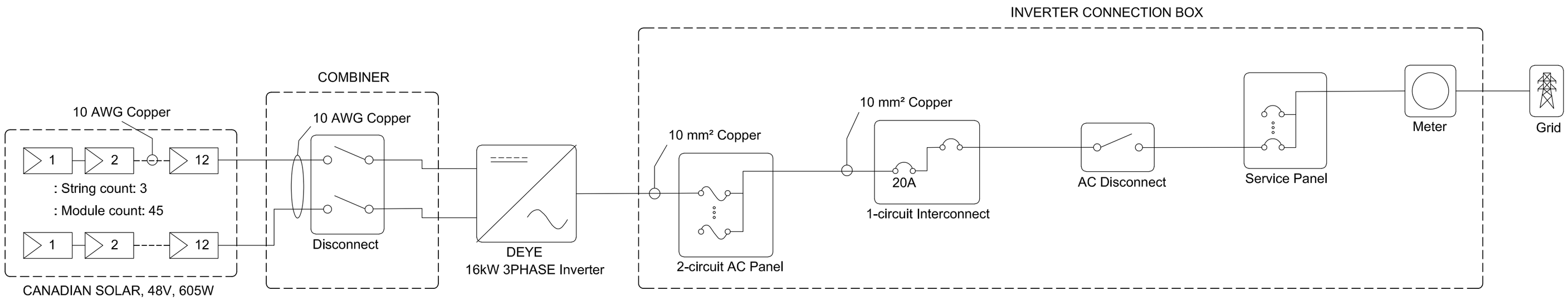
drawing title

TYPICAL SCHEMATIC OF LV + PV SUPPLY

| | |
|---|---|
| ref.no. . | designed A.M |
| scale N.T.S | drawn K.N |
| date 2023-07-27 | checked A.M |

Drawing number

OTVET - RB-E03




| Module Specifications | |
|---|---|
| CANADIAN SOLAR, 605W | |
| STC Rating | 605 W |
| Vmp | 42.8 V |
| Imp | 11.69 A |
| Voc | 51.7 V |
| Isc | 12.28 A |

| Inverter Specifications | |
|---|---|
| DEYE, 16kW | |
| Max AC Power Rating | 16 kW |
| Max Input Voltage | 1,000 V |
| Min AC Power Rating | 0 W |
| Min Input Voltage | 480 V |

| Wire Schedule | | |
|---|---|---|
| Tier | Wire | Length |
| AC Run | l x 10 mm² | 1003m |
| AC Branch | 1 x 10 mm² | 155m |
| String | 6 x 10 AWG | 219m |

NOTE:

1. ATESS INVERTERS MAY BE SUPPLIED AS AN ALTERNATIVE INVERTER, BUT THE ALTERNATIVE ATESS INVERTER MUST HAVE A POTENTIAL FREE AUXILIARY OUTPUT CONTACT THAT CAN TRIGER LOAD SHEDDING AT A BUSS TIE.

| No. | DATE | DESCRIPTION | SIGN |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

client

ORBIT TVET COLLEGE

consultant

emzansi CONSULTING
Tel: (012) 345 3383 Fax: (012) 345 4583

discipline: ELECTRICAL

service

Orbit TVET Campus Rustenburg

WCS number

drawing title

Orbit TVET Campus
-TYPICAL SOLAR SYSTEM

ref.no. .

