



TRANSNET PORT TERMINALS

TENDER NUMBER: iCLM DB 1007/TPT

DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING, FOR TRANSNET SOC LTD OPERATING AS TRANSNET PORT TERMINALS, (HEREINAFTER REFERRED TO AS "TPT"), AT DURBAN CONTAINER TERMINAL PIER 1, FOR THE DURATION OF 12 MONTHS.

Transnet Port Terminals

an Operating Division **TRANSNET SOC LTD**

[Registration Number 1990/000900/30]

REQUEST FOR PROPOSAL (RFP)

FOR THE DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING, FOR TRANSNET SOC LTD OPERATING AS TRANSNET PORT TERMINALS, (HEREINAFTER REFERRED TO AS "TPT"), AT DURBAN CONTAINER TERMINAL PIER 1, FOR THE DURATION OF 12 MONTHS

RFP NUMBER	: iCLM DB 1007/TPT
ISSUE DATE	: 13 MAY 2025
COMPULSORY BRIEFING	: 21 MAY 2025
CLOSING DATE	: 09 JUNE2025
CLOSING TIME	: 12h00 pm
TENDER VALIDITY PERIOD	: 180 Days from the closing date

DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING, FOR TRANSNET SOC LTD OPERATING AS TRANSNET PORT TERMINALS, (HEREINAFTER REFERRED TO AS "TPT"), AT DURBAN CONTAINER TERMINAL PIER 1, FOR THE DURATION OF 12 MONTHS.

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T1.1 TENDER NOTICE AND INVITATION TO TENDER

SECTION 1: NOTICE TO TENDERERS

1. INVITATION TO TENDER

Responses to this Tender [hereinafter referred to as a **Tender**] are requested from persons, companies, close corporations or enterprises [hereinafter referred to as a Tenderer].

DESCRIPTION	DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING, FOR TRANSNET SOC LTD OPERATING AS TRANSNET PORT TERMINALS, (HEREINAFTER REFERRED TO AS "TPT"), AT DURBAN CONTAINER TERMINAL PIER 1, FOR THE DURATION OF 12 MONTHS
TENDER DOWNLOADING	This Tender may be downloaded directly from the National Treasury eTender Publication Portal at www.etenders.gov.za and the Transnet website at https://transnetetenders.azurewebsites.net (please use Google Chrome to access Transnet link) FREE OF CHARGE.
COMPULSORY TENDER CLARIFICATION MEETING	A Compulsory Tender Clarification Meeting will be conducted at Pier 1 Container Terminal, Port Entrance 8, Bayhead Road, Bhekulwandle Staff Facility Building, Genius Boardroom, on the 21st MAY 2025 at 10:00am [10 O'clock] for a period of ± 3 (three) hours. [Tenderers to provide own transportation and accommodation]. The Compulsory Tender Clarification Meeting will start punctually, and information <u>will not</u> be repeated for the benefit of Tenderers arriving late. A Site visit to the EES Mini Substations will take place after the clarification meeting, tenderers are to note communication to be directed to Hlengiwe Mthimkhulu at 031 361 8708 or email. Hlengiwe.Mthimkhulu@transnet.net



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	• Tenderers are required to wear safety shoes, high visibility vests and hard hats. • Tenderers without the recommended PPE will not be allowed on the site walk. • Tenderers and their employees, visitors, clients and customers entering Transnet Offices, Depots, Workshops and Stores will have to undergo breathalyser testing. • All forms of firearms are prohibited on Transnet properties and premises. • The relevant persons attending the meeting must ensure that their identity documents, passports or driver's licences are on them for inspection at the access control gates. Certificate of Attendance in the form set out in the Returnable Schedule T2.2-01 hereto must be completed and submitted with your Tender as proof of attendance is required for a compulsory site meeting and/or tender briefing. Tenderers are required to bring this Returnable Schedule T2.2-01 to the Compulsory Tender Clarification Meeting to be signed by the Employer's Representative. Tenderers failing to attend the compulsory tender briefing will be disqualified.
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CLOSING DATE	12:00pm on 09th JUNE 2025 Tenderers must ensure that tenders are uploaded timeously onto the system. If a tender is late, it will not be accepted for consideration.
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2. TENDER SUBMISSION

Transnet has implemented a new electronic tender submission system, the e-Tender Submission Portal, in line with the overall Transnet digitalization strategy where suppliers can view advertised tenders, register their information, log their intent to respond to bids and upload their bid proposals/responses on to the system.

a) The Transnet e-Tender Submission Portal can be accessed as follows:



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Log on to the Transnet eTenders management platform website (<https://transnetetenders.azurewebsites.net>);

- Click on "ADVERTISED TENDERS" to view advertised tenders;
 - Click on "SIGN IN/REGISTER – for bidder to register their information (must fill in all mandatory information);
 - Click on "SIGN IN/REGISTER" - to sign in if already registered;
 - Toggle (click to switch) the "Log an Intent" button to submit a bid;
 - Submit bid documents by uploading them into the system against each tender selected.
 - **Tenderers are required to ensure that electronic bid submissions are done at least a day before the closing date to prevent issues which they may encounter due to their internet speed, bandwidth or the size of the number of uploads they are submitting. Transnet will not be held liable for any challenges experienced by bidders as a result of the technical challenges. Please do not wait for the last hour to submit. A Tenderer can upload 30mb per upload and multiple uploads are permitted.**
- b) Each company must register its profile using its company details and use the corresponding registered profile to log an intent to bid as well as submitting any bid.
- c) Transnet will not accept a bid or will disqualify a bidder who submits a bid in the Transnet e-tender submission through another bidders'/Company's profile. In other words, each bidder must register the intent to bid and submit its bid through its own profile under the same company name that will eventually bid for the tender. No company shall submit a bid on behalf of another company regardless of the company being a subsidiary or holding company.
- d) In case of a Joint Venture, any of the parties/companies to the Joint Venture may use its registered profile to submit a bid on behalf of the Joint Venture
- e) The tender offers to this tender will be opened as soon as possible after the closing date and time. Transnet shall not, at the opening of tenders, disclose to any other company any confidential details pertaining to the Tender Offers / information received, i.e. pricing, delivery, etc. The names and locations of the Tenderers will be divulged to other Tenderers upon request.
- f) Submissions must not contain documents relating to any Tender other than that shown on the submission.



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3. CONFIDENTIALITY

All information related to this RFP is to be treated with strict confidentiality. In this regard Tenderers are required to certify that they have acquainted themselves with the Non-Disclosure Agreement. All information related to a subsequent contract, both during and after completion thereof, will be treated with strict confidence. Should the need however arise to divulge any information gleaned from provision of the Works, which is either directly or indirectly related to Transnet's business, written approval to divulge such information must be obtained from Transnet.

4. DISCLAIMERS

Tenderers are hereby advised that Transnet is not committed to any course of action as a result of its issuance of this Tender and/or its receipt of a tender offer. In particular, please note that Transnet reserves the right to:

- 4.1. Award the business to the highest scoring Tenderer/s unless objective criteria justify the award to another tenderer.
- 4.2. Not necessarily accept the lowest priced tender or an alternative Tender;
- 4.3. Go to the open market if the quoted rates (for award of work) are deemed unreasonable;
- 4.4. Should the Tenderers be awarded business on strength of information furnished by the Tenderer, which after conclusion of the contract is proved to have been incorrect, Transnet reserves the right to terminate the contract;
- 4.5. Request audited financial statements or other documentation for the purposes of a due diligence exercise;
- 4.6. Not accept any changes or purported changes by the Tenderer to the tender rates after the closing date;
- 4.7. Verify any information supplied by a Tenderer by submitting a tender, the Tenderer/s hereby irrevocably grant the necessary consent to the Transnet to do so;
- 4.8. Conduct the evaluation process in parallel. The evaluation of Tenderers at any given stage must therefore not be interpreted to mean that Tenderers have necessarily passed any previous stage(s);
- 4.9. Unless otherwise expressly stated, each tender lodged in response to the invitation to tender shall be deemed to be an offer by the Tenderer. The Employer has the right in its sole and unfettered discretion not to accept any offer.



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4.10. Not be held liable if tenderers do not provide the correct contact details during the clarification session and do not receive the latest information regarding this RFP with the possible consequence of being disadvantaged or disqualified as a result thereof.

4.11. Transnet reserves the right to exclude any Tenderers from the tender process who has been convicted of a serious breach of law during the preceding 5 [five] years including but not limited to breaches of the Competition Act 89 of 1998, as amended. Tenderers are required to indicate in tender returnable [clause 12 on T2.2-20], [**Breach of Law**] whether or not they have been found guilty of a serious breach of law during the past 5 [five] years.

4.12. Transnet reserves the right to perform a risk analysis on the preferred tenderer to ascertain if any of the following might present an unacceptable commercial risk to the employer:

- *unduly high or unduly low tendered rates or amounts in the tender offer;*
- *contract data of contract provided by the tenderer; or*
- *the contents of the tender returnables which are to be included in the contract.*

5. Transnet will not reimburse any Tenderer for any preparatory costs or other work performed in connection with this Tender, whether or not the Tenderer is awarded a contract.

6. NATIONAL TREASURY'S CENTRAL SUPPLIER DATABASE

Tenderer are required to self-register on National Treasury's Central Supplier Database (CSD) which has been established to centrally administer supplier information for all organs of state and facilitate the verification of certain key supplier information. The CSD can be accessed at <https://secure.csd.gov.za/>. Tenderer are required to provide the following to Transnet in order to enable it to verify information on the CSD:

Supplier Number..... and Unique registration reference number.....

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Transnet urges its clients, suppliers and the general public

to report any fraud or corruption to

TIP-OFFS ANONYMOUS: 0800 003 056 OR Transnet@tip-offs.com



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T1.2 TENDER DATA

The conditions of tender are the Standard Conditions of Tender as contained in Annex C of the CIDB Standard for Uniformity in Engineering and Construction Works Contracts. The Standard for Uniformity in Construction Procurement was first published in Board Notice 62 of 2004 in Government Gazette No 26427 of 9 June 2004. It was subsequently amended in Board Notice 67 of 2005 in Government Gazette No 28127 of 14 October 2005, Board Notice 93 of 2006 in Government Gazette No 29138 of 18 August 2006, Board Notice No 9 of 2008 in Government Gazette No 31823 of 30 January 2009, Board Notice 86 of 2010 in Government Gazette No 33239 of 28 May 2010, Board Notice 136 of 2015 in Government Gazette 38960 of 10 July 2015 and Board Notice 423 of 2019 in Government Gazette No 42622 of 8 August 2019.

This edition incorporates the amendments made in Board Notice 423 of 2019 in Government Gazette 42622 of 8 August 2019. (see www.cidb.org.za).

The Standard Conditions of Tender make several references to Tender data for detail that apply specifically to this tender. The Tender Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the Standard Conditions of Tender.

Each item of data given below is cross-referenced in the left-hand column to the clause in the Standard Conditions of Tender to which it mainly applies.

Clause	Data
C.1.1 The <i>Employer</i> is	Transnet SOC Ltd (Reg No. 1990/000900/30)
C.1.2 The tender documents issued by the <i>Employer</i> comprise:	
Part T: The Tender	
Part T1: Tendering procedures	T1.1 Tender notice and invitation to tender T1.2 Tender data
Part T2 : Returnable documents	T2.1 List of returnable documents T2.2 Returnable schedules
Part C: The contract	
Part C1: Agreements and contract data	C1.1 Form of offer and acceptance C1.2 Contract data (Part 1 & 2) C1.3 Form of Securities
Part C2: Pricing data	C2.1 Pricing instructions



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C2.2 Price Activity Schedule

Part C3: Scope of work

C3.1 Works Information

Part C4: Site information

C4.1 Site information

C.1.4	The Employer's agent is:	Procurement Officer
	Name:	Hlengiwe Mthimkhulu
	Address:	DCT Pier 2, Admin Building, Bayhead Road
	Tel No.	031 361 8708
	E – mail	Hlengiwe.Mthimkhulu@transnet.net

C.2.1 Transnet will utilise the following methodology and criteria in selecting a preferred Supplier/Service Provider:

1. Stage One – Test for Administrative Responsiveness to RFP:

The test for administrative responsiveness to this RFP will include the following:

Administrative responsiveness check	RFP Reference
Whether the Bid has been lodged on time	<i>T.1.1 Section 1/ E-tender Management System</i>
Whether all Returnable Documents and/or schedules [where applicable] were completed and returned by the closing date and time	<i>Part T2</i>
Verify the validity of all returnable documents	<i>All Sections</i>
Verify if the Bid document has been duly signed by the authorised respondent	<i>All sections</i>

The test for administrative responsiveness [Stage One] must be passed for a Respondent's Proposal to progress to Stage Two for further evaluation



2. Stage Two - Test for Substantive Responsiveness to RFP:

The test for substantive responsiveness to this RFP will include the following:

Substantive responsiveness check	RFP Reference
Whether any general and legislation qualification criteria set by Transnet, have been met	<i>All sections</i>
Whether the Bid contains a priced offer as prescribed in the pricing and delivery schedule	<i>Part C1.1/ C2.1 & C2.2</i>
Verify the validity of all returnable documents	<i>All Sections</i>
Whether the Bid materially complies with the scope and/or specification given	<i>All sections</i>

The test for substantive responsiveness [Stage Two] must be passed for a Respondent's Proposal to progress to Stage Three for further evaluation

Only those tenderers who satisfy the following eligibility criteria are eligible to submit tenders:

3. Stage Three - Eligibility with regards to attendance at the compulsory clarification meeting:

An authorised representative of the tendering entity or a representative of a tendering entity that intends to form a Joint Venture (JV) must attend the compulsory clarification meeting in terms C2.7

4. Stage Four - Eligibility in terms of the Construction Industry Development Board:

- a) Only those tenderers who are registered with the CIDB or are capable of being so prior to the evaluation of submissions, in a contractor grading designation equal to or higher than a contractor grading designation determined in accordance with the sum tendered or a value determined in accordance with Regulation 25 (1B) or 25(7A) of the Construction Industry Development Regulations, designation of **4EP or higher** class of construction work, are eligible to have their tenders evaluated.

- b) Joint Venture (JV)

Joint ventures are eligible to submit tenders subject to the following:

- every member of the joint venture is registered with the CIDB;



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2. the lead partner has a contractor grading designation of not lower than one level below the required class of construction works under consideration and possesses the required recognition status; and
3. the combined Contractor grading designation calculated in accordance with the Construction Industry Development Regulations is equal to or higher than a Contractor grading designation determined in accordance with the sum tendered for a 4EP or **higher class** of construction work or a value determined in accordance with Regulation 25(1B) or 25(7A) of the Construction Industry Development Regulations

The tenderer shall provide a certified copy of its signed joint venture agreement

5. Stage Five - Compliance to Technical Eligibility Criteria:

Tenderers are to list evidence in this schedule of compliance to the Eligibility Criteria for the design, manufacture, off site testing, supply, delivery, installation, testing and commissioning of one (1) new 1000kva mini substation and one (1) 1000kva mobile generator. For Evidence tenderers are to submit proof of registration with ECSA and the Department of Labour. Failure to comply with eligibility criteria i.e., a "No" answer or "No" response will lead to disqualification.

Eligibility Criteria	Comply (Yes/No)
T2.2-03 Evaluation Schedule: Proof of registration for Bidder or their sub-contractor with ECSA as a Professional Engineer for the design and sign off of the installation.	
T2.2-04 Evaluation Schedule: Proof of registration with the Department of Labour as an Electrical Contractor for the bidder or their subcontractor submitted	

Any tenderer that fails to meet the stipulated eligibility criteria will be regarded as an unacceptable tender.

6. Stage Five - Functionality:

Only those tenderers who obtain the minimum qualifying score for functionality will be evaluated further in terms of price and the applicable preference point system. The minimum qualifying for score for functionality is **70** points.

The evaluation criteria for measuring functionality and the points for each criteria and, if any, each sub-criterion are as stated in C.3.11. below.



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C.2.7 The arrangements for a compulsory clarification meeting are as stated in the Tender Notice and Invitation to Tender. **Tenderers must complete and sign the attendance register.** Addenda will be issued to and tenders will only be received from those tendering entities including those entities that intends forming a joint venture appearing on the attendance register.

Tenderers are also **required to bring their RFP document to the briefing session and have their returnable document T2.2-01 certificate of attendance** signed off by the Employer's authorised representative.

C.2.12 No alternative tender offers will be considered.

C.2.13.3 Each tender offer shall be in the **English Language**.

C.2.13.5 The *Employer's* details and identification details that are to be shown on each tender offer are as follows:

Identification details:	The tender documents must be uploaded with: ▪ Name of Tenderer: ▪ Contact person and details: ▪ The Tender Number: ▪ The Tender Description
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Documents must be marked for the attention of:
Employer's Agent:

C.2.13.9 Telephonic, telegraphic, facsimile or e-mailed tender offers will not be accepted.

C.2.15 The closing time for submission of tender offers is:

Time: **12:00pm** on the **2nd of JUNE 2025**

Location: The Transnet e-Tender Submission Portal:

(<https://transnetetenders.azurewebsites.net>);

NO LATE TENDERS WILL BE ACCEPTED

C.2.16 The tender offer validity period is **180 days from closing date** after the closing date. Tenderers are to note that they may be requested to extend the validity period of their tender, on the same terms and conditions, if Transnet's internal evaluation and governance approval processes has not been finalised within the validity period.

C.2.23 The tenderer is required to submit with his tender:

1. A valid Tax Clearance Certificate issued by the South African Revenue Services.
Tenderers also to provide Transnet with a TCS PIN to verify Tenderers compliance status.



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2. A **valid B-BBEE Certificate** from a Verification Agency accredited by the South African Accreditation System [**SANAS**], or a **sworn affidavit** confirming annual turnover and level of black ownership in case of all EMEs and QSEs with 51% black ownership or more together with the tender;
3. A valid CIDB certificate in the correct designated grading;
4. Proof of registration on the Central Supplier Database;
5. Letter of Good Standing with the Workmen's compensation fund by the tendering entity or separate Letters of Good Standing from all members of a newly constituted JV.

Note: Refer to Section T2.1 for List of Returnable Documents

C3.11 The minimum number of evaluation points for functionality is **70**

The procedure for the evaluation of responsive tenders is Functionality, Price and Preference:

Only those tenderers who attain the minimum number of evaluation points for Functionality will be eligible for further evaluation, failure to meet the minimum threshold will result in the tender being disqualified and removed from any further consideration.

Functionality Criteria

The evaluation criteria for measuring functionality and the points for each criterion and, if any, each sub-criterion is as stated in Returnable Evaluation Schedules.

Functionality shall be scored independently by not less than 3 (three) evaluators and averaged in accordance with the following schedules:

- | | |
|----------------|---|
| T2.2-05 | Evaluation Schedule: Management and CV's of Key Persons |
| T2.2-06 | Evaluation Schedule: Approach Paper/Method Statement |
| T2.2-07 | Evaluation Schedule: Health and Safety |
| T2.2-08 | Evaluation Schedule: Previous Experience |
| T2.2-09 | Evaluation Schedule: Quality Management |



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Each evaluation criteria will be assessed in terms of scores of 0, 20, 40, 60, 80 or 100 (linear scale, more suitable for NEC3, ECC (construction related procurement)).

The scores of each of the evaluators will be averaged, weighted and then totalled to obtain the final score for functionality, unless scored collectively. (See CIDB Inform Practice Note #9).

Note: Any tender not complying with the above-mentioned requirements, will be regarded as non-responsive and will therefore not be considered for further evaluation. This note must be read in conjunction with Clause C.2.1.



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Stage Six – Evaluation and Final Weighted Scoring:

- C.3.11. Only tenders that achieve the minimum qualifying score for functionality will be evaluated further in accordance with the 80/20 preference points systems as described in Preferential Procurement Regulations.

80 where the financial value of one or more responsive tenders received have a value equal to or below R50 million, inclusive of all applicable taxes,

Evaluation Criteria	Final Weighted Scores
Price	80
Specific goals: Scorecard	20
TOTAL SCORE:	100

Up to 100 minus W_1 tender evaluation points will be awarded to tenderers who complete the preferencing schedule and who are found to be eligible for the preference claimed. **Should the evidence required for any Specific Goals applicable in this tender not be provided, a tenderer will score zero points for that particular "Specific Goals".**

In terms of Transnet Preferential Procurement Policy (TPPP) and Procurement Manuals, the following preference points must be awarded to a bidder who provides the relevant required evidence for claiming points

Selected Specific Goal	Number of points allocated (80/20)
B-BBEE Level of contributor – Level 1 & 2	10
30% Black Women Owned Entities	10

In terms of Transnet Preferential Procurement Policy (TPPP) and Procurement Manuals, preference points must be awarded to a bidder for providing evidence in accordance with the table below:

Specific Goals	Acceptable Evidence
B-BBEE	B-BBEE Certificate / Sworn- Affidavit / B-BBEE CIPC Certificate (in case of JV, a consolidated scorecard will be accepted) as per DTIC guideline
30% Black Women Owned Entities	B-BBEE Certificate / Sworn- Affidavit / B-BBEE CIPC Certificate (in case of JV, a consolidated scorecard will be accepted) as per DTIC



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guideline

	POINTS
PRICE	80
B-BBEE STATUS LEVEL OF CONTRIBUTION	
B-BBEE LEVEL 1 & 2	10
30% BLACK WOMEN OWNED ENTITIES	10
Total points for Price and Specific Goals must not exceed	100

Note: Transnet reserves the right to carry out an independent audit of the tenderers scorecard components at any stage from the date of close of the tenders until completion of the contract.

Stage Seven – Post Tender Negotiations (if applicable):

- Respondents are to note that Transnet may not award a contract if the price offered is not market related. In this regard, Transnet reserves the right to engage in PTN with the view to achieving a market-related price or to cancel the tender. Negotiations will be done in a sequential manner i.e.:
 - first negotiate with the highest ranked bidder or cancel the bid, should such negotiations fail,
 - negotiate with the 2nd and 3rd ranked bidders (if required) in a sequential manner.
- In the event of any Respondent being notified of such short-listed/preferred bidder status, his/her bid, as well as any subsequent negotiated best and final offers (BAFO), will automatically be deemed to remain valid during the negotiation period and until the ultimate award of business.
- Should Transnet conduct post tender negotiations, Respondents will be requested to provide their best and final offers to Transnet based on such negotiations. Where a market related price has been achieved through negotiation, the contract will be awarded to the successful Respondent(s).

Stage Eight – Award of business and conclusion of contract:

Immediately after approval to award the contract has been received, the successful bidder(s) will be informed of the acceptance of his/their Bid by way of a Letter of



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Award. Thereafter the final contract will be concluded with the successful Respondent(s).

A final contract will be concluded and entered into with the successful Bidder at the acceptance of a letter of award by the Respondent

C.3.13 Tender offers will only be accepted if:

1. The tenderer or any of its directors/shareholders is not listed on the Register of Tender Defaulters in terms of the Prevention and Combating of Corrupt Activities Act of 2004 as a person prohibited from doing business with the public sector;
2. the tenderer does not appear on Transnet's list for restricted tenderers and National Treasury's list of Tender Defaulters;
3. the tenderer has fully and properly completed the Compulsory Enterprise Questionnaire and there are no conflicts of interest which may impact on the tenderer's ability to perform the contract in the best interests of the Employer or potentially compromise the tender process and persons in the employ of the state.
4. Transnet reserves the right to award the tender to the tenderer who scores the highest number of points overall, unless there are **objective criteria** which will justify the award of the tender to another tenderer. Objective criteria include but are not limited to the outcome of a due diligence exercise to be conducted. The due diligence exercise may take the following factors into account inter alia;

the tenderer:

- a) is not under restrictions, or has principals who are under restrictions, preventing participating in the employer's procurement,
- b) can, as necessary and in relation to the proposed contract, demonstrate that he or she possesses the professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, expertise and the personnel, to perform the contract,
- c) has the legal capacity to enter into the contract,
- d) is not insolvent, in receivership, under Business Rescue as provided for in chapter 6 of the Companies Act, 2008, bankrupt or being wound up, has his



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affairs administered by a court or a judicial officer, has suspended his business activities, or is subject to legal proceedings in respect of any of the foregoing,

e) complies with the legal requirements, if any, stated in the tender data and

f) is able, in the option of the employer to perform the contract free of conflicts of interest.

C.3.17 The number of paper copies of the signed contract to be provided by the Employer is 1 (one).



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T2.1 List of Returnable Documents

2.1.1 These schedules are required for pre-qualification and eligibility purposes:

- T2.2-01 **Stage Three as per CIDB: Eligibility Criteria Schedule** - Certificate of attendance at Compulsory Tender Clarification Meeting
- T2.2-02 **Stage Four as per CIDB: Eligibility Criteria Schedule** - CIDB Registration
- T2.2-03 **Stage Five as per CIDB: Eligibility Criteria Schedule** - ECSA Certification
- T2.2-04 **Stage Five as per CIDB: Eligibility Criteria Schedule** - Electrical Contractor Registration

2.1.2 Stage Six as per CIDB: these schedules will be utilised for evaluation purposes:

- T2.2-05 **Evaluation Schedule:** Management and CV's of Key Persons
- T2.2-06 **Evaluation Schedule:** Approach Paper/Method Statement
- T2.2-07 **Evaluation Schedule:** Health and Safety
- T2.2-08 **Evaluation Schedule:** Previous Experience
- T2.2-09 **Evaluation Schedule:** Quality Management

Stage Seven: these schedules will be utilised for Specific Goals:

Valid proof of Respondent's compliance to Specific Goals evidence (Preference Claim Form) requirements stipulated in SBD6.1. (Refer to T2.2-17)

2.1.3 Returnable Schedules:

General:

- T2.2-10 Authority to submit tender
- T2.2-11 Record of addenda to tender documents
- T2.2-12 Letter of Good Standing
- T2.2-13 Risk Elements
- T2.2-14 Details of Plant Offered
- T2.2-15 Schedule of proposed Subcontractors
- T2.2-16 Site Establishment requirements

Agreement and Commitment by Tenderer:

- T2.2-17 CIDB SFU ANNEX G Compulsory Enterprise Questionnaire
- T2.2-18 Non-Disclosure Agreement
- T2.2-19 RFP Declaration Form
- T2.2-20 RFP – Breach of Law



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- T2.2-21 Certificate of Acquaintance with Tender Document
- T2.2-22 Service Provider Integrity Pact
- T2.2-23 Supplier Code of Conduct
- T2.2-23 Protection of Personal Information Act, 4 of 2013 ("POPIA")

Bonds/Guarantees/Financial/Insurance:

- T2.2-24 Insurance provided by the Contractor
- T2.2-25 Form of Intent to provide a Performance Guarantee
- T2.2-26 Three (3) years audited financial statements

2.2 C1.1 Offer portion of Form of Offer & Acceptance

2.3 C1.2 Contract Data

2.4 C1.3 Forms of Securities

2.5 C2.1 Pricing Instructions (Bill of Quantities)

2.6 C2.2 Activity Schedule

Note: The Employer shall provide the proforma documents that shall be completed by the contractors after award of the contract within the stipulated period. (Form A1 List of Recognised Skills Development Agencies, Form A2 Baseline Training Plan, Form A3 Project Interim Report, Form A4 Supervisor Agreement, Form A5 Project Completion Report)



STAATSKOERANT, 8 AUGUSTUS 2019

DEPARTMENT OF PUBLIC WORKS

NOTICE 423 OF 2019

STANDARD FOR UNIFORMITY IN ENGINEERING AND CONSTRUCTION

WORKS CONTRACTS

AUGUST 2019

Annex C

Standard Conditions of Tender

C.1 General

C.1.1 Actions

C.1.1.1 The employer and each tenderer submitting a tender offer shall comply with these conditions of tender. In their dealings with each other, they shall discharge their duties and obligations as set out in C.2 and C.3, timeously and with integrity, and behave equitably, honestly and transparently, comply with all legal obligations and not engage in anticompetitive practices.

C.1.1.2 The employer and the tenderer and all their agents and employees involved in the tender Process shall avoid conflicts of interest and where a conflict of interest is perceived or known, declare any such conflict of interest, indicating the nature of such conflict. Tenderers shall declare any potential conflict of interest in their tender submissions. Employees, agents and advisors of the employer shall declare any conflict of interest to whoever is responsible for overseeing the procurement process at the start of any deliberations relating to the procurement process or as soon as they become aware of such conflict and abstain from any decisions where such conflict exists or recuse themselves from the procurement process, as appropriate.

Note: 1) A conflict of interest may arise due to a conflict of roles which might provide an incentive for improper acts in some circumstances. A conflict of interest can create an appearance of impropriety that can undermine confidence in the ability of that person to act properly in his

or her position even if no improper acts result.

2) Conflicts of interest in respect of those engaged in the procurement process include direct, indirect or family interests in the tender or outcome of the procurement process and any personal bias, inclination, obligation, allegiance or loyalty which would in any way affect any decisions taken.

C.1.1.3 The employer shall not seek and a tenderer shall not submit a tender without having a firm intention and the capacity to proceed with the contract.

C.1.2 Tender Documents

The documents issued by the employer for the purpose of a tender offer are listed in the tender data.

C.1.3 Interpretation

C.1.3.1 The tender data and additional requirements contained in the tender schedules that are Included in the returnable documents are deemed to be part of these conditions of tender.

C.1.3.2 These conditions of tender, the tender data and tender schedules which are required for Tender evaluation purposes, shall form part of any contract arising from the invitation to tender.

C.1.3.3 For the purposes of these conditions of tender, the following definitions apply:

a) **conflict of interest** means any situation in which:

- i) someone in a position of trust has competing professional or personal interests which make it difficult to fulfill his or her duties impartially;
- ii) an individual or tenderer is in a position to exploit a professional or official capacity in some way for their personal or corporate benefit; or
- iii) incompatibility or contradictory interests exist between an employee and the tenderer who employs that employee.

b) **comparative offer** means the price after the factors of a non-firm price and all unconditional discounts it can be utilised to have been taken into consideration;

c) **corrupt practice** means the offering, giving, receiving or soliciting of anything of value to influence the action of the employer or his staff or agents in the tender process;

d) **fraudulent practice** means the misrepresentation of the facts in order to influence the tender process or the award of a contract arising from a tender offer to the detriment of the employer, including collusive practices intended to establish prices at artificial levels;

C.1.4 Communication and employer's agent

Each communication between the employer and a tenderer shall be to or from the employer's agent only, and in a form that can be readily read, copied and recorded. Communications shall be in the

English language. The employer shall not take any responsibility for non-receipt of communications from or by a tenderer. The name and contact details of the employer's agent are stated in the tender data.

C.1.5 Cancellation and Re-Invitation of Tenders

C.1.5.1 An employer may, prior to the award of the tender, cancel a tender if

- a) due to changed circumstances, there is no longer a need for the engineering and construction works specified in the invitation;
- b) funds are no longer available to cover the total envisaged expenditure; or
- c) no acceptable tenders are received.
- d) there is a material irregularity in the tender process.

C.1.5.2 The decision to cancel a tender invitation must be published in the same manner in which the original tender invitation was advertised

C.1.5.3 An employer may only with the prior approval of the relevant treasury cancel a tender Invitation for the second time.

C.1.6 Procurement procedures

C.1.6.1 General

Unless otherwise stated in the tender data, a contract will, subject to C.3.13, be concluded with the tenderer who in terms of C.3.11 is the highest ranked or the tenderer scoring the highest number of tender evaluation points, as relevant, based on the tender submissions that are received at the closing time for tenders.

C.1.6.2 Competitive negotiation procedure

C.1.6.2.1 Where the tender data require that the competitive negotiation procedure is to be followed, tenderers shall submit tender offers in response to the proposed contract in the first round of submissions. Notwithstanding the requirements of C.3.4, the employer shall announce only the names of the tenderers who make a submission. The requirements of C.8 relating to the material deviations or qualifications which affect the competitive position of tenderers shall not apply.

C.1.6.2.2 All responsive tenderers or at least a minimum of not less than three responsive tenderers that are highest ranked in terms of the evaluation criteria stated in the tender data shall be invited to enter into competitive negotiations based on the principle of equal treatment, keeping confidential the proposed solutions and associated information.
Notwithstanding the provisions of C.2.17, the employer may request that tenders be clarified,

Specified and fine-tuned in order to improve a tenderer's competitive position provided that such clarification, specification, fine-tuning or additional information does not alter any fundamental aspects of the offers or impose substantial new requirements which restrict or distort competition or have a discriminatory effect.

C.1.6.2.3 At the conclusion of each round of negotiations, tenderers shall be invited by the employer to revise their tender offer based on the same evaluation criteria, with or without adjusted weightings. Tenderers shall be advised when they are to submit their best and final offer.

C.1.6.2.4 The contract shall be awarded in accordance with the provisions of C.3.11 and C.3.13 after tenderers have been requested to submit their best and final offer.

C.1.6.3 Proposal procedure using the two stage-system

C.1.6.3.1 Option 1

Tenderers shall in the first stage submit technical proposals and, if required, cost parameters around which a contract may be negotiated. The employer shall evaluate each responsive submission in terms of the method of evaluation stated in the tender data, and in the second stage negotiate a contract with the tenderer scoring the highest number of evaluation points and award the contract in terms of these conditions of tender.

C.1.6.3.2 Option 2

C.1.6.3.2.1 Tenderers shall submit in the first stage only technical proposals. The employer shall invite all responsive tenderers to submit tender offers in the second stage, following the issuing of procurement documents.

C.1.6.3.2.2 The employer shall evaluate tenders received during the second stage in terms of the method of evaluation stated in the tender data, and award the contract in terms of these conditions of tender.

C.2 Tenderer's obligations

C.2.1 Eligibility

C.2.1.1 Submit a tender offer only if the tenderer satisfies the criteria stated in the tender data and the tenderer, or any of his principals, is not under any restriction to do business with employer.

C.2.1.2 Notify the employer of any proposed material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used by the employer as the basis in a prior process to invite the tenderer to

submit a tender offer and obtain the employer's written approval to do so prior to the closing time for tenders.

C.2.2 Cost of tendering

C.2.2.1 Accept that, unless otherwise stated in the tender data, the employer will not compensate the tenderer for any costs incurred in the preparation and submission of a tender offer, including the costs of any testing necessary to demonstrate that aspects of the offer complies with requirements.

C.2.2.2 The cost of the tender documents charged by the employer shall be limited to the actual cost incurred by the employer for printing the documents. Employers must attempt to make available the tender documents on its website so as not to incur any costs pertaining to the printing of the tender documents.

C.2.3 Check documents

Check the tender documents on receipt for completeness and notify the employer of any discrepancy or omission.

C.2.4 Confidentiality and copyright of documents

Treat as confidential all matters arising in connection with the tender. Use and copy the documents issued by the employer only for the purpose of preparing and submitting a tender offer in response to the invitation.

C.2.5 Reference documents

Obtain, as necessary for submitting a tender offer, copies of the latest versions of standards, specifications, conditions of contract and other publications, which are not attached but which are incorporated into the tender documents by reference.

C.2.6 Acknowledge addenda

Acknowledge receipt of addenda to the tender documents, which the employer may issue, and if necessary apply for an extension to the closing time stated in the tender data, in order to take the addenda into account.

C.2.7 Clarification meeting

Attend, where required, a clarification meeting at which tenderers may familiarize themselves with aspects of the proposed work, services or supply and raise questions. Details of the meeting(s) are stated in the tender data.

C.2.8 Seek clarification

Request clarification of the tender documents, if necessary, by notifying the employer at least five (5) working days before the closing time stated in the tender data.

C.2.9 Insurance

Be aware that the extent of insurance to be provided by the employer (if any) might not be for the full cover required in terms of the conditions of contract identified in the contract data. The tenderer is advised to seek qualified advice regarding insurance.

C.2.10 Pricing the tender offer

C.2.10.1 Include in the rates, prices, and the tendered total of the prices (if any) all duties, taxes

Except Value Added Tax (VAT), and other levies payable by the successful tenderer, such duties, taxes and levies being those applicable fourteen (14) days before the closing time stated in the tender data.

C.2.10.2 Show VAT payable by the employer separately as an addition to the tendered total of the prices.

C.2.10.3 Provide rates and prices that are fixed for the duration of the contract and not subject to adjustment except as provided for in the conditions of contract identified in the contract data.

C.2.10.4 State the rates and prices in Rand unless instructed otherwise in the tender data. The conditions of contract identified in the contract data may provide for part payment in other currencies.

C.2.11 Alterations to documents

Do not make any alterations or additions to the tender documents, except to comply with instructions issued by the employer, or necessary to correct errors made by the tenderer. All signatories to the tender offer shall initial all such alterations.

C.2.12 Alternative tender offers

C.2.12.1 Unless otherwise stated in the tender data, submit alternative tender offers only if a main tender offer, strictly in accordance with all the requirements of the tender documents, is also submitted as well as a schedule that compares the requirements of the tender documents with the alternative requirements that are proposed.

C.2.12.2 Accept that an alternative tender offer must be based only on the criteria stated in the tender data or criteria otherwise acceptable to the employer.

C.2.12.3 An alternative tender offer must only be considered if the main tender offer is the winning tender.

C.2.13 Submitting a tender offer

- C.2.13.1 Submit one tender offer only, either as a single tendering entity or as a member in a joint venture to provide the whole of the works identified in the contract data and described in the scope of works, unless stated otherwise in the tender data.
- C.2.13.2 Return all returnable documents to the employer after completing them in their entirety, either electronically (if they were issued in electronic format) or by writing legibly in non-erasable ink.
- C.2.13.3 Submit the parts of the tender offer communicated on paper as an original plus the number Of copies stated in the tender data, with an English translation of any documentation in a language other than English, and the parts communicated electronically in the same format as they were issued by the employer.
- C.2.13.4 Sign the original and all copies of the tender offer where required in terms of the tender data. The employer will hold all authorized signatories liable on behalf of the tenderer. Signatories for tenderers proposing to contract as joint ventures shall state which of the signatories is the lead partner whom the employer shall hold liable for the purpose of the tender offer.
- C.2.13.5 Seal the original and each copy of the tender offer as separate packages marking the Packages as "ORIGINAL" and "COPY". Each package shall state on the outside the employer's address and identification details stated in the tender data, as well as the tenderer's name and contact address.
- C.2.13.6 Where a two-envelope system is required in terms of the tender data, place and seal the returnable documents listed in the tender data in an envelope marked "financial proposal" and place the remaining returnable documents in an envelope marked "technical proposal". Each envelope shall state on the outside the employer's address and identification details stated in the tender data, as well as the tenderer's name and contact address.
- C.2.13.7 Seal the original tender offer and copy packages together in an outer package that states on the outside only the employer's address and identification details as stated in the tender data.
- C.2.13.8 Accept that the employer will not assume any responsibility for the misplacement or premature opening of the tender offer if the outer package is not sealed and marked as stated.
- C.2.13.9 Accept that tender offers submitted by facsimile or e-mail will be rejected by the employer, unless stated otherwise in the tender data.

C.2.14 Information and data to be completed in all respects

Accept that tender offers, which do not provide all the data or information requested completely and in the form required, may be regarded by the employer as non-responsive.

C.2.15 Closing time

C.2.15.1 Ensure that the employer receives the tender offer at the address specified in the tender data not later than the closing time stated in the tender data. Accept that proof of posting shall not be accepted as proof of delivery.

C.2.15.2 Accept that, if the employer extends the closing time stated in the tender data for any reason, the requirements of these conditions of tender apply equally to the extended deadline.

C.2.16 Tender offer validity

C.2.16.1 Hold the tender offer(s) valid for acceptance by the employer at any time during the validity period stated in the tender data after the closing time stated in the tender data.

C.2.16.2 If requested by the employer, consider extending the validity period stated in the tender data for an agreed additional period with or without any conditions attached to such extension.

C.2.16.3 Accept that a tender submission that has been submitted to the employer may only be withdrawn or substituted by giving the employer's agent written notice before the closing time for tenders that a tender is to be withdrawn or substituted. If the validity period stated in C.2.16 lapses before the employer evaluating tender, the contractor reserves the right to review the price based on Consumer Price Index (CPI).

C.2.16.4 Where a tender submission is to be substituted, a tenderer must submit a substitute tender in accordance with the requirements of C.2.13 with the packages clearly marked as "SUBSTITUTE".

C.2.17 Clarification of tender offer after submission

Provide clarification of a tender offer in response to a request to do so from the employer during the evaluation of tender offers. This may include providing a breakdown of rates or prices and correction of arithmetical errors by the adjustment of certain rates or item prices (or both). No change in the competitive position of tenderers or substance of the tender offer is sought, offered, or permitted.

Note: *Sub-clause C.2.17 does not preclude the negotiation of the final terms of the contract with a preferred tenderer following a competitive selection process, should the Employer elect to do so.*

C.2.18 Provide other material

C.2.18.1 Provide, on request by the employer, any other material that has a bearing on the tender offer, the tenderer's commercial position (including notarized joint venture agreements), preferencing arrangements, or samples of materials, considered necessary by the employer for the purpose of a full and fair risk assessment. Should the tenderer not provide the material, or a satisfactory reason as to why it cannot be provided, by the time for submission stated in the employer's request, the employer may regard the tender offer as non-responsive.

C.2.18.2 Dispose of samples of materials provided for evaluation by the employer, where required.

C.2.19 Inspections, tests and analysis

Provide access during working hours to premises for inspections, tests and analysis as provided for in the tender data.

C.2.20 Submit securities, bonds and policies

If requested, submit for the employer's acceptance before formation of the contract, all securities, bonds, guarantees, policies and certificates of insurance required in terms of the conditions of contract identified in the contract data.

C.2.21 Check final draft

Check the final draft of the contract provided by the employer within the time available for the employer to issue the contract.

C.2.22 Return of other tender documents

If so instructed by the employer, return all retained tender documents within twenty-eight (28) days after the expiry of the validity period stated in the tender data.

C.2.23 Certificates

Include in the tender submission or provide the employer with any certificates as stated in the tender data.

C.3 The employer's undertakings

C.3.1 Respond to requests from the tenderer

C.3.1.1 Unless otherwise stated in the tender Data, respond to a request for clarification received up To five (5) working days before the tender closing time stated in the Tender Data and notify all tenderers who collected tender documents.

C.3.1.2 Consider any request to make a material change in the capabilities or formation of the Tendering entity (or both) or any other criteria which formed part of the qualifying requirements used to prequalify a tenderer to submit a tender offer in terms of a previous procurement process and deny any such request if as a consequence:

- a) an individual firm, or a joint venture as a whole, or any individual member of the joint venture fails to meet any of the collective or individual qualifying requirements;
- b) the new partners to a joint venture were not prequalified in the first instance, either as individual firms or as another joint venture; or
- c) in the opinion of the Employer, acceptance of the material change would compromise the outcome of the prequalification process.

C.3.2 Issue Addenda

If necessary, issue addenda that may amend or amplify the tender documents to each tenderer during the period from the date that tender documents are available until three (3) working days before the tender closing time stated in the Tender Data. If, as a result a tenderer applies for an extension to the closing time stated in the Tender Data, the Employer may grant such extension and, shall then notify all tenderers who collected tender documents.

C.3.3 Return late tender offers

Return tender offers received after the closing time stated in the Tender Data, unopened, (unless it is necessary to open a tender submission to obtain a forwarding address), to the tenderer concerned.

C.3.4 Opening of tender submissions

C.3.4.1 Unless the two-envelope system is to be followed, open valid tender submissions in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data. Tender submissions for which acceptable reasons for withdrawal have been submitted will not be opened.

C.3.4.2 Announce at the meeting held immediately after the opening of tender submissions, at a venue indicated in the tender data, the name of each tenderer whose tender offer is opened and, where applicable, the total of his prices, number of points claimed for its BBBEE status level and time for completion for the main tender offer only.

C.3.4.3 Make available the record outlined in C.3.4.2 to all interested persons upon request.

C.3.5 Two-envelope system

C.3.5.1 Where stated in the tender data that a two-envelope system is to be followed, open only the technical proposal of valid tenders in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data and announce the name of each tenderer whose technical proposal is opened.

C.3.5.2 Evaluate functionality of the technical proposals offered by tenderers, then advise tenderers who remain in contention for the award of the contract of the time and place when the financial proposals will be opened. Open only the financial proposals of tenderers, who score in the functionality evaluation more than the minimum number of points for functionality stated in the tender data, and announce the score obtained for the technical proposals and the total price and any points claimed on BBBEE status level. Return unopened financial proposals to tenderers whose technical proposals failed to achieve the minimum number of points for functionality.

C.3.6 Non-disclosure

Not disclose to tenderers, or to any other person not officially concerned with such processes, information relating to the evaluation and comparison of tender offers, the final evaluation price and recommendations for the award of a contract, until after the award of the contract to the successful tenderer.

C.3.7 Grounds for rejection and disqualification

Determine whether there has been any effort by a tenderer to influence the processing of tender offers and instantly disqualify a tenderer (and his tender offer) if it is established that he engaged in corrupt or fraudulent practices.

C.3.8 Test for responsiveness

C.3.8.1 Determine, after opening and before detailed evaluation, whether each tender offer properly received:

- a) complies with the requirements of these Conditions of Tender,
- b) has been properly and fully completed and signed, and
- c) is responsive to the other requirements of the tender documents.

C.3.8.2 A responsive tender is one that conforms to all the terms, conditions, and specifications of the tender documents without material deviation or qualification. A material deviation or qualification is one which, in the Employer's opinion, would:

- a) detrimentally affect the scope, quality, or performance of the works, services or supply identified in the Scope of Work,
- b) significantly change the Employer's or the tenderer's risks and responsibilities under the

contract, or

- c) affect the competitive position of other tenderers presenting responsive tenders, if it were to be rectified. Reject a non-responsive tender offer, and not allow it to be subsequently made responsive by correction or withdrawal of the non-conforming deviation or reservation.

C.3.9 Arithmetical errors, omissions and discrepancies

C.3.9.1 Check responsive tenders for discrepancies between amounts in words and amounts in figures. Where there is a discrepancy between the amounts in figures and the amount in words, the amount in words shall govern.

C.3.9.2 Check the highest ranked tender or tenderer with the highest number of tender evaluation points after the evaluation of tender offers in accordance with C.3.11 for:

- a) the gross misplacement of the decimal point in any unit rate;
- b) omissions made in completing the pricing schedule or bills of quantities; or
- c) arithmetic errors in:
 - (i) line item totals resulting from the product of a unit rate and a quantity in bills of quantities or schedules of prices; or
 - (ii) the summation of the prices.

C.3.9.3 Notify the tenderer of all errors or omissions that are identified in the tender offer and either confirm the tender offer as tendered or accept the corrected total of prices.

C.3.9.4 Where the tenderer elects to confirm the tender offer as tendered, correct the errors as follows:

- a) If bills of quantities or pricing schedules apply and there is an error in the line item total resulting from the product of the unit rate and the quantity, the line item total shall govern and the rate shall be corrected. Where there is an obviously gross misplacement of the decimal point in the unit rate, the line item total as quoted shall govern, and the unit rate shall be corrected.
- b) Where there is an error in the total of the prices either as a result of other corrections Required by this checking process or in the tenderer's addition of prices, the total of the prices shall govern and the tenderer will be asked to revise selected item prices (and their rates if bills of quantities apply) to achieve the tendered total of the prices.

C.3.10 Clarification of a tender offer

Obtain clarification from a tenderer on any matter that could give rise to ambiguity in a contract arising from the tender offer.

C.3.11 Evaluation of tender offers

The Standard Conditions of Tender standardize the procurement processes, methods and procedures from the time that tenders are invited to the time that a contract is awarded. They are generic in nature and are made project specific through choices that are made in developing the Tender Data associated with a specific project. Conditions of tender are by definition the document that establishes a tenderer's obligations in submitting a tender and the employer's undertakings in soliciting and evaluating tender offers. Such conditions establish the rules from the time a tender is advertised to the time that a contract is awarded and require employers to conduct the process of offer and acceptance in terms of a set of standard procedures.

The CIDB Standard Conditions of Tender are based on a procurement system that satisfies the following system requirements:

Requirement Qualitative interpretation of goal

Fair The process of offer and acceptance is conducted impartially without bias, providing simultaneous and timely access to participating parties to the same information.

Equitable Terms and conditions for performing the work do not unfairly prejudice the interests of the parties.

Transparent The only grounds for not awarding a contract to a tenderer who satisfies all requirements are restrictions from doing business with the employer, lack of capability or capacity, legal impediments and conflicts of interest.

Competitive The system provides for appropriate levels of competition to ensure cost effective and best value outcomes.

Cost effective The processes, procedures and methods are standardized with sufficient flexibility to attain best value outcomes in respect of quality, timing and price, and least resources to effectively manage and control procurement processes.

The activities associated with evaluating tender offers are as follows:

- a) Open and record tender offers received
- b) Determine whether or not tender offers are complete
- c) Determine whether or not tender offers are responsive
- d) Evaluate tender offers

DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) DURBAN CONTAINER TERMINAL PIER 1 FOR THE DURATION OF 12 MONTHS

-
- e) Determine if there are any grounds for disqualification
 - f) Determine acceptability of preferred tenderer
 - g) Prepare a tender evaluation report
 - h) Confirm the recommendation contained in the tender evaluation report

C.3.11.1 General

The employer must appoint an evaluation panel of not less than three persons conversant with the proposed scope of works to evaluate each responsive tender offer using the tender evaluation methods and associated evaluation criteria and weightings that are specified in the tender data.

C.3.12 Insurance provided by the employer

If requested by the proposed successful tenderer, submit for the tenderer's information the policies and / or certificates of insurance which the conditions of contract identified in the contract data, require the employer to provide.

