



21 May 2024

TENDER NUMBER: CPTSC02/24

NOTICE TO TENDERERS: ADDENDUM NO.1

PROJECT TITLE:

**MARION ISLAND: SUPPLY; INSTALLATION & COMMISSIONING OF FIVE
INDOOR FULL BASE LOAD 250 KVA GENERATOR SETS**

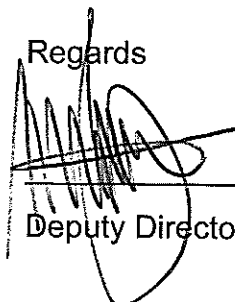
Dear Tenderer

1. The above mentioned matter bears the reference.
2. Herewith Addendum No.1 for your attention
3. The following amendment is to be included with the above tender document when submitting the tender on the closing date.

PLEASE ACKNOWLEDGE RECEIPT OF THIS AMENDMENT AS FOLLOWS:

1. Confirm receipt of this addendum by completing and signing the attached acknowledgement of receipt and send back with your tender document on the closing date of tenders.
2. Bidders are requested to utilise the information issued in terms of this addendum.

Regards


Deputy Director: SCM

THIS ACKNOWLEDGEMENT OF RECEIPT OF ADDENDUM NO. 1 MUST BE SUBMITTED TOGETHER WITH THE TENDER DOCUMENT

DEPARTMENT OF PUBLIC WORKS – CAPE TOWN

CUSTOMS HOUSE BUILDING

HEERENGRACHT STR

8000

Dear Sir/Madam

PROJECT TITLE:

MARION ISLAND: SUPPLY; INSTALLATION & COMMISSIONING OF FIVE INDOOR FULL BASE LOAD 250 KVA GENERATOR SETS

WORKS TENDER NUMBER: CPTSC02/24

The above mentioned tender was advertised:

1. without drawings
2. the closing date as per advert is 31 May 2024
3. PA-09 (EC): List of Returnable Documents

Changes to the document:

1. kindly note the following amendments on the advertised tender document as per the next page.
2. **extension of Closing Date**: the extension of the closing date has been changed from 31 May 2024 to 07 June 2024 at 11:00 am.
3. please note that the Declaration Certificate for Local Production and Content for designated sectors (PA-36 and Annexure/s C) is not applicable to this tender.

CHANGES REQUIRED IN TERMS OF THIS ADDENDUM:

This tender addendum is being issued due to information that was excluded from the original tender documentation, in error.

Please make use of the now included drawings, technical specifications, and **updated Bill of Quantity**.

Section 1: Tender Exclusions

The information that was excluded are as follows:

1. Design drawings and as referenced in the Bill of Quantity;
 - a. *MI_DEFF_E_SLD_005
 - b. MI_DEFF_E_SLD_004
 - c. MI_DAFF_E_CP_001
2. Technical Specification Documents

Section 2: Retrieval of Excluded Information

As a result of the missing information, the relevant drawings and specifications were sourced for this addendum as shown below. The Bill of Quantities was also updated as necessary.

1. Drawings:
 - a. MI_DEFF_E_SLD_004
 - b. MI_DAFF_E_CP_001
 - c. MI_DAFF_E_CP_002 (not previously referenced in BOQ)
 - d. MI_DAFF_E_CS_003 (not previously referenced in BOQ)

*Drawing MI_DEFF_E_SLD_005 is not required– refer to *Section 3: 1(e)*.

2. Specification documents:
 - a. Specification for the Supply, Installation and Commissioning of 5 (Five) Indoor Emergency Prime Generator Sets
 - b. Supplementary Specification for the Electrical Installation of a Comprehensive Service.

Section 3: Further Notes

Upon receipt of the information retrieved, mentioned in Section 2 above, the following is to be noted:

1. Updates to the Bill of Quantities are included in the addendum, in red text:
 - a. Update to panel/DB names to match Single Line Diagram.
 - b. Allowance for one additional 350A 3p circuit breaker at the Main DB
 - c. Alignment of panel material to 316 S/S
 - d. Update of reference drawings
 - e. The ADE Shack DB is not required, hence the drawing (MI_DEFF_E_SLD_005) is not included. However this item will remain on the BOQ and should be priced for accordingly.
2. The following two drawings are issued in this addendum, with errors as follows:
 - a. MI_DAFF_E_CP_001 – General Arrangement excludes Section 5 of the Panel (Incomer Main Breaker) as described in the BOQ.
 - b. MI_DAFF_E_CP_002 General Arrangement excludes Section 3 of the Panel (Incomer Main Breaker) as described in the BOQ.
3. In the event that there are any discrepancies between the drawings, technical specification, and BOQ, the items on the BOQ will take precedence.

I/We _____ accept that this Addendum forms part of the Tender Document.

(a) Have noted the contents of this Addendum

(b) Have fully considered this Addendum

(c) Have incorporated the amendments contained in this Addendum in my/our Tender Document for Tender

COMPANY NAME: _____

SIGNATURE: _____

DATE: _____

STATUS: This Addendum forms an integral part of the Tender Document and the subsequent contract with the successful Tenderer. The variations and amendments to the tender document as described hereafter, shall take precedence. Notwithstanding anything said during the tender period, only the additional information or variations and amendments contained in this Addendum, will be legally binding.

DEPARTMENT OF PUBLIC WORKS AND INFRASTRUCTURE



Comprising of:

Section 1 - Preliminaries and General

Section 2 - Generator Installation


Section 3 - LT Distribution and Service Reticulation

Section 4 - Electrical Installation

Section 5 - Prime Cost Sum

Section 6 - Summary

SECTION 1: PRELIMINARIES AND GENERAL

 <div> <p>public works & infrastructure</p> <p>Department: Public Works and Infrastructure REPUBLIC OF SOUTH AFRICA</p> </div>					
<div> <div>MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION</div> <div>ELECTRICAL ENGINEERING SERVICES</div> </div>					
ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	PART 1A: PRELIMINARY AND GENERAL				
	The agreement is to be the General Conditions of Contract (GCC 2010) (Second Edition), Published by the SA Institution of Civil Engineering.				
	The preliminaries are to be the Construction and management requirements for works contracts - Part 1: General engineering and construction works (SANS 1921 -1: 2004 Edition 1) prepared by Standards South Africa and shall be deemed to be incorporated herein.				
	Tenderers are referred to the abovementioned documents for the full intent and meaning of each clause thereof (hereinafter referred to by heading and clause number only) for which such allowance must be made as may be considered necessary.				
	Where standard clauses or alternatives are not entirely applicable to this contract such modifications, corrections or supplements as will apply are given under each relevant clause heading.				
	Where any item is not relevant to this specific contract such items is marked N/A (signifying "not applicable").				
	Adjustment of the preliminaries: each item priced, is to be allocated to one or more of the three categories, where "F" denotes a fixed amount (amount not to be varied), "V" denotes an amount variable in proportion to value and "T" denotes an amount in proportion to time.				
	Time (T) related Preliminaries will only be adjusted for omissions or additions, issued by the Employer, or delays caused by the Employer, for which variation and extension of time has been granted.				
	SECTION A: GENERAL CONDITIONS OF CONTRACT				
A1	General (Clause 1)				
	F: V: T:	Item	1		
A2	Basis of Contract (Clause 2)				
	F: V: T:	Item	1		
A3	Engineer (Clause 3)				
	F: V: T:	Item	1		
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
A4	Contractor's General Obligation (Clause 4)				
	F: V: T:	Item	1		
A5	Time and Related Matters (Clause 5)				
	F: V: T:	Item	1		
A6	Payment and Related Matters (Clause 6)				
	F: V: T:	Item	1		
A7	Quality and Related Matters (Clause 7)				
	F: V: T:	Item	1		
A8	Risk and Related Matters (Clause 8)				
	F: V: T:	Item	1		
A9	Termination of Contract (Clause 9)				
	F: V: T:	Item	1		
A10	Claims and Disputes (Clause 10)				
	F: V: T:	Item	1		
	SECTION B: SANS 1921-1:2004 (Edition 1):				
	CONSTRUCTION AND MANAGEMENT				
	REQUIREMENTS FOR WORKS CONTRACTS: PART 1				
B1	Scope				
	F: V: T:	Item	1		
B2	Normative references				
	F: V: T:	Item	1		
B3	Definitions				
	F: V: T:	Item	1		
B4	Requirements for construction and management				
	F: V: T:	Item	1		
B4.1	General				
	F: V: T:	Item	1		
B4.2	Responsibilities for design and construction				
	F: V: T:	Item	1		
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
B4.3	Planning, programme and method statements				
	F: V: T:	Item	1		
B4.4	Quality assurance				
	F: V: T:	Item	1		
B4.5	Settling out				
	F: V: T:	Item	1		
B4.6	Management and disposal of water				
	F: V: T:	Item	1		
B4.7	Blasting				
	F: V: T:	Item	1		
B4.8	Works adjacent to services and structures				
	F: V: T:	Item	1		
B4.9	Management of the works and site				
	F: V: T:	Item	1		
B4.10	Earthworks				
	F: V: T:	Item	1		
B4.11	Testing				
	F: V: T:	Item	1		
B4.12	Materials, samples and fabrication drawings				
	F: V: T:	Item	1		
B4.13	Equipment				
	F: V: T:	Item	1		
B4.14	Site establishment				
	F: V: T:	Item	1		
B4.15	Survey control				
	F: V: T:	Item	1		
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
B4.16	Temporary works				
	F: V: T:	Item	1		
B4.17	Existing services				
	F: V: T:	Item	1		
B4.18	Health and safety				
	F: V: T:	Item	1		
B4.19	Environmental requirements				
	F: V: T:	Item	1		
B4.20	Alterations, additions, extentions and modifications to existing works				
	F: V: T:	Item	1		
B4.21	Inspection of adjoining structures, services, buildings and property.				
	F: V: T:	Item	1		
B4.22	Attendance on nominated and selected subcontractors				
	F: V: T:	Item	1		N/A
	SECTION C: SCOPE OF WORK IN ACCORDANCE WITH SANS 10403				
	(The reference to clauses refer to table B.1 of SANS 1921-1:2004)				
C1	Cerification by recognised bodies - (Clause 4.4)				
	F: V: T:	Item	1		
C2	Agrément - (Clause 4.5)				
	F: V: T:	Item	1		
C3	Other services and facilities - (Clause 4.8)				
	F: V: T:	Item	1		
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
C4	Recording of weather - (Clause 5.2)				
	F: V: T:	Item	1		
C5	Management meetings - (Clause 5.3)				
	F: V: T:	Item	1		
C6	Daily records - (Clause 5.6)				
	F: V: T:	Item	1		
C7	Permits - (Clause 5.9)				
	F: V: T:	Item	1		
C8	Proof of compliance with the law - (Clause 5.10)				
	F: V: T:	Item	1		
	SECTION D: SPECIFICATION DATA ASSOCIATED WITH SANS 1921-1:2004 (Table A.1)				
D1	Requirements for drawings, information and calculations for which the contractor is responsible - (Clause 4.1.7)				
	F: V: T:	Item	1		
D2	The planning, programme and method statements- (Clause 4.3)				
	F: V: T:	Item	1		
D3	Samples of materials. Workmanships and finishes - (Clause 4.12.1)				
	F: V: T:	Item	1		
D4	Fabrication drawings that the contractor is to provide and deliver to the employer - (Clause 4.12.2)				
	F: V: T:	Item	1		
D5	Office for the foreman - (Clause 4.14.3)				
	F: V: T:	Item	1		
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
D6	Telephone - (Clause 4.14.3)				
	F: V: T:	Item	1		
D7	Office for inspector of works - (Clause 4.14.3)				
	F: V: T:	Item	1		N/A
D8	Telephone in office for inspector of works - (Clause 4.14.3)				
	F: V: T:	Item	1		N/A
D9	Provision and erection of signboards - (Clause 4.14.6)				
	F: V: T:	Item	1		N/A
D10	Termination, diversion or maintenance of existing services - (Clause 4.17.1)				
	F: V: T:	Item	1		
D11	Services which are known to exist - (Clause 4.17.3)				
	F: V: T:	Item	1		
D12	Detection apparatus - (Clause 4.17.4)				
	F: V: T:	Item	1		
D13	Additional health and safety requirements - (Clause 4.18)				
	F: V: T:	Item	1		
	SECTION E: SPECIFIC PRELIMINARIES				
	(Section E contains specific preliminaries items which apply to this contract except where "N/A" (Not applicable) appears against the item.				
E1	WORKING OVER THE WEEKEND				
	Contractor to make allowance to work over the weekend in order to allow for the disconnection of utilities and the connection of the generator. The weekend to be used for disconnection and connection and must be communicated to the Department two weeks in advance.				
	F: V: T:	Item	1		
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
E2	SITE INSTRUCTIONS				
	Site 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				
	F: V: T:	Item	1		
E3	PLANT RECORD				
	At every site meeting, the Contractor shall provide the Engineer/Principal agent with a written record, in schedule form, reflecting the number, type and capacity of all plant, excluding hand tools, currently used on the works.				
	F: V: T:	Item	1		
E4	SITE OFFICE				
	The Contractor is to allow for the provision and removal of a site office in accordance with the Principal Agent's requirements. To accommodate 6 persons.				
	F: V: T:	Item	1		
E5	TRADE NAMES				
	Wherever a Trade Name for any product has been described in the Bill of Quantities, the Bidder's attention is drawn to the fact that any other product of equal quality may be used, subject to the written approval of the Principal Agent being obtained prior to the closing date for the submission of the Bids.				
	F: V: T:	Item	1		
E6	INACCURATE AND DEFECTIVE WORK EXECUTED UNDER PREVIOUS CONTRACT				
	The contractor shall, after taking possession of the site and before commencing the work, check all levels, liners, profiles and the like and satisfy himself as to the dimensional accuracy of all work executed under the previous contract which may affect his work.				
	Should any inaccurate or defective work be found, the contractor shall immediately notify the principal agent in writing requesting his instructions with regard thereto and afford every facility to those rectifying such inaccurate or defective work.				
	F: V: T:	Item	1		
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
E7	VIEWING THE SITE IN SECURITY AREAS				
	If the site is situated in a security area and the bidder must arrange with the Authorities to obtain permission to enter the site for Bidding purposes.				
	F: V: T:	Item	1		
E8	COMMENCEMENT OF WORKS IN SECURITY AREAS				
	If the works falls within a security area, the contractor must arrange with the Authorities and give the necessary notices before commencement of the works.				
	Should the contractor fail to make such arrangements, admission to the site may be refused and any additional costs will be for the contractor's account.				
	F: V: T:	Item	1		
E9	ENTRANCE PERMITS TO SECURITY AREAS				
	If the works falls within a security area, the contractor shall obtain entrance permits for his personnel and workmen entering the area and shall comply with all regulations and instructions which be issued from the time to time regarding the protection of persons and property under the control of the Authority.				
	F: V: T:	Item	1		
E10	PROHIBITION ON TAKING PHOTOGRAPHS				
	In terms of article 119 of the Defence Act, 44 of 1957, it is prohibited to sketch or to take photographs of any military site or installation or any building or civil works thereon or to be in possession of a camera or other apparatus used for taking photographs, except when authorised thereto by or on behalf of the Minister				
	The same prohibition is also applicable to all Correctional Institutions in terms of article 44.1 of the Correctional Services Act 8 of 1959.				
	F: V: T:	Item	1		
E11	TOILET FACILITIES				
	Allow for the supply and removal of portable toilet facilities. The contractor is to maintain the cleanliness of the facilities throughout the contract period. The contractor must provide enough toilets for his/her entire workforce.				
	F: V: T:	Item	1		
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
E12	MANAGEMENT OF WATER				
	Water for Construction puposes must be obtained from alternative water sources (i.e. supply other than water that is produced and distributed by a regulated water service authority from a licensed water treatment works for human consumption), e.g. dams, rivers, boreholes, springs, rainwater harvesting, recycled sewerage water, etc. The alternative water source shall not be of an inferior quality/ standard than that required for construction purposes. The client reserves the right through his agents to test such supplies or request certificates confirming the grade and nature of the water supply. Relevant knowledge of the respective area will be an advantage.				
	F: V: T:	Item	1		
E13	OCCUPATIONAL HEALTH AND SAFETY ACT & CONSTRUCTION REGULATIONS				
	It is required of the Contractor to thoroughly study the Health and Safety specification that must be read together with and is deemed to be incorporated under this section of the Bill of Quantities. Provision for pricing thereof is made under items E12.1 to E12.15 hereafter and it is explicitly pointed out that all requirements of the aforementioned specification are deemed to be priced hereunder, as the said items represent the only method of measurement and no additional items or extras to the contract in this regard shall be entertained.				
	The contractor must take note that compliance with the Occupational Health and Safety Act, Construction Regulations and Health and Safety specification is compulsory. In the event of partial or total non-compliance, the Principal Agent , notwithstanding the provisions of Clause 6 of Section 1: Preliminaries (Part A) or any other clause to the contrary, reserves the right to delay issuing any progress payment certificate until the Contractor provides satisfactory proof of compliance. The Contractor shall not be entitled to any compensation of whatsoever nature, including interest, due to such delay of payment.				
	All references hereafter are to Regulations of the Construction Regulations, 2003 issued under the Occupational Health and Safety Act, 1993 (Act No 85 of 1993).				
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
	The contractor shall, in submitting his bid, demonstrate that he has made provision for the cost of compliance with the specified health and safety requirements, the Act and the Construction Regulations.				
	F: V: T:	Item	1		
E13.1	NOTIFICATION OF CONSTRUCTION WORK (Construction Regulations 3)				
	The contractor shall, before commencing work, notify the Department of Labour of the intend construction work in terms o Regulation 3. The Contractor shall submit the notification in writing, on the appropriate form, prior to commencement of work.				
	F: V: T:	Item	1		
E13.2	HEALTH AND SAFETY PLAN (Construction regulations 5.4)				
	The Contractor shall provide and demonstrate to the Principal Agent a suitable and sufficiently documented health and safety plan based on the Act, Construction Regulations and the health and safety specification, which shall be applied from the date of commencement of and for the duration of the construction work. The Contractor shall ensure that a copy of the health and safety plan is available on request to an employee, inspector, sub contractor or principal agent all in terms of Regulation 5.				
	F: V: T:	Item	1		
E13.3	REGISTRATION WITH THE COMPENSATION FUND (Construction Regulations 5.3 f)				
	The Contractor shall provide proof of his registration and good standing with the Compensation Fund or a licensed compensation insurer prior to the commencement of work				
	F: V: T:	Item	1		
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
E13.4	HEALTH AND SAFETY FILE (Construction Regulation 5.7)				
	The contractor shall ensure that a health and safety file, which shall include all documentation required in terms of health and safety specification, the Act and the Construction Regulations, is opened and kept on site and made available to the Principal Agent or inspector upon request. Upon completion of the works, the contractor shall hand over a consolidated health and safety file to the principal agent.				
	F: V: T:	Item	1		
E13.5	SUPERVISION OF CONSTRUCTION WORK (Safety officer) (Construction Regulation 6)				
	The Contractor shall appoint a full-time competent employee in writing as the construction supervisor, with the duty of supervising the construction work.				
	The Contractor shall appoint a full-time or part-time construction safety officer in writing to assist in the control of all safety related aspects on the site. Such appointments are required to ensure that at all times the requirements of the Act and Construction Regulations are adhered to. Refer to Regulation 6.				
	F: V: T:	Item	1		
E13.6	RISK ASSESSMENT AND SAFETY POLICY (Construction Regulation 7)				
	Before commencing work the Contractor shall cause a risk assessment to be performed by a competent person appointed in writing and the risk assessment shall form part of the health and safety plan. A copy of the risk assessment shall be available on site at all times for inspection.				
	The Contractor shall at all time carry out the works in a manner to avoid the risk of bodily harm to persons or risk of damage to any property. He shall take all precautions regarding training of employees in any hazards and the related work procedures, health and safety induction training of employees, visitors or any other persons entering the site and provide personal protective equipment to all employees and visitors to site which are necessary and adequate to eliminate any conditions which contribute to the risk of injury to persons or damage to property in terms of Regulation 7.				
	F: V: T:	Item	1		
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
E13.7	SIGNIFICANT HAZARD IDENTIFICATION RISK ASSESSMENT PREPARED BY THE DESIGN CONSULTANTS The Contractor shall allow for additional financial provision, if any , to take the necessary precautions regarding the significant hazards and risks identified and assessed by the design consultants.				
	F: V: T:	Item	1		N/A
E13.8	ADDITIONAL FINANCIAL PROVISION The Contractor shall allow for additional financial provision, if any, to comply with the requirements of the Occupational Health and Safety Act (Act No 85 of 1993) and the Construction Regulations issued there under which have not been specifically elsewhere.				
	F: V: T:	Item	1		
E13.9	FALL PROTECTION PLAN (Construction Regulation 8) The Contractor shall, before commencing any construction work submit a fall protection plan identified all steps to be taken in order to ensure the continued adherence to the fall protection plan and shall include a risk assessment of all work carried out from a relevant position. The fall protection plan shall form part of the health and safety plan and file.				
	F: V: T:	Item	1		
E13.10	PHYSICAL AND PSYCHOLOGICAL FITNESS (Construction Regulation 8.2 (b)) The Contractor and sub-contractor shall before commencing any construction work submit proof of his employees that shall carried out work from an elevated position their physical and psychological fitness and shall be recorded in the health and safety file.				
	F: V: T:	Item	1		
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
E13.11	CONSTRUCTION VEHICLES AND MOBILE PLANT (Construction Regulations 21) The Contractor and sub-contractors shall ensure that all operated workers received training and been certified competent to operate such vehicles, and are physical and psychological fit to operate such construction vehicles and mobile plants and shall be recorded in the health and safety file.				
	F: V: T:	Item	1		
E13.12	TRAINING (Construction Regulation 8 (c)) The Contractor and sub-contractor shall, before commencing any construction work, submit his training program of all his employees. This program shall form part of the health and safety plan.				
	F: V: T:	Item	1		
E13.13	DEMOLITION WORK (Construction Regulations 12) The Contractor shall, before any demolition work shall be carried out, submit all methods of demolition to be used. This method shall form part of the health and safety plan and file.				
	F: V: T:	Item	1		
E13.14	REMOVAL AND DISPOSAL OF ASBESTOS MATERIAL (Asbestos Regulation) The principle contractor shall appoint a contractor that is registered with the Department of Labour as an AIA. The contractor must allow for: NOTIFICATION OF ASBESTOS PROCESSING PERSONAL PROTECTIVE EQUIPMENT PACKAGING AND TRANSPORT AND STORAGE TO DISPOSAL SITE DEMOLITION WORK LABELLING, INFORMATION, ETC.				
	F: V: T:	Item	1		N/A
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL

[illegible]

SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
E14	IMPLEMENTATION OF LABOUR-INTENSIVE INFRASTRUCTURE PROJECTS UNDER THE EXPANDED PUBLIC WORKS PROGRAMME (EPWP)				
	The contractor shall comply with all the requirements of the "Code of Good Practice for Employment and Conditions of Work for Special Public Works Programmes" issued in terms of the "Basic Conditions of Employment Act, 1997 (Act No 75 of 1997)" and the related "Ministerial Determination", for the employment of locally employed temporary workers on a labour intensive infrastructure project under the Expanded Public Works Programme (EPWP)				
	The contractor shall maintain daily records with regard to the workers employed and shall, on a monthly basis, submit a report (Contract, ID Copy, Attendance register, Proof of payment) to the principal agent in the prescribed format. Compulsory indicators such as the project budget, actual project expenditure, number of job opportunities created, demographic characteristics of workers employed, minimum daily wage rate, number of person-days of employment created and number of training person-days, shall be included in said report, all as defined in the "Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the Expanded Public Works Programme (EPWP)"				
	Provision for pricing of compliance with the aforementioned is made under this clause and it is explicitly pointed out that all that all requirements in respect of the aforementioned are deemed to be priced hereunder and no additional claims in this regard shall be entertained				
	F: V: T:	Item	1		
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL


[illegible]


SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
E15	HIV/AIDS AWARENESS				
	It is required of the contractor to thoroughly study the HIV/AIDS Specification (PW 1544) of the Department that must be read together with and is deemed to be incorporated under this Section of the Bills of Quantities.				
	Provision for pricing of HIV/AIDS awareness is made under items E14.1 to E14.5 hereafter and it is explicitly pointed out that all requirements of the aforementioned specification are deemed to be priced hereunder, as the said items represent the only method of measurement and no additional items or extras to the contract in this regard shall be entertained				
	The contractor must take note that compliance with the HIV/AIDS Specification is compulsory. In the event of partial or total non-compliance, the principal agent, notwithstanding the provisions of Clause A 31.0 of Section A or any other clause to the contrary, reserves the right to delay issuing any progress payment certificate until the contractor provides satisfactory proof of compliance. The contractor shall not be entitled to any compensation of whatsoever nature, including interest, due to such delay of payment				
E15.1	AWARENESS CHAMPION				
	Selection, appointment, briefing and making available of an Awareness Champion including provision of all relevant services, all in accordance with the HIV/AIDS Specification				
	F: V: T:	Item	1		
E15.2	AWARENESS WORKSHOPS				
	Selection and appointment of a competent Service Provider approved by the principal agent, provision of a Service Provider Workshop Plan and a suitable venue, conducting of awareness workshops by means of traditional and/or modern multimedia techniques, including follow-up courses, making available all tuition material and performing assessment procedures, all in accordance with the HIV/AIDS Specification				
	F: V: T:	Item	1		
	CARRIED FORWARD				

SECTION 1: PRELIMINARIES AND GENERAL

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
E15.3	POSTERS, BOOKLETS, VIDEOS, ETC. Provision, displaying, maintaining and replacing when necessary of four plastic laminated posters, booklets and educational videos, etc. for the duration of the construction period, all in accordance with the HIV/AIDS Specification F: V: T:	Item	1		
E15.4	ACCESS TO CONDOMS Provision and maintenance of condom dispensers fixed in position, including male and female condoms, replenishing male and female condoms on a daily basis as required for the duration of the construction period, all in accordance with the HIV/AIDS Specification F: V: T:	Item	1		
E15.5	MONITORING Monitoring HIV/AIDS awareness of workers, providing the principal agent with access to information including making available all reports, thoroughly completed and reflecting the correct information, for the duration of the construction period and close out, all in accordance with the HIV/AIDS Specification F: V: T:	Item	1		
E16	CONSTRUCTION VEHICLES FOR DELIVERY OF EQUIPMENT Allow for vehicles such as truck cranes, forklifts, etc for the moving of the generator into place and delivery of other necessary equipment for the project. F: V: T:	Item	1		
E17	ALTERNATE POWER SUPPLIES FOR CONSTRUCTION Allow for the supply of portable generators and/or other alternate power supplies for construction equipment in the event of power failure on the premises. F: V: T:	Item	1		
	CARRIED FORWARD TO SECTION 6 SUMMARY				

<div>  <div> public works & infrastructure Department: Public Works and Infrastructure REPUBLIC OF SOUTH AFRICA </div> </div> <div> MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION ELECTRICAL ENGINEERING SERVICES </div>					
TENDER NUMBER:					
ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
1.1	<u>EMERGENCY STANDBY GENERATOR ENGINE</u> Supply, Deliver, install and commissioning of prime standby generator complete as specified for the following sizes: The Engine shall be a Diesel Fuelled, old starting liquid cooled, compression ignition, direct injection industrial type as complying with SANS 8528. The cooling system shall be thermostatically controlled entirely self-contained and shall consist of a radiator, fan and Circulation pump as per DPWI 722 specification. The following from part of genset: Water jacket heater, fuel level indicator, fire fuse link shut off system, drip tray, battery charger, battery charger amp meter, canopy lights, fuel filling pump, Anti vibration mounts.				
1.1.1	250kVA, 3 Phase Indoor Open Type Prime Genenerator set	ea	5		
1.2	<u>316 S/S CHANGE OVER PANEL WITH CONTROLLER</u> The control shall contain the engine, alternator management and protection system, as well as the control logistics for the remote changeover switchgear. These functions shall be controlled by a micro-processor-based programmable control and it shall be equipped with an optional GSM cellphone-type modem as per DPWI 722 specifications (modem with sim card), c/w adjustable CB, motorized c/p & by pass switch Supply				
1.2.1		ea	5		
	<u>LUBRICATION, OIL AND DIESEL</u> Supply and fill up to 100% all required lubrications to run generator including diesel. Tank shall be a 1300L capacity each	ea	5		
1.3	<u>EXHAUST SILENCER - Sound Attenuated</u> Design supply and install the stainless steel exhaust silencer for the mentioned generator, including lagging:	ea	5		
1.3.1		ea	5		
1.5	<u>WARNING NOTICES</u> Supply and Install warning notices on the container as specified. Set of Warning Notices as per SANS and OHS specifications.	ea	5		
1.5.1		ea	5		
1.6	<u>DOCUMENTATION</u> Compilation of Maintenance, operational and technical Manuals to the client satisfaction. Supply manuals	sum	1		
1.6.1		sum	1		
1.7	<u>SITE TESTING, COMMISSIONING & DOCUMENTATION</u> Test and Commission to deliver a fully operational generating set to the client and engineers satisfaction: At the suppliers premises, prior to delivery to site On site after completion of the installation	ea	5		
1.7.1		ea	5		
1.8	<u>1 YEAR MAINTENANCE</u> 12 Month maintenance as per the specification. Quarterly (4) service of the plant as per the manufacturer's requirements	Item	20		
1.8.1		Item	20		
CARRIED FORWARD					

 <div> public works & infrastructure Department: Public Works and Infrastructure REPUBLIC OF SOUTH AFRICA </div>					
<div> MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION ELECTRICAL ENGINEERING SERVICES </div>					
TENDER NUMBER:					
ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	BROUGHT FORWARD				
1.9	PADLOCKS				
1.9.1	Supply and install A82 padlocks.	ea	10		
1.10	DECOMMISSION				
1.10.1	Decommissioning of the existing generator sets and delivering to storage/appointed location.	ea	5		
CARRIED FORWARD TO SECTION 6 SUMMARY					

SECTION 3: ELECTRICAL INSTALLATION



MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION
ELECTRICAL ENGINEERING SERVICES

TENDER NUMBER:

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
3	LT DISTRIBUTION AND SERVICE RETICULATION				
3.1	<u>LOW VOLTAGE SUPPLY CABLES</u> Supply and install the following 600/1000V PVC/SWA/PVC cables with copper conductor to SABS 1507 laid vertically or horizontally in conduiting /ducting/clipped direct in accordance with the specifications and drawings, including fixing. (Termination elsewhere).				
	Generator Room (Technical Centre)				
3.1.1	70mm ² 4 core Gen 1 to Main Sync Control Panel	m	60		
3.1.2	70mm ² 4 core Gen 2 to Main Sync Control Panel	m	60		
3.1.3	70mm ² 4 core Gen 3 to Main Sync Control Panel	m	60		
3.1.4	95mm ² 4 core Main Sync Control Panel to Main DB	m	100		
3.1.5	95mm ² 4 core Main Sync Control Panel to Sync Control Panel (ADE Shack Room)	m	500		
	ADE Shack Room				
3.1.6	70mm ² 4 core Gen 4 to Sync Control Panel	m	60		
3.1.7	70mm ² 4 core Gen 5 to Sync Control Panel	m	60		
3.2	<u>CABLE TERMINATIONS</u> Termination of LV cables as specified including connection of conductors, cable lugs, captive glands, shrouds, etc. for the following cable sizes.				
	Generator Room (Technical Centre)				
3.2.1	70mm ² 4 core Gen 1 to Main Sync Control Panel	No	4		
3.2.2	70mm ² 4 core Gen 2 to Main Sync Control Panel	No	4		
3.2.3	70mm ² 4 core Gen 3 to Main Sync Control Panel	No	4		
3.2.4	95mm ² 4 core Main Sync Control Panel to Main DB	No	4		
3.2.5	95mm ² 4 core Main Sync Control Panel to Sync Control Panel (ADE Shack Room)	No	4		
	ADE Shack Room				
3.2.6	70mm ² 4 core Gen 4 to Sync Control Panel	No	4		
3.2.7	70mm ² 4 core Gen 5 to Sync Control Panel	No	4		
CARRIED FORWARD					

SECTION 3: ELECTRICAL INSTALLATION



MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION
ELECTRICAL ENGINEERING SERVICES

TENDER NUMBER:

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD					
3.3	<u>BARE COPPER EARTH WIRES</u> Supply and install 600/1000V conductors and bare stranded copper conductors on wire ways or trenching including terminations for earthing in accordance with the specifications and drawings				
	Generator Room (Technical Centre)				
3.3.1	70mm ² BCEW Gen 1 to Main Sync Control Panel	m	30		
3.3.2	70mm ² BCEW Gen 2 to Main Sync Control Panel	m	30		
3.3.3	70mm ² BCEW Gen 3 to Main Sync Control Panel	m	30		
3.3.4	95mm ² BCEW Main Sync Control Panel to Main DB	m	50		
3.3.5	95mm ² BCEW Main Sync Control Panel to Sync Control Panel (ADE Shack Room)	m	250		
	ADE Shack Room				
3.3.6	70mm ² BCEW Gen 4 to Sync Control Panel	m	30		
3.3.7	70mm ² BCEW Gen 5 to Sync Control Panel	m	30		
3.4	<u>BARE COPPER EARTH WIRES TERMINATIONS</u> Termination of BCEW cables as specified including connection of conductors, cable lugs, captive glands, shrouds, etc. for the following cable sizes.				
	Generator Room (Technical Centre)				
3.4.1	70mm ² BCEW Gen 1 to Main Sync Control Panel	No	2		
3.4.2	70mm ² BCEW Gen 2 to Main Sync Control Panel	No	2		
3.4.3	70mm ² BCEW Gen 3 to Main Sync Control Panel	No	2		
3.4.4	95mm ² BCEW Main Sync Control Panel to Main DB	No	2		
3.4.5	95mm ² BCEW Main Sync Control Panel to Sync Control Panel (ADE Shack Room)	No	2		
	ADE Shack Room				
3.4.6	70mm ² BCEW Gen 4 to Sync Control Panel	No	2		
3.4.7	70mm ² BCEW Gen 5 to Sync Control Panel	No	2		
CARRIED FORWARD					

SECTION 3: ELECTRICAL INSTALLATION


MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION
ELECTRICAL ENGINEERING SERVICES
TENDER NUMBER:

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD					
3.5	<u>CABLE BASKET</u> Supply and Install Heavy duty galvanised Cable ladder including all supports etc.				
3.5.1	300mm wide	sum	1		
3.6	<u>JOINTING KIT</u>				
3.6.1	Jointing of LV cables as specified with all the accessories	sum	1		
3.7	<u>GENERAL</u>				
3.7.1	Test, commission, and certify complete LT reticulation and distribution in accordance with the specifications	sum	1		
3.8	<u>EARTHING AND ACCESSORIES</u> Supply and install 1.2 m long copper coated earth spike incl earth clamp and earth coupling on Distribution Board				
3.8.1	1.2m earth spike	No	14		
3.9	<u>DISTRIBUTION BOARDS</u> Supply of distribution boards including delivery to site				
	Installation of boards including moving into position, connecting up to all trunking and conduit, circuit and earthing terminations and compilation of legend cards but excluding cable terminations which are measured elsewhere.				
3.9.1	Main Distribution Board <i>Physical size parameters</i> 1100 mm Wide, 1800 mm High, 400 mm Deep Circuit breakers to be cascaded as per drawing MI_DEFF_E_SLD_004 Allow for additional 350 Amp 3P circuit breaker fed from Main Sync Control Panel. 350 Amp Circuit breaker to be connected to BUSBAR system, and feeding out to distribution circuit breakers, cascaded as per drawing MI_DEFF_E_SLD_004	ea	1		
CARRIED FORWARD					