designed A.M

scale N.T.S

drawn K.N

date 2023-07-27

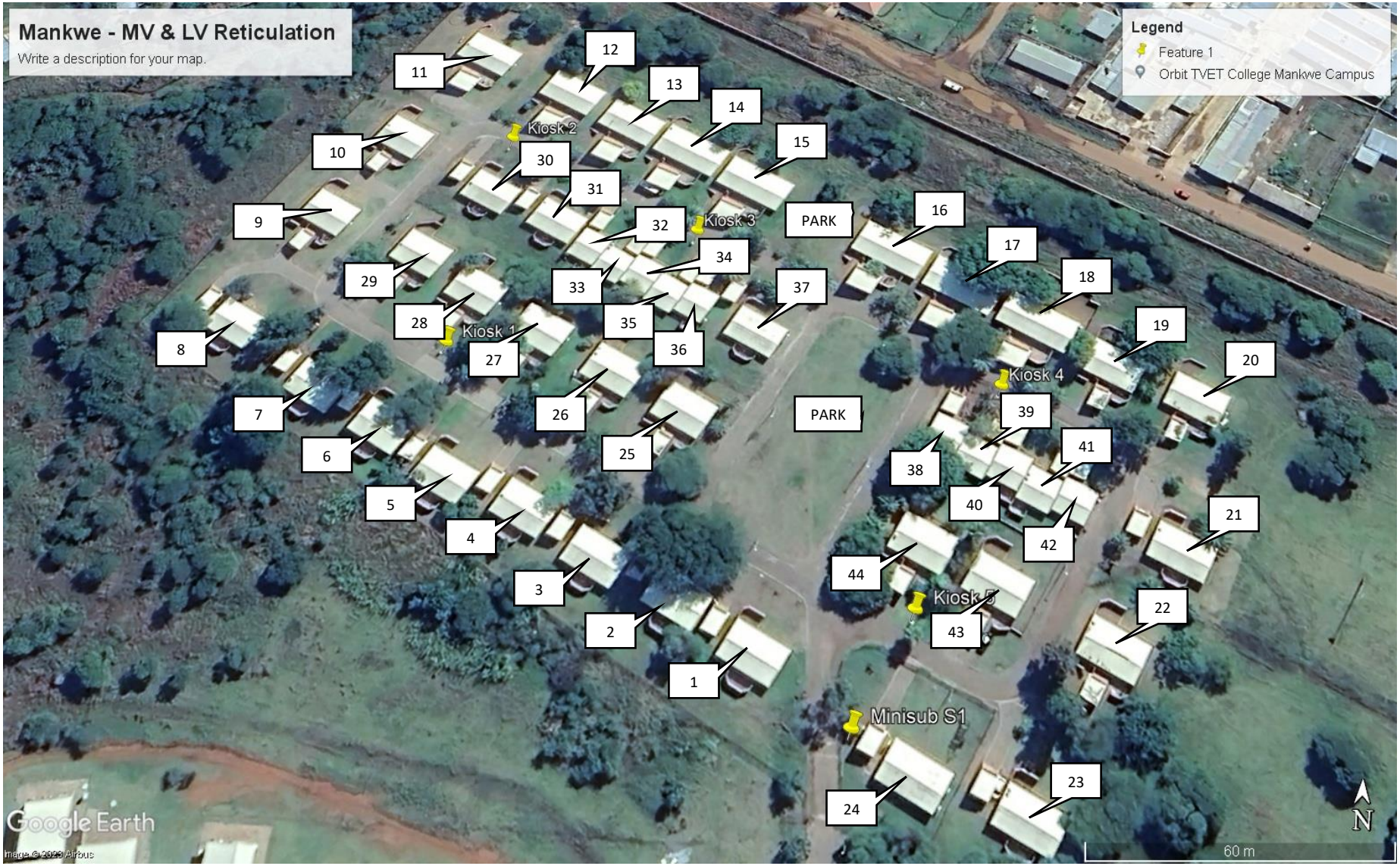
checked A.M

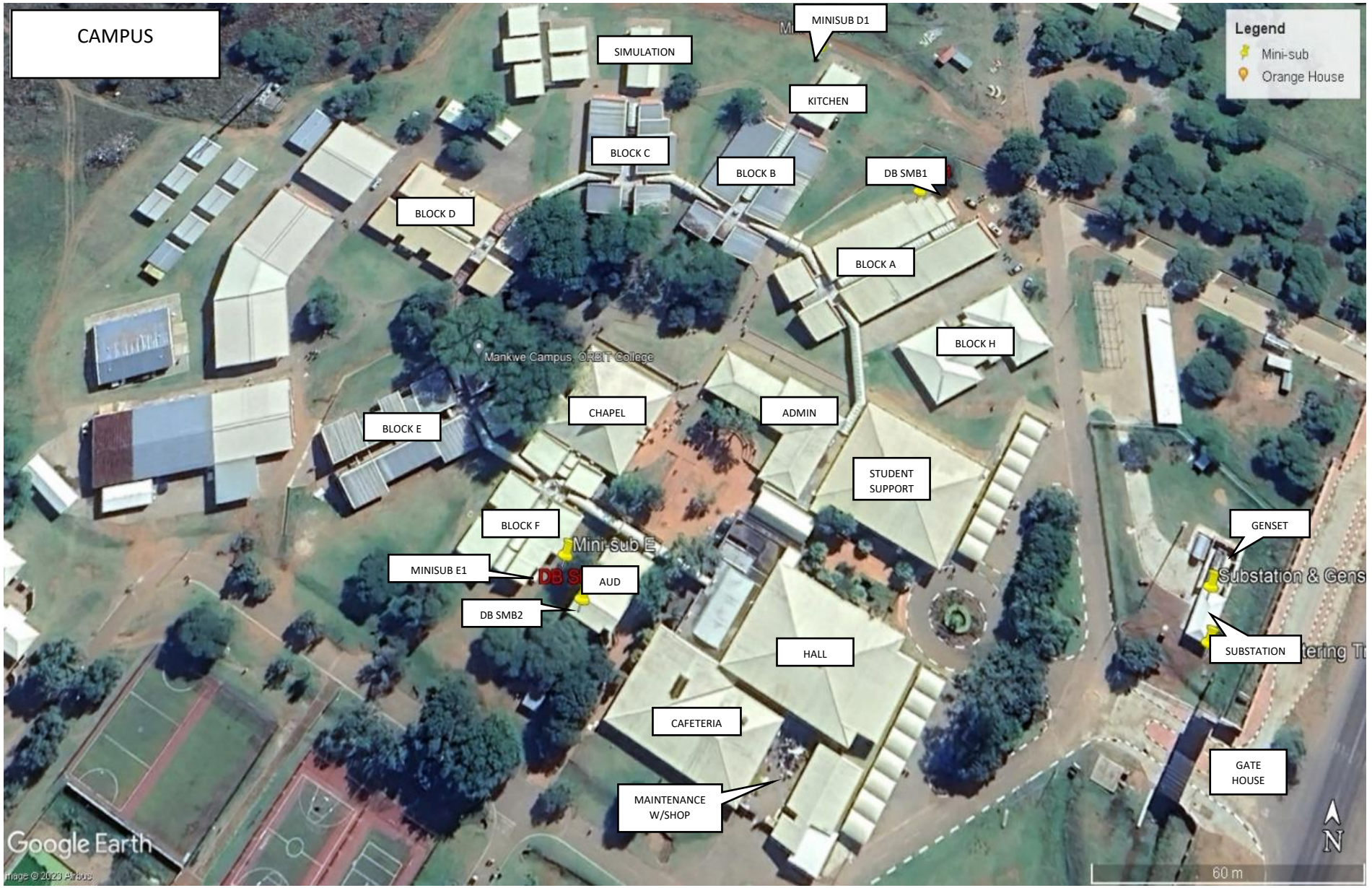
Drawing number

OTVET - EL20

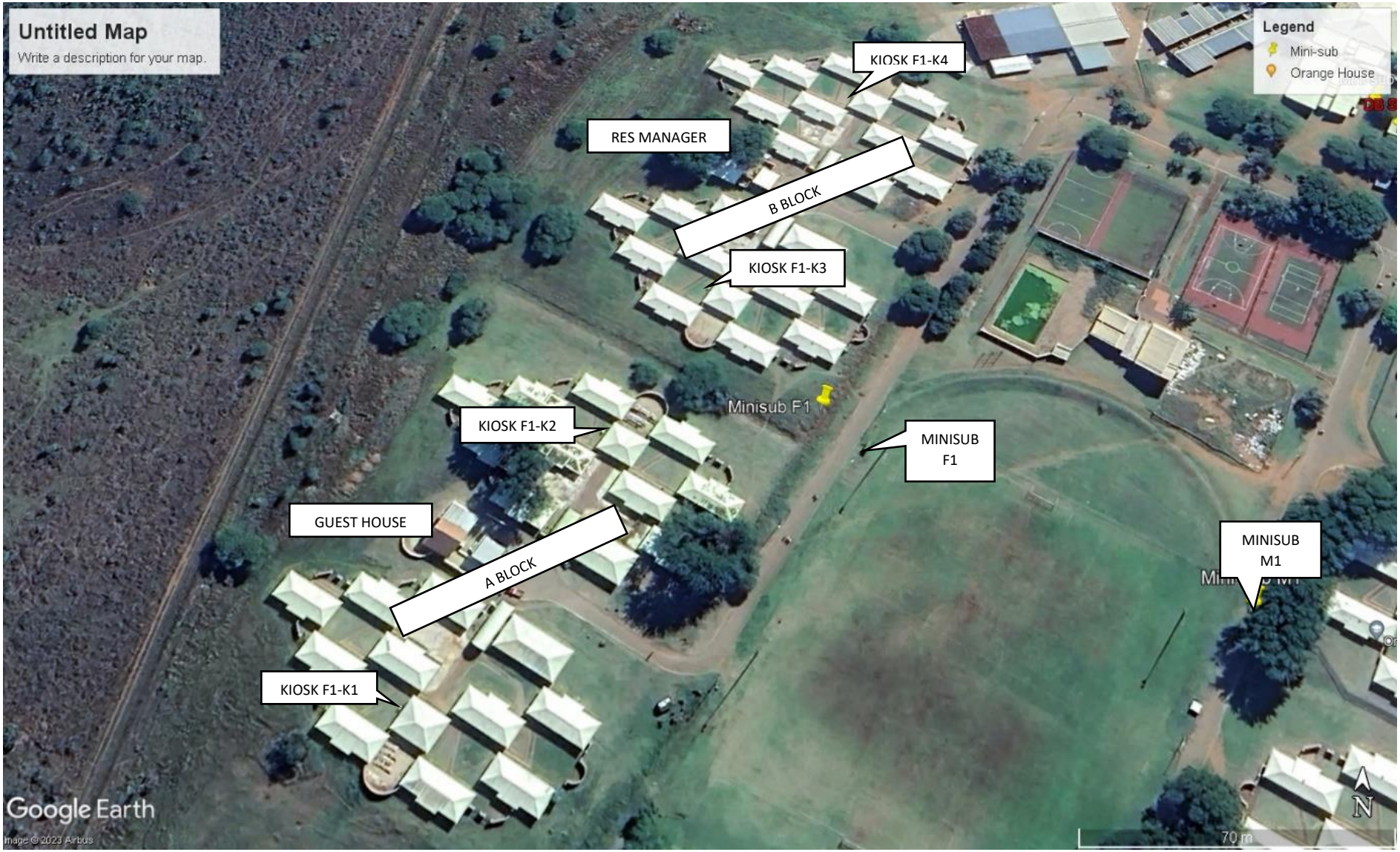
TVET – Mankwe Campus – LV Reticulation

Staff Quarters Layout – 2023

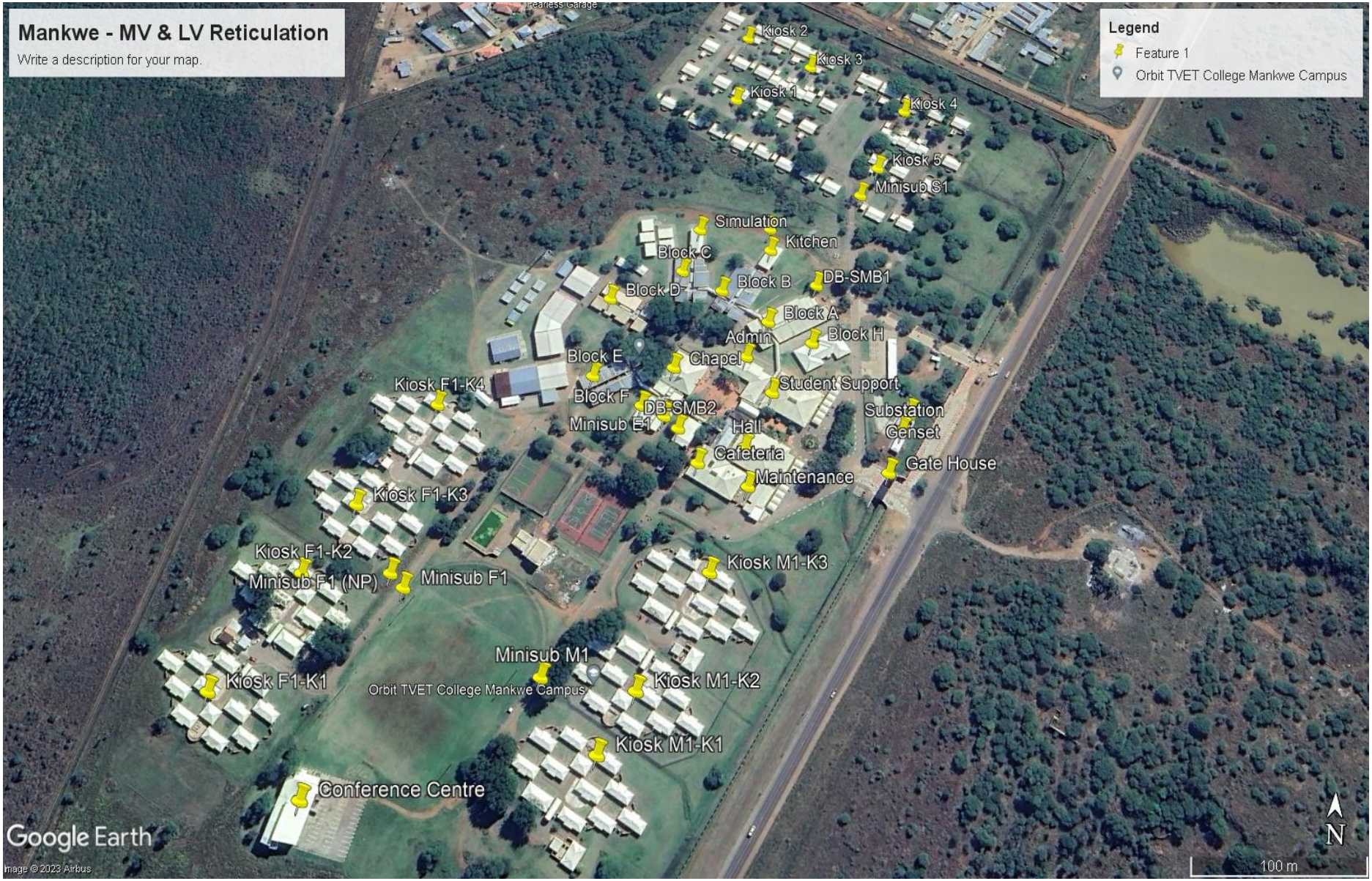


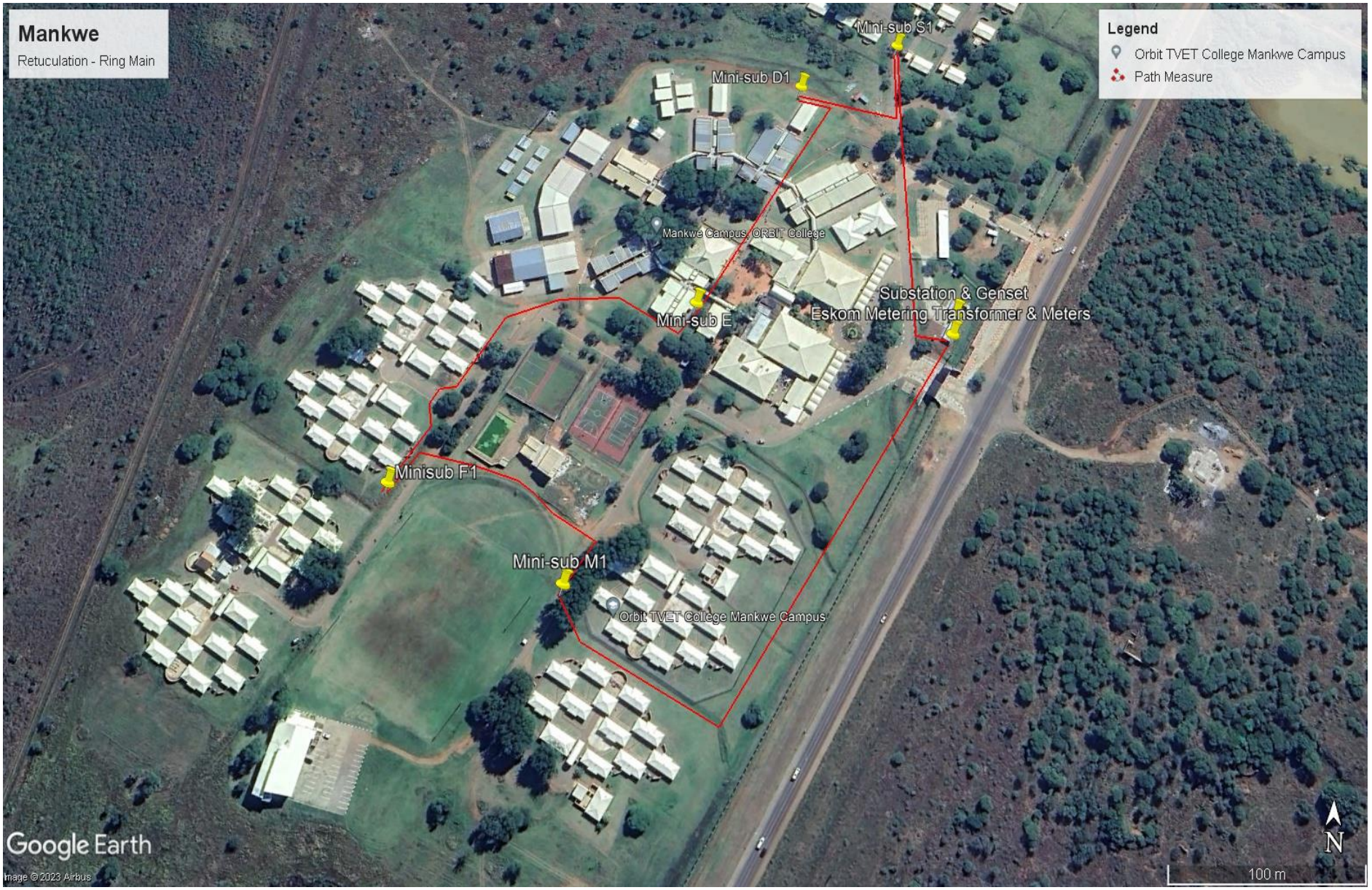

CAMPUS
MINISUB D1
SIMULATION
KITCHEN
BLOCK C
BLOCK B
DB SMB1
BLOCK D
BLOCK A
BLOCK H
Mankwe Campus, ORBIT College
CHAPEL
ADMIN
BLOCK E
STUDENT SUPPORT
BLOCK F
GENSET
Mini-sub E
MINISUB E1
AUD
DB SMB2
SUBSTATION
HALL
CAFETERIA
GATE HOUSE
MAINTENANCE W/SHOP
Legend
Mini-sub
Orange House
Google Earth
60 m
N

Student Residence - Male



Student Residence – Female


Mankwe - MV & LV Reticulation
Write a description for your map.
Legend
Feature 1
Orbit TVET College Mankwe Campus
Kiosk 2
Kiosk 3
Kiosk 1
Kiosk 4
Kiosk 5
Minisub S1
Simulation
Kitchen
Block C
Block B
DB-SMB1
Block D
Block A
Admin
Block H
Block E
Chapel
Kiosk F1-K4
Student Support
Block F
DB-SMB2
Substation
Genset
Minisub E1
Hall
Cafeteria
Gate House
Maintenance
Kiosk F1-K3
Kiosk F1-K2
Kiosk M1-K3
Minisub F1 (NP)
Minisub F1
Minisub M1
Kiosk F1-K1
Orbit TVET College Mankwe Campus
Kiosk M1-K2
Kiosk M1-K1
Conference Centre
Google Earth
Image © 2023 Airbus
N
100 m


Mankwe
Retuculation - Ring Main
Legend
Orbit TVET College Mankwe Campus
Path Measure
Mini-sub S1
Mini-sub D1
Mankwe Campus, ORBIT College
Substation & Genset
Eskom Metering Transformer & Meters
Mini-sub E
Minisub F1
Mini-sub M1
Orbit TVET College Mankwe Campus
Google Earth
Image © 2023 Airbus
N
100 m

## SOLAR BROCHURES AND ADDITIONAL SPECIFICATION

Deye®

# Hybrid Inverter

SUN-8K-SG04LP3

SUN-10K-SG04LP3

SUN-12K-SG04LP3

## User Manual

# Contents

## About This Manual

The manual mainly describes the product information, guidelines for installation, operation and maintenance. The manual cannot include complete information about the photovoltaic (PV) system.

## How to Use This Manual

Read the manual and other related documents before performing any operation on the inverter. Documents must be stored carefully and be available at all times.

**Contents may be periodically updated or revised due to product development. The information in this manual is subject to change without notice.** The latest manual can be acquired via service@deye.com.cn

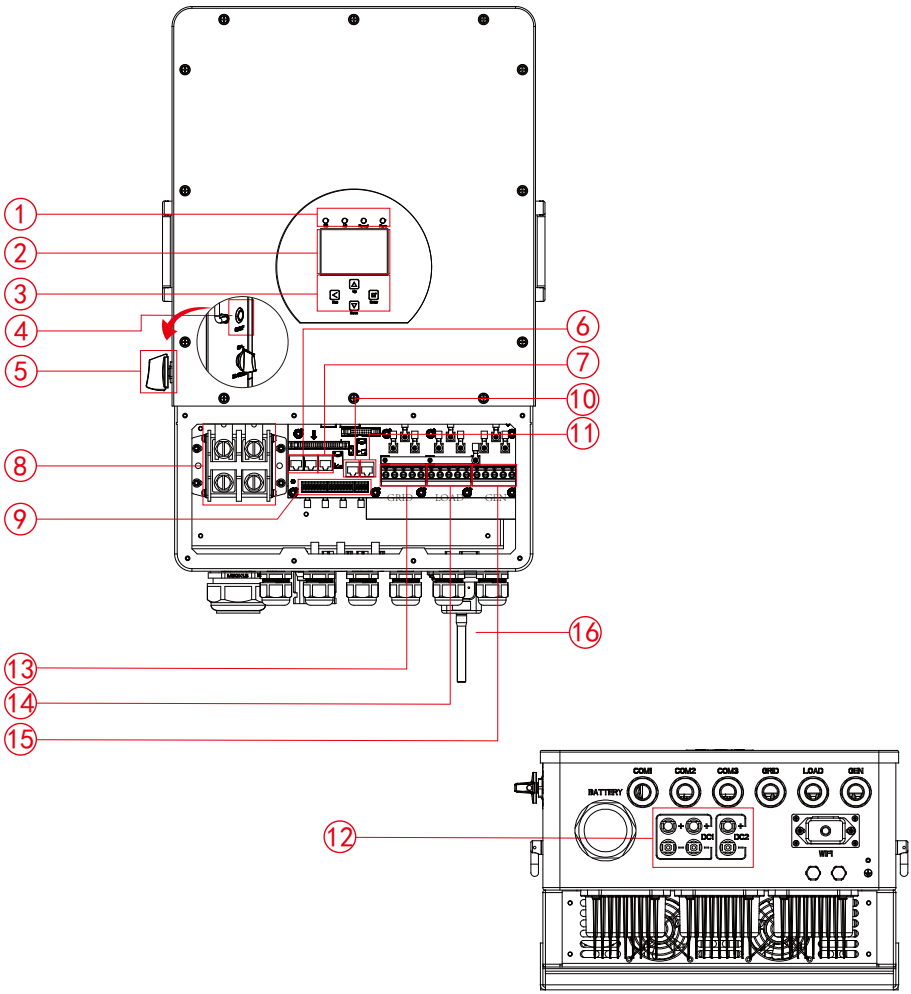
## 1. Safety Introductions

· This chapter contains important safety and operating instructions. Read and keep this manual for future reference.
· Before using the inverter, please read the instructions and warning signs of the battery and corresponding sections in the instruction manual.
· Do not disassemble the inverter. If you need maintenance or repair, take it to a professional service center.
· Improper reassembly may result in electric shock or fire.
· To reduce risk of electric shock, disconnect all wires before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
· Caution: Only qualified personnel can install this device with battery.
· Never charge a frozen battery.
· For optimum operation of this inverter, please follow required specification to select appropriate cable size. It is very important to correctly operate this inverter.
· Be very cautious when working with metal tools on or around batteries. Dropping a tool may cause a spark or short circuit in batteries or other electrical parts, even cause an explosion.
· Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to "Installation" section of this manual for the details.
· Grounding instructions - this inverter should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
· Never cause AC output and DC input short circuited. Do not connect to the mains when DC input short circuits.

## 2. Product Introduction

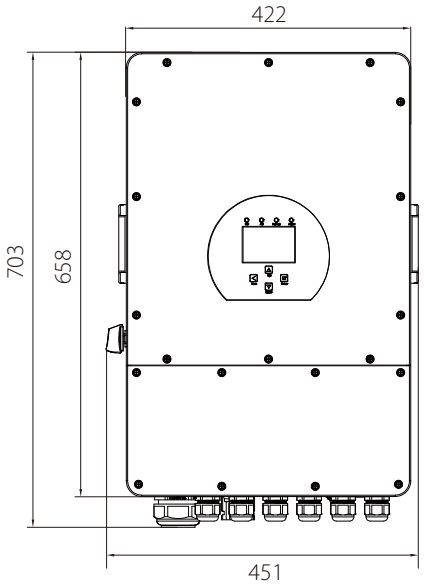
This is a multifunctional inverter, combining functions of inverter, solar charger and battery charger to offer uninterruptible power support with portable size. Its comprehensive LCD display offers user configurable and easy accessible button operation such as battery charging, AC/solar charging, and acceptable input voltage based on different applications.