C.3.13 Acceptance of tender offer

Accept the tender offer; if in the opinion of the employer, it does not present any risk and only if the tenderer:

- a) is not under restrictions, or has principals who are under restrictions, preventing participating in the employer's procurement;
- b) can, as necessary and in relation to the proposed contract, demonstrate that he or she possesses the professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, expertise and the personnel, to perform the contract;
- c) has the legal capacity to enter into the contract;
- d) is not; insolvent, in receivership, under Business Rescue as provided for in chapter 6 of the Companies Act No. 2008, bankrupt or being wound up, has his/her affairs administered by a court or a judicial officer, has suspended his/her business activities or is subject to legal proceedings in respect of any of the foregoing;
- e) complies with the legal requirements, if any, stated in the tender data; and
- f) is able, in the opinion of the employer, to perform the contract free of conflicts of interest.

C.3.14 Prepare contract documents

C.3.14.1 If necessary, revise documents that shall form part of the contract and that were issued by

The employer as part of the tender documents to take account of:

- a) addenda issued during the tender period,
- b) inclusion of some of the returnable documents and
- c) other revisions agreed between the employer and the successful tenderer.

C.3.14.2 Complete the schedule of deviations attached to the form of offer and acceptance, if any.

C.3.15 Complete adjudicator's contract

Unless alternative arrangements have been agreed or otherwise provided for in the contract, arrange for both parties to complete formalities for appointing the selected adjudicator at the same time as the main contract is signed.

C.3.16 Registration of the award

An employer must, within twenty-one (21) working days from the date on which a contractor's offer to perform a construction works contract is accepted in writing by the employer, register and publish the award on the cidb Register of Projects.

C.3.17 Provide copies of the contracts

Provide to the successful tenderer the number of copies stated in the Tender Data of the signed copy of the contract as soon as possible after completion and signing of the form of offer and acceptance.

C.3.18 Provide written reasons for actions taken

Provide upon request written reasons to tenderers for any action that is taken in applying these conditions of tender but withhold information which is not in the public interest to be divulged, which is considered to prejudice the legitimate commercial interests of tenderers or might prejudice fair competition between tenderers.

T2.2-01: Eligibility Criteria Schedule:

Certificate of Attendance at Tender Clarification Meeting

This is to certify that

(Company
Name/Member of
Joint Venture)

Represented
by:

(Name and
Surname)

Was represented at the compulsory tender clarification meeting

Held at:		
On (date)		Starting time:

Particulars of person(s) attending the meeting:

Name

Signature

Capacity

Attendance of the above company at the meeting was confirmed:

Name

Signature

**For and on Behalf of the
Employers Agent.**

Date

T2.2-02: Eligibility Criteria Schedule - CIDB Grading Designation

Note to tenderers:

Tenderers are to indicate their CIDB Grading by filling in the table below. **Attach a copy of the CIDB Grading Designation or evidence of being capable of being so registered.**

CRS Number	Status	Grading	Expiry Date

1. Only those tenderers who are registered with the CIDB or are capable of being so prior to the evaluation of submissions, in a contractor grading designation equal to or higher than a contractor grading designation determined in accordance with the sum tendered or a value determined in accordance with Regulation 25 (1B) or 25(7A) of the Construction Industry Development Regulations, for a **4EP or higher** class of construction work, are eligible to have their tenders evaluated.

2. Joint Venture (JV)

Joint ventures are eligible to submit tenders subject to the following:

1. every member of the joint venture is registered with the CIDB;
2. the lead partner has a contractor grading designation of not lower than one level one level below the required grading designation in the class of construction works under consideration and possesses the required recognition status; and
3. the combined Contractor grading designation calculated in accordance with the Construction Industry Development Regulations is equal to or higher than a Contractor grading designation determined in accordance with the sum tendered for a **4EP or higher** class of construction work or a value determined in accordance with Regulation 25(1B) or 25(7A) of the Construction Industry Development Regulations
4. the Contractor shall provide the employer with a certified copy of its signed joint venture agreement;
5. and in the event that the joint venture is an 'Incorporated Joint Venture' the Memorandum of Incorporation to be provided within 4 (four) weeks of the Contract Date.

TRANSNET PORT TERMINALS

TENDER NUMBER: iCLM DB 1007/TPT

DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) DURBAN CONTAINER TERMINAL PIER 1 AS FOR THE DURATION OF 12 MONTHS

iCLM DB 1007/TPT	Compliance to Eligibility Criteria	Tender Returnable Schedule: T2.2-03
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Tenderers are to list evidence in this schedule of compliance to the Eligibility Criteria for the design, manufacture, off site testing, supply, delivery, installation, testing and commissioning of one (1) new 1000kva mini substation and one (1) 1000kva mobile generator. For Evidence tenderers are to submit proof of registration with ECSA as a Professional Engineer for the design and sign off of the installation. Failure to comply with eligibility criteria i.e., a **"No" answer** or **"No" response** will lead to disqualification.

Eligibility Criteria	Comply (Yes/No)	Evidence Provided (Yes/No)
1. Proof of registration for Bidder or their sub-contractor with ECSA as a Professional Engineer for the design and sign off of the installation.		

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

TRANSNET PORT TERMINALS

TENDER NUMBER: iCLM DB 1007/TPT

DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) DURBAN CONTAINER TERMINAL PIER 1 FOR THE DURATION OF 12 MONTHS

iCLM DB 1007/TPT	Compliance to Eligibility Criteria	Tender Returnable Schedule: T2.2-04
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Tenderers are to list evidence in this schedule of compliance to the Eligibility Criteria for the design, manufacture, off site testing, supply, delivery, installation, testing and commissioning of one (1) new 1000kva mini substation and one (1) 1000kva mobile generator. For Evidence tenderers are to submit proof of registration with the Department of Labor. Failure to comply with eligibility criteria i.e., a **"No" answer** or **"No" response** will lead to disqualification.

Eligibility Criteria	Comply (Yes/No)	Evidence Provided (Yes/No)
1. Proof of registration with the Department of Labour as an Electrical Contractor for the bidder or their subcontractor submitted.		

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

Technical Evaluation Scorecard				
DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) PIER 1 CONTAINER TERMINAL				
Tender number:				
Eligibility Criteria	Description		Returnable Schedule	Compliance
	Proof of registration for Bidder or their sub-contractor with ECSA as a Professional Engineer for the design and sign off of the installation.		See returnable T2.2-01	Yes / No
	Proof of registration with the Department of Labour as an Electrical Contractor for the bidder submitted.		See returnable T2.2-01	Yes / No
Evaluation Criteria	Criteria	Scoring principal	Scoring Matrix	Weighting
Quality Management	Project Specific Quality Plan	Documented Quality Plan in accordance with Transnet Quality Management Specifications	See returnable T2.2-06	5
	Project specific Quality Control Plan	Project specific QCP relevant to the works information must be submitted	See returnable T2.2-06	5
	Total			10
Management & CV's of Key Personnel	Relevant experience as detailed in T2.2.02 returnable for the following	Site Management ≥ 10 years experience = 40% -Contracts Manager = 55% -Electrical (MV/LV) Site Agent = 45% Foremen = 40% -Electrical MV/LV = 100% Site Officer ≥5 years' experience = 20% -SHE Officer= 100%	See returnable T2.2-02	5
	Education, training and skills Adequacy as detailed in T2.2.02 returnable for the following	Site Management = 40% -Contracts Manager = 55% -Electrical (MV/LV) Site Agent = 45% Foremen = 40% -Electrical MV/LV = 100% Site Officer = 20% -SHE Officer= 100%	See returnable T2.2-02	5
	Knowledge of issues pertinent to the project as detailed in T2.2.02 returnable for the following:	Site Management ≥ 10 years experience = 40% -Contracts Manager = 55% -Electrical (MV/LV) Site Agent = 45% Foremen = 40% -Electrical MV/LV = 100% Site Officer ≥5 years' experience= 20% -SHE Officer= 100%	See returnable T2.2-02	15
	Total			25
Approach Paper/ Method statement	The method statement must respond to the scope of work (the Works Information) and outline the proposed methodology including that relating to the Health and Safety also including Environmental considerations. The method statement needs to be project specific. Uninstall and removal and refurbishing of 630kVA mini substation - 30% Supply, install of 1000kVA mini substation and 1000kVA generator -30% Test and commissioning of 1000kVA mini substation and 1000kVA generator -30% Health and Safety and Environmental consideration during execution = 10 %		See returnable T2.2-03	5
	The method statement should articulate the sequence the Tenderer shall use to achieve the project objectives. Tenderers to submit the schedule as an attachment to the method statement for evaluation of the sequencing, critical paths, allocation of resources, and bases for measuring progress. The alignment with the schedule needs to be clearly articulated. Construction sequence as per program		See returnable T2.2-03	10
	The tenderer must as such explain his / her understanding of the objectives of the assignment and the Employer's stated and implied requirements, highlight the issues of importance, and explain the technical approach they would adopt to address them. The method statement should also correlate with the tenderer's quality plan outlining the processes, procedures, and associated resources, applied by whom and when, to meet the requirements and indicate how risks will be managed and what contribution can be made regarding value management. A clear articulation of how the tenderer will meet performance specification requirements, FATS and SATS requirements, commissioning requirements, adherence to regulatory requirement is expected. Points will be allocated for the demonstration of the form of offer. High level arrangement, datasheets, and specifications shall be provided for evaluation. A clear link with the QCP is expected. Uninstall and removal and refurbishing of 630kVA mini substation - 30% Supply, install of 1000kVA mini substation and 1000kVA generator -30% Test and commissioning of 1000kVA mini substation and 1000kVA generator -30% Health and Safety and Environmental consideration during execution = 10 %		See returnable T2.2-03	10
Health and Safety	Total			25
	Safety, Health & Environmental Policy Roles & Responsibilities, as per the Occupational health and safety Act 85 of 1993 Safety cost breakdown Overview of the project specific Baseline Risk Assessment (RA), indicating major activities of the project. One year synopsis of SHE incidents, description, type and action taken to prevent re-occurrence. Contractor site specific Health and Safety plan.	Policy 1. Commitment to Safety, prevention of pollution, 2. Continual improvement, 3. Compliance to legal requirements, appropriate to the nature of contractor's activities, 4. Hold management accountable for development of the safety systems, 5. Include objectives and targets.	See returnable T2.2-04	1
		Roles &Responsibilities, such as S16.1 Chief Executive Officer, S16 2 Assistant to Chief Executive Officer, 8.1 Construction manager/Foreman, 8.2 Assistant Construction manager/ Installation Electrician 8.5 Safety officer, 8.7 Risk Assessor, 17.1 SHE Reps, etc. as per the Occupational health and safety Act 85 of 1993	See returnable T2.2-04	2
		Safety cost breakdown.	See returnable T2.2-04	2
		Overview of the Baseline Risk Assessment indicating major activities of the project namely: Electrical MV and LV Installation Works, Earthing and lightning protection, Supply, and installation of gensets.	See returnable T2.2-04	4
		One year synopsis of SHE incidents, description, type and action taken to prevent reoccurrence.	See returnable T2.2-04	2
		Contractor site specific Health and Safety plan.	See returnable T2.2-04	4
	Total			15
Previous Experience	Tenderers are required to demonstrate performance in comparable projects of similar size and nature over the last 5 years by supplying the following: • A list of past / current comparable projects. • Construction of similar works as detailed in the Works Information with reference to: Supply, install and commissioning of mini substation and generators including refurbishment works related to the works information. • Sufficient references to substantiate experience indicated (Client name and contact details, project description, duration and contract value).	Proof of previous work involving supply, installation, refurbishment, and commissioning of a 1000 kVA or larger mini substation.	See returnable T2.2.05	5
		Proof of previous work involving supply, installation, and commissioning of a 500 kVA or larger standby generator.	See returnable T2.2.05	5
		Proof of previous work of the supply, installation, and commissioning of a 500 kVA or larger standby generator that is connected to a new MV/LV switchgear installation.	See returnable T2.2.05	15
	Total			25
Technical Qualification Threshold = 70%.	(Total Weighting x 100 / 100)			100

T2.2-05: Evaluation Schedule - Management & CV's of Key Persons

Please describe the management arrangements for the *works*.

1. The experience of assigned *key persons* in relation to the scope of work will be evaluated from three different points of view below:
 - i. General/ Relevant experience (total duration of construction activity) and positions held of each discipline specific team member.
 - ii. The education, training and skills of the assigned staff in the specific sector, field, subject, etc. which is directly linked to the scope of work. Proof of education and training must be attached to the C.V.
 - iii. The key staff members' / experts' knowledge of issues which the tenderer considers pertinent to the project e.g., local conditions, affected communities, legislation, techniques etc.
 - iv. An organogram shall be submitted showing the key personnel and other project personnel to be used by the contractor. CVs of only key personnel shall be submitted for evaluation.
 - v. Tenderers to note that the key personnel requirements as per this criterion shall be a consistent requirement throughout the contract. This shall mean that these requirements shall be deemed as compliance with the WI. Shall less requirements be submitted for evaluation; the bidder's will be scored accordingly but the submission for the execution of the works shall be for the acceptance by the employer.
2. Comprehensive CV's should be attached to this schedule:
As a minimum each CV should address the following, but not limited to;
 - i. Personal particulars
 - Name
 - Date and place of birth
 - Place (s) of tertiary education and dates associated therewith
 - Professional awards
 - ii. Qualifications (degrees, diplomas, grades of membership of professional societies and professional registrations)
 - iii. Skills
 - iv. Name of current employer and position in enterprise
 - v. Overview of postgraduate / diploma experience (year, organization and position)
 - vi. Outline of recent assignments / experience that has a bearing on the scope of work
3. CV's for people proposed for all identified posts including:

Site Management:

- Contracts Manager X 1
The Contracts Manager should at least have a minimum qualification of a BSc. Eng./B-Tech./National Diploma in Electrical Engineering and an ECSA registration as Pr. Eng./Pr.Tech.Eng with at least 5-year post registrations of experience in Electrical MV/LV must have experience working in at least 3 separate projects, with at least 1 project in excess of R5m in electrical works (MV/LV switchgear, Gensets, reticulation systems, and SCADA) component value. The contracts manager shall have and demonstrate project management experience and education.

- **Electrical (MV/LV) Site Agent X 1**
The Installation Electrician must have at least 10 years of experience in MV and LV installations and be registered with Department of Labour as an installation electrician. The installation electrician shall demonstrate experience of MV/LV cable terminations.

Foreman:

- **Foreman (Electrical MV/LV) x 1**
The Electrical Foreman must have a minimum of NTC 4 Trade Certificate in Electrical Engineering with at least 10 years of experience in Electrical MV and LV Projects and registered with the Department of Labour as an installation electrician. The foreman must have and demonstrate experience supervising installations that involves MV/LV cable joints, terminations, generator sets, and switchgear. The electrical foreman shall be expected to the main contractor's personnel onsite and liaise with the employer for inspections, instructions, and construction progress review.

Site Officers

- **SHE Officer X 1,**
SHE Officer: Registered as Health and Safety Officer with SACPCMP with at least 5 years of experience on MV/LV electrical construction projects and have a SAMTRAC or NEBOSH or modern SHEQ risk management training course as a minimum qualification. The SHE officer must also have experience in environmental requirements in line with the SoW.
4. Details of experience for proposed staff working in similar projects in terms of nature, complexity and value.
 5. An explanation of how you propose to allocate adequate resources to enable you to comply with the requirements and prohibitions imposed on you by or under the statutory provisions relating to health and safety.
 6. Details of experience for proposed staff in respect to NEC3 Engineering and Construction Contract Option chosen for this contract. If staff experience is limited, an indication of relevant training that they have attended would be helpful.

The following table is to be populated by the tenderer identifying the resources for the key roles on the project.

Key Person Role	Name of Resource
Contracts Manager	
Electrical (MV/LV) Site Agent	
Foremen – Electrical MV/LV	
SHE Officer	

Attached submissions to this schedule:

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The scoring of the Management & CV's of Key Persons will be as follows:

General experience for the following:		Education, training and skills Adequacy for the following:		Knowledge of issues pertinent to the project for the following:	
	Weight		Weight		Weight
Site Management	40%	Site Management	40%	Site Management	40%
Contracts Manager	55%	Contracts Manager	55%	Contracts Manager	55%
Electrical (MV/LV) Site Agent	45%	Electrical (MV/LV) Site Agent	45%	Electrical (MV/LV) Site Agent	45%
Foremen	40%	Foremen	40%	Foremen	40%
Electrical MV/LV	100%	Electrical MV/LV	100%	Electrical MV/LV	100%
Site Officers	20%	Site Officers	20%	Site Officers	20%
SHE officer	100%	SHE officer	100%	SHE officer	100%
Points	5	5		15	
Score 0	The Tenderer has submitted no information to determine a score.				
Score 20	Key staff does not have relevant levels of experience. - Site Management: ≤ 2 years - Foremen: ≤ 2 years - Site officers: ≤ 1 year	Key staff does not have project specific education, skills and training. Very poor response – Education, training and skills are totally insignificant to satisfy the minimum requirements.	Key staff has no experience of issues pertinent to the project. - Site Management: ≤ 2 years - Foremen: ≤ 2 years - Site officers: ≤ 1 year		
Score 40	Key staff has limited levels of relevant experience. Site Management:	Key staff has limited levels of project specific education, skills and training. Below minimum response –	Key staff has limited knowledge of issues pertinent to the project. Site Management: (> 2 < 10 years)		

	($> 2 < 10$ years) - Foremen: ($> 2 < 10$ years) - Site officers: ($> 1 < 5$ years)	Education, Training and skills lacks convincing evidence to satisfy the minimum requirements.	- Foremen: ($> 2 < 10$ years) - Site officers: ($> 1 < 5$ years)
Score 60	Key staff has the required minimum levels of experience. - Site Management: ($\geq 10 \leq 12$ years) - Foremen: ($\geq 10 \leq 12$ years) - Site officers: ($\geq 5 \leq 7$ years)	Key staff has the required minimum levels of project specific education, skills and training. Satisfactory response – Education, training and skills meet certain aspects of the minimum requirements.	Key staff has the required minimum level of knowledge of issues pertinent to the project. - Site Management: ($\geq 10 \leq 12$ years) - Foremen: ($\geq 10 \leq 12$ years) - Site officers: ($\geq 5 \leq 7$ years)
Score 80	Key staff has extensive levels of relevant experience. Site Management: ($> 12 \leq 15$ years) - Foremen: ($> 12 \leq 15$ years) - Site officers: ($> 7 \leq 10$ years)	Key staff has extensive levels of project specific education, skills and training. Good response – Education, training and skills meet the minimum requirements	Key staff has extensive knowledge of issues pertinent to the project. - Site Management: ($> 12 \leq 15$ years) - Foremen: ($> 12 \leq 15$ years) - Site officers: ($> 7 \leq 10$ years)
Score 100	Key staff has outstanding levels of relevant experience. - Site Management: >15 years - Foremen: >15 years - Site officers: >10 years	Key staff has outstanding levels of project specific education, skills and training. Excellent response – All specified education, training and skills minimum requirements are met and exceeded	Key staff has outstanding knowledge of issues pertinent to the project. - Site Management: >15 years - Foremen: >15 years - Site officers: >10 years

The undersigned, who warrants that he / she is duly authorised to do so on behalf of the enterprise, confirms that the contents of this schedule are within my personal knowledge and are to the best of my belief both true and correct.

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

T2.2-06: Evaluation Schedule: Method Statement: Functionality Criteria

Note to tenderers:

Method Statement

1. The method statement must respond to the scope of work (the Works Information) and outline the proposed methodology including that relating to the Health and Safety and Environmental considerations.
2. The method statement should articulate the sequence the Tenderer shall use to achieve the project objectives.
3. The tenderer must as such explain his / her understanding of the objectives of the assignment and the Employer's stated and implied requirements, highlight the issues of importance, and explain the technical approach they would adopt to address them. The method statement should also correlate with the tenderer's quality plan outlining the processes, procedures and associated resources, applied by whom and when, to meet the requirements and indicate how risks will be managed and what contribution can be made regarding value management.

The tenderer must attach his / her method statement to this page. The method statement should be about 3 pages.

TRANSNET PORT TERMINALS

TENDER NUMBER: iCLM DB 1007/TPT

DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) DURBAN CONTAINER TERMINAL PIER 1 FOR THE DURATION OF 12 MONTHS

The scoring of the method statement will be as follows:

CORE			
	The method statement must respond to the scope of work (the Works Information) and outline the proposed methodology including that relating to the Health and Safety also including Environmental considerations. The method statement needs to be project specific.	The method statement should articulate the sequence the Tenderer shall use to achieve the project objectives. Tenderers to submit the schedule as an attachment to the method statement for evaluation of the sequencing, critical paths, allocation of resources, and bases for measuring progress. The alignment with the schedule needs to be clearly articulated.	The tenderer must as such explain his / her understanding of the objectives of the assignment and the Employer's stated and implied requirements, highlight the issues of importance, and explain the technical approach they would adopt to address them. The method statement should also correlate with the tenderer's quality plan outlining the processes, procedures, and associated resources, applied by whom and when, to meet the requirements and indicate how risks will be managed and what contribution can be made regarding value management. A clear articulation of how the tenderer will meet performance specification requirements, FATS and SATS requirements, commissioning requirements, adherence to regulatory requirement is expected. Points will be allocated for the demonstration of the form of offer. High level arrangement, datasheets, and specifications shall be provided for evaluation. A clear link with the QCP is expected.
Weight	5	10	10

TRANSNET PORT TERMINALS

TENDER NUMBER: ICLM DB 1007/TPT

DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) DURBAN CONTAINER TERMINAL PIER 1 FOR THE DURATION OF 12 MONTHS

	Method Statement
(score 0)	The tenderer has no information or inadequate information to determine a score.
(score 20)	The methodology/approach and work alignment is poor, the Tenderer has misunderstood the scope.
(score 40)	The tenderer has submitted a method statement with major omissions and/or irregularities.
(score 60)	The tenderer has submitted a method statement with minor omissions and/or irregularities.
(score 80)	The tenderer has submitted an extensive method statement: 1. Approach clearly articulated and based on the works to be performed; 2. The proposed methodology will ensure that operations will not be disrupted; and 3. The method Statement covers all the aspects of the project.
(score 100)	The tenderer has submitted an outstanding method statement: 1. Approach clearly articulated and based on this project; 2. The <i>works</i> are aligned to working hours; 3. The proposed methodology will ensure that operations will not be disrupted; and 4. Besides meeting the "good" rating, the important issues are approached in an innovative and efficient way.

TRANSNET PORT TERMINALS

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The undersigned, who warrants that he / she is duly authorised to do so on behalf of the enterprise, confirms that the contents of this schedule are within my personal knowledge and are to the best of my belief both true and correct.

Signed

Date

Name

Position

Tenderer

T2.2-07: Evaluation Schedule - Health and Safety Requirements

Submit the following documents as a minimum with your tender:

1. Safety, Health & Environmental Policy signed by the CEO. List the five elements -
 - Commitment to Safety, prevention of pollution,
 - Continual improvement,
 - Compliance to legal requirements, appropriate to the nature of contractor's activities,
 - Hold management accountable for development of the safety systems,
 - Include objectives and targets.
2. Roles & Responsibilities, as per the Occupational health and safety Act 85 of 1993
3. Safety cost breakdown
4. Overview of the project specific Baseline Risk Assessment (RA), indicating major activities of the project.
5. One year synopsis of SHE incidents, description, type and action taken to prevent re-occurrence.
6. Contractor site specific Health and Safety plan.

Attached submissions to this schedule:

The scoring of the Tenderer's Health and safety requirements will be as follows:

	Policy 1. Commitment to Safety, prevention of pollution, 2. Continual improvement, 3. Compliance to legal requirements, appropriate to the nature of contractor's activities, 4. Hold management accountable for development of the safety systems, 5. Include objectives and targets.	Roles &Responsibilities , such as S16.1 Chief Executive Officer, S16 2 Assistant to Chief Executive Officer, 8.1 Construction manager/Foreman, 8.2 Assistant Construction manager/ Installation Electrician 8.5 Safety officer, 8.7 Risk Assessor, 17.1 SHE Reps, etc. as per the Occupational health and safety Act 85 of 1993	Safety cost breakdown.	Overview of the Baseline Risk Assessment indicating major activities of the project namely: Electrical MV and LV Installation Works, Earthing and lightning protection, Supply, and installation of gensets.	One year synopsis of SHE incidents, description, type and action taken to prevent re-occurrence.	Contractor site specific Health and Safety plan.
Points	1	2	2	4	2	4

(score 0)	The Tenderer has submitted no information or inadequate information to determine a score.					
(score 20)	1 of the 5 key policy components are recognized and meet the <i>Employer's</i> requirement.	Roles and responsibilities do not meet the Occupational health and safety Act as per construction regulations and Project health and safety specification.	Key responsible persons are not included on training matrix as per proposed organogram structure.	Information supplied is totally insignificant/inadequate to achieve the required standard of service.	Information supplied is totally insignificant/inadequate to achieve the Employers Works information.	Information supplied is totally insignificant/inadequate to achieve the Employers Works information.
(score 40)	2 of the 5 key policy components are recognized and meet the <i>Employer's</i> requirement.	Roles and responsibilities are unlikely to ensure compliance as per the Works information and not in line with OHS Act and Project health and safety specification.	Not all key responsible persons are included in the training matrix. Trainings matrix submitted does not cover all SHE training listed on Health and Safety specification. Training matrix not signed by responsible personnel.	Poor response/answer/solution lacks convincing evidence, medium risk that stated <i>employer's</i> requirements will not be met.	Poor response/answer/solution lacks convincing evidence, medium risk that stated <i>Employer's</i> requirements will not be met.	Poor response/answer/solution lacks convincing evidence, medium risk that stated <i>Employer's</i> requirements will not be met.
(score 60)	3 of the 5 key policy components are recognized and meet the <i>Employer's</i>	Satisfactory response on roles and responsibilities as per Employer's requirements.	Satisfactory response on the list of job categories and trainings as per proposed project organogram structure. Training matrix covers	Satisfactory response/answer/solution to the particular aspect of the requirement, evidence given that the stated <i>Employer's</i> requirements will be	Satisfactory response/answer/solution to the particular aspect of the requirement,	Satisfactory response/answer/solution to the particular aspect of the requirement,

	requirements.		most of the trainings listed on TCP Health and safety specification.	met.	evidence given that the stated <i>Employer's</i> requirements will be met.	evidence given that the stated <i>Employer's</i> requirements will be met.
(score 80)	4 of the five key policy components are recognized and meets the <i>Employer's</i> requirements.	Roles and responsibilities are likely to ensure compliance as per Works Information, OHS Act and Project health and safety specification.	Most of key persons listed on the training matrix as per proposed project organogram structure. Trainings specified on the matrix are in line with TCP health and safety specification.	Good response/answer/solution which demonstrates real understanding and evidence of ability to meet stated <i>Employer's</i> requirements.	Good response/answer/solution which demonstrates real understanding and evidence of ability to meet stated <i>Employer's</i> requirements.	Good response/answer/solution which demonstrates real understanding and evidence of ability to meet stated <i>Employer's</i> requirements.
(score 100)	All 5 key policy components are recognized and meets the <i>Employer's</i> requirements	Roles and Responsibilities most likely to ensure compliance as per requirements of OHS Act and Project health and safety specification.	Training matrix include Management and all employees /personnel in the project. Training matrix had been signed by responsible personnel.	Very good response/answer/solution gives real confidence that the tenderer is most likely to ensure compliance with stated <i>Employer's</i> requirements.	Very good response/answer/solution gives real confidence that the tenderer is most likely to ensure compliance with stated <i>Employer's</i> requirements.	Very good response/answer/solution gives real confidence that the tenderer is most likely to ensure compliance with stated <i>Employer's</i> requirements.

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The undersigned, who warrants that he / she is duly authorised to do so on behalf of the enterprise, confirms that the contents of this schedule are within my personal knowledge and are to the best of my belief both true and correct.

Signed

Date

Name

Position

Tenderer

T2.2-08: Evaluation Schedule: Previous Experience

Note to tenderers:

Tenderers are required to demonstrate performance in comparable projects of similar size and nature over the last 10 years by supplying the following:

- A list of past / current comparable projects.
- Construction of similar works as detailed in the Works Information with reference to: Supply, install and commissioning of mini substation and generators including refurbishment works related to the works information.
- Sufficient references to substantiate experience indicated (Client name and contact details, project description, duration and contract value).

Tenderers to submit sufficiently detailed reference list with contact details for tracing and verification of customers, indicate previous experience, and provide completion certificates. Tenderers are required to provide sufficient information about the reference work previously undertaken because only references that are similar to the scope of work of this contract will be considered for evaluation.

Index of documentation attached to this schedule.

	DOCUMENT NAME
1	
2	
3	
4	
5	
6	
7	

	Proof of previous work involving supply, installation, refurbishment, and commissioning of a 1000 kVA or larger mini substation.	Proof of previous work involving supply, installation, and commissioning of a 500 kVA or larger standby generator.	Proof of previous work of the supply, installation, and commissioning of a 500 kVA or larger standby generator that is connected to a new MV/LV switch gear installation.
Weight	5	5	15

	<u>Score</u> $Points = 100 \times \text{Weight}\%$
Score	Previous Experience
0	The Tenderer failed to address the question / issue. Has not submitted the required information.
20	The Tenderer's previous experience presented has no relevance to the scope of this project and did not address any of the required categories. Tenderers generally have experience in one (1) project relating to the scope of works. The tenderer has limited or poor evidence of previous experience.
40	The Tenderer's previous experience presented has some relevance to the project but lacks detail i.e. Description of previous projects, value and references. Tenderers generally have experience in three (2) projects relating to scope of <i>works</i> . The tenderer lacks convincing evidence of knowledge of previous experience, specific to the <i>works</i> .
60	The Tenderer's previous experience presented demonstrates sufficient knowledge and experience to successfully execute this project scope. Tenderers generally have experience in four (3) projects relating to the scope of works. The tenderer has reasonable and relevant previous experience to the particular requirements of the <i>works</i> .
80	The Tenderer's previous experience presented demonstrates a real understanding and substantial evidence of the ability meet the stated project requirements. Tenderers generally have experience in five (4) projects relating to the scope of works. The tenderer has extensive previous experience in relation to the <i>works</i> .
100	The Tenderer's previous experience presented demonstrates real confidence extensive understanding in all of the categories as required. Tenderers generally

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	have experience in more than five (5) projects relating to the scope of works. The tenderer has comprehensive previous experience in projects of a similar nature.
--	--

Signed _____ Date _____

Name _____ Position _____

Tenderer

T2.2-09: Evaluation Schedule – Quality Management

The tenderer is to note that if successful, and awarded the contract, shall execute and complete the contract as per the Quality Management Standard, EEAM-Q-009 Quality Management (as attached as Annexures A of this RFP).

The tenderer shall as a minimum submit the following:

- Project Quality Plan which satisfies the technical and quality requirements of the *works*, identifying all procedures, reviews, audits, controls and records used to control and verify compliance with the Works Information.
- Project specific Quality data book index.
- Valid ISO 9001 certification.
- Index/List of procedures and method statements to be used during the contract.
- Quality Control Plans Specific to the Works Information.

These Q.C.P's shall identify all inspections, tests and verification requirements to meet Contractual obligations, specifications, drawings and related details including witnessing and hold points.

- A signed Quality Policy based on International Organisation for Standardisation (ISO 9001:2008) that displays the five key policy requirements. These requirements include:
 1. Is appropriate to the purpose of the organisation,
 2. Includes a commitment to comply with requirements and continually improve the effectiveness of the quality management system,
 3. Provides a framework for establishing and reviewing quality objectives,
 4. Is communicated and understood within the organisation, and
 5. Is reviewed for continuing suitability.

Attached submissions to this schedule:

.....
.....
.....
.....
.....
.....
.....

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The scoring of the Quality Management will be as follows:

	Project Specific Quality Plan for the contract	Project specific Quality Control Plan
Weight	5	5

Score			
0	No PQP submitted.	No ISO 9001 certificate / certificate has expired	No QCPs submitted
20	PQP is too general with not project specifics	N/A	QCPs are not project specific
40	PQP is project specific but inadequate to cover project scope	N/A	QCPs are project specific but inadequate to cover project scope
60	PQP shows adequate understanding of project quality requirements	N/A	QCP's shows adequate understanding of project quality requirements

Score			
80	PQP shows above average understanding of the project quality requirements	N/A	QPC's shows above average understanding of the project quality requirements
100	PQP covers all and above the project quality requirements of the project scope	ISO 9001 certificate is valid.	QCP's covers all and above the project quality requirements of the project scope

Signed _____ Date _____

Name _____ Position _____

Tenderer

T2.2-10: Authority to submit a Tender

Indicate the status of the tenderer by ticking the appropriate box hereunder. The tenderer must complete the certificate set out below for his category of organisation or alternatively attach a certified copy of a company / organisation document which provides the same information for the relevant category as requested here.

A - COMPANY	B - PARTNERSHIP	C - JOINT VENTURE	D - SOLE PROPRIETOR

A. Certificate for Company

I, _____ chairperson of the board of directors _____
_____, hereby confirm that by resolution of the
board taken on _____ (date), Mr/Ms _____,
acting in the capacity of _____, was authorised to sign all
documents in connection with this tender offer and any contract resulting from it on behalf of
the company.

Signed

Date

Name

Position

Chairman of the Board of Directors

B. Certificate for Partnership

We, the undersigned, being the **key partners** in the business trading as _____

_____ hereby authorise Mr/Ms _____

acting in the capacity of _____, to sign all documents in connection with the tender offer for Contract _____ and any contract resulting from it on our behalf.

Name	Address	Signature	Date

NOTE: This certificate is to be completed and signed by the full number of Partners necessary to commit the Partnership. Attach additional pages if more space is required.

C. Certificate for Joint Venture

We, the undersigned, are submitting this tender offer in Joint Venture and hereby authorise

Mr/Ms _____, an authorised signatory of the company

_____, acting in the capacity of lead

partner, to sign all documents in connection with the tender offer for Contract _____

_____ and any contract resulting from it on our behalf.

This authorisation is evidenced by the attached power of attorney signed by legally authorised signatories of all the partners to the Joint Venture.

Furthermore we attach to this Schedule a copy of the joint venture agreement which incorporates a statement that all partners are liable jointly and severally for the execution of the contract and that the lead partner is authorised to incur liabilities, receive instructions and payments and be responsible for the entire execution of the contract for and on behalf of any and all the partners.

Name of firm	Address	Authorising signature, name (in caps) and capacity

D. Certificate for Sole Proprietor

I, _____, hereby confirm that I am the sole owner of the
business trading as _____.

Signed

Date

Name

Position

Sole Proprietor

T2.2-11: Record of Addenda to Tender Documents

This schedule as submitted confirms that the following communications received from the Purchaser before the submission of this tender offer, amending the tender documents, have been taken into account in this specific tender offer:

	Date	Title or Details
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

T2.2-12 Letter/s of Good Standing with the Workmen's Compensation Fund

Attached to this schedule is the Letter/s of Good Standing.

- 1.
- 2.
- 3.
- 4.

Name of Company/Members of Joint Venture:

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

T2.2-13: Risk Elements

Tenderers to identify and evaluate the potential risk elements associated with the Works and possible mitigation thereof. The risk elements and the mitigation as identified thereof by the Tenderer are to be submitted.

If No Risks are identified "No Risks" must be stated on this schedule.

Tenderers are also to evaluate any risk/s stated by the *Employer* in Contract Data Part C1, and provide possible mitigation thereof.

[illegible]

Tenders to note: Notwithstanding this information, all costs related to risk elements which are at the Contractor's risk are deemed to be included in the tenderer's offered total of the Prices.

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iCLM DB 1007/TPT	Details of Plant Offered	Tender Returnable Schedule: T2.2-14
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Note to Tenderer:

Tenderers are required to submit the form of offer for critical plant. This will be used to evaluate the compliance to the employers works information. Where there is/are material deviation/s from the employers WI requirements, the Bid will be considered unacceptable.

#	Description.	Compliance requirement.	Complies fully with the WI. Yes/No	Comments
1				
2				
3				

Signed

Date

Name

Position

Tenderer

T2.2-15: Schedule of Proposed Subcontractors

The tenderer is required to provide details of all the sub-contractors that will be utilised in the execution of the *works*.

Note to tenderers:

- In terms of PPPFA Regulation 6 (5), A tenderer may not be awarded points for B-BBEE status level of contributor if the tender documents indicate that the tenderer intends subcontracting more than 25% of the value of the contract to any other person not qualifying for at least the points that the tenderer qualifies for, unless the intended subcontractor is an EME that has the capability to execute the subcontract.
- In terms of PPPFA Regulation 12 (3), A person awarded a contract may not subcontract more than 25% of the value of the contract to any other enterprise that does not have an equal or higher B-BBEE status level of contributor that the person concerned, unless the contract is subcontracted to an EME that has the capability and ability to execute the contract.

Tenderer to note that after award, any deviations from this list of proposed sub-contractors will be subject to acceptance by the *Project Manager* in terms of the Conditions of Contract.

Provide information of the Sub-contractors below:

Name of Proposed Subcontractor			Address		Nature of work		Amount of Worked	Percentage of work	
% Black Owned	EME	QSE	Youth	Women	Disabilities		Rural/ Underdeveloped areas/ Townships		Military Veterans
	☐	☐	☐	☐	☐		☐		☐

Name of Proposed Subcontractor			Address		Nature of work		Amount of Worked	Percentage of work
% Black Owned	EME	QSE	Youth	Women	Disabilities	Rural/ Underdeveloped areas/ Townships	Military Veterans	
	☐	☐	☐	☐	☐	☐	☐	

DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) DURBAN CONTAINER TERMINAL PIER 1 FOR THE DURATION OF 12 MONTHS

Name of Proposed Subcontractor			Address		Nature of work		Amount of Worked	Percentage of work
% Black Owned	EME	QSE	Youth	Women	Disabilities	Rural/ Underdeveloped areas/ Townships		Military Veterans
	☐	☐	☐	☐	☐	☐		☐

Name of Proposed Subcontractor			Address		Nature of work		Amount of Worked	Percentage of work
% Black Owned	EME	QSE	Youth	Women	Disabilities	Rural/ Underdeveloped areas/ Townships		Military Veterans
	☐	☐	☐	☐	☐	☐		☐

T2.2-16: Site Establishment Requirements

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There is a solid black vertical line along the left edge, creating a margin. The paper appears to be from a notebook or a standard ruled document.

T2.2-17 : Compulsory Enterprise Questionnaire

The following particulars hereunder must be furnished.

In the case of a Joint Venture, separate enterprise questionnaires in respect of each partner/member must be completed and submitted.

Section 1: Name of enterprise: _____

Section 2: VAT registration number, if any: _____

Section 3: CIDB registration number, if any: _____

Section 4: CSD number: _____

Section 5: Particulars of sole proprietors and partners in partnerships

Name	Identity number	Personal income tax number

* Complete only if sole proprietor or partnership and attach separate page if more than 3 partners

Section 6: Particulars of companies and close corporations

Company registration number _____

Close corporation number _____

Tax reference number: _____

Section 7: The attached SBD4 must be completed for each tender and be attached as a tender requirement.

Section 8: The attached SBD 6 must be completed for each tender and be attached as a requirement.

The undersigned, who warrants that he / she is duly authorised to do so on behalf of the enterprise:

- i) authorizes the Employer to obtain a tax clearance certificate from the South African Revenue Services that my / our tax matters are in order;
- ii) confirms that the neither the name of the enterprise or the name of any partner, manager, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears on the Register of Tender Defaulters established in terms of the Prevention and Combating of Corrupt Activities Act of 2004;
- iii) confirms that no partner, member, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears, has within the last five years been convicted of fraud or corruption;
- iv) confirms that I / we are not associated, linked or involved with any other tendering entities submitting tender offers and have no other relationship with any of the tenderers or those responsible for compiling the scope of work that could cause or be interpreted as a conflict of interest; and
- v) confirms that the contents of this questionnaire are within my personal knowledge and are to the best of my belief both true and correct.

Signed _____	Date _____
Name _____	Position _____
Enterprise name _____	_____

SBD 6.1**PREFERENCE POINTS CLAIM FORM**

This preference form must form part of all bids invited. It contains general information and serves as a claim for preference points for Specific Goals contribution. Transnet will award preference points to companies who provide valid proof of evidence as per the table of evidence in paragraph 4.1 below.

1. GENERAL CONDITIONS

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

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

1.2 The value of this bid is estimated to not exceed R50 000 000 (all applicable taxes included) and therefore the 80/20 preference point system shall be applicable. Despite the stipulated preference point system, Transnet shall use the lowest acceptable bid to determine the applicable preference point system in a situation where all received acceptable bids are received outside the stated preference point system.

1.3 Preference points for this bid shall be awarded for:

- (a) Price;
- (b) B-BBEE Status Level of Contribution; and
- (c) Any other specific goal determined in the Transnet preferential procurement policy

1.4 The maximum points for this bid are allocated as follows:

	POINTS
PRICE	80
SPECIFIC GOALS	
B-BBEE STATUS LEVEL OF CONTRIBUTION Level 1 or 2	10
30% BLACK WOMEN OWNED ENTITIES	10
Total points for Price and B-BBEE must not exceed	100

1.5 Failure on the part of a bidder to submit proof of evidence required for any of the specific

goals together with the bid will be interpreted to mean that preference points for that specific goal are not claimed.

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

2. DEFINITIONS

- (a) **"all applicable taxes"** includes value-added tax, pay as you earn, income tax, unemployment insurance fund contributions and skills development levies;
- (b) **"B-BBEE"** means broad-based black economic empowerment as defined in section 1 of the Broad-Based Black Economic Empowerment Act;
- (c) **"B-BBEE status level of contributor"** means the B-BBEE status received by a measured entity based on its overall performance using the relevant scorecard contained in the Codes of Good Practice on Black Economic Empowerment, issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act;
- (d) **"bid"** means a written offer in a prescribed or stipulated form in response to an invitation by an organ of state for the supply/provision of services, works or goods, through price quotations, advertised competitive bidding processes or proposals;
- (e) **"Broad-Based Black Economic Empowerment Act"** means the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);
- (f) **"EME"** means an Exempted Micro Enterprise as defines by Codes of Good Practice under section 9 (1) of the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);
- (g) **"functionality"** means the ability of a bidder to provide goods or services in accordance with specification as set out in the bid documents
- (h) **"Price"** includes all applicable taxes less all unconditional discounts.
- (i) **"Proof of B-BBEE Status Level of Contributor"**
 - i) the B-BBBEE status level certificate issued by an authorised body or person;
 - ii) a sworn affidavit as prescribed by the B-BBEE Codes of Good Practice; or
 - iii) any other requirement prescribed in terms of the B-BBEE Act.
- (j) **"QSE"** means a Qualifying Small Enterprise as defines by Codes of Good Practice under section 9 (1) of the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);
- (k) **"rand value"** means the total estimated value of a contract in South African currency, calculated at the time of bid invitations, and includes all applicable taxes and excise duties.
- (l) **"Specific goals"** means targeted advancement areas or categories of persons or groups either previously disadvantaged or falling within the scope of the Reconstruction and Development Programme identified by Transnet to be given

preference in allocation of procurement contracts in line with section 2(1) of the PPPFA.

3. POINTS AWARDED FOR PRICE

3.1 THE 80/20 PREFERENCE POINT SYSTEMS

A maximum of 80 points is allocated for price on the following basis:
80/20

$$P_s = 80 \left(1 - \frac{P_t - P_{\min}}{P_{\min}} \right)$$

Where

P_s = Points scored for comparative price of bid under consideration

P_t = Comparative price of bid under consideration

$P_{\min}$ = Comparative price of lowest acceptable bid

4. EVIDENCE REQUIRED FOR CLAIMING SPECIFIC GOALS

4.1 In terms of Transnet Preferential Procurement Policy (TPPP) and Procurement Manuals, preference points must be awarded to a bidder for providing evidence in accordance with the table below:

Specific Goals	Acceptable Evidence
B-BBEE Status contributor	B-BBEE Certificate / Sworn- Affidavit / B-BBEE CIPC Certificate (in case of JV, a consolidated scorecard will be accepted) as per DTIC guideline
EME or QSE 51% Black Owned	B-BBEE Certificate / Sworn-Affidavit / CIPC Certificate

4.2 The table below indicates the required proof of B-BBEE status depending on the category of enterprises:

Enterprise	B-BBEE Certificate & Sworn Affidavit
Large	Certificate issued by SANAS accredited verification agency
QSE	Certificate issued by SANAS accredited verification agency Sworn Affidavit signed by the authorised QSE representative and attested by a Commissioner of Oaths confirming annual turnover and black ownership (only black-owned QSEs - 51% to 100% Black owned) [Sworn affidavits must substantially comply with the format that can be obtained on the DTI's website at www.dti.gov.za/economic_empowerment/bee_codes.jsp .]

EME¹	Sworn Affidavit signed by the authorised EME representative and attested by a Commissioner of Oaths confirming annual turnover and black ownership Certificate issued by CIPC (formerly CIPRO) confirming annual turnover and black ownership Certificate issued by SANAS accredited verification agency only if the EME is being measured on the QSE scorecard
------------------------	--

- 4.3 A trust, consortium or joint venture (including unincorporated consortia and joint ventures) must submit a consolidated B-BBEE Status Level verification certificate for every separate bid.
- 4.4 Tertiary Institutions and Public Entities will be required to submit their B-BBEE status level certificates in terms of the specialized scorecard contained in the B-BBEE Codes of Good Practice.
- 4.5 A person will not be awarded points for B-BBEE status level if it is indicated in the bid documents that such a bidder intends sub-contracting more than 25% of the value of the contract to any other enterprise that does not qualify for at least the points that such a bidder qualifies for, unless the intended sub-contractor is an EME that has the capability and ability to execute the sub-contract.
- 4.6 A person awarded a contract may not sub-contract more than 25% of the value of the contract to any other enterprise that does not have an equal or higher B-BBEE status level than the person concerned, unless the contract is sub-contracted to an EME that has the capability and ability to execute the sub-contract.
- 4.7 Bidders are to note that the rules pertaining to B-BBEE verification and other B-BBEE requirements may be changed from time to time by regulatory bodies such as National Treasury or the DTI. It is the Bidder's responsibility to ensure that his/her bid complies fully with all B-BBEE requirements at the time of the submission of the bid.

5. BID DECLARATION

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

6. B-BBEE STATUS LEVEL OF CONTRIBUTION CLAIMED IN TERMS OF PARAGRAPHS 1.4 AND 6.1

- 6.1 B-BBEE Status Level of Contribution: . =(maximum of 10 points)
- (Points claimed in respect of paragraph 6.1 must be in accordance with the table reflected in paragraph 4.1 and must be substantiated by relevant proof of B-BBEE status level of contributor.

¹ In terms of Transnet Preferential Procurement Policy (TPPP) and Procurement Manuals, preference points must be awarded to a bidder for providing evidence in accordance with clause 4.1

7. SUB-CONTRACTING

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

(**Tick applicable box**)

YES		NO	
-----	--	----	--

7.1.1 If yes, indicate:

- i) What percentage of the contract will be subcontracted.....%
- ii) The name of the sub-contractor.....
- iii) The B-BBEE status level of the sub-contractor.....
- iv) Whether the sub-contractor is an EME or QSE.

(**Tick applicable box**)

YES		NO	
-----	--	----	--

- v) Specify, by ticking the appropriate box, if subcontracting with any of the following enterprises:

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

8. DECLARATION WITH REGARD TO COMPANY/FIRM

8.1 Name of company/firm:.....

8.2 VAT registration number:.....

8.3 Company registration number:.....

8.4 TYPE OF COMPANY/ FIRM

- ☐ Partnership/Joint Venture / Consortium
- ☐ One person business/sole propriety
- ☐ Close corporation
- ☐ Company

- ☐ (Pty) Limited
[TICK APPLICABLE BOX]

8.5 DESCRIBE PRINCIPAL BUSINESS ACTIVITIES

.....
.....
.....

8.6 COMPANY CLASSIFICATION

- ☐ Manufacturer
☐ Supplier
☐ Professional Supplier/Service provider
☐ Other Suppliers/Service providers, e.g. transporter, etc.
[TICK APPLICABLE BOX]

8.7 Total number of years the company/firm has been in business:.....

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

- i) The information furnished is true and correct;
- ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form;
- iii) In the event of a contract being awarded as a result of points claimed as shown in paragraph 1.4 and 6.1, the contractor may be required to furnish documentary proof to the satisfaction of the purchaser that the claims are correct;
- iv) If a bidder submitted false information regarding its B-BBEE status level of contributor,, which will affect or has affected the evaluation of a bid, or where a bidder has failed to declare any subcontracting arrangements or any of the conditions of contract have not been fulfilled, the purchaser may, in addition to any other remedy it may have
 - (a) disqualify the person from the bidding process;
 - (b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;
 - (c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;
 - (d) if the successful bidder subcontracted a portion of the bid to another person without disclosing it, Transnet reserves the right to penalise the bidder up to 10 percent of the value of the contract;
 - (e) recommend that the bidder or contractor, its shareholders and directors, or only the shareholders and directors who acted on a

fraudulent basis, be restricted by the National Treasury from obtaining business from any organ of state for a period not exceeding 10 years, after the audi alteram partem (hear the other side) rule has been applied; and

(f) forward the matter for criminal prosecution.

WITNESSES

1.

2.

.....

SIGNATURE(S) OF BIDDERS(S)

DATE:

SBD4**BIDDER'S DISCLOSURE****1. PURPOSE OF THE FORM**

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

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

2. Bidder's declaration

2.1 Is the bidder, or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest² in the enterprise, employed by the state? **YES/NO**

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

Full Name	Identity Number	Name of institution	State

² the power, by one person or a group of persons holding the majority of the equity of an enterprise, alternatively, the person/s having the deciding vote or power to influence or to direct the course and decisions of the enterprise.

2.2 Do you, or any person connected with the bidder, have a relationship with any person who is employed by the procuring institution? **YES/NO**

2.2.1 If so, furnish particulars:

.....

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

2.3.1 If so, furnish particulars:

.....