SECTION 3: ELECTRICAL INSTALLATION



MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION
ELECTRICAL ENGINEERING SERVICES

TENDER NUMBER:

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD					
3.9.2	Synchronization Distribution and Generator Control Panel (Main Sync Control Panel)	ea	1		
	<i>Physical size parameters</i> 3200 mm Wide, 1830 mm High, 800 mm Deep				
	Cables bottom entry, floor standing Red finish indoor DB with doors Panel to be 316 S/S				
3.9.2.1	Section No 1 - Alternator Set 1				
	350 Amp Motorized circuit breaker to be fed from 250kVA generator according to monitor Generator specifications				
	350 Amp circuit breakers to be connected to a BUSBAR system and feeding out to a 350 Amp circuit breaker to feed Main Distribution DB				
	Panel to include Hub for the SCADA connections from generator controllers to 8610 MIMIC Panel				
	Deep Sea or approved battery charger				
	Front Panel lock-out key switch for maintenance lock-out				
	All relevant controls such as Oil, Temp etc as per 8610 wiring diagram				
	Front panel plug point to work only if generator operation incl. contrl gear and protection				
	Control gear to alternator heater and Engine water heater				
	Emergency stop				
CARRIED FORWARD					

SECTION 3: ELECTRICAL INSTALLATION



MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION
ELECTRICAL ENGINEERING SERVICES

TENDER NUMBER:

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD					
3.9.2.2	<p>Section No 2 - Alternator Set 2</p> <p>350 Amp Motorized circuit breaker to be fed from 250kVA generator according to monitor Generator specifications</p> <p>350 Amp circuit breakers to be connected to a BUSBAR system and feeding out to a 350 Amp circuit breaker to feed Main Distribution DB</p> <p>Panel to include Hub for the SCADA connections from generator controllers to 8610 MIMIC Panel</p> <p>Deep Sea or approved battery charger</p> <p>Front Panel lock-out key switch for maintenance lock-out</p> <p>All relevant controls such as Oil, Temp etc as per 8610 wiring diagram</p> <p>Front panel plug point to work only if generator operation incl. contrl gear and protection</p> <p>Control gear to alternator heater and Engine water heater</p>				
3.9.2.3	<p>Section No 3 - Alternator Set 3</p> <p>350 Amp Motorized circuit breaker to be fed from 250kVA generator according to monitor Generator specifications</p> <p>350 Amp circuit breakers to be connected to a BUSBAR system and feeding out to a 350 Amp circuit breaker to feed Main Distribution DB</p> <p>Panel to include Hub for the SCADA connections from generator controllers to 8610 MIMIC Panel</p> <p>Deep Sea or approved battery charger</p> <p>Front Panel lock-out key switch for maintenance lock-out</p> <p>All relevant controls such as Oil, Temp etc as per 8610 wiring diagram</p>				
CARRIED FORWARD					

SECTION 3: ELECTRICAL INSTALLATION



MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION
ELECTRICAL ENGINEERING SERVICES

TENDER NUMBER:

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD					
3.9.2.4	<p>Front panel plug point to work only if generator operation incl. contrl gear and protection</p> <p>Control gear to alternator heater and Engine water heater</p> <p>Emergency stop</p> <p>Section No 4 - ADE SHACK MAIN BUS</p> <p>350 Amp Motorized circuit breaker to be fed from Sync Control Panel (ADE Shack Room) according to monitor Generator specifications and as per drawing <i>MI_DAFF_E_CP_001</i></p>				
3.9.2.5	<p>350 Amp circuit breakers to be connected to a BUSBAR system and feeding out to a 350 Amp circuit breaker to feed Main Distribution DB</p> <p>Section No 5 - INCOMER MAIN BREAKER</p> <p>350 Amp Motorized circuit breaker to be fed from the Main Sync Control Panel BUSBAR according to monitor Generator specifications and as per drawing <i>MI_DAFF_E_CP_001</i></p>				
3.9.2.6	<p>350 Amp circuit breakers to be connected to a BUSBAR system and feeding out to a 350 Amp circuit breaker to feed Main Distribution DB</p> <p>Section No 6</p> <p>Generator No1 controls with Deep Sea 8610 Controller or approved, Sync ready.</p> <p>Generator No2 controls with Deep Sea 8610 Controller or approved, Sync ready.</p> <p>Generator No3 controls with Deep Sea 8610 Controller or approved, Sync ready.</p> <p>Multi-set remote overview display Deep Sea 8003 contoller, or approved, Sync ready.</p> <p>Controller 1 with DSE124 CANBUS Extender Controller or approved, Sync ready.</p> <p>Deep Sea or approved battery charger</p> <p>Contols etc as per Section No 1</p>				
CARRIED FORWARD					

SECTION 3: ELECTRICAL INSTALLATION



MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION
ELECTRICAL ENGINEERING SERVICES

TENDER NUMBER:

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD					
3.9.3	ADE Shack Generator Control DB (Sync Control Panel (ADE Shack Room)) <i>Physical size parameters</i> 1800 mm Wide, 1830 mm High, 400 mm Deep Cables bottom entry, floor standing Red finish indoor DB with doors Panel to be 316 S/S Section No 1 350 Amp Motorized circuit breaker to be fed from 250kVA generator according to monitor Generator specifications 350 Amp circuit breakers to be connected to a BUSBAR system and feeding out to a 350 Amp circuit breaker to feed Main Sync Control Panel Panel to include Hub for the SCADA connections from generator controllers to 8610 MIMIC Panel Deep Sea or approved battery charger Front Panel lock-out key switch for maintenance lock-out All relevant controls such as Oil, Temp etc as per 8610 wiring diagram Front panel plug point to work only if generator operation incl. contrl gear and protection Control gear to alternator heater and Engine water heater Emergency stop	ea	1		
3.9.3.1	Section No 1 350 Amp Motorized circuit breaker to be fed from 250kVA generator according to monitor Generator specifications 350 Amp circuit breakers to be connected to a BUSBAR system and feeding out to a 350 Amp circuit breaker to feed Main Sync Control Panel Panel to include Hub for the SCADA connections from generator controllers to 8610 MIMIC Panel Deep Sea or approved battery charger				
3.9.3.2	Section No 2 350 Amp Motorized circuit breaker to be fed from 250kVA generator according to monitor Generator specifications 350 Amp circuit breakers to be connected to a BUSBAR system and feeding out to a 350 Amp circuit breaker to feed Main Sync Control Panel Panel to include Hub for the SCADA connections from generator controllers to 8610 MIMIC Panel Deep Sea or approved battery charger				
CARRIED FORWARD					

SECTION 3: ELECTRICAL INSTALLATION




MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION
ELECTRICAL ENGINEERING SERVICES


TENDER NUMBER:

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD					
3.9.3.3	<p>Front Panel lock-out key switch for maintenance lock-out</p> <p>All relevant controls such as oil, temp etc as per 8610 wiring diagram</p> <p>Front panel plug point to work only if generator operation incl. contrl gear and protection</p> <p>Control gear to alternator heater and Engine water heater</p> <p>Emergency stop</p> <p>Section No 3 - INCOMER MAIN BREAKER</p> <p>350 Amp Motorized circuit breaker to be fed from the Sync Control Panel (ADE Shack Room) according to monitor Generator specifications and as per drawing MI_DAFF_E_CP_002</p>				
3.9.3.4	<p>350 Amp circuit breakers to be connected to a BUSBAR system and feeding out to a 350 Amp circuit breaker to feed Main Sync Control Panel</p> <p>Section No 4</p> <p>Generator No1 controls with Deep Sea 8610 Controller or approved, Sync ready.</p> <p>Generator No1 controls with Deep Sea 8610 Controller or approved, Sync ready.</p> <p>Controller 2 with DSE124 CANBUS Extender Controller or approved, Sync ready.</p> <p>Deep Sea or approved battery charger</p>				
3.9.4	<p>Contols etc as per Section No 1</p> <p>ADE Shack Main DB</p> <p><i>Physical size parameters</i></p> <p>1100 mm Wide, 1800 mm High, 400 mm Deep</p> <p>Cables bottom entry, Floor Standing Red Finish Indoor DB with doors 316 S/S</p> <p>Circuit breakers to be cascaded as per drawing MI_DEFF_E_SLD_005</p>	ea	1		
CARRIED FORWARD					

SECTION 3: ELECTRICAL INSTALLATION

 <div> <div>public works & infrastructure</div> <div>Department: Public Works and Infrastructure REPUBLIC OF SOUTH AFRICA</div> </div>					
<div> <div>MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION</div> <div>ELECTRICAL ENGINEERING SERVICES</div> </div>					
TENDER NUMBER:					
ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD					
3.9.5	Test and Issue Certificates of Compliance in accordance with SANS 10142 and the Occupational Health and Safety Act. Main Distribution Board Synchronization Distribution and Generator Control Panel (Main Sync Control Panel) ADE Shack Generator Control Panel (Sync Control Panel (ADE Shack Room)) ADE Shack Main DB	sum	1		
3.9.6	General Test, commission and certify complete L.T reticulation and distribution in accordance with the specifications	sum	1		
CARRIED FORWARD TO SECTION 6 SUMMARY					

SECTION 3: ELECTRICAL INSTALLATION

<div>  <div> <p>MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION</p> <p>ELECTRICAL ENGINEERING SERVICES</p> </div> </div>					
TENDER NUMBER:					
ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
4	ELECTRICAL INSTALLATION				
4.1	<u>Trunking</u> Supply and Install galvanized trunking suspended on hangers 600mm below slab soffit or roof structure inclusive of splices; hanging brackets; fixings, steel covers, bends etc.				
4.1.1	P8000	m	20		
4.1.2	P2000	m	20		
4.2	<u>Conduit and Boxes</u> Galvanized conduit inclusive fixings, fittings, adaptors and locknut etc.				
4.2.1	20mm diameter PVC boxes installed including Galvanised conduit ends	m	50		
4.2.2	100x50x50mm surface box	ea	4		
4.2.3	100x100x50mm surface box	ea	50		
4.3	<u>Conductors</u> PVC insulated black 'UV resistant' surfix cable with aluminium sheath and copper conductors				
4.3.1	2,5mm ² /2c	m	100		
4.3.2	PVC insulated black 'UV resistant' surfix terminators 2,5mm ² /2c terminations	ea	10		
4.4	<u>Socket Outlets</u> Supply and Install Crabtree Classic, similar or proven equivalent, outlets including cradles and covers including wire terminations				
4.4.1	16A duo normal switched socket outlets	ea	10		
4.4.2	Allow for the supply, acceptance, storage, fixing and connecting up of the following luminaires excluding cutting of holes including wire terminations for surface mounted fittings Vapour Proof Luminaire 5ft	ea	10		
4.5	<u>Light Switches</u> Supply and Install Crabtree Classic , similar or proven equivalent, light switches including conductor terminations				
4.5.1	1 lever 1 way	ea	4		
4.6	<u>General</u> Test and commission complete general power and lighting installation	sum	1		
4.6.1	Supply as-built documentation	sum	1		
CARRIED FORWARD TO SECTION 6 SUMMARY					

SECTION 3: ELECTRICAL INSTALLATION



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MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION
ELECTRICAL ENGINEERING SERVICES

TENDER NUMBER:

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
5	PRIME COST SUMS				
5.1	<u>Distribution Boards</u> Sum for the supply of distribution boards including delivery to site				
5.1.1	Main Distribution Board	ea	1		
5.1.2	Synchronization Distribution and Generator Control Panel	ea	1		
5.1.3	ADE Shack Generator Control DB	ea	1		
5.1.4	ADE Shack Main DB	ea	1		
5.2	<u>Luminaires</u> Sum for the supply only to site of the following luminaires;				
5.2.1	Vapour Loom	ea	10		
CARRIED FORWARD TO SECTION 6 SUMMARY					



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**MARION ISLAND GENERATOR UPGRADE AND ELECTRICAL INSTALLATION
ELECTRICAL ENGINEERING SERVICES**

TENDER NUMBER:

SECTION 6 : FINAL SUMMARY		
SECTION		AMOUNT
1	PRELIMINARIES AND GENERAL	
2	GENERATOR INSTALLATION	
3	LT DISTRIBUTION AND SERVICE RETICULATION	
4	ELECTRICAL INSTALATION	
5	PRIME COST SUMS	
	TOTAL TENDERED VALUE EXCLUDING. VAT.	
	15% VAT	
	TOTAL TENDERED VALUE INCLUDING VAT. CARRIED TO FORM OF OFFER AND ACCEPTANCE DPW-07(EC)	



**public works
& infrastructure**

Department:
Public Works and Infrastructure
REPUBLIC OF SOUTH AFRICA

NATIONAL DEPARTMENT OF PUBLIC WORKS AND INFRASTRUCTURE

ELECTRICAL ENGINEERING SERVICES

SPECIFICATION FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF FIVE (5) INDOOR EMERGENCY PRIME GENERATOR SET

Date: January 2023

Engineering Services Chief Directorate
Electrical Engineering Directorate
Electrical Engineering Standards & Specifications Committee
256 Madiba Street
Pretoria

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SECTION 1 – GENERAL

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1. SECTION 1 – GENERAL

1.1. Intent of Specification

The specification is intended to cover the complete installation and commissioning of the generator plant. The minimum equipment requirements are outlined, but do not cover all the details of design and construction. Such details are recognised as being the exclusive responsibility of the contractor.

For the purposes of this document the following applies:

- Generator Contractor shall be referred to as the Generator Contractor or simply Contractor;
- The masculine includes the feminine;
- The singular includes the plural.

1.2. Standards and Codes

All standards referenced shall be the latest editions.

SANS 10142-1	the wiring of premises: Low Voltage Installations
SANS 8528	Reciprocating internal combustion engine driven alternating current generating sets.
SANS 60034	Rotating electrical Machines
SANS IEC 60947	Low Voltage Switchgear
OHSACT	Occupational Health and Safety Act.
Department of Public Works Quality Specification Parts A, B and C.	
Local municipality by-laws for generator installations. (To be obtained from local municipality)	

1.3. Compliance with Regulations

The installation shall be erected and tested in accordance with the following Acts and regulations:

- a) The Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended,
- b) The Local Government Ordinance 1939 (Ordinance 17 of 1939) as amended and the municipal by-laws and any special requirements of the local supply authority,
- c) The Fire Brigade services Act 1987 (Act 99 of 1987) as amended,
- d) The National Building Regulations and Building Standards Act 1977 (Act 103 of 1977) as amended,
- e) The Electricity Act 1984 (Act 41 of 1984) as amended.
- f) The environmental Act and regulations

1.4. Scope of Work

Included in this indoor Generator Specification

Supply, delivery, installation and commissioning of the complete indoor emergency generator set specified in this document.

The plant room will be provided by other trades and the contractor shall ensure that the space allowed is sufficient for the installation of the generator set and that the ventilation of the plant room is adequate. If any changes to the design have to be made the contractor must inform the consulting engineer in writing.

1.5. Co-ordinating

The Contractor shall familiarise himself with the requirements of the other professional disciplines and shall examine the plans and specifications covering each of these sections.

The generator space, noise and vibration requirements shall be carefully checked with other professional disciplines to ensure that the equipment can be installed in the proper sequence in the space allotted.

1.6. Tests Certificates and Inspections

The following tests are to be carried out:

- a) At the supplier's premises, before the generating set will be delivered to site Representatives of the Department must be present during the test to satisfy themselves that the generating set complies with the specification and delivers the specified output. The test must be carried out in accordance with SANS 8528. The Representative/Agent must be timeously advised of the date for the test.
- b) After completion of the works and before practical completion is taken, 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 installation will be inspected and the contractor shall make good, to the satisfaction of the Representative/Agent, any defects which may arise.
- c) 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 installation at completion.
- d) Test reports of both tests as specified under (a) and (b) are to be submitted to the Representative/Agent.

The total costs for these test shall be included in the tendered amount.

In the event of the plant, equipment or installation not passing the test, the Representative/Agent shall be at liberty to deduct from the Contract amount all reasonable expenses incurred by the Employer and/or the Representative/Agent attending the test.

1.7. Operating and Maintenance Manuals

The Contractor shall be responsible for the compilation of a complete set of Operating and Maintenance manuals.

This shall be done in accordance with Section 4 – Operating and Maintenance manuals.

All information shall be recorded and reproduced in electronic format as well as supplying the Representative/Agent with three sets of hard copies.

Approval of the final Operating and Maintenance Manuals shall be a prerequisite for issuing of a Certificate of Practical Completion of the installation.

1.8. Guarantee

After works completion of the installation have been achieved, there will follow a 12-month free maintenance period.

During this period the generator contractor shall maintain the generator installation as per the requirements of the Occupational Health and Safety Act. This maintenance shall include systematic examinations, adjustments and lubrication of all generator equipment. Electrical and mechanical parts shall be repaired or replaced whenever it is required to maintain optimum performance without additional cost to the Department, unless the condition was caused by misuse or vandalism of the generator equipment or natural hazards/force majeure.

The work under this section shall be performed by competent, qualified accredited personnel under the supervision and in the direct employment of the Generator Contractor and shall not be transferred to any non-affiliated agent. Contract maintenance and repair work shall be done during normal working hours and shall further provide emergency call-back service twenty-four (24) hours a day, seven (7) days a week.

During the guarantee/maintenance period the Department will invite tenders for the comprehensive maintenance of the generator, which will commence after the final completion has taken place, i.e. after the twelfth month guarantee period is over and all defects are corrected.