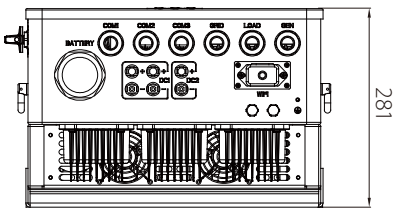
## 2.1 Product Overview



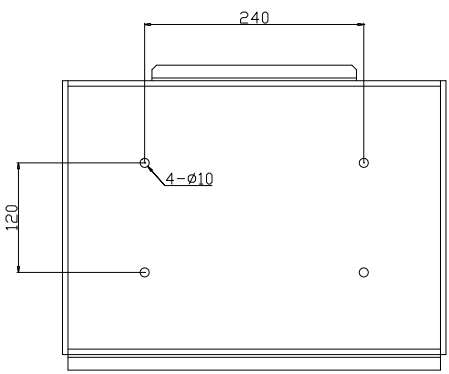

1: Inverter indicators
2: LCD display
3: Function buttons
4: Power on/off button
5: DC switch
6: Parallel port
7: Meter-485 port
8: Battery input connectors
9: Function port
10: ModeBUS port
11: BMS port
12: PV input with two MPPT
13: Grid
14: Load
15: Generator input
16: WiFi Interface

## 2.2 Product Size




Inverter Size




Mounting bracket

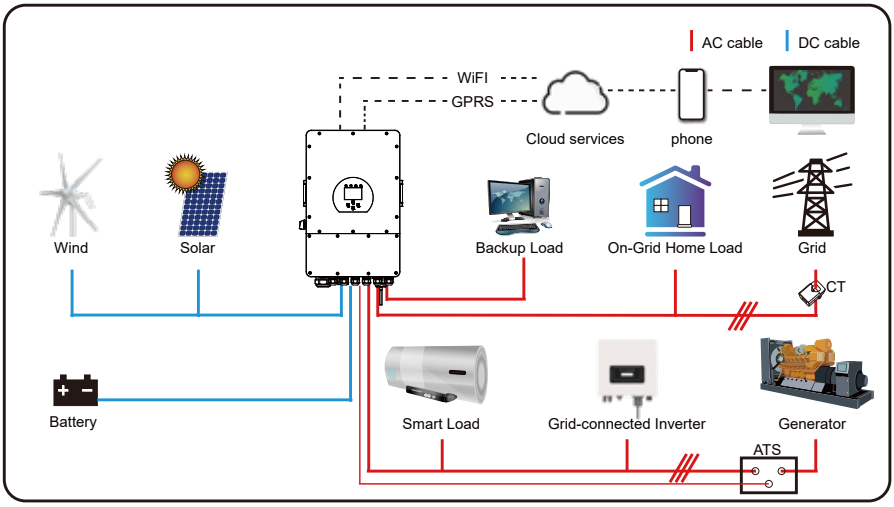
## 2.3 Product Features

- 230V/400V Three phase Pure sine wave inverter.
- Self-consumption and feed-in to the grid.
- Auto restart while AC is recovering.
- Programmable supply priority for battery or grid.
- Programmable multiple operation modes: On grid, off grid and UPS.
- Configurable battery charging current/voltage based on applications by LCD setting.
- Configurable AC/Solar/Generator Charger priority by LCD setting.
- Compatible with mains voltage or generator power.
- Overload/over temperature/short circuit protection.
- Smart battery charger design for optimized battery performance
- With limit function, prevent excess power overflow to the grid.
- Supporting WIFI monitoring and build-in 2 strings for 1 MPP tracker, 1 string for 1 MPP tracker.
- Smart settable three stages MPPT charging for optimized battery performance.
- Time of use function.
- Smart Load Function.

## 2.4 Basic System Architecture

The following illustration shows basic application of this inverter.
It also includes following devices to have a Complete running system.
- Generator or Utility
- PV modules

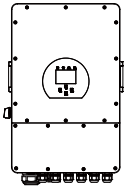
Consult with your system integrator for other possible system architectures depending on your requirements.
This inverter can power all kinds of appliances in home or office environment, including motor type appliances such as refrigerator and air conditioner.



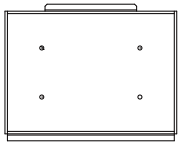
# 3. Installation

## 3.1 Parts List

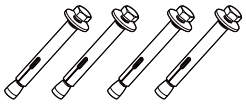
Check the equipment before installation. Please make sure nothing is damaged in the package. You should have received the items in the following package:



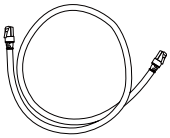
Hybrid inverter
x1



Wall mounting bracket x1

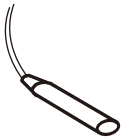


Stainless steel anti-collision bolt M8×80
x4



Parallel communication cable x1

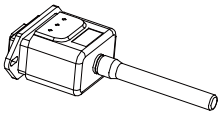
L-type Hexagon wrench
x1



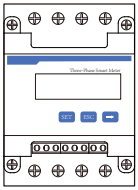
Battery sensor x1

User manual

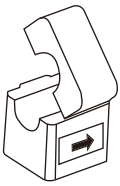
User manual x1



Wi-Fi-Plug (optional) x1



Meter(optional)
x 1



Sensor Clamp(optional)
x 3

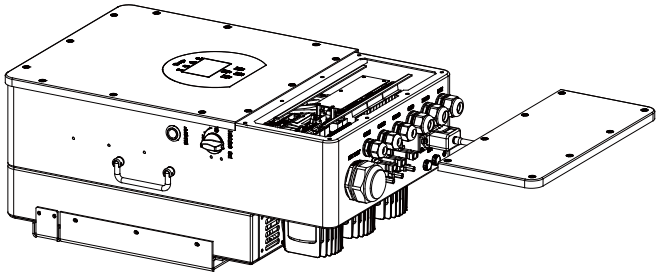
## 3.2 Mounting instructions

### Installation Precaution

This Hybrid inverter is designed for outdoor use(IP65), Please make sure the installation site meets below conditions:

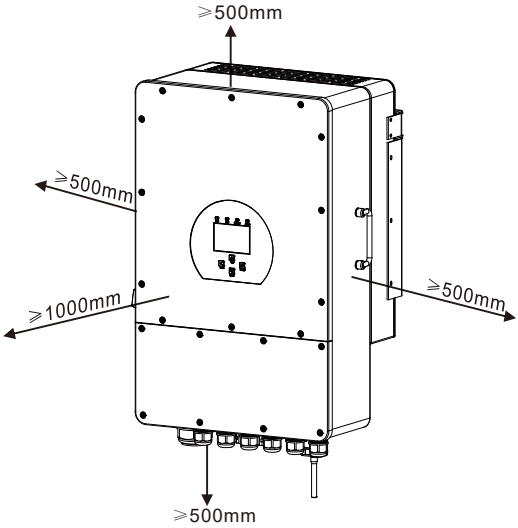
· Not in direct sunlight
· Not in areas where highly flammable materials are stored.
· Not in potential explosive areas.
· Not in the cool air directly.
· Not near the television Antenna or antenna cable.
· Not higher than altitude of about 2000 meters above sea level.
· Not in environment of precipitation or humidity(>95%)

Please AVOID direct sunlight, rain exposure, snow laying up during installation and operation. Before connecting all wires, please take off the metal cover by removing screws as shown below:



### Considering the following points before selecting where to install:

· Please select a vertical wall with load-bearing capacity for installation, suitable for installation on concrete or other non-flammable surfaces,installation is shown below.
· Install this inverter at eye level in order to allow the LCD display to be read at all times.
· The ambient temperature should be between -25~60℃ to ensure optimal operation.
· Be sure to keep other objects and surfaces as shown in the diagram to guarantee sufficient heat dissipation and have enough space for removing wires.

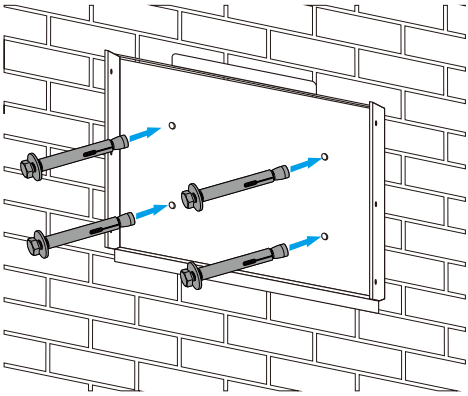



For proper air circulation to dissipate heat, allow a clearance of approx. 50cm to the side and approx. 50cm above and below the unit. And 100cm to the front.

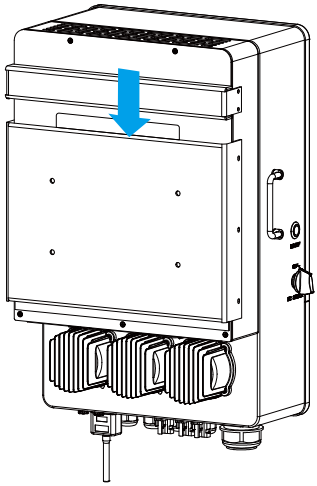
## Mounting the inverter

Remember that this inverter is heavy! Please be careful when lifting out from the package. Choose the recommend drill head(as shown in below pic) to drill 4 holes on the wall, 52-60mm deep.

1. Use a proper hammer to fit the expansion bolt into the holes.
2. Carry the inverter and holding it, make sure the hanger aim at the expansion bolt,fix the inverter on the wall.
3. Fasten the screw head of the expansion bolt to finish the mounting.



Inverter hanging plate installation



### 3.3 Battery connection

For safe operation and compliance, a separate DC over-current protector or disconnect device is required between the battery and the inverter. In some applications, switching devices may not be required but over-current protectors are still required. Refer to the typical amperage in the table below for the required fuse or circuit breaker size.

| *Model* | *Wire Size* | *Cable($mm^2$)* | *Torque value(max)* |
|---|---|---|---|
| 8Kw | 1AWG | 40 | 24.5Nm |
| 10Kw | 1/0AWG | 60 | 24.5Nm |
| 12Kw | 1/0AWG | 60 | 24.5Nm |

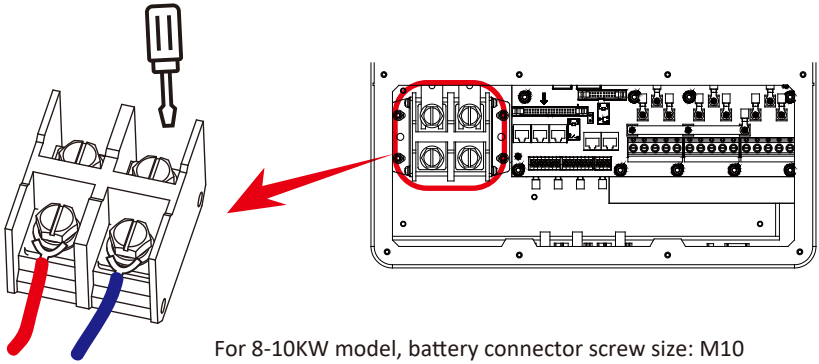
Chart 3-2 Cable size

All wiring must be performed by a professional person.

Connecting the battery with a suitable cable is important for safe and efficient operation of the system. To reduce the risk of injury, refer to Chart 3-2 for recommended cables.

Please follow below steps to implement battery connection:

1. Please choose a suitable battery cable with correct connector which can well fit into the battery terminals. 2. Use a suitable screwdriver to unscrew the bolts and fit the battery connectors in, then fasten the bolt by the screwdriver, make sure the bolts are tightened with torque of 24.5 N.M.
2. Nm in clockwise direction, make sure polarity at both the battery and inverter is correctly connected.



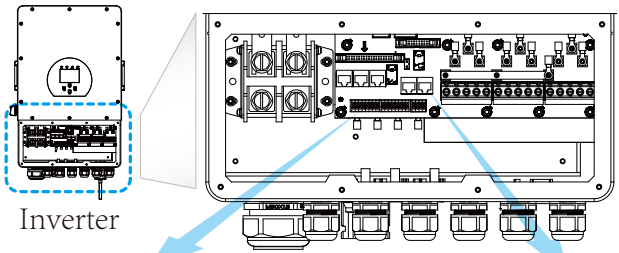
For 8-10KW model, battery connector screw size: M10

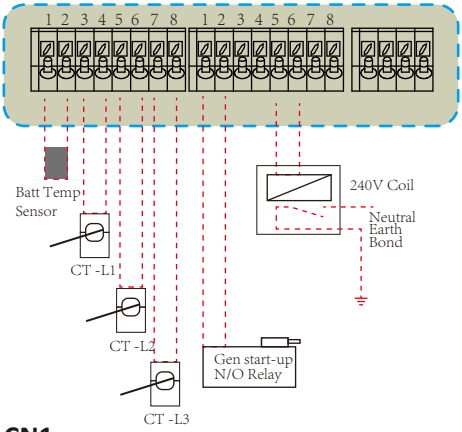
3. In case of children touch or insects go into the inverter, Please make sure the inverter connector is fasten to waterproof position by twist it clockwise.

Installation must be performed with care.

Before making the final DC connection or closing DC breaker/disconnect, be sure positive(+) must be connect to positive(+) and negative(-) must be connected to negative(-). Reverse polarity connection on battery will damage the inverter.

### 3.3.2 Function port definition



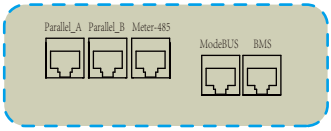

**CN1:**

TEMP (1,2): battery temperature sensor for lead acid battery.

CT-L1 (3,4): current transformer (CT1) for"zero export to CT"mode clamps on L1 when in three phase system.

CT-L2 (5,6): current transformer (CT2) for"zero export to CT"mode clamps on L2 when in three phase system.

CT-L3 (7,8): current transformer (CT3) for"zero export to CT"mode clamps on L3 when in three phase system.




Parallel A: Parallel communication port 1 (CAN interface).

Parallel B: Parallel communication port 2 (CAN interface).

Meter_485: for energy meter communication.

ModeBUS: Reserved.

BMS: BMS port for battery communication(CAN/RS485).

**CN2:**

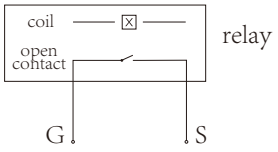
G-start (1,2): dry contact signal for startup the diesel generator.

When the "GEN signal" is active, the open contact (GS) will switch on (no voltage output).

G-valve (3,4): reserved.

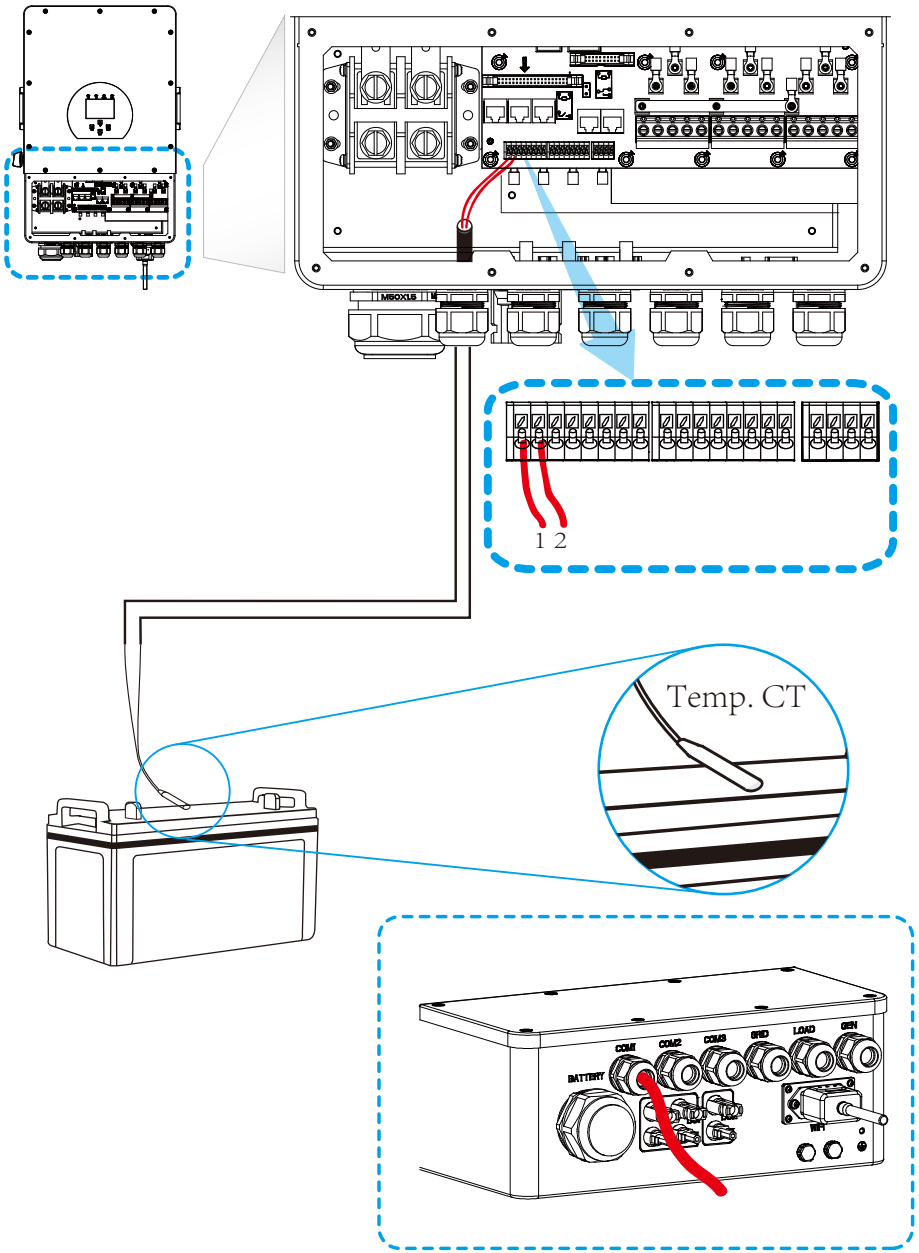
Grid_Ry(5,6): 230V output port when inverter is on

RSD (7,8): provide 12Vdc output when inverter is on.