3 DECLARATION

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

- 3.1 I have read and I understand the contents of this disclosure;
- 3.2 I understand that the accompanying bid will be disqualified if this disclosure is found not to be true and complete in every respect;
- 3.3 The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium³ will not be construed as collusive bidding.
- 3.4 In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications, prices, including methods, factors or formulas used to calculate prices, market allocation, the intention or decision to submit or not to submit the bid, bidding with the intention not to win the bid and conditions or delivery particulars of the products or services to which this bid invitation relates.
- 3.4 The terms of the accompanying bid have not been, and will not be, disclosed by the bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.
- 3.5 There have been no consultations, communications, agreements or arrangements made by the bidder with any official of the procuring institution in

³ Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill and knowledge in an activity for the execution of a contract.

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

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

I CERTIFY THAT THE INFORMATION FURNISHED IN PARAGRAPHS 1, 2 and 3 ABOVE IS CORRECT.

I ACCEPT THAT THE STATE MAY REJECT THE BID OR ACT AGAINST ME IN TERMS OF PARAGRAPH 6 OF PFMA SCM INSTRUCTION 03 OF 2021/22 ON PREVENTING AND COMBATING ABUSE IN THE SUPPLY CHAIN MANAGEMENT SYSTEM SHOULD THIS DECLARATION PROVE TO BE FALSE.

.....	
Signature	Date
.....	
Position	Name of bidder

T2.2-18 NON-DISCLOSURE AGREEMENT

Note to tenderers: This Non-Disclosure Agreement is to be completed and signed by an authorised signatory:

THIS AGREEMENT is made effective as of day of 20..... by and between:

TRANSNET SOC LTD

(Registration No. 1990/000900/30), a company incorporated and existing under the laws of South Africa, having its principal place of business at Transnet Corporate Centre 138 Eloff Street, Braamfontein, Johannesburg 2000

and

.....

(Registration No.), a private company incorporated and existing under the laws of South Africa having its principal place of business at

.....

.....

WHEREAS

Transnet and the Company wish to exchange Information [as defined below] and it is envisaged that each party may from time to time receive Information relating to the other in respect thereof. In consideration of each party making available to the other such Information, the parties jointly agree that any dealings between them shall be subject to the terms and conditions of this Agreement which themselves will be subject to the parameters of the Tender Document.

IT IS HEREBY AGREED

1. INTERPRETATION

In this Agreement:

- 1.1 **Agents** mean directors, officers, employees, agents, professional advisers, contractors or sub-contractors, or any Group member;
- 1.2 **Bid or Bid Document** (hereinafter Tender) means Transnet's Request for Information [**RFI**] Request for Proposal [**RFP**] or Request for Quotation [**RFQ**], as the case may be;
- 1.3 **Confidential Information** means any information or other data relating to one party [the **Disclosing Party**] and/or the business carried on or proposed or intended to be carried on by that party and which is made available for the purposes of the Bid to the other party [the **Receiving Party**] or its Agents by the Disclosing Party or its Agents or recorded in agreed minutes following oral disclosure and any other information otherwise made available by the Disclosing Party or its Agents to the Receiving Party or its Agents, whether before, on or after the date of this Agreement, and whether in writing or otherwise, including any information, analysis or specifications derived from, containing or reflecting such information but excluding information which:

- 1.3.1 is publicly available at the time of its disclosure or becomes publicly available [other than as a result of disclosure by the Receiving Party or any of its Agents contrary to the terms of this Agreement]; or
- 1.3.2 was lawfully in the possession of the Receiving Party or its Agents [as can be demonstrated by its written records or other reasonable evidence] free of any restriction as to its use or disclosure prior to its being so disclosed; or
- 1.3.3 following such disclosure, becomes available to the Receiving Party or its Agents [as can be demonstrated by its written records or other reasonable evidence] from a source other than the Disclosing Party or its Agents, which source is not bound by any duty of confidentiality owed, directly or indirectly, to the Disclosing Party in relation to such information;
- 1.4 **Group** means any subsidiary, any holding company and any subsidiary of any holding company of either party; and
- 1.5 **Information** means all information in whatever form including, without limitation, any information relating to systems, operations, plans, intentions, market opportunities, know-how, trade secrets and business affairs whether in writing, conveyed orally or by machine-readable medium.

2. CONFIDENTIAL INFORMATION

- 2.1 All Confidential Information given by one party to this Agreement [the **Disclosing Party**] to the other party [the **Receiving Party**] will be treated by the Receiving Party as secret and confidential and will not, without the Disclosing Party's written consent, directly or indirectly communicate or disclose [whether in writing or orally or in any other manner] Confidential Information to any other person other than in accordance with the terms of this Agreement.
- 2.2 The Receiving Party will only use the Confidential Information for the sole purpose of technical and commercial discussions between the parties in relation to the Tender or for the subsequent performance of any contract between the parties in relation to the Tender.
- 2.3 Notwithstanding clause 2.1 above, the Receiving Party may disclose Confidential Information:
- 2.3.1 to those of its Agents who strictly need to know the Confidential Information for the sole purpose set out in clause 2.2 above, provided that the Receiving Party shall ensure that such Agents are made aware prior to the disclosure of any part of the Confidential Information that the same is confidential and that they owe a duty of confidence to the Disclosing Party. The Receiving Party shall at all times remain liable for any actions of such Agents that would constitute a breach of this Agreement; or
- 2.3.2 to the extent required by law or the rules of any applicable regulatory authority, subject to clause 2.4 below.
- 2.4 In the event that the Receiving Party is required to disclose any Confidential Information in accordance with clause 2.3.2 above, it shall promptly notify the Disclosing Party and cooperate with the Disclosing Party regarding the form, nature, content and purpose of such disclosure or any action which the Disclosing Party may reasonably take to challenge the validity of such requirement.

- 2.5 In the event that any Confidential Information shall be copied, disclosed or used otherwise than as permitted under this Agreement then, upon becoming aware of the same, without prejudice to any rights or remedies of the Disclosing Party, the Receiving Party shall as soon as practicable notify the Disclosing Party of such event and if requested take such steps [including the institution of legal proceedings] as shall be necessary to remedy [if capable of remedy] the default and/or to prevent further unauthorised copying, disclosure or use.
- 2.6 All Confidential Information shall remain the property of the Disclosing Party and its disclosure shall not confer on the Receiving Party any rights, including intellectual property rights over the Confidential Information whatsoever, beyond those contained in this Agreement.

3. RECORDS AND RETURN OF INFORMATION

- 3.1 The Receiving Party agrees to ensure proper and secure storage of all Information and any copies thereof.
- 3.2 The Receiving Party shall keep a written record, to be supplied to the Disclosing Party upon request, of the Confidential Information provided and any copies made thereof and, so far as is reasonably practicable, of the location of such Confidential Information and any copies thereof.
- 3.3 The Company shall, within 7 [seven] days of receipt of a written demand from Transnet:
- 3.3.1 return all written Confidential Information [including all copies]; and
- 3.3.2 expunge or destroy any Confidential Information from any computer, word processor or other device whatsoever into which it was copied, read or programmed by the Company or on its behalf.
- 3.4 The Company shall on request supply a certificate signed by a director as to its full compliance with the requirements of clause 3.3.2 above.

4. ANNOUNCEMENTS

- 4.1 Neither party will make or permit to be made any announcement or disclosure of its prospective interest in the Tender without the prior written consent of the other party.
- 4.2 Neither party shall make use of the other party's name or any information acquired through its dealings with the other party for publicity or marketing purposes without the prior written consent of the other party.

5. DURATION

The obligations of each party and its Agents under this Agreement shall survive the termination of any discussions or negotiations between the parties regarding the Tender and continue thereafter for a period of 5 [five] years.

6. PRINCIPAL

Each party confirms that it is acting as principal and not as nominee, agent or broker for any other person and that it will be responsible for any costs incurred by it or its advisers in considering or pursuing the Tender and in complying with the terms of this Agreement.

7. ADEQUACY OF DAMAGES

Nothing contained in this Agreement shall be construed as prohibiting the Disclosing Party from pursuing any other remedies available to it, either at law or in equity, for any such threatened or actual breach of this Agreement, including specific performance, recovery of damages or otherwise.

8. PRIVACY AND DATA PROTECTION

- 8.1 The Receiving Party undertakes to comply with South Africa's general privacy protection in terms Section 14 of the Bill of Rights in connection with this Tender and shall procure that its personnel shall observe the provisions of such Act [as applicable] or any amendments and re-enactments thereof and any regulations made pursuant thereto.
- 8.2 The Receiving Party warrants that it and its Agents have the appropriate technical and organisational measures in place against unauthorised or unlawful processing of data relating to the Tender and against accidental loss or destruction of, or damage to such data held or processed by them.

9. GENERAL

- 9.1 Neither party may assign the benefit of this Agreement, or any interest hereunder, except with the prior written consent of the other, save that Transnet may assign this Agreement at any time to any member of the Transnet Group.
- 9.2 No failure or delay in exercising any right, power or privilege under this Agreement will operate as a waiver of it, nor will any single or partial exercise of it preclude any further exercise or the exercise of any right, power or privilege under this Agreement or otherwise.
- 9.3 The provisions of this Agreement shall be severable in the event that any of its provisions are held by a court of competent jurisdiction or other applicable authority to be invalid, void or otherwise unenforceable, and the remaining provisions shall remain enforceable to the fullest extent permitted by law.
- 9.4 This Agreement may only be modified by a written agreement duly signed by persons authorised on behalf of each party.
- 9.5 Nothing in this Agreement shall constitute the creation of a partnership, joint venture or agency between the parties.
- 9.6 This Agreement will be governed by and construed in accordance with South African law and the parties irrevocably submit to the exclusive jurisdiction of the South African courts.

Signed

Date

Name

Position

Tenderer

T2.2-19: RFP DECLARATION FORM

NAME OF COMPANY: _____

We _____ do hereby certify that:

1. Transnet has supplied and we have received appropriate tender offers to any/all questions (as applicable) which were submitted by ourselves for tender clarification purposes;
2. we have received all information we deemed necessary for the completion of this Tender;
3. at no stage have we received additional information relating to the subject matter of this tender from Transnet sources, other than information formally received from the designated Transnet contact(s) as nominated in the tender documents;
4. we are satisfied, insofar as our company is concerned, that the processes and procedures adopted by Transnet in issuing this tender and the requirements requested from tenderers in responding to this tender have been conducted in a fair and transparent manner; and
5. furthermore, we acknowledge that a direct relationship exists between a family member and/or an owner / member / director / partner / shareholder (unlisted companies) of our company and an employee or board member of the Transnet Group as indicated below:

[Respondent to indicate if this section is not applicable]

FULL NAME OF OWNER/MEMBER/DIRECTOR/

PARTNER/SHAREHOLDER:

ADDRESS:

Indicate nature of relationship with Transnet:

[Failure to furnish complete and accurate information in this regard may lead to the disqualification of your response and may preclude a Respondent from doing future business with Transnet]

We declare, to the extent that we are aware or become aware of any relationship between ourselves and Transnet (other than any existing and appropriate business relationship with Transnet) which could unfairly advantage our company in the forthcoming adjudication process, we shall notify Transnet immediately in writing of such circumstances.

6. We accept that any dispute pertaining to this tender will be resolved through the Ombudsman process and will be subject to the Terms of Reference of the Ombudsman. The Ombudsman process must first be exhausted before judicial review of a decision is sought. (Refer "Important Notice to respondents" below).
7. We further accept that Transnet reserves the right to reverse a tender award or decision based on the recommendations of the Ombudsman without having to follow a formal court process to have such award or decision set aside.
8. We have acquainted ourselves and agree with the content of T2.2-16 "Supplier Provider Integrity Pact".

For and on behalf of
.....
duly authorised thereto
Name:
Signature:
Date:

IMPORTANT NOTICE TO TENDERERS

- Transnet has appointed a Procurement Ombudsman to investigate any material complaint in respect of tenders exceeding R5,000,000.00 (five million S.A. Rand) in value. Should a Tenderer have any material concern regarding a tender process which meets this value threshold, a complaint may be lodged with Transnet's Procurement Ombudsman for further investigation.
- It is incumbent on the Tenderer to familiarise himself/herself with the Terms of Reference for the Transnet Procurement Ombudsman, details of which are available for review at Transnet's website www.transnet.net.

-
- An official complaint form may be downloaded from this website and submitted, together with any supporting documentation, within the prescribed period, to procurement.ombud@transnet.net
 - For transactions below the R5,000,000.00 (five million S.A. Rand) threshold, a complaint may be lodged with the Chief Procurement Officer of the relevant Transnet Operating Division.
 - All Tenderers should note that a complaint must be made in good faith. If a complaint is made in bad faith, Transnet reserves the right to place such a tenderer on its List of Excluded Bidders.

T2.2-20: REQUEST FOR PROPOSAL – BREACH OF LAW

NAME OF COMPANY: _____

I / We _____ do hereby certify that ***I/we have/have not been*** found guilty during the preceding 5 (five) years of a serious breach of law, including but not limited to a breach of the Competition Act, 89 of 1998, by a court of law, tribunal or other administrative body. The type of breach that the Tenderer is required to disclose excludes relatively minor offences or misdemeanors, e.g., traffic offences.

Where found guilty of such a serious breach, please disclose:

NATURE OF BREACH:

DATE OF BREACH:

Furthermore, I/we acknowledge that Transnet SOC Ltd reserves the right to exclude any Tenderer from the tendering process, should that person or company have been found guilty of a serious breach of law, tribunal or regulatory obligation.

Signed on this _____ day of _____ 20____

SIGNATURE OF TENDER

T2.2-21 Certificate of Acquaintance with Tender Documents

NAME OF TENDERING ENTITY:

1. By signing this certificate, I/we acknowledge that I/we have made myself/ourselves thoroughly familiar with and agree with all the conditions governing this RFP. This includes those terms and conditions of the Contract, the Supplier Integrity Pact, Non-Disclosure Agreement etc. contained in any printed form stated to form part of the documents thereof, but not limited to those listed in this clause.
2. I/we furthermore agree that Transnet SOC Ltd shall recognise no claim from me/us for relief based on an allegation that I/we overlooked any tender/contract condition or failed to take it into account for the purpose of calculating my/our offered prices or otherwise.
3. I/we understand that the accompanying Tender will be disqualified if this Certificate is found not to be true and complete in every respect.
4. For the purposes of this Certificate and the accompanying Tender, I/we understand that the word "competitor" shall include any individual or organisation, other than the Tenderer, whether or not affiliated with the Tenderer, who:
 - a) has been requested to submit a Tender in response to this Tender invitation;
 - b) could potentially submit a Tender in response to this Tender invitation, based on their qualifications, abilities or experience; and
 - c) provides the same Services as the Tenderer and/or is in the same line of business as the Tenderer
5. The Tenderer has arrived at the accompanying Tender independently from, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium will not be construed as collusive Tendering.
6. In particular, without limiting the generality of paragraph 5 above, there has been no consultation, communication, agreement or arrangement with any competitor regarding:
 - a) prices;

-
- b) geographical area where Services will be rendered [market allocation]
- c) methods, factors or formulas used to calculate prices;
- d) the intention or decision to submit or not to submit, a Tender;
- e) the submission of a tender which does not meet the specifications and conditions of the tender; or
- f) Tendering with the intention not winning the tender.
7. In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications and conditions or delivery particulars of the Services to which this tender relates.
8. The terms of the accompanying tender have not been, and will not be, disclosed by the Tenderer, directly or indirectly, to any competitor, prior to the date and time of the official tender opening or of the awarding of the contract.
9. I/We am/are aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to tenders and contracts, tenders that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No 89 of 1998 and/or may be reported to the National Prosecuting Authority [NPA] for criminal investigation. In addition, Tenderers that submit suspicious tenders may be restricted from conducting business with the public sector for a period not exceeding 10 [ten] years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.

Signed on this _____ day of _____ 20____

SIGNATURE OF TENDERER



TRANSNET PORT TERMINALS

TENDER NUMBER: ICLM DB 10077/TPT

DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) DURBAN CONTAINER TERMINAL PIER 1 FOR THE DURATION OF 12 MONTHS.

T2.2-22 Service Provider Integrity Pact

Important Note: All potential tenderers must read this document and certify in the RFP Declaration Form that that have acquainted themselves with and agree with the content.

The contract with the successful tenderer will automatically incorporate this Integrity Pact and shall be deemed as part of the final concluded contract.

INTEGRITY PACT

Between

TRANSNET SOC LTD

Registration Number: 1990/000900/30

("Transnet")

and

The Contractor (hereinafter referred to as the "Tenderer/Service Providers/Contractor")



PREAMBLE

Transnet values full compliance with all relevant laws and regulations, ethical standards and the principles of economical use of resources, fairness and transparency in its relations with its Tenderers/Service Providers/Contractors.

In order to achieve these goals, Transnet and the Tenderer/Service Provider/Contractor hereby enter into this agreement hereinafter referred to as the "Integrity Pact" which will form part of the Tenderer's/Service Provider's/Contractor's application for registration with Transnet as a vendor.

The general purpose of this Integrity Pact is to agree on avoiding all forms of dishonesty, fraud and corruption by following a system that is fair, transparent and free from any undue influence prior to, during and subsequent to the currency of any procurement and/or reverse logistics event and any further contract to be entered into between the Parties, relating to such event.

All Tenderers/Service Providers/Contractor's will be required to sign and comply with undertakings contained in this Integrity Pact, should they want to be registered as a Transnet vendor.

1 OBJECTIVES

- 1.1 Transnet and the Tenderer/Service Provider/Contractor agree to enter into this Integrity Pact, to avoid all forms of dishonesty, fraud and corruption including practices that are anti-competitive in nature, negotiations made in bad faith and under-pricing by following a system that is fair, transparent and free from any influence/unprejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to:
 - a) Enable Transnet to obtain the desired contract at a reasonable and competitive price in conformity to the defined specifications of the works, goods and services; and
 - b) Enable Tenderers/Service Providers/Contractors to abstain from bribing or participating in any corrupt practice in order to secure the contract.

2 COMMITMENTS OF TRANSNET

Transnet commits to take all measures necessary to prevent dishonesty, fraud and corruption and to observe the following principles:

- 2.1 Transnet hereby undertakes that no employee of Transnet connected directly or indirectly with the sourcing event and ensuing contract, will demand, take a promise for or accept directly or through intermediaries any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage



from the Tenderer, either for themselves or for any person, organisation or third party related to the contract in exchange for an advantage in the tendering process, Tender evaluation, contracting or implementation process related to any contract.

- 2.2 Transnet will, during the registration and tendering process treat all Tenderers/Service Providers/Contractor with equity, transparency and fairness. Transnet will in particular, before and during the registration process, provide to all Tenderers/Service Providers/Contractors the same information and will not provide to any Tenderers/Service Providers/Contractors confidential/additional information through which the Tenderers/Service Providers/Contractors could obtain an advantage in relation to any tendering process.
- 2.3 Transnet further confirms that its employees will not favour any prospective Tenderers/Service Providers/Contractors in any form that could afford an undue advantage to a particular Tenderer during the tendering stage and will further treat all Tenderers/Service Providers/Contractors participating in the tendering process in a fair manner.
- 2.4 Transnet will exclude from the tender process such employees who have any personal interest in the Tenderers/Service Providers/Contractors participating in the tendering process.

3 OBLIGATIONS OF THE TENDERER / SERVICE PROVIDER

- 3.1 Transnet has a '**Zero Gifts**' Policy. No employee is allowed to accept gifts, favours or benefits.
 - a) Transnet officials and employees **shall not** solicit, give or accept, or from agreeing to solicit, give, accept or receive directly or indirectly, any gift, gratuity, favour, entertainment, loan, or anything of monetary value, from any person or juridical entities in the course of official duties or in connection with any operation being managed by, or any transaction which may be affected by the functions of their office.
 - b) Transnet officials and employees **shall not** solicit or accept gifts of any kind, from vendors, suppliers, customers, potential employees, potential vendors, and suppliers, or any other individual or organisation irrespective of the value.
 - c) Under **no circumstances** should gifts, business courtesies or hospitality packages be accepted from or given to prospective suppliers participating in a tender process at the respective employee's Operating Division, regardless of retail value.
 - d) Gratuities, bribes or kickbacks of any kind must never be solicited, accepted or offered, either directly or indirectly. This includes money, loans, equity, special

privileges, personal favours, benefit or services. Such favours will be considered to constitute corruption.

3.2 The Tenderer/Service Provider/Contractor commits itself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its Tender or during any ensuing contract stage in order to secure the contract or in furtherance to secure it and in particular the Tenderer/Service Provider/Contractor commits to the following:

- a) The Tenderer/Service Provider/Contractor will not, directly or through any other person or firm, offer, promise or give to Transnet or to any of Transnet's employees involved in the tendering process or to any third person any material or other benefit or payment, in order to obtain in exchange an advantage during the tendering process; and
- b) The Tenderer/Service Provider/Contractor will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any employee of Transnet, connected directly or indirectly with the tendering process, or to any person, organisation or third party related to the contract in exchange for any advantage in the tendering, evaluation, contracting and implementation of the contract.

3.3 The Tenderer/Service Provider/Contractor will not collude with other parties interested in the contract to preclude a competitive Tender price, impair the transparency, fairness and progress of the tendering process, Tender evaluation, contracting and implementation of the contract. The Tenderer / Service Provider further commits itself to delivering against all agreed upon conditions as stipulated within the contract.

3.4 The Tenderer/Service Provider/Contractor will not enter into any illegal or dishonest agreement or understanding, whether formal or informal with other Tenderers/Service Providers/Contractors. This applies in particular to certifications, submissions or non-submission of documents or actions that are restrictive or to introduce cartels into the tendering process.

3.5 The Tenderer/Service Provider/Contractor will not commit any criminal offence under the relevant anti-corruption laws of South Africa or any other country. Furthermore, the Tenderer/Service Provider/Contractor will not use for illegitimate purposes or for restrictive purposes or personal gain, or pass on to others, any information provided by Transnet as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

- 3.6 A Tenderer/Service Provider/Contractor of foreign origin shall disclose the name and address of its agents or representatives in South Africa, if any, involved directly or indirectly in the registration or tendering process. Similarly, the Tenderer / Service Provider / Contractor of South African nationality shall furnish the name and address of the foreign principals, if any, involved directly or indirectly in the registration or tendering process.
- 3.7 The Tenderer/Service Provider/Contractor will not misrepresent facts or furnish false or forged documents or information in order to influence the tendering process to the advantage of the Tenderer/Service Provider/Contractor or detriment of Transnet or other competitors.
- 3.8 Transnet may require the Tenderer/Service Provider/Contractor to furnish Transnet with a copy of its code of conduct. Such code of conduct must address the compliance programme for the implementation of the code of conduct and reject the use of bribes and other dishonest and unethical conduct.
- 3.9 The Tenderer/Service Provider/Contractor will not instigate third persons to commit offences outlined above or be an accessory to such offences.
- 3.10 The Tenderer/Service Provider/Contractor confirms that they will uphold the ten principles of the United Nations Global Compact (UNGC) in the fields of Human Rights, Labour, Anti-Corruption and the Environment when undertaking business with Transnet as follows:
- a) Human Rights
- Principle 1: Businesses should support and respect the protection of internationally proclaimed human rights; and
 - Principle 2: make sure that they are not complicit in human rights abuses.
- b) Labour
- Principle 3: Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining;
 - Principle 4: the elimination of all forms of forced and compulsory labour;
 - Principle 5: the effective abolition of child labour; and
 - Principle 6: the elimination of discrimination in respect of employment and occupation.
- c) Environment



- Principle 7: Businesses should support a precautionary approach to environmental challenges;
 - Principle 8: undertake initiatives to promote greater environmental responsibility; and
 - Principle 9: encourage the development and diffusion of environmentally friendly technologies.
- d) Anti-Corruption
- Principle 10: Businesses should work against corruption in all its forms, including extortion and bribery.

4 INDEPENDENT TENDERING

- 4.1 For the purposes of that Certificate in relation to any submitted Tender, the Tenderer declares to fully understand that the word "competitor" shall include any individual or organisation, other than the Tenderer, whether or not affiliated with the Tenderer, who:
- a) has been requested to submit a Tender in response to this Tender invitation;
 - b) could potentially submit a Tender in response to this Tender invitation, based on their qualifications, abilities or experience; and
 - c) provides the same Goods and Services as the Tenderer and/or is in the same line of business as the Tenderer.
- 4.2 The Tenderer has arrived at his submitted Tender independently from, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium will not be construed as collusive tendering.
- 4.3 In particular, without limiting the generality of paragraph 5 above, there has been no consultation, communication, agreement or arrangement with any competitor regarding:
- a) prices;
 - b) geographical area where Goods or Services will be rendered [market allocation];
 - c) methods, factors or formulas used to calculate prices;
 - d) the intention or decision to submit or not to submit, a Tender;
 - e) the submission of a Tender which does not meet the specifications and conditions of the RFP; or
 - f) tendering with the intention of not winning the Tender.



- 4.4 In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications and conditions or delivery particulars of the Goods or Services to which his/her tender relates.
- 4.5 The terms of the Tender as submitted have not been, and will not be, disclosed by the Tenderer, directly or indirectly, to any competitor, prior to the date and time of the official Tender opening or of the awarding of the contract.
- 4.6 Tenderers are aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to Tenders and contracts, Tenders that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No 89 of 1998 and/or may be reported to the National Prosecuting Authority [**NPA**] for criminal investigation and/or may be restricted from conducting business with the public sector for a period not exceeding 10 [ten] years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.
- 4.7 Should the Tenderer find any terms or conditions stipulated in any of the relevant documents quoted in the Tender unacceptable, it should indicate which conditions are unacceptable and offer alternatives by written submission on its company letterhead, attached to its submitted Tender. Any such submission shall be subject to review by Transnet's Legal Counsel who shall determine whether the proposed alternative(s) are acceptable or otherwise, as the case may be.

5 DISQUALIFICATION FROM TENDERING PROCESS

- 5.1 If the Tenderer/Service Provider/Contractor has committed a transgression through a violation of section 3 of this Integrity Pact or in any other form such as to put its reliability or credibility as a Tenderer/Service Provider/Contractor into question, Transnet may reject the Tenderer's / Service Provider's / Contractor's application from the registration or tendering process and remove the Tenderer/Service Provider/Contractor from its database, if already registered.
- 5.2 If the Tenderer/Service Provider/Contractor has committed a transgression through a violation of section 3, or any material violation, such as to put its reliability or credibility into question. Transnet may after following due procedures and at its own discretion also exclude the Tenderer/Service Provider/Contractor from future tendering processes. The imposition and duration of the exclusion will be determined by the severity of the transgression. The severity will be determined by the circumstances of the case, which will include amongst

others the number of transgressions, the position of the transgressors within the company hierarchy of the Tenderer/Service Provider/Contractor and the amount of the damage. The exclusion will be imposed for up to a maximum of 10 (ten) years. However, Transnet reserves the right to impose a longer period of exclusion, depending on the gravity of the misconduct.

- 5.3 If the Tenderer/Service Provider/Contractor can prove that it has restored the damage caused by it and has installed a suitable corruption prevention system, or taken other remedial measures as the circumstances of the case may require, Transnet may at its own discretion revoke the exclusion or suspend the imposed penalty.

6 TRANSNET'S LIST OF EXCLUDED TENDERERS (BLACKLIST)

- 6.1 The process of restriction is used to exclude a company/person from conducting future business with Transnet and other organs of state for a specified period. No Tender shall be awarded to a Tenderer whose name (or any of its members, directors, partners or trustees) appear on the Register of Tender Defaulters kept by National Treasury, or who have been placed on National Treasury's List of Restricted Suppliers. Transnet reserves the right to withdraw an award, or cancel a contract concluded with a Tenderer should it be established, at any time, that a tenderer has been restricted with National Treasury by another government institution.
- 6.2 All the stipulations on Transnet's restriction process as laid down in Transnet's Supply Chain Policy and Goods and Services Manual (CPM included) are included herein by way of reference. Below follows a condensed summary of this restriction procedure.
- 6.3 On completion of the restriction procedure, Transnet will submit the restricted entity's details (including the identity number of the individuals and registration number of the entity) to National Treasury for placement on National Treasury's Database of Restricted Suppliers for the specified period of exclusion. National Treasury will make the final decision on whether to restrict an entity from doing business with any organ of state for a period not exceeding 10 years and place the entity concerned on the Database of Restricted Suppliers published on its official website.
- 6.4 The decision to restrict is based on one of the grounds for restriction. The standard of proof to commence the restriction process is whether a "*prima facie*" (i.e. on the face of it) case has been established.
- 6.5 Depending on the seriousness of the misconduct and the strategic importance of the Goods/Services, in addition to restricting a company/person from future

business, Transnet may decide to terminate some or all existing contracts with the company/person as well.

6.6 A Service Provider or Contractor to Transnet may not subcontract any portion of the contract to a blacklisted company.

6.7 Grounds for blacklisting include: If any person/Enterprise which has submitted a Tender, concluded a contract, or, in the capacity of agent or subcontractor, has been associated with such Tender or contract:

- a) Has, in bad faith, withdrawn such Tender after the advertised closing date and time for the receipt of Tenders;
- b) has, after being notified of the acceptance of his Tender, failed or refused to sign a contract when called upon to do so in terms of any condition forming part of the Tender documents;
- c) has carried out any contract resulting from such Tender in an unsatisfactory manner or has breached any condition of the contract;
- d) has offered, promised or given a bribe in relation to the obtaining or execution of the contract;
- e) has acted in a fraudulent or improper manner or in bad faith towards Transnet or any Government Department or towards any public body, Enterprise or person;
- f) has made any incorrect statement in a certificate or other communication with regard to the Local Content of his Goods or his B-BBEE status and is unable to prove to the satisfaction of Transnet that:
 - (i) he made the statement in good faith honestly believing it to be correct; and
 - (ii) before making such statement he took all reasonable steps to satisfy himself of its correctness;
- g) caused Transnet damage, or to incur costs in order to meet the contractor's requirements and which could not be recovered from the contractor;
- h) has litigated against Transnet in bad faith.

6.8 Grounds for blacklisting include a company/person recorded as being a company or person prohibited from doing business with the public sector on National

Treasury's database of Restricted Service Providers or Register of Tender Defaulters.

- 6.9 Companies associated with the person/s guilty of misconduct (i.e. entities owned, controlled or managed by such persons), any companies subsequently formed by the person(s) guilty of the misconduct and/or an existing company where such person(s) acquires a controlling stake may be considered for blacklisting. The decision to extend the blacklist to associated companies will be at the sole discretion of Transnet.

7 PREVIOUS TRANSGRESSIONS

- 7.1 The Tenderer/Service Provider/Contractor hereby declares that no previous transgressions resulting in a serious breach of any law, including but not limited to, corruption, fraud, theft, extortion and contraventions of the Competition Act 89 of 1998, which occurred in the last 5 (five) years with any other public sector undertaking, government department or private sector company that could justify its exclusion from its registration on the Tenderer's/Service Provider's/Contractor's database or any tendering process.
- 7.2 If it is found to be that the Tenderer/Service Provider/Contractor made an incorrect statement on this subject, the Tenderer/Service Provider/Contractor can be rejected from the registration process or removed from the Tenderer/Service Provider/Contractor database, if already registered, for such reason (refer to the Breach of Law Returnable Form contained in the document.)

8 SANCTIONS FOR VIOLATIONS

- 8.1 Transnet shall also take all or any one of the following actions, wherever required to:
- a) Immediately exclude the Tenderer/Service Provider/Contractor from the tendering process or call off the pre-contract negotiations without giving any compensation the Tenderer/Service Provider/Contractor. However, the proceedings with the other Tenderer/Service Provider/Contractor may continue;
 - b) Immediately cancel the contract, if already awarded or signed, without giving any compensation to the Tenderer/Service Provider/Contractor;
 - c) Recover all sums already paid by Transnet;
 - d) Encash the advance bank guarantee and performance bond or warranty bond, if furnished by the Tenderer/Service Provider/Contractor, in order to recover the payments, already made by Transnet, along with interest;
 - e) Cancel all or any other contracts with the Tenderer/Service Provider/Contractor; and

- f) Exclude the Tenderer/ Service Provider/Contractor from entering into any Tender with Transnet in future.

9 CONFLICTS OF INTEREST

- 9.1 A conflict of interest includes, inter alia, a situation in which:
 - a) A Transnet employee has a personal financial interest in a tendering / supplying entity; and
 - b) A Transnet employee has private interests or personal considerations or has an affiliation or a relationship which affects, or may affect, or may be perceived to affect his / her judgment in action in the best interest of Transnet, or could affect the employee's motivations for acting in a particular manner, or which could result in, or be perceived as favouritism or nepotism.
- 9.2 A Transnet employee uses his / her position, or privileges or information obtained while acting in the capacity as an employee for:
 - a) Private gain or advancement; or
 - b) The expectation of private gain, or advancement, or any other advantage accruing to the employee must be declared in a prescribed form.

Thus, conflicts of interest of any Tender committee member or any person involved in the sourcing process must be declared in a prescribed form.

- 9.3 If a Tenderer/Service Provider/Contractor has or becomes aware of a conflict of interest i.e. a family, business and / or social relationship between its owner(s)/ member(s)/director(s)/partner(s)/shareholder(s) and a Transnet employee/ member of Transnet's Board of Directors in respect of a Tender which will be considered for the Tender process, the Tenderer/Service Provider/ Contractor:
 - a) must disclose the interest and its general nature, in the Request for Proposal ("RFX") declaration form; or
 - b) must notify Transnet immediately in writing once the circumstances has arisen.
- 9.4 The Tenderer/Service Provider/Contractor shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any committee member or any person involved in the sourcing process, where this is done, Transnet shall be entitled forthwith to rescind the contract and all other contracts with the Tenderer/Service Provider/Contractor.

10 DISPUTE RESOLUTION

- 10.1 Transnet recognises that trust and good faith are pivotal to its relationship with its Tenderer / Service Provider / Contractor. When a dispute arises between Transnet and its Tenderer / Service Provider / Contractor, the parties should use their best endeavours to resolve the dispute in an amicable manner, whenever

possible. Litigation in bad faith negates the principles of trust and good faith on which commercial relationships are based. Accordingly, following a blacklisting process as mentioned in paragraph 6 above, Transnet will not do business with a company that litigates against it in bad faith or is involved in any action that reflects bad faith on its part. Litigation in bad faith includes, but is not limited to the following instances:

- a) **Vexatious proceedings:** these are frivolous proceedings which have been instituted without proper grounds;
- b) **Perjury:** where a Tenderer / Service Provider / Contractor make a false statement either in giving evidence or on an affidavit;
- c) **Scurrilous allegations:** where a Tenderer / Service Provider / Contractor makes allegations regarding a senior Transnet employee which are without proper foundation, scandalous, abusive or defamatory; and
- d) **Abuse of court process:** when a Tenderer / Service Provider / Contractor abuses the court process in order to gain a competitive advantage during a Tender process.

11 GENERAL

- 11.1 This Integrity Pact is governed by and interpreted in accordance with the laws of the Republic of South Africa.
- 11.2 The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the law relating to any civil or criminal proceedings.
- 11.3 The validity of this Integrity Pact shall cover all the tendering processes and will be valid for an indefinite period unless cancelled by either Party.
- 11.4 Should one or several provisions of this Integrity Pact turn out to be invalid the remainder of this Integrity Pact remains valid.
- 11.5 Should a Tenderer/Service Provider/Contractor be confronted with dishonest, fraudulent or corruptive behaviour of one or more Transnet employees, Transnet expects its Tenderer/Service Provider/Contractor to report this behaviour directly to a senior Transnet official/employee or alternatively by using Transnet's "Tip-Off Anonymous" hotline number 0800 003 056, whereby your confidentiality is guaranteed.

The Parties hereby declare that each of them has read and understood the clauses of this Integrity Pact and shall abide by it. To the best of the Parties' knowledge and belief, the information provided in this Integrity Pact is true and correct.



TRANSNET PORT TERMINALS

TENDER NUMBER: iCLM DB 1007/TPT

DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) DURBAN CONTAINER TERMINAL PIER 1 FOR THE DURATION OF 12 MONTHS.

I duly authorised by the tendering entity, hereby certify that the tendering entity are **fully acquainted** with the contents of the Integrity Pact and further **agree to abide by it** in full.

Signature

Date

T2.2-23 : Supplier Code of Conduct

Transnet SOC Limited aims to achieve the best value for money when buying or selling goods and obtaining services. This however must be done in an open and fair manner that supports and drives a competitive economy. Underpinning our process are several acts and policies that any supplier dealing with Transnet must understand and support. These are:

- The Transnet Procurement Policy – A guide for Tenderers.
- Section 217 of the Constitution - the five pillars of Public PSCM (Procurement and Supply Chain Management): fair, equitable, transparent, competitive and cost effective;
- The Public Finance Management Act (PFMA);
- The Broad Based Black Economic Empowerment Act (BBBEE)
- The Prevention and Combating of Corrupt Activities Act (PRECCA); and
- The Construction Industry Development Board Act (CIDB Act).

This code of conduct has been included in this contract to formally appraise Transnet Suppliers of Transnet's expectations regarding behaviour and conduct of its Suppliers.

Prohibition of Bribes, Kickbacks, Unlawful Payments, and Other Corrupt Practices

Transnet is in the process of transforming itself into a self-sustaining State Owned Enterprise, actively competing in the logistics industry. Our aim is to become a world class, profitable, logistics organisation. As such, our transformation is focused on adopting a performance culture and to adopt behaviours that will enable this transformation.

1. Transnet SOC Limited will not participate in corrupt practices. Therefore, it expects its suppliers to act in a similar manner.

- Transnet and its employees will follow the laws of this country and keep accurate business records that reflect actual transactions with, and payments to, our suppliers.
- Employees must not accept or request money or anything of value, directly or indirectly, from suppliers.
- Employees may not receive anything that is calculated to:

- Illegally influence their judgement or conduct or to ensure the desired outcome of a sourcing activity;
- Win or retain business or to influence any act or decision of any person involved in sourcing decisions; or
- Gain an improper advantage.
- There may be times when a supplier is confronted with fraudulent or corrupt behaviour of Transnet employees. We expect our Suppliers to use our “Tip-offs Anonymous” Hot line to report these acts. (0800 003 056).

2. *Transnet SOC Limited is firmly committed to the ideas of free and competitive enterprise.*

- Suppliers are expected to comply with all applicable laws and regulations regarding fair competition and antitrust practices.
- Transnet does not engage with non-value adding agents or representatives solely for the purpose of increasing BBBEE spend (fronting).

3. *Transnet’s relationship with suppliers requires us to clearly define requirements, to exchange information and share mutual benefits.*

- Generally, suppliers have their own business standards and regulations. Although Transnet cannot control the actions of our suppliers, we will not tolerate any illegal activities. These include, but are not limited to:
 - Misrepresentation of their product (origin of manufacture, specifications, intellectual property rights, etc);
 - Collusion;
 - Failure to disclose accurate information required during the sourcing activity (ownership, financial situation, BBBEE status, etc.);
 - Corrupt activities listed above; and
 - Harassment, intimidation or other aggressive actions towards Transnet employees.
- Suppliers must be evaluated and approved before any materials, components, products or services are purchased from them. Rigorous due diligence is conducted and the supplier is expected to participate in an honest and straight forward manner.

-
- Suppliers must record and report facts accurately, honestly and objectively.
Financial records must be accurate in all material respects.

Conflicts of Interest

A conflict of interest arises when personal interests or activities influence (or appear to influence) the ability to act in the best interests of Transnet SOC Limited.

- Doing business with family members.
- Having a financial interest in another company in our industry

Where possible, contracts will be negotiated to include the above in the terms of such contracts. To the extent such terms are not included in contractual obligations and any of the above code is breached, then Transnet reserves its right to review doing business with these suppliers.

I, _____ of _____
(insert name of Director or as per Authority Resolution from Board of Directors) *(insert name of Company)*

hereby acknowledge having read, understood and agree to the terms and conditions set out in the "Transnet Supplier Code of Conduct."

Signed this on day _____ at _____

 Signature

T2.2-24: Agreement in terms of Protection of Personal Information Act, 4 of 2013 ("POPIA")

1. PREAMBLE AND INTRODUCTION

- 1.1. The rights and obligation of the Parties in terms of the Protection of Personal Information Act, 4 of 2013 ("POPIA") are included as forming part of the terms and conditions of this contract.

2. PROTECTION OF PERSONAL INFORMATION

- 2.1. The following terms shall bear the same meaning as contemplated in Section 1 of the Protection of Person information act, No. of 2013 "(POPIA)":
- consent; data subject; electronic communication; information officer; operator; person; personal information; processing; record; Regulator; responsible party; special information; as well as any terms derived from these terms.
- 2.2. The Operator will process all information by the Transnet in terms of the requirements contemplated in Section 4(1) of the POPIA:
- Accountability; Processing limitation; Purpose specification; Further processing limitation; Information quality; Openness; Security safeguards and Data subject participation.
- 2.3. The Parties acknowledge and agree that, in relation to personal information of Transnet and the information of a third party that will be processed pursuant to this Agreement, the Operator is (.....) hereinafter Operator and the Data subject is "Transnet". Operator will process personal information only with the knowledge and authorisation of Transnet and will treat personal information and the information of a third party which comes to its knowledge as confidential and will not disclose it, unless so required by law or subject to the exceptions contained in the POPIA.
- 2.4. Transnet reserves all the rights afforded to it by the POPIA in the processing of any of its information as contained in this Agreement and the Operator is required to comply with all prescripts as detailed in the POPIA relating to all information concerning Transnet.
- 2.5. In terms of this Agreement, the Operator acknowledges that it will obtain and have access to personal information of Transnet and the information of a third party and agrees that it shall only process the information disclosed by Transnet in terms of this Agreement and only for the purposes as detailed in this Agreement and in accordance with any applicable law.
- 2.6. Should there be a need for the Operator to process the personal information and the information of a third party in a way that is not agreed to in this Agreement, the Operator must request consent

from Transnet to the processing of its personal information or and the information of a third party in a manner other than that it was collected for, which consent cannot be unreasonably withheld.

- 2.7. Furthermore, the Operator will not otherwise modify, amend or alter any personal information and the information of a third party submitted by Transnet or disclose or permit the disclosure of any personal information and the information of a third party to any third party without prior written consent from Transnet.
- 2.8. The Operator shall, at all times, ensure compliance with any applicable laws put in place and maintain sufficient measures, policies and systems to manage and secure against all forms of risks to any information that may be shared or accessed pursuant to the services offered to Transnet in terms of this Agreement (physically, through a computer or any other form of electronic communication).
- 2.9. The Operator shall notify Transnet in writing of any unauthorised access to personal information and the information of a third party, cybercrimes or suspected cybercrimes, in its knowledge and report such crimes or suspected crimes to the relevant authorities in accordance with applicable laws, after becoming aware of such crimes or suspected crime. The Operator must inform Transnet of the breach as soon as it has occurred to allow Transnet to take all necessary remedial steps to mitigate the extent of the loss or compromise of personal information and the information of a third party and to restore the integrity of the affected personal information as quickly as is possible.
- 2.10. Transnet may, in writing, request the Operator to confirm and/or make available any personal information and the information of a third party in its possession in relation to Transnet and if such personal information has been accessed by third parties and the identity thereof in terms of the POPIA.
- 2.11. Transnet may further request that the Operator correct, delete, destroy, withdraw consent or object to the processing of any personal information and the information of a third party relating to the Transnet or a third party in the Operator's possession in terms of the provision of the POPIA and utilizing Form 2 of the POPIA Regulations .
- 2.12. In signing this addendum that is in terms of the POPIA, the Operator hereby agrees that it has adequate measures in place to provide protection of the personal information and the information of a third party given to it by Transnet in line with the 8 conditions of the POPIA and that it will provide to Transnet satisfactory evidence of these measures whenever called upon to do so by Transnet.

The Operator is required to provide confirmation that all measures in terms of the POPIA are in place when processing personal information and the information of a third party received from Transnet:

YES	
------------	--

NO	
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2.13. Further, the Operator acknowledges that it will be held liable by Transnet should it fail to process personal information in line with the requirements of the POPIA. The Operator will be subject to any civil or criminal action, administrative fines or other penalty or loss that may arise as a result of the processing of any personal information that Transnet submitted to it.

2.14. Should a Tenderer have any complaints or objections to processing of its personal information, by Transnet, the Tenderer can submit a complaint to the Information Regulator on <https://www.justice.gov.za/infoereg/>, click on contact us, click on complaints.IR@justice.gov.za

3. SOLE AGREEMENT

3.1. The Agreement constitute the sole agreement between the parties relating to the subject matter referred to in paragraph 1.1 of this and no amendment/variation/change shall be of any force and effect unless reduced to writing and signed by or on behalf of both parties.

Signed at _____ on this _____ day of _____ 2021

Name: _____

Title: _____

Signature: _____

TBC

(Operator)

Authorised signatory for and on behalf of TBC who warrants that he/she is duly authorised to sign this Agreement.

AS WITNESSES:

1. Name: _____ Signature: _____

2. Name: _____ Signature: _____

T2.2-25: Insurance provided by the *Contractor*

Clause 84.1 in NEC3 Engineering & Construction Contract (June 2005)(amended June 2006 and April 2013) requires that the *Contractor* provides the insurance stated in the insurance table except any insurance which the *Employer* is to provide as stated in the Contract Data.

Please provide the following details for insurance which the *Contractor* is still to provide. Notwithstanding this information all costs related to insurance are deemed included in the tenderer's rates and prices.

Insurance against (See clause 84.2 of the ECC)	Name of Insurance Company	Cover	Premium
Liability for death of or bodily injury to employees of the <i>Contractor</i> arising out of and in the course of their employment in connection with this contract			
Motor Vehicle Liability Insurance comprising (as a minimum) "Balance of Third Party" Risks including Passenger and Unauthorised Passenger Liability indemnity with a minimum indemnity limit of R5 000 000.			
Insurance in respect of loss of or damage to own property and equipment.			
(Other)			

T2.2-26: Form of Intent to Provide a Performance Guarantee

It is hereby agreed by the Tenderer that a Performance Guarantee drafted **exactly** as provided in the tender documents will be provided by the Guarantor named below, which is a **bank or insurer registered in South Africa**:

Name of Guarantor
(Bank/Insurer)

Address

The Performance Guarantee shall be provided within **2 (Two)** weeks after the Contract Date defined in the contract unless otherwise agreed to by the parties.

Signed

Name

Capacity

On behalf of (name of
tenderer)

Date

Confirmed by Guarantor's Authorised Representative

Signature(s)

Name (print)

Capacity

On behalf of Guarantor
(Bank/insurer)

Date

T2.2-27: Three (3) years audited financial statements

Attached to this schedule is the last three (3) years audited financial statements of the single tenderer/members of the Joint Venture.

NAME OF COMPANY/IES and INDEX OF ATTACHMENTS:

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TRANSNET PORT TERMINALS

TENDER NUMBER: ICLM DB 1007/TPT

DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) DURBAN CONTAINER TERMINAL PIER 1 FOR THE DURATION OF 12 MONTHS.

C1.1 Form of Offer & Acceptance

Offer

The *Purchaser*, identified in the Acceptance signature block, has solicited offers to enter into a contract for the procurement of:

DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) DURBAN CONTAINER TERMINAL PIER 1 AS ONCE OFF PROJECT SUPPLY

The tenderer, identified in the Offer signature block, has

examined the draft contract as listed in the Acceptance section and agreed to provide this Offer.

By the representative of the tenderer, deemed to be duly authorised, signing this part of this Form of Offer and Acceptance the tenderer offers to perform all of the obligations and liabilities of the *Supplier* under the contract including compliance with all its terms and conditions according to their true intent and meaning for an amount to be determined in accordance with the *conditions of contract* identified in the Contract Data.

	The offered total of the Prices exclusive of VAT is	R
	Value Added Tax @ 15% is	R
	The offered total of the amount due inclusive of VAT is ¹	R
	(in words)	

This Offer may be accepted by the *Purchaser* by signing the Acceptance part of this Form of Offer and Acceptance and returning one copy of this document including the Schedule of Deviations (if any) to the tenderer before the end of the period of validity stated in the Tender Data, or other period as agreed, whereupon the tenderer becomes the party named as the *Supplier* in the *conditions of contract* identified in the Contract Data.

Signature(s)

Name(s)

Capacity

**For the
tenderer:**

(Insert name and address of organisation)

Name &
signature of

Date

¹ This total is required by the *Purchaser* for budgeting purposes only. Actual amounts due will be assessed in terms of the *conditions of contract*.

**TRANSNET PORT TERMINALS**

TENDER NUMBER: ICLM DB 1007/TPT

DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) DURBAN CONTAINER TERMINAL PIER 1 FOR THE DURATION OF 12 MONTHS.

witness

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TRANSNET PORT TERMINALS

TENDER NUMBER: ICLM DB 1007/TPT

DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) DURBAN CONTAINER TERMINAL PIER 1 FOR THE DURATION OF 12 MONTHS.

Acceptance

By signing this part of this Form of Offer and Acceptance, the *Purchaser* identified below accepts the tenderer's Offer. In consideration thereof, the *Purchaser* shall pay the *Supplier* the amount due in accordance with the *conditions of contract* identified in the Contract Data. Acceptance of the tenderer's Offer shall form an agreement between the *Purchaser* and the tenderer upon the terms and conditions contained in this agreement and in the contract that is the subject of this agreement.

The terms of the contract, are contained in:

Part C1	Agreements and Contract Data, (which includes this Form of Offer and Acceptance)
Part C2	Pricing Data
Part C3	Scope of Work: Goods Information including Supply Requirements

and drawings and documents (or parts thereof), which may be incorporated by reference into the above listed Parts.

Deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Returnable Schedules as well as any changes to the terms of the Offer agreed by the tenderer and the *Purchaser* during this process of offer and acceptance, are contained in the Schedule of Deviations attached to and forming part of this Form of Offer and Acceptance. No amendments to or deviations from said documents are valid unless contained in this Schedule.

The tenderer shall within two weeks of receiving a completed copy of this agreement, including the Schedule of Deviations (if any), contact the *Purchaser's Supply Manager* (whose details are given in the Contract Data) to arrange the delivery of any securities, bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the *conditions of contract* identified in the Contract Data at, or just after, the date this agreement comes into effect. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.