1.9. Materials and Workmanship

- a) The work throughout shall be executed to the highest standards and to the entire satisfaction of the Representative/Agent who shall interpret the meaning of the Contract Document and shall have the authority to reject any work and materials, which, in his judgement, are not in full accordance therewith. All condemned material and workmanship shall be replaced or rectified as directed and approved by the Representative/Agent.
- b) All work shall be executed in a first-class manner by qualified accredited tradesman.
- c) The Contractor shall be fully responsible for his work and shall replace any of the work which may be damaged, lost or stolen. The Contractor shall protect the building and its contents against damage by him, his employees or sub-contractors and shall make good any damage thereto.
- d) The Contractor shall indemnify the Employer of all liability for damages arising from injuries or disabilities to persons or damage to property occasioned by any act or omission of the Contractor or any of his sub-contractors, including any and all expenses, legal or otherwise, which may be incurred by the Employer or Representative/Agent in the defence of any claim, action or suit.
- e) The Contractor shall warrant that the materials and workmanship shall be of the highest grade, that the equipment shall be installed in a practical and first-class manner in accordance with the best practices and ready and complete for full operation. It is specifically intended that all material or labour which is usually provided as part of such equipment as is called for and which is necessary for its proper completion and operation shall be provided without additional cost whether or not shown or described in the Contract Document.
- f) The Contractor shall thoroughly acquaint himself with the work involved and shall verify on site all measurements necessary for proper installation and commissioning work. The Contractor shall also be prepared to promptly furnish any information relating to his own work as may be necessary for the proper installation work and shall co-operate with and co-ordinate the work of others as may be applicable.
- g) The Contractor shall inspect and verify that the existing power feeder system is compatible with the equipment offered and any changes or upgrading of the electrical supply shall be brought to the attention of the Representative/Agent.
- h) Material and equipment damaged in transit shall be replaced with undamaged material without additional cost to the Department.
- i) All components and their respective adjustment, which do not form part of the equipment installation work, but influence the optimum and safe operation of the equipment shall be considered to form part of, and shall be included in the Contractor's scope of works.
- j) All control equipment and serviceable items shall be installed and positioned such that they will be accessible and maintainable.
- k) The Contractor shall make sure that all safety regulations and measures and environmental regulations are applied and enforced during the installation and guarantee period to ensure the safety of the public and the User Client.

1.10. Brochures

Detailed brochures of all equipment offered shall be presented together with the tender documents.

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2. SECTION 2 – EQUIPMENT REQUIREMENTS

2.1. Engine

2.1.1. General

The engine must comply with the requirements laid down in SANS 8528 and must be of the atomized injection, compression ignition type, running at a speed not exceeding 1500 r.p.m. The engine must be amply rated for the required electrical output of the set, when running under the site conditions. The starting period for either manual or automatic switching-on until the taking over by the generating set, in one step, of a load equal to the specified site electrical output, shall not exceed 15 seconds. This must be guaranteed by the Tenderer.

Turbo-charged engines will only be accepted if the Tenderer submits a written guarantee that the engine can deliver full load within the specified starting period.

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

2.1.2. Rating

The set shall be capable of delivering the specified output continuously under the site Conditions, without overheating. The engine shall be capable of delivering an output of 110% of the specified output for one hour in any period of 12 hours consecutive running in accordance with SANS 8528.

2.1.3. De-Rating

The engine must be de-rated for the site conditions as set out in the Technical Specification, Section 3 of this document.

The de-rating of the engine for site conditions shall be strictly in accordance with SANS 8528 as amended to date. Any other methods of de-rating must have the approval of the Department and must be motivated in detail. Such de-rating must be guaranteed in writing and proved by the successful Tenderer at the site test.

2.1.4. Starting and Stopping

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

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

2.1.5. Starter Battery

The set must be supplied a fully charged lead-acid type or maintenance free type battery, complete with necessary electrolyte. The battery must have sufficient capacity to provide the starting torque stipulated by the engine manufacturer. The battery capacity shall not be less than 120 Ah and shall be capable of providing three consecutive start attempts from cold and thereafter a fourth attempt under manual control of not less than 20 seconds duration each. The battery must be of the heavy duty "low maintenance" type, housed in a suitable battery box.

2.1.6. Cooling

The engine may be either of the air or water cooled type. In the case of water-cooling, a built-on heavy duty, tropical type pressurised radiator must be fitted. Only stand-by sets that are water cooled shall have electric heaters.

For either method of cooling, protection must be provided against running at excessive temperatures. The operation of this protective device must give a visual and audible indication on the switchboard. Water-cooled engines shall in addition be fitted with a low water cut-out switch, installed in the radiator, to switch the set off in the event of a loss of coolant. The protection shall operate in the same way as the other cut-outs (e.g. low oil pressure). All air ducts for the cooling of the engine are to be allowed for. The air shall be supplied from the cooling fan cowling/radiator face to air outlet louvers in the plant room wall.

2.1.7. Lubrication

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

2.1.8. Fuel Pump

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

2.1.9. Fuel Tank

A fuel tank shall be installed in the plant room. The fuel tank shall be a free standing type or alternatively be an integral part of the base frame of the generator set. The tank shall have sufficient capacity for standby sets to run the engine on full load for a period of 24 hours.

The diesel fuel storage system / tank which will be provided with the standby generator installation must be fitted with a fuel filtration and water separation system (filter & separator) which is entirely separate from the fuel supply line and line filter to the engine. This filtration and water separation system must be dedicated to purifying the content of the storage system / tank by way of the cleaning processes which are applied while circulating the fuel through the filter & separator unit.

The filtration system must be able to handle diesel fuel of "high" and of "low" sulphur content for an indefinite period. The suction line of the system must be connected to the lowest part of the storage system / tank. The return line must be connected in the top section of the storage system / tank in such a position and in such a way that the flow of fuel within the storage system / tank between the fuel return point and the fuel suction point will induce scouring of the bottom of the system / tank to effectively capture sediment and water in the to be filtered fuel.

The filtration unit must filter the diesel fuel, removing suspended particles of effective diameters down to 5 micron. In addition, it must separate all water from the fuel and the fuel storage system and automatically dispose of / dump such water into an open, removable receptacle for disposal at the installation or in a suitable position outside the building. Separation of the fuel and water must be sufficiently effective that the discharged water will meet the standard required for it to be disposed of into a municipal drain and sewer system.

The filter and water separator unit must draw its power from the DC batteries used to power the relevant generator set. The circulating pump shall be provided with a controller programmed to switch the pump through not more than three complete on and off cycles of equal time (i.e. 50% on; 50% off) , per hour, with a deviation of not more than 10 % \pm . The pump must be capable of a duty cycle of not less than 60% running time. The flow rate through the circulating pump must be between 1 L/min and 1.25 L /min.

The filter cartridge of the filter and water separator unit must be replaceable, and, in normal operational conditions, not require replacement within periods shorter than three months. The replacement units must be readily available.

The filtration & separator system may be mounted against the wall of the plant room or on the inside of a container, which may house the installation as may be specified elsewhere in this document.

The tank shall be fitted with a suitable filter, a full height gauge glass, "low fuel level" alarm, giving an audible and visible signal on the switchboard as well as a low-low fuel level cut-out.

An electrically operated pump with sufficient length of oil resistant hose to reach 2m beyond the door, shall be supplied, for each set for filling the fuel tank/s from 200 litre drums.

The interconnection fuel piping shall consist of copper tubes and the connection to vibrating components shall be in flexible tubing with armoured covering.

2.1.10. Governor

The speed of the engine shall be controlled by a governor in accordance with ECM of SANS 8528 if not otherwise specified in the Detailed Specification.

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

2.1.11. Flywheel

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

The cyclic irregularity of the set must be within the limit laid down in SANS 8528.

2.1.12. Exhaust Silencer

It is essential to keep the noise level as low as possible. An effective exhaust silencing system of the residential type must be provided and shall be capable of providing 20 to 30 decibels of suppression.

The exhaust system shall consist of 3CR12 steel for inland areas (greater than 50km from the coast) or Grade 304 stainless steel in coastal areas.

The exhaust pipe shall be installed in such a way that the expelled exhaust fumes will not cause discomfort to the public. The exhaust pipe must be flexibly connected to the engine to take up vibrations transmitted from the engine, which may cause breakage. The exhaust piping and silencer shall be lagged and then cladded in stainless steel sheet to reduce the heat and noise transmission into the plant room and shall be protected against the ingress of driving rain at 45° to the horizontal. The exhaust pipe must extend 0,5m above the roof gutters or higher to avoid pollution of gas emissions into other buildings/offices. It must be secured by stainless steel flanges both sides of the wall at the point of exit. These flanges must be clamped to the wall with bolts through the wall.

2.1.13. Accessories

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

2.1.14. Exhaust emissions

The exhaust emissions shall comply with US Tier III/EU stage III standards.

2.2. Alternator

2.2.1. General

The alternator shall be of the self-excited brushless type, with enclosed ventilated drip-proof housing and must be capable of supplying the specified output continuously with a temperature rise not exceeding the limits laid down in SANS 60034-1 for rotor and stator windings.

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

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

2.2.2. Regulation

The alternator must preferably be self-regulated without the utilisation of solid state elements. The inherent voltage regulation must not exceed plus or minus 5% of the nominal voltage specified, at all loads with the power factor between unity and 0,9 lagging and within the driving speed variations of 4,5% between no-load and full load.

2.2.3. Performance

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

2.2.4. Coupling

The engine and alternator must be directly coupled by means of a high quality flexible coupling, ISO 9001:2000 approved and must be designed and manufactured to this quality system.

2.3. Switchboard

2.3.1. General

A switchboard must be supplied and installed to incorporate the equipment for the control and protection of the generating set and battery charging.

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

2.3.2. Construction

The switchboard shall be a totally enclosed, floor mounted unit, fabricated from steel panels, carried on and-substantial angle iron framework.

The board shall be flush fronted and all equipment to be mounted behind the front plate, on suitable supports.

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

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

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

Suitably rated terminals must be provided for all main circuits and the control and protection circuits. Where cable lugs are used, these shall be crimped onto the cable strands. Screw terminals shall be of the type to prevent spreading of cable strands. All terminals shall be clearly marked.

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

The modular generator set controller and protection equipment shall be mounted on a separate easily replaceable panel.

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

Access to the cubicle will be such that all components can be conveniently reached for testing and maintenance purposes.

The necessary bushes and a screen over the terminals will be provided where the power feeds enter and leave the cubicle.

The cubicle will be so constructed that the ac and dc components are screened from one another.

2.3.3. Protection and Alarm Devices

All switchboards shall be equipped with protection and alarm devices as described below.

A circuit breaker and an adjustable current limiting protection relay must be installed for protection of the alternator. The protection relay shall be of the type with inverse time characteristics. The relay shall cause contactor to isolate the alternator and stop the engine.

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

Reset push buttons are required on the modular generator set controller and a visible signal are required and the engine must stop when any of the protective devices operate. In the case of manual operation of standby sets, it shall not be possible to restart the engine.

The indication on the modular generator set controller must be in ENGLISH.

"OVERLOAD"

"TEMPERATURE HIGH"

"OIL PRESSURE LOW"

"OVERSPEED"

"START FAILURE"

"LOW WATER LEVEL"

In addition an audible and visible flashing signal shall be provided, when:

- a) The fuel level in the service tank is low. The indication on the modular generator set controller shall be "FUEL LOW".
- b) The battery charger failed. The indication on the modular generator set controller shall be "CHARGER FAIL"

A low-low level sensor must be provided. At this level the engine must stop to prevent air entering the fuel system.

This is also applicable to the engine driven generator/alternator.

All alarm conditions must operate an alarm hooter. A pushbutton must be installed in the hooter circuit to stop the audible signal, but the fault indicating light on the control panel must remain lit until the fault has been rectified.

An on/off switch is not acceptable. After the hooter has been stopped, it must be re-set automatically, ready for a further alarm.

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

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

A test pushbutton must be provided to test all indicators lamps.

2.3.4. Modular Generator Set controller

The modular generator set controller shall be an electronic unit to match those of the other modular generator set controllers and of a high quality i.e. Levato, Deep Sea Electronics, Circom. It must be provided with IO and communication facilities.

The modular generator set controller will be supplied with all its functions and shall be mounted on a separate easily replaceable panel with plug in termination blocks for easy installation and replacement.

The modular generator set controller interface will be implemented with relays, contractors etc.

The modular generator set controller will have a mimic display of the alternator/mains/ change over contractors configuration with LED's showing the status of the mains, alternator and change over contractors.

Configuration software shall be supplied with the system. The software will be capable of the following:

- Fault management (event log)
- Configuration management (software upgrades and function changes)
- Account management (energy management)
- Performance management (generator set point changes)
- Security management (passwords)

The modular generator set controller will have a standard RS 232/485 or Ethernet interface suitable for TCP I/P transport medium. All communication including configuration management will be done through this port. Equipment connected at each end of the RS 232 or Ethernet cable shall be adequately protected against transient over-voltages, lightning effects (particularly if the set and remote alarms are in separate buildings), switching surges, power system surges or mains and alternator borne noise/interference.

The controller will incorporate the following functions:

- Mains sensing
- Alternator output-voltage sensing
- Alternator over- frequency sensing
- Control of processor unit (self-diagnostics)
- Alarm/ Status indications
- Control selector and operation
- Phase rotation monitor

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

- OFF: Diesel/ alternator generator set switched off
- MANUAL: Mains bypassed: Diesel/ alternator will not take load
- AUTO: Diesel /alternator takes load on mains failure
- TEST: Diesel /alternator takes load on mains failure
- A standby failure alarm (SF) will be given on the controller and to the output alarms when “Not in Auto” is selected.

The modular generator set controller must monitor the following

When the voltage of the incoming mains varies by more than a pre-program value (default $\pm 10\%$) from the normal voltage on any phase, the controller will signal that the incoming mains will be disconnected and the engine-starting sequence initiated.

When the frequency of the incoming mains varies by more than pre- program value (default $\pm 5\%$) from the normal frequency, the controller will signal that the incoming mains will be disconnected and the engine-starting sequence initiated.

Upon restoration of the incoming mains to the pre-program value (default $\pm 10\%$) of the normal voltage on all phases, the monitor will signal that the load will be disconnected from the alternator and reconnected to the incoming mains.

If the alternator has been disconnected from the load and the incoming mains within the voltage limits of $\pm 10\%$ on all phases, the controller will signal that the load will be reconnected to the incoming mains.

Should the incoming mains fail or not in the specified limits while the engine is running under control of the cooling-off timer, the control for the cooling –off timer in the controller will be cancelled and the load connected to the alternator.

When the output voltage of the alternator varies by more than the pre-program value (default value $\pm 10\%$) on ANY phase, the controller will signal that the load will be disconnected from the alternator and the engine stopped.

A software over and under-frequency monitor will be provided in the controller if the frequency exceeds or drop below pre-programmed values. It will meet the requirements of class G2 governing. The monitor will not be influenced by harmonics.

Note: Software monitors will include adjustable overshoot and undershoot timers to be fully compatible with Class G2 governing.

All timers will be implemented in software.

Incoming supply failure timer

It is essential that incoming supply failures, occurring at short intervals, do not cause a series of starts and stops.

A timer adjustable from 1 s to 10 s required

The timer default value will be generator set to 3 s

The signal generated by the mains voltage monitor will start the timer. If the duration of the signal is less than the generator setting on the timer, the signal is suppressed so that the switching and starting sequence is initiated. However, if the duration of the signal is more than the generator setting on the timer, the signal will be transmitted to initiate the switching and starting sequence.

Incoming supply restoration timer

It is essential that incoming supply failures, occurring at short intervals, do not cause a series of starts and stops.

A timer adjustable from 1 s to 10 s required.

The timer default value will be generator set to 3 s.

The signal generated by the mains voltage monitor will start the timer. If the duration of the signal is less than 150 sec, the signal is suppressed and the timer is regenerator set. However, if the duration of the signal is more than 150 sec, the signal will be transmitted to initiate the switching sequence.

Alternator supply/ incoming supply change-over timer

It is essential that the supply be disconnected from the load before the incoming supply is reconnected to the load. This will be software generator settable in the controller with a minimum of 5 seconds and maximum of 20 seconds.

On receipt of the switching signal, the alternator supply will be disconnected from the load and timer started. After 5 sec, the incoming supply will be reconnected to the load.

Engine cooling-off timer

After the load has been transferred to the incoming supply the engine will run without load for a period to cool off and then stop.

A timer, software adjustable in the controller from 5 to 10 min is required.

Repeat- start control

A repeat- start control is required in the controller software adjustable so that in the event of the engine failing to start on the first start attempt, the starter motor will be released and repeat the start attempt.

The repeat-start attempt will be repeated 3 times.

The duration of each start attempt will be 6 sec with a period of 15 sec between successive start attempts.

Should the engine fail to start after the third start attempt, the controller will transmit a signal for alarm purposes.

In addition to the requirement for the switchboard instruments listed elsewhere in this document metering will also form part of the modular generator set controller and must be accessible on the software.

The modular generator set controller shall display the following alarm/status indications:

- High engine temperature.
- Low Oil pressure
- High/low alternator output voltage
- Over and under speed (frequency)
- Low water level
- Emergency stop activated
- Mains fail
- Battery charger fail
- Dummy load in operation (When provided)
- Unit not in Auto
- Engine running
- Low fuel alarm
- Engine start failure

Conditions one to six above will stop the engine.

The Contractor shall provide a remote alarm mimic panel and the associated control wiring for the set. The panel shall be installed in the duty/security room at the entrance to the building approximately 70m from the generator set position.

The mimic panels must fit into furniture and blend with the design. Before manufacture, the Contractor shall submit and obtain the approval, from the Engineer, for the mimic panel.

The remote alarm must have potential free relay contacts which shall indicate the following on each set:

- 1) Mains on/off
- 2) Alternator running

- 3) Common fault alarm
- 4) Buzzer which can only be reset at the generator panel
- 5) Fuel low

The cable between the remote alarms is to be a signal cable with a screen and this option must be able to operate from a 12 / 24 V dc supply so that it can be powered from the generator set batteries.

A facility to originate a fault message should a warning or shutdown fault occur.

A facility to allow the mode of the control system to be changed to any of the four modes to allow the set to be run from a remote location.

A facility to originate a call to the control cellular and to transfer a fault message should a warning or shutdown fault occur. The alarm conditions above from the controller will be extended to four relays with a make and break contact and terminal strip to allow for remote monitoring of the following alarms:

- Mains fail
- Standby run
- Standby fail
- Low Fuel

A remote start facility must be supplied, software controllable in the controller.