GS (diesel generator startup signal)

### 3.3.3 Temperature sensor connection for lead-acid battery



## 3.4 Grid connection and backup load connection

· Before connecting to grid, please install a separate AC breaker between inverter and grid. Also, it is recommended that installs an AC breaker between backup load and inverter.This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current.The recommended of AC breaker is 20A for 8kw, 20A for 10kw and 20A for 12KW.

· There are three terminal blocks with "Grid" "Load"and "GEN" markings. Please do not misconnect input and output connectors.

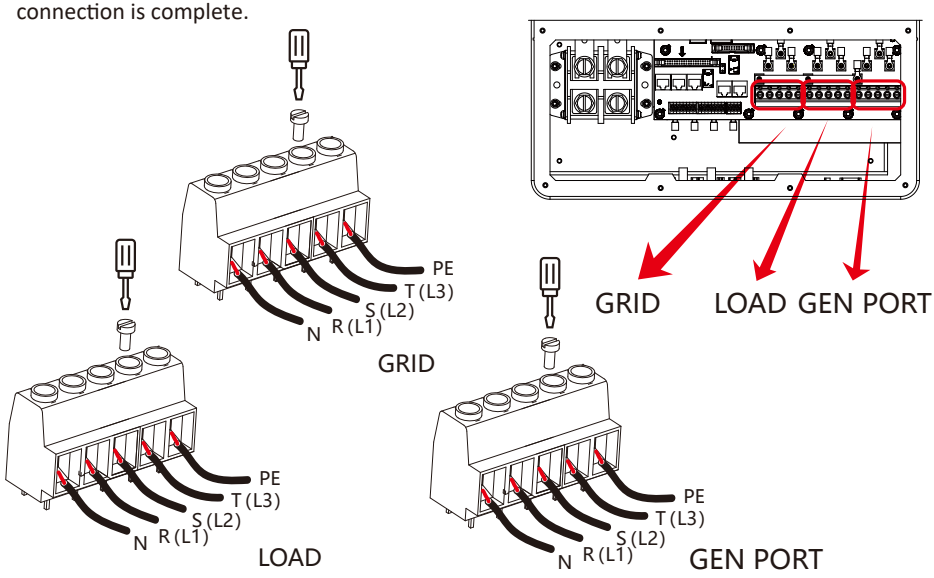
All wiring must be performed by a qualified personnel.It is very important for system safety and efficient operation to use appropriate cable for AC input connection. To reduce risk of injury, please use the proper recommended cable as below.

| *Model* | *Wire Size* | *Cable(mm²)* | *Torque value(max)* |
|---|---|---|---|
| 8/10/12KW | 11AWG | 4 | 1.2Nm |

Chart 3-3 Recommended Size for AC wires

### Please follow below steps to implement Grid, load and Gen port connection:

1. Before making Grid, load and Gen port connection, be sure to turn off AC baeaker or disconnector first.
2. Remove insulation sleeve 10mm length, unscrew the bolts, insert the wires according to polarities indicated on the terminal block and tighten the terminal screws. Make sure the connection is complete.



Be sure that AC power source is disconnected before attempting to wire it to the unit.

3. Then, insert AC output wires according to polarities indicated on the terminal block and tighten terminal. Be sure to connect corresponding N wires and PE wires to related terminals as well.
4. Make sure the wires are securely connected.
5. Appliances such as air conditioner are required at least 2-3 minutes to restart because it is required to have enough time to balance refrigerant gas inside of circuit. If a power shortage occurs and recovers in short time, it will cause damage to your connected appliances. To prevent this kind of damage, please check manufacturer of air conditioner if it is equipped with time-delay function before installation. Otherwise, this inverter will trigger overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner

## 3.5 PV Connection

Before connecting to PV modules, please install a separately DC circuit breaker between inverter and PV modules. It is very important for system safety and efficient operation to use appropriate cable for PV module connection. To reduce risk of injury, please use the proper recommended cable size as below.

| *Model* | *Wire Size* | *Cable(mm² )* |
|---|---|---|
| 8/10/12KW | 12AWG | 4 |

Chart 3-4 Cable size

To avoid any malfunction, do not connect any PV modules with possible current leakage to the inverter. For example, grounded PV modules will cause current leakage to the inverter. When using PV modules, please be sure NO grounding.

It is requested to use PV junction box with surge protection. Otherwise, it will cause damage on inverter when lightning occurs on PV modules.

### 3.5.1 PV Module Selection:

When selecting proper PV modules, please be sure to consider below parameters:
1) Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.
2) Open circuit Voltage (Voc) of PV modules should be higher than min. start voltage.

| *Inverter Model* | *8KW* | *10KW* | *12KW* |
|---|---|---|---|
| PV Input Voltage | 550V (160V~800V) | | |
| PV Array MPPT Voltage Range | 200V-650V | | |
| No. of MPP Trackers | 2 | | |
| No. of Strings per MPP Tracker | 1+1 | 2+1 | 2+1 |

Chart 3-5

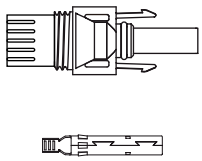
### 3.5.2 PV Module Wire Connection:

1. Switch the Grid Supply Main Switch(AC)OFF.
2. Switch the DC Isolator OFF.
3. Assemble PV input connector to the inverter.

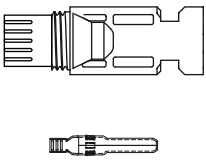
*Safety Hint:*
Please don't connect PV array positive or negative pole to the ground, it could cause serious damages to the inverter.

*Safety Hint:*
Before connection, please make sure the polarity of the output voltage of PV array matches the "DC+" and "DC-" symbols.

*Safety Hint:*
Before connecting inverter, please make sure the PV array open circuit voltage is within the 1000V of the inverter.



Pic 3.1 DC+connector (MC4)



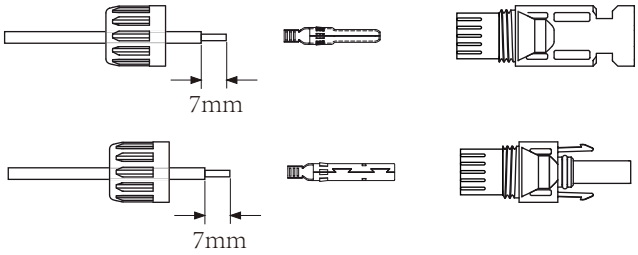
Pic 3.2 DC-connector (MC4)

*Safety Hint:*
Please use approved DC cable for PV system.

| *Cable type* | *Cross section* (mm²) | |
|---|---|---|
| | *Range* | *Recommended value* |
| Industry generic PV cable (model: PV1-F) | 4.0~6.0 (12~10AWG) | 4.0(12AWG) |

Chart 3-6

The steps to assemble the DC connectors are listed as follows:
a) Strip off the DC wire about 7mm, disassemble the connector cap nut (see picture 5.3).

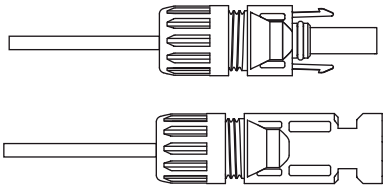



Pic 3.3 Disassemble the connector cap nut

b) Crimping metal terminals with crimping pliers as shown in picture 5.4.

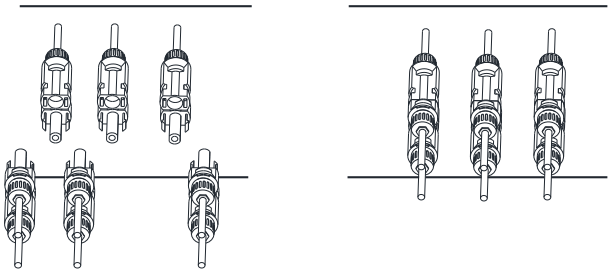

Pic 3.4 Crimp the contact pin to the wire

c) Insert the contact pin to the top part of the connector and screw up the cap nut to the top part of the connector. (as shown in picture 5.5).



Pic 3.5 connector with cap nut screwed on

d) Finally insert the DC connector into the positive and negative input of the inverter, shown as picture 5.6

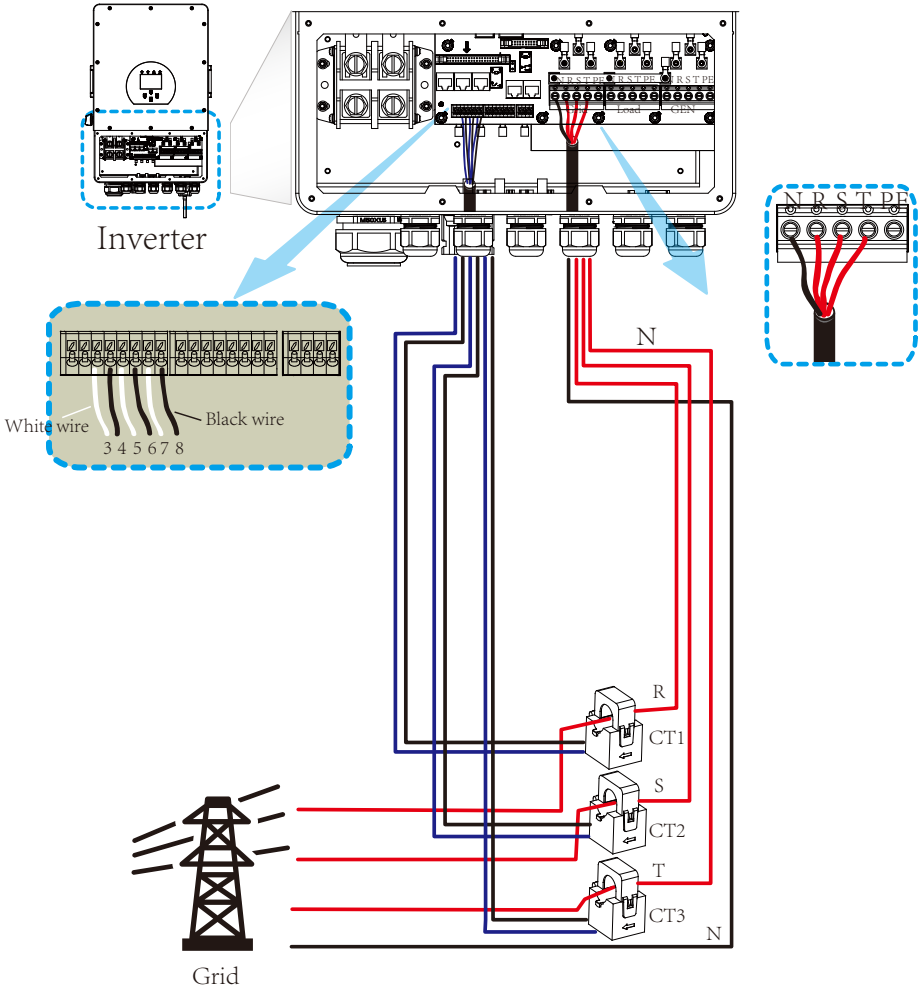


Pic 3.6 DC input connection

*Warning:*

Sunlight shines on the panel will generate voltage, high voltage in series may cause danger to life. Therefore, before connecting the DC input line, the solar panel needs to be blocked by the opaque material and the DC switch should be 'OFF', otherwise, the high voltage of the inverter may lead to life-threatening conditions.

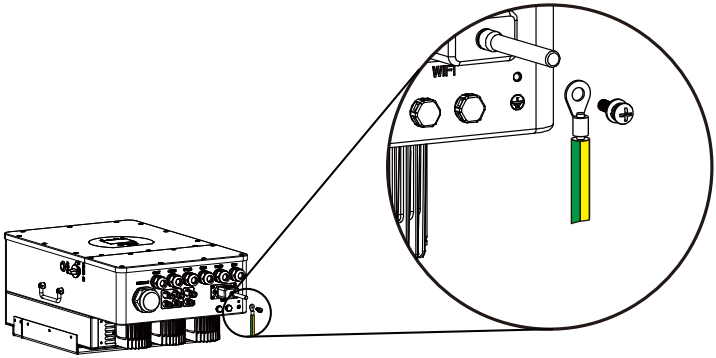
## 3.6 CT Connection



*Note:*
When the inverter is in the off-grid state, the N line needs to be connected to the earth.

## 3.7 Earth Connection(mandatory)

Ground cable shall be connected to ground plate on grid side this prevents electric shock. if the original protective conductor fails.