Notwithstanding anything contained herein, this agreement comes into effect on the *starting date* as set out in Clause 30.1 of the Contract Data by *Purchaser*.

Unless the tenderer (now *Supplier*) within five working days of the date of such receipt notifies the *Purchaser* in writing of any reason why he cannot accept the contents of this agreement, this agreement shall constitute a binding contract between the Parties.

Signature(s)

Name(s)

Capacity

**for the
Purchaser**

(Insert name and address of organisation)

Name &
signature of
witness

Date



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Schedule of Deviations to be completed by the *Purchaser* prior to contract award

Note:

1. This part of the Offer & Acceptance would not be required if the contract has been developed by negotiation between the Parties and is not the result of a process of competitive tendering.
2. The extent of deviations from the tender documents issued by the Purchaser prior to the tender closing date is limited to those permitted in terms of the Conditions of Tender.
3. A tenderer's covering letter must not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid be the subject of agreement reached during the process of Offer and Acceptance, the outcome of such agreement shall be recorded here, and the final draft of the contract documents shall be revised to incorporate the effect of it.

No.	Subject	Details
1		
2		
3		
4		
5		
6		
7		

By the duly authorised representatives signing this Schedule of Deviations below, the *Purchaser* and the tenderer agree to and accept this Schedule of Deviations as the only deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Tender Schedules, as well as any confirmation, clarification or changes to the terms of the Offer agreed by the tenderer and the *Purchaser* during this process of Offer and Acceptance.

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the tender documents and the receipt by the tenderer of a completed signed copy of this Form shall have any meaning or effect in the contract between the parties arising from this Agreement.

For the tenderer:

For the Purchaser

Signature

Name

Capacity

On behalf
of

(Insert name and address of organisation)

Transnet SOC Ltd

Name &
signature
of witness

Date

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C1.2 Contract Data

Part one - Data provided by the *Employer*

Clause	Statement	Data
1	General	
	The <i>conditions of contract</i> are the core clauses and the clauses for main Option	A: Activity Schedule
	dispute resolution Option	W1: Dispute resolution procedure
	and secondary Options	X5: Sectional Completion X7: Delay damages X13: Performance Bond X16: Retention X18: Limitation of liability Z: Additional conditions of contract
	of the NEC3 Engineering and Construction Contract June 2005 (amended June 2006 and April 2013)	
10.1	The <i>Employer</i> is:	Transnet SOC Ltd (Registration No. 1990/000900/30)
	Address	Registered address: Carlton Centre 150 Commissioner Street Johannesburg 2001
	Having elected its Contractual Address for the purposes of this contract as:	Transnet Port Terminals 202 Anton Lembede Street Durban 4001

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10.1	SCM contact: (Name)	Hlengiwe Mthimkhulu
	Address	Transnet Port Terminals Port of Durban
	Tel	031 361 8708
	e-mail	hlengiwe.mthimkhulu@transnet.net
	The <i>Project Manager</i> is: (Name)	Wilbert Dzitiro
	Address	Transnet Port Terminals Port of Durban
	Tel	
	e-mail	wilbert.dzitiro@transnet.net
10.1	The <i>Supervisor</i> is: (Name)	Samukelo Magcaba
	Address	Transnet Port Terminals Port of Durban
	Tel No.	
	e-mail	samukelo.magcaba@transnet.net
11.2(13)	The <i>works</i> are	The Design, Manufacture, Off Site Testing, Supply, Delivery, Installation, Testing and Commissioning of One (1) New 1000KVA Mini Substation and One (1) 1000KVA Mobile Generator for the Engineering Equipment Services (EES) Building at Transnet Port Terminals (TPT) Durban Container Terminal Pier 1 for the duration of 12 months
11.2(14)	The following matters will be included in the Risk Register	no additional risk
11.2(15)	The <i>boundaries of the site</i> are	As stated in Part C4.1." Description of the Site and its surroundings"

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11.2(16)	The Site Information is in	Part C4
11.2(19)	The Works Information is in	Part C3
12.2	The <i>law of the contract</i> is the law of	the Republic of South Africa subject to the jurisdiction of the Courts of South Africa.
13.1	The <i>language of this contract</i> is	English
13.3	The <i>period for reply</i> is	2 weeks
2	The <i>Contractor's</i> main responsibilities	No additional data is required for this section of the <i>conditions of contract</i>.
3	Time	
11.2(3)	The <i>completion date</i> for the whole of the <i>works</i> is	12 Months

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11.2(9)	The <i>key dates</i> and the <i>conditions</i> to be met are:	Condition to be met	key date
		1 Site Establishment	TBC
		2 FAT for the new Mini-Sub	TBC
		3 Supply, install and commissioning of new Mini-Sub.	TBC
		4 Complete repairs for the existing mini substation.	TBC
		5 FAT for the new Gen Set Supply, installation, and testing of a New Gen set.	TBC
		6 Training for the employer's personnel.	TBC
		7 Commissioning of the Works.	TBC
		8 Handover	TBC

30.1	The <i>access dates</i> are	Part of the Site	Date
		1 Access to entire site	TBC

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31.1	The <i>Contractor</i> is to submit a first programme for acceptance within	2 weeks of the Contract Date.
31.2	The <i>starting date</i> is	TBA
32.2	The <i>Contractor</i> submits revised programmes at intervals no longer than	2 weeks.
35.1	The <i>Employer</i> is not willing to take over the <i>works</i> before the Completion Date.	
4	Testing and Defects	
42.2	The <i>defects date</i> is	52 (fifty-two) weeks after Completion of the whole of the <i>works</i>.
43.2	The <i>defect correction period</i> is	2 weeks
5	Payment	
50.1	The <i>assessment interval</i> is monthly on the	25th (twenty fifth) day of each successive month.
51.1	The <i>currency of this contract</i> is the	South African Rand.
51.2	The period within which payments are made is	Payment will be affected on or before the last day of the month following the month during which a valid Tax Invoice and Statement were received.
51.4	The <i>interest rate</i> is	the prime lending rate of Standard Bank of South Africa.
6	Compensation events	
60.1(13)	The <i>weather measurements</i> to be recorded for each calendar month are,	the cumulative rainfall (mm) the number of days with rainfall more than 10 mm the number of days with wind speed exceeding 40 km/hr

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The place where weather is to be recorded (on the Site) is: **The *Contractor's* Site establishment area**

The *weather data* are the records of past *weather measurements* for each calendar month which were recorded at: **Durban Weather Station**

and which are available from: **South African Weather Service 012 367 6023 or info3@weathersa.co.za.**

7	Title	No additional data is required for this section of the <i>conditions of contract</i>.
8	Risks and insurance	
80.1	These are additional <i>Employer's</i> risks	No additional risks are accepted by the Employer other than those which are provided for in this contract
84.1	The <i>Employer</i> provides these insurances from the Insurance Table	
	1 Insurance against:	Loss of or damage to the <i>works</i>, Plant and Materials is as stated in the Insurance policy for Contract Works/ Public Liability.
	Cover / indemnity:	to the extent as stated in the insurance policy for Contract Works / Public Liability
	The deductibles are:	as stated in the insurance policy for Contract Works / Public Liability
	2 Insurance against:	Loss of or damage to property (except the <i>works</i>, Plant and Materials & Equipment) and liability for bodily injury to or death of a person (not an employee of the <i>Contractor</i>) arising out of or in connection with the performance of the Contract as stated in the insurance policy for Contract Works / Public Liability
	Cover / indemnity	Is to the extent as stated in the insurance policy for Contract Works / Public Liability

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The deductibles are		as stated in the insurance policy for Contract Works / Public Liability
3	Insurance against:	Loss of or damage to Equipment (Temporary Works only) as stated in the insurance policy for contract Works and Public Liability
	Cover / indemnity	Is to the extent as stated in the insurance policy for Contract Works / Public Liability
	The deductibles are:	As stated in the insurance policy for Contract Works / Public Liability
4	Insurance against:	Contract Works SASRIA insurance subject to the terms, exceptions and conditions of the SASRIA coupon
	Cover / indemnity	Cover / indemnity is to the extent provided by the SASRIA coupon
	The deductibles are	The deductibles are, in respect of each and every theft claim, 0,1% of the contract value subject to a minimum of R2,500 and a maximum of R25,000.
	Note:	The deductibles for the insurance as stated above are listed in the document titled "Certificate of Insurance: Transnet (SOC) Limited Principal Controlled Insurance." To be issued to the awarded contractor.

- 84.1 The minimum limit of indemnity for insurance in respect of death of or bodily injury to employees of the *Contractor* arising out of and in the course of their employment in connection with this contract for any one event is **The *Contractor* must comply at a minimum with the provisions of the Compensation for Occupational Injuries and Diseases Act No. 130 of 1993 as amended.**

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-
- The *Contractor* provides these additional Insurances
- 1 **Where the contract requires that the design of any part of the *works* shall be provided by the *Contractor* the *Contractor* shall satisfy the *Employer* that professional indemnity insurance cover in connection therewith has been affected**
 - 2 **Where the contract involves manufacture, and/or fabrication of Plant & Materials, components or other goods to be incorporated into the *works* at premises other than the site, the *Contractor* shall satisfy the *Employer* that such plant & materials, components or other goods for incorporation in the *works* are adequately insured during manufacture and/or fabrication and transportation to the site.**
 - 3 **Should the *Employer* have an insurable interest in such items during manufacture, and/or fabrication, such interest shall be noted by endorsement to the *Contractor's* policies of insurance as well as those of any sub-contractor**
 - 4 **Motor Vehicle Liability Insurance comprising (as a minimum) "Balance of Third Party" Risks including Passenger and Unauthorised Passenger Liability indemnity with a minimum indemnity limit of R 5 000 000.**

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		5 The insurance coverage referred to in 1, 2, 3, and 4 above shall be obtained from an insurer(s) in terms of an insurance policy approved by the <i>Employer</i>. The <i>Contractor</i> shall arrange with the insurer to submit to the <i>Project Manager</i> the original and the duplicate original of the policy or policies of insurance and the receipts for payment of current premiums, together with a certificate from the insurer or insurance broker concerned, confirming that the policy or policies provide the full coverage as required. The original policy will be returned to the <i>Contractor</i>.
84.2	The minimum limit of indemnity for insurance in respect of loss of or damage to property (except the works, Plant, Materials and Equipment) and liability for bodily injury to or death of a person (not an employee of the <i>Contractor</i>) caused by activity in connection with this contract for any one event is	Whatever the <i>Contractor</i> requires in addition to the amount of insurance taken out by the <i>Employer</i> for the same risk.
84.2	The insurance against loss of or damage to the works, Plant and Materials as stated in the insurance policy for contract works and public liability selected from:	Principal Controlled Insurance policy for Contract OR Project Specific Insurance for the contract
9	Termination	There is no additional Contract Data required for this section of the <i>conditions of contract</i>.
10	Data for main Option clause	
A	Priced contract with Activity Schedule	No additional data is required for this Option.
11	Data for Option W1	

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W1.1	The <i>Adjudicator</i> is	Both parties will agree as and when a dispute arises. If the parties cannot reach an agreement on the <i>Adjudicator</i> , the Chairman of the Association of Arbitrators will appoint an <i>Adjudicator</i> .		
W1.2(3)	The <i>Adjudicator nominating body</i> is: If no <i>Adjudicator nominating body</i> is entered, it is:	The Chairman of the Association of Arbitrators (Southern Africa) the Association of Arbitrators (Southern Africa)		
W1.4(2)	The <i>tribunal</i> is:	Arbitration		
W1.4(5)	The <i>arbitration procedure</i> is	The Rules for the Conduct of Arbitrations of the Association of Arbitrators (Southern Africa)		
	The place where arbitration is to be held is	Durban, South Africa		
	The person or organisation who will choose an arbitrator - if the Parties cannot agree a choice or - if the arbitration procedure does not state who selects an arbitrator, is	The Chairman of the Association of Arbitrators (Southern Africa)		
12	Data for secondary Option clauses			
X5	Sectional Completion			
X5.1	The <i>completion date</i> for each <i>section</i> of the <i>works</i> is:	<i>Section</i>	Description	<i>Completion date</i>
		1	Mobile Generator	TBC
		2	Min Substation	TBC
X7	Delay damages			
X7.1	Delay damages for Completion of the whole of the <i>works</i> are	0.1% of the total contract value per day limited to 10% of the total contract value		

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X13	Performance bond	
X13.1	The amount of the performance bond is	5% of the total of the Prices
X16	Retention	
X16.1	The retention free amount is	Nil
	The retention percentage is	10% on all payments certified.
X18	Limitation of liability	
X18.1	The <i>Contractor's</i> liability to the <i>Employer</i> for indirect or consequential loss is limited to:	An amount being equal to the loss or total contract value inclusive of VAT
X18.2	For any one event, the <i>Contractor's</i> liability to the <i>Employer</i> for loss of or damage to the <i>Employer's</i> property is limited to:	The deductible of the relevant insurance policy
X18.3	The <i>Contractor's</i> liability for Defects due to his design which are not listed on the Defects Certificate is limited to:	The cost of correcting the Defect
X18.4	The <i>Contractor's</i> total liability to the <i>Employer</i> for all matters arising under or in connection with this contract, other than excluded matters, is limited to:	The Total of the Prices
X18.5	The <i>end of liability date</i> is	A period being 12 (twelve) consecutive months after the completion by the Contractor of the whole of the works to the Employer in terms of the Contract

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Z	<i>Additional conditions of contract are:</i>	
Z2	Additional clause relating to Performance Bonds and/or Guarantees	
Z2.1		The Performance Guarantee under X13 above shall be an irrevocable, on-demand performance guarantee, to be issued exactly in the form of the Pro Forma documents provided for this purpose under C1.3 (Forms of Securities), in favour of the <i>Employer</i> by a financial institution reasonably acceptable to the <i>Employer</i>.

Z3 Additional clauses relating to Joint Venture

Z3.1

Insert the additional core clause 27.5

27.5. In the instance that the *Contractor* is a joint venture, the *Contractor* shall provide the *Employer* with a certified copy of its signed joint venture agreement, and in the instance that the joint venture is an 'Incorporated Joint Venture,' the Memorandum of Incorporation, within 4 (four) weeks of the Contract Date.

The Joint Venture agreement shall contain but not be limited to the following:

- **A brief description of the Contract and the Deliverables;**
- **The name, physical address, communications addresses and domicilium citandi et executandi of each of the constituents and of the Joint Venture;**
- **The constituent's interests;**
- **A schedule of the insurance policies, sureties, indemnities and guarantees which must be taken out by the Joint Venture and by the individual constituents;**
- **Details of an internal dispute resolution procedure;**
- **Written confirmation by all of the constituents:**
 - i. **of their joint and several liabilities to the *Employer* to Provide the Works;**
 - ii. **identification of the lead partner in the joint venture confirming the authority of the lead partner to bind the joint venture through the *Contractor's* representative;**

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- iii. Identification of the roles and responsibilities of the constituents to provide the Works.
- Financial requirements for the Joint Venture:
- iv. the working capital requirements for the Joint Venture and the extent to which and manner whereby this will be provided and/or guaranteed by the constituents from time to time;
- v. the names of the auditors and others, if any, who will provide auditing and accounting services to the Joint Venture.

Z3.2

Insert additional core clause 27.6

27.6. The *Contractor* shall not alter its composition or legal status of the Joint Venture without the prior approval of the *Employer*.

Z4 Additional obligations in respect of Termination

Z4.1

The following will be included under core clause 91.1:

In the second main bullet, after the word 'partnership' add 'joint venture whether incorporate or otherwise (including any constituent of the joint venture)' and

Under the second main bullet, insert the following additional bullets after the last sub-bullet:

- commenced business rescue proceedings (R22)
- repudiated this Contract (R23)

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Z4.2	Termination Table	The following will be included under core clause 90.2 Termination Table as follows: Amend "A reason other than R1 – R21" to "A reason other than R1 – R23"
Z4.3		Amend "R1 – R15 or R18" to "R1 – R15, R18, R22 or R23."
Z5	Right Reserved by the Employer to Conduct Vetting through SSA	
Z5.1		The <i>Employer</i> reserves the right to conduct vetting through State Security Agency (SSA) for security clearances of any <i>Contractor</i> who has access to National Key Points for the following without limitations: 1. Confidential – this clearance is based on any information which may be used by malicious, opposing or hostile elements to harm the objectives and functions of an organ of state. 2. Secret – clearance is based on any information which may be used by malicious, opposing or hostile elements to disrupt the objectives and functions of an organ of state. 3. Top Secret – this clearance is based on information which may be used by malicious, opposing or hostile elements to neutralise the objectives and functions of an organ of state.

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DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) DURBAN CONTAINER TERMINAL PIER 1 FOR THE DURATION OF 12 MONTHS

Z6	Additional Clause Relating to Collusion in the Construction Industry	
Z6.1		The contract award is made without prejudice to any rights the <i>Employer</i> may have to take appropriate action later with regard to any declared tender rigging including blacklisting.
Z7	Protection of Personal Information Act	
Z7.1		The <i>Employer</i> and the <i>Contractor</i> are required to process information obtained for the duration of the Agreement in a manner that is aligned to the Protection of Personal Information Act.
Z8	Assignment and Waiver	
Z8.1		Neither the Employer nor the Contractor may, without the written consent of the other, assign the Contract or any part thereof or any obligation under the Contract or cede any right or benefit thereunder.
Z8.2		No grant by the Contractor or the Employer to the other of any concession, waiver, condonation or allowance is, in respect of any specific event or circumstance other than that in respect of which the grant was made to constitute a waiver of the rights of the grantor in terms of the Contract or an estoppel of the grantor's right to enforce the provisions of the Contract.

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**Z9 Anti-corruption, TPT
Indemnity**

Z9.1 Anti - Corruption

In the event that the Contractor is alleged to be, or found by any competent court or Tribunal to be involved in any corrupt, unlawful or illegal activities, or is being investigated for any alleged corrupt, unlawful or illegal activity in relation to Transnet or any other party with whom Contractor does business, or if Transnet learns that:

- a. Improper payments are being or have been made or offered to Transnet officials or any other person by Contractor or those acting on behalf of Contractor with respect to the Services; or**
- b. *Contractor* or those acting on behalf of *Contractor* has accepted any payment or benefit, regardless of value, as an improper inducement to award, obtain or retain business or otherwise gain or grant an improper business advantage from or to any other person or entity.**

Transnet reserves the right to terminate the aforementioned awarded contract, by giving immediate written notice to the effect that, all or any Agreements it may have with *Contractor* or any and all Awards made *Contractor* for breach of this clause.

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Further in the event of such termination, Contractor shall not be entitled to any further payment, regardless of any activities undertaken or agreements with additional third parties entered into by Contractor prior to such termination; and further.

Contractor shall be liable to Transnet for any actual damages or remedies as provided either in the Agreements that are to be signed or in law.

Z9.2 Indemnity

1) Contractor irrevocably and unconditionally undertakes to indemnify and does hereby keep TPT indemnified and hold TPT harmless against, and, in respect of, all and any loss or damage incurred by itself or any other third- Party as a result of, arising out of or connected with any failure, act or omission or breach of this Agreement by Contractor or any of its employees, security officers, servants, agents , assigns, contractors or sub-contractors, or occurring during or as a result of the provision by the Contractor of the Security Service. Such absolute obligation of Contractor to indemnify TPT on a full indemnity basis against all claims shall including, but not be limited to:

a) liability in respect of any loss or damage to property, whether movable or immovable, belonging to third parties; or other

b) liability in respect of lost property belonging to third parties;

c) liability arising out of any unlawful act committed by or *Contractor* or its employees, security officers, servants, agents, contractors and sub-contractors during the process of rendering a Security Services; or at any other time when a claim

has been and could be made against the TPT arising out of the acts of or omissions of one or more of such persons;

d) liability in respect of the death, unlawful arrest, injury, illness or disease of any person, or entity should the damage, loss, unlawful arrest, death, injury, illness or disease referred to above be attributable to or arise out of the Security Services that are being or have been rendered by the Contractor, its agents, contractors, sub-contractors in terms of this Agreement.

2) *Contractor* shall at its own expense and with effect from the date of signature hereof, take reasonable precautions for the protection of life and or property that is in any way connected with in whole or any part of this agreement and shall hold TPT harmless against all claims for any loss, demands, proceedings, damages, costs, charges, expenses whatsoever, arising out of this agreement.

3) *Contractor* agrees that it shall intervene in any claim arising and to indemnify and hold TPT harmless from any claim, damage, loss, cost, expense, legal expenses, arising from or attributable to *Contractor* provision of services, its acts, or omissions or those of its agents, employees, sub-contractors, representative/s or other for whom TPT may be / may not be deemed responsible for in terms of the agreement.

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C1.2 Contract Data

Part two - Data provided by the *Contractor*

The tendering *Contractor* is advised to read both the NEC3 Engineering and Construction Contract - June 2005 (with amendments June 2006 and April 2013) and the relevant parts of its Guidance Notes (ECC3-GN) in order to understand the implications of this Data which the tenderer is required to complete. An example of the completed Data is provided on pages 156 to 158 of the ECC3 Guidance Notes.

Completion of the data in full, according to Options chosen, is essential to create a complete contract.

Clause	Statement	Data
10.1	The <i>Contractor</i> is (Name):	
	Address	
	Tel No.	
	Fax No.	
11.2(8)	The <i>direct fee percentage</i> is	%
	The <i>subcontracted fee percentage</i> is	%
11.2(18)	The <i>working areas</i> are the Site and	
24.1	The <i>Contractor's</i> key persons are:	
	1 Name:	
	Job:	
	Responsibilities:	
	Qualifications:	
	Experience:	
	2 Name:	
	Job	
	Responsibilities:	
	Qualifications:	

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	Experience:	
		CV's (and further key persons data including CVs) are appended to Tender Schedule entitled.
11.2(14)	The following matters will be included in the Risk Register	
31.1	The programme identified in the Contract Data is	
B	Priced contract with Activity Schedule	
11.2(21)	The <i>activity schedule</i> is in	C2 Part 2 Pricing Data Option A
11.2(31)	The tendered total of the Prices is	(in figures) (in words), excluding VAT
	Data for Schedules of Cost Components	<i>Note "SCC" means Schedule of Cost Components starting on page 60 of ECC, and "SSCC" means Shorter Schedule of Cost Components starting on page 63 of ECC.</i>

B	Priced contract with bill of quantities	Data for the Shorter Schedule of Cost Components		
41 in SSCC	The percentage for people overheads is:	%		
21 in SSCC	The published list of Equipment is the last edition of the list published by			
	The percentage for adjustment for Equipment in the published list is	% (state plus or minus)		
22 in SSCC	The rates of other Equipment are:	Equipment	Size or capacity	Rate

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61 in SCCC	The hourly rates for Defined Cost of design outside the Working Areas are	Category of employee		Hourly rate
62 in SCCC	The percentage for design overheads is	%		
63 in SCCC	The categories of design employees whose travelling expenses to and from the Working Areas are included in Defined Cost are:			



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C1.3 Forms of Securities

Pro forma Performance Guarantee

For use with the NEC3 Engineering & Construction Contract

The *conditions of contract* stated in the Contract Data Part 1 include the following Secondary Option:

Option X13: Performance bond

The pro forma document for this Guarantee is provided here for convenience but is to be treated as part of the *Works Information*.

The organisation providing the Guarantee does so by copying the pro forma document onto its letterhead without any change to the text or format and completing the required details. The completed document is then given to the *Employer* within the time stated in the contract.

The Performance Bond needs to be issued by an institution that are reasonably acceptable to the *Employer*.

Transnet may choose to not to accept an Issuer. Should the issuer not being accepted, the performance bond needs to be replaced by an issuer that are acceptable to Transnet. Issuers need to be verified for acceptance by Transnet before a performance bond is issued.



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Pro-forma Performance Bond (for use with Option X13)

(to be reproduced exactly as shown below on the letterhead of the Surety)

Transnet SOC Ltd
C/o Transnet Port Terminals
Transnet Corporate Centre
138 Eloff Street
Braamfontein
Johannesburg
2000

Date:

Dear Sirs,

Performance Bond for Contract No. iCLM DB 1007/TPT

With reference to the above numbered contract made or to be made between

Transnet SOC Limited, Registration No. 1990/000900/30

(the *Employer*) and

{Insert registered name and address of the *Contractor*}

(the *Contractor*), for

{Insert details of the *works* from the Contract Data}

(The Design, Manufacture, Off Site Testing, Supply, Delivery, Installation, Testing and Commissioning of One (1) New 1000KVA Mini Substation and One (1) 1000KVA Mobile Generator For The Engineering Equipment Services (EES) Building at Transnet Port Terminals (TPT) Durban Container Terminal Pier 1 as once off Project Supply).

I/We the undersigned

on behalf of the
Guarantor

of physical address



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and duly authorised thereto do hereby bind ourselves as Guarantor and co-principal debtors in solidum for the due and faithful performance of all the terms and conditions of the Contract by the *Contractor* and for all losses, damages and expenses that may be suffered or incurred by the *Employer* as a result of non-performance of the Contract by the *Contractor*, subject to the following conditions:

1. The terms *Employer*, *Contractor*, *Project Manager*, *works* and Completion Certificate have the meaning as assigned to them by the *conditions of contract* stated in the Contract Data for the aforesaid Contract.
2. We renounce all benefits from the legal exceptions "Benefit of Excussion and Division", "No value received" and all other exceptions which might or could be pleaded against the validity of this bond, with the meaning and effect of which exceptions we declare ourselves to be fully acquainted.
3. The *Employer* has the absolute right to arrange his affairs with the *Contractor* in any manner which the *Employer* deems fit and without being advised thereof the Guarantor shall not have the right to claim his release on account of any conduct alleged to be prejudicial to the Guarantor. Without derogating from the foregoing compromise, extension of the construction period, indulgence, release or variation of the *Contractor's* obligation shall not affect the validity of this performance bond.
4. This bond will lapse on the earlier of
 - the date that the Guarantor receives a notice from the *Project Manager* stating that the Completion Certificate for the whole of the *works* has been issued, that all amounts due from the *Contractor* as certified in terms of the contract have been received by the *Employer* and that the *Contractor* has fulfilled all his obligations under the Contract, or
 - the date that the Surety issues a replacement Performance Bond for such lesser or higher amount as may be required by the *Project Manager*.
5. Always provided that this bond will not lapse in the event the Guarantor is notified by the *Project Manager*, (before the dates above), of the *Employer's* intention to institute claims and the particulars thereof, in which event this bond shall remain in force until all such claims are paid and settled.
6. The amount of the bond shall be payable to the *Employer* upon the *Employer's* demand and no later than 7 days following the submission to the Guarantor of a certificate signed by the *Project Manager* stating the amount of the *Employer's* losses, damages and expenses incurred as a result of the non-performance aforesaid. The signed certificate shall be deemed to be conclusive proof of the extent of the *Employer's* loss, damage and expense.
7. Our total liability hereunder shall not exceed the sum of:
 (say) _____
 R _____
8. This Performance Bond is neither negotiable nor transferable and is governed by the laws of the Republic of South Africa, subject to the jurisdiction of the courts of the Republic of South Africa



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Signed at _____ on this _____ day of _____ 2024

Signature(s)

Name(s) (printed)

Position in Guarantor company

Signature of Witness(s)

Name(s) (printed)

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PART 2: PRICING DATA

Document reference	Title	No of pages
	This cover page	1
C2.1	Pricing instructions: Option A	3
C2.2	Activity Schedule	1
	Total number of pages	6

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C2.1 Pricing instructions: Option A

1. The conditions of contract

1.1. How the contract prices work and assesses it for progress payments

Clause 11 in NEC3 Engineering and Construction Contract, June 2005, (with amendments June 2006 and April 2013) (ECC) Option A states:

Identified and defined terms

- 11
- 11.2 (20) The Activity Schedule is the *activity schedule* unless later changed in accordance with this contract.
- (22) Defined Cost is the cost of the components in the Shorter Schedule of Cost Components whether work is subcontracted or not excluding the cost of preparing quotations for compensation events.
- (27) The Price for Work Done to Date is the total of the Prices for
- each group of completed activities and
 - each completed activity which is not in a group
- A completed activity is one which is without Defects which would either delay or be covered by immediately following work.
- (30) The Prices are the lump sums for each of the activities on the Activity Schedule unless later changed in accordance with this contract.

1.2. Measurement and Payment

- 1.2.1 The Activity Schedule provides the basis of all valuations of the Price for Work Done to Date, payments in multiple currencies, price adjustments for inflation and general progress monitoring.
- 1.2.2 The amount due at each assessment date is based on **completed activities and/or milestones** as indicated on the Activity Schedule.
- 1.2.3 The Activity Schedule work breakdown structure provided by the *Contractor* is based on the Activity Schedule provided by the *Employer*. The activities listed by the *Employer* are the minimum activities acceptable and identify the specific activities which are required to achieve Completion. The activity schedule work breakdown structure is compiled to the satisfaction of the *Project Manager* with any additions and/or amendments deemed necessary.
- 1.2.4 The *Contractor's* detailed Activity Schedule summates back to the Activity Schedule provided by the *Employer* and is in sufficient detail to monitor completion of activities related to the Accepted Programme in order that payment of completed activities may be assessed.
- 1.2.5 The short descriptions in the Activity Schedule are for identification purposes only. All work described in the Works Information is deemed included in the activities.

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- 1.2.6 The Activity Schedule is integrated with the Prices, Accepted Programme and where required the forecast rate of payment schedule.
- 1.2.7 Activities in multiple currencies are separately identified on both the Activity Schedule and the Accepted Programme for each currency.
- 1.2.8 The tendered total of the prices as stated in the Contract Data is obtained from the Activity Schedule summary. The tendered total of the prices includes for all direct and indirect costs, overheads, profits, risks, liabilities and obligations relative to the Contract.

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C2.2 Activity Schedule

The Employer requires at least the following activities to be priced. Each activity must be priced individually.

The price reflected below must be fixed and firm. Failure to provide a fixed and firm price will declare the Contractor nonresponsive.

The Employer's proposed percentage payment split is reflected below.

Contractors are to advise details of any alternative proposed payment split.

The proposed payment date MUST be completed.

It is Transnet's preference to enter into a Rand based contract, where the contractor will hedge the Foreign exchange (FX) risk exposure on their balance sheet at a cost acceptable to Transnet by verifying cost of hedging with Transnet Treasury before hedge execution by the contractor. Should this not be possible, and should it be required that the Employer hedge the FX risk, the Contractor will be required to re-imburse the Employer for any hedging related costs (losses that arise due to the moving of hedges), in the event that a payment cannot take place on the hedged date due to the Contractor.

It is Transnet's preference to enter into a contract on a DDP (Incoterms 2010, Port of Durban) basis. However, a DAP (Incoterms 2010, Port of Durban) will be accepted, provided the contractor agrees to reimburse the Employer in respect of any additional costs to be incurred as a result of choosing the DAP Incoterms 2010, e.g., Customs VAT, cargo dues and other cargo clearance levies relating to this contract.

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C2.2 Activity Schedule

Mandatory Returnable

Item	Activity Description	Unit	Qty.	Unit Cost	Total cost
1	The scope of Goods				
1.1	The Contractor to provide safety file for approval prior to the commencement of the works as per <i>Employer</i> Health and Safety Project Specifications.	item	1		
1.2	Decommission the existing mini substation. Including all decommissioning works.	item	1		
1.3	Design, manufacture, and off-site testing of one (1) new 1000kva Mini Substation	item	1		
1.4	Supply, delivery, and installation of one (1) new 1000kva Mini Substation	item	1		
1.5	Testing and commissioning of one (1) new 1000kva Mini Substation	item	1		
1.6	Design, manufacture, and off-site testing of one (1) new 1000kva Mobile Generator	item	1		
1.7	Supply, delivery, and installation of one (1) new 1000kva Mobile Generator	item	1		
1.8	Testing and commissioning of one (1) new 1000kva Mobile Generator	item	1		
1.9	Training of Employer's Operation and Maintenance personnel	item	1		
1.10	Provide a price of Maintenance of Mini Substation and Mobile Generator	item	1		
1.11	The Contractor to make an allowance of 5m cable for all LV feeders from the existing mini substation	item	1		
1.12	Select, supply, and install new terminations (price for all terminations including plugged type as per the SoW).	item	1		
1.13	Supply and install a 400m cable for connecting the genset to the mini-sub.	item	1		
1.14	Earthing and lightning protection.	item	1		

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1.15	Factory Acceptance tests.	Item	1		
1.16	Site Acceptance tests.	item	1		
1.17	Commissioning (all requirements as per the SoW).	item	1		

Total Price to be carried over to the Form of Offer & Acceptance C1.1 (Excl. VAT)

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PART 3: SCOPE OF *WORK/WORKS* INFORMATION

Document reference	Title	No of pages
	This cover page	1
C3.1	<i>Employer's Works Information</i>	
C3.2	<i>Contractor's Works Information</i>	
	Total number of pages	24

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C3.1 EMPLOYER'S WORKS INFORMATION: FOR THE DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) PIER 1 CONTAINER TERMINAL.

1. Description of the works

1.1. Executive Overview

The *works* that the *Contractor* is to perform include design, manufacture, off site testing, supply, delivery, installation, testing and commissioning of one (1) new 1000kva Mini Substation and one (1) 1000kva Mobile Generator for the Engineering Equipment Services (EES) building at Transnet Port Terminals (TPT) Pier 1 Container Terminal.

Durban Container Terminal (DCT) 'Pier 1' in the port of Durban is a specialized maritime facility with dedicated infrastructure and equipment for handling containerized cargo. The EES and Workshop, together with the administration offices of the terminal manager, administration staff, and a server room at Pier 1, are electrically powered by an aged 630 kVA mini substation located at the EES building. The mini substation is now unreliable due to previous failures, its many years of service, and its degrading condition. The facility also has a 1000 kVA standby mobile generator for backup power during outages. However, the standby mobile generator, which has been in use since 2016 after having been relocated from Maydon Wharf, has broken down due to age and use and is no longer in service. As a result, the facility is completely depending on the existing unreliable mini substation.

It is in this context that DCT Pier 1 seeks the services of a qualified *Contractor* to supply and install a new 1000 kVA mini substation and a 1000 kVA mobile generator. The *Contractor* will also refurbish the existing 630 kVA mini substation and do all necessary tests thereafter.

1.1.1. The *Contractor* to be appointed shall be:

1.1.1.1. Suitably qualified and experienced to supply, install, test, and issue a valid certificate of compliance for a standby generator and mini substation upon successful Completion of the *works*.

TRANSNET PORT TERMINALS

TENDER NUMBER: ICLM DB 1007/TPT

DESCRIPTION OF THE WORKS: DESIGN, MANUFACTURE, OFF SITE TESTING, SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF ONE (1) NEW 1000KVA MINI SUBSTATION AND ONE (1) 1000KVA MOBILE GENERATOR FOR THE ENGINEERING EQUIPMENT SERVICES (EES) BUILDING AT TRANSNET PORT TERMINALS (TPT) DURBAN CONTAINER TERMINAL PIER 1 FOR THE DURATION OF 12 MONTHS.

1.1.1.2. Be registered with department of labour as an electrical *Contractor* and be an accredited *Contractor* with the merchandise supplier.

1.1.1.3. Execute the *works* to a high quality and safe manner, complying with the project requirements and applicable statutory requirements, regulations, and standards where applicable, such as:

- a) Occupational Health and Safety Act (Act 85 of 1993) – Electrical Machinery Regulations.
- b) SANS 10142 – Code of Practice for Electrical Installations.
- c) OEM recommendations – where required.

1.2. The scope of the works

1.2.1. Design, manufacture, off site testing, supply, delivery, installation, testing and commissioning of one (1) new 1000kva Mini Substations for the Engineering Equipment Services (EES) building at Transnet Port Terminals (TPT) DCT Pier 1 Container Terminal as detailed in section 4.

1.2.2. Design, manufacture, off site testing, supply, delivery, installation, testing and commissioning of one (1) 1000kva Mobile Generator for the Engineering Equipment Services (EES) building at Transnet Port Terminals (TPT) DCT Pier 1 Container Terminal as detailed in section 4.

1.2.3. Decommission the existing mini substation, transport, refurbish, and deliver it back to the stores at DCT Pier 1 Container Terminal.

1.2.4. Training of *Employer's* Operation and Maintenance personnel.

2. Definitions/ Terminology

2.1. SPECIFICATION means the document/s forming part of the contract in which are described the methods of executing the various items of work to be done, and the nature and quality of the materials to be supplied and includes technical schedules and drawings attached thereto as well as all samples and patterns.

2.2. Reference in the Works Information and standard specifications to “equipment” means the mini substations and associated equipment and its components as defined in the scope of the *works*.

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Table 1: Terminology

Terminology	Description
<i>Employer</i>	For this document, the <i>Employer</i> shall be regarded as Transnet Port Terminals
<i>Contractor</i>	For the purposes of this document the <i>Contractor</i> refers to the person(company) whom has been awarded the contract to perform the works stipulated by the <i>Employer</i>
Specialist	Is a person or company appointed by the <i>Contractor</i> or employer who has significant expertise in execution of a particular work
<i>Employer's Engineer</i>	For this document, the <i>Employer's Engineer</i> is a technical representative appointed by the <i>Employer</i> who holds a Bsc/BEng/Btech/Ndip and registered with ECSA as Pr Eng/Pr Tech in a relevant field of engineering. The purpose for the <i>Employer's Engineer</i> is to review, support and accept the designs, proposals, documents, and drawings for this project.
Accepted	For this document, the term "Accepted" shall be used to describe that an activity/task/document/drawing/design/calculation is received and believed to be true. However, by Accepting any of the above items does not alleviate legal and ethical responsibilities that is carried by the ECSA responsible signatory for the item.
Supported	For this document, the term "Supported" shall be used to describe that an activity/task/document/drawing/design/calculation is received and the contents herein with are agreed upon with encouragement to proceed.
Nominal voltage	The rms phase-to-phase voltage of the supply to which equipment is connected.
Rated voltage	The highest rms phase-to-phase voltage of the supply for which equipment is designed to operate continuously
Dangerous/hazardous task	specific element of work, which has produced and/or which possesses the potential to produce major loss or harm to people, assets, processes/production and/or the environment when performed properly.

Table 2: Definition/Abbreviation

Abbreviation	Definition
°C	Degree Celsius
A	Ampere
ACB	Air Circuit Breaker
AIS	Air Insulated Switchgear
D	Diameter
ECC	Earth Continuity Conductor
ECSA	Engineering Council of South Africa
FAT	Factory Acceptance Test

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FEL	Front End Loading
GIS	Gas Insulated Switchgear
Hz	Hertz
ICs	Service Short Circuit Current
km	Kilo meter
kVA	Kilo-Volt Ampere
LV	Low Voltage
m	Meter
MCB	Miniature Circuit Breaker
MCC	Motor Control Centre
MCCB	Moulded Case Circuit Breaker
mm	millimetre
mm ²	millimetre squared
MV	Medium Voltage
ONAN	Oil Natural Air Natural
ORS	Owners Requirement Specification
PVC	Polyvinyl Chloride
SCADA	Supervisory Control and Data Acquisition
SANS	South African National Standards
SAT	Site Acceptance Test
SF ₆	Sulphur Hexafluoride
TPT	Transnet Port Terminals
DCT	Durban Container Terminal
MVA	Mega-Volt Ampere
PO	Purchase Order
OEM	Original Equipment Manufacturer
Cu	Copper
XLPE	Cross linked polyethylene

3. Management and start up.

3.1. Management meetings

The *Contractor* shall attend all management meetings as called by the *Project Manager*. It is envisaged that at least bi-weekly contract management meetings, plus weekly site meetings

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during the delivery/erection phase and daily meetings during the commissioning phase, will be held. The *Contractor* must present all relevant information including quality plans, schedules, (including progress) subcontractor management, and health, environmental and safety issues at such meetings.

The *Project Manager* shall arrange for regular inspections during the manufacturing phase in accordance with agreed hold and witness points in the quality control plan (QCP) and shall also be used as a manufacturing progress report evaluation. The *Contractor* shall attend risk reduction meetings as and when called by the *Project Manager*.

3.2. Documentation control

The *Contractor* shall submit all documentation (including correspondence and drawings) to Transnet (*Employer*) standards and to the *Project Manager's* requirements in accordance with the *Project Manager's* document control procedure. The *Contractor* shall submit all documents through the *Employer's* document control email address **GRP-TPT-DocControl@transnet.net**. The *Employer* shall use his own suitable document control system for the control, maintenance and handling of all relevant documentation and drawings issued to him.

3.3. Safety risk management

3.3.1. *Contractor's* General Requirements for Health and Safety

3.3.1.1. The *Contractor* is solely responsible for carrying out the *works* under the contract having the highest regard for the health and safety of its employees, Transnet's employees and persons at or in the vicinity of the Site, the *works*, temporary *works*, Materials, the property of third parties and any purpose relating to the *Contractor* carrying out its obligations under this contract.

3.3.1.2. The *Contractor* must initiate and maintain safety precautions and programs to conform to all applicable Health and Safety laws or other requirements, including requirements of any applicable government instrumentality and client corporate, business unit and site requirements. The *Contractor* must, at its own cost, erect and maintain safeguards for the protection of workers and the public. The *Contractor* must manage all reasonably foreseeable hazards created by performance of the *works*.

3.3.2. The *Contractor* must:

3.3.2.1. Provide all things and take all measures necessary for maintaining proper personal hygiene, ensuring safety of persons and property and protecting the environment at or near the *working areas*.

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3.3.2.2. Avoid unnecessary interference with the passage of people and property at or near the *working areas*.

3.3.2.3. Prevent nuisance and excessive noises and unreasonable disturbances in performing the *works*.

3.3.2.4. Be responsible for the adequacy, stability and safety of all of its site operations, of all its methods of design, construction and the *works* and be responsible for all of the *works*, irrespective of any acceptance, recommendation or consent by TPT, its *Contractors*, employees, agents and invitees, or any Government Body.

3.3.2.5. Costs for the above are borne by the *Contractor*.

3.3.3. The *Contractor* must comply and is responsible for ensuring that all of its Subcontractors comply with the relevant legislation(s) and statutory regulations for health and safety, the Transnet Health and Safety requirements included in the contract and other document pertaining to health & safety contained in the Programme Health & Safety Management System and include standards, policies, procedures, guidelines and safe work instructions.

The *Contractor* must prepare, implement and maintain a project-specific Health and Safety Management Plan. The plan must be based on the requirements set out in this Project Health and Safety specification as well as all applicable legislation. It must cover all activities that will be carried out on the project site(s), from mobilisation and set-up through to rehabilitation and decommissioning. The *Contractor* ensures that its Subcontractors comply with the requirements of the SMP.

The *Contractor* must appoint a level 3 SHE Officer with First Aid and SHE Rep training, the Health and Safety Officer shall be responsible for:

3.3.3.1. Reviewing all applicable legal and project health and safety requirements and providing guidance to Contractor and Subcontractor personnel (particularly the Contractor's Project Manager) to help ensure compliance at all times;

3.3.3.2. Assisting with the implementation of effective hazard identification and risk management processes for all the work to be carried out by the Contractor;

3.3.3.3. Participating in the Baseline Risk Assessment for the Contractor's scope of work (prior to site establishment) and ensuring that identified control measures are implemented;

3.3.3.4. Participating in all Task-Based Risk Assessments conducted for the work to be carried out by the Contractor and ensuring that identified control measures are implemented;

3.3.3.5. Conducting Contractor health and safety induction training for all Contractor and Subcontractor personnel;

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- 3.3.3.6. Compiling and maintaining all health and safety related documents and records required of the Contractor;
- 3.3.3.7. Communicating relevant health and safety information to Contractor and Subcontractor personnel (e.g. incidents and lessons learnt, leading practices, hazards, risks and control measures, etc.);
- 3.3.3.8. Evaluating (on a daily basis) the content of the Daily Safe Task Instructions (DSTI's) conducted by the Contractor's appointed Supervisors, and attending at least one DSTI each day;
- 3.3.3.9. Assisting with the implementation of the Contractor's Health and Safety Management Plan and associated Safe Work Procedures.
- 3.3.3.10. Carrying out Planned Task Observations on an ad hoc basis;
- 3.3.3.11. Assisting with the implementation, testing and maintenance of an effective Emergency Response Plan for all *Contractor* and Subcontractor activities;
- 3.3.3.12. Responding to workplace incidents (as appropriate);
- 3.3.3.13. Participating in incident investigations;
- 3.3.3.14. Maintaining accurate health and safety statistics (for the Contractor and all Subcontractors), and compiling health and safety performance reports as required;
- 3.3.3.15. Auditing the health and safety management system and workplace activities of the *Contractor* and each Subcontractor on a monthly basis to assess compliance with the project health and safety requirements; and
- 3.3.3.16. Tracking and reporting on the implementation of corrective actions (arising from incident investigations, audits, inspections, etc.).

3.3.4. Performance Measurement and Reporting

3.3.4.1. Health and Safety Statistics

The *Contractor* and each of its Subcontractor(s) must complete and submit Health and Safety statistics to the *Project Manager* or the *Project Manager's* nominated representative, or as amended by the *Project Manager*, before mid-day on the Friday of each week. The *Contractor* must submit monthly Health & Safety Statistics before mid-day on the last day of each month to the *Project Manager's* nominated representative.

3.3.4.2. Safety Management Records

The *Contractor* must submit to the *Project Manager* for acceptance a schedule of the specific Health and Safety records it intends to maintain for the contract. As a minimum, such records

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are as specified by applicable legislation. Copies are provided to the *Project Manager* or the *Project Manager's* nominated representative if requested.

3.3.4.3.Pre-Start Safety Briefings

The *Contractor* must hold documented Daily Safe Task Instructions with each work team before the start of each shift. Attendance records and brief topic notes is kept for auditing and record purposes.

3.3.4.4.Commissioning Safety Study

The *Project Manager*, through his Construction Management Team, will facilitate and coordinate a formal Commissioning Safety Study and ensure that required procedures are prepared prior to the commencement of the commissioning phase.

The Commissioning Safety Study will provide a final checkpoint for the completed work and is part of the process for ensuring that all necessary actions have been completed. The elements to be considered include:

3.3.4.5.Electrical integrity systems are in place (e.g. equipment tests and inspections of critical equipment, quality control procedures, etc.) which will confirm that construction, equipment and materials are in accordance with design specifications.

3.3.4.6.Formal hazard analyses for pre-commissioning and commissioning activities have been completed, appropriately documented and communicated, and are available to all personnel.

3.3.4.7.Punch-list work has been sufficiently completed so that installations are safe to apply hazardous energy.

3.3.4.8.Documentation relevant to any modifications has been created/updated.

3.3.4.9.Safe operating, maintenance and emergency procedures are in place.

3.3.4.10. Operating and maintenance manuals are available and training of commissioning employees have been completed.

3.3.4.11. As Built drawings are available.

3.3.4.12. A Commissioning Permit (to apply hazardous energy) is developed and implemented.

3.3.5. Emergency Preparedness and Response (EPR)

Contractor should develop and implement the EPR that is specifically night time environment and submit for approval before work at night is carried out. A well-established EPR can help both the *Contractor* and employees to prepare; response and recover should a disaster occur.

3.3.6. All aspects of on-site work must comply with the Health and Safety requirement OHS act No 85 of 1993.

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3.4. Environmental constraints and management

All aspects of the *works* must comply with the *Employer's* environmental management plan, statutory requirements and regulations made by relevant authorities and the *Contractor* must ensure compliance of site activities as well as the design of the equipment supplied.

3.5. Quality assurance requirements

Refer to EEAM-Q-009 for the *Employer's* Quality Management. Special attention must be paid to the following:

- 3.5.1. Quality management objectives.
- 3.5.2. Documentation and change control procedures.
- 3.5.3. Quality control procedures that will apply to purchased materials.
- 3.5.4. Quality control plan for all components manufactured or supplied to ensure conformance.
- 3.5.5. The identification of suitable hold points to ensure proper quality assurance throughout manufacturing.
- 3.5.6. Quality control of all welding and corrosion protection activities.
- 3.5.7. The quality control procedure will apply to erection and painting on site if applicable.
- 3.5.8. The services of an independent third party may be engaged by the *Employer* to assist in meeting the quality assurance objectives and the *Contractor* must give the necessary co-operation and supply all the necessary quality management documentation as required. The cost of the QA work by the third party will be borne by the *Employer*.
- 3.5.9. The *Contractor* shall ensure that the quality assurance requirements placed on him under this contract are transferred into any Subcontractor(s).
- 3.5.10. Quality system requirements shall be applied on all Subcontractor(s) to the point where the acceptability of supplies can be demonstrated solely by the conduct of inspection and/or examination of *works* upon receipt at the designated point of delivery.
- 3.5.11. The *Contractor's* quality plan shall include or reference the quality plans of Subcontractor(s).

3.6. Programming constraints

3.6.1. General

The contract programme, progress reports, subsequent updates, revisions and supplementary programmes as detailed in this section are an essential part of the project control system used by the *Employer* for managing the *works* and in monitoring the progress of the work under the contract. The information and data provided by the *Contractor* pursuant to this procedure must

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therefore be reliable, accurate and timely in presentation. A resource schedule must also be submitted.

3.6.2. Programme submission

A copy of the *Contractor's* First Programme shall be submitted with the Tender Document Returnable Schedules that shall comply with the requirements as indicated in the Works Information. The *Contractor's* detailed programme shall be submitted in both hard and soft copy forms within two weeks of award using a computer software package approved by the *Project Manager*. The preferred software package is Microsoft Projects or similar approved.

3.6.3. Contract programme (baseline)

The *Contractor's* First Programme, agreeing with the tender submission, shall become the "Contract Programme" or "baseline" against which actual time performance will be compared. Once the baseline has been established, all subsequent programmes will have baseline (target) bars shown against each activity. This programme will be used as the basis on which all variations, extensions of time and changes to methods of delivery shall be assessed. Identified deviations from the baseline shall be addressed by the *Contractor* by either demonstrating that the deviation does not constitute a problem to the overall *Contractor's* Programme or providing a course of action to remedy the deviation.