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

The modular generator set controller system must be able to operate with a minimum DC supply voltage of 4 volts (without making use of either an internal or an external auxiliary battery) to allow cranking and starting under conditions of low battery capacity. Control cables between the set and the control panel shall be fitted with sockets for ease of undoing in the event the modular generator set controller has to be removed.

2.3.5. Manual Starting

Each switchboard shall be equipped with two pushbuttons marked "START" and "STOP" for manual starting and stopping of the set.

2.3.6. Battery Charging Equipment

Each switchboard shall be equipped with battery charging equipment.

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

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

The starter battery voltage will be software monitored by the modular generator set controller. The voltage will be digitally displayed.

2.3.7. Switchboard Instruments

Each generating set shall have a switchboard equipped as follows:

- a) One flush square dial voltmeter, reading the alternator voltage, scaled as follows:
 - (i) 0-300V for single phase generators.
 - (ii) 0-500V for three phase generator. In this case a six position and off selector switch must be installed for reading all phase and phase to neutral voltages.
- b) A flush square dial combination maximum demand and instantaneous ampere meter for each phase, with resettable pointer suitably scaled 20% higher than the alternator rating. A red arc stripe above scale markings from 0-20A and a red radial line through the scale at full-load current, shall be provided. This instruments shall be supplied complete with the necessary current transformer.
- c) One flush square dial vibrating type frequency meter, indicating the alternator frequency.
- d) A six digit running hour meter with digital counter, reading the number of hours the plant has been operating. The smallest figure on this meter must read 1/10 hour.
- e) Fuses or m.c.b.'s for the potential voltage circuits of the meters.
- f) One flush square dial ampere meter suitably scaled for the battery charging current.
- g) One flush square dial voltmeter with a spring loaded pushbutton or switch for the battery voltage.

2.3.8. Marking

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

2.3.9. Earthing

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

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

2.3.10. Operation Selector Switch

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

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

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

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

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

2.3.11. Automatic Change-over System

A fully automatic change-over system must be provided to isolate the mains supply and connect the standby set to the outgoing feeder in case of a mains failure and reverse this procedure on return of the mains.

The contactors for this system must be electrically and mechanically interlocked.

2.3.12. By-pass Switch and Main Isolator

The switchboard shall be equipped with an on-load isolator to isolate the mains and a manually operated on-load 4 pole 4 position by-pass switch, which shall switch the connected loads as follows:

NORMAL: will allow for the normal connection i.e. connects the incoming mains to the Automatic control gear or directly to the outgoing feeder.

In the GEN BY-PASS position the switch will disconnect the automatic changeover control gear, and will connect the municipal mains directly to the essential supply busbar which will allow for the maintenance of either or both the generator and the automatic changeover equipment.

MAINS BY-PASS switching position would allow the generator to be connected directly to the essential supply busbar. This is when there is a problem with the automatic changeover equipment and there is no municipal power available.

The final position is an OFF position which will remove all power downstream of this switch.

It is required that this by-pass switch and mains isolator be mounted away from the automatic control gear, in a separate compartment, either on the side or in the lower portion of the switchboard cubicle, and that the switches are operated from the front of the compartment.

Contractor to note: The by-pass and mains isolator switch shall also break the main neutral.

2.3.13. Start Delay

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

2.3.14. Stop Delay

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

2.4. Installation

Except for the supply of the incoming mains cable and outgoing feeder cables, the tenderer must include for the complete installation and wiring of the plant in running order, including the connection of the incoming cable and outgoing feeder cables.

The connecting of the cable and control cabling to the generator and the control terminals in the LV board remains the responsibility of the tenderer.

2.5. Warning Notices

Notices, in English, must be installed at the entrance doors to and in the plant rooms.

The contents of these notices are summarised below.

- a) Unauthorised entry prohibited.
- b) Unauthorised handling of equipment prohibited.
- c) Procedure in case of electric shock.
- d) Procedure in case of fire.
- e) Ear Protection required

The successful tenderer must consult the Occupational Health and Safety Act 83 of 1993 and get approval of the wording from the Department's representative, prior to ordering the notices.

Lettering must be black on a yellow background.

Notices (a) must be installed outside next to the entrance of the plant room and (b-d) inside the plant room.

In the plant room, a clearly legible and indelible warning notice must be mounted in a conspicuous position.

The motive shall be made of a non-corrodible and non-deteriorating material, preferable plastic, and must read as follows:

DANGER: This engine will start without notice. Turn selector switch on control board to "OFF" before working on the plant.

An engraved label shall be installed on the generator control panel that indicates the following:

- Base Tank Capacity
- Bulk Tank Capacity (if provided)
- Full load litres per hour consumption

2.6. Construction

The engine and alternator of the set shall be built together on a common frame, which must be mounted on a skid base on anti-vibration mountings. The set must be placed direct on the concrete of the generator room. A drip tray must be fitted under the engine. The tray must be large enough to catch a drip from any part of the engine.

The frame must be of the 'DUPLEX' type.

2.7. Operation

The set is required to supply the lighting and power requirements in the case of a mains power failure.

The set shall be fully automatic i.e. it shall start when any one phase of the main supply fails or get switched and shall shut down when the normal supply is re-established. In addition it shall be possible to manually start and stop the set by means of pushbuttons on the switchboard.

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

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

SECTION 3 – TECHNICAL SPECIFICATION

(TO BE COMPLETED BY CONSULTING ENGINEER)

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3. SECTION 3 – TECHNICAL SPECIFICATION

3.1. General

Supply, deliver, install, commission, test and maintain 5 emergency prime generating sets at **Marion Island Research Base, Southern-East of Cape Town.**

This installation must comply fully with all the sections and drawings of this document. This technical specification is supplementary to the Equipment Requirements, Section 2, and must be read together where they are at variance the Technical Specification shall apply.

The set must be installed in the plant room.

3.2. Site Information and Conditions

3.2.1. Location

The site is at **Marion Island Research Base, Southern-East of Cape Town.**

3.2.2. Site Conditions

The following site conditions will be applicable and equipment shall be suitably rated to develop their assigned rating and duty at these conditions.

- | | |
|---|-------------------------|
| a) Height above sea level | : 10 Meter At sea level |
| b) Maximum ambient temperature | : -20 °C |
| c) Maximum ambient humidity at lowest temperature | : 84 % |

3.3. Output and Voltage

After the de-rating factors for the engine and generator due to site conditions have been taken into account, the set must have a site output and voltage as follows: -

No load voltage	:	400/230 Volt
Rating	:	250 kVA
Power at 0.9 power factor	:	236 kW
Frequency	:	50 Hz
Fault Level	:	25 kA

3.4. Switchboard/Control Panel Unit

All switch- and control gear shall be rated for a fault current level of 25kA.

The switchboard/control panel unit shall be a free standing floor mounted type, which shall be installed in the plant rooms (Generator Room and ADE Shack).

Main Switches

- Main Isolator is 350A with 25kA rating of protection circuit breaker for all **five Generators**.
- Feeder cables for the above will be a 2x70mm² 4 Core.

3.5. Cables

The contractor will be responsible for all electrical cable connections associated with the complete generating set installation.

The following cables will be supplied, installed and terminated at the Switchboard by others. Adequate provision shall be made for the termination of these cables at the Switchboard:

<u>Generator Room (Technical Centre)</u>	<u>PVC/SWA PVC 4 Core Cable</u>
Gen 1 to Sync Control Panel	2x70 mm ² 4core
Gen 2 to Sync Control Panel	2x70 mm ² 4core
Gen 3 to Sync Control Panel	2x70 mm ² 4core

<u>ADE Shack Room</u>	<u>PVC/SWA PVC 4 Core Cable</u>
Gen 4 to DB Gen 4 Control Panel	2x70 mm ² 4core
Gen 5 to DB Gen 5 Control Panel	2x70 mm ² 4core
DB Gen 4 Control Panel to Sync Control Panel	2x95 mm ² 4core
DB Gen 5 Control Panel to Sync Control Panel	2x95 mm ² 4core

3.6. Engine

A sump drainpipe must be fitted with a shut-off valve placed in a convenient position outside the base frame to facilitate drainage.

Recommended oil types must be indicated on the engine, or base frames, by means of suitable labels.

All engine instruments shall have clear markings on the faceplates, indicating the normal operating zone(s), maximum and minimum allowable values/limits and danger zone(s).

The flywheel shall be covered by approved hoods.

3.7. Alternator

The Alternator shall be of the low harmonic type.

3.8. Load Acceptance

The generator set shall be capable of accepting 75% of the specified site electrical output 10 seconds after the starter motor is energised and the remaining 25%, 5 seconds thereafter, i.e. 100% load acceptance shall not exceed 15 seconds.

3.9. Generator Room

The existing Generator Room and ADE Shack shall be reused for the storage of the generators.

3.10. Alarms

The successful tenderer must pay particular attention to the requirements of the alarms as described in the Equipment Requirements, Section 2.

One alarm hooter and red light shall be supplied and installed on the outside wall of the generator room in the position as shown on the drawing in this specification.

The hooter shall consist of an electronic unit similar and equal to a "Klaxon" - type SY2/725 hooter with a continuously rated output and 110 dB at a distance of 2 metres, and shall be IP55 weatherproof rated.

The warning light shall consist of a 40W flashing red light, which shall be mounted on a galvanised steel frame together with the hooter.

The hooter and light shall be switched on or off simultaneously after initiation or cancellation of an alarm condition. The supply and installation of the wiring between the control board and the alarm unit forms part of this contract.

The successful tenderer must ensure that the hooter control circuit resets automatically after cancellation due to a low fuel condition or battery charger failure, but the visible fault indication must remain, i.e. should the operator continue to run the set, the hooter must sound, should any other condition develop.

A remote alarm panel shall be supplied and installed by the contractor in the control room. This shall be of surface mounting, enamelled sheet metal (colour to approval), minimum depth construction, and shall incorporate a flashing red pilot alarm light, adjustable electronic sounder, and a silence push button. The silence button shall not switch off the pilot light - this shall only be switched off when the alarm is reset at the Generator Panel.

A 2,5mm² x 4-core PVC SWA PVC cable will be supplied, installed and terminated by others between the Generator Panel and the Charge Office. The Contractor shall connect this cable at both ends and shall supply and install all switch gear relays, etc. to ensure satisfactory operation of the Remote Alarm Panel.

3.11. Remote Control Generator Switch

A Remote Control Generator "ON/OFF/AUTO" switch will be supplied and installed by others in the control room, and a 2,5mm² x 4-core PVC SWA PVC cable will be supplied and installed by others between the control room and the Generator Panel.

The contractor shall connect this cable at both ends, and shall supply and install all switch gear, relays, etc. to ensure satisfactory operation of the remote control switch.

3.12. Fuel Drip Tray

A drip tray approximately 100mm deep shall be mounted below the fuel tank and must be large enough to collect any fuel that drips from the tank accessories. The drip tray shall be manufactured from black mild steel. The thickness of the drip tray sheet steel shall not be less than 2mm.

3.13. Completion Time

The Generator Set is required to be commissioned in conjunction with the building contract.

3.14. Inform

The successful tenderer shall inform the Engineer when the set is ready for installation.

3.15. Fuel Supply Tank

The fuel tank shall be a free-standing type, which shall be installed in the plant room. The tank shall have sufficient capacity for the generating set to run the engine on full load for a period of 24 hours. A diesel containment tank shall be mounted below the fuel tank and must be large enough (110% of the diesel tank) to collect any fuel that might spill from the tank. The containment tank shall be manufactured from black mild steel with a thickness of not less than 2mm.

As an alternative to the free-standing type the fuel tank can be an integral part of the base frame of the generator set. The tank shall have sufficient capacity to run the engine on full load for a period of 24 hours. The base tank shall be an open channel self-bund walled type that shall be of sufficient capacity to contain a spillage equivalent to 110% in volume of the base tank. The containment tank shall be manufactured from black mild steel with a thickness of not less than 2mm.

A float level alarm connected to the generator controller shall be incorporated into the bund area located such that the alarm will be activated when 50% of the volume of the bund area has been reached in the event of any diesel fuel leakage.

SECTION 4 – SCHEDULES OF TECHNICAL INFORMATION
(TO BE FULLY COMPLETED BY TENDERER)

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4. SECTION 4 – SCHEDULES OF TECHNICAL INFORMATION

4.1. Engine

NO	ITEM	REMARKS
1.	Manufacturer's Name	
2.	Country of Origin	
3.	Manufacturer's model No. and year of manufacture	
4.	Continuous sea level rating after allowing for ancillary equipment : a) In b.h.p. b) In kW	
5.	Percentage de-rating for site conditions, in accordance with SANS 8528 a) For altitude b) For temperature c) For humidity d) Total de-rating	
6.	Net output on site in kW	
7.	Nominal speed in r.p.m.	
8.	Number of cylinders	
9.	Strokes per working cycle	
10.	Stroke in mm	
11.	Cylinder bore in mm	
12.	Swept volume in cm ³	
13.	Mean piston speed in m/min	
14.	Compression ratio	
15.	Cyclic irregularity	
16.	Fuel consumption of the complete generating set on site in l/h of alternator output at : a) Full load b) $\frac{3}{4}$ load c) $\frac{1}{2}$ load NOTE : A tolerance of 5% shall be allowed above the stated value of fuel consumption.	
17.	Make of fuel injection system.	
18.	Capacity of fuel tank in litres	
19.	Is gauge glass fitted to tank?	
20.	Is electric pump for filling the fuel tank included?	

NO	ITEM	REMARKS
21.	Method of starting	
22.	Voltage of starting system	
23.	Method of cooling	
24.	Type of radiator if water-cooled	
25.	Type of heater for warming cylinder heads	
26.	Capacity of heater in kW	
27.	Method of protection against high temperature	
28.	Method of protection against low oil pressure	
29.	Type of governor	
30.	Speed variation in % a. Temporary b. Permanent	
31.	Minimum time required for as assumption of full load in seconds	
32.	Recommended interval in running hours for : a. Lubricating oil change b. Oil filter element change c. Decarbonising	
33.	Type of base	
34.	Can plant be placed on solid concrete floor?	
35.	Are all accessories and ducts included?	
36.	Is engine naturally aspirated?	
37.	Are performance curves attached?	
38.	Diameter of exhaust pipe	
39.	Noise level in plant room in dBA	N/A
40.	Noise level at tail of exhaust pipe in dBA	
41.	BMEP (4 stroke) at continuous rating (kPa)	
42.	% Load acceptance to SANS 8528, with 10% transient speed drop	

4.2. Alternator

NO	ITEM	REMARKS
1.	Maker's name and model no.	
2.	Country of Origin and year of manufacture	
3.	Type of enclosure	
4.	Nominal speed in r.p.m.	
5.	Number of bearings	
6.	Terminal voltage	
7.	Sea level rating kVA at 0,9 power factor	
8.	De-rating for site conditions	
9.	Input required in kW	
10.	Method of excitation	
11.	Efficiency at 0,9 power factor and : a) Full load b) $\frac{3}{4}$ load c) $\frac{1}{2}$ load	
12.	Maximum permanent voltage variation in %	
13.	Transient voltage dip on full load	
14.	Voltage recovery on full load application in milli-seconds	
15.	Is alternator brushless?	
16.	Class of insulation of windings	
17.	Is alternator tropicalised?	
18.	Symmetrical short circuit current at terminals n Ampere	
19.	Type of Coupling	

4.3. Switchboard

NO	ITEM	REMARKS
1.	Maker's Name	
2.	Country of Origin	
3.	Is board floor mounted?	
4.	Finish of board	
5.	Make of volt, amp, and frequency meters	
6.	Dial size of meters in mm	
7.	Scale range of voltmeter	
8.	Scale range of ammeters	
9.	Ratio of current transformers	
10.	Make of hour meter	
11.	Range of cyclometer counter	
12.	Smallest unit shown on counter (Item 11)	
13.	Make of circuit breaker	
14.	Type of circuit breaker	
15.	Rating of circuit breaker in Amp and fault level in kA	
16.	Setting range of overload trips	
17.	Setting range of instantaneous trips	
18.	Make of change-over equipment	
19.	Make of voltage relay	
20.	Is control and protection equipment mounted on a small removable panel?	
21.	Type of control equipment	
22.	Make of mains isolator	
23.	Type of indicators for protective devices	
24.	Make of rectifier	
25.	Type of rectifier	
26.	Is battery charging	
27.	Are volt- and ammeters provided for charging circuit?	
28.	Is the alarm hooter of the continuous duty type?	
29.	Rating in Amps of : a. Change-over equipment b. Mains on load isolator c. By-pass switch d. Circuit breaker to outgoing feed	
30.	Is manufacture of switchboard/control panel to be sub-let?	

NO	ITEM	REMARKS
31.	If yes, state name and address of specialist manufacturer	

4.4. Battery

NO	ITEM	REMARKS
1.	Maker's Name	
2.	Country of Origin	
3.	Type of battery	
4.	Voltage of battery	
5.	Number of cells	
6.	Capacity in cold crank amp	

4.5. Dimensions

NO	ITEM	REMARKS
1.	Overall dimensions of set in mm	
2.	Overall mass	
3.	Is the generator room adequate for the installation of the set	

4.6. Deviation from the Specification as an Alternative (State Briefly)

NO	DESCRIPTION

4.7. Spare Parts and Maintenance Facilities

NO	ITEM	REMARKS
1	Approximate value of spares carried in stock for this particular diesel engine and alternator	
2	Where are these spares held in stock	
3	What facilities exist for the servicing of the equipment offered	
4	Where are these facilities available	

SECTION 5 – PRICE SCHEDULES

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5. SECTION 5 – PRICE SCHEDULES

5.1. General

- 1) The conditions of contract and the application of the Contract Price Adjustment Provisions shall be as set out in Part A: Section 1: Preliminaries.
- 2) The descriptions in this Price Schedule shall be read in conjunction with the specification.
- 3) The unit rate for each item in the Price Schedules shall include for all materials, labour, profit, transport, etc., everything necessary for the execution and complete installation of the work in accordance with the description.
- 4) The Price Schedules shall not be used for ordering purposes. The Contractor shall check the lengths of cables and overhead conductors on site before ordering any of the cables. Any allowance for off-cuts shall be made in the unit rates.
- 5) The rates shall exclude Value Added Tax and the total carried over to the final summary in PART A.
- 6) All material covered by this Specification shall, wherever possible, be of South African manufacture.