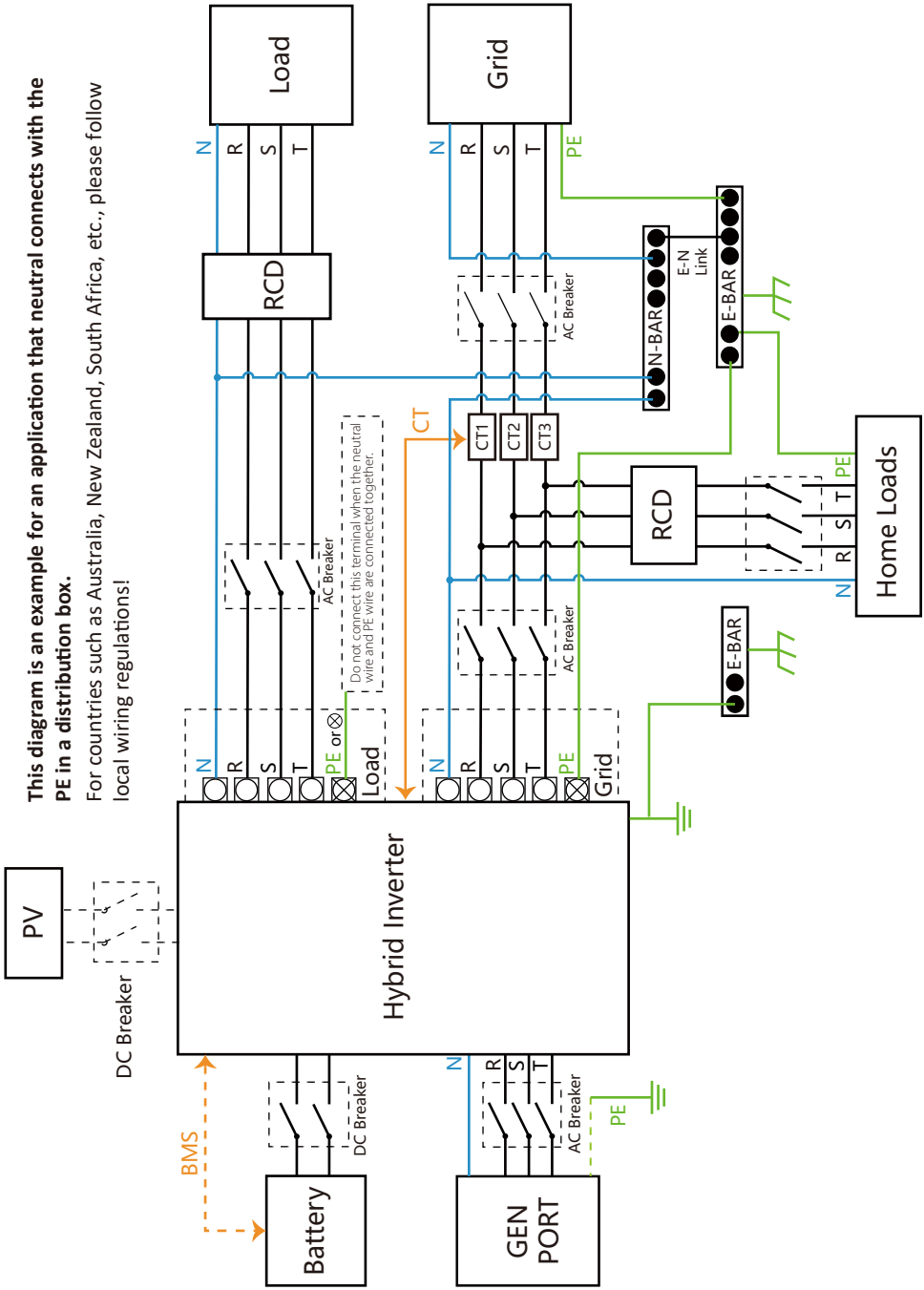

## 3.8 WIFI Connection

For the configuration of Wi-Fi Plug, please refer to illustrations of the Wi-Fi Plug.

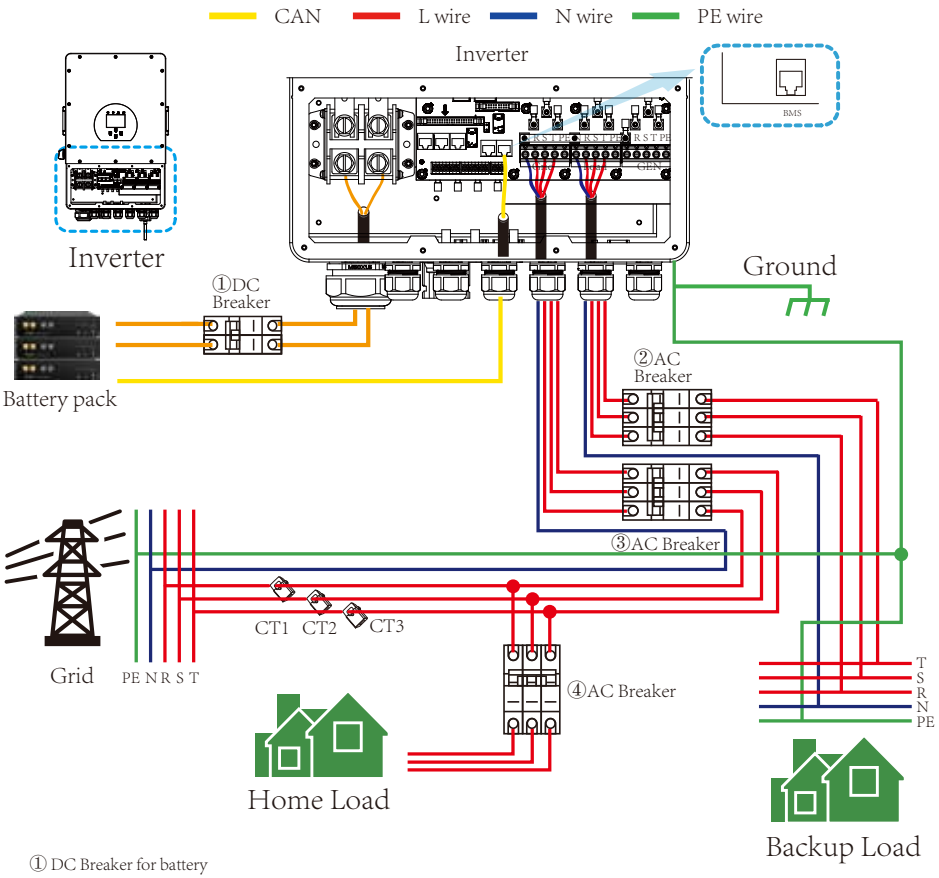
## 3.9 Wiring System for Inverter

**This diagram is an example for an application that neutral connects with the PE in a distribution box.**

For countries such as Australia, New Zealand, South Africa, etc., please follow local wiring regulations!



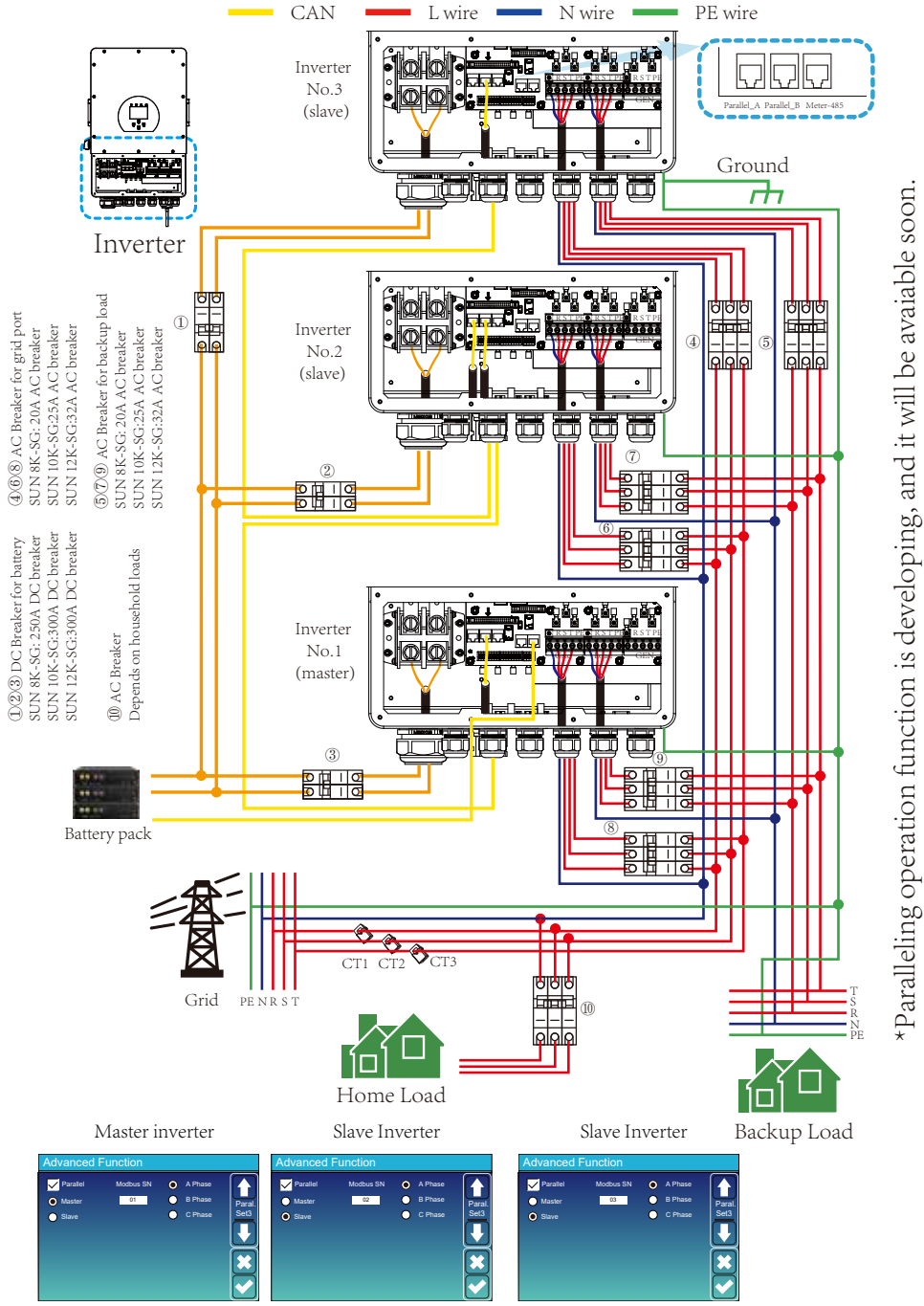
## 3.10 Wiring diagram




① DC Breaker for battery
SUN 8K-SG: 250A DC breaker
SUN 10K-SG:300A DC breaker
SUN 12K-SG:300A DC breaker

②③④AC Breaker for grid and backup load
SUN 8K-SG: 20A AC breaker
SUN 10K-SG:25A AC breaker
SUN 12K-SG:32A AC breaker

## 3.11 phase parallel connection diagram




*Paralleling operation function is developing, and it will be avaiable soon.

# 4. OPERATION

## 4.1 Power ON/OFF

Once the unit has been properly installed and the batteries are connected well, simply press On/Off button(located on the left side of the case) to turn on the unit. When system without battery connected, but connect with either PV or grid, and ON/OFF button is switched off, LCD will still light up(Display will show OFF), In this condition, when switch on ON/OFF button and select NO battery,system can still working.

## 4.2 Operation and Display Panel

The operation and display panel, shown in below chart, is on the front panel of the inverter. It includes four indicators, four function keys and a LCD display, indicating the operating status and input/output power information.

| ***LED Indicator*** | | ***Messages*** |
|---|---|---|
| DC | Green led solid light | PV Connection normal |
| AC | Green led solid light | Grid Connection normal |
| Normal | Green led solid light | Inverter operating normal |
| Alarm | Red led solid light | Malfunction or warning |

Chart 4-1 LED indicators

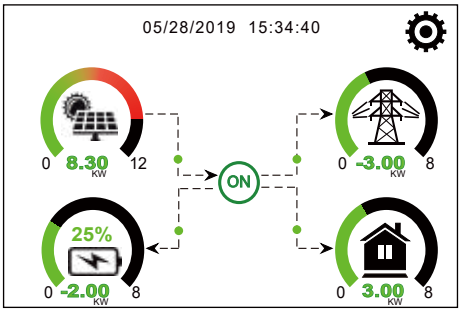
| ***Function Key*** | ***Description*** |
|---|---|
| Esc | To exit setting mode |
| Up | To go to previous selection |
| Down | To go to next selection |
| Enter | To confirm the selection |

Chart 4-2 Function Buttons

# 5. LCD Display Icons

## 5.1 Main Screen

The LCD is touchscreen, below screen shows the overall information of the inverter.




1.The icon in the center of the home screen indicates that the system is Normal operation. If it turns into "comm./F01~F64" , it means the inverter has communication errors or other errors, the error message will display under this icon(F01-F64 errors, detail error info can be viewed in the System Alarms menu).

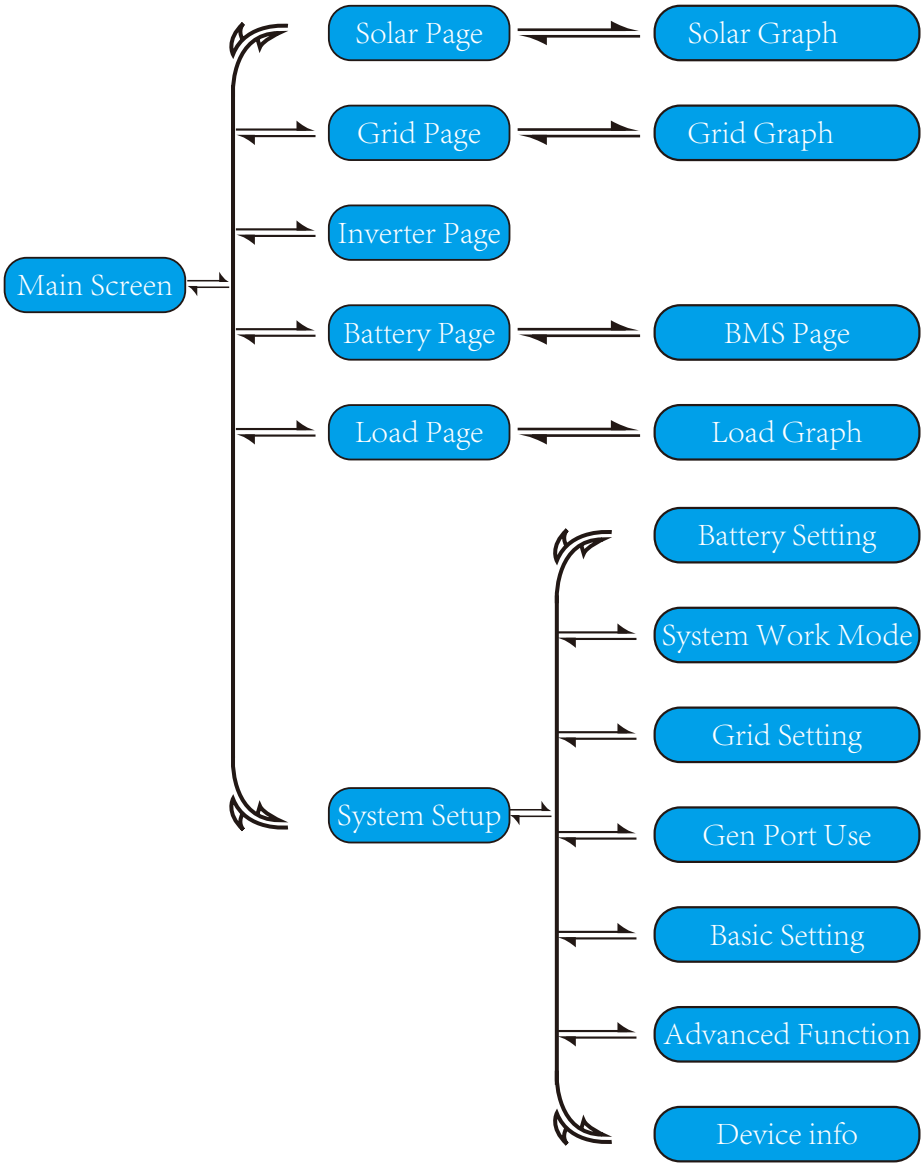
2.At the top of the screen is the time.

3.System Setup Icon, Press this set button,you can enter into the system setup screen which including Basic Setup, Battery Setup, Grid Setup, System Work Mode, Generator port use, Advanced function and Li-Batt info.

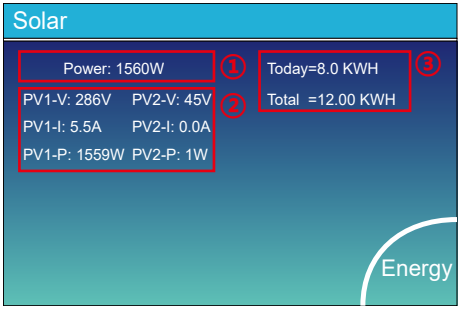
4.The main screen showing the info including Solar, Grid, Load and Battery. Its also displaying the energy flow direction by arrow. When the power is approximate to high level, the color on the panels will changing from green to red so system info showing vividly on the main screen.