3.6.4. Revisions to a programme

The *Project Manager's* written approval of any revised programme shall be obtained prior to the revised programme becoming the latest programme. Additional detail may be inserted into the programme at the request of either the *Contractor* or the *Project Manager*. In such cases, the overall start and finish dates of the detail activities shall not vary from the original summary activity(s) that were replaced. All revisions to a programme shall be prepared by, and at the cost of the *Contractor*.

3.6.5. Supplementary programmes

The *Project Manager* may at any time, and at the cost and expense of the *Contractor*, direct the *Contractor* to produce supplementary programmes to highlight a particular aspect of the work under the contract. The *Project Manager* shall not unreasonably request supplementary programmes.

3.6.6. Cash flow

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The *Contractor* shall submit to the *Project Manager* a detailed cash flow chart based on the programme showing the anticipated cash flow as represented by expected payment claim submissions, not only payments received.

3.6.7. Progress reporting

To demonstrate the actual progress of the work the *Contractor* shall, monthly, update and submit a programme and the progress to the *Project Manager*. A programme shall be in the form of a two week look ahead schedule, and shall show the following two separate bars for each activity to enable comparison of the actual progress to a programme:

3.6.7.1. The programme “baseline” activity bar

3.6.7.2. The current schedule activity bar identifying the currently forecast start and finish dates of the activity, and the status (% completion of each activity).

3.6.7.3. Progress monitoring and review. Monitoring and review of the progress shall consist of an assessment of all activities currently in progress. The following shall be determined:

- 3.6.7.3.1. percentage complete.
- 3.6.7.3.2. forecast completion date.
- 3.6.7.3.3. deviations from the baseline programme; and
- 3.6.7.3.4. actions required to remedy any deviations.

3.6.8. Monthly status report

The *Contractor* shall provide a written status report by the 20th of each month, or such other reporting period as may be required by the *Project Manager* from time-to-time. The report shall summarise progress and problems encountered during that month in respect of all parts of the *works*. As a minimum the report shall include:

3.6.8.1. Progress against the latest accepted programme.

3.6.8.2. Summary of progress achieved during the period.

3.6.8.3. List of milestones achieved during the period.

3.6.8.4. Status of design, procurement, and off-site *works*.

3.6.8.5. Status of on-site *works*.

3.6.8.6. Deviations from a programme “baseline”, and in particular, the forecast completion dates of activities which have or should have commenced.

3.6.8.7. Status of approvals.

3.6.8.8. Actual or anticipated problems with corresponding action plans to minimize the impact;

3.6.8.9. Summary of the *works* planned for the following period, and

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3.6.8.10. cash flow status versus the original forecast.

The progress report shall form the basis of a monthly progress meeting between the *Project Manager* and the *Contractor*.

3.7. Contractor's management, supervision and key people

The *Contractor* shall make an adequate, experienced and stable project team available for the duration of the contract. Every effort must be exercised by the *Contractor* to minimize replacement of individual project team members in order to ensure optimum contract management continuity. It is a requirement of this contract that the *Contractor* employs a full time, fully qualified and experienced site manager who has been delegated sufficient authority to manage the contract efficiently on-site during erection and commissioning. The site manager is required to be fluent in English, both in writing and orally.

3.8. Technical Training

3.8.1. The following *Employer's* personnel will be made available for training by the *Contractor* in operation and maintenance of the switchgears.

Terminal	Number of Participants
Technical Electrical	6

4. Engineering and the Contractor's design

4.1. Electrical scope

The high-level scope is but not limited to the following:

- 4.1.1. Supply, delivery, installation, testing, commissioning, and issuing a valid certificate of compliance for a new 1000 kVA, 11kV/400V mini substation.
- 4.1.2. Supply, delivery, testing and issuing a valid certificate of compliance for a new 1000 kVA mobile diesel generator.
- 4.1.3. Select and supply of a suitable feeder 400V, Cu, cable for the 1000 kVA genset.
- 4.1.4. Decommission and refurbishment of the Transnet (DCT Pier 1) existing 630 kVA mini substation.

4.2. Legal Requirements

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In addition to the specifications, DCT Pier 1 mini substation and diesel mobile generator new installations shall comply with the following relevant South African Acts and Regulations, and they shall apply in the order of precedence as listed below:

4.2.1. Reference Documents

4.2.1.1. South African National Documents(S)

Table 3: List of South African and International Codes used in the development of this document.

Item	Document Number	Description
[1]	OSH Act No. 85 of 1993	South African National Occupational Health and Safety Act 85 of 1993

4.2.1.2. Standards

Table 4: List of all South African and International Standards used in the development of this document.

Item	Document Number	Description
[1]	SANS 10142-1&2	Code of Practice for the Wiring of Premises.
[2]	SANS 62305-1	Protection against lightning Part 1: General principles
[3]	SANS 62305-2	Protection against lightning Part 2: Risk management
[4]	SANS 62305-3	Protection against lightning Part 3: Physical damage to structures and life hazard
[5]	SANS 62305-4	Protection against lightning Part 4: Electrical and electronic systems within structures
[6]	SANS 10313	Protection against lightning - Physical damage to structures and life hazard
[7]	SANS 10199	The design and installation of earth electrodes
[8]	SANS 1063	Earth rods, couplers, and connections
[9]	SANS 10198-1-8	The selection, handling, and installation of electric power cables of rating not exceeding 33 kV Part 8: Cable laying and installation
[10]	SANS 1091	National Colour Codes
[11]	SANS 1973-1	Low Voltage switchgear assemblies >10kA
[12]	SANS 1973-2	Low Voltage switchgear assemblies <10kA
[13]	SANS 10292	Earthing of Low Voltage (LV) distribution systems
[14]	SANS 60529	Degrees of protection by enclosure (IP codes)
[15]	SANS 61689	Instrument Transformer
[16]	SANS 62268	Electricity Metering Equipment
[17]	SANS 725	IEEE Guide for Safety in AC Substation Grounding

4.2.1.3. Standby Generator Standard

The 1000 kVA units shall be designed and tested in compliance with the latest versions of the following standards.

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Table 4: Standby Generator Standard

Item	Document Number	Description
[1]	SANS 10142-1&2	Code of Practice for the Wiring of Premises.
[2]	IEC 60034	Rotating Electrical Machines
[3]	IEC 60085:	Thermal Evaluation and Classification of Electrical Insulation
[4]	ISO 10816:	Specification for Mechanical Performance: Vibration
[5]	ISO 3046:	Specification for Reciprocating Internal Combustion Engines
[6]	SI 426:	European Commission (dangerous substances) (Classification, packing, labelling, and Notification of Regulations 1992.
[7]	CIMAC	Congress International des Machines a Combustion Recommendations for Diesel Engine Acceptance Test.
[8]	ISO 9000:	Quality assurance

4.2.1.4. Specifications

Table 5: List of all Transnet Specifications used in the development of this document.

Item	Document Number	Description
[1]	TPD-001-EL&PSPEC	Specification for electrical installations to buildings other than dwellings houses
[2]	TPD-002-DBSPEC	Specification for low voltage distribution boards
[3]	TPD-003-CABLESPEC	Specification for the supply and installation of medium voltage and low voltage electrical cables
[4]	TPD-004-EARTHINGSPEC	Specification for earthing and the protection of buildings and structures against lightning.
[5]	TPD-008-MINISUBSPEC	Specification for the supply, delivery, offloading and installation of miniature substations
[6]	TPD-009-STANDBYPLANTSPEC	Specification for the supply, delivery, installation, and commissioning of a Diesel Driven Standby Generator Set

4.3. Service Conditions

4.3.1. Plant Ratings for Continuous Operation

The plant or equipment shall be designed and rated for continuous operation under the following conditions.

Table 3: Site Condition

Description	Parameter
Altitude above sea level	0-1800m (above sea level)
Ambient air temperature	45 Degree Celsius; -5 Degree Celsius
Degree of pollution	moderate
Lightning conditions	Severe

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4.3.2. Low Voltage Power System

All Low Voltage equipment and or plants to be provided as part of the engineering solution shall normally operate in the following conditions:

Table 4: Low Voltage Power System Parameters

Description	Parameter
Nominal system voltage	400V
Minimum-Maximum system voltage	380V - 420V
Nominal frequency	50 Hz $\pm$ 2 Hz
Number of phases	3 Phase and Neutral
Short Circuit	50kA
Neutral Point	Solidly Earthed

4.3.3. Medium Voltage Power System

All Medium Voltage equipment and or plants to be provided as part of the engineering solution shall normally operate in the following conditions:

Table 5: Medium Voltage Power System Parameters

Description	Parameter
Nominal system voltage	11kV
Minimum-Maximum system voltage	10.45kV – 11.55kV
Nominal frequency	50 Hz $\pm$ 2 Hz
Number of phases	3 Phase
Short Circuit	31.5kA
Neutral Point	Solidly Earthed

4.4. Electrical Engineering Works

4.4.1. Works to be executed by the *Contractor*.

4.4.1.1. Removal of the Existing Mini substation

- The *Contractor* shall apply for a working permit one week before any commencement of the work and ensure minimal disruption to operations.
- The *Contractor* shall disconnect and remove the existing cables (LV and MV) from the existing 630 kVA mini substation with care and ensure that no risk is or will be posed to the cable's properties.
- The *Contractor* shall decommission (disconnect) and remove the existing 630 kVA mini substation. The removed 630 kVA mini substation shall be transported by the *Contractor* to the original or equal OEM for refurbishment.
- The *Contractor* shall deliver back the mini substation from the OEM depot to Transnet once the refurbishment is completed.

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- e. The *Contractor* shall submit all necessary test results for the refurbished mini substation and produce a valid certification upon successful completion of the refurbishment work.
- f. The *Contractor* shall ensure that the plinth does not crack during the removal process of the existing mini substation. If it does crack, it must be replaced with a new one and it will be a *Contractor's* responsibility.
- g. The *Contractor* shall only disconnect or decommission the existing mini substation once a new 1000 kVA mobile generator has been delivered and installed (commissioned).
- h. The *Contractor* shall allow for the backup power supply of the servers during the occupation necessary for installing and re-energizing the new mini-substation.

4.4.1.2. Installation of the new mini substation

- a. The *Contractor* shall clear and ready the site of any obstructions for the installation work of a new 1000 kVA mini substation, including taking necessary measurements.
- b. During fabrication, the *Contractor* shall submit fabrication drawings for acceptance by the *Employer's* engineer.
- c. Supply, delivery, installation, testing and commissioning of a new 1000 kVA, 11kV/400V mini substation in accordance with TPD-008-MINISUBSPEC and issue a valid certificate of compliance upon successful completion of works.
- d. The *Contractor* shall ensure that the plinth is of the correct size for the new mini substation and that the new mini substation MV and LV cable entry positions correspond to that of the plinth cable entry spaces to avoid running MV and LV cables across each other.
- e. The *Contractor* shall ensure that the plinth is not damaged before installing the new unit.
- f. The *Contractor* shall ensure the proper earthing and lightning protection installation of a new mini substation.

4.4.1.3. Cables Installation and Termination

- a. The *Contractor* shall make use of the existing disconnected cables to connect the new mini substation.
- b. The *Contractor* must ensure that appropriate cable slack is left in LV cables. If necessary, the *Contractor* shall join each LV cable with 5m (with a cable of the same size and properties) to the respective distribution boards. This is to say an allowance of 5m cable shall be made for all the LV feeders from the existing mini substation.

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- c. The *Contractor* shall, select, supply, and install new cable terminations in relation to the proposed work as per SANS 101980-4 and Transnet specification TPD-003-CABLESPEC. The *Contractor* shall return all removed material to the Transnet Workshop building electrical supervisor.
- d. The *Contractor* shall label each of the cables to ensure that they can be identified at a later stage.
- e. The *Contractor* shall ensure proper installation of cables with the correct cable slack to allow the correct bending radius and no skew cables connections.

4.4.1.4.New 1000 kVA Mobile Diesel Generator

- a. The *Contractor* shall clear and ready site of any obstructions for installation work.
- b. Supply, delivery, installation, and commissioning of a new 1000 kVA mobile diesel generator in accordance with TPD-009-STANDBYPLANTSPEC.
- c. During fabrication, the *Contractor* shall submit shop drawings for acceptance by the *Employer's* engineer.
- d. The new genset shall be complete with two 400V, 600A plugged type female termination for connecting the feeder to the genset. The termination must be a standard plug and socket.
- e. The *Contractor* shall supply a suitable 400V, 300mm², 300m Cu, flexible cable for the genset feeder.
- f. The *Contractor* shall issue all required certification upon successful completion of work.
- g. The *Contractor* shall select, supply, and install two 600A, 400V plugged type male termination on one end of the cable. The termination must be a plug and socket combination connectors.
- h. The *Contractor* shall select, supply, and install standard terminations on one end on the feeder cable.

4.4.1.5.Protection testing and Commissioning of the installation.

- a. The *Contractor* shall conduct a Factory Acceptance Test (FAT) for all Plant's to be installed as part of the *works* to be executed in this contract prior to delivery to site. The FAT shall be conducted in the presence of the *Employer's* engineer. The legal transfer of ownership from the Plant's supplier to the *Contractor* shall be held by the *Contractor* until the Plant is fully installed, tested commissioned on the *Employer's* designated site.
- b. The *Contractor* shall conduct a Site Acceptance Test (SAT) for all Plant's supplied, offloaded, and delivered to the designated *Employer's* site. The SAT shall be conducted in the presence of the *Employer's* Engineer. The legal transfer of ownership from the Plant's supplier to the *Contractor* shall be held by the *Contractor* until the Plant is fully installed, tested commissioned on the *Employer's* designated site.

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- c. The *Contractor* shall test the LV installation and hand over all relevant test certificates to the *Employers* engineer for acceptance. The *Contractor* shall hand over the LV certificate of compliance respectively as per the OHS Act of 85 and SANS 10142-1 and SANS1042-2 for the installation.
- d. The *Contractor* shall test and commission the entire earthing and bonding as per Transnet Specification TPD-004-EARTHINGSPEC and SANS 10142-1 in the presence of the *Employer's* Engineer. The *Contractor* shall handover all test certificates to the *Employer's Project Manager* for acceptance by the *Employer's* Engineer.
- e. The *Contractor* shall provide training for six employer's personnel on the plant required for the works.
- f. The hand overpack shall comprise of the data books for the plant and all maintenance requirements.
- g. The *Contractor* design requirements guarantees and warranties shall be as per the *Employer's* specifications.

5. Procurement

5.1. Contractor's procurement of Plant and Materials

The *Contractor* must take all necessary steps to ensure that all Plants and Materials are adequately protected against damage during shipping, transport and storage. If any Equipment is transported by sea, the *Contractor* shall take extra precaution to protect all mechanical and electrical Plant from the corrosive effect of wave splashes, rain and salt spray. Waxoyl or similar, shall be applied where applicable, refer to EEMA-Q-008.

5.2. Spares and consumables

The *Contractor* shall supply to the delivery place all the spares and consumables as identified by the *Project Manager* from the *Contractor's* recommended spares list. Packaging of the spares and consumables shall be suitable to protect its contents from environmental damage when stored in warehouses in close proximity to the coast. Packaging of sensitive spares and consumables shall be suitable to protect its contents from mechanical damage due to handling.

5.3. Tests and inspections before delivery

The *Contractor* shall provide assistance, labor, materials, electricity, fuel, stores, apparatus and instruments as may be a requisite and as may be reasonable demanded to carry out tests efficiently. The *Contractor* shall ensure that all gauges, templates, tools and other equipment

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required to check the accuracy of the work are calibrated at regular intervals by a laboratory approved by the National Calibration Services of the Council for Scientific and Industrial Research of South Africa, or by the respective authority in the country of origin of the equipment.

6. Delivery place and delivery of the works

6.1. Delivery place and Working Areas

6.1.1. Working Areas

When required in terms of the delivery methodology, the *Contractor* will indicate his space requirements at the delivery place on a suitable drawing submitted with the tender. The delivery place is located at the Port of Durban, South Africa. The location where the Equipment is to be installed is within the premises of TPT Durban Container Terminal Pier 1. The *Contractor* shall take all necessary steps for his work not to interfere with port operations and to ensure that normal traffic flow of the operational terminal is not obstructed. Establishment, fencing and other work required to make the delivery place fit for use is entirely the *Contractor's* responsibility. The *Contractor* is responsible for the security of the delivery place until completion and hand-over, and must make his own arrangements for security and the safekeeping of his property. The *Contractor's* watchmen are allowed on site for this purpose. The *Contractor* must maintain the delivery place in a neat and tidy condition by acceptance of the *Project Manager*. The *Contractor* must comply with Transnet Port Terminals' SHEQ and Environmental Specifications

6.1.2. Clearing of delivery place

The *Contractor*, within fourteen days after completion, must completely remove from the delivery place all his Plant, Materials, Equipment, stores and temporary accommodation or any other asset belonging to him and leaves the delivery place in a tidy condition for acceptance by the *Project Manager*.

6.1.3. Customs and port regulations

The delivery place is situated within a customs-controlled area and the *Contractor* and his people shall observe all customs regulations within the port area. The delivery place is also within a promulgated port area and the *Contractor*, and his people shall observe all ISPS and Port Regulations within the port area. Copies of the Harbour Regulations are obtainable from the Port admin offices. The fullest collaboration between the *Contractor*, the Port and the *Project Manager* is essential with regard to the working of the port.

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6.1.4. Health and safety facilities at the delivery place

At all times during the delivery and testing of the Equipment the *Contractor* is responsible for the safety of all persons on the delivery place and on the Equipment and shall have the necessary systems and procedures in place to effectively manage this. The *Contractor's* workforce must attend an induction relating to the safety and operational aspects of the terminal for about 45 minutes before they can work at the terminal. The *Contractor* is responsible to supply all the necessary PPE to his employees.

6.2. Completion, testing, commissioning and correction of Defects

6.2.1. Works to be done by the Completion Date

On or before the Completion Date the *Contractor* shall have done everything required to provide the *works*. The *Project Manager* cannot certify Completion until all the work has been done and is also free of Defects which would have, in his opinion, prevented the *Employer* from using the *works* and Others from doing their work.

6.2.2. Technical support after Completion

The *Contractor* shall undertake that spares for all mechanical and electrical components of the Equipment shall be readily available for at least 10 years from date of delivery. Should spares be required during this period but not be readily available, the *Contractor* shall make modifications to the Equipment to use readily available spares at that time, and at no cost to the *Employer*.

Should the Equipment become substantially inoperable, inefficient or unsafe during the period between take over and the *defects date* due to Defects, the *defects date* will be extended by the same amount of time that it takes to return the Equipment to satisfactory operating state.

7. Plant and Materials standards and workmanship

7.1. Referenced standard specifications.

The tests prescribed in the relevant standard specifications shall be carried out at the manufacturer's premises before delivery of the Plant and Materials ordered by the *Contractor*.

The test results shall be submitted to the *Project Manager*. Plant and Materials made and tested to alternative standard specifications will be considered for acceptance by the *Project Manager*, provided that such specifications are not less stringent than those laid down.

7.2. General

7.2.1. All Plant and Materials shall be new.

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- 7.2.2. All Plant shall be installed according to the manufacturer's recommendations.
- 7.2.3. All Plant must be securely mounted on the Equipment such that vibration and movement will not dislodge any components.
- 7.3. Referenced Specifications
 - 7.3.1. EEAM-Q-008 Corrosion Protection Standard
 - 7.3.2. EEAM-Q-016 – General Requirements and Conditions
 - 7.3.3. EEAM-Q-009 Quality Management Specification
 - 7.3.4. EEAM-Q-013 Commissioning and Handover
 - 7.3.5. EEAM-Q-012 General Electrical Equipment
 - 7.3.6. EEAM-Q-020 Testing on Electrical Equipment
 - 7.3.7. EEAM-Q-021 Electronic Equipment

NOTE: EEAM-Q-008 replaces HE9/2/8 in EEAM-Q-017 AND all the above specifications will be distributed during the compulsory briefing session

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LIST OF ANNEXURES		
Annexures	Description / Discipline	Document No(s)
1	Health and Safety Plan and Specification	-PHSS-0001
2	Quality Management Specification	EEAM-Q-009
3	Code of Practice for Electrical Installations.	SANS 10142
4	Code of Practice for the Wiring of Premises.	SANS 10142-1&2
5	Protection against lightning Part 1: General principles	SANS 62305-1
6	Protection against lightning Part 2: Risk management	SANS 62305-2
7	Protection against lightning Part 3: Physical damage to structures and life hazard	SANS 62305-3
8	Protection against lightning Part 4: Electrical and electronic systems within structures	SANS 62305-4
9	Protection against lightning - Physical damage to structures and life hazard	SANS 10313
10	The design and installation of earth electrodes	SANS 10199
11	Earth rods, couplers, and connections	SANS 1063
12	The selection, handling, and installation of electric power cables of rating not exceeding 33 kV Part 8: Cable laying and installation	SANS 10198-1-8
13	National Colour Codes	SANS 1091
14	Low Voltage switchgear assemblies >10kA	SANS 1973-1
15	Low Voltage switchgear assemblies <10kA	SANS 1973-2
16	Earthing of Low Voltage (LV) distribution systems	SANS 10292
17	Degrees of protection by enclosure (IP codes)	SANS 60529
18	Instrument Transformer	SANS 61689
19	Electricity Metering Equipment	SANS 62268
20	IEEE Guide for Safety in AC Substation Grounding	SANS 725
21	Code of Practice for the Wiring of Premises.	SANS 10142-1&2
22	Rotating Electrical Machines	IEC 60034
23	Thermal Evaluation and Classification of Electrical Insulation	IEC 60085:
24	Specification for Mechanical Performance: Vibration	ISO 10816:
25	Specification for Reciprocating Internal Combustion Engines	ISO 3046:
26	European Commission (dangerous substances) (Classification, packing, labelling, and Notification of Regulations 1992.	SI 426:
27	Congress International des Machines a Combustion Recommendations for Diesel Engine Acceptance Test	CIMAC
	Quality assurance	ISO 9000:
28	Specification for electrical installations to buildings other than dwellings houses	TPD-001-EL&PSPEC
29	Specification for low voltage distribution boards	TPD-002-DBSPEC

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	Specification for the supply and installation of medium voltage and low voltage electrical cables	TPD-003-CABLESPEC
30	Specification for earthing and the protection of buildings and structures against lightning.	TPD-004-EARTHINGSPEC
31	Specification for the supply, delivery, offloading and installation of miniature substations	TPD-008-MINISUBSPEC
32	Specification for the supply, delivery, installation, and commissioning of a Diesel Driven Standby Generator Set	TPD-009-STANDBYPLANTSPEC
33	Corrosion Protection Standard	EEAM-Q-008
34	General Requirements and Conditions	EEAM-Q-016
35	Quality Management Specification	EEAM-Q-009
36	Commissioning and Handover	EEAM-Q-013
37	General Electrical Equipment	EEAM-Q-012
38	Testing on Electrical Equipment	EEAM-Q-020
39	Electronic Equipment	EEAM-Q-021

PART C4: SITE INFORMATION

Document Reference	Title	No of pages
C4	This cover / index sheet	1
	Site Information	2

PART 4: SITE INFORMATION

Core clause 11.2(16) states

"Site Information is information which

- describes the Site and its surroundings and
- is in the documents which the Contract Data states it is in."

In Contract Data, reference has been made to this Part 4 of the contract for the location of Site Information

1. Description of the Site and its surroundings

1.1. General description – Replacement of Mini sub and Generator

The site is within the Engineering Equipment Services (EES) building at Transnet Port Terminals (TPT) Pier 1 Container Terminal. The Durban Container Terminal (DCT) 'Pier 1' in the port of Durban is a specialized maritime facility with dedicated infrastructure and equipment for handling containerized cargo.

1.2. Direction and Access to Site

From the N2 of ramp, drive on the M7 Solomon Mahlangu Dr and make a turn to the R102 Umbilo Rd then make turn on Glosstonbury PI Road that will lead to Bayhead Rd that will lead to site. Access permit required to enter the Pier 1 entrance towards the site opposite the Bhekulwandle building to the Engineering Equipment Services (EES) building to the where the site is at. It is always important that the Contractor familiarise and adhere to ALL Employers (TPT) rules and regulations regarding security / access control. The Contractor shall however be responsible for his / her own security and the Employer (TPT) will not be held liable / responsible for any stolen / lost property, tools, and equipment by the Contractor.

1.3. Existing buildings, structures, and plant & machinery on the Site

The EES Workshop, is surrounded by the administration offices of the terminal manager, administration staff, and a server room at Pier 1, as the mini substation located at the EES building that will be replaced.

The vicinity of the work area and administration office has a traffic flow of cargo handling equipment, trucks as well as employees. During the construction / installation, the con must

always maintain a safe access to the port users.

1.4. Contractor Establishment

Upon receipt of the site access certificate, the contractor will be required to establish site offices and laydown areas. The facilities established on site will remain for the duration of the works, and connection points will be available for the contractor, however, the contractor will be required to pay for services utilized during the duration of the contract. The proposed contractor site establishment and laydown area is shown below.

Figure 2: Site Establishment



There is a basic screening (Alcohol and drug) required at all entry and exit points of the Port. If the contractor or its employees tested positive during the screening, employee will not be permitted inside the premises.

1.5. Operations on the site

The works will be performed in an operational environment; the road will remain operational with on-going traffic for the entire duration of the contract. The contractor is to take cognisance of the Transnet employees and its stakeholders in and around the road.

1.6. Subsoil information

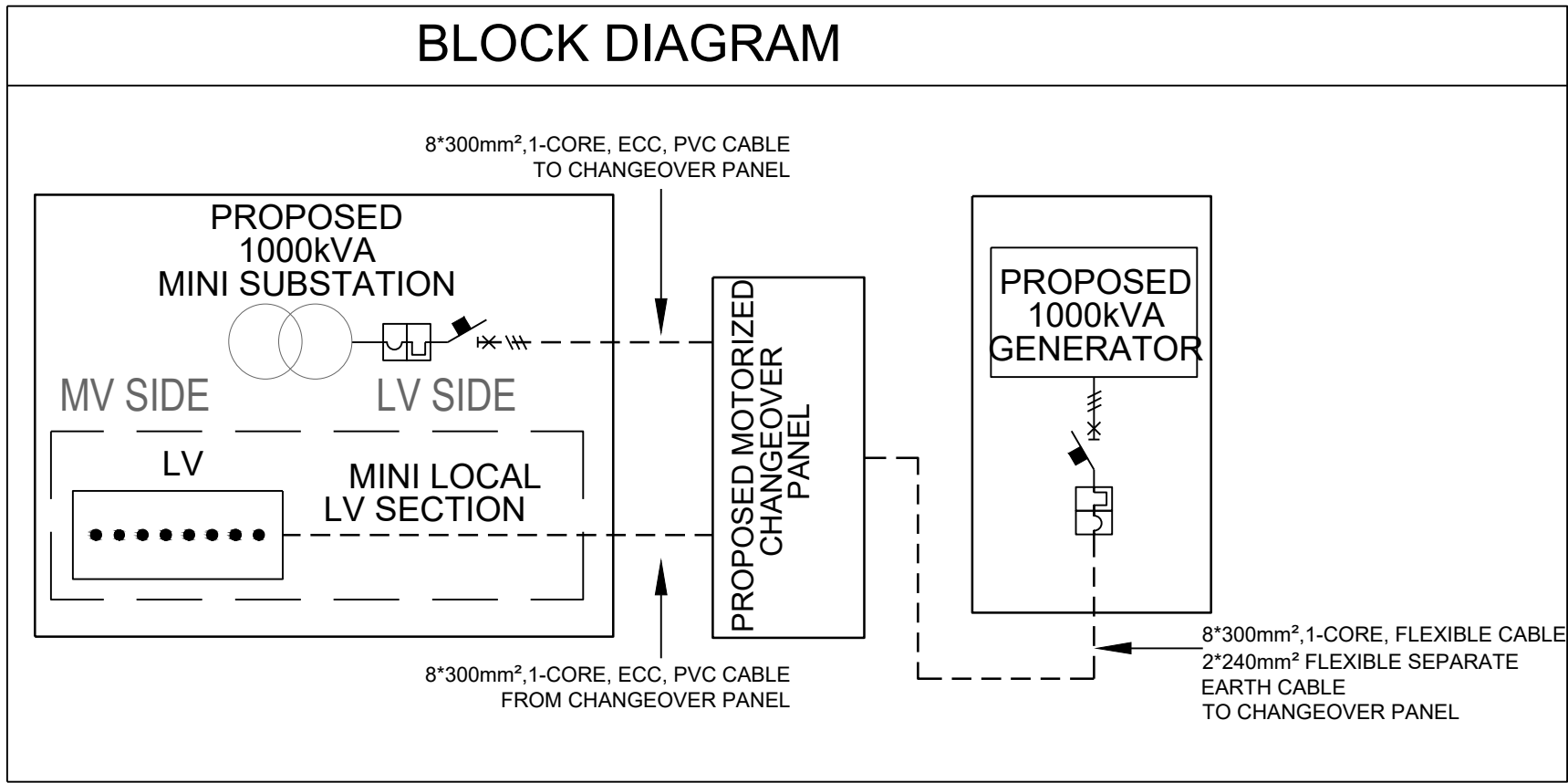
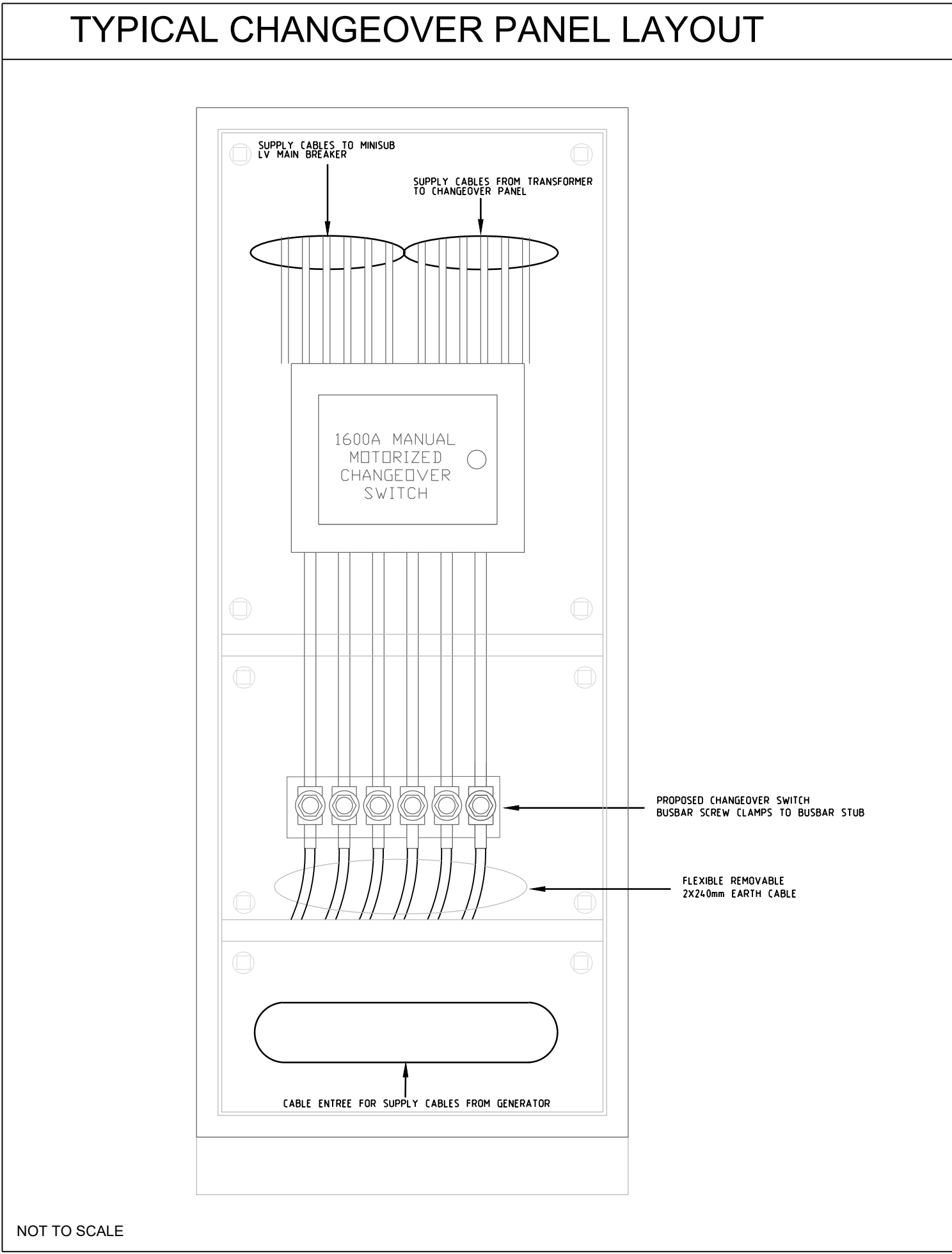
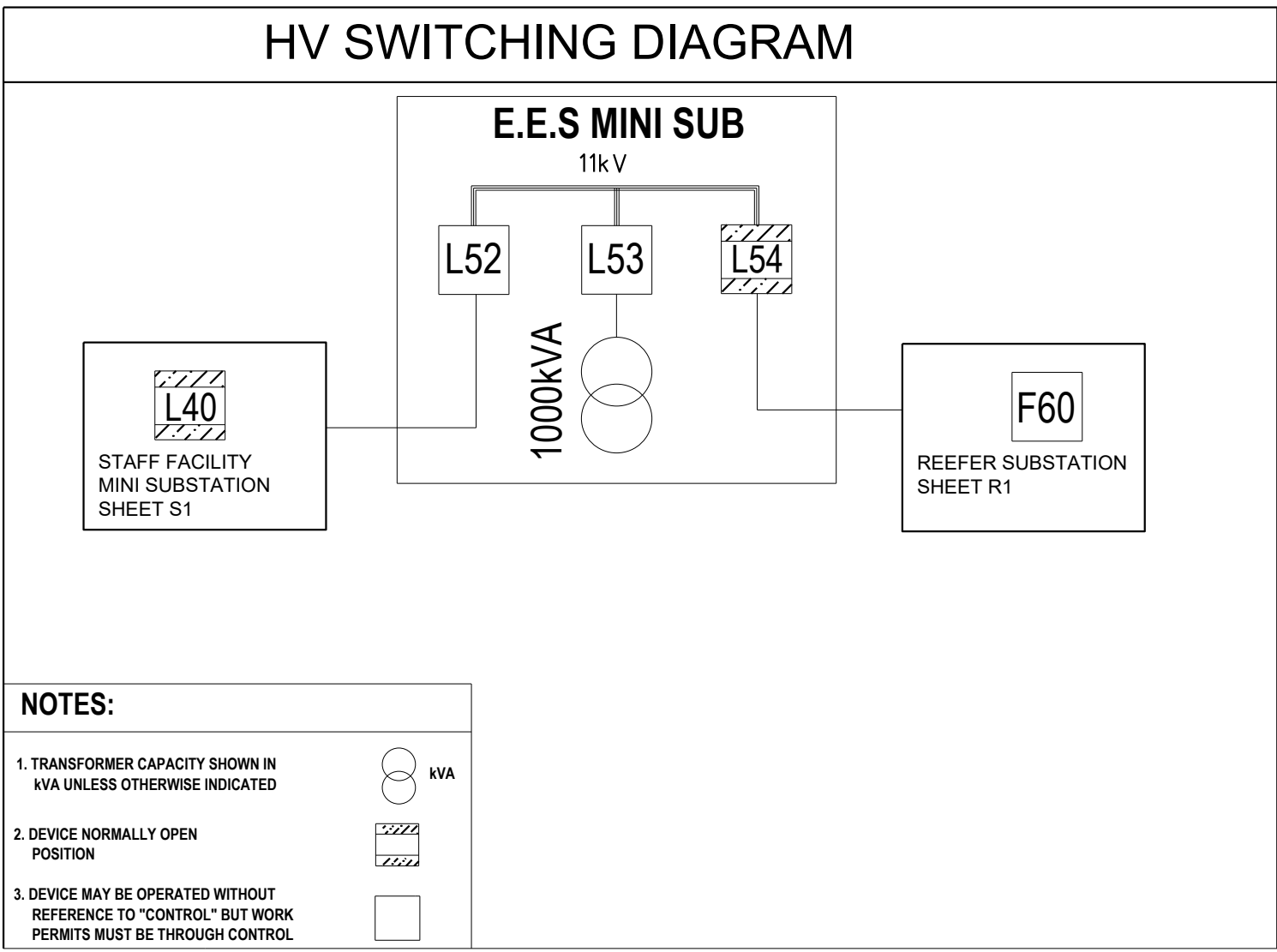
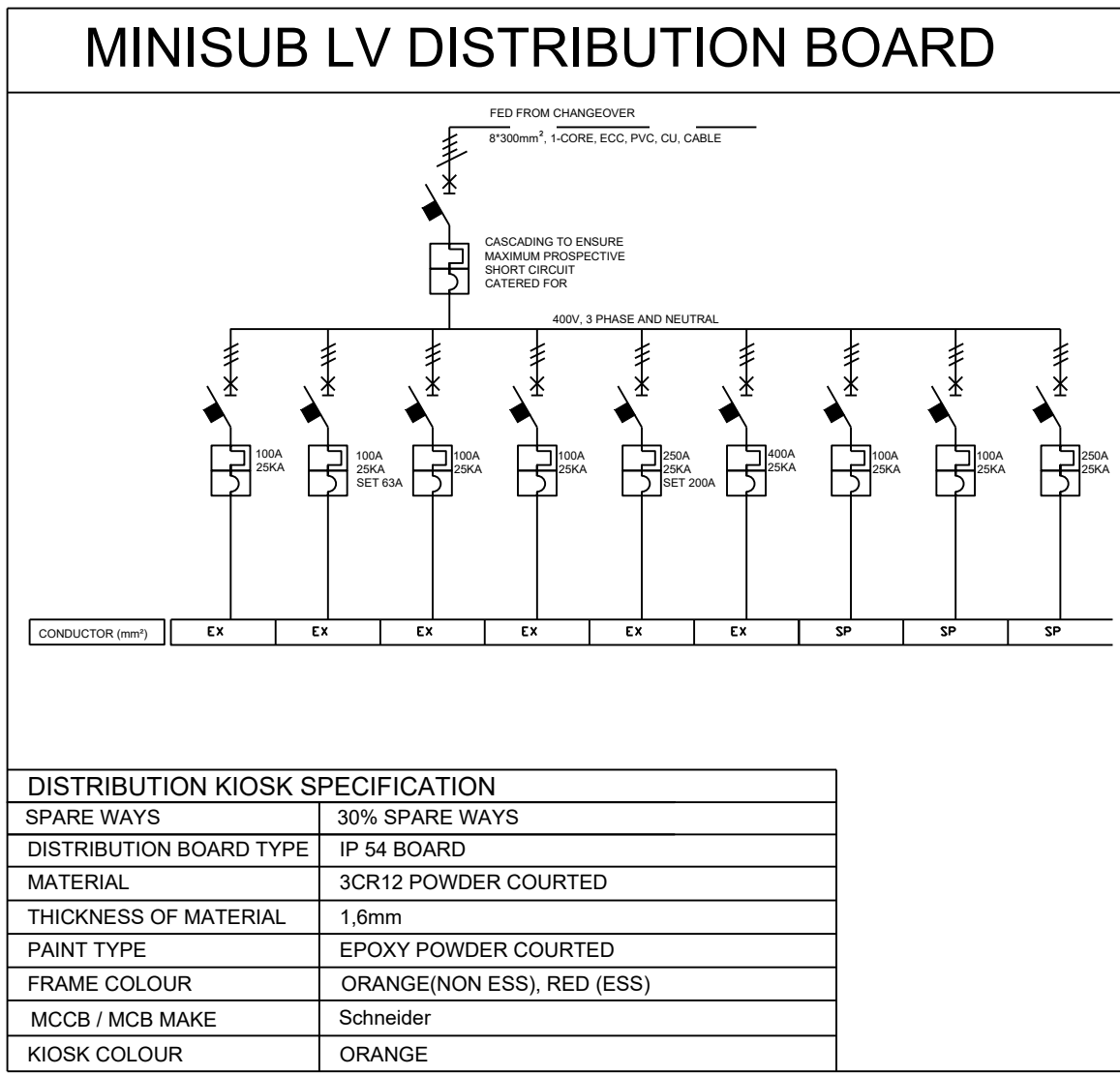
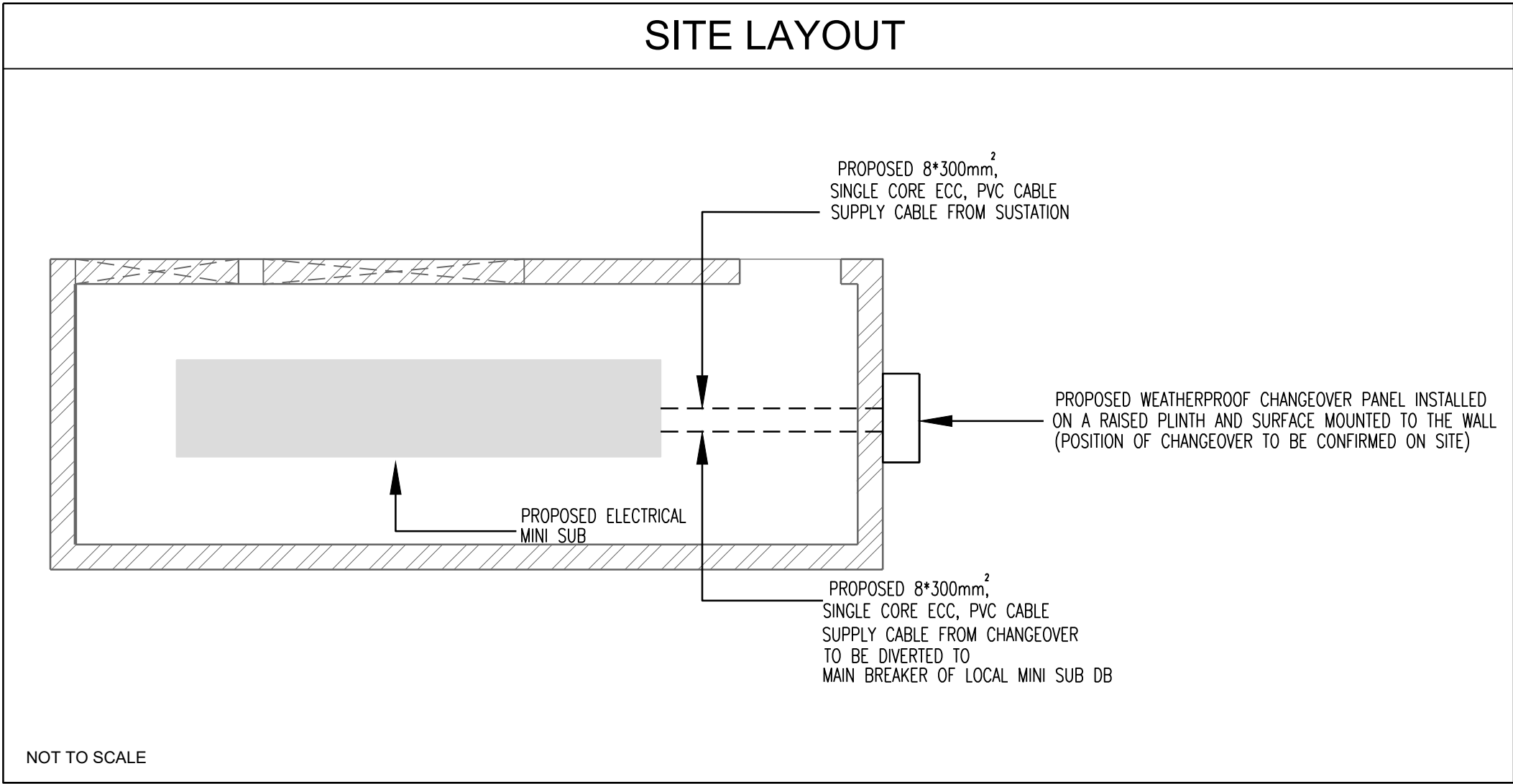
Not applicable.

1.7. Hidden services

Not applicable.

1.8. Other reports and publicly available information

This report is to be read in conjunction with the C3 Works Information Report provided. It is envisaged that the contraction site will be available to the contractor through the duration of the works.



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ANNEXURE A

REVISION 0	REFERENCE EEAM-Q-009		
DOCUMENT TYPE SPECIFICATION		AUTHORISATION DATE: Date signed by CEO	
TITLE: QUALITY MANAGEMENT SPECIFICATION FOR SUPPLIER/CONSTRUCTION		PAGE 1 of 14	
COMPILED BY:	REVIEWED BY:	REVIEWED BY:	
SENIOR MANAGER (QUALITYMANAGER)	SENIOR MANAGER (PROJECT MANAGER)	SENIOR MANAGER (GENERAL MANAGER)	
ACCEPTED BY:		AUTHORIZED BY:	
CHIEF FINANCIAL OFFICER		CEO	
FUTURE REVISION RECORD NUMBER	DESCRIPTION OF REVISION	APPROVAL	DATE 01/03/2010
-1-			
CONTENTS 1.0 QUALITY MANAGEMENT SPECIFICATION FOR SUPPLIER/CONSTRUCTION			

KEYWORDS SPECIFICATION	DATE OF LAST REVIEW: N/A
	DATE OF NEXT REVIEW: 01/03 2010

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1. Introduction

This Specification outlines the minimum requirements to ensure that products and services supplied to Transnet Port Terminals are manufactured, provided, constructed or installed in accordance with all specified requirements as defined in the Contract, all associated specifications, drawings, codes and standards.

2. Definitions

Term, Abbreviation	Meaning
Data	All drawings/documents/data/information and DP's required to be supplied under the Contract
Data Pack (DP)	A compilation of manufacturing data, certification, inspection and testing records prepared by the Supplier/Contractor to verify compliance with the Contractual requirements.
Employer	For the purposes of this document, the term Employer has the same meaning as applied to the term Client.
Field Inspection Checklist (FIC)	A document that details the checks, requirements and test parameters for each type of equipment to permit field installation and pre- commissioning of the equipment.
TPT	Transnet Port Terminals is the Employer's Nominated Agent in terms of the Conditions of Contract.
Inspection Release Report (IRR)	A document issued to the Supplier/Contractor by TPT advising release of the Materials for shipment. This does not relieve the Supplier/Contractor of its obligations in accordance with the Terms and Conditions of the Contract.
Inspection Waiver Report (IWR)	A document issued to the Supplier/Contractor by TPT advising that TPT has waived final inspection for the materials listed in this document. The issue of this Report does not preclude further inspection by TPT, is issued without prejudice and does not relieve the Supplier/ Contractor from the guarantees and obligations included in the Contract/ Contract. A document prepared by the Supplier/Contractor providing relevant information applicable to the installation and maintenance of the specific equipment, including consumables (eg. oils etc)
Project Quality Plan (PQP)	A document that outlines the Supplier/Contractor's strategy, methodology, resources allocation, Quality Assurance and Quality Control coordination activities to ensure that Goods and Services supplied meet or exceed the requirements defined in the Contract, drawings, codes and standards.
Quality Control Plan (QCP)*	A document outlining specific manufacturing / construction inspection and testing requirements, including responsibilities, test acceptance criteria, nomination of witness and hold points. For the purposes of this document, the term Supplier/Contractor has the same meaning as applied to the term Sub-Supplier/Sub-Contractor
Supplier/Contractor	This refers to the documentation required to be submitted by the relevant Supplier / Contractor in terms of the Contract.
Supplier/Contractor Data Requirements	These requirements are generally tailored to suit the particular Scope of Work, although it also addresses the manner in which the documentation is required to be submitted, eg Hard copy, Electronic copy etc
Technical Query Note (TQN)	This refers to a document used by the Supplier/Contractor to formally clarify a Technical Query related to the scope of supply. This should not be used where a non-conformance has already been initiated.

3. Applicable Documents

3.1 General

All work performed shall comply with the requirements of this Specification, the documentation referenced in the Contract and the latest revision/edition of the relevant Codes and Standards referenced herein.

3.2 Statutory Regulations

Occupational Health & Safety Act, Act No 85, of 1993 and Regulations as amended.

3.3 Codes and Standards

Document No.	Title
ISO 9001	International Standard Series Quality Systems
EEAM-Q-013	Punch Listing Standard

4. Quality System

4.1 General

The Supplier/Contractor shall be responsible for all quality activities necessary to ensure the Work meets the requirements specified in the Contract, and shall manage and coordinate all Quality aspects of Work in accordance with the requirements of this Specification, and the Supplier/Contractor's PQP and QCP's once reviewed and approved by TPT.

The Supplier/Contractor shall ensure that all Sub-Suppliers/Sub-Contractors also conform with the requirements of this Specification.

4.2 Supplier/Contractor Quality System Requirements

The Supplier/Contractor shall have, maintain and demonstrate its use to TPT, its documented Quality Management System. The Supplier/Contractors Quality Management System should be in accordance with the International Standard ISO 9001.

The Supplier/Contractor shall submit its Quality System documentation to TPT at the time of tender and at Contract Phases as detailed below:

- Project Quality Plan
- Quality Policy
- Index of Procedures to be used
- Programme of internal and external audits

4.3 Supplier/Contractor Documentation Requirements

The Supplier/Contractor shall develop and maintain a comprehensive register of documents that will be generated throughout the project, and shall include all quality related documents. The register shall be submitted to TPT for review.

TPT shall indicate those documents required to be submitted for information/review and/or acceptance and this shall be indicated in the Supplier/Contractors' Document Register. The register shall indicate the dates of issue of the documents taking into account sufficient time to allow TPT review/acceptance cycle prior to the document being required for use.