**public works
& infrastructure**

Department:
Public Works and Infrastructure
REPUBLIC OF SOUTH AFRICA

SUPPLEMENTARY SPECIFICATION

FOR THE

ELECTRICAL INSTALLATION

OF A

COMPREHENSIVE SERVICE

JANUARY 2023

SUPPLEMENTARY SPECIFICATION FOR THE ELECTRICAL INSTALLATION
OF A COMPREHENSIVE SERVICE

AT

MARION ISLAND RESEARCH BASE, SOUTHERN-EAST OF CAPE TOWN.

CONSISTING OF:

SECTION C3..... : ELECTRICAL INSTALLATION WORK

In part C3 see separate documents for:

Electrical work
Generator
Etc.

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SPECIFICATION FOR ELECTRICAL WORK

PART 1 - GENERAL

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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 NOTICES AND FEES

The Contractor shall give all notices required by and pay all necessary fees, including any inspection fees, which may be due to the local Supply Authority.

On production of the official account, only the net amount of the fee charged by the Supply Authority for connection of the installation to the supply mains, will be refunded to the Contractor by the Employer.

5 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.

6 QUALITY OF MATERIALS

Only materials of first class quality shall be used and all materials shall be subject to the approval of the Employer. Departmental specifications for various materials to be used on this Contract are attached to and form part of this specification.

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.

7 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 Department's 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 Department to any claim submitted by the Contractor, which may result from a lack of knowledge in regard to the supply authority's requirements.

8 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.

9 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 CONDUIT IN CONCRETE SLABS

In order not to delay building operations the Contractor must ensure that all conduits and other electrical equipment which are to be cast in the concrete columns and slabs are installed in good time.

The Contractor shall have a representative in attendance at all times when the casting of concrete takes place.

Draw-boxes, expansion joint boxes and round conduit boxes are to be provided where necessary. Sharp

bends of any nature will not be allowed in concrete slabs.

Draw and/or inspection boxes shall be grouped under one common cover plate, and must preferably be installed in passages or male toilets.

All boxes, etc., are to be securely fixed to the shuttering to prevent displacement when concrete is cast. The conduit shall be supported and secured at regular intervals and installed as close as possible to the neutral axis of concrete slabs and/or beams.

Before any concrete slabs are cast, all conduit droppers to switchboards shall be neatly spaced and rigidly fixed.

11 FLEXIBLE CONNECTIONS FOR CONNECTING UP OF STOVES, MACHINES, ETC.

Flexible tubing connections shall be of galvanised steel construction, and in damp situations of the plastic sheathed galvanised steel type. Other types may only be used subject to the prior approval of the Department's site electrical representative.

Connectors for coupling onto the flexible tubing shall be of the gland or screw-in types, manufactured of either brass or cadmium or zinc plated mild steel, and the connectors after having been fixed onto the tubing, shall be durable and mechanically sound.

Aluminium and zinc alloy connectors will not be acceptable.

12 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.

13 SWITCHES AND SOCKET OUTLETS

All switches and switch-socket outlet combination units shall conform to the Department Quality Specifications, which form part of this specification.

No other than 16 A 3 pin sockets are to be used, unless other special purpose types are distinctly specified or shown on the drawings.

All light switches shall be installed at 1,4m above finished floor level and all socket outlets as directed in the Schedule of Fittings which forms part of this specification or alternatively the height of socket outlets may be indicated on the drawings.

14 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 Departmental 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.

15 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.

16 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.

17 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.

18 EARTHING OF INSTALLATION

Main earthing

The type of main earthing must be as required by the supply authority if other than the Employer, and in any event as directed by the Principal Agent/Electrical Engineer, who may require additional earthing to meet test standards.

Where required an earth mat shall be provided, the minimum size, unless otherwise specified, being 1,0m

x 1,0m and consisting of 4mm diameter hard-drawn bare copper wires at 250mm centres, brazed at all intersections.

Alternatively or additionally earth rods or trench earths may be required as specified or directed by the Electrical Engineer.

Installations shall be effectively earthed in accordance with the "Wiring Code" and to the requirements of the supply authority. All earth conductors shall be stranded copper with or without green PVC installation.

Connection from the main earth bar on the main board must be made to the cold water main, the incoming service earth conductor, if any and the earth mat or other local electrode by means of 12mm x 1,60 mm solid copper strapping or 16 mm² stranded (not solid) bare copper wire or such conductor as the Department's representative may direct. Main earth copper strapping where installed below 3m from ground level, must be run in 20 mm diameter conduit securely fixed to the walls.

All other hot and cold water pipes shall be connected with 12mm x 0,8mm perforated for solid copper strapping (not conductors) to the nearest switchboard. The strapping shall be fixed to the pipework with brass nuts and bolts and against walls with brass screws at 150-mm centres. In all cases where metal water pipes, down pipes, flues, etc., are positioned within 1,6m of switchboards an earth connection consisting of copper strapping shall be installed between the pipework and the board. In vertical building ducts accommodating both metal water pipes and electrical cables, all the pipes shall be earthed at each distribution board.

Roofs, gutters and down pipes

Where service connections consist of overhead conductors, all metal parts of roofs, gutters and down pipes shall be earthed. One bare 10mm² copper conductor shall be installed over the full length of the ceiling void, fixed to the top purlin and connected to the main earth conductor and each switchboard. The roof and gutters shall be connected at 15m intervals to this conductor by means of 12mm X 0,8mm copper strapping (not conductors) and galvanised bolts and nuts. Self-tapping screws are not acceptable. Where service connections consist of underground supplies, the above requirements are not applicable.

Sub-distribution boards

A separate earth connection shall be supplied between the earth busbar in each sub-distribution board and the earth busbar in the Main Switchboard. These connections shall consist of a bare or insulated stranded copper conductors installed along the same routes as the supply cables or in the same conduit as the supply conductors. Alternatively armoured cables with earth continuity conductors included in the armouring may be utilised where specified or approved.

Sub-circuits

The earth conductors of fall sub-circuits shall be connected to the earth busbar in the supply board in accordance with SANS 10142.

Ring Mains

Common earth conductors may be used where various circuits are installed in the same wire way in accordance with SANS 10142. In such instances the sizes of earth conductors shall be equivalent to that of the largest current carrying conductor installed in the wire way, alternatively the size of the conductor shall be as directed by the Engineer. Earth conductors for individual circuits branching from the ring main shall be connected to the common earth conductor with T-ferrules or soldered. The common earth shall not be broken.

Non-metallic Conduit

Where non-metallic conduit is specified or allowed, the installation shall comply with the Department's standard quality specification for "conduit and conduit accessories".

Standard copper earth conductors shall be installed in the conduits and fixed securely to all metal appliances and equipment, including metal switch boxes, socket-outlet boxes, draw-boxes, switchboards,

luminaires, etc. The securing of earth conductors by means of self-threading screws will not be permitted.

Flexible Conduit

An earth conductor shall be installed in all non-metal flexible conduit. This earth conductor shall not be installed externally to the flexible conduit but within the conduit with the other conductors. The earth conductor shall be connected to the earth terminals at both ends of the circuit.

Connection

Under no circumstances shall any connection points, bolts, screws, etc., used for earthing be utilised for any other purpose. It will be the responsibility of the Contractor to supply and fit earth terminals or clamps on equipment and materials that must be earthed where these are not provided.

Unless earth conductors are connected to proper terminals, the end shall be tinned and lugged.

19 MOUNTING AND POSITIONING OF LUMINAIRES

The Contractor is to note that in the case of board and acoustic tile ceilings, i.e. as opposed to concrete slabs, close co-operation with the building contractor is necessary to ensure that as far as possible the luminaires are symmetrically positioned with regard to the ceiling pattern.

The layout of the luminaires as indicated on the drawings must be adhered to as far as possible and must be confirmed with the Department's representative.

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

Fluorescent luminaires to be mounted on board ceilings shall be secured by means of two 40mm x No. 10 round head screws and washers. The luminaires shall also be bonded to the circuit conduit by means of locknuts and brass bushes. The fixing screws are to be placed $\frac{3}{4}$ of the length of the fitting apart.

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

Incandescent luminaires are to be screwed directly to outlet boxes in concrete slabs. Against board ceilings the luminaires shall be secured to the bracing or joists by means of two 40mm x No. 8 round head screws.

PART 2: INSTALLATION DETAILS

[Omit which is not applicable. Clauses 1 to 10 of Part 2 are standard clauses (which should not be altered) and must be inserted in the document in the order as set out.]

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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 NOTICES

The Contractor shall issue all notices and make the necessary arrangements with Supply Authorities, the Postmaster-General, and S.A. Transport Services, Provincial or National Road Authorities and other authorities as may be required with respect to the installation.

3 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.

4 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.

5 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 SWITCHES AND SOCKET OUTLETS

The installation of switches and socket outlets must conform to clause 13 of Part 1 of this specification.

8 LIGHT FITTINGS AND LAMPS

The installation and mounting of luminaires must conform to clause 19 of Part 1 of this specification.

All fittings to be supplied by the Contractor shall have the approval of the Employer.

The light fittings must be of the type specified in the Schedule of Light Fittings.

9 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.

10 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.

11 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.

12 SUPPLY AND CONNECTION

The supply will be at 400/230 Volt 50Hz.

Standby Plant

The five (5) 250kVA open type indoor standby generator plants, complete with automatic changeover control panel including the Main Sync Control Panel for the generator room in the Technical Block, and the Sub Sync Control Panel in the ADE Shack, for the low tension installations at the island. All generators shall be supplied, installed and commissioned by others.

The Contractor will only be responsible for the supply and installation of the cable connections between the Sync Control Panels. The size and length of the cable is listed in the Schedule of Cables and measured in the Bills of Quantities.

13 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.

13.1 Telephone Installation

The Contractor shall allow for the complete installation of all conduits, outlet boxes, the communication service provider Distribution boards, sleeve pipes, etc., required for the telephone system as shown on the drawings.

The sizes of all telephone conduits are indicated on the drawings and must be installed in the floor slab. Galvanized steel draw-wires shall be installed in all conduits.

End boxes must consist of a 50mm x 100 mm x 100mm outlet box fitted with suitable blank cover plates, flush mounted 0,4m above floor level.

The communication service provider Distribution Board must consist of a 150mm x 600mm x 600mm metal box and hinged door with a 20mm thick wooden backboard. The board must be flush mounted, 1,37m above the floor.

13.2 Intercom Installation

The supply and installation of the intercom system is not included in this Contract.

The Contractor shall allow for the complete supply and installation of all conduits and outlet boxes required for the intercom installation as shown on the drawings.

The size of all conduits, boxes and mounting heights of the end boxes are indicated on the drawings. Galvanized steel draw-wires shall be installed in all conduits and the boxes fitted with suitable blank cover plates.

13.3 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.

14 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-resin 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 than 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.

14.1 LAYING, JOINTING AND MAKING OFF OF ELECTRICAL CABLES

[The requirements specified hereafter, are aimed essentially at high tension cable but are also valid for low tension cable, where applicable.]

1. The use of the term "Inspector", includes the engineer or inspector of the Department or an empowered person of the concerned supervising consulting engineer's firm.
2. 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 inspector.
3. After the cable has been laid and before the cable trench is back-filled the inspector must ensure that the cable is properly bedded and that there is no undesirable material included in the bedding layer.
4. All cable jointing and the making off of the cables must only be carried out by qualified experienced cable jointers. Helpers of the jointers may not saw, strip, cut, solder, etc. The cable and other work undertaken by them must be carried out under the strict and constant supervision of the jointer.
5. Before the Contractor allows the jointer to commence with the jointing work or making off of the cable (making off is recognized as half a joint) he must take care and ensure:
 - 5.1 That he has adequate and suitable material available to complete the joint properly and efficiently. Special attention must be given to ensure the cable ferrules and cable lugs are of tinned copper and of sufficient size. The length of the jointing lugs must be at least six times the diameter of the conductor,
 - 5.2 That the joint pit is dry and that all loose stones and material are removed,
 - 5.3 That the walls and banks of the joint pit are reasonable firm and free from loose material which can fall into the pit,
 - 5.4 That the necessary coffer-dams or retaining walls are made to stop the flow of water into the joint pit,
 - 5.5 That the joint pit is provided with suitable groundsheets so that the jointing work is carried out in clean conditions,
 - 5.6 That the necessary tents or sails are installed over the joint pit to effectively avert unexpected rainfall and that sufficient light or lighting is provided,
 - 5.7 That the necessary means are available to efficiently seal the jointing or cable end when an unexpected storm or cloudburst occurs, regardless of how far the work has progressed,

- 5.8 That the cables and other materials are dry, undamaged and in all respects are suitable for the joint work or making off,
- 5.9 That the heating of cable oil, cable compound, plumbers metal and solder is arranged that they are at the correct temperature when required so that the cable is not unnecessarily exposed to the atmosphere and consequently the ingress of moisture (care must be taken of overheating)

Flow temperatures of cable oil and compound must be determined with suitable thermometers. Cable oil and compound must not be heated to exceed the temperatures given on the containers and precaution must be taken to ensure that the tin is not overheated in one position. The whole mass must be evenly and proportionally heated.

(Temperatures of solder and plumbers metal may be tested with brown paper (testing time: 3 seconds). The paper must colour slightly - not black or burnt).

6. Before the paper-insulated cables are joined, they must be tested for the presence of moisture by the cable jointers test. This consists of the insertion of a piece of unhandled insulated impregnated paper tape in warm cable oil heated to a temperature of $130 \pm 5^{\circ}\text{C}$.

Froth on the surface of the oil is an indication that moisture is present in the impregnated insulation and the amount of the froth gives an indication of the moisture present.

7. If the cable contains moisture or is found to be otherwise unsuitable for jointing or making of the inspector is to be notified immediately and he will issue the necessary instruction to cope with the situation.
8. The joint or making off of paper insulated cables must not be commenced during rainy weather.
9. Once a joint is in progress the jointer must proceed with the joint until it is complete and before he leaves the site.
10. The jointer must ensure that the material and his tools are dry at all times, reasonably clean and absolutely free from soil.
11. Relating to the jointing of the cable the following requirements apply:
- 11.1 All jointing must be carried out in accordance with recognized and tried techniques and comply strictly with the instructions given by the supplier of the jointing kit.
- 11.2 The cables must be twisted by hand so that the cores can be joined according to the core numbers. If necessary the cable is to be exposed for a short distance to accomplish this. Under no circumstances may the cores in a joint be crossed so as to enable cores to be joined according to the core numbers. If it is not possible to twist the cables so that the preceding requirements can be met, then cores are to be joined in the normal way without any consideration of the core numbers.
- 11.3 Normally the cables will have profile conductors. The conductors shall be pinched with gas pliers to form a circular section, bound with binding wire so that they do not spread, and then tinned before jointing.
- 11.4 Jointing ferrules, the length of which are at least 6 times the diameter of the conductors, must be slid over the conductor ends to be joined and pinched tightly. Then they are soldered by means of the ladle process whilst being pinched further closed.

Use resin only as a flux. The slot opening in the ferrule must be completely filled, including all depressions.

Remove all superfluous metal with a cloth dipped in tallow. Work during the soldering process must be from top to bottom. Rub the ferrule smooth and clean with aluminium oxide tape after it has cooled down to ensure that there are not any sharp points or edges.

- NB:** The spaces between the conductor strands must be completely filled by soldering process and must be carried out quick enough to prevent the paper insulation from burning or drying out unnecessarily.
- 11.5 After the ferrules have been rubbed smooth and clean, they and the exposed cores must be treated with hot cable oil (110°C) to remove all dust and moisture. These parts are to be thoroughly basted with the oil.
- 11.6 The jointer must take care that his hands are dry and clean before the joint is insulated. Also the insulating tape which is to be used must first be immersed in warm cable oil (110°C) for a sufficient period to ensure that no moisture is present.
- 11.7 After the individual cores have been installed they must be well basted with hot cable oil and again after the applicable separator and/or belt insulation tape is applied before the lead joint sleeve is placed in position.
- 11.8 The lead joint sleeve must be thoroughly cleaned and prepared before it is placed on the cable and must be kept clean during the whole jointing process. Seal the filling apertures of the sleeve with tape until the sleeve is ready for compound filling.
- 11.9 The plumbing joints employed to solder the joint sleeve to the cable sheath, must be cooled off with tallow and the joint sleeve is to be filled with compound while it is still warm. Top up continuously until the joint is completely filled to compensate for the compound shrinkage.
- 11.10 The outer joint box must be clean and free from corrosion. After it has been placed in position it must be slightly heated before being filled with compound. Top up until completely full.
12. As far as cable end boxes are concerned the requirements as set out above are valid where applicable.

15. 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.

The following types of distribution boards are required for the service/replacement:

DISTRIBUTION BOARD NAME	POSITION & TYPE	WORK REQUIRED
MAIN SYNC CONTROL PANEL	Technical Block, Floor standing	Replace
SUB SYNC CONTROL PANEL	ADE Shack Block, Floor standing	Replace
MAIN DB	Technical Block, Floor standing	Refurbishment and rewiring
ADE SHACK DB	ADE Shack Block	Refurbishment and rewiring

16. OUTDOOR LIGHTING

The Contractor shall allow for the supply and installation of the light fittings, conduit and outlets for the general external lighting. The external lighting shall be controlled via a photocell / contactor arrangement with a by-pass switch at the position agreed on with the Client's Representative.

17. PHOTO-ELECTRICAL CELL

The Contractor shall allow for the supply and installation of a photo-electric cell with a 10A contact. The photocell shall operate a 15A AC3 Duty triple pole contactor with a by-pass switch.