· PV power and Load power always keep positive.
· Grid power negative means sell to grid, positive means get from grid.
· Battery power negative means charge, positive means discharge.

### 5.1.1 LCD operation flow chart



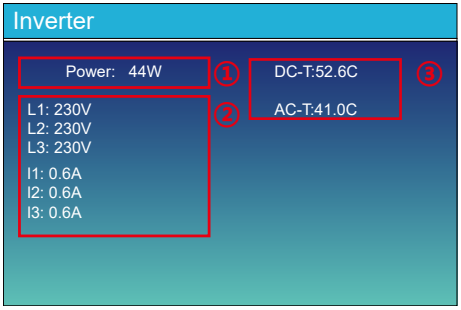
## 5.2 Solar Power Curve




**This is Solar Panel detail page.**

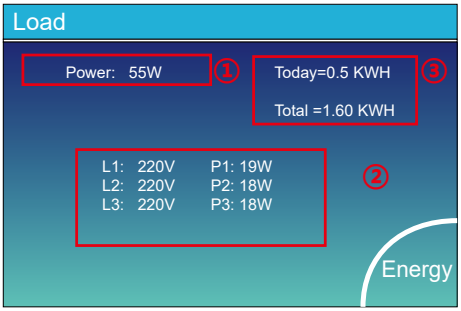
① Solar Panel Generation.
② Voltage, Current, Power for each MPPT.
③ Solar Panel energy for Day and Total.

Press the “Energy “button will enter into the power curve page.




**This is Inverter detail page.**

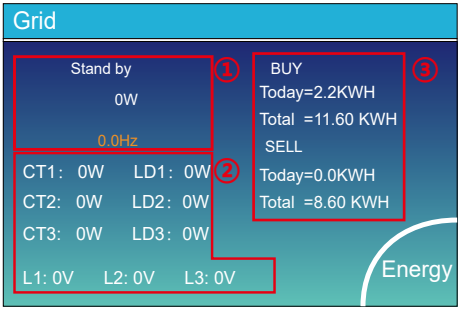
① Inverter Generation.
② Voltage, Current, Power for each Phase.
③ *DC-T: mean DC-DC temperature,
AC-T: mean Heat-sink temperature.
*Note: this part info is not avaiable for some LCD FW.




**This is Back-up Load detail page.**

① Back-up Power.
② Voltage, Power for each Phase.
③ Back-up consumption for Day and Total.

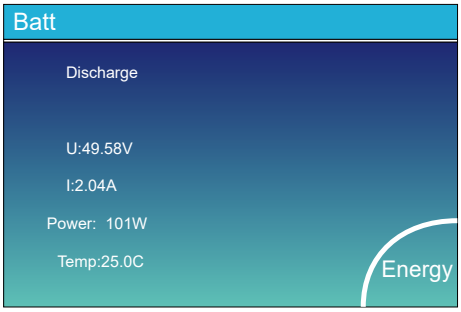
Press the “Energy “ button will enter into the power curve page.

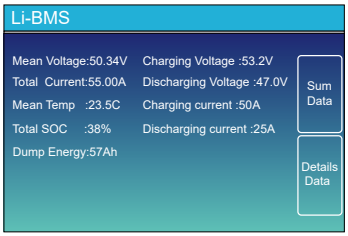


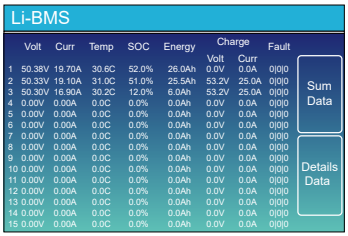

**This is Grid detail page.**

① Status, Power, Frequency.
② L: Voltage for each Phase
CT: Power detected by the external current sensors
LD: Power detected using internal sensors on AC grid in/out breaker
③ BUY: Energy from Grid to Inverter,
SELL: Energy from Inverter to grid.

Press the “Energy “ button will enter into the power curve page.



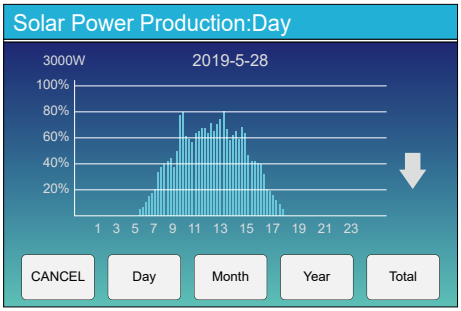



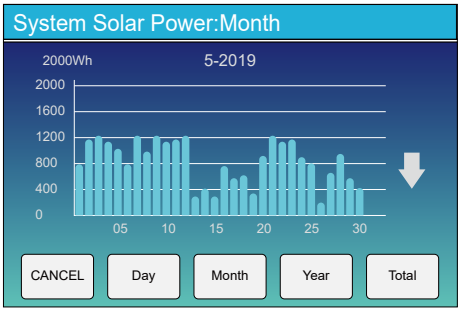



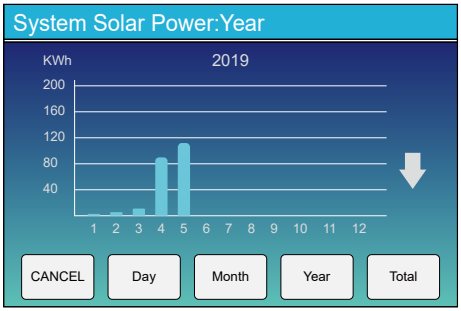

This is Battery detail page.

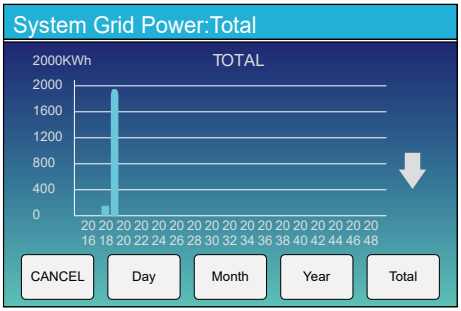
if you use Lithium Battery, you can enter BMS page.

## 5.3 Curve Page-Solar & Load & Grid



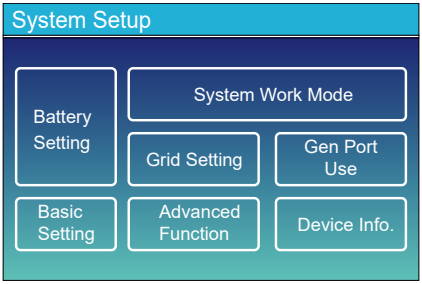



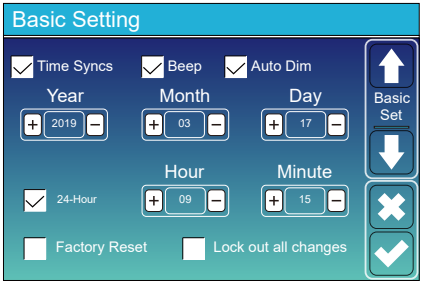

Solar power curve for daily, monthly, yearly and total can be roughly checked on the LCD, for more accuracy power generation, pls check on the monitoring system. Click the up and down arrow to check power curve of different period.

## 5.4 System Setup Menu

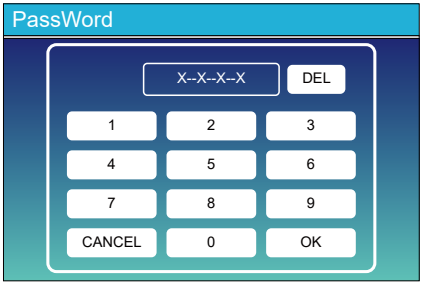



This is System Setup page.

## 5.5 Basic Setup Menu



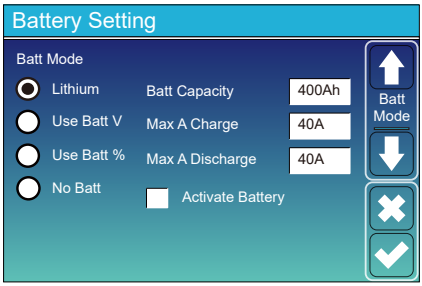

**Factory Reset:** Reset all parameters of the inverter.
**Lock out all changes:** Enable this menu for setting parameters that require locking and cannot be set up. Before performing a successful factory reset and locking the systems, to keep all changes you need to type in a password to enable the setting.
The password for factory settings is 9999 and for lock out is 7777.




**Factory Reset PassWork:** 9999

**Lock out all changes PassWork:** 7777

## 5.6 Battery Setup Menu




**Battery capacity:** it tells Deye hybrid inverter to know your battery bank size.

**Use Batt V:** Use Battery Voltage for all the settings (V).

**Use Batt %:** Use Battery SOC for all the settings (%).

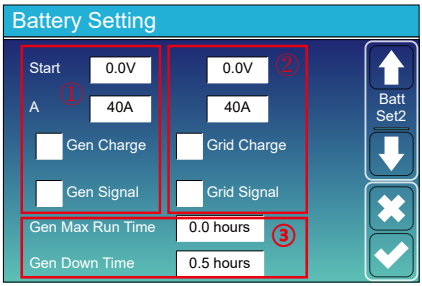
**Max. A charge/discharge:** Max battery charge/discharge current(0-115A for 5KW model, 0-90A for 3.6KW model). For AGM and Flooded, we recommend Ah battery size x 20%= Charge/Discharge amps.

. For Lithium, we recommend Ah battery size x 50% = Charge/Discharge amps.

. For Gel, follow manufacturer' s instructions.

**No Batt:** tick this item if no battery is connected to the system.

**Active battery:** This feature will help recover a battery that is over discharged by slowly charging from the solar array or grid.




**This is Battery Setup page.** ①③

**Start =30%:** Percent S.O.C at 30% system will AutoStart a connected generator to charge the battery bank.

**A = 40A:** Charge rate of 40A from the attached generator in Amps.

**Gen Charge:** uses the gen input of the system to charge battery bank from an attached generator.

**Gen Signal:** Normally open relay that closes when the Gen Start signal state is active.

**Gen Max Run Time:** It indicates the longest time Generator can run in one day, when time is up, the Generator will be turned off. 24H means that it does not shut down all the time.

**Gen Down Time:** It indicates the delay time of the Generator to shut down after it has reached the running time.

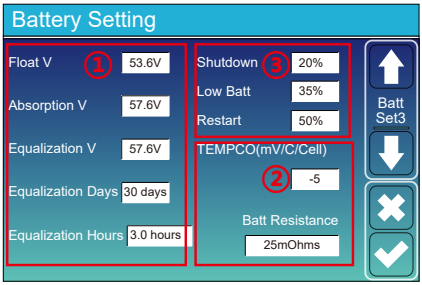
**This is Grid Charge, you need select.** ②

**Start =30%:** No use， Just for customization.

**A = 40A:** It indicates the Current that the Grid charges the Battery.

**Grid Charge:** It indicates that the grid charges the battery.

**Grid Signal:** Disable.




**There are 3 stages of charging the Battery .** ①

This is for professional installers, you can keep it if you do not know. ②

**Shutdown 20%:** The inverter will shutdown if the SOC below this value.

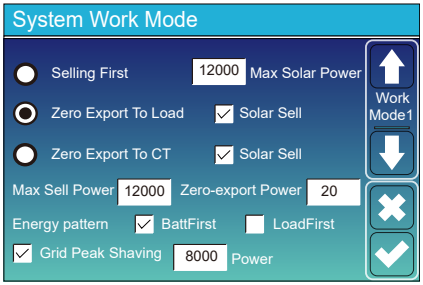
**Low Batt 35%:** The inverter will alarm if the SOC below this value. ③

**Restart 50%:** Battery SOC at 50% AC output will resume.

Recommended battery settings

| *Battery Type* | *Absorption Stage* | *Float Stage* | *Torque value (every 30 days 3hr )* |
|---|---|---|---|
| AGM (or PCC) | 14.2v (57.6v) | 13.4v (53.6v) | 14.2v(57.6v) |
| Gel | 14.1v (56.4v) | 13.5v (54.0v) | |
| Wet | 14.7v (59.0v) | 13.7v (55.0v) | 14.7v(59.0v) |
| Lithium | Follow its BMS voltage parameters | | |

## 5.7 System Work Mode Setup Menu




**Work Mode**

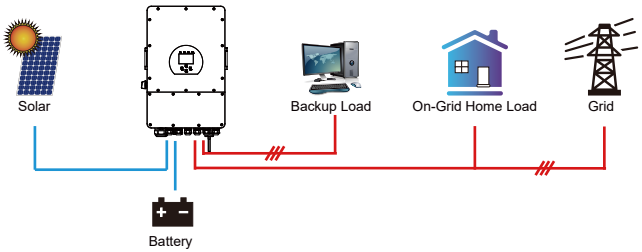
**Selling First:** This Mode allows hybrid inverter to sell back any excess power produced by the solar panels to the grid. If time of use is active, the battery energy also can be sold into grid.

The PV energy will be used to power the load and charge the battery and then excess energy will flow to grid.

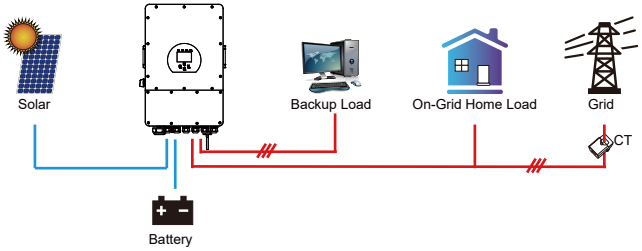
Power source priority for the load is as follows:

1. Solar Panels.
2. Grid.
3. Batteries (until programable % discharge is reached).

**Zero Export To Load:** Hybrid inverter will only provide power to the backup load connected. The hybrid inverter will neither provide power to the home load nor sell power to grid. The built-in CT will detect power flowing back to the grid and will reduce the power of the inverter only to supply the local load and charge the battery.




**Zero Export To CT:** Hybrid inverter will not only provide power to the backup load connected but also give power to the home load connected. If PV power and battery power is insufficient, it will take grid energy as supplement. The hybrid inverter will not sell power to grid. In this mode, a CT is needed. The installation method of the CT please refer to chapter 3.6 CT Connection. The external CT will detect power flowing back to the grid and will reduce the power of the inverter only to supply the local load, charge battery and home load.



**Solar Sell:** "Solar sell" is for Zero export to load or Zero export to CT: when this item is active, the surplus energy can be sold back to grid. When it is active, PV Power source priority usage is as follows: load consumption and charge battery and feed into grid.

**Max. sell power:** Allowed the maximum output power to flow to grid.

**Zero-export Power:** for zero-export mode, it tells the grid output power. Recommend to set it as 20-100W to ensure the hybrid inverter won' t feed power to grid.

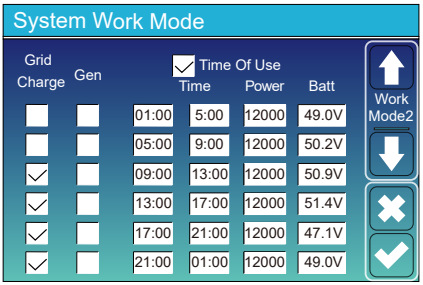
**Energy Pattern:** PV Power source priority.

**Batt First:** PV power is firstly used to charge the battery and then used to power the load. If PV power is insufficient, grid will make supplement for battery and load simultaneously.