5. Quality Assurance

5.1 Project Quality Plan

Where specified, the Supplier/Contractor shall submit a PQP to TPT within 28 days after the Contract start date. The PQP shall detail how the Supplier/Contractor's Quality System will be applied to the Scope of Work specified in the Contract, and shall address the following:

- Satisfying the technical and quality requirements of the Supplier/Contractor's Scope of Work, and relevant elements of the applicable ISO 9001 standard
- include all quality activities relevant to the Scope of Work, identifying all procedures, reviews, audits, controls and records used to control and verify compliance with the specified Contractual requirements

Include a listing of all special processes (eg. welding and non-destructive testing, cube testing etc) envisaged for use, including confirmation of personnel certification as required

- Include all proposed method statements (for site based work activities)
- Include a description of the Supplier/Contractor's project organisation, with key positions and responsibilities identified and individuals named. The organisation structure shall also indicate the resources committed to the management / coordination of QA / QC activities
- Include a listing of all Quality Control Plans (QCP's), and associated Field Inspection Checklists (FIC's), as applicable
- Identify in the Project Quality Plan any Sub-Supplier/Sub-Contractor work. Sub-Supplier/Sub-Contractor plans shall be approved by the Supplier/Contractor, and a copy forwarded to the TPT
- Include the proposed Authorised Inspection Authority (where applicable - for pressurised equipment and systems)
- Include a schedule of proposed quality records

The PQP shall be controlled and re-submitted for approval when required to incorporate any change necessary during the Contract duration to ensure that the document is maintained as an effective control, change management and records. The change management will be done to an agreed policy or procedure.

Note: Where the Supplier/Contractor is required to provide a PQP, no work shall commence until the PQP is approved by TPT.

5.2 Procedures

The Supplier/Contractor's PQP and procedures shall address the system elements and activities appropriate to the Scope of Work, in compliance with the specified Quality Standard.

Where specified, the Supplier/Contractor shall submit copies of Quality Procedures for review. In addition, the Supplier/Contractor shall ensure that copies of all Procedures relevant to the Scope of Work are available for reference by TPT at each work location.

These will include, as applicable, the following:

5.2.1 Document Control

The Supplier/Contractor's Project Quality Plan shall provide a description of how TPT provided, Supplier/Contractor and Sub-Supplier/Sub-Contractor documents are to be managed. The description shall address as a minimum:

- Management tools and databases
- Receipt, registration and maintenance
- Internal and external distribution to Employer, third parties and Sub-Contractors
- Management of Codes, Standards and Specifications

-
- Internal review and approval routines and authorities
 - How it is ensured that the correct revisions of documents are available at the point of use including retention periods for all documentation.

5.2.2 Design Control

Where the Supplier/Contractor is responsible for any aspect of design related to their Scope of Work, the Quality Plan shall describe the Supplier/Contractor's methods and procedures for the control of these design activities.

5.2.3 Procurement

Where the Supplier/Contractor is responsible for any aspect of procurement related to their Scope of Work, the Quality Plan shall describe the Supplier/Contractor's methods and procedures for the control of these activities.

5.3 Supplier/Contractor Audits

The Supplier/Contractor shall:

- Carry out audits in accordance with its Quality System at its own and Sub-Supplier/Sub-Contractor's facilities to ensure project quality requirements are being achieved
- Include a QA Audit Schedule in the Supplier/Contractor PQP submitted to TPT prior to commencement of the Scope of Work. The Audit Schedule shall include all audits to be implemented by the Supplier/Contractor and Sub-Supplier/Sub-Contractor during the execution of the Contract
- Where stipulated in the Contract, perform an audit within three months after the Contract start date and thereafter at a minimum frequency of three months. Audit reports shall be submitted to TPT at the completion of each Audit. Where unsatisfactory performance is evident, additional audits shall be performed by the Supplier/Contractor as directed by TPT.

5.4 Transnet Port Terminals Audit

TPT reserves the right to perform quality audits or participate as an observer in Supplier/Contractor audits to verify compliance with the Contractual requirements. The Supplier/Contractor shall within a time frame as agreed upon, correct any adverse audit finding advised by TPT.

6. Inspection and Testing

6.1 General

TPT may, at its discretion perform surveillance inspection at the Supplier/Contractor's premises, SubSupplier/Sub-Contractor's premises or at the location of the Scope of Work.

Dependent on the nature of the Scope of Work and the frequency of inspections TPT may elect to have inspection personnel resident at the place of manufacture, fabrication, or assembly.

The Supplier/Contractor shall ensure free entry and access is given to TPT, certifying authorities and statutory authorities to inspect the Scope of Work and review procedures and quality records at all parts of the Supplier/Contractor's and Sub-Supplier/Sub-Contractor's premises, or at the location of the Scope of Work while any work or test is in progress.

The Supplier/Contractor shall provide TPT with all necessary tools, calibrated measuring equipment, safety equipment and workspace to verify or witness tests in progress.

While TPT is at the Supplier/Contractor's premises, the Supplier/Contractor shall provide, free of charge, reasonable facilities including office facilities and reasonable access to a telephone, facsimile machine and computer connection point.

The Supplier/Contractor shall provide notice in writing in within a time frame time as agreed upon, to allow the attendance of TPT and other representatives at nominated witness and hold points.

6.2 Quality Control Plans

The Supplier/Contractor shall prepare and submit QCP's to TPT for review in accordance with the requirements of the Contract and PQP.

QCP's shall identify all inspection, test and verification requirements to meet the Contractual obligations, specifications, drawings and related details including destructive and non-destructive testing, witness and hold points.

The Supplier/Contractor shall not commence fabrication or manufacture prior to review and approval of the applicable QCP by the TPT.

QCP's shall include reference to all tests specified in the Contract Document.

A typical format for an QCP is shown in Appendix A. The Supplier/Contractor may use its own format providing all information shown in Appendix A is included.

6.3 Inspection Points

The QCP shall identify points in the fabrication, manufacturing and/or installation process that are selected for inspection and shall be denoted by the following inspection codes:

- Hold Point (H) Inspection point in the manufacturing cycle, beyond which work shall not proceed without the specified activity, work or function being witnessed. Holding points require written notification to TPT.
- Witness Point (W) An inspection point in the manufacturing cycle that will be witnessed or verified. If TPT confirms it is unable to attend after being provided with the written notification then manufacture may proceed. Witness points require written notification to TPT.
- Review Point (R) A point at which products and quality records are verified and endorsed. Review points are not notifiable points.
- Surveillance (S) An inspection point in the manufacturing cycle during which any activity, work or function is observed. No formal notification is required.

The Supplier/Contractor shall maintain the status of testing and inspection by progressively having the QCP's signed off.

6.4 Revision to Quality Control Plans

Revision of the QCP shall be subject to the same submission, review and acceptance routines as described for the original QCP issue

6.5 Kick Off Meeting

After the Contract start date, and prior to manufacture, TPT will require a Kick Off Meeting with the Supplier/Contractor to discuss fully the implications of meeting TPT quality requirements. This meeting may be held as part of the Contract kick-off meeting for each package or may be a separate meeting, subject to the critical or complex nature of the work. This requirement for a pre-inspection meeting may be repeated when sub-Supplier/Contractors of key equipment are engaged.

After mobilization of the Contractor, and prior to the commencement of any construction activities, TPT will arrange for a Quality kick-off meeting to discuss fully the implications of meeting the projects' quality requirements. This meeting may be held as part of the formal kick-off meeting for each contractor, or may be a separate meeting subject to the critical or complex nature of the work.

6.6 Schedule of Inspection

The Supplier/Contractor shall submit a Schedule showing the proposed dates for inspections and tests nominated in the QCP where witness and hold points are required. The Schedule shall be regularly updated with progress and issued to TPT to show the current inspection and test status.

6.7 Field Inspection Checklists

For site installation and construction activities, the Supplier/Contractor shall prepare Field Inspection Checklists (FIC's) to permit inspection and testing of installed equipment and constructed facilities in accordance with the respective QCP's.

FIC's shall be provided to TPT for initial review, and shall be used to record the results of inspection and testing (where applicable), and on completion be submitted to TPT to confirm satisfactory completion of the tests and inspections at nominated QCP witness and hold points.

6.8 Inspection Notification

The Supplier/Contractor shall notify TPT in writing at least two calendar weeks prior to the advent of inspections or tests that require witnessing.

For inspections or tests within the country, arrangements shall be confirmed at least two working days before the event. For inspection and tests outside of the country, arrangements shall be confirmed at least seven working days before the event.

Inspection notifications shall include the following essential information:

- Contract Number
- Location of Inspection or Test
- Nature of Inspection or Test
- Date and Time of Inspection or Test
- Name and telephone number of the Supplier/Contractor's Representative.

6.9 Inspection and Testing

The Supplier/Contractor is responsible for the conduct of all Supplier/Contractor inspections and tests, and includes:

- Documenting inspection and tests result in the QCP's and relevant FIC's
- Progressively inspecting the quality of the Scope of Work performed, including that of all Sub-Supplier/Sub-Contractors
- Inspecting to meet all Contractual requirements, in number, type and form
- Inspecting day to day activities, material receipts, issue of material for installation, in-process inspections, and final inspections.

Completed original QCP's and FIC's shall be submitted to TPT in the DP

6.10 Inspection Release

At completion of the Scope of Work, either in total or in phases, TPT may issue an Inspection Release Report (IRR) or a waiver of inspection.

The issue of either an inspection release or waiver of inspection does not relieve the Supplier/Contractor of its obligations under the Contract. The Supplier/Contractor shall ensure a copy of the release note and final expediting release note for transport, where appropriate, is attached to the delivery docket and accompanies the Work to the designated destination indicated in the Contract. Items delivered to TPT without a copy of these documents may not be accepted.

A copy of the inspection release or waiver of inspection shall be included in the DP.

6.11 Special Processes

It is the Supplier/Contractor's responsibility to ensure that all processes which require prequalified procedures and/or work methods are tested and qualified before work begins. This typically covers such activities as welding, non-destructive testing, special fabrication techniques and painting. Unless specified such procedures are the Supplier/Contractor's responsibility and do not require submission to TPT before work begins. When such procedures are requested, no work shall commence until procedures are approved by TPT.

It is the Supplier/Contractor's responsibility to ensure all operators are qualified for the processes in accordance with the procedure and/or applicable standards. Records of qualification of operators shall be maintained by the Supplier/Contractor and made available to TPT when requested.

Records of qualification of procedures and processes shall be maintained by the Supplier/Contractor in accordance with the applicable procedure or code.

6.12 Welding Procedures

Where the Supplier/Contractor's Scope of Work includes fabricated weldments, Welding Procedure Specifications (WPS) defining the method, preparation and sequences to be adopted to achieve a satisfactory welded joint shall be provided for all weld types required in the execution of the Supplier/Contractor's Scope of Work. The procedure shall only be submitted to TPT when requested in the Contract.

WPS shall include all welding essential and non-essential variables for each process used, including appropriate test results and shall comply with the standard or code pertaining to welding required in the execution of the Supplier/Contractor's Scope of Work.

When requested in the Contract a suitably marked "weld map" shall be completed by the Supplier/Contractor for all items to be fabricated. A summary of WPS shall be prepared and when used, shall be identified on the weld map.

Where TPT approval is required, fabrication shall not commence until written approval of WPS and Welding Procedure Qualification Records (WPQR) is received by the Supplier/Contractor. No welding fabrication will be accepted that is not covered by an TPT approved WPS/WPQR.

Welding Procedure Qualification (WPQ) tests may be witnessed by TPT and/or an independent inspection authority. Testing of the specimens prepared during the WPQ Tests shall be carried out by an independent approved testing laboratory independent of the Supplier/Contractor. In certain instances, a certificate to EN 10204 3.1 B may be required which will be clarified at Tender review and clarification stage.

Where actual weld deposit analysis and weld metal physical properties are required for procedure qualification, the information shall be taken from the procedure qualification tests. Data listed in the catalogues of the manufacturer of welding consumables is not acceptable.

Welders/welding operators shall be qualified in accordance with the relevant welding code prior to commencing production fabrication. Specific Welder Qualifications (WQ's) records will be reviewed by TPT in the Supplier/Contractor's works and should NOT be submitted for review.

A register of welders qualified to work shall be maintained by the Supplier/Contractor.

6.13 Material Traceability

Where, and to the extent that material traceability is required, the Contractor shall provide its procedures for the maintenance of material identification throughout all phases of manufacture. Methods of identification, routines for re-stamping or stencilling as appropriate shall be defined and agreed with the Employer.

Adequate records shall be maintained throughout construction enabling traceability of key materials from final product back to original material certificates. The material traceability records shall form part of the DP

The Contractor shall prepare a schedule of materials and equipment that are subject to traceability requirements.

6.14 Material Certification

Where specified in the Contract the following certificates shall be provided to TPT and included in the DP.

Type A:	A Supplier/Contractor's certificate of compliance with the Contract. This certifies that the goods or services are supplied in compliance with the Contract without mention of any test results (EN10204 certificate 2.1).
Type B:	A certificate issued by a laboratory or test facility independent of the Supplier/Contractor's works. It shall quote test results carried out on the product supplied and state whether compliance with the relevant technical standard, code etc has been complied with. (EN 10204 certificate 3.1 B).
Type C:	The same as Type B, the tests are to be witnessed by a third party (EN 10204 certificate 3.1C).

7. Non Conforming Products

7.1 General

The Supplier/Contractor shall establish and maintain procedures to control material or products that do not meet the specified requirements.

All Supplier/Contractor product and/or materials identified as not conforming to requirements shall be dealt with promptly as follows:

- If the Supplier/Contractor discovers material or product which is not in accordance with the requirements of the Contract, i.e. a non conformance (NCR), the Supplier/Contractor shall promptly initiate the non-conformance procedure in terms of the Supplier/Contractor's Quality Management System, advise TPT promptly, and provide a copy of the NCR to TPT
- If TPT or it's agent identifies a non conformance an TPT NCR may be raised.
- Originals of all closed out NCR's shall be included in the DP.

7.2 Corrective and Preventative Action

If the Supplier/Contractor proposes a disposition of any non conforming materials or product which varies from the requirements of the Specification or Contract, such a proposal shall be submitted in writing to TPT whose decision on the proposal shall be obtained in writing before the non conforming material or product is covered up or incorporated into the Works, or is the subject of any other disposition.

The disposition of non-conformances which do not vary the requirements of the Contract, specification or drawings may be approved by the Supplier/Contractor following discussion and agreement with TPT.

8. Concession Requests and Technical Queries

8.1 Concession Requests

Where a Supplier/Contractor requests a Concession to deviate from the requirements of the Contract or specified requirements, the Supplier/Contractor shall raise the request with TPT using the format as shown in Annexure B.

The Concession Requests shall clearly identify all elements of the proposed deviation together with any resulting technical, commercial and/or schedule impacts.

Completed original Concession Requests shall be included in the DP.

8.2 Technical Queries

For clarification of technical issues (only), Supplier/Contractor may submit a Technical Query Note (TQN) to TPT in accordance with the Contract.

The TQN shall clearly identify all elements of the query, and all supporting documentation and/or drawings shall be attached where appropriate.

Completed original TQN's shall be included in the DP.

9. Inspection, Measuring and Test Equipment

9.1 Calibration

The Supplier/Contractor, including its Sub-Supplier/Sub-Contractors shall ensure the calibration of test and measuring equipment is performed and maintained in accordance with the relevant Supplier/Contractor procedures and/or the equipment manufacturer's specifications.

Where calibration is required by an external laboratory, the Supplier/Contractor shall ensure that the facility selected for calibration possesses current certification. Calibration certificates shall contain a statement that the test equipment is accurate to within specified tolerances.

The Supplier/Contractor should establish the frequency of calibration for each item of equipment (including jigs, fixtures or templates) and record the details in a 'Measuring and Test Equipment Register' (or similar).

9.2 Use of Inspection, Measuring and Test Equipment

The Supplier/Contractor shall ensure that authorised equipment users:

- Use the equipment in accordance with manufacturers instructions, and accepted industry practices
- Ensure the equipment is covered by a current calibration certificate
- Conduct the measurements or tests in accordance with the equipment manufacturer's specifications or other relevant specification
- Prior to commencement of each inspection or test activities:
 - Identify the measurements to be made
 - Determine the accuracy required
 - Select the appropriate inspection, measuring or test equipment for the scope of work.

9.3 Verification of Previous Test Results

Where the calibration status of the equipment is unknown, expired or has doubtful accuracy, the equipment shall immediately be quarantined, and tagged according to Supplier/Contractor's Quality System procedures. The Supplier/Contractor shall then arrange for either in-house or external calibration, and:

- review all previous test results associated with the suspect equipment
- identify the inspections, measurements or tests required to re-validate the results
- ensure that suitable re-testing is performed with calibrated equipment
- document the results of the re-testing on the respective inspection and test documentation.

10. Quality Records

Supplier/Contractors shall maintain Quality Records necessary to provide objective evidence that demonstrates and verifies achievement of the QA / QC requirements associated with the Scope of Work. All Quality Records, including original source material test certificates and non destructive test reports, shall be retained by the Supplier/Contractor during the project, and be provided to TPT at the times, and in the quantities specified in the Contract.

The Supplier/Contractor shall collate all quality records in the DP and submit the DP to TPT in accordance with the Contract and all referenced standards and specifications. This DP shall be compiled progressively, and shall be available for review at all phases of manufacture or construction activities.

The Scope of Work shall not be complete until the Supplier/Contractor's DP including the quality records from Sub-Supplier/Sub-Contractors have been reviewed and accepted by TPT.

The DP shall be compiled progressively during the execution of the Scope of Work and shall be made available for review by TPT as required.



Annexure A - Sample Quality Control Plan

Quality Control Plan No.: _____	Rev: _____	Date Issued: _____
Contract No.: _____	Description: _____	Item No.: _____
Supplier / Contractor: _____	Location: _____	

[illegible]

Annexure B - Request for Concession

Request for Concession				No: _____ of 2	
A. SUPPLIER/CONTRACTOR SUPPLIED INFORMATION					
SUPPLIER/CONTRACTOR NAME:			CONTRACT NO.:		
SUPPLIER/CONTRACTOR CONCESSION NO.:			DATE:		
Required concession applicable to: (Item/Material/Equipment/Area)					
Description of Concession — Revised Requirements:					
Justification:					
(NOTE: This concession will be rejected if the following information is not provided):					
(i) VALUE OF BENEFIT TO CLIENT	(ii) AGREE TO AN EXTENSION OF THE WARRANTY	YES	NO	(iii) ANY IMPACT ON SCHEDULE?	NO
S/R	IF "YES" WHAT PERIOD?			CF "YES" \ WHAT PERIOD?	
References:					
Original reference:					
Requirements	Rev.:	Specification	N	Rev.:	
Drawing No.:	Rev.:	Specification	O.	Rev.:	
Drawing No.:	Rev.:	Specification	:	Rev.:	
Attached applicable documentation:			N		
Requested by:					
(Supplier/Contractor) Name:			Signature		
			: _____ D		
Note: Sections B to F on Page 2					

<i>Request for Concession No:</i>			
B. SITE ADMINISTERED CONTRACT?	Yes ☐	Nn ☐	Go to "D"
Possible QC implications:			
Recommendations Recommendations		Rejected	
Site Construction Manager:		Signature:	Date:
Site Engineer:		Signature:	Date:
C. RECOMMENDATION BY CONTRACT ADMINISTRATOR: Name:			
Signature		Date:	
D. RECOMMENDATION BY ENGINEERING:			
☐ Recommended	☐ Rejected	☐ Conditional, with the following	
recommendations:			
Package Engineer:		Signature:	Date:
Lead Discipline Engineer:		Signature:	Date:
Engineering Manager:		Signature:	Date:
Comments:			
E. PROJECT MANAGER DISPOSITION: Accepted ☐ Rejected ☐			
Name:		Signature	Date:
F. EMPLOYER DISPOSITION: Accepted ☐ Rejected ☐			

	Specification No: TPD-009- STANDBYPLANTSPEC	Engineering
---	--	--------------------

Title: **SPECIFICATION FOR DIESEL GENERATOR**

SYSTEMS

Unique Identifier:

Area of Applicability: **Engineering**

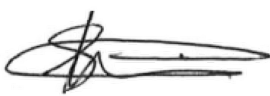
Documentation Type: **Standard**

Revision: **1**

Total Pages: **63**

Next Review Date:

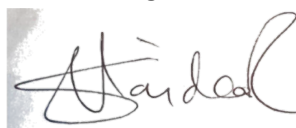
Prepared by:



Samukelo Magcaba (Electrical)

08/04/2025

Date



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08/04/2025

Date

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1. Introduction

The document is required to provide the baseline requirements for new Diesel Generator systems to be used within the Transnet Port Terminals. It also provides a standardised approach when defining the user or site- specific requirements for Diesel Generator systems.

2. Supporting Clauses

2.1 Scope

This standard covers the design, testing, supply, delivery to site, erection, and commissioning requirements for Diesel Generator (DG) Systems.

2.1.1 Purpose

To provide the minimum technical requirements for DG systems used in Transnet Port Terminals.

2.1.2 Applicability

This document shall apply throughout Transnet Port Terminals.

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

- [1] ISO 9001 Quality Management Systems.
- [2] BS 5514-5, Reciprocating internal combustion engines: performance -Part 5: Torsional vibrations.
- [3] ISO 3046, Reciprocating internal combustion engines.
- [4] NFPA 850, Recommended practice for fire protection for electric generating plants and high voltage direct current converter stations
- [5] Act No. 85 of 1993, Occupational Health and Safety Act
- [6] SANS 342, Automotive diesel fuel
- [7] SANS 1186, Symbolic safety signs
- [8] SANS 1507, Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V)
- [9] SANS 1632, Batteries
- [10] SANS 1652, Battery chargers – industrial type
- [11] SANS 8528, Reciprocating internal combustion engine driven alternating current generating sets (all parts)
- [12] SANS 10089, The Petroleum Industry: Storage and distribution of petroleum products in above- ground bulk installation

- [13] SANS 10140, Identification colour marking.
- [14] SANS 60034, Rotating electrical machines.
- [15] SANS 60529, Degrees of protection provided by enclosures.
- [16] SANS 60947, Low-voltage switchgear and control gear – Part 7-1: Ancillary equipment – Terminal blocks for copper conductors
- [17] SANS 10142, Wiring of Premises
- [18] 240-56227516, Specification for LV switchgear and control assemblies and associate's equipment for voltages up to and Including 1 000 V AC and 1 500 V DC
- [19] 36-1126, Specification for corrosion protection of plant and equipment with coatings
- [20] 32-333, Standard for Electronic Protection and Fault Monitoring Equipment for Power Stations

2.3 Definitions

2.3.1 General

Refer to [11] SANS 8528-1 and [14] SANS 60034-1 for definitions relevant to this document.

2.3.2 Disclosure classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 Abbreviations

Table 1: Abbreviations

Abbreviation	Description
AC	Alternating Current
AVR	Automatic Voltage Regulator
BIL	Basic Insulation Level
CAP	Committee for Accepted Products
CCA	Cold Cranking Amps
COP	Continuous Power
DC	Direct Current
DCS	Distributed Control System
DG	Diesel Generator
ESP	Emergency Standby Power
FAT	Factory Acceptance Test
HMI	Human–Machine Interface
HV	High Voltage
IP	International (Ingress) Protection
ISO	International Organization for Standardization

LAP	List of Accepted Products
LCD	Liquid Crystal Display
LED	Light-emitting Diode
LTP	Limited-time running power
MCCB	Moulded Case Circuit-breaker
n/a	not applicable
NFPA	National Fire Protection Association
OEM	Original Equipment Manufacturer
OHSA	Occupational Health and Safety Act
P	Proportional
PI	Proportional Integral
PID	Proportional Integral Differential
PRP	Prime Power
rpm	revolutions per minute
SAE	Society of Automotive Engineers
SANS	South African National Standards
SAT	Site Acceptance Test
SC	Steering Committee
THD	Total Harmonic Distortion
VAR	Volt-Ampere Reactive

2.5 Roles and responsibilities

This document shall be used whenever diesel generators are procured for Transnet Port Terminals purposes.

2.6 Process for Monitoring

The engineering Department shall ensure that this document is maintained.

2.7 Related/Supporting Documents

This document is to be used in conjunction with the following:

- Application-specific Design Guide (where available)
- Employer's Specification for Works which will contain the plant-specific Operating and Control philosophy.
- Supporting AB Schedules

3. Requirements

3.1 General

- a) The DG shall be built in accordance with the latest revisions of [11] SANS 8528, except where deviations are specified in this document and its accompanying Schedule A and Schedule B.
- b) Where deviations exist between this document; its accompanying Schedule A, Schedule B and [11] SANS 8528, the order of precedence is as follows: accompanying Schedule A and Schedule B; followed by this document; and then [11] SANS 8528.
- c) The system shall be designed to run free of excessive vibration and noise under all conditions of load and speed, and shall comply with the requirements of [14] SANS 60034 and [2] BS 5514-5.
- d) All moving and rotating parts shall comply with the requirements of the Occupational Health and Safety Act (OHSA) [5] Act No. 85 of 1993.
- e) The Genset shall be of the integrated self-contained, super silent sound attenuated canopy type with self bunding base tank. The canopy should be a minimum 3CR12 grade of steel.

3.2 Application and operating philosophy

- a) DGs will be generally used at the following sites:
 - Transnet Port Terminals sites
 - Substations
 - Office buildings
 - Cranes
- b) The generator configuration will be generally used for mobile applications unless specified differently in Schedule A.
- c) The DG will generally be used for extended backup unless specified differently in Schedule A.
- d) The Specification is only applicable to AC generating sets.

3.3 Site conditions

- a) The DG shall be designed for use inland or coastal as specified in Schedule A.
- b) The DG System shall be designed for a maximum ambient temperature of 50 °C.
- c) The following conditions shall be specified in Schedule A:
 - 1) Minimum ambient temperature
 - 2) Altitude
 - 3) Humidity
 - 4) Air quality (dust or sand)
 - 5) Marine environment
 - 6) Shock and imposed vibration

- 7) Chemical pollution
- 8) Radiation
- 9) Cooling water/liquid

3.4 Reliability

- a) The DG System shall be designed for an operating life of 20 years under the specified operating conditions in Schedule A.
- b) A warranty of minimum 5 years and 10000 operating hours is required from the engine manufacturer, with an included maintenance plan for the period, with real time data and predictive alert functionality with all software provided and integrated together with the unit.
- c) A warranty of 5 years is required from the alternator manufacturer, with an included maintenance plan for the period, with real time data and predictive alert functionality with all software provided and integrated together with the unit.
- d) Any deviation from this shall be clearly indicated.

3.5 Maintainability

- a) The DG System shall be designed to minimize the need for maintenance.
- b) Whether preventative or predictive, where maintenance is required, the design shall provide for good ergonomics to make it as easy as possible, with due consideration given to personnel safety.
- c) The design shall allow for modular replacement of assemblies and components to a level as low as possible.
- d) The time to isolate a faulty component shall be reduced by making extensive use of built-in test facilities.
- e) Component conditions that may lead to a failure shall be monitored, and an alarm condition generated.
- f) Spares and parts availability shall be guaranteed for the designed life of the DG.
- g) Warranty on any part of the system shall be at least two years unless specified differently in Schedule A or otherwise in this document.
- h) All safety requirements to enable fueling whilst running (refuel on the fly) shall be included in the design of the genset.

3.6 System definition

The overview of a typical DG system is defined in in more detail in the clauses following the table.

Table 2: System definition – overview

Diesel Engine (prime mover)	Alternator	Control and switchgear	Auxiliaries	Mechanical build
- Engine rating - Speed - Governor - Emissions - Deutz/Cummins/Volvo Penta	- Type - Excitation - Power Output - Voltage and Frequency - Marelli	- Equipment for the control, switching, operation, monitoring, and alarming of the generating set shall be part of the associated control gear and switchgear systems - Comap Intelligen 1000 autosynchronising paralleling controller	- Starting system - Air intake and exhaust gas systems - Cooling systems - Lubricating oil system - Fuel system (including fuel treatment where applicable) - Auxiliary electrical power supply - Earthing	- Base frame - Coupling - Enclosure - Fire detection - Canopy-Type - Integrated Self bunding base tank

3.6.1 Diesel Engine

3.6.1.1 General

- The diesel engine shall be of the diesel fueled, cold starting, water-cooled , speed-governed type.
- Engine Preheater and Pre-start Lubricating Oil Pump (Prelube Pump) are required..
- The supplier shall state in Schedule A, the guaranteed specific fuel consumption of the complete set with all auxiliary equipment at full load, three-quarter load, and half load to

accuracy within 5%.

- d) The fuel consumption shall be determined in accordance with [3] ISO 3046-1, and given in litres per kilowatt hour (l/kWh). The supplier shall also make reference to lubricating oil consumption.

3.6.1.2 Rating

- a) The engine shall be suitably rated to provide the required power output from the generator, even under impact loading when all pre-impact loads are connected.
- b) The generator start-up time (as specified in [11] SANS 8528-1) shall be specified in Schedule A.
- c) The engine shall deliver full load in accordance with [3] ISO 3046-1, within the starting period, and under the specified environmental conditions.
- d) De-rating shall be in accordance with [3] ISO 3046-1.
- e) The engine performance classification shall be Continuous Power (COP), Prime Power (PRP), Limited time running power (LTP) or Emergency Standby Power (ESP) as defined in [11] SANS 8528-1 and as specified in Schedule A.
- f) The required mounting type and Generating set configuration shall be in accordance with [11] SANS 8528-1 and specified in Schedule A.
- g) The required Performance Class as defined in [11] SANS 8528-1 and load type are also given in Schedule A. If no performance class is specified, a G3 class shall be assumed.
- h) Where the employer does not declare a duty type, the supplier shall assume that duty type S1 (continuous running duty) applies.
- i) The power rating shall be expressed in kilowatts at rated frequency and a power factor of 0,8 lagging unless otherwise stated in Schedule A.
- j) The output of the engine under the specified site conditions shall be the net available output power after allowance has been made for all auxiliary equipment (i.e. parasitic losses) including air filter, radiator fan, oil pump, water pump, battery charger alternator, governor, etc.
- k) It shall be possible to operate the DG with a lagging Power Factor from 0,8 up until Unity, depending on the active power demand, unless otherwise stated in Schedule A.
- l) The DG shall be capable of performing a single load step equal $\geq 50\%$ of the continuous kilowatt (kW) rating of the machine while remaining within operating limits.
- m) The DG shall be capable of performing a single load step equal to 110% of the most severe single step load in the plant design profile.
- n) The DG shall accept the load without voltage collapse or engine stalling and recover to normal operating speed.
- o) The supplier shall document the voltage and frequency deviation observed.
- p) The supplier shall supply with the tender all technical data with de-rating graphs on altitude of all engines. This shall form part of the engine sizing.

3.6.1.3 Governor

- a) The engine shall be fitted with an electronic governor to provide speed control in accordance with the requirements of [3] ISO 3046-4 and [11] SANS 8528-1.
- b) The governor shall be of the Proportional Integral (PI) or Proportional Integral Differential (PID) type as specified in Schedule A.

3.6.1.4 Speed

An engine operating nominal speed of 1 500 rpm is preferred, except where it is otherwise stated in Schedule A.

3.6.1.5 Emissions

Any emission (noise, vibration, heat, gas, and electromagnetic disturbance) limits as specified by applicable legislation relating to the protection of the environment and to the health and safety of personnel operating or maintaining the generating set shall be specified in Schedule A.

3.6.2 Alternator (Generator)

3.6.2.1 Type

- a) The alternator shall be of the brushless type and comply with the relevant requirements of [14] SANS 60034-1, [14] SANS 60034-8, [14] SANS 60034-9 and [11] SANS 8528-3, and with the additional requirements specified.
- b) Where the Employer's Engineer does not declare a duty type, the supplier shall assume that duty type S1 (continuous running duty) applies.

3.6.2.2 Excitation

- a) Whether a permanent magnet is required for excitation shall be specified in Schedule A.
- b) The method of excitation, the excitation voltage range and the maximum field control current shall be provided.
- c) Series current boost (consisting of controls and current transformers) shall be provided, if required, to meet transient voltage response performance.

3.6.2.3 Heaters

- a) The alternator shall be fitted with one or more anti-condensation heater elements to protect those components that can be adversely affected by moisture.
- b) The heater shall be approved by the alternator supplier.
- c) The heater's power requirement shall be stated.

3.6.2.4 Power Output

- a) The Employer's Engineer shall specify the required output power requirements in kilovolt-ampere (kVA) and the power factor.

- b) The rated output is the apparent power at the terminals and shall be expressed in kilovolt-ampere (kVA) together with the power factor.
- c) The supplier shall specify the short-circuit rating of the alternator. The alternator shall comply with the requirements of section 5.2 of [11] SANS 8528-3 in respect of short-circuits.
- d) The alternator's efficiency at full load, 3/4 load, 1/2 load and 1/4 load at unity and at 0.8 lag power factors shall be stated in Schedule A.
- e) The continuous current capabilities and the regulation percentages shall be stated in Schedule A.

3.6.2.5 Loading

- a) Linear and non-linear loads shall be started as per the Starting Sequence detailed in Schedule A and the load schedules.
- b) The alternator shall be suitable for supplying the following types of loads:
 - 1) Linear loads, such as lighting circuits and motors.
 - 2) Non-linear loads, such as saturable-reactor controlled rectifiers, six-pulse or 12-pulse controlled thyristors, Variable speed drives or stop/start control systems.

3.6.2.6 Voltage and Frequency

- a) The nominal voltage and frequency, including tolerances, shall be as stated in Schedule A. The terminal voltage shall be adjustable over the specified range.
- b) The generator voltage shall remain within the limits specified from no-load to full-load at unity, and at 0.8 lag power factors, inclusive of diesel engine speed drop of 4% and temperature drift.
- c) The maximum permissible voltage drop and frequency variation for the maximum load step should be maintained within the specified limits as stated in Schedule A.

3.6.2.7 Type of Construction

- a) Details shall be provided of the bearings offered.
- b) The alternator shall be air-cooled.
- c) The alternator insulation class for its different parts shall be as specified in Schedule A.

3.6.3 Control, Monitoring, Alarms, Indications and Switchgear

3.6.3.1 General

The Employer's Engineer shall provide the Employer's Specification for Works which will contain the Operating and Control philosophy for the electrical plant system. This will include operating scenarios (test functionality, test load, shut down, breaker status, etc) in a Matrix table.

- a) The control system shall comply with the requirements of [11] SANS 8528-4, and shall be electrically fail-safe.

- b) The control system shall be powered from Direct Current (DC) available from the engine cranking batteries.
- c) The control system shall be capable of operating on an alarm-only basis or alarm and shut down, if so required.
- d) All data shall be date and time stamped.

3.6.3.2 Control Panel Controls

- a) The DG control panel shall provide local control of most of DG functions.
- b) As a minimum, the local control panel shall include the following. Any or all the functions can be available from a local Human–Machine Interface (HMI).
 - 1) Local Start
 - 2) Local Stop
 - 3) Emergency Stop
 - 4) Raise/Lower Load (when synchronized)
 - 5) Raise/Lower Volt-Ampere Reactive (VAR)
 - 6) Breaker Selection (Generator or Paralleling)
 - 7) Initiate Sync Command
 - 8) Remote/Local
 - 9) DG Breaker Trip and Close Functions
 - 10) Raise/Lower Voltage
 - 11) Raise/Lower Speed
 - 12) Alarm Accept/Test/Reset
 - 13) Lamp Test
 - 14) Local/Remote Control
 - 15) Mains Circuit-breaker operation
 - 16) Generator Bus Breaker (if parallel units)
- c) The sync function shall utilize the Comap Intelligen 1000 Autosynchronising paralleling controller
- d) Manual sync capability (including sync scope and sync lights) shall not be provided unless specifically requested in Schedule A.

3.6.3.3 Control Panel Features

- a) The following features shall be included in the control panel. Any or all of the functions can be available from a local HMI:
 - 1) Analogue Alternating Current (AC) Metering panel: Provides a colour-coded display of generator set output, voltage, current, frequency, power factor and kilowatt (kW).

- 2) Graphical Data Display: Allows the operator to view all engine and alternator data; to perform operator adjustments for speed, voltage, and time delays; and to view fault history.
 - 3) Light-emitting Diode (LED) Status Lamps: Indicate remote start command, not in auto, warning and shutdown.
 - 4) Exercise switch: Automated exercise function in the DG controller allows the operator to initiate an exercise period and have it automatically completed by the controller. The controller shall start the engine; perform the testing method as specified in the AB Schedules (synch with main supply, dummy resistor load or unloaded); run for a pre-set period; then run down, open the generator breaker, and shut down.
 - 5) Fault Reset switch: Allows the operator to reset the control after a warning or shutdown condition.
 - 6) LED lamp, which indicates that a fault is present on the system.
- b) The following features shall be included in the control panel and not from a local HMI:
- 1) Emergency stop push-button: Provides positive and immediate shutdown of the generator set.
 - 2) Key-type mode selector switch (local/remote/maintenance).

3.6.3.4 Remote Control System Interface (If required in the AB Schedules)

- a) The control system shall cater for all the input/output signals required for a complete system. Remote inputs/outputs may include, but are not limited to the following, **from the Remote Control System (inputs)**:
- 1) Remote Start Command
 - 2) Remote Stop Command
 - 3) Initiate Sync Command
 - 4) Select Generator Breaker for Sync
 - 5) Select Paralleling Breaker for Sync
 - 6) Load Demand (kW)
 - 7) VAR Demand (kVAR)
 - 8) Emergency Mode (disabled engine trips)
- b) The control system shall cater for all the input/output signals required for a complete system. Remote inputs/outputs may include, but are not limited to the following, **to the Remote Control System (outputs)**:
- 1) Control Mode (local/remote/maintenance)
 - 2) Engine Running
 - 3) Load kW (analogue)
 - 4) VARs (analogue)

- 5) Ready to Load
 - 6) Ready to Start
 - 7) Common Alarm
 - 8) Shutdown Alarm
 - 9) Breaker Interface
 - 10) Generator Breaker Open
 - 11) Generator Breaker in Operate Position
 - 12) Generator Breaker Protective Relay Reset
 - 13) Generator Breaker Close Command
 - 14) Generator Breaker Trip Command
 - 15) Generator Breaker Trip Status
 - 16) Paralleling Breaker Open
 - 17) Paralleling Breaker in Operate Position
 - 18) Paralleling Breaker Protective Relay Reset
 - 19) Paralleling Breaker Close Command
 - 20) Generator Voltage
 - 21) Bus Voltage (reference for testing)
 - 22) Paralleling Source Voltage (reference for return after power outage)
- c) If the required input/output signals are not specified by the Employer's Engineer, the control system shall cater for the following:
- 1) 8 × Digital inputs.
 - 2) 2 × Analogue inputs.
 - 3) 16 × Digital outputs.
 - 4) 4 × Analogue outputs.

3.6.3.5 Diesel Generator Control Panel Indications

- a) As a minimum, the following indications are available locally on the DG control panel HMI:
- 1) Control system in remote mode.
 - 2) Control system in local.
 - 3) DG control system healthy.
 - 4) Diesel engine ready to accept load.
 - 5) Main DC supply healthy.
 - 6) Backup DC supply healthy (if required).
 - 7) Generating kVAR (kilovolts-ampere reactive), kW (kilowatt), Volts, Frequency and

Amps are displayed on digital instruments.

- 8) Starter battery charger voltage and current.
- 9) Engine running hours.
- 10) Fuel level.
- 11) Engine temperature.
- 12) Oil pressure.

3.6.3.6 Diesel Generator Annunciator Alarms (if required in the AB Schedules)

a) The following alarms are available on the local DG annunciator:

- 1) Diesel engine start failure.
- 2) Low engine oil pressure.
- 3) Low radiator water level.
- 4) Engine over speed.
- 5) Engine air flaps closed.
- 6) Emergency stop activated.
- 7) Generator field breaker tripped.
- 8) Fuel tank < 5%.
- 9) Fuel tank < 15%.
- 10) Fuel tank > 105%.
- 11) Fuel tank rupture alarm.
- 12) Fire alarm.
- 13) Protection trip.
- 14) High engine temperature.
- 15) Low engine temperature.
- 16) High bearing temperature.
- 17) Stator temperature.
- 18) Under frequency.
- 19) Abnormal voltage.
- 20) Low starter battery voltage.
- 21) Charger fail.
- 22) Auxiliary supply fail.
- 23) Fuel transfer scheme failure.
- 24) Synch Failure.
- 25) DC failure.

26) Moulded Case Circuit-breaker (MCCB) tripped.

b) The following alarms will be repeated for input into the Remote-Control System (i.e DCS):

- 1) Engine protection tripped alarm.
- 2) Engine protection delayed time before trip will occur alarm.
- 3) Engine protection alarm.

3.6.3.7 Safety features

a) The following safety features shall be available:

- 1) A continuously rated, fail-safe engine stop solenoid used to control the fuel injection system.
- 2) An emergency stop push button on the diesel engine.
- 3) An emergency stop push button on the control panel.
- 4) Remote emergency shutdown capability.
- 5) Over speed protection.
- 6) Fully automatic mode with very little human interaction during power restoration after a blackout.
- 7) The DG controller will ensure that an engine will only shut down after running at no load for the engine manufacturer's recommended time period. This no load run is necessary to cool down the turbo chargers properly. However, using the emergency shutdown function will stop the machine immediately. Using the manual key switch function will also override the no load run function.

3.6.3.8 Control System Functionality

- a) Emergency stop: An emergency stop push-button shall be provided both on the engine and on the control panel. These push buttons shall be of the self-latching, twist-to-release type, red in colour, and at least 25 mm in diameter. Directly above each push-button, there shall be a red label indicating the function of the push-button. The button shall open the DG main breaker and shut the diesel engine down by cutting the fuel.
- b) Automatic Voltage Regulator (AVR): The AVR shall control the generator output voltage by three- phase sensing. When operating in either the asynchronous or in the synchronous mode, the AVR' shall operate accordingly.
- c) Control functions: Refer to the Employer's Specification for Works for the required control philosophy.

3.6.3.9 Alarms and Indications

- a) Each alarm shall register and maintain the alarm indication until manually cancelled, even if the signal that initiated the alarm has ceased.
- b) Each alarm shall be displayed in the front of the alarm panel by an indicating lamp, LED, or Liquid Crystal Display (LCD).

- c) A common 'Alarm Reset' push-button shall be provided to restore the control circuit to its original state once the alarm conditions have been noted and rectified.
- d) All alarm lamps or LEDs shall have a Lamp Test facility to test whether they are operational; this facility shall be operated by a single push-button.
- e) Each alarm shall be duplicated at a potential-free changeover contact. Both positions (three wires) shall be wired to outgoing terminals. Archiving/logging of alarms shall be kept.

3.6.3.10 Assemblies, Terminals, Wiring and Cabling

- a) LV Switchgear and control gear assemblies and associated equipment shall be in accordance with [18] 240-56227516 and [20] 32-333.
- b) [17] SANS 10142 shall be used as a minimum for Distribution boards.
- c) External wiring for low voltage control, interlocking, alarm, measuring, and DC circuits shall terminate on numbered wiring terminals that comply with the requirements of [16] SANS 60947-7- 1.
- d) Unless otherwise agreed upon, all terminals shall be marked in accordance with [14] SANS 60034-8. The position of the supplier terminal boxes, if of importance, shall be as specified.
- e) Where heat-generating equipment is present and the internal temperature is likely to exceed 50 °C, heat-resistant insulation (silicon wire) shall be used on stranded conductors. The supplier shall state where such insulation is used.

3.6.4 Auxiliaries

3.6.4.1 Cooling

- a) The engine shall be cooled by a pressurized radiator and shall be entirely self-contained. The radiator shall be filled with anti-freeze.
- b) Unless otherwise specified, fans of engines that are installed in an engine room shall draw air through the room and exhaust it externally. The method of driving the radiator fan (i.e. whether it is driven by electric motor or mechanical coupling to the engine) is listed in Schedule A. Electric motors will only be used for remote radiators and should be avoided where possible.
- c) A heating element operating at either U_{AC} 230 V single-phase, or U_{AC} 400 V three-phase shall be fitted in the engine water jacket to maintain the engine at a temperature suitable for cold starting. It is a requirement that these jacket water heaters can be isolated individually for heating element change out without draining the complete engine coolant capacity.
- d) The element terminals shall be brought out separately, such that both terminals of each heater element are available externally. The element wiring shall be terminated on a separate external terminal strip. The circuit shall be wired independently to ensure that a heater element failure will not affect the DG control system. The power to the heater element shall be thermostatically controlled to adequately regulate the engine

temperature. An alarm shall be issued if the engine temperature drops below the minimum temperature specified by the supplier.

3.6.4.2 Starting

- a) The starting method shall be specified in Schedule A.
- b) For electric motor starter, on initiation of the start command, the engine starter shall make five consecutive start attempts. Depending on the application, the required start philosophy will be as follows and indicated by the Employer's Engineer in Schedule A:
 - 1) Start Initiation 1: maximum duration of 10 s each, with rest periods of not more than 10 s between attempts (Generation Division only).
 - 2) Start Initiation 2: maximum duration of 8 s each, with rest periods of not less than 10 s between attempts.
- c) If the fifth start attempt is unsuccessful, the indication 'Start Failure' (red) shall be activated on the control panel.

3.6.4.3 Batteries

- a) The type of batteries to be used shall be specified in Schedule A.
- b) Batteries shall be rated for the voltage and currents of the starting motors and the control equipment, and for the time requirements of the alarm system specified. Details of the batteries offered shall be provided.
- c) The starting battery discharge capacity at 25 °C shall be such that the full cranking current can be drawn for 30 s, and that the final discharge voltage does not fall below the value as specified in [9] SANS 1632.
- d) During engine operation, the starter battery shall be charged from a charging generator. The battery charger shall take over battery charging when the charging generator fails or if the engine is shutdown.
- e) The battery shall be mounted separately from the vibrating part of the set, preferably in a clean and cool environment.
- f) The battery mounting shall be protected against corrosion, and shall include a spill tray and a transparent cover over the battery.
- g) A removable link system between battery and starters, whereby it is safe to isolate the engine for maintenance, yet have the charger and controller still energized shall be installed. The starter battery mounting shall be as close as possible to the starter motor and shall be arranged in a position permitting easy access for maintenance.

3.6.5 Battery Charger

- a) Equipment shall be provided in the control panel for charging the starter battery from the Employer's Engineer's U_{AC} 230 V or U_{AC} 400 V system.

- b) Battery chargers shall comply with the requirements of [10] SANS 1652, and shall be of the constant voltage, current limited type.
- c) The performance characteristics of battery chargers shall comply with the recommendations of the battery manufacturer.
- d) There shall be a separate charger for each battery/starter system if specified in Schedule A.

3.6.5.1 Fuel System

- a) Each Generator Set shall be equipped with a day tank or base tank as specified in Schedule A and the required accessories such as pumps, valves, and piping to supply the DG Set with fuel, when running at full load for duration as specified in Schedule A.
- b) The fuel system design and installation shall comply with the requirements of the local authority, e.g. fire department, and of the latest OHSAS standards.
- c) Galvanized materials or materials that contain zinc, copper, brass shall not be used in the fuel system for piping, valves, etc.
- d) To filter the input fuel to the DG, a water and fuel separator shall be fitted before the engine supply pump.
- e) The fuel/water separator device shall be installed between the fire shut-off valve and the engine fuel pump.
- f) The water fuel water filter drain shall be connected to an external outlet.
- g) A water level alarm system shall be provided to monitor the water level in the water fuel separator.
- h) The alarm system shall have a 'water in fuel' alarm.

3.6.5.2 Fuel Injection

- a) The engine shall be equipped with a means of priming the fuel system to the injectors following long engine shutdown times.
- b) If the fuel serves as 'injector cooling', the supplier shall provide adequate cooling to the fuel supply system to avoid increases in day tank temperature.
- c) A continuously rated fail-safe engine-stop solenoid shall be provided on the fuel pump supply line.
- d) The main fuel line shall be equipped with a fire-resistant shutdown valve, operated by a fusible link or similar type fire detector that closes off the main fuel supply line and 'spill' return line between the tank and diesel in the event of a fire.

3.6.5.3 Day Fuel Tank (if applicable)

- a) Each engine shall be equipped with its own day fuel tank installed next to the generator.
- b) The supplier shall construct and install the day tank in accordance with [12] SANS 10089 parts 1 to 3.

- c) The capacity of the day fuel tank shall be a minimum of 2 h continuous operation at full load unless specified differently in Schedule A.
- d) The day tank shall be of double wall construction unless specified differently in Schedule A and shall have a leak detection sensor in the interstitial space.
- e) Alarm sensors shall be furnished for high fuel, low fuel, and critical low fuel.
- f) Alarm contacts from these fuel sensors shall be connected to the engine control system for local alarm indication. In addition, single-pole double-throw contacts from each alarm sensor shall be connected to terminal blocks in the engine control panel for the Employer's Engineer's use.
- g) The top of the day tank shall be such as to allow for gravity feed from the bulk storage tank.
- h) The day fuel tank shall have a sloping bottom with a drain valve at the lowest point of the tank. The slope shall be 1:20 towards the drain valve.
- i) The intake to the fuel delivery pipe to the engine shall be located at a level that is equal to a position representing at least 2% of the total tank capacity. A manual shut-off valve (no copper or brass) shall be fitted in this pipe.
- j) The overflow pipe shall be twice the diameter of the filler pipe and shall be so positioned that the overflow can occur only when the tank is 98% full. The overflow pipe shall be connected to the bulk storage tank.
- k) A filler pipe shall be provided and shall preferably pass through the tank top.
- l) A removable hand hole with an inspection cover shall be provided in the top of the day tank, for maintenance purposes. The cover shall have a gasket and be provided with a locking facility.
- m) The capacity of the fuel tank shall be limited to 1 000 l. No farm tank shall be used for fuel storage.
- n) The fuel supply line shall be fitted with a fire valve. For this purpose, a suitably designed fused-link system shall be provided to cut off the fuel to the engine in the event of fire.

3.6.5.4 Diesel Fuel

The fuel injection equipment offered shall use diesel fuel that complies with the requirements of [6] SANS 342.

3.6.5.5 Lubrication

- a) The engine shall be supplied with a force-feed lubrication system rated to supply the circulating lubrication oil to all the bearings, gear trains and other moving parts.
- b) An oil pressure gauge (if required) and an oil pressure sensor and switch shall be so mounted downstream of the oil filter that the engine lubricating oil pressure is readily indicated on the engine or on the control panel (or on both), as specified. The safety range and the danger zones shall be indicated on the gauge.
- c) The oil pressure sensor shall be connected to the control system, to give an alarm and to

stop the engine if low oil pressure occurs.

- d) The oil filter shall have adequate capacity of at least 250 h continuous operation.
- e) Where duplex oil filters are installed, it shall be possible to switch from one filter to the other while the engine is running.
- f) Oil filters shall be readily accessible.
- g) All bearings and continuously rotating moving parts that are not pressure lubricated shall be fitted with sealed ball, roller, or needle bearings.
- h) If so, specified in Schedule A, a lubrication oil make-up tank shall be supplied. The make-up oil shall be gravity fed into the engine sump.
- i) If so, specified in Schedule A, a semi-rotary hand-operated sump drain pump shall be fitted, and so positioned as to facilitate oil drainage during oil change servicing.
- j) If a motor-driven lubricating oil priming pump is provided, this shall be stated in Schedule A. The supplier shall also indicate if this is a prerequisite for engine pre-lubing, and should no oil gallery pressure be successfully achieved, any engines starting shall be aborted.
- k) A label indicating the grade of oil to use the frequency of oil changes and the volume of oil shall be affixed to the engine. The use of multigrade oils is preferred against monograde oils.
- l) Any need for separate oil cooler or auxiliary oil heater or both for cold starting shall be stated in Schedule A together with the power requirements for any auxiliary oil heater.
- m) The crank case breather shall be extended/ routed beyond the radiator system where vapours can be discharged within the hot airflow.

3.6.5.6 Aspiration and Cooling Air Intake

- a) The engine air filter shall be dry type as appropriate for the site conditions.
- b) The air intake shall be so mounted that the intake of dust or other particles is minimized.
- c) The air intake shall be screened to prevent vermin or birds from entering the intake.
- d) If water has entered the intake, it shall be possible to drain the water from a low-lying collection point.
- e) The air filter construction shall be such that the filter element can be readily cleaned or replaced.
- f) If so, specified in Schedule A, a 'differential pressure high' switch shall be provided to indicate a dirty filter element condition.
- g) The air intake shall be positioned such that the intake of exhaust gasses or radiated heat is avoided.

3.6.6 Earthing

3.6.6.1 General

- a) Earthing shall be provided to meet the system protection and safety requirements for the DG Set power circuits. The minimum earth fault current dictates the generator protection settings for correct operation.
- b) The maximum earth fault current and its duration determine the cross-sectional area of the earth conductors to be used.
- c) Independent earthing is required to eliminate electromagnetic disturbances in control circuitry, and to prevent mechanical damage to the shaft and bearings in the set, caused by induced and stray currents.
- d) Provision shall be made by the supplier to enable the earthing of the plant.
- e) The supplier shall provide details of its specific earthing system requirements, philosophy, etc. The system shall be suitable for a movable and transportable unit.

3.6.6.2 Generator Neutral Earthing

- a) Neutral earthing implies interconnection of the generator's neutral and the Employer's Engineer's power system's neutral, which is generally earthed.
- b) Multiple earth connections can cause neutral circulating currents between parallel systems. Care shall be taken to avoid this phenomenon and the consequent unnecessary operation of the protection.
- c) The neutral earthing method employed shall be in accordance with [11] SANS 8528 and will depend on the existing site earthing philosophy, DG mode of operation and level of protection required. The Employer's Engineer shall specify the neutral earthing method in Schedule A.
- d) The neutral connector shall be able to carry the full earth-fault current of the generator.
- e) The supplier shall provide protection of the generator against internal earth faults, and details of such protection shall also be supplied.

3.6.6.3 Earth and Bonding of Components

- a) Each main component of equipment shall be earthed direct to a solid copper earth bar, which shall be connected to the Employer's earth system at a point as specified.
- b) As a rule, the earth continuity conductor shall be of a nominal cross-sectional area at least half that of the largest phase conductor, but not more than 70 mm².
- c) Earth conductors may be bare copper, insulated copper, aluminium or an anti-theft copper/steel compound unless specifically stated in Schedule A. Where aluminium is used as an earth conductor, bimetal connections shall be used between different materials, and these cannot be installed underground.
- d) On batteries and battery chargers, the negative pole shall be earthed to the frame of the set unless specified differently.
- e) The frame of the DG Set shall be flexibly earthed to the earth continuity conductor with due regard to the magnitude and duration of possible local earth faults.
- f) Electrolytic corrosion shall be avoided. A suitable earthing facility shall be provided on the

frame. If so recommended, bypass earthing of insulated bearings shall be carried out by means of an earthed brush, to prevent damage caused by induced shaft currents.

- g) Tanks shall have an earthing facility provided on the tank, for connection of an earth conductor between the tank and the frame of the set.
- h) Junction boxes shall be fitted with an earth terminal. The earthing conductor shall be of suitable cross-sectional area to withstand any earth fault currents.
- i) Junction boxes enclosures shall be rated IP54 as per [15] SANS 60529, unless specified otherwise in Schedule A.

3.6.6.4 Enclosures

- a) Enclosures shall be rated IP65 as per [15] SANS 60529, unless specified otherwise in [15] SANS 60529. Colour shall be as specified in [15] SANS 60529.
- b) Enclosures shall be constructed of minimum 3CR12 material and powder coated to colour as per the Employer's Engineer's requirements.
- c) Enclosure doors shall be positively drawn and closed onto seals by means of pad-lockable lever-operated catches. Cable entry shall be from the bottom using removable gland plates.
- d) Enclosures containing a rectifier and/or inverter shall be fitted with removable filters that prevent the ingress of dust. The airflow to air-cooled components shall be arranged to promote cross ventilation, and such that it cannot be impeded accidentally in any way.
- e) A stud shall be provided for earth connections from inside and outside the enclosure. Where studs are not welded to the plate, flat washers shall be used as the final mating surface in the case of a conductive gland plate. A bolt and nut arrangement may also be used.
- f) Where the plate is coated with non-conductive covering, studs shall be welded to the plate after the coating is removed.
- g) An earth bar shall be provided. The earth bar shall be connected to the earth stud inside the enclosure by the shortest possible path. All earth connections shall follow the shortest path, and no 'pigtailed' (wire coils for neatening purposes) are permissible.
- h) The connection between the earth stud and the earth bar shall be made using a suitability sized conductor and shall be appropriately lugged for the purpose.
- i) Gland plates shall be fabricated from a conductive material and shall be protectively coated against corrosion using a conductive coating, such as cadmium.
- j) The gland plate shall be bolted to the enclosure in at least four places, in such a manner as to ensure galvanic continuity between the plate and the enclosure is ensured.
- k) Doors shall be bonded to the enclosure using earth studs.
- l) Doors > 0,5 m in length shall be bonded in at least two different locations, with 0,5 m spacing between each bond.
- m) Bonds shall be made using braided copper strapping ≥ 10 mm wide and having a width to

3.6.7 Mechanical Build

3.6.7.1 Coupling

- a) The generator and engine may be coupled directly with a flange adapter ring or a bell housing within which a shock absorbing flexible coupling is fitted. The method shall be fully described by the supplier.
- b) In the case of large DG Sets, the generator and engine may be coupled directly.
- c) If the generator is offered with double bearings, it shall be coupled to the engine with a flexible coupling designed to take up any angular misalignment, and to transmit the drive torque smoothly.

3.6.7.2 Base Frames

- a) DG Sets shall be mounted on a simplex frame.
- b) The overall dimensions of the frame shall be provided.
- c) Lifting provisions on the base shall be provided to lift the complete set, including any canopy or enclosure, if fitted. Lifting provisions are to be clearly marked. Lifting eyes not suitable for complete lifting shall be indicated as such.
- d) The maximum overall mass of the DG Set (including oil) and its frame shall be provided. This is required to ensure suitable rated equipment to lift the complete set, without decoupling.
- e) The base shall be so constructed as to allow for an integrated base tank, oil drip tray, and to allow space for draining the engine oil from the sump.

3.6.7.3 Vibration damping

- a) The system shall comply with the requirements of [11] SANS 8528.
- b) Vibration damping mounting details shall be provided.

3.6.7.4 Exhaust System

- a) The exhaust line diameter shall be adequate for the length of the exhaust line.
- b) The exhaust shall have an effective silencer that reduces the noise level to not more than that allowed by local noise regulations.
- c) The exhaust system shall have a low-lying collection point provided with a drain plug, to enable any condensation to be removed.
- d) Exhaust gases shall be released at a location that complies with the local and national regulations and shall not be drawn into the engine or ventilation intake again.
- e) The position of the exhaust shall not hinder operation and maintenance.
- f) The exhaust pipe shall be so arranged as to prevent the ingress of rain and bird nesting.
- g) Emission levels and noise levels shall be as defined in Schedule A. The maximum will be 90 dB.
- h) The exhaust system, with the exception of expansion bellows and flexible joints, shall be

constructed from aluminized steel.

- i) The external (from the building) exhaust system shall be manufactured from (316) stainless steel.
- j) Expansion bellows shall be fabricated from stainless steel and shall be of the type, length and diameter recommended by the supplier.
- k) Leak-tight flexible joints shall allow for expansion and contraction without straining the system.
- l) No welding shall be done on the exhaust system.
- m) Adequate lagging, of non-asbestos material, shall be provided. The type of lagging and the thermal capabilities of the lagging offered shall be provided in Schedule A. As a minimum, the lagging shall be rated 400 °C fiberglass material or other suitable material.
- n) Expansion bellows shall not be lagged. Flexible joints shall be lagged.
- o) The piping outside the Plant room shall not be lagged. Non-lagged piping shall be corrosion protected with a heat-resistant paint.
- p) Exhaust lagging shall be protected by means of metal cladding/cowling if specified in Schedule A.
- q) Safety guards to prevent accidental contact shall be provided over all exposed exhaust pipes and bellows.
- r) Suitable flexibility shall be built into the system to isolate the exhaust system from the structure, and to prevent any stresses on the engine flanges. Relative movement of the engine and surrounding structure shall be considered.
- s) Hangers, supports and guides shall be designed to allow for expansion and contraction, and to allow necessary access to the set.
- t) All metal and surface preparation, painting and coating processes shall comply with the requirements of [19].
- u) Before lagging, all silencers, fittings, etc. shall be painted with heat-resistant, aluminium/zinc- based, high-temperature paints.
- v) Exhaust outlets shall either be fitted with a weight-operated rain flap; or, if exiting in a horizontal direction, fitted with a 'bird screen' and appropriately cut at an angle that does not allow rain water to enter the opening.
- w) Exhaust cowling/cladding shall be manufactured from (316) stainless steel sheet as a minimum.
- x) Rubber hoses and belts shall not be painted.

3.6.7.5 Fire Protection

- a) A fire risk analysis shall be performed to determine suitability to the required solution.
- b) Fire protection and detection shall be provided by others if required.

3.6.7.6 Outdoor Canopy (if required)

- a) Refer to Schedule A for whether an outdoor canopy is required. If required, the canopy will comply with the following:
 - 1) The canopy shall be sized for the required generator.
 - 2) The canopy shall be constructed from minimum 3CR12 and epoxy powder coated for a coastal environment.

3.6.7.7 Acoustic Canopy (if required)

Under special conditions, an indoor acoustic canopy may be required to reduce the acoustic noise level. The requirement will be specified in Schedule A.

3.6.7.8 Control Panel

- a) The control panel shall:
 - 1) be vermin-proof.
 - 2) have 20% of component mounting space and wire ways available for future additions.
 - 3) include 'closed cell' neoprene seals throughout to ensure that foreign objects, such as dust and moisture, do not ingress into the enclosure.
 - 4) have an easy means of access to the underside of the gland plates from above floor level.
 - 5) have removable, cadmium-plated, hot-dip galvanized or white painted, steel equipment- mounting panels or chassis, of thickness at least 2 mm.
 - 6) include suitable rigging facilities (eyebolts, lifting brackets, etc.) if required. There shall be no protrusions beyond the bounds of the cubicles.
 - 7) have sufficiently large doors, stiffened if necessary, to permit easy and complete access to the interior.
- b) In addition, the doors shall have:
 - 1) one pad-lockable locking mechanism on doors of height < 600 mm.
 - 2) two pad-lockable locking mechanisms on doors of height in the range 600 mm to 1 200 mm.
 - 3) three lockable mechanisms in doors of height > 1 200 mm, one of which is pad lockable.
 - 4) keepers, if necessary, to keep the door open
 - 5) corrosion-resistant hinges and handles; and
 - 6) removable, undrilled, cadmium-plated or hot-dip galvanized steel gland plates of thickness at least 2 mm.
- c) Individual component labelling shall be placed on the backing plate.
- d) The engine control panel can be mounted to the base frame if additional anti-vibration bolts are used, all components are securely fixed and suitably rated for the vibrations.
- e) Alternatively, the control panel can be mounted separately using 'anti-vibration' fix on the concrete floor to ensure that engine vibrations do not cause unnecessary vibration of the

components mounted within the engine.

- f) All relays shall be adequately secured to prevent the relay base from falling out during vibrations.
- g) The wiring between the control panel and the engine-mounted devices shall be resistant to temperature.
- h) Components shall be mounted in the compartments on the equipment mounting plates or chassis, using bolts screwed into tapped holes, or hank nuts that engage at least three full threads.
- i) A DIN mounting rail shall be fixed to the mounting plate or chassis in a similar manner.
- j) Self-tapping screws or bolts with loose nuts shall not be used.
- k) Components shall be spaced at least 10 mm apart when components are dissimilar or intended for flush mounting on front doors and covers.
- l) Equipment manufactured for surface mounting shall not be modified for flush mounting and shall be labelled exactly in accordance with the drawing or the wiring diagram.
- m) Fuse bases shall be labelled with the rating of the fuse link that should be fitted into them.
- n) Control transformers shall:
 - 1) Be double-wound isolating transformers with an earth screen between the primary and secondary windings; rated Class 1; and not exceed the burden.
 - 2) Have one leg of the secondary winding earthed.
 - 3) Include at least 25% spare output capacity.
- o) Wiring in the assemblies shall be:
 - 1) Run in covered wire duct that is filled to not more than 80% of its capacity.
 - 2) Protected against chafing, with grommets, where it passes through the panel work.
 - 3) Loomed with spiral wrap or alternative protection, and arranged for minimal twisting rather than a bending action where it crosses door hinges and other areas that can move relative to one another.
 - 4) Thermoplastic-insulated or thermosetting-insulated, stranded copper wire. Solid conductors shall not be used.
 - 5) Of cross-sectional area at least 1,5 mm², except for current transformer circuits, where it shall be at least 2,5 mm² and shall be 600 V/1 000 V grade in accordance with [8] SANS 1507.
 - 6) Identified at each end with an indelibly marked, interlocking, slip-on identification ferrule. The number on the ferrule shall be shown on the wiring diagram; adhesive wrap-on type ferrules shall not be used.
 - 7) Terminated at each end with pre-insulated crimp lugs. Lugs shall be crimped on with ratchet type crimping tools that do not release until the crimp is complete.
 - 8) Colour-coded in accordance with [18] 240-56227516.
 - 9) Free from joints or splices.

- p) All terminals shall, as far as possible, be at the front of the control panel, and shall be accessible without it being necessary to disturb wiring or remove components.
- q) All metalwork, including the cabinet, shall be electrically bonded to the earth connection with a conductor of suitable cross-section.

3.7 Marking, Labelling and Packaging

3.7.1 General

A metal file holder or box shall be provided and attached at a suitable location for the purpose of holding relevant documentation and drawings.

3.7.2 Marking

- a) All water pipes for external cooling circuits shall be clearly and permanently marked at all connection points to indicate the direction of flow.
- b) All drain plugs shall be clearly marked with an identifying colour in accordance with [13] SANS 10140 parts 1 to 3.
- c) Fuel pipes and taps to be clearly marked and labelled.
- d) Battery and DC circuit terminals shall be clearly marked to indicate their polarity.
- e) All timers shall be marked or labelled to indicate their time control range.
- f) Earth connections shall be labelled with a standard earth symbol in black on a yellow background.

3.7.3 Labelling

3.7.3.1 Labels

- a) Labels shall be in English.
- b) Labels shall be indelibly and permanently marked and shall be securely attached to the equipment.
- c) A label indicating the grade of oil shall be attached to the diesel engine.
- d) All printed-circuit cards shall be clearly identified.
- e) All instruments shall be clearly labelled to indicate their function, and all alarm indicators shall be clearly labelled to indicate the alarm they represent.
- f) Statutory labels required to be attached to building doors, etc. shall be provided and fitted when applicable.
- g) Labels that have red letters on a white background, the lettering being of height at least 10 mm, shall be affixed to all places where danger can exist owing to automatic start-up. The text on these labels shall be in accordance with 3:

Table 3: Danger label

DANGER	
THIS MACHINE SHALL START WITHOUT NOTICE. BEFORE WORKING ON THE MACHINE, LOCK THE CONTROL SWITCH ON THE CONTROL PANEL IN THE OFF POSITION	

- h) A label shall be attached adjacent to each terminal to indicate its function and designation in accordance with the relevant circuit diagram.
- i) A graphic diagram with an electric flash in accordance with type designation WW7 of [7] SANS 1186, and a label indicating the voltage shall be placed near all mains terminals.
- j) Labels may be engraved on sandwich plastic material that is suitable for tropical outdoor use.
- k) Warning and danger labels shall be in red on a white background.
- l) Information and instruction labels shall be in black on a white background.
- m) Devices fitted to the set shall be labelled in accordance with the relevant circuit diagram.
- n) Components shall not be labelled on the component, but on the chassis or printed circuit board adjacent to the component.
- o) Electronic modules shall be labelled to identify them, and the rear connectors shall be keyed to prevent incorrect positioning.

3.7.3.2 Rating Plates

- a) All major items of plant shall be provided with corrosion-resistant rating plates that comply with the requirements of the South African National Standards (SANS).
- b) The following details shall be clearly, legibly, and indelibly marked on the plates:
 - 1) manufacturer's name
 - 2) manufacturer's type number
 - 3) manufacturer's serial number
 - 4) year of manufacture
 - 5) rated engine speed, power, operating altitude
 - 6) voltage, power factor, frequency, etc.
 - 7) short-time withstand current, in kilo-amperes (kA), for the maximum time, in seconds
 - 8) performance class
 - 9) load acceptance
 - 10) type of fuel used
- c) Rating plates shall be permanently fixed in a prominent position on the equipment.

3.7.4 LOAD BANK (DUMMY LOAD)

- a) A correctly sized Load Bank to be supplied to enable periodic testing, including for built-in capability of feeding the Employer's Local Grid through the synchroniser controller and motorised autochangeover during routine tests, if the load present on the local grid is sufficient for the test.
- b) If the load present is insufficient for test requirements the option to use the Load BANK in combination with grid load shall be available, in addition to the option of LOAD BANK only.

3.7.5 Packaging and Shipping

- c) The system shall be suitable packed to prevent damage to the system or any components during transportation to site, and to allow for outdoor storage on site before installation.
- d) The DG System may be shipped as a unit or dismantled (shipped as a unit as far as practically possible).

4. Tests

4.1 Responsibility for Testing

- a) The supplier shall be responsible for all tests.
- b) Test shall be performed and certified in accordance with [11] SANS 8528-6 and this section of the standard.
- c) As a minimum, the International Organization for Standardization (ISO) standard functional tests (as specified in [11] SANS 8528-6) and the tests specified in sections 4.1.48-4.1.51 shall be performed.
- d) Additional ISO standard acceptance tests to be performed shall be specified in Schedule A.

4.2 Type Tests

- a) All test certificates for all the Genset shall be provided from the OEM component manufacturers. The component certificates shall be submitted with the tender documents.
- b) Type tests shall include as a minimum:
 - Measurement of Winding Resistance
 - Voltage Ratio & Vector Relationship Test
 - Impedance Voltage & Short-Circuit Test
 - No-Load Loss & Current Test
 - Separate-Source Voltage Withstand Test
 - Induced Overvoltage Withstand Test
 - Lightning Impulse Test

- Temperature Rise Test

c) The following Compliance Standards must be met:

- IEC 60034-22 (Alternator Performance)
- IEC 60034-1 (Mechanical & Electrical Performance)
- European Non-Road Mobile Machinery Directive (NRMM) 2016/1628/CE or EU Stage V minimum

4.3 Insulation Resistance Testing

- a) An insulation resistance test shall be applied to all circuits that do not contain components such as semiconductor devices, electronic modules and printed-circuit cards.
- b) Printed-circuit cards shall be removed from the connectors prior to testing of circuits.
- c) This test shall be performed in an atmosphere where the relative humidity is not higher than 85%, and shall consist of the following:
- 1) a test voltage of 2 kV (rms) applied for 1 min for all AC circuits below 1 000 V, between the conductors and any earthed components.
 - 2) a DC test voltage of 500 V applied for 2 min between two separate circuits, using a 500 V resistance tester. The resistance recorded shall exceed 50 MΩ.
 - 3) a test voltage as in (b) above, but between all circuits connected together and the frame.
 - 4) a test voltage of 1 kV (rms) applied for 1 min to all DC circuits.

4.4 Factory Acceptance Tests

- a) As a minimum, the following Factory Acceptance Tests (FATs) shall be performed:
- 1) A full functional test of all control and operating systems.
 - 2) A full load test, at the rated kilovolt-ampere (kVA) of the generator, for a period of at least 8 hours.
- b) The full load test should be followed immediately by any overload capacity test as specified. During this test, the following shall be recorded at 10 min intervals:
- 1) engine temperature
 - 2) engine oil pressure
 - 3) generator voltage
 - 4) generator frequency
 - 5) generator current
- c) The DG shall be capable of performing a single load step equal $\geq 50\%$ of the continuous kilowatt (kW) rating of the machine while remaining within operating limits.
- d) The DG shall be capable of performing a single load step equal to 110% of the most severe single step load in the plant design profile. The DG shall accept the load without voltage collapse or engine stalling and recover to normal operating speed. The supplier shall

document the voltage and frequency deviation observed.

- e) The supplier shall provide the Employer's Engineer with copies of the following:
 - 1) The engine manufacturer's test results, clearly indicating the specified performance.
 - 2) The generator manufacturer's test results, clearly indicating the specified performance.
 - 3) A pressure test of the air receiver of the compressed-air starter system.
 - 4) A pressure and functional test of the air valves included in the compressed-air starter system.
- f) The supplier shall perform a simulated function test of the control panel.
- g) Test results shall indicate that the performance at the specified site altitude meets the requirements of [3] ISO 3046.

4.5 Site Acceptance Tests

- a) On completion of the installation, the following Site Acceptance Tests (SATs) shall be performed:
 - 1) A full Functional test and Acceptance test of all control and operating conditions.
 - 2) A load test utilizing the available site load and under the load parameters given, for a period of at least 1 hour (if practically possible).
- b) During the load test, the following shall be recorded at 10 min intervals:
 - 1) engine temperature
 - 2) engine oil pressure
 - 3) generator voltage
 - 4) generator frequency
 - 5) generator current
- c) The load test shall be continued until it is established that the engine temperature is stable for at least 20 min.
- d) The equipment shall perform in accordance with the requirements as specified; and the noise produced by the engine/generator set shall comply with the noise levels as specified.
- e) The following tests shall then be performed:
 - 1) Battery discharge test.
 - 2) Battery charger test.

5. Authorization

This document has been seen and accepted by:

Name and surname	Designation

Annex A – A/B Technical Schedules

NOTE: Schedule A: User requirements - Indicates typical requirements for Generation applications where S >1MVA. Change User requirement as per application.

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.0	Qualification				
AB.0.1	Local Agent Representation required	Yes / No	Yes (Provide Details)		
AB.0.2	Number of Years local representative exists in South Africa	Years	Yes		
AB.0.3	Supply Reference list with installations (Projects), designs and MVA size (not less than 1000KVA) duration, location, contract persons	Yes / No	Yes		
AB.0.4	Compliance with SANS (ISO) 9001:2008 required	Yes/No	Yes		
AB.0.5	The Diesel Generators are to build in accordance with SANS 8528-All Parts	Yes/No	Yes		
AB.1	The Works				
AB.1.1	Supplier				
	Generator Set Output Characteristics (No transformer Required to achieve the output Voltage)	kVA/V	1000kVA prime		
AB.1.1	Number of Diesel Generator Sets required		1		
AB.1.2	Name of Diesel Generator Set Manufacturer (Local/ Foreign)				
AB.1.3	Factory Test	Yes / No	Yes		
AB.1.4	Install and Erect	Yes / No	Yes		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.1.5	Site test and Commission	Yes / No	Yes		
AB.1.6	Install Fire Protection System	Yes / No	No		
AB.1.6.1	Perform Fire Risk Analysis	Yes / No	Yes		
AB.1.7	Type Of Fire Protection System				
AB.1.8	Fire Protection Trigger system				
AB.1.9	Diesel Generator Set Components and Services required		Yes- 5 year and 10000 hrs		
AB.1.9.1	Local Control Cubicle	Yes/No	Yes (One for each Diesel Generator)		
AB1.9.1.1	Local Control Panel contains AVR	Yes/No	Yes		
AB1.9.1.2	Local Control Panel contains Governor Controller	Yes/No	Yes		
AB1.9.1.3	Local Control Panel contains Interlocking Logic, Alarming, Tripping and Annunciation	Yes/No	Yes		
AB1.9.1.4	Controller Battery Chargers and Battery	Yes/No	Yes		
AB1.9.1.5	Synchronizing Equipment	Yes/No	Yes		
AB1.9.1.6	Interfaces with Remote Control System	Yes/No	Yes		
AB.1.9.2	Control wiring between Control Cubicle and Diesel Generator	Yes/No	Yes		
AB.1.9.3	Diesel Generator Engine	Yes/No	Yes		
AB.1.9.4	Generator	Yes/No	Yes		
AB.1.9.5	Diesel Bulk Tank	Yes/No	No		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.1.9.6	Diesel Day Tank	Yes/No	Yes-Integrated Base		
AB.1.9.6.1	Maximum height from the finished floor to the top of Day Tank	m			
AB.1.9.7	Interlocking and Control cabling between Diesel Generator Control Panels	Yes/No	No		
AB.1.9.8	Control cabling between Diesel Generators and relevant Switchgear	Yes/No	No		
AB.1.9.9	First Fuel fill				
AB.1.9.9.1	Supply First Fuel Fill for Commissioning and Testing Purposes	Yes / No	Yes		
AB.1.9.9.2	First Fill Amount	liters	Full Tank		
AB.2	Contractor Facilities				
AB.2.1	Contractor to provide own cranes for off-loading equipment	Yes / No	Yes		
AB.2.2	Contractor to provide own jacks & other tools for off-loading	Yes / No	Yes		
AB.2.3	Height of Lift required	m			
AB.2.2	Contractor to provide own lifting equipment	Yes / No	Yes		
AB.3	Site Conditions:				
AB.3.1	Site Criteria	Marine/ Land Use			

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
		Coastal/ Land Use Inland			
AB.3.2	Altitude above sea level	m			
AB.3.3	Ambient air temperatures:				
AB.3.3.1	Average Ambient Temperature	°C	25		
AB.3.3.2	Maximum Temperature	°C	42		
AB.3.3.3	Minimum Temperature	°C	0		
AB.3.4	External Vibration source		Normal		
AB.3.5	Radiation	Yes/No			
AB.3.6	Chemical Pollution	Yes/No			
AB.3.7	Dust Pollution		High		
AB.3.8	External Cooling Water Average Temperature				
AB.3.9	Humidity	%	30% to 80%		
AB.4	Generator Set Generic Requirements				
AB.4.1	Designed Operating Life	Years	20		
AB.4.2	Warranty of parts	Years	Minimum 5		
AB.4.3	Application	Continuous Operation at Constant Load/ Continuous Operation at Varying Load/	Continuous Operation at Varying Load		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
		Limited Time Operation at Constant Load/ Limited Time Operation at Varying Load			
AB.4.4	Operation	Parallel/Single/ Parallel with Utility supply	Parallel/Parallel with Utility		
AB.4.5	Generator Set Class	G1/ G2/ G3/ G4	G3		
AB.4.6	Maximum (Starting) load increment which may be applied with the voltage and frequency maintained within the limits specified (load acceptance)	kW	As per ISO 8528- 5:2022 for Class G3		
AB.4.7	Cold Start Time (To rated Speed)	s			
AB.4.8	Time from Rated speed to acceptance of Full Load	s			
AB.4.9	Time that the Generator Set can run at No Load	s			
AB.4.10	Start Up Classification	Long Break/ Short Break/ No Break			
AB.4.11	Installation Requirements	Inside (Indoors) Installation/ Outside Installation with Protection/ Open Air	Outside Installation with Protection- enclosure type		

		Installation			
	Sound attenuation	dB	65dB at 1m		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.4.12	Installation Configuration	Fixed/ Transportable/ Mobile	Transportable		
AB.4.13	Generating Set Configurations	A: without base frame/ B: with base frame/ C: with base frame, integrally mounted control gear, day tank, and auxiliaries/ D: configuration as given in C with enclosure/ E: configuration as given in C having an integral set of wheels or mounted on a trailer	C		
AB.4.14	Mounting Type	Ridged/ Fully Resilient Semi- Resilient/Resilient Foundation			
AB.4.15	Coupling Arrangement	rigid/ torsionally			

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
		rigid/ flexible/ torsionally flexible or clutch			
AB.4.16	Maximum acoustic noise level in the Generator Room at specified distance	dBA	65		
		m	1		
AB.4.17	Generator set, terminal box and control panel	IP Rating	65		
AB.5	Generator-Set Routine Testing (Routine Load testing to ensure reliability of the Generator Set)				
AB.5.1	Required Generator-Set Test Frequency	Times per month	Per OEM requirement		
AB.5.2	Testing Method	Synch with Main Supply/ Dummy resistor/ Load Unloaded	Synchronized with Main Supply (Automated)		Specify whether the testing method must be performed automatically
AB.5.3	Minimum Loading during routine Testing (if applicable). Preferred 70-80% load with bi-annually running at 100 and 110% loading	kW			
AB.5.4	Interval between major services				
AB.5.5	Interval between minor services				

AB.5.5.1	Oil change intervals of engine sump	Monthly/ hours run time, / or oil condition monitoring bases.	Per OEM requirement		
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Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.6	Generator-Set Engine Details				
AB.6.1	Manufacturer of Engine and Turbo Charger / Supercharger		Deutz/Cummins/Volvo Penta/Perkins/Caterpillar/Scania/Baudouin		
AB.6.2	Type				
AB.6.3	Rated Speed	rpm			
AB.6.4	Idle Speed	rpm			
AB.6.5	Over Speed withstand capability	%	125		
AB.6.6	Critical Speeds	rpm	Shall not be above or below 25% of rated speed		
AB.6.7	Speed at point of stalling	rpm			
AB.6.8	Prime Mover Type	Compression-Ignition Engine/ Spark-Ignition Engine	Compression Ignition		
AB.6.9	Continuous Power Output (COP)	kW			
AB.6.10	Prime Power (PRP)	kW			
AB.6.11	Limited-Time Running Power (LTP)	kW			
AB.6.12	Emergency Standby Power (ESP)	kW			

AB.6.12	Overload capability (Two hours in any 24-hour period)	%	10		
AB.6.13	Additional governing power reserve*	%	10		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.6.14	Minimum Running Load of rated without adverse effect on the Prime Mover	%	30		
AB.6.15	Engine Power Output at Sea Level				
AB.6.16	Engine Output at maximum Engine capability				
AB.6.17	Maximum (Starting) permissible frequency deviation during sudden application of Load	%	According to SANS 8528-5		
		kW			
AB.6.18	Aspiration	Super Charged/ Turbo Charged/ Naturally Aspirated			
AB.6.19	Number and Arrangement of Cylinders				
AB.6.20	Bore and Stroke	Mm			
AB.6.21	Piston Displacement	Cubic meters			
AB.6.22	Compression Ratio				
AB.6.23	Piston speed at rated rpm	m/s			
AB.6.24	Lubricating oil consumption at rated output	l/kW			
AB.6.25	Delay between application of loads	s			

AB.6.26	Diesel Generator and auxiliary systems enclosures type	IP Rating	65		
AB.6.27	Diesel Generator and auxiliary systems enclosures colour	Colour			

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
*This additional percentage governing power is not the same as the overload power.					
AB.7	Generator-Set Engine Lubrication				
AB.7.1	Engine Lube Oil Storage capacity	l			
AB.7.2	Oil Flow Required to maintain the Recommended temperature difference between the engine inlet and outlet	l/s			
AB.7.3	Maximum Lube Oil temperature at Full Load Capacity	°C			
AB.7.4	Lube Oil sump Running Capacity	l			
AB.7.5	SAE rating and Type of Lube Oil				
AB.7.6	Number of Oil Filters				
AB.7.7	Oil Filter Type				
AB.7.8	Location of Oil Pressure sensor				
AB.7.9	Oil Temperature System Required	Yes/No	Yes		
AB.7.9.1	Sump breather pipe to be vented beyond radiator/outside of building to avoid vapours fouling up radiator	Yes/No	Yes		
AB.7.10	Lube Oil Pump				
AB.7.10.1	Engine Driven Lube Oil Pump required	Yes/No	Yes		
AB.7.10.2	Lube Oil Pump manufacturer				

AB.7.10.3	Lube Oil Pump Type				
AB.7.10.4	Lube Oil Pump Capacity	l			

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.7.10.5	Electrical Standby Lube Oil Pump required	Yes/No	Yes		
AB.7.10.6	Standby Lube Oil Pump manufacturer				
AB.7.10.7	Standby Lube Oil Pump Type				
AB.7.10.8	Standby Lube Oil Pump Capacity	l			
AB.7.10.9	Motor Size	kW, rpm, Voltage			
AB.7.11	Lube Oil Cooler				
AB.7.11.1	Manufacturer				
AB.7.11.2	Heat Exchanger Type				
AB.7.11.3	Heat Exchanger Class				
AB.7.11.4	Duty at Rated Load	J/hour			
AB.7.11.5	Effective Heat transfer area	meters square			
AB.7.11.6	Temperature Into the Heat exchanger (Normal)	°C			
AB.7.11.7	Temperature out of the Heat exchanger (Normal)	°C			
AB.7.11.8	Temperature Into the Heat exchanger (Maximum)	°C			
AB.7.11.9	Temperature out of the Heat exchanger (Maximum)	°C			
AB.7.11.10	Design Pressure Drop	Pa			
AB.7.11.11	Design Velocity	m/s			

AB.7.11.12	Design Pressure Drop	Pa			
AB.7.11.13	Design Temperature	°C			
AB.7.11.14	Fouling Factor				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.8	Closed Cooling System				
AB.8.0	Cooling system designed for an ambient temperature of	°C			
AB.8.1	Engine driven Cooling pump Required	Yes/No	Yes		
AB.8.2	Cooling Pump Manufacturer				
AB.8.3	Cooling Pump Type				
AB.8.4	Cooling Pump Capacity	l/s			
AB.8.5	Standby Electric Motor Driven Pump required	Yes/No	No		
AB.8.6	Cooling Pump Type				
AB.8.7	Cooling Pump Capacity	l/s			
AB.8.8	Cooling Pump Motor size	kW, Rpm, V			
AB.8.9	Flow	l/s			
AB.8.10	Maximum water inlet temperature at full rated load	°C			
AB.8.11	Pressure drop through engine heaters and jackets	Pa			
AB.8.11.1	Coolant Temperature sensor required	Yes/No (Position)	Yes		
AB.8.12	Radiator				
AB.8.12.1	Radiator Manufacturer (Radiator must be OEM)	Yes/No	Yes		

AB.8.12.2	Radiator Mounting	Horizontal / Vertical	Vertical		
AB.8.12.3	Size (KW heat rejection)				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.8.12.4	Capacity	l/s			
AB.8.12.5	Cooling Fan drive (Engine driven is the preferred)	Engine/ Motor Driven	Engine		
AB.8.12.6	Fan(s) Make				
AB.8.12.7	Radiator(s) / Cooling Tower Fluid Type		Anti-Freeze		
AB.8.12.8	Radiator(s) / Cooling Tower Fluid Flow Rate	l/s			
AB.8.12.9	Radiator(s) / Cooling Tower Fluid temperature In Normal	°C			
AB.8.12.10	Radiator(s) / Cooling Tower Fluid temperature Out Normal	°C			
AB.8.12.11	Radiator(s) / Cooling Tower Fluid temperature In Maximum	°C			
AB.8.12.12	Radiator(s) / Cooling Tower Fluid temperature Out Maximum	°C			
AB.8.12.13	Radiator(s) / Cooling Tower Design Pressure Drop	Pa			
AB.8.12.14	Radiator(s) / Cooling Tower Design Temperature	°C			
AB.8.12.15	Fouling Factor				
AB.8.13	Coolant Pre-Heating System				

AB.8.13.1	Supply Coolant pre-heating System	Yes/No	Yes		
AB.8.13.2	Coolant Pre-Heating Type		Thermo-Static Heater		
AB.8.13.3	Coolant Pre-Heating control temperature	°C (switch on) / °C			

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
		(switch off)			
AB.8.13.4	Pre-Heating System Power Requirements	kW			
AB.8.13.5	Pre-Heating System Voltage	V	400V 3-phase or 230V 1-phase		
AB.8.13.6	Contractor to specify ideal pre-heating temperature.	Yes/No	Yes		
AB.9	Engine Air Intake				
AB.9.1	Airflow required per engine ventilation	cubic- meters/second			
AB.9.2	Air Filter Make and Model				
AB.9.3	Air Filter Type				
AB.9.4	Air Filter Size	(LxDxW)m			
AB.9.5	Silencer Make and Model				
AB.9.6	Maximum allowable pressure drop in intake piping				
AB.9.7	"Blocked" Filter indicator to be fitted	Yes/No	Yes		
AB.10	Exhaust System				

AB.10.1	Maximum Allowable Exhaust Pressure Drop	Pa			
AB.10.2	Lagging offered				
AB.10.3	Thermal Properties of Lagging Material offered				
AB.10.4	Silencer Make and Model				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.10.5	Silencer pressure drop at Rated Flow	Pa			
AB.10.6	Silencer Manufacturer				
AB.10.7	Silencer type & model				
AB.10.8	Silencer weight				
AB.10.9	Silencer noise reduction	dBa			
AB.10.10	Silencer and Exhaust piping material				
AB.10.11	Exhaust outlet flaps/screening to be detailed				
AB.10.12	Exhaust drains to be provided				
AB.11	Fuel System				
AB.11.1	Fuel Pump Drive	Engine/ Electric Motor	Engine		
AB.11.2	Fuel Pump Manufacturer				
AB.11.3	Fuel Pump Type and Model				
AB.11.4	Fuel Pump Capacity	l/s			
AB.11.5	Fuel Pump Motor size	kW, rpm, V			
AB.11.6	Standby Electrical Fuel Pump required	Yes/No	Yes		
AB.11.7	Standby Electrical Fuel Pump Manufacturer				

AB.11.8	Standby Electrical Fuel Pump Type and Model				
AB.11.9	Standby Electrical Fuel Pump Capacity				
AB.11.10	Standby Fuel Pump Motor Size	kW, rpm, V			

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.11.11	Engine Fuel Injection System Manufacturer				
AB.11.12	Engine Fuel Injection System Fuel Filters	Simplex/Duplex	Duplex		
AB.11.13	Fail Safe engine fuel cut-off solenoid required	Yes/No	Yes		
AB.11.14	Diesel Fuel Consumption				
AB.11.14.1	Fuel Consumption at Rated Load	l/kWh @ temperature			
AB.11.14.2	Fuel Consumption at ¾Load	l/kWh @ temperature			
AB.11.14.3	Fuel Consumption at ½ Load	l/kWh @ temperature			
AB.11.14.4	Fuel Consumption at ⅓ Load	l/kWh @ temperature			
AB.11.15	Fuel Storage				
AB.11.15.1	Number of Day Tanks Required Per Engine	number	1		
AB.11.15.2	Day Tank capacity for continuous operation for a single generator set at full load	hours	2		
AB.11.15.3	Percentage Fuel Spare capacity required	%	10		

AB.11.15.4	Day Tank Volume	Litres			
AB.11.15.5	Day Tank Dimensions	L x W x H			
AB.11.15.6	Double Walled Day Tank Required	Yes/No	Yes		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.12	Generator				
AB.12.1	Generator Type	Asynchronous/ Synchronous	Synchronous		
AB.12.2	Generator class		S1		
AB.12.3	Manufacturer		Marelli Motori		
AB.12.4	Type and Model				
AB.12.5	Number of Phases	Single or Three			
AB.12.6	Continuous Power Rating	kW			
AB.12.7	Overload capability (Two hours in any 24 hour period)	%	10		
AB.12.8	Power Factor	PF	0.8 to 1		
AB.12.9	Generator Amperes	A			
AB.12.10	Generator Terminal Voltage phase to phase at No Load	V			
AB.12.11	Generator Terminal Voltage at Full Load	V	400V		
AB.12.12	Steady State Voltage Droop (0-110% of Full Load)	%			
AB.12.13	Maximum (Starting) permissible voltage drop during sudden application of Load	%	According to SANS 8528-5		
AB.12.14		kW			

AB.12.15	Basic Impulse withstand (BIL)	V	95000		
AB.12.16	Power Frequency withstand Voltage	kV rms	28		
AB.12.17	Generator Insulation Class		F or H		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.12.18	Generator Rotor Rated Speed	rpm			
AB.12.19.1	Generator Stator Temperature Rise	K	Limited to class 130 (B)		
AB.12.19.2	Rotor Insulation Class		F		
AB.12.19.3	Rotor Temperature Rise above Ambient	K	105		
AB.12.20	Generator Efficiency				
AB.12.20.1	Generator Efficiency at Full Load and 0.8PF	%	Min 95.3%		
AB.12.20.2	Generator Efficiency at ¾ Load and 0.8PF	%			
AB.12.20.3	Generator Efficiency at ½ Load and 0.8PF	%	Min 95.6%		
AB.12.20.4	Generator Efficiency at Full Load and 0.9PF	%			
AB.12.20.5	Generator Efficiency at ¾ Load and 0.9PF	%			
AB.12.20.6	Generator Efficiency at ½ Load and 0.9PF	%			
AB.12.20.7	Generator Space heater (Supply Voltage 400V or 230V)	Yes/No	Yes		
AB.12.21	Reactance Values expressed on rated kVA base				
AB.12.21.1	Direct Axis, synchronous, Xd				
AB.12.21.2	Quadrature axis synchronous, Xq				
AB.12.21.3	Direct Axis transient, X'd				

AB.12.21.4	Direct Access Sub transient Axed				
AB.12.21.5	Negative sequence, X2				
AB.12.21.6	Zero Sequence, X0				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.12.21.7	Armature reactance at 75 °C				
AB.12.21.8	X/R ratio				
AB.12.21.9	Generator Zero sequence capacitance				
AB.12.21.10	Generator Short Circuit Ratio				
AB.12.21.11	Generator cooling		Air Self ventilated		
AB.12.22					
AB.12.22.1	Direct axis transient, open circuit, T'do	s			
AB.12.22.2	Direct axis transient, short circuit, T'd	s			
AB.12.22.3	Direct axis Sub transient, short circuit, T''d	s			
AB.12.22.4	Synchronization coefficient	kW/T			
AB.12.22.5	Time required for the Generator Output voltage to return to normal following a three-phase short circuit, cleared within 100ms with the Generator at rated speed and full load prior to the fault	s			
AB.12.22.6	The Generator no-load line-line voltage output waveform deviation from an ideal sine wave at rated voltage and frequency	%			
AB.12.23	Rated Short circuit withstand current (10s)				
AB.12.24	Maximum permissible asymmetric load at 0.8 p.f	%			

AB.13	Regulation and quality of supply				
AB.13.1	Base Frequency	Hz	50		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.13.2	Continuous frequency operating range	Hz	48.5 to 51.5		
AB.13.3	Frequency deviation not more than 10 minute per incident	Hz	48 to 52		
AB.13.4	Frequency deviation not more than 1 minute per incident	Hz	47.5 to 52.5		
AB.13.5	Total Harmonic Distortion (THD) of HV side Voltage and % even harmonics	% / %	5/1		
AB.13.6	HV side Voltage symmetrical three phase supply voltages (negative and zero phase sequence voltages less than)	%	2		
AB.13.7	Continuous Overflux rating	%	110% continuously		
AB.13.8	Load type		Impact Type loading		
AB.13.9	Adjustment Range on terminal voltage	%	±2.5		
AB.13.10	adjustment range of terminal frequency	%	±1.5		
AB.13.11	Voltage Output Waveform				
AB.13.11.1	Waveform deviation factor limit	%	<10		
AB.13.11.2	Total Harmonic Distortion relative to the fundamental	%	<5		
AB.13.11.3	Percentage of any one harmonic relative to the fundamental	%	<3		

AB.13.12	Alternator Bearings		Cartridge assemble type		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.14	Generator Protection				
AB.14.1	Electrical Protection				
AB.14.1.1	Supply Differential Protection	Yes/No	No		
AB.14.1.2	Supply Over current Protection	Yes/No	Yes		
AB.14.1.3	Supply 3-Phase Short Circuit Protection	Yes/No	Yes		
AB.14.1.4	Supply Phase to Ground Protection	Yes/No	Yes		
AB.14.1.5	Over-current / Over-Load and ground Fault protection,	Yes/No	Yes		
AB.14.1.6	Over-current Alarm	Yes/No	Yes		
AB.14.1.7	Reverse Power Protection	Yes/No	Yes		
AB.14.1.8	Differential Protection	Yes/No	No		
AB.14.1.9	Loss of Excitation / Field Protection	Yes/No	Yes		
AB.14.1.10	Negative Phase Sequence Protection	Yes/No	Yes		
AB.14.1.11	Winding Temperature measurement	Yes/No	Yes		
AB.14.1.12	Over flux Protection	Yes/No	Yes		
AB.14.1.13	Over Voltage Protection	Yes/No	Yes		
AB.14.1.14	Field Over-Current / Overheating protection	Yes/No	Yes		
AB.14.1.15	Over speed trip protection (Mechanical Protection)	Yes/No	Yes		

AB.14.1.16	Mains decoupling relay (Opens the Diesel Generator breaker when synchronized with the main supply for testing purposes and the main supply fails)	Yes/No	Yes		
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Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.14.1.17	Under Voltage protection,	Yes/No	Yes		
AB.14.1.18	Under/Over frequency protection	Yes/No	Yes		
AB.14.2	Mechanical				
AB.14.2.1	Crankcase mist detection,	Yes/No	Yes		
AB.14.2.2	Bearing Temperature High,	Yes/No	Yes		
AB.14.2.3	Overspeed trip,	Yes/No	Yes		
AB.14.2.4	Generator fault trip	Yes/No	Yes		
AB.14.2.5	Lubricating oil pressure very low	Yes/No	Yes		
AB.14.2.6	Oil Temperature very high	Yes/No	Yes		
AB.14.2.7	Cooling water temperature very high.	Yes/No	Yes		
AB.14.2.8	Overcrank trip alarm.	Yes/No	Yes		
AB.14.2.9	Low coolant level alarm	Yes/No	Yes		
AB.14.2.10	Low lube oil pressure pre-alarm	Yes/No	Yes		
AB.14.2.11	Low oil temperature pre-alarm	Yes/No	Yes		
AB.14.2.12	High Cooling water temperature pre-alarm	Yes/No	Yes		
AB.14.5	CT (s) 1 Neutral Star Point				
AB.14.5.1	Application				
AB.14.5.2	Location				

AB.14.5.3	Number per Set		3		
AB.14.5.4	Type				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.14.5.5	Class				
AB.14.5.6	Number of Cores				
AB.14.5.7	ratio				
AB.14.5.8	Burden				
AB.14.6	CT (s) 2 Governor And Engine Control System				
AB.14.6.1	Application				
AB.14.6.2	Location				
AB.14.6.3	Number per Set		3		
AB.14.6.4	Type				
AB.14.6.5	Class				
AB.14.6.6	Number of Cores				
AB.14.6.7	ratio				
AB.14.6.8	Burden				
AB.15	Automatic Voltage Regulator (AVR)				
AB.15.1	Manufacturer				
AB.15.2	Type and Model				

AB.15.3	Response Rate	V/s			
AB.15.4	Regulator operating time	s			
AB.15.5	Maximum excitation required to maintain rated load at steady state	A			

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.15.6	Maximum Excitation required during transient conditions	A			
AB.15.7	Transient Voltage deviation	%	20		
AB.15.8	Voltage Regulation from 0 to 100% rated Load	±%			
AB.15.9	Manual Voltage adjustment range	%	90 - 110		
AB.15.10	Maximum Voltage Droop over the Load Range 0 to 100%	%	2		
AB.15.11	Regulation Drift limit	%	0.50%		
AB.15.12	Sensitivity	%			
AB.16	Exciter				
AB.16.1	Manufacturer				
AB.16.2	Type and Model				
AB.16.3	Rating	kVA			
AB.16.4	Rated Voltage	V			
AB.16.5	Rated Current	A			

AB.16.6	Exciter System Current when Generator is at full Load and 0.8 p.f	Ampere dc			
AB.16.7	Exciter system current when Generator is at full Load and 0.8 p.f				
AB.16.8	Exciter No Load current	Ampere dc			
AB.16.9	Exciter System resistance normalized at 75°C	Ω			

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.16.10	Permanent Magnet Generator for Voltage Regulator Power	Yes/No	Yes		
AB.16.11	Response Rate	V/s			
AB.16.12	Temperature Rise of Excitation System	K			
AB.16.13	Insulation Class of Exciter system		F or H		
AB.16.14	Time Constant of Exciter Build-up	s			
AB.16.15	Current series boost provided	Yes/No	if required		
AB.17	Governor				
AB.17.1	Manufacturer				
AB.17.2	Electronic Governor Controller	P (Proportional)/ PI (Proportional Integral)/ PID (Proportional Integral Differential)			
AB.17.3	Speed Manual Adjustment Range	%	±2.5		
AB.17.4	Drop Setting Range	%	0 to 7		

AB.18	Generator Set Outer Coating				
AB.18.1	Corrosion Protection required	Non-Corrosive/ High Corrosive/ Very High Corrosive	Very High Corrosive		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.18.2	Main tank external final colour coding	SANS 10140			
AB.19	Generator Set Starting System				
AB.19.1.1	Starting Method	Air Battery			
AB.19.1.2	Supply Air Pressure required	kPa			
AB.19.1.3	Supply Air Minimum Flow Rate	m ³ /s			
AB.19.1.4	Air Supply quality required				
AB.19.1.5	Air Supply Flanch details				
AB.19.1.6	Number of Starting Attempts		5		
AB.19.1.7	Crank time until over-crank lockout	s			
AB.19.1.8	Redundant Starting System (Battery Banks, Starter Motor And Charger)	Yes/No	Yes		
AB.19.5	Electrical Starter System				
AB.19.5.1	Starter System Manufacturer				
AB.19.5.2	Voltage of Starting System	V			
AB.19.5.3	Nominal Power of Starting Motor	kW			

AB.19.5.4	Maximum cranking current of Starting Motor (Cold Cranking Amps-CCA)	A			
AB.19.5.4	Battery Type	AGM/VRLA	5 year Maintenance Free AGM		
AB.19.5.5	Number of Battery banks per Gen Set				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.19.5.6	Number of Batteries per battery bank				
AB.19.5.7	Voltage of each battery	V			
AB.19.5.8	Final Discharge voltage	V			
AB.19.5.9	Battery Capacity	Ah			
AB.19.5.10	Battery Earthing pole		Negative		
AB.19.5.11	Earthing and Bonding Conductor		Copper		
AB.19.6	Battery Charger				
AB.19.6.1	Available input voltage	V	220V or 400V		
AB.19.6.2	Battery Charger Manufacturer				
AB.19.6.3	Battery Charger Type				
AB.19.6.4	Battery Charger model				
AB.19.6.5	Charger Rated Output	kW			
AB.19.6.6	Charger rated Output Voltage	Vdc			
AB.19.6.7	Charger rated Output Current	A			
AB.19.6.8	DC Voltage ripple amplitude when operating without batteries	%	5		

AB.19.6.9	Charger Per Battery Unit	Yes/No	Yes		
AB.19.6.10	Batteries Shall Be Manufactured According to SANS1632	Yes/No	Yes		
AB.20	Generator Set Neutral Earthing System				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.20.1	Generator Neutral Earthing method				
AB.20.2	Supply Neutral Contactor	Yes/No	No		
AB.20.3	Neutral Contactor Manufacturer				
AB.20.4	Neutral Contactor type				
AB.20.5	Neutral Contactor maximum continuous current	A			
AB.20.6	Rated Phase to Earth fault current (10s)	A			
AB.20.7	Contactor BIL (Basic Insulation Level)	kV, peak			
AB.20.8	Contactor Power Frequency withstand Voltage	kVrms			
AB.20.9	Supply Neutral Earthing Resistor	Yes/No	Yes		
AB.20.10	Neutral Earthing Resistor Manufacturer				
AB.20.11	Neutral Earthing Resistor Type				
AB.20.12	Neutral Earthing Resistor Nominal Voltage	kV			
AB.20.13	Neutral Earthing Resistor Insulation Material				
AB.20.14	Neutral Earthing Resistor Resistance at 100°C	Ω			
AB.20.15	Neutral Earthing Resistor rated phase to Earth Fault current (10s)	A			

AB.20.16	Impedance of Resistor	Ω			
AB.20.17	Neutral Earthing Resistor BIL (Basic Insulation Level)	kV, peak	75		
AB.20.18	Neutral Earthing Resistor Power Frequency Withstand Voltage	kV rms	28		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.21	Generator Set Vibrations Limits				
AB.21.1	Max engine-generator set vibration in horizontal, vertical, and axial	mm, rms	0.15		
AB.21.2	Overall velocity limit	mm, rms	24		
AB.21.3	Maximum speed relative to rated speed, for which the above limits apply	%	110		
AB.21.4	Maximum vibration peak force transmitted to the floor through Isolation system	N			
AB.21.5	Vibration damper type				
AB.21.6	Number of Vibration Dampers				
AB.21.7	Wr ² of the Engine	kgm ²			
AB.21.8	Wr ² of the Generator Rotor	kgm ²			
AB.21.9	Wr ² of the coupling	kgm ²			
AB.22	Weights and Dimensions				
AB.22.1	Dimensions				
AB.22.1.1	Overall Length				

AB.22.1.2	Overall Width				
AB.22.1.3	Overall Height from floor				
AB.22.1.4	Required end clearances				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.22.1.5	Generator Length				
AB.22.1.6	Generator Width				
AB.22.1.7	Generator Height from floor				
AB.22.1.8	Engine Length				
AB.22.1.9	Engine Width				
AB.22.1.10	Engine Height from floor				
AB.22.2	Weights				
AB.22.2.1	Engine weight	kg			
AB.22.2.2	Generator Weight total	kg			
AB.22.2.3	Generator Stator Copper Weight	kg			
AB.22.2.4	Generator Stator Machine steel weight	kg			
AB.22.2.5	Generator Rotor Copper Weight	kg			
AB.22.2.6	Generator Rotor Machine steel weight	kg			
AB.22.2.7	Shipping Weight of Engine	kg			
AB.22.2.8	Shipping Weight of Generator	kg			
AB.22.2.9	Shipping weight of the heaviest piece to be handled	kg			

AB.23	Control system				
AB.23.1	Manufacturer				
AB.23.2	Type				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.23.3	Controller Power Requirements	kW			
AB.23.4	Controller Voltage	V			
AB.23.5	Controller position		Stand Alone Control cabinet in close proximity to the Diesel Generator set		
AB.23.6	Local Alarms and Plant Status		To be displayed on a local HMI		
AB.23.7	Communication Protocol		Hardwired System		
AB.23.8	Diagnostic abilities required	Yes/No	Yes		
AB.23.9	Automatic Start	Yes/No	Yes		
AB.23.10	Remote Control System interface required	Yes/No	Yes		Employer's Engineer to provide Operating and Control Philosophy
AB.23.11	Manual Start	Yes/No	Yes		
AB.23.12	Isolate Function Inhibiting All Start Commands	Yes/No	Yes		
AB.23.13	Manual Sync function	Yes/No	No		

AB.23.14	Local DG alarm annunciator panel required	Yes/No	Yes		Employer's Engineer to provide Operating and Control Philosophy
AB.24	Air Flows				

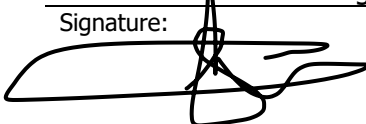
Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.24.1	Combustion Airflow Total	m ³ /s			
AB.24.2	Exhaust Airflow	m ³ /s			
AB.25	Heat Rejection to the room by:				
AB.25.1	The Engine	kW			
AB.25.2	Oil Cooler	kW			
AB.25.3	Generator	kW			
AB.25.4	Engine water Radiator	kW			
AB.25.5	Radiator required Airflow Rate	m ³ /s			
AB.25.6	Other Accessories	kW			
AB.26	Emissions				
AB.26.1	NOx	mg/nm ³			
AB.26.2	CO	mg/nm ³			
AB.26.3	HC	mg/nm ³			

AB.26.4	PM	mg/nm ³			
AB.27	Tests				
AB.27.1	Perform Factory Acceptance Test in accordance with SANS 8528 - 6	Yes/No	Yes (Groups C and M)		
AB.27.2	Perform Efficiency Test to verify AB.28	Yes/No	Yes		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.27.3	Perform 100% step load test	Yes/No	Yes		
AB.28	Efficiency Evaluation				
AB.28.1	R	Rand/Liter			
AB.28.2	P Ratio1	hours			
AB.28.3	P Ratio2	hours			
AB.28.4	P Ratio3	hours			
AB.28.5	P Ratio3	hours			
AB.28.6	Fuel Consumption at Full Load	kg / hour			
AB.28.7	Fuel Consumption at ¾ Load	kg / hour			
AB.28.8	Fuel Consumption at ½ Load	kg / hour			
AB.28.9	Fuel Consumption at ⅓ Load	kg / hour			

Transnet Port Terminals High Level Commissioning Plan Electrical Equipment

Document No:

Prepared by: Name: Samukelo Magcaba Date: May 2018
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Approved by: Name: Samukelo Magcaba Date: September 2022
Signature:  Date

00	May 2018	Issued for Review
Rev	Date	Revision Details

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1. INTRODUCTION

The purpose of the High Level Commissioning Plan is to outline the procedures associated with commissioning various types of electrical and mechanical systems and equipment. A detailed commissioning plan as where deemed appropriate at the discretion of the responsible engineer, shall be prepared as required for the various systems. International best practice norms and standards shall be followed in terms of inspection, testing for safety, setting and configuring, and rendering the installed equipment fully functional to its intended purpose.

2. STATUTORY REQUIREMENTS

All aspects of the commissioning process shall adhere to any and all relevant requirements of the following legislation, as appropriate:

- Occupational Health and Safety Act 85 of 1993
- National Environmental Management Act 107 of 1998
- South African National Standards and Codes of Practice
- All local, provincial or S.A. Government laws in force at the time.

3. GOVERNING CODES, STANDARDS AND SPECIFICATIONS

The commissioning process for all electrical and mechanical equipment shall adhere to any specific and relevant requirements contained in the following national and international standards. Where different standards call for different testing and commissioning procedures for the same equipment, the most stringent alternative shall apply.

Note: Where reference is made to a code, standard or specification, the reference shall be taken to mean the latest edition of the code, standard or specification, including latest Addenda, supplements and revisions thereto.

The commission process in general, shall be in accordance with the recommendations of:

- ♦ The International Electrotechnical Commission (IEC), and
- ♦ The Institute of Electrical and Electronic Engineers (IEEE)
- ♦ International Standards and Codes – ISO, DIN, BS, ASME, ASCE, ANSI, ASTM, EU

4. SCOPE

This plan covers site electrical pre-operational tests and commissioning tests required for electrical apparatus, wire, cables and other miscellaneous equipment and material as called for in the specifications and must be read in conjunction with the other specifications.

5. GENERAL INFORMATION

- 5.1. Pre-operational tests and acceptance certificates as herein specified are defined as those tests and inspections required by the ENGINEER prior to equipment being energized to

determine that the apparatus involved may be safely energized.

- 5.2. Calibrating tests, checks on limit switch settings, interlocking, PLC functioning etc. are so called cold commissioning or dry tests.
- 5.3. Hot commissioning tests are the tests as specified by the Engineer such as burn in tests for electronic equipment and continuous cycle tests etc. when the equipment is handling the product it was designed for.
- 5.4. Final acceptance will not only depend on equipment dependability, as determined by the subject tests, but will depend on complete operational tests on all equipment to show that the equipment will perform the functions for which it was designed.
- 5.5. These specifications intend that the workmanship methods, inspections and materials used in erection and installation of the subject equipment shall conform with accepted engineering practices, the specifications as prepared by the Engineer, Manufacturer's instructions and the relevant Standards as referred to in all the attached specifications.
- 5.6. **Thermographic images shall be taken, as directed by the Engineer, of all equipment put into service, as part of the commissioning documentation. These images shall be time and date stamped.**
- 5.7. The Contractor shall bear the costs of all tests required.

6. RESPONSIBILITY

- 6.1. The testing shall be performed by and under the immediate supervision of the Contractor and witnessed by the Engineer and/or his duly authorised representative. This representative may be an Independent Commissioning Engineer appointed by the contractor with the Engineer's approval.
- 6.2. The Contractor shall adjust, set, co-ordinate, calibrate and test all systems and equipment furnished and/or installed by him.
- 6.3. The Contractor shall determine, and the Engineer shall approve the individuals in whom final responsibility and authority rests for carrying out these tests and inspection procedures on particular equipment. The method to be followed in obtaining clearances on electrical equipment shall also be established and such method rigidly adhered to.
- 6.4. All testing shall be scheduled by the Contractor and cleared through the Engineer. No testing of any kind shall be done or scheduled without this clearance.
- 6.5. The Contractor shall notify in person or by letter all the interested parties at least 24 hours prior to tests, establishing the time the test is to be performed.
- 6.6. The interested parties to be informed will be determined in conjunction with the Engineer.
- 6.7. The parties notified shall be responsible for having their representatives present at the designated time. Absence of any one representative will not prohibit the test from proceeding on schedule, unless such representative is essential in doing the tests.
- 6.8. Each of the notified interested parties and the testers employed shall be individually responsible for the safety of all members of their organization during such time as the tests

are performed.

- 6.9. The Contractor will coordinate all testing to ensure that all trades are prepared and that the conditions are safe.
- 6.10. Detailed testing method and equipment shall be approved by the Engineer.
- 6.11. On some tests, particularly the final inspections of important equipment, the manufacturer's Engineer or representative shall be present and perform same. The request for a manufacturer's representative shall be made sufficiently in advance to the date the test is scheduled so that satisfactory arrangements for the representative's services can be made. Frequently, the manufacturer's responsibility applies to both electrical and mechanical equipment. Where such joint responsibility exists, the request for a manufacturer's representative shall be arranged to satisfy both electrical and mechanical requirements simultaneously.
- 6.12. Manufacturer's instructions shall be carefully read for any special conditions that may be required for testing.
- 6.13. Following established procedures, equipment will be energized after certification on the relevant form by the personnel performing the tests, that equipment is ready for energizing and with the concurrence of the Engineer.

7. TESTING EQUIPMENT

- 7.1. All testing equipment for tests which are to be performed shall be furnished by the Contractor.
- 7.2. Testing equipment required to prove guarantee values shall be calibrated immediately prior to the relevant tests to be performed. The error curves shall be submitted with the report.

8. TESTING RECORDS

- 8.1. Test results shall be entered in test forms provided by the Contractor or, if such forms are not available, in test forms approved by the Engineer.
- 8.2. Authorized, qualified representatives of the parties interested (see paragraph 3.0 shall be present to approve a test when made. One (1) copy of the rough draft-test report shall be given to each authorized representative at the time the test is made.
- 8.3. Formal test reports approved by the Engineer shall be supplied and prepared by the party performing the test within 48 hours, signed by the authorized representatives, and furnished to the Engineer for distribution.

9. SAFETY PRECAUTIONS

- 9.1. The Contractor shall exercise extreme care in performing the tests specified so as not to jeopardize the safety of personnel and to prevent equipment damage during any tests. All exposed live parts subject to testing shall be guarded by personnel, barricades, or other practical means to ensure against personnel being injured by coming in contact or close proximity to exposed parts.
- 9.2. All equipment, exposed live parts, etc., shall be completely discharged by grounding or other accepted methods so as to eliminate the possibility of injury to personnel from electrical shock after the tests have been completed.

10. PROVISIONAL ACCEPTANCE

- 10.1. The Engineer's Provisional Acceptance of any electrical installation shall be based upon the completion of tests and checks prescribed in clauses 8 through 13, submission of test data (where required), satisfactory materials and workmanship, and demonstration of satisfactory start-up.

11. EARTH CONTINUITY AND RESISTANCE TESTS

11.1. General:

- 11.1.1. All earthing and bonding cables must be checked for continuity and earth resistance.

11.2. Test procedure:

- 11.2.1. Measuring the cable and connection resistance simultaneously with a resistance bridge or accurate multi-meter.

11.3. Acceptance:

- 11.3.1. The resistance of the earthing and bonding cables and connections must be less than stated in SABS 0142/latest.
- 11.3.2. Complete and accurate records of all resistance readings of all earthing conductors of motors, transformers, power cables etc. must be made.

The records shall include the following:

- 11.3.2.1. Complete identification of the cable and connection points including its approximate length;
- 11.3.2.2. Resistance reading;
- 11.3.2.3. The approximate average cable temperature.
- 11.3.3. No electrical systems will be energized until the master copy of its test record is approved by the Engineer.

12. MEDIUM VOLTAGE CABLES

12.1. General:

- 12.1.1. The Contractor shall give all medium voltage cables a Very Low Frequency (VLF) Hi Pot test in compliance with the cable manufacturers specifications, after all splices and potheads or cable terminations have been made.
- 12.1.2. The Contractor shall then perform a Dissipation Factor (Tan-Delta) test on the cable as per the cable manufacturer's specifications.
- 12.1.3. The medium voltage cables shall be given a complete dielectric absorption test before and after the VLF and Tan-Delta test. The cable test shall be performed prior to connections to the electrical equipment at either end.
- 12.1.4. DC Hi Pot Testing is strictly prohibited on any MV cables or systems owned and operated by Transnet.
- 12.1.5. The Contractor shall supply all instruments for testing.

12.2. Test Procedures:

- 12.2.1. Medium voltage stress cone type terminations or potheads shall remain intact but testing shall not include any bus work beyond the pothead or stress termination.
- 12.2.2. Cable continuity and phase identification shall be checked.
- 12.2.3. In setting up the test set special safety precautions should be taken regarding grounding of the test equipment. The test set, it's voltmeter and the cable shield should be grounded at the same ground.
- 12.2.4. All 4 core cables shall be tested between one conductor and ground with the other conductors and the metallic shield, metallic sheath or armour grounded to the same ground. Each conductor to be tested in this manner.
- 12.2.5. All single conductor cables shall also be tested between one conductor and ground with the other conductor in the same conduit grounded.
- 12.2.6. Each cable is to be given a full dielectric absorption test as herein specified with a suitable motor driven or electronic megger. The readings taken shall be recorded in the test record.
- 12.2.7. The dielectrical absorption megger test shall be applied for a long enough duration to fully charge the cable. Megger readings shall be taken every fifteen (15) seconds during the first three (3) minutes and at one (1) minute intervals thereafter. The test shall continue until three (3) equal readings one (1) minute apart are obtained. The cable may then be considered to be fully charged.
- 12.2.8. All cables should have approximately the same megohm reading. In the event that a cable shows an appreciably lower resistance value than the others in the same conduit or cable run, this condition shall be discussed with the Engineer prior to the application of the high potential test.
- 12.2.9. After an acceptable megger test, the Contractor shall give the cables a VLF high potential test in accordance with the requirements of IEEE 400.2-2013. After completion of the test, the contractor shall ensure that there is no residual charge contained in the cables. Any cable that does not perform as per manufacturer's specifications shall be rejected.

12.2.10. Cables shall then be subjected to the Tan-Delta testing.

12.2.11. The successful high potential test shall be immediately followed by another megger test as heretofore specified.

12.3. Acceptance:

12.3.1. The cable must withstand the specified high voltage without an appreciable increase in leakage current.

12.3.2. Final acceptance will also depend on satisfactory results of the two megger tests. The results of the final megger test should reasonably parallel those of the first megger test and should show no evidence of differing performance prior to the VLF Hi-Pot and Tan-Delta Testing.

12.3.3. Complete and accurate records of all megger and accompanying VLF and Tan-Delta tests shall be made. The records shall include the following:-

12.3.3.1. Complete identification of the cable including its approximate length;

12.3.3.2. Megger readings vs time data;

12.3.3.3. VLF and Tan-Delta test results with date and time of test.

12.3.3.4. The approximate average cable temperature taken by Thermographic Imager, with images recorded along the entire length of cable.

12.3.4. No cable shall be energized until the master copy of its test record is approved by the Engineer.

13. LOW VOLTAGE POWER CABLES

13.1. General:

13.1.1. All wires and cables shall be tested for continuity. Except for 60 volt services and below, all wires and cables shall be given a megger test.

13.1.2. All cable connections must pass visual inspections for workmanship and conformance with standard practice.

13.2. Test Procedure:

13.2.1. Continuity shall be checked by means of a DC test device using a beeper.

- 13.2.2. Bus tie cables shall be meggered before connections to buses are made.
- 13.2.3. Each 400 volt service cable from substations shall be meggered with the cable connected to the switch gear with the corresponding breaker racked in and open. Connections at the other end of each of these cables shall be as follows:-
 - 13.2.3.1. Cables to individual motors shall be disconnected from the motor for initial tests, and followed by cables connected to motors as per specification for rotating equipment;
 - 13.2.3.2. Cables to control centres shall be connected to the control centre main breaker with breaker in the open position.
- 13.2.4. Minimum megger readings shall be 1 Me 6 ohm.
- 13.2.5. The megger test must be held until the reading reaches a constant value. For 400 volt cables the cable megger test shall be held until three (3) equal readings, each one (1) minute apart, are obtained.
- 13.2.6. A 1000 volt motor-driven or electronic megger with a value of at least twice that of the RMS voltage shall be used on all service conductors.
- 13.3. Acceptance:
 - 13.3.1. Minimum megger requirements must be met.
 - 13.3.2. Any cable having a megger reading 50% lower than average, even though meeting minimum requirements, shall await further instructions from the Engineer as to drying or other treatment to be given the cable prior to acceptance.
 - 13.3.3. Complete and accurate records of all tests and inspections shall be made.

14. MEDIUM VOLTAGE SWITCH GEAR AND CIRCUIT BREAKERS

- 14.1. General:
 - 14.1.1. All switch gear shall be given operational tests. This shall include mechanical operation, as well as operation by control circuits, relays and tripping devices. All breakers and busbars shall be given a megger test.

14.2. Test Procedures:

- 14.2.1. Megger tests on the medium voltage bus shall be applied between each phase separately and ground with other phases tied to ground. All breakers shall be racked-out.
- 14.2.2. In addition each breaker shall be given a megger test in the racked-out and closed position. Megger tests shall be applied between each phase to ground and to each other phase.
- 14.2.3. A suitable motor driven or electronic megger shall be used. Each test shall be held until a constant reading is obtained. Minimum test values shall be as specified in specifications.
- 14.2.4. All test readings shall be recorded.
- 14.2.5. All circuit breakers shall be operated through at least three (3) open-close-open cycles in both the rack-in and test positions by manual operation and by control circuits from each control point. All indication lights, annunciators, alarms and targets shall be observed to determine correct operation and breaker mechanism shall be observed for correct alignment, freedom of binding and good contact. All breakers shall be checked for ease of rack-in and rack-out and checked to determine that the breaker cannot be moved out of operation position while the breaker is closed.
- 14.2.6. The interchangeability of the circuit breakers shall be demonstrated.
- 14.2.7. PT and CT data shall be recorded and PT and CT circuits shall be checked with a multi-tester.
- 14.2.8. Protective relays shall be adjusted and calibrated with an injection type test arrangement (multi-amp or equal). Results shall be recorded and the co-ordination of the protective relaying shall be proved.
- 14.2.9. After initial energization, switch gear shall be checked for correct phase sequence.

14.3. Acceptance:

- 14.3.1. Minimum megger requirements must be met;
- 14.3.2. Proper mechanical and electrical operation of switch gear must be assured;
- 14.3.3. Correct protective relaying operation must be proven;
- 14.3.4. Complete and accurate records of all tests and inspections shall be made.

15. POWER TRANSFORMERS

15.1. General:

- 15.1.1. Before testing, all transformers shall be inspected for cleanliness, damage, moisture (blue coloured silica gel), oil leaks and phase identification. Each transformer winding shall be given megger tests.
- 15.1.2. Oil filled transformers shall have the oil checked for dielectric strength.
- 15.1.3. Accessories and auxiliary circuits to switchgear and alarm panels shall be checked.

15.2. Test Procedures:

- 15.2.1. Transformer windings shall be meggered with cables disconnected. (The cables have to be disconnected anyhow for cable high potential tests). See clause 9.0.
- 15.2.2. The 400 volt connection to the switchgear does not have to be opened, but the secondary isolator shall be racked out.
- 15.2.3. The transformer neutral has to be disconnected from ground.
- 15.2.4. When meggering the primary side, the secondary winding has to be grounded and vice versa.
- 15.2.5. The minimum values of the specified megger tests shall be as specified in the standard specification.
- 15.2.6. All 2500 V megger tests shall be held at least five (5) minutes and until three (3) consecutive equal readings one (1) minute apart are obtained. Readings shall be taken every thirty (30) seconds during the first two (2) minutes and every minute thereafter. 1000 V Megger readings must be held until the reading reaches a constant value and until three (3) consecutive equal readings one (1) minute apart are obtained.
- 15.2.7. The oil samples for the dielectric strength test shall be taken from the bottom of the transformer tank and tested in accordance with SABS Specifications.
- 15.2.8. Oil temperature indicator, level gauge and pressure relief devices must be manually actuated to check operation of auxiliary circuits.
- 15.2.9. To check the Bucholz relay, air shall be injected at the test connection.

15.3. Acceptance:

- 15.3.1. Minimum megger requirements must be met.
- 15.3.2. Oil dielectric strength shall be above the minimum specified by the manufacturer.
- 15.3.3. Auxiliary circuits shall be fully operational.

16. LOW VOLTAGE SWITCH GEAR

16.1. General:

- 16.1.1. The 400 volt switch gear bus shall be given a phase-to phase and phase-to-ground megger test.
- 16.1.2. All switch gear, relays and control devices shall be given complete operational tests to show that the equipment performs all design functions and meets design and equipment procurement specifications.

16.2. Test Procedures:

- 16.2.1. With transformer secondary breaker and load breakers open, all current transformers shorted, all potential transformer fuses removed and all 400 volt feeder breaker load terminals grounded, the 400 volt bus shall be given a phase-to-phase and phase-to-ground megger test.
- 16.2.2. Megger tests on the 400 volt bus shall be applied between each phase and ground with phases not under test also grounded.
- 16.2.3. All circuit breakers shall be operated through at least three (3) open-close-open cycles in both the rack-in and test position by manual operation and by control circuits from each control point (draw out breakers only). All indicating lights, annunciators, and breaker mechanisms shall be observed for correct alignment, freedom of binding and good contact. Draw out breakers shall be checked for ease of rack-in and rack-out and checked to determine that the breaker cannot be moved out of operating position while the breaker is closed.
- 16.2.4. PT and CT data shall be recorded and PT and CT circuits shall be checked with a multi-tester.
- 16.2.5. Protective relays shall be adjusted and calibrated with an injection type test arrangement (multi-amp or equal). Results shall be recorded and the co-ordination of the protective relaying shall be proved.

16.2.6. After initial energization, switch gear shall be checked for correct phase sequence.

16.3. Acceptance:

16.3.1. Minimum megger requirements must be met.

16.3.2. Proper mechanical and electrical operation of switch gear must be assured.

16.3.3. Correct protective relaying operation must be proven.

16.3.4. Complete and accurate records of all tests and inspections shall be made.

17. COLD COMMISSIONING

17.1. The programmable logic control system shall only be tested once the LV switchboard and other control panels have been tested in the manual mode and been provisionally accepted by the Engineer.

17.2. The control system shall firstly be tested DRY, i.e. all motor fuses shall be removed or circuit breakers shall be in the OPEN positions.

17.3. All plant/external inputs to the PLC shall be individually checked in the field or motor control centre by operating the required field limit switch, relays etc. and checked on the programmer monitor if the status indication of the correct input reference alters.

17.4. All plant/external outputs shall be checked individually by forcing the PLC output coil by means of the programming unit and checking the field, motor control or mimic display panel if the correct relay, indication lamp or contactor has operated.

17.5. A signed test record showing all input/ output references and reference to which field, motor control centre or mimic panel device was initiated or was operated shall be made and handed to the Engineer before the second part of the DRY test commences.

17.6. The second part of the DRY test shall be by carrying out drive selections, route start ups and route stops for all possible drives as listed. All inputs which cannot be present because of the absence of any plant movement shall be simulated by a plant input simulator to be provided by the Contractor.

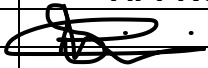
17.7. Upon completion of the tests, a signed test record showing all route selections, starts and stops simulated for every route and a list of all simulated inputs/outputs used shall be made and handed to the Engineer.

17.8. The Contractor shall then call upon the Engineer to witness a repetition of all previous DRY tests.

18. HOT COMMISSIONING

- 18.1. Commissioning of the whole installation shall not commence until all work which is essential for safe operation has been completed.
- 18.2. First, the electrical equipment and circuitry shall be checked and tested in each Motor Control Board and shall be rendered "healthy" and fully operational before any other part of the installation is commissioned.
- 18.3. The settings of all protective, instrument and timing devices are to be correctly based on the manufacturer's characteristic curves.
- 18.4. The operation of all equipment and motors shall be tested on the "manual" sequence first prior to attempting "automatic" sequence control.
- 18.5. Commissioning shall follow the electrical testing procedures necessary prior to start-up of the equipment.
- 18.6. The start-up of each system or plant shall be done in the presence of the authorized representatives of the machine suppliers, the mechanical contractors, the electrical suppliers of the boards, the Electrical Contractor and the Engineer, unless otherwise arranged by the Engineer.
- 18.7. During hot commissioning the temperature rise of all motors will be calculated using the resistance method.
- 18.8. For a period determined elsewhere in this document, after completion of the foregoing operations, the Electrical Contractor shall arrange for a competent representative to remain on site to test-run the installation to the satisfaction of the Engineer.

**SPECIFICATION FOR ELECTRICAL INSTALLATIONS TO BUILDINGS OTHER
THAN DWELLINGS HOUSES**

REVISIONS		
REV	DATE	APPROVED
0	September 2022	

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1.0 SCOPE

- 1.1 This specification covers the requirements with respect to the electrical installation, including the supply of all material and labour necessary to complete the EL&P installation for buildings.
- 1.2 This specification also applies to electrical alterations and additions carried out to existing installations.

2.0 REFERENCES

- 2.1 The following publications (latest edition) are referred to herein:

CODES OF PRACTICE

SANS 10313		Code of Practice for Protection of Buildings against Lightning.
SABS 086	-	Installation and Maintenance of Electrical Equipment used in Explosive Atmospheres.
SABS 0108	-	The Classification of Hazardous Locations and the Selection of Electrical Apparatus for use in such Locations.
SABS 0114	-	Artificial Lighting
SANS 10142-1	-	Code of Practice for the Wiring of Premises
SABS 0199	-	Bulkhead Lighting Fittings (surface mounted).

SPECIFICATIONS

SABS 152	-	Low Voltage Air Break Switches, Connectors, Switch Disconnecters, Fuse Combination Units.
SABS 156	-	Moulded Case Circuit Breakers.
SABS 160	-	Electric Air Heaters.
SABS 162	-	Screwed Metal Conduit and Fittings for Electrical Wiring.
SABS 163	-	Wall and Appliance Switches.
SABS 164	-	Two Pole and Earthing Pin Plugs and Switch Socket Outlets
SABS 165	-	Lampholders
SABS 172	-	Cartridge Type Fuse Links
SABS 181	-	Thermostats for Electric Storage Heaters
SABS 314	-	Flameproof Enclosures for Electrical Apparatus
SABS 743	-	Low Voltage Isolating Transformers
SABS 767	-	Core Balance Earth Leakage Protection Units.
SABS 763	-	Hot Dip Zinc (galvanised) Coatings
SABS 784	-	Metal Enclosed Busbar Trunking Systems
SABS 890	-	Ballasts for Fluorescent Lamps
SABS 908	-	Meter Cabinets
SABS 950	-	Non-metallic Conduit and Fittings.
SABS 1012	-	Electric Light Dimmers
SABS 1041	-	Tubular Fluorescent Lamps
SABS 1065	-	Screwed Metal Conduit
SABS 1085	-	Wall Outlet Boxes.

SABS 1092	-	Contactors
SABS 1119	-	Interior Luminaires for Fluorescent Lamps.
SABS 1180	-	Electrical Distribution Boards.
SABS 1197	-	Metallic Wireways for installation in floors
SABS 1247	-	Coatings Applied by the Power-coating Process
SABS 1278	-	Interior Luminaires for Discharge Sodium Lamps
SABS 1279	-	Floodlight Luminaires
SABS CKS 50199	-	Bulkhead Luminaires (surface mounted)
SABS IEC 439	-	Low Voltage Switchgear
SABS IEC 309	-	Plugs, Socket Outlets and Couplers for Industrial Purposes
SABS IEC 742	-	Isolating Transformers and Safety Isolating Transformers

3.0 SERVICE CONDITIONS

3.1 The cable shall be designed and rated for continuous operation under the following conditions :-

3.1.1 Ambient/Environment Conditions :

- 3.1.1.1 Altitude : Sea level.
- 3.1.1.2 Ambient temperature : -5° C to +45° C (daily average +35° C).
- 3.1.1.3 Relative humidity : As high as 96%
- 3.1.1.4 Lightning conditions : Severe, with a maximum lightning ground flash density 11 flashes per km² per annum.
- 3.1.1.5 Exposure conditions : Salt laden, industrial atmosphere as well as hazardous gases and dust atmosphere.
- 3.1.1.6 Electrolytic corrosion conditions prevail in all the areas owing to the proximity of direct current traction system and cathodic protection schemes.

4.0 ELECTRICAL INSTALLATION

- 4.1 The contractor shall carry out the installation in accordance with SANS 10142-1: Code of Practice for the Wiring of Premises and the requirements of this specification.
- 4.2 Where the local supply authority requirements differ from those specified herein Transnet Projects Electrical Engineer shall be approached for a decision.
- 4.3 All equipment and material shall comply with the relevant National or International standard specification. Where equipment does not comply it shall be submitted with the Transnet Projects Electrical Engineer for approval.

- 4.4 The system of supply will be three phase, 4 wire or single phase 2 wire 50 Hz. alternating current with earthed neutral at a nominal voltage of 400/230 volts. The voltage may vary within the range of $\pm 5\%$ of the nominal voltage.
- 4.5 Wiring
- 4.5.1 All wiring shall be carried out in cable trunking and/or conduit. Only the loop in system of wiring shall be accepted.
- 4.5.2 Joints in wiring, nor the cutting away of strands to facilitate connections shall be permitted.
- 4.5.3 Single core cable smaller than 1,5 mm shall not be used. PVC cables shall not be connected directly to the lampholders for incandescent lamps. Conductors shall terminate in an approved connector in the conduit box directly behind the luminaire, and connection to the lampholder made by means of adequately rated silicone heat resistant wire.
- 4.5.4 Colour identification of conductors shall be used.
- 4.5.5 Flameproof equipment shall comply with SABS 314 or BS 229 for installation in hazardous areas, as defined in SABS 0108.
- 4.5.6 Equipment in hazardous areas shall be installed in accordance with SABS Code of Practice 086.
- 4.6 The provision and installation of the supply cable to the building, the termination and the connection thereof to the distribution board main incoming isolating shall be the responsibility of the Contractor, as directed by the Engineer.
- 4.7 The Contractor shall be responsible for the provision and connection of power supplies to electric urns, stoves, geysers, frytops, fans etc. provided by others; unless otherwise stated in the Schedule of Requirements.
- 6.7.1 The Contractor shall provide power supplies to air-conditioning equipment. The connection to air-conditioning equipment will be undertaken by others.
- 4.8 Cables shall be adequately supported to prevent strain on the terminals.
- 4.9 Drilling or welding of steelwork for the mounting of electrical equipment will not be permitted unless approved by Transnet's Civil Engineer on site. Equipment shall be fixed to the steelwork by means of approved, purpose made clamp/brackets.
- 4.10 Lightning protection shall be in accordance with the requirements of the local supply authority and SANS 10313 : Code of Practice for Protection of Buildings against Lightning.

5.0 DISTRIBUTION BOARDS

- 5.1 Architrave type for flush mounting, and surface type for mounting on indoor walls shall comply with SABS 1180 Parts 1 and 2 respectively.
 - 5.1.1 These distribution boards shall be supplied with a cover plate or open window door and be suitably painted and finished to harmonise with wall finish.
 - 5.1.2 All switches and associated equipment shall be fully enclosed within the distribution board with only the operating handles protruding through the cover plate or door.
- 5.2 Cubicle type shall comply with IEC publication 439.
- 5.3 Distribution boards for outdoor use shall be weatherproof and corrosion resistant.
- 5.4 A substantial earthing terminal shall be firmly attached to the steel work of the distribution board and connected to the earthing bar.
- 5.5 Entries suitable for all incoming and outgoing cables shall be provided. Glands for bottom entry cables shall not be less than 600mm above floor level.
- 5.6 Space for mounting of 20% additional control units shall be allowed on all distribution boards. In addition, 20% spare conduits (20mm diameter) shall be provided between flush distribution boards and the ceiling/roof space in pitched roof buildings (minimum 2 conduits).
- 5.7 All circuits shall be clearly labelled. Labels shall be of the fabricated type and permanently secured. Embossed tape is not acceptable.
- 5.8 When called for labelling of moulded case circuit breakers shall be labelled by means of numerals. A legend inserted behind a clear plastic window on the inside of the door shall be provided to detail the various circuits.

6.0 ISOLATING SWITCHES

- 6.1 Isolating switches for machines shall be lockable in the open position.
- 6.2 Isolating switches shall comply with SABS 152.

7.0 MOULDED CASE CIRCUIT BREAKERS

- 7.1 Moulded case circuit breakers shall: -
 - 7.1.1 comply with SABS 156.
 - 7.1.2 have a breaking capacity as specified.
 - 7.1.3 be of the fixed pattern, non-adjustable type.
 - 7.1.4 be suitable for clip-on tray mounting.

8.0 EARTH LEAKAGE PROTECTION UNITS

8.1 Earth leakage protection units shall: -

8.1.1 be the integral moulded case type and comply with SABS 767.

8.1.2 have a sensitivity of 30 mA.

8.1.3 be similar in design to moulded case circuit breakers and suitable for clip-on tray mounting.

8.1.4 have a breaking capacity and current rating as specified.

9.0 FUSE SWITCHES

9.1 Fuse switches shall:

9.1.1 comply with SABS 152

9.1.2 be of the double break, horizontal drawout, air insulated type, suitable for flush mounting.

11.1.3 be of the quick break, dustproof type.

12.0 HIGH RUPTURING CAPACITY FUSE LINKS

12.1 High rupturing capacity fuse links shall:

12.1.1 comply with SABS 172

12.1.2 be of the cartridge type with a breaking capacity not less than that shown in the Category of Duty AC 50 table 2 of SABS 172.

12.1.3 have a class Q1 fusing factor

12.1.4 A spare set of fuse links for each of the different ratings shall be provided and accommodated in the distribution board.

13.0 CONTACTORS

13.1 Contractors shall comply with SABS 1992.

14.0 LUMINAIRES FOR INCANDESCENT LAMPS

14.1 Luminaires shall be suitable for accommodating 100 watt B.C. lamps.

14.2 The insulation of internal wiring shall be heat resistant.

14.3 Bulkhead luminaires shall comply with CKS 199.

14.4 Bowl type luminaires shall have porcelain or acrylic galleries with white opal, high impact acrylic screw-in type bowls.

14.5 Well glass luminaires shall consist of a body of non-corrosive material with a top entry for a 20mm conduit, have a clear glass cover and be completely weatherproof.

15.0 LUMINAIRES FOR FLUORESCENT LAMPS

15.1 Luminaires for fluorescent lamps shall comply with SABS 1119.

15.2 Lampholders shall be of the telescopic type.

15.3 The luminaires shall be suitable for 1,2m or 1,5m "rapid start" lamps to SABS 1041, class B, group 2, with rated colour 3. (warm white).

15.4 Anti-corrosive luminaires shall have a body channel constructed of fibre-glass or non-corrosive material with a moulded acrylic enclosing diffuser.

15.5 A gasket shall be provided between the body channel and the diffuser to ensure a reliable seal.

15.6 The enclosing diffuser shall latch to the body channel with captive-type non-corrosive latches.

15.7 It is essential that full descriptions and photometric data of the luminaires and lamps offered, accompany tenders. This information shall include description and drawings of the various items of equipment as well as full photometric data issued by the South African Bureau of Standards.

16.0 INTERIOR LUMINAIRES FOR HIGH INTENSITY DISCHARGE LAMPS

16.1 Interior luminaires for high intensity discharge lamps shall comply with SABS 1278 and be suitable for use in an ambient temperature of 40°C.

16.2 Suitable provision shall be made on the ballast housing for eyes or lugs, for the attachment of safety chains.

16.3 The electronic ignition device for high pressure of sodium and metal halide lamps shall be of the three wire type operating on the superposed pulse principle. The circuitry shall be such that at starting, or on failure of a lamp, high voltage pulses will be confined to the high voltage lead between the igniter and centre contact of the lampholder. Igniters incorporating a switching element are not acceptable.

16.4 A fully electronic ignition circuit shall be utilized to trigger the pulse transformer.

16.5 The natural frequency of the electronic ignition circuit shall be in the order of 100kHz.

16.6 The lamp ignition voltage shall remain constant within a mains voltage variation of between 200 and 250 volts.

16.7 Tenderers shall guarantee that pulsing of the igniter on a failed lamp will not have a detrimental effect on the life and efficient operation of the control gear, igniter, lampholders and circuit wiring.

16.8 It is essential that full descriptions and photometric data of the luminaires and lamps offered, accompany tenders. This information shall include description and drawings of the various items of equipment, as well as full photometric data issued by the South African Bureau of Standards.

17.0 ELECTRIC AIR HEATERS

17.1 Electric air heaters shall comply with SABS 160.

17.2 Tubular heaters shall be rated at 260 watt per metre length of tube and have an enclosed entry box containing terminals for incoming line, neutral and earth connections with a suitable entry for a flexible conduit connector.

17.2.1 Tubular heaters shall be mounted with the bottom 200mm above floor level

17.3 Convector Heaters shall:

17.3.1 be of the natural convection type, of good appearance and suitable for flush or surface mounting.

17.3.2 have incorporated a manually adjustable control switch, automatic controlling thermostat and indicating neon pilot lighting showing when the heater is on.

17.3.3 have a mounting box or housing suitable for a 20mm electrical conduit entry.

17.3.4 be installed with the bottom of the mounting box/housing 200mm above floor level.

17.4 Fan Heaters shall :

17.4.1 be of the wall mounted type with air flow directional adjustment and locking facilities.

17.4.2 have a totally enclosed type fan motor fully protected from damp and dust and fitted with self aligning noiseless bearings.

17.4.3 have a separate manually adjustable control unit incorporating an automatic controlling thermostat. The control unit shall be housed in a adequately ventilated sheet steelcase. Means of protecting and isolating the heater, shall be provided. The control unit circuit shall be arranged such that during summer months the heater can be switched off and the fan used alone for ventilation.

18.0 ROOM THERMOSTATS

18.1 Room thermostats shall comply with BS 3955 Part 2, section 2F, and be to category A.

18.2 An over-riding switch shall be mounted adjacent to the thermostat for manual control.

19.0 LIGHT SWITCHES

- 19.1 Light switches shall comply with SABS 163 and be of the rocker type.
- 19.2 They shall be mounted 1 500 mm above floor level and where possible 200 mm from door frames.

20.0 LIGHT SENSITIVE CONTROL UNITS

- 20.1 The complete unit shall be of the solid state type and housed in a sealed weatherproof enclosure suitable for mounting in any position.
- 20.2 The light sensitive cell shall operate in a manner to give an area of detection not less than a hemisphere.
- 20.3 The unit shall not operate due to light fluctuations of duration less than 5 minutes. They shall incorporate main contacts rated at least to 10 amps and be mounted at a height of not less than 2 400 mm.
- 20.4 An over-riding switch shall be provided.

21.0 SOCKET OUTLETS

- 21.1 All 220 volt, 16 amp socket outlets shall comply with SABS 164 and be of the 3 round pin shuttered type.
- 21.2 All 32V, 5A socket outlets for lead lights shall be of the industrial two pin, weatherproof type with a screw cover attached to the socket outlet by a short length of chain.
 - 21.2.1 They shall be mounted on columns/walls 1 500mm above floor level or in recesses provided in inspection pits.
- 21.3 Welding socket outlets shall be in accordance with IEC publication 309 and be rated for 63A (unless other rating is indicated on the drawing) and be of the 5 pin, 6 h configuration type.
 - 21.3.1 Welding plugs shall be supplied complete with matching male plugs and be mounted 1 500mm above floor level.

22.0 TRANSFORMERS 220V/32V

- 22.1 The transformers for 32V socket outlets shall be in accordance with SABS SV 118 and be designed for 220V to 250V primary power supply and have an output voltage of 32V.

23.0 ISOLATING AND SAFETY ISOLATING TRANSFORMERS

- 23.1 Isolating and safety isolating transformers shall comply with SABS IEC 742 and SABS 743.

24.0 POWER POINTS

- 24.1 Power points for hot water cylinders shall be equipped with a 2 or 3 pole isolating switch adjacent to the cylinder except for hot water cylinders mounted below sinks.
- 24.2 Where contactors are necessary for the operation of hot water cylinders these shall be installed adjacent to the appliance where practicable and in a suitable enclosure.
- 24.3 Power points for tubular heaters shall be equipped with a flush mounted 100mm x 100mm conduit box, blanked off with a cover plate accommodating a 15A flush mounted switch. Connection to the heater shall be by means of a PVC covered flexible conduit. The flexible conduit shall have sufficient slack to avoid strain but shall not touch the floor.
- 24.4 Power points for fan heaters shall be equipped with two recessed interconnected conduit boxes, one for connection to the heater and the other for connection to the control unit 1 500mm above floor level.
- 24.5 Power points for stoves, fry tops and boiling tables shall be equipped with a 2 or 3 pole isolating switch for the appliance shall be 1 500mm above floor level. The outlet for connection to the appliance shall be 500mm above floor level.
- 24.6 Power points for air-conditioning units shall terminate in a 100mm x 100mm conduit box mounted adjacent to the unit and equipped with a 2 pole isolating switch.
- 24.7 Power points for extractor fan units shall terminate in a 100mm x 100mm conduit box mounted adjacent to the unit.
- 24.8 Where a common thermostat is specified for controlling a number of fans, power points shall be so arranged to allow for circuit wiring between the fans and thermostat.
- 24.9 Power points for smoke detection and CO₂ equipment shall terminate in a 100mm x 100mm conduit box equipped with a 30A, 2 pole isolating switch, lockable in the "on" position, mounted 1500mm above floor level, with connecting facilities to the equipment.
- 24.10 Power points for air conditioning units shall terminate in a 100mm x 100mm conduit box mounted adjacent to the unit and equipped with a 2 pole isolating switch, with connecting facilities for the unit.
- 24.11 Power points for machinery shall terminate in a connection box suitable for mounting a 2 or 3 pole isolating switch, with connecting facilities to the machine.
- 24.12 Power points for lighting shall terminate in a circular conduit box fitted with an unswitched 5 A 3 pin socket outlet.

25.0 CONDUIT AND ASSOCIATED FITTINGS

- 25.1 Screwed metal conduit shall comply with SABS 162.

- 25.2 Non-metallic conduit and fittings shall comply with SABS 950. Non- metallic conduit shall not be cast into concrete.
- 25.3 Wall outlet boxes shall comply with SABS 1085.
- 25.4 In areas within 50 km of the coast only galvanised or non- metallic conduit shall be used. Where conduit is exposed to the weather elements only galvanised conduit shall be used or UV T. Routed P.V.C. pipe.
- 25.5 Threads of metallic conduit and associated fittings shall be effectively protected against rust by non-corrosive paint where they are exposed to moisture or weather elements.
- 25.6 Wall outlet boxes shall be positioned with the major dimension vertical and not more than 15 mm below the finished wall surface. Cover plates shall fit plumb and flush with wall surfaces.
- 25.7 Conduits are to be concealed and chased into plastered brick walls or cast into concrete work as building work proceeds. Where conduit cannot be concealed these shall be installed neatly on the surface as approved by the Engineer.
- 25.8 Conduits are to be concealed and chased into plastered brickwalls or cast into concrete work as the building work proceeds.
- 25.9 Chasing of finished walls or concrete work will not be allowed. Under no circumstances will chases be permitted through structural members of the building.
- 25.10 Chasing of face brick walls will not be permitted. Conduits and outlet boxes shall be built into walls.

26.0 CABLES AND GLANDS

- 26.1 Polyvinyl-chloride cables shall comply with SABS 150. Armoured cables shall be of the earth continuity conductor type.
- 26.2 Cable glands shall be of the compression type, (brass or bronze) and be suitable for termination of earth continuity conductor type cables. Glands shall be supplied with neoprene shroud.

27.0 BUSBAR TRUNKING

- 27.1 Busbar trunking shall comply with SABS 784.

28.0 CABLE TRAYS

- 28.1 Cable trays shall be protected against corrosion and be adequately supported so that when fully loaded the deflection does not exceed 10mm. They shall be wide enough to accommodate the power cables in a single layer.

29.0 EARTHING AND BONDING

- 29.1 The complete electrical installation shall be earthed in accordance with SABS 10142-1: Code of Practice for the Wiring of Premises.
- 29.2 Earth electrodes shall consist of an exterior copper layer molecularly bonded to a high strength steel core. The copper shall have a minimum thickness of 0.25mm.
- 29.3 Only approved non-corrosive substances may be used to reduce earth resistivity. The earth resistance as measured with a earth resistance tester shall not exceed 5 ohm.
- 29.4 Copper tape used for bonding and earthing of waste pipes shall have a minimum cross sectional area of 12mm², and when run along walls shall be fixed by means of non-ferrous screws in plastic plugs at intervals of 300 maximum.

30.0 PAINTING

- 30.1 All surfaces of distribution boards shall be light orange to SABS 1091 colour No. B26 unless otherwise stated in the Schedule of Requirements attached to this specification.
- 30.2 All surfaces shall be cleaned according to the appropriate method described in SABS 064 for the particular surface to be cleaned, the contamination to be removed and the primer to be applied.
- 30.3 Components that will be powder coated shall be cleaned and prepared in accordance with the requirements of SABS 064. Powder coating shall comply with the requirements of SABS 1274 - 1979 Type 4; Corrosion