18. SCHEDULE OF CABLES, CONDUIT AND WIRING

Supply, install and connect the following cable, conduit and wiring:

FROM	TO	SIZE AND TYPE	CABLE LENGTH (m)
Gen 1	Main Sync Control Panel	2x70mm ² 4-core PVCA cable and 70mm ² earth wire	60 30
Gen 2	Main Sync Control Panel	2x70mm ² 4-core PVCA cable and 50mm ² earth wire	60 30
Gen 3	Main Sync Control Panel	2x70mm ² 4-core PVCA cable and 70mm ² earth wire	60 30
Gen 4	ADE Shack Sync Control Panel	2x70mm ² 4-core PVCA cable and 70mm ² earth wire	60 30
Gen 5	ADE Shack Sync Control Panel	2x70mm ² 4-core PVCA cable and 70mm ² earth wire	60 30
ADE Shack Sync Control Panel	Main Sync Control Panel	2x95mm ² 4-core PVCA cable and 95mm ² earth wire	500 250
Main Sync Control Panel	Main DB	2x95mm ² 4-core PVCA cable and 95mm ² earth wire	100 50

19. SCHEDULE OF DISTRIBUTION BOARDS

The front panels of normal supply, standby power and no-break supply sections shall be painted in distinctive colours as follows:

Normal supply : Light Orange, colour B26 of SANS 1091.
 Standby power : Signal Red, colour A11 of SANS 1091.
 No-break supply: Dark Violet, colour F06 or Olive Green, Colour H05 of SANS 1091.

Indicated is the probable fault level rating (kA) of the busbars. Refer to the Summary of Switchgear and Circuits for the minimum fault level rating of specified equipment.

BOARD	TYPE	PANEL	FAULT LEVEL (kA)
Main Sync Control Panel	Floor standing, without door	Standby power	25
ADE Shack Sync Control Panel	Floor standing, without door	Standby power	25
Main DB	Floor standing, without door	Standby power	25

PART 3: QUALITY SPECIFICATION FOR MATERIALS AND EQUIPMENT OF ELECTRICAL INSTALLATIONS

“Section C: Quality specification for materials and equipment for electrical installation” manual of the Department of Public Works is applicable for this Contract and the manual can be obtained from the Department of Public Works website, under consultants guidelines.

[ONLY ITEMS OF MATERIAL applicable to the Contract must be included in Part 3]

CONTENTS

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ADDITIONAL REQUIREMENTS OR SPECIFICATIONS NOT COVERED IN QUALITY SPECIFICATIONS ABOVE

LED LIGHTS

All Light fittings installed for this project is to be of the LED type, unless otherwise stated.

The following international standard specifications and South-African Bureau of Standards shall apply to the LED luminaire specification:

SANS 475	Luminaires for interior lighting, street lighting and floodlighting – Performance and requirements
SANS 10114-1	Interior lighting part 1: Artificial lighting of interiors
SANS 10114-2	Interior lighting part 2: Emergency lighting
SANS 60598-1	Luminaires part 1: General requirements and tests
SANS 60598-2.1	Luminaires part 2: Particular requirements section 1 – Fixed general purpose luminaires.
SANS 60598-2.2	Luminaires part 2: Particular requirements section 2 – Recessed luminaires.
SANS 60598-2.3	Luminaires part 2: Particular requirements section 3 – Luminaires for road and street lighting.
SANS 60598-2.5	Luminaires part 2: Particular requirements section 5 – Flood lighting.

SANS 61347-1 to 13	Lamp control gear
SANS 62031	LED modules for general lighting – Safety specifications
SANS 62384	DC or AC supplied electronic control gear for LED modules – Performance requirements.
SANS 62560	Self-ballasted LED lamps for general lighting services with supply voltages > 50V – Safety specification.
SANS 62612	Self-ballasted LED lamps for general lighting services with supply voltages > 50V – Performance requirements
EN 55015	Limits and methods of measurement of radio disturbance of electrical lighting or equipment.
EN 61000-3.2	Electromagnetic compatibility (EMC) limits for harmonic current emissions.
EN 61000-3.3	Electromagnetic compatibility (EMC) limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.
EN 61547	Equipment for general lighting purposes: EMC immunity requirements.
IEC-EN 62471	Photo biological safety of lamps and lamp systems for LEDs
IES LM-79-08	Approved method: Electrical and photometric measurement of solid-state lighting products.
IES LM-80	Approved method: Measuring lumen maintenance of LED light sources.

General requirements:

The luminaire shall be suitable for operation with mid-power LEDs. **Note that no LED tubes are allowed to be used.**

The luminaire shall be suitable for operation on a 230V single phase 50Hz mains supply.

Power factor capacitors shall be supplied to correct the power factor to at least 0.95 or higher.

The luminaire shall be marked with identification labels stating the brand name and model and shall bear the SANS approval mark.

The driver shall comply with IEC 61347-1 and IEC 61347-2B as applicable and shall be suitable for operation on 230V $\pm 10\%$, 50Hz single phase system and it must be insured that harmonics filter is provided as per SANS 61000-3-2. The drivers and LED circuitry shall be protected against lighting and power surges. Suitable surge arrestors with a 10kA rating shall be provided for indoor installations and 20kA for outdoor installations.

Colour rendering (Ra) shall be not less than 80 and lumen depreciation of not more than 30% L70 at 50 000 hours @ T_q 25°C. Colour temperature of the LED lamp shall be 4000K, unless otherwise stated.

Thermal requirements:

The luminaire must be able to withstand an ambient temperature of 35°C. Storage temperature of this luminaire should be able to handle $-40^{\circ}\text{C} < T < 60^{\circ}\text{C}$.

To this end internal electrical and mechanical components shall not be allowed to exceed their maximum temperature ratings of 75°C. Test reports from an independent authorised testing facility proving this requirement shall be made available on request.

Noise requirements:

The noise level emitted from the luminaire shall be kept as low as possible. Drivers/electronic components shall therefore fully comply with the latest edition of SANS 55015.

= END OF SPECIFICATION =

PART 4: BILLS OF QUANTITIES

Electrical, mechanical and/or any other engineering work must be measured by the quantity surveyor and must be prepared in accordance with the latest edition of the Standard System of Measuring Building Work.

No additional provision for Preliminaries may be included in the engineering sections of the bills of quantities.

Bills of Quantities are included in part C2.2 of the tender document.

PART 5: ELECTRICAL WORK MATERIAL SCHEDULE

The Contractor shall complete the following schedules and submit them to the Electrical Engineer within 21 days of the date of the acceptance of the tender.

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

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

Item	Material	Make or trade name	Country of origin
1.	Distribution boards		
2.	Circuit breakers 1P, 2P, 3P		
3.	On load isolators without trips		
4.	Contactors 1P, 2P, 3P		
5.	Earth leakage relays 1 & 3 phase		
6.	H.R.C. fuse switches		
7.	Kilowatt hour meter		
8.	Current transformers		
9.	Voltmeter		
10.	Maximum demand ammeter		
11.	Daylight sensitive switch		
12.	Time switch		
13.	Conduit		
14.	Conduit boxes		
15.	Power skirting		
16.	Surface switches		
17.	Watertight switches		
18.	16A flush socket outlets		
19.	16A surface socket outlets		
20.	16A watertight socket outlets		
21.	LED luminaires		
23.	Bulkhead fittings: Type F		
24.	Spherical fittings: Type G		
25.	4 plate stove		
26.	Convection heater		
27.	Fan heater		
28.	Fans		
29.	Clocks		
30.	PVCA cable		
31.	Cable trays		

PARTICULARS OF ELECTRICAL CONTRACTOR

Note to consultants

Please ensure that DPW -22(EC) Particulars of electrical contractor is inserted in main tender document.

PART 6: DRAWINGS

The drawings are schematic and do not show the exact dimensions or positions of equipment. Tenderers must satisfy themselves that the equipment offered by them will fit in the available space and can be positioned so that access for maintenance, repair or removal is not encumbered.

The successful tenderer shall submit, via the Principal Contractor to the Client/Engineer two copies of the detailed working drawings showing the required conduits, conduit boxes, position of equipment, cable trays, ducts, etc. These drawing shall only be created after a thorough site inspection and discussions with the electrical sub-contractor to ensure that the conduits indicated on the drawings will be feasible to install. It must also be ensured that the complete installation is according to the specifications and standards.






Approval by the Client/Engineer of these drawings submitted by the Sub-contractor via the Principal Contractor shall not relieve him of his liability to carry out the work in accordance with the requirements of the contract documents. NOTE: Final dimensions must be taken on site before any equipment or material is either purchased or manufactured.

The tender drawings must be returned with the tender. Any proposed alterations to the architectural layout shall be indicated on these drawings in red ink and may only be submitted as an alternative offer.

Where air-conditioning ducts, lights, etc. are being installed in the space to be protected, the successful tenderer shall consult the Client / Engineer via the Principal Contractor for any information in this regard before completing his detailed working drawings.

Drawing schedule and numbers shall be as follows:

#	Drawing Description	Drawing Number	Purpose	Size
1	Control Panel for G1-G3 in the Generator Room	MI_DAFF_E_SLD_001	Tender	A0
2	Control Panel for G4-G5 in the ADE Shack Room	MI_DAFF_E_SLD_002	Tender	A0
3	Schematic Layout for the Generators Control Mechanism	MI_DAFF_E_SLD_003	Tender	A0
4	Main Distribution Board	MI_DAFF_E_SLD_004	Tender	A0

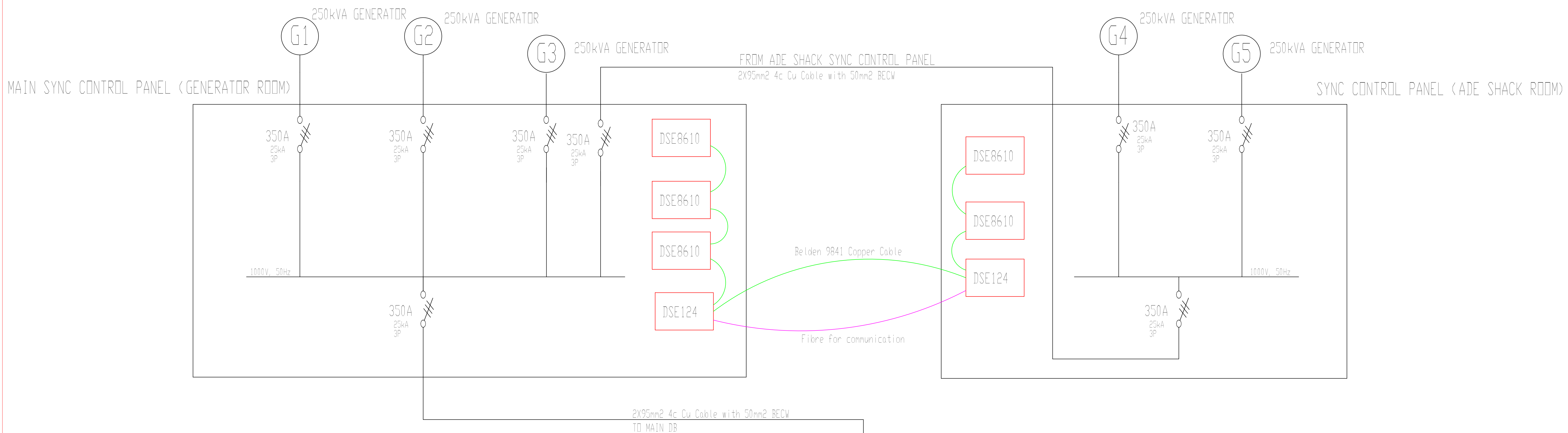
LEGEND		
SYM	DESCRIPTION	QTY
	ISOLATOR	
	CIRCUIT BREAKER	
	SURGE/LIGHTNING PROTECTION DEVICE	
	CONTACTOR	
	GENERATOR	

Notes for ALL DBs Ground Floor

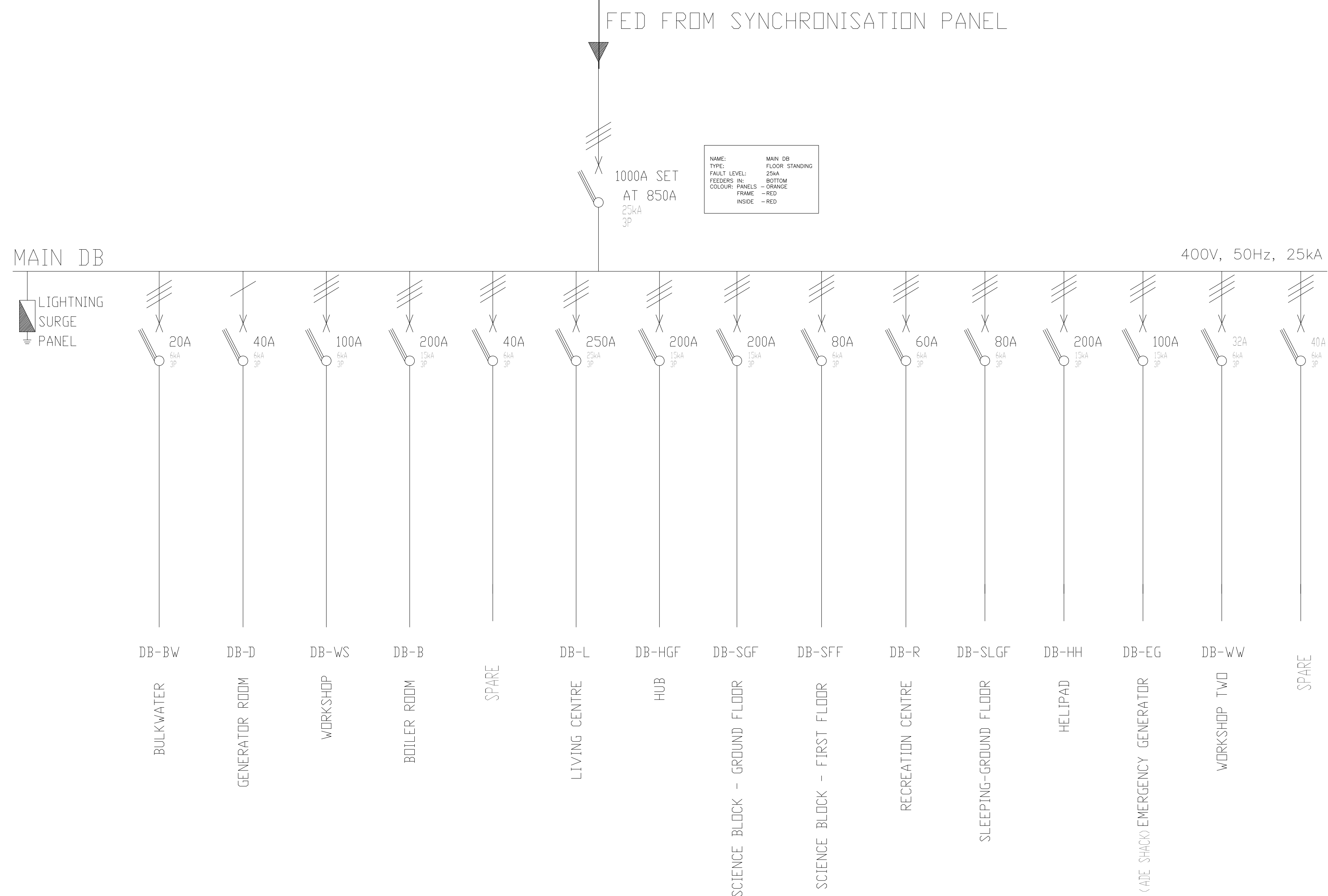
1. Reuse existing DB equipment
2. Allow 30% spare space for future expansion
3. Colour: Frame = Orange
Normal section = Orange
Emergency section = N/A
UPS section = N/A
4. Equipment = CBI (Similar or equally approved)
5. Cascading to local sections
6. A4 legend card shall be provided

GENERAL NOTES:

1. PRODUCTS AND INSTALLATION SHALL COMPLY WITH ALL APPLICABLE SACS, DPW CODES AND GOVERNMENT REGULATIONS.
2. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE SAFETY OF THEIR EMPLOYEES, ALL CONSTRUCTION MEANS, METHODS, SEQUENCES AND PROCEDURES FOR COORDINATING THIS WORK.
3. THE CONTRACTOR MUST MAINTAIN THE CONSTRUCTION PREMISES IN A NEAT AND ORDERLY CONDITION AT THE END OF EACH WORKING DAY.
4. LABEL PLANS, DISTRIBUTION BOARDS, MAIN DEVICES, SAFETY SWITCHES AND OTHER SPECIFICALLY DESIGNED EQUIPMENT SHOWN ON PLANS. THE LABELS MUST COMPLY WITH DPW REQUIREMENTS.
5. IN CASES OF DOUBT AS TO THE WORK INTENDED, OR IN THE EVENT OF NEED FOR EXPLANATION THEREOF, THE CONTRACTOR SHALL REQUEST SUPPLEMENTARY INSTRUCTIONS FROM THE ENGINEER. NO CHARGE TO THE CONTRACTOR FOR THE ENGINEER'S TIME, TRAVEL, KNOWLEDGE AND APPROVAL OF THE ENGINEER.