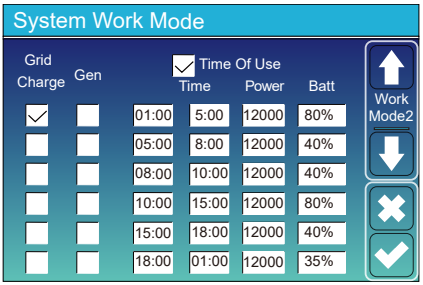
**Load First:** PV power is firstly used to power the load and then used to charge the battery. If PV power is insufficient, grid will make supplement for battery and load simultaneously.

**Max Solar Power:** allowed the maximum DC input power.

**Grid Peak-shaving:** when it is active, grid output power will be limited within the set value. If the load power exceeds the allowed value, it will take PV energy and battery as supplement. If still can't meet the load requirement, grid power will increase to meet the load needs.




**Time of use:** it is used to program when to use grid or generator to charge the battery, and when to discharge the battery to power the load. Only tick "Time Of Use" then the follow items (Grid, charge, time, power etc.) will take effect.
**Note:** when in selling first mode and click time of use, the battery power can be sold into grid.
**Grid charge:** utilize grid to charge the battery in a time period.
**Gen charge:** utilize diesel generator to charge the battery in a time period.
**Time:** real time, range of 01:00-24:00.
**Power:** Max. discharge power of battery allowed.
**Batt(V or SOC %):** battery SOC % or voltage at when the action is to happen.




**For example:**

During 01:00-05:00, when battery SOC is lower than 80%, it will use grid to charge the battery until battery SOC reaches 80%.

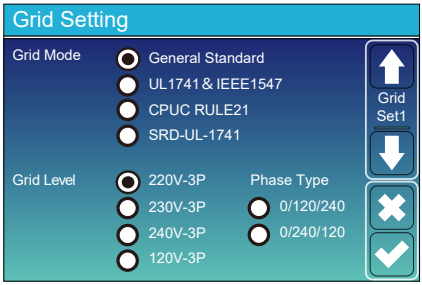
During 05:00-08:00 and 08:00-10:00, when battery SOC is higher than 40%, hybrid inverter will discharge the battery until the SOC reaches 40%.

During 10:00-15:00, when battery SOC is higher than 80%, hybrid inverter will discharge the battery until the SOC reaches 80%.

During 15:00-18:00, when battery SOC is higher than 40%, hybrid inverter will discharge the battery until the SOC reaches 40%.

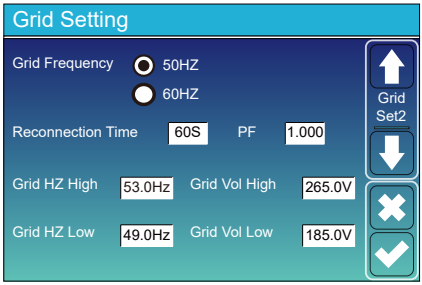
During 18:00-01:00, when battery SOC is higher than 35%, hybrid inverter will discharge the battery until the SOC reaches 35%.

## 5.8 Grid Setup Menu




Please select the correct Grid Mode in your local area. If you are not sure, please choose General Standard.

Please select the correct Grid Type in your local area, otherwise the machine will not work or be damaged.

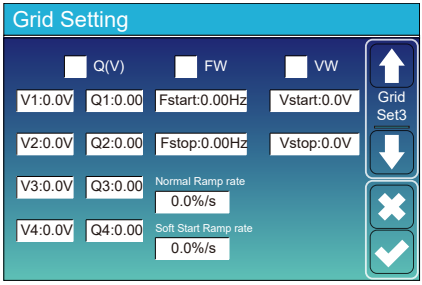



**UL1741&IEEE1547**, **CPUC RULE21**, **SRD-UL-1741**

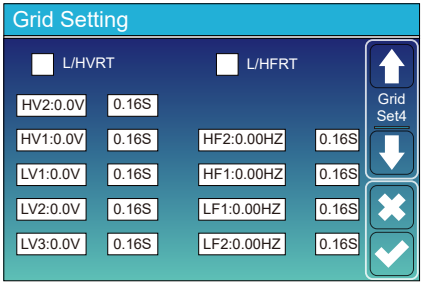
No need to set the function of this interface.

**General Standard**

Please select the correct Grid Frequency in your local area.
You can hole this in default value.

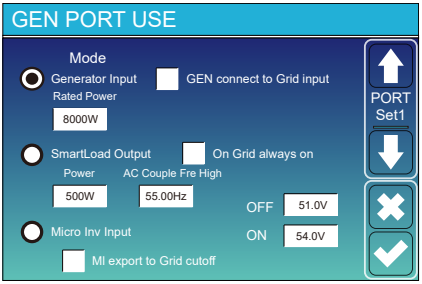



For California only.




For California only.

## 5.9 Generator  Port Use Setup Menu




**Generator input rated power:** allowed Max. power from diesel generator.
**GEN connect to grid input:** connect the diesel generator to the grid input port.
**Smart Load Output:** This mode utilizes the Gen input connection as an output which only receives power when the battery SOC and PV power is above a user programmable threshold.
**e.g. Power=500W, ON: 100%, OFF=95%:** When the PV power exceeds 500W, and battery bank SOC reaches 100%, Smart Load Port will switch on automatically and power the load connected. When the battery bank SOC < 95% or PV power < 500w, the Smart Load Port will switch off automatically.

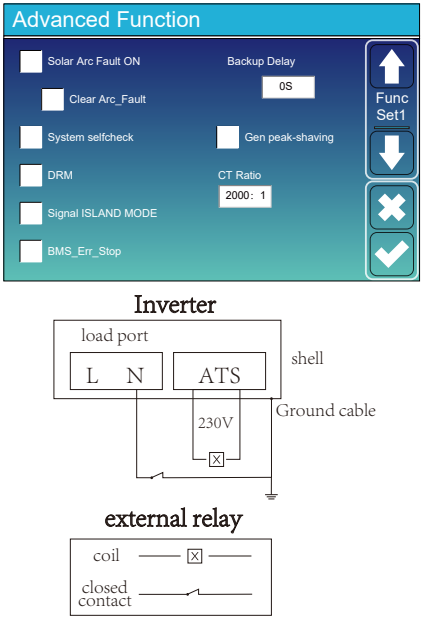
**Smart Load OFF Batt**
• Battery SOC at which the Smart load will switch off.
**Smart Load ON Batt**
• Battery SOC at which the Smart load will switch on. Also, the PV input power should exceed the setting value (Power) simultaneously and then the Smart load will switch on.
**On Grid always on:** When click "on Grid always on" the smart load will switch on when the grid is present.
**Micro Inv Input:** To use the Generator input port as a micro-inverter on grid inverter input (AC coupled), this feature will also work with "Grid-Tied" inverters.

* Micro Inv Input OFF: when the battery SOC exceeds setting value, Microinveter or grid-tied inverter will shut down.
* Micro Inv Input ON: when the battery SOC is lower than setting value, Microinveter or grid-tied inverter will start to work.

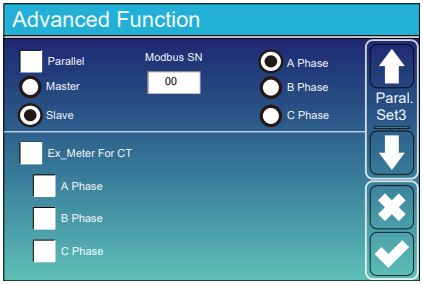
**AC Couple Fre High:** If choosing“Micro Inv input”, as the battery SOC reaches gradually setting value (OFF), During the process, the microinverter output power will decrease linear. When the battery SOC equals to the setting value (OFF), the system frequency will become the setting value (AC couple Fre high) and the Microinverter will stop working.
MI export to grid cutsoff:  Stop exporting power produced by the microinverter to the grid.

* Note: Micro Inv Input OFF and On is valid for some certain FW version only.

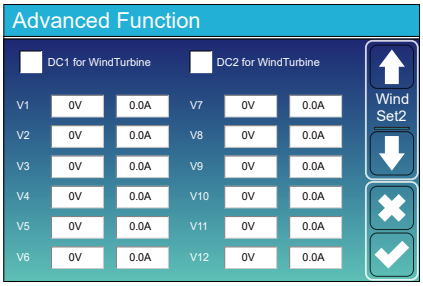
## 5.10 Advanced Function Setup Menu




**Solar Arc Fault ON:** This is only for US.
**System selfcheck:** Disable. this is only for factory.
**Gen Peak-shaving:** Enable When the power of the generator exceeds the rated value of it, the inverter will provide the redundant part to ensure that the generator will not overload.
**DRM:** For AS4777 standard
**Backup Delay:** Reserved
**BMS_Err_Stop:** When it is active, if the battery BMS failed to communicate with inverter, the inverter will stop working and report fault.
**Signal island mode:** when the inverter connects grid, the ATS port will output 230Vac and it is used to cuts off Earth-Neutral(load port N line) bond via connect external relay. When the inverter disconnects from the grid, ATS port voltage will be 0 and the Earth-Neutral bond keeps on. More details, please refer to left picture.



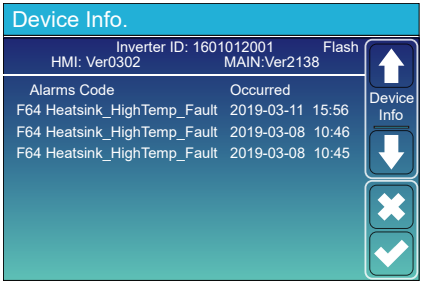

**Ex_Meter For CT:** when in Three phase system with CHNT Three phase energy meter (DTSU666), click corresponding phase where hybrid inverter is connected. e.g. when the hybrid inverter output connects to A phase, please click A Phase.




**This is for Wind Turbine**

**Note:** This interface is not available for some firmware version

## 5.11 Device Info Setup Menu



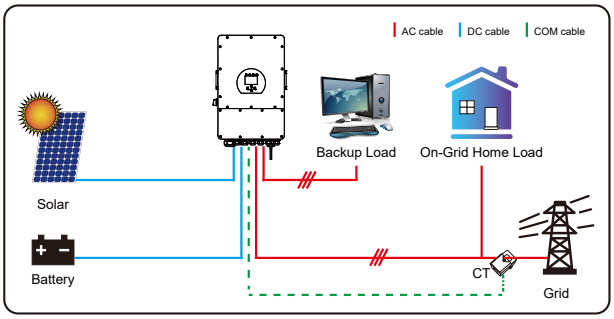

**This page show Inverter ID, Inverter version and alarm codes.**

**HMI:** LCD version

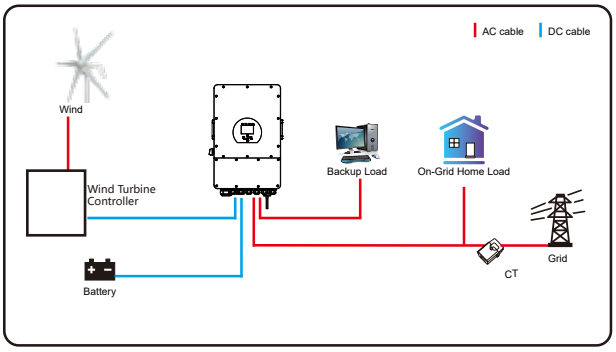
**MAIN:** Control board FW version

# 6. Mode

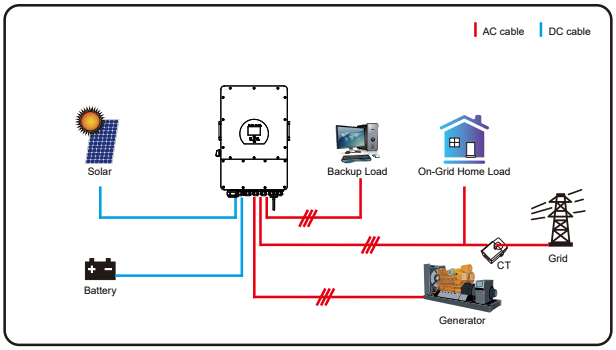
## Mode I:Basic



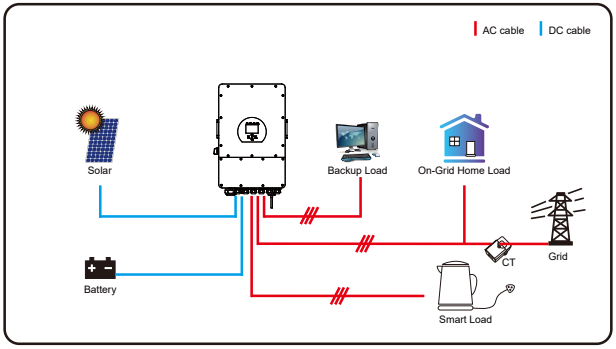

## Mode II: With Wind Turbine



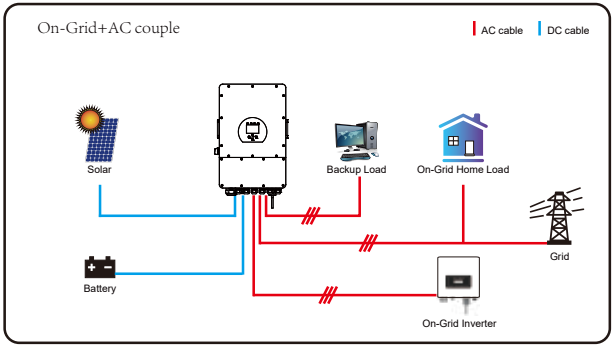
## Mode III: With Generator




## Mode IV: With Smart-Load




## Mode V: AC Couple



The 1st priority power of the system is always the PV power, then 2nd and 3rd priority power will be the battery bank or grid according to the settings. The last power backup will be the Generator if it is available.

## 7. Limitation of Liability

In addition to the product warranty described above, the state and local laws and regulations provide financial compensation for the product's power connection (including violation of implied terms and warranties). The company hereby declares that the terms and conditions of the product and the policy cannot and can only legally exclude all liability within a limited scope.

## 8. Datasheet

| ***Model*** | ***SUN-8K-SG04LP3*** | ***SUN-10K-SG04LP3*** | ***SUN-12K-SG04LP3*** |
|---|---|---|---|
| ***Battery Input Date*** | | | |
| Battery Type | Lead-acid or Li-Ion | | |
| Battery Voltage Range(V) | 40-60V | | |
| Max. Charging Current(A) | 190A | 210A | 240A |
| Max. Discharging Current(A) | 190A | 210A | 240A |
| Charging Curve | 3 Stages / Equalization | | |
| External Temperature Sensor | Optional | | |
| Charging Strategy for Li-Ion Battery | Self-adaption to BMS | | |
| ***PV String Input Data*** | | | |
| Max. DC Input Power(W) | 10400W | 13000W | 15600W |
| PV Input Voltage(V) | 550V (160V~800V) | | |
| MPPT Range(V) | 200V-650V | | |
| Start-up Voltage(V) | 160V | | |
| PV Input Current(A) | 12.5A+12.5A | 25A+12.5A | 25A+12.5A |
| No. of MPPT Trackers | 2 | | |
| No. of Strings Per MPPT Tracker | 1+1 | 2+1 | 2+1 |
| ***AC Output Data*** | | | |
| Rated AC Output and UPS Power(W) | 8000 | 10000 | 12000 |
| Max. AC Output Power(W) | 8800 | 11000 | 13200 |
| Peak Power(off grid) | 2 times of rated power, 10 S | | |
| AC Output Rated Current(A) | 11.6A | 14.5A | 17.4A |
| Max. AC Current(A) | 12.8A | 16A | 19.1A |
| Max. output current of each phase(A) | 17.4A | 21.7A | 26.1A |
| Max. Continuous AC Passthrough(A) | 50A | | |
| Output Frequency and Voltage | 50/60Hz; 230/400Vac (Three phase) | | |
| Grid Type | Three Phase | | |
| Current Harmonic Distortion | THD<3% (Linear load<1.5%) | | |
| ***Efficiency*** | | | |
| Max. Efficiency | 97.60% | | |
| Euro Efficiency | 97.00% | | |
| MPPT Efficiency | 99.90% | | |

| *Model* | *SUN-8K-SG04LP3 SUN-10K-SG04LP3 SUN-12K-SG04LP3* |
|---|---|
| ***Protection*** | |
| PV Arc Fault Detection | Integrated |
| PV Input Lightning Protection | Integrated |
| Anti-islanding Protection | Integrated |
| PV String Input Reverse Polarity Protection | Integrated |
| Insulation Resistor Detection | Integrated |
| Residual Current Monitoring Unit | Integrated |
| Output Over Current Protection | Integrated |
| Output Shorted Protection | Integrated |
| Output Over Voltage Protection | DC Type II / AC Type II |
| ***Certifications and Standards*** | |
| Grid Regulation | VDE 0126, AS4777,<br>NRS2017, G98, G99, IEC61683, IEC62116, IEC61727 |
| Safety Regulation | IEC62109-1, IEC62109-2 |
| EMC | EN61000-6-1, EN61000-6-3, FCC 15 class B |
| ***General Data*** | |
| Operating Temperature Rande(℃) | -25~60℃, >45℃ Derating |
| Cooling | Smart cooling |
| Noise(dB) | <30 dB |
| Communication with BMS | RS485; CAN |
| Weight(kg) | 36.8 |
| Size(mm) | 422W×658H×281D |
| Protection Degree | IP65 |
| Installation Style | Wall-mounted |
| Warranty | 5 years |

# 9. Appendix I

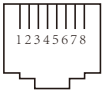
Approved battery brand from Deye

| Brand | Model | 48V Storage inverter | RS485 or CAN | INVERTER SETUP | note |
|---|---|---|---|---|---|
| PYLON | US2000 | ● | CAN | 0 | |
| | | ● | RS485 | 5 | |
| | US2000-PLUS | ● | CAN | 0 | |
| | | ● | RS485 | 5 | |
| DYNESS | B4850 | ● | CAN | 0 | Short line 6&7 at inverter side |
| | POWERBOX F | ● | CAN | 0 | |
| CCGX | 48Vxxxx | ● | CAN | 0 | Need confirm CAN_H CAN_L |
| SACRED SUN | 48Vxxxx | ● | RS485 | 1 | Cut line 3,6,8 |
| SOLAX | 48Vxxxx | ● | CAN | 0 | |
| UZ ENERGY | UZ-EB51.2-100-A11 | ● | CAN | 0 | |
| GSL ENERGY | 48Vxxxx | ● | CAN | 0 | |
| | | | RS485 | 12 | |
| Herewin techlogy | HY48050 | ● | CAN | 0 | |
| GenixGreen | | ● | RS485 | 6 | |
| Sunwoda | H4850M | ● | CAN | 0 | |
| X-ratong | 48Vxxxx | ● | RS485 | 8 | |
| Enershare Technology | BMS48150 | ● | RS485 | 9 | |
| PYLON 3.0 | | ● | RS485 | 12 | |
| Murata | | ● | RS485 | 11 | |
| GS10000 | | ● | RS485 | 3 | |
| BPE | | ● | CAN | 0 | |
| AOBOET | | ● | CAN | 0 | |
| VISION Group | | ● | CAN | 13 | |
| Alpha Ess | | ● | CAN | 0 | |

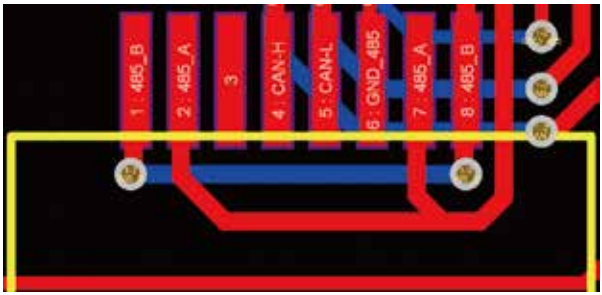
## 10. Appendix II

Definition of RJ45 Port Pin for BMS

| No. | RS485 Pin |
|---|---|
| 1 | 485_B |
| 2 | 485_A |
| 3 | -- |
| 4 | CAN-H |
| 5 | CAN-L |
| 6 | GND_485 |
| 7 | 485_A |
| 8 | 485_B |

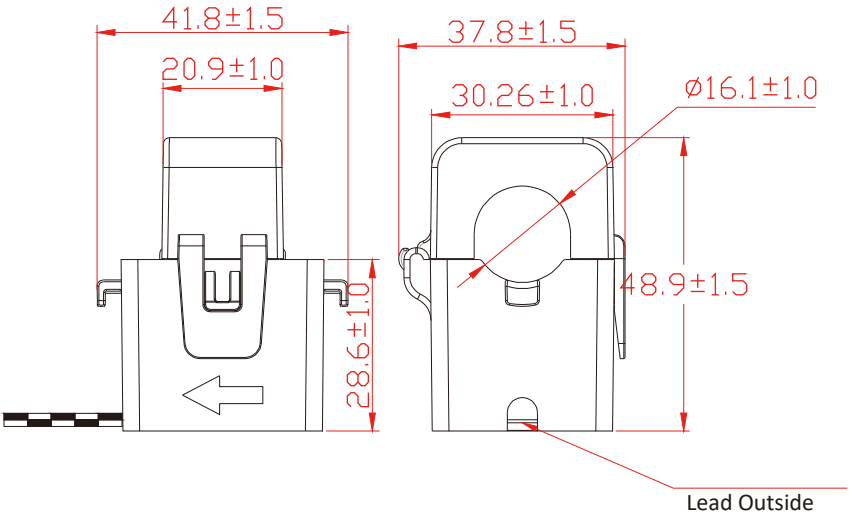



BMS Port



## 11. Appendix III

1. Split Core Current Transformer (CT) dimension: (mm)
2. Seconddary output cable length is 4m.




NINGBO DEYE INVERTER TECHNOLOGY CO., LTD.
Add: No.26-30, South Yongjiang Road, Beilun, 315806, Ningbo, China
Tel: +86 (0) 574 8622 8957
Fax: +86 (0) 574 8622 8852
E-mail: service@deye.com.cn
Web: www.deyeinverter.com
Ver: 2.0, 2021-1

NEW

CanadianSolar

# HiKu7 Mono PERC

## 575 W ~ 605 W

## CS7L-575|580|585|590|595|600|605MS (IEC1000 V)

## CS7L-575|580|585|590|595|600|605MS (IEC1500 V)

### MORE POWER

- 605 W — Module power up to 605 W<br>Module efficiency up to 21.4 %
- Up to 3.5 % lower LCOE<br>Up to 5.7 % lower system cost
- Comprehensive LID / LeTID mitigation technology, up to 50% lower degradation
- Compatible with mainstream trackers, cost effective product for utility power plant
- Better shading tolerance

### MORE RELIABLE

- 40 °C lower hot spot temperature, greatly reduce module failure rate
- Minimizes micro-crack impacts
- Heavy snow load up to 5400 Pa, wind load up to 2400 Pa*

25 Years **Linear Power Performance Warranty***

**12 Years Enhanced Product Warranty on Materials and Workmanship***

**1st year power degradation no more than 2%**

**Subsequent annual power degradation no more than 0.55%**

*According to the applicable Canadian Solar Limited Warranty Statement.

### MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001:2015 / Quality management system
ISO 14001:2015 / Standards for environmental management system
ISO 45001: 2018 / International standards for occupational health & safety

### PRODUCT CERTIFICATES*

IEC 61215 / IEC 61730 / INMETRO
UL 61730 / IEC 61701 / IEC 62716
Take-e-way

Canadian Solar recycles panels at the end of life cycle

* The specific certificates applicable to different module types and markets will vary, and therefore not all of the certifications listed herein will simultaneously apply to the products you order or use. Please contact your local Canadian Solar sales representative to confirm the specific certificates available for your Product and applicable in the regions in which the products will be used.

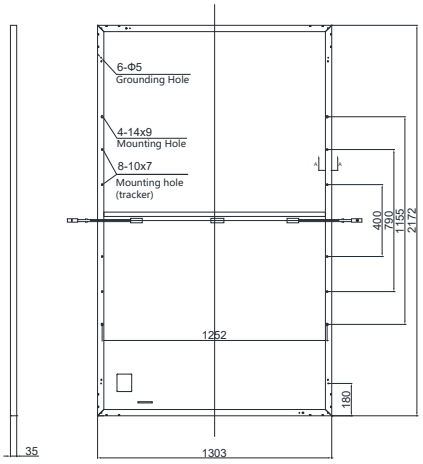
**CSI Solar Co., Ltd.** is committed to providing high quality solar products, solar system solutions and services to customers around the world. Canadian Solar was recognized as the No. 1 module supplier for quality and performance/price ratio in the IHS Module Customer Insight Survey, and is a leading PV project developer and manufacturer of solar modules, with over 52 GW deployed around the world since 2001.

* For detailed information, please refer to the Installation Manual.

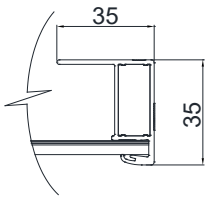
**Canadian Solar MSS (Australia) Pty Ltd.**
44 Stephenson St, Cremorne VIC 3121, Australia, sales.au@csisolar.com, www.csisolar.com/au

## ENGINEERING DRAWING (mm)

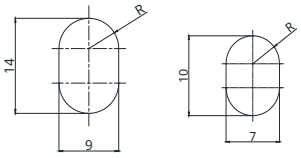
### Rear View



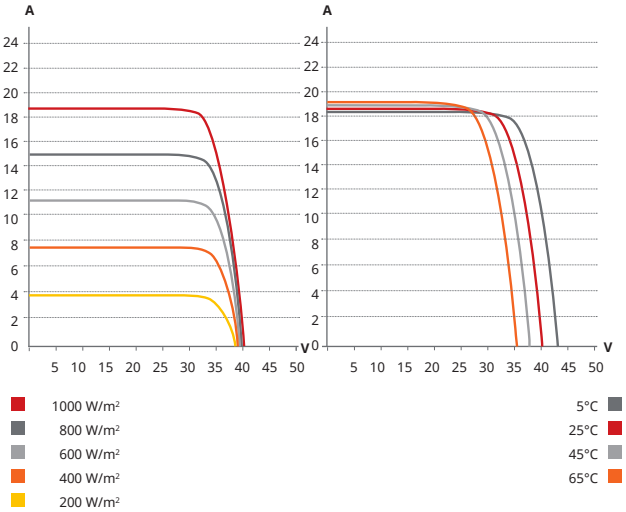

### Frame Cross Section A-A




### Mounting Hole




## CS7L-590MS / I-V CURVES




## ELECTRICAL DATA | STC*

| CS7L | 575MS | 580MS | 585MS | 590MS | 595MS | 600MS | 605MS |
|---|---|---|---|---|---|---|---|
| Nominal Max. Power (Pmax) | 575 W | 580 W | 585 W | 590 W | 595 W | 600 W | 605 W |
| Opt. Operating Voltage (Vmp) | 33.9 V | 34.1 V | 34.3 V | 34.5 V | 34.7 V | 34.9 V | 35.1 V |
| Opt. Operating Current (Imp) | 16.97 A | 17.02 A | 17.06 A | 17.11 A | 17.15 A | 17.20 A | 17.25 A |
| Open Circuit Voltage (Voc) | 40.3 V | 40.5 V | 40.7 V | 40.9 V | 41.1 V | 41.3 V | 41.5 V |
| Short Circuit Current (Isc) | 18.22 A | 18.27 A | 18.32 A | 18.37 A | 18.42 A | 18.47 A | 18.52 A |
| Module Efficiency | 20.3% | 20.5% | 20.7% | 20.8% | 21.0% | 21.2% | 21.4% |
| Operating Temperature | -40°C ~ +85°C | | | | | | |
| Max. System Voltage | 1500V (IEC) or 1000V (IEC) | | | | | | |
| Module Fire Performance | CLASS C (IEC 61730) | | | | | | |
| Max. Series Fuse Rating | 30 A | | | | | | |
| Application Classification | Class A | | | | | | |
| Power Tolerance | 0 ~ + 5 W | | | | | | |

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C. Measurement uncertainty: ±3 % (Pmax).

## ELECTRICAL DATA | NMOT*

| CS7L | 575MS | 580MS | 585MS | 590MS | 595MS | 600MS | 605MS |
|---|---|---|---|---|---|---|---|
| Nominal Max. Power (Pmax) | 431 W | 435 W | 439 W | 442 W | 446 W | 450 W | 454 W |
| Opt. Operating Voltage (Vmp) | 31.8 V | 32.0 V | 32.2 V | 32.3 V | 32.5 V | 32.7 V | 32.9 V |
| Opt. Operating Current (Imp) | 13.56 A | 13.60 A | 13.64 A | 13.70 A | 13.73 A | 13.77 A | 13.80 A |
| Open Circuit Voltage (Voc) | 38.1 V | 38.3 V | 38.5 V | 38.7 V | 38.8 V | 39.0 V | 39.2 V |
| Short Circuit Current (Isc) | 14.68 A | 14.73 A | 14.77 A | 14.80 A | 14.85 A | 14.88 A | 14.93 A |

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

## MECHANICAL DATA

| Specification | Data |
|---|---|
| Cell Type | Mono-crystalline |
| Cell Arrangement | 120 [2 x (10 x 6) ] |
| Dimensions | 2172 × 1303 × 35 mm (85.5 × 51.3 × 1.38 in) |
| Weight | 31.4 kg (69.2 lbs) |
| Front Cover | 3.2 mm tempered glass |
| Frame | Anodized aluminium alloy, crossbar enhanced |
| J-Box | IP68, 3 bypass diodes |
| Cable | 4 mm² (IEC) |
| Cable Length (Including Connector) | 460 mm (18.1 in) (+) / 340 mm (13.4 in) (-) or customized length* |
| Connector | PV-KST4/xy-UR, PV-KBT4/xy-UR (IEC 1000 V) or T4-PC-1 (IEC 1500 V) or PV-KST4-EVO2/XY, PV-KBT4-EVO2/XY (IEC 1500 V) or UTXCFA4AM, UTXCMA4AM (IEC 1500 V) |
| Per Pallet | 31 pieces |
| Per Container (40' HQ) | 527 pieces |

* For detailed information, please contact your local Canadian Solar sales and technical representatives.

## TEMPERATURE CHARACTERISTICS

| Specification | Data |
|---|---|
| Temperature Coefficient (Pmax) | -0.34 % / °C |
| Temperature Coefficient (Voc) | -0.26 % / °C |
| Temperature Coefficient (Isc) | 0.05 % / °C |
| Nominal Module Operating Temperature | 41 ± 3°C |

## PARTNER SECTION

* The specifications and key features contained in this datasheet may deviate slightly from our actual products due to the on-going innovation and product enhancement. CSI Solar Co., Ltd. reserves the right to make necessary adjustment to the information described herein at any time without further notice.
Please be kindly advised that PV modules should be handled and installed by qualified people who have professional skills and please carefully read the safety and installation instructions before using our PV modules.

**Canadian Solar MSS (Australia) Pty Ltd.**
44 Stephenson St, Cremorne VIC 3121, Australia, sales.au@csisolar.com, www.csisolar.com/au


* Manufactured and assembled in China, Thailand and Vietnam.