EQUIPMENT QUANTITIES



TWIN & EARTH CONDUCTOR SIZE mm ²															
SURFIX CABLE mm ²															
PVC/SWA/PVC CABLE SIZE mm ²	4	6	25	50	6	2 x 35	70	50	16	25	25	50	25	6	4
GLAND SIZE	1	1	3	4	2	4	5	4	3	3	3	4	3	2	1
EARTH WIRE mm ²	6	10	16	10	6	35	35	16	10	16	16	25	16	6	
No. OF CORES	4	3	4	4	4	4	4	4	4	4	4	4	4	4	3
LENGTH	30	15	20	15	25	40	60	80	100	100	100	260	160	40	15

SCHEMATIC DIAGRAM OF : DB – MAIN
PROJECT : INSTALLATION OF BACK-UP GENERATORS
ISSUE DATE : DECEMBER 2022

TYPE:
WALL MOUNTED

EXTERNAL COLOUR :
ORANGE

DOORS: YES

COLOUR OF NORMAL
FACIA PANEL: ORANGE

LOCKS ON DOORS: NO

COLOUR OF EMERGENCY
FACIA PANEL: RED

FACIA PANELS: YES

LOCKABLE FACIA PANEL: N/A

COLOUR OF UPS FACIA PANEL:	N/A
----------------------------	-----

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& infrastructure

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Public Works and Infrastructure
REPUBLIC OF SOUTH AFRICA

DIRECTOR-GENERAL

client

discipline ELECTRICAL

service

MARION ISLAND:
GENERATOR INSTALLATIONS

Issued for **DETAILED DESIGN**

drawing title

MAIN DISTRIBUTION BOARD

ref.no. N/.

designed T.MSIMANGA

scale NTS

drawn T.MSIMANGA

date 30-

checked S.PALACKAL

DPW drawing number

MI_DEFF_E_SLD_004

LEGEND

E_H

ENGINE HOURS RUN COUNTER

BC_VM

BATTERY CHARGER VOLT METER

BC_AM

BATTERY CHARGER CURRENT METER

PF_M

POWER FACTOR METER

S_VM

SYSTEM VOLT METER

L1_AM

PHASE 1 CURRENT METER

L2_AM

PHASE 2 CURRENT METER

L3_AM

PHASE 3 CURRENT METER

VM

VOLT METER KNOB

Hz_M

FREQUENCY METER

kW_M

KILOWATT METER

V_M

VOLT METER

PM

KILOWATT METER KNOB

SPEED

SPEED KNOB

ACB

ACB

WT

WATER TEMPERATURE METER

OP

OIL PRESSURE METER

CA

CHARGING AMPS METER

EO

EMERGENCY OPERATION

ES

EMERGENCY START OVERRIDE

ES

EMERGENCY STOP BUTTON

CIRCUIT BREAKER

ISOLATOR

250kVA GENERATOR(G1)

250kVA GENERATOR(G2)

250kVA GENERATOR(G3)

CONNECTED TO CONTROLLER 2 VIA FIBRE OPTIC CABLE

GENERATOR SET 1

DSE8003 MKII MULTI-SET REMOTE OVERVIEW DISPLAY

GENERATOR SET 1

DSE8610 MKII CONTROL MODULE

GENERATOR SET 2

DSE8610 MKII CONTROL MODULE

GENERATOR SET 3

DSE8610 MKII CONTROL MODULE

CONTROLLER 1

DSE124 CANBUS EXTENDER

ALTERNATOR SET 1 250KVA

E_H

BC_VM

BC_AM

PF_M

S_VM

L1_AM

L2_AM

L3_AM

VM

Hz_M

kW_M

V_M

PM

SPEED

ACB

EO

WT

OP

CA

ES

ES

MAIN SWITCH

350A 25kA 3P

ALTERNATOR SET 2 250KVA

E_H

BC_VM

BC_AM

PF_M

S_VM

L1_AM

L2_AM

L3_AM

VM

Hz_M

kW_M

V_M

PM

SPEED

ACB

EO

WT

OP

CA

ES

ES

MAIN SWITCH

350A 25kA 3P

ALTERNATOR SET 3 250KVA

E_H

BC_VM

BC_AM

PF_M

S_VM

L1_AM

L2_AM

L3_AM

VM

Hz_M

kW_M

V_M

PM

SPEED

ACB

EO

WT

OP

CA

ES

ES

MAIN SWITCH

350A 25kA 3P

ADE SHACK MAIN BUS

MAIN SWITCH

350A 25kA 3P

Notes Generator Panel

1. Generator Panel to be IEC Standards

2. 8610 MKII controllers or approved, for each generator

3. 220VAC Motor operators

4. Under voltage coils

5. Reverse power protection

6. Battery Chargers

7. AC Power for JWH and Alternator Heaters

8. Pilot lights to show Gen running and AC Present

Notes Sync Board

1. All boards to be 316 Stainless Steel

2. All boards to be SABS approved

3. All Boards to comply with SANS 10142

4. Panels to be type 2 (min) form separation

5. All breakers on synch panel to have locks to lockout

6. Pilot lights to show Gen running and AC Present

7. Lever Switches for Manual Operation

8. Ethernet HUB for Ethernet Communication

9. DSE8003 or approved and products for operation

10. Victron DC Selector

11. DSE 160 Self Seeking Power Supply Unit or approved

12. DSE124 CANBUS Extender for signal communication

13. Fibre convertor for communication

14. Fibre convertor for Ethernet

15. Belden 9841 cable

Notes ADE Board

1. All boards to be 316 Stainless Steel

2. All boards to be SABS approved

3. All Boards to comply with SANS 10142

4. Panels to be type 2 (min) form separation

5. All breakers on synch panel to have locks to lockout

6. All breakers to have trip coils (ESTOP per breakers)

7. Pilot lights to show gen running and AC Present

8. Lever switches for manual operation

9. Ethernet HUB to Fibre convertor

10. Victron DC Selector

11. Fibre convertor for communication

12. Fibre convertor for Ethernet

No.

DATE

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discipline

ELECTRICAL

service

issued for

DETAILED DESIGN

WCS number

drawing title

CONTROL PANEL FOR G1-G3 IN THE GENERATOR ROOM

ref no

N/A

designed

T.MSIMANGA

scale

NTS

drawn

T.MSIMANGA

date

30-11-2022

checked

S.PALACKAL

approved

M.TLADI

D.P.W drawing number

MI_DAFF_E_CP_001

LEGEND

E_H

ENGINE HOURS RUN COUNTER

BC_VM

BATTERY CHARGER VOLT METER

BC_AM

BATTERY CHARGER CURRENT METER

PF_M

POWER FACTOR METER

S_VM

SYSTEM VOLT METER

L1_AM

PHASE 1 CURRENT METER

L2_AM

PHASE 2 CURRENT METER

L3_AM

PHASE 3 CURRENT METER

VM

VOLT METER KNOB

Hz_M

FREQUENCY METER

kW_M

KILOWATT METER

V_M

VOLT METER

PM

KILOWATT METER KNOB

SPEED

SPEED KNOB

ACB

ACB

WT

WATER TEMPERATURE METER

OP

OIL PRESSURE METER

CA

CHARGING AMPS METER

EO

EMERGENCY OPERATION

ESO

EMERGENCY START OVERRIDE

ES

EMERGENCY STOP BUTTON

CIRCUIT BREAKER

ISOLATOR

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6. Pilot lights to show Gen running and AC Present

7. Lever Switches for Manual Operation

8. Ethernet HUB for Ethernet Communication

9. DSE8003 or approved and products for operation

10. Victron DC Selector

11. DSE 160 Self Seeking Power Supply Unit or approved

12. DSE124 CANBUS Extender for signal communication

13. Fibre convertor for communication

14. Fibre convertor for Ethernet

15. Belden 9841 cable

- Notes ADE Board
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7. Pilot lights to show gen running and AC Present

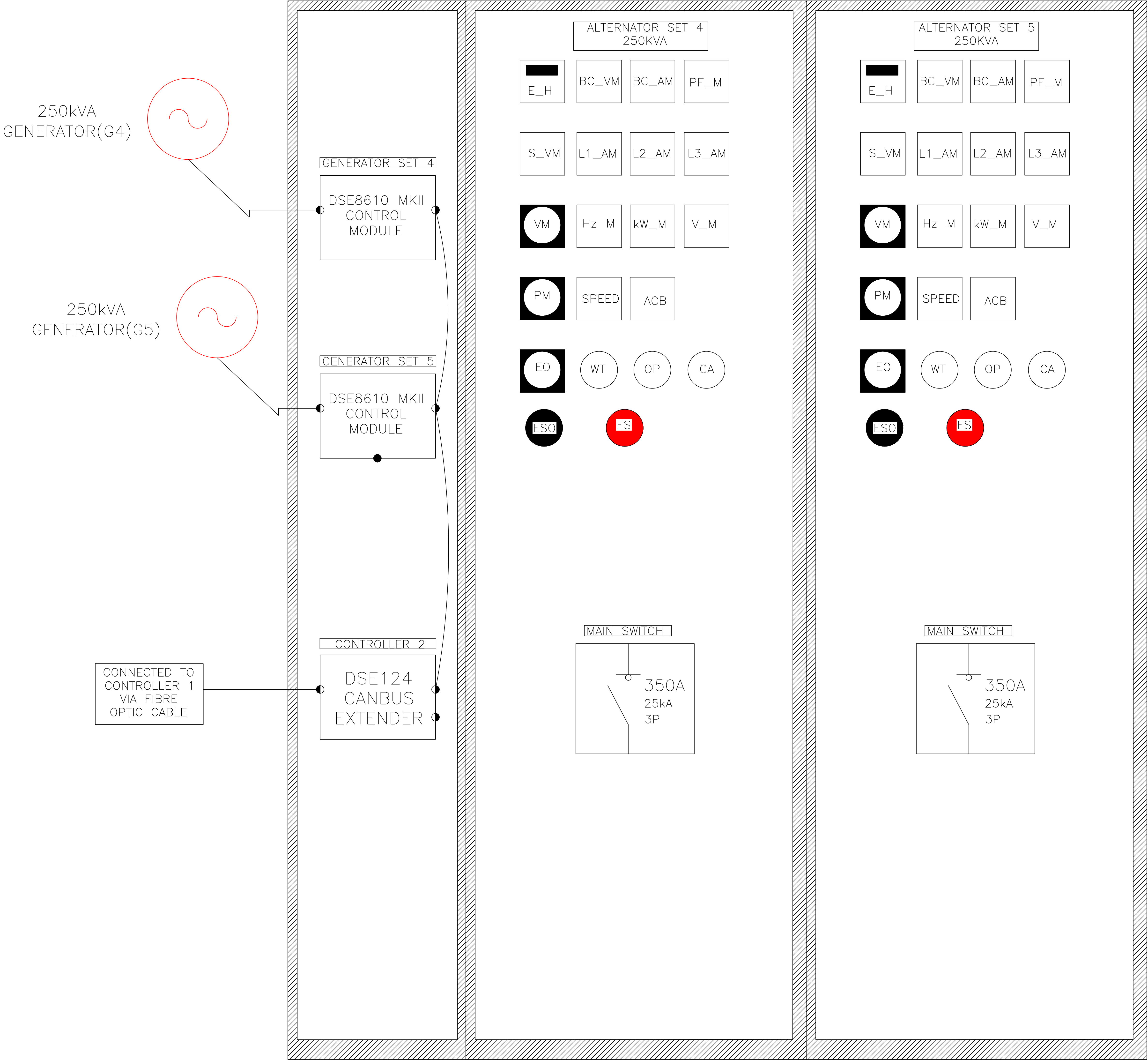
8. Lever switches for manual operation


9. Ethernet HUB to Fibre convertor

10. Victron DC Selector

11. Fibre convertor for communication

12. Fibre convertor for Ethernet



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LEGEND

FIBRE CABLE FOR DSE124 MODBUS EXTENDER CONNECTION

BELDEN 9841 CABLE FOR DSE8610 CONTROLLERS CONNECTION

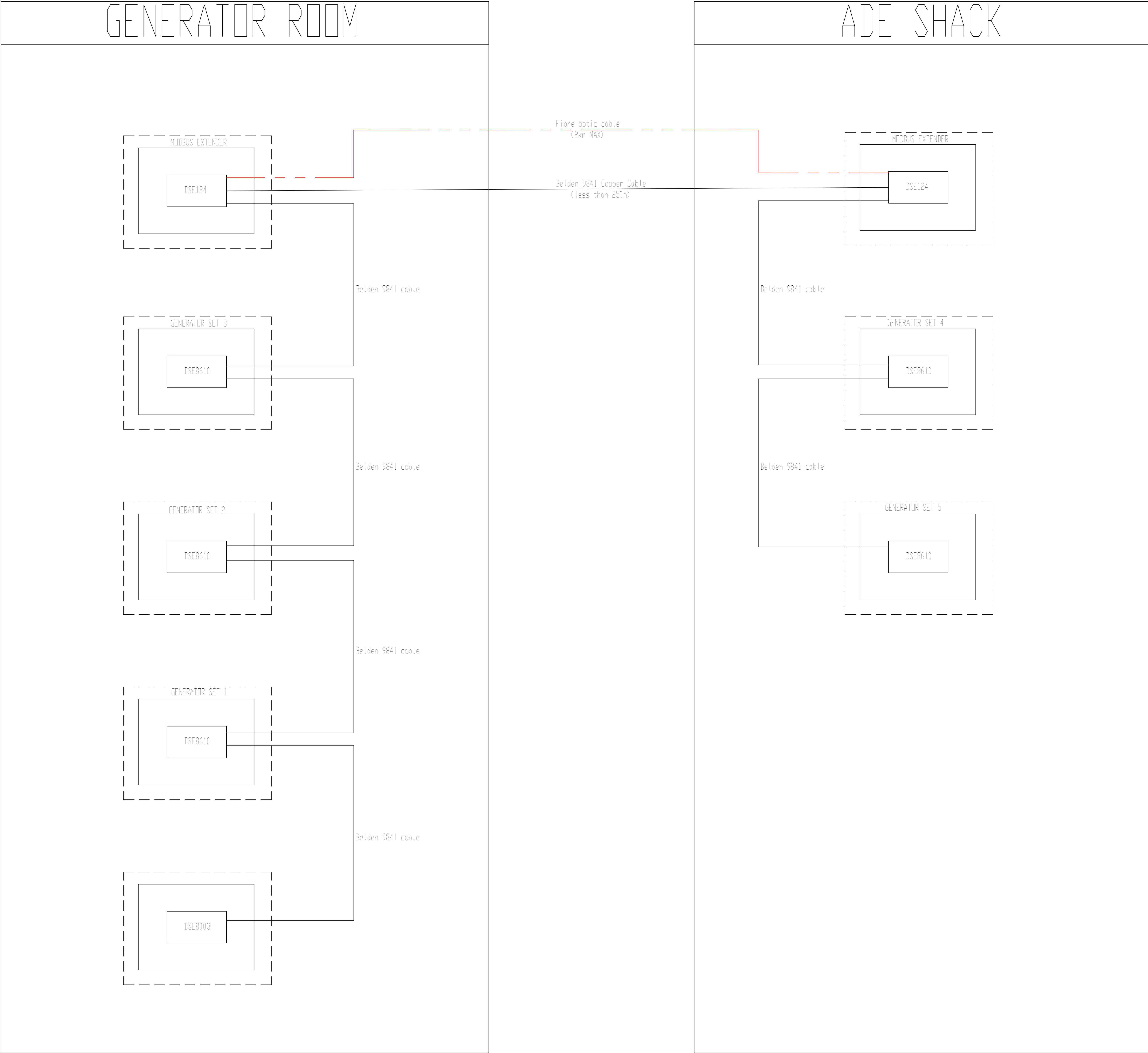
JUNCTION BOX

GENERAL NOTES:

- PRODUCTS AND INSTALLATION SHALL COMPLY WITH ALL APPLICABLE SANS, DPW CODES AND GOVERNMENT REGULATIONS.
- THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE SAFETY OF THEIR EMPLOYEES, ALL CONSTRUCTION MEANS, METHODS, SEQUENCES AND PROCEDURES FOR COORDINATING THIS WORK.
- THE CONTRACTOR MUST MAINTAIN THE CONSTRUCTION PREMISES IN A NEAT AND ORDERLY CONDITION AT THE END OF EACH WORKING DAY.
- LABEL PANELS, DISTRIBUTION BOARDS, MAIN DEVICES, SAFETY SWITCHES AND OTHER SPECIFICALLY DESIGNATED EQUIPMENT SHOWN ON PLANS. THE LABELS MUST COMPLY WITH DPW REQUIREMENTS.
- IN CASES OF DOUBT AS TO THE WORK INTENDED, OR IN THE EVENT OF NEED FOR EXPLANATION THEREOF, THE CONTRACTOR SHALL REQUEST SUPPLEMENTARY INSTRUCTIONS FROM THE ENGINEER. NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT PRIOR KNOWLEDGE AND APPROVAL OF THE ENGINEER.

NOTES ON CONTROL SYSTEM MECHANISM

- THIS DRAWING IS ISSUED FOR INFORMATION ONLY.
- THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE ELECTRICAL SPECIFICATIONS, DETAIL DESIGN REPORT AS WELL AS OTHER DRAWINGS THAT FORM PART OF THE SPECIFICATION.
- THIS DRAWING DOES NOT SHOW THE EXACT CABLE WAY. HENCE, MUST NOT BE USED TO MEASURE CABLE LENGTHS.
- ALL CABLES MUST BE MEASURED ON SITE BEFORE PURCHASING.
- ALL DSE8610 CONTROLLERS IN THE GENERATOR ROOM AND ADE SHACK SHALL BE CONNECTED TOGETHER VIA A BELDEN 9841 CABLE.
- THE DSE8610 CONTROLLER FOR GENERATOR SET 3 SHALL BE CONNECTED TO A DSE124 MODBUS EXTENDER VIA A BELDEN 9841 CABLE, AS PER DRAWING.
- TWO DSE124 MODBUS EXTENDERS SHALL BE INSTALLED ON BOTH CONTROL PANELS (GENERATOR ROOM CONTROL PANEL AND ADE SHACK). THE MODBUS EXTENDERS SHALL BE CONNECTED VIA FIBRE OPTIC CABLE.
- A DSE8003 MULTI-SET REMOTE OVERVIEW DISPLAY SHALL BE INSTALLED IN THE GENERATOR ROOM CONTROL PANEL AND BE LINKED TO ALL THE DSE8610 CONTROLLERS.



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ELECTRICAL

service

issued for

DETAILED DESIGN

WCS number

drawing title

SCHEMATIC LAYOUT FOR THE GENERATORS CONTROL MECHANISM

ref no. N/A

designed T.MSIMANGA

scale NTS

drawn T.MSIMANGA

date 30-11-2022

checked S.PALACKAL

approved M.TLADI

DPW drawing number

MI_DAFF_E_CS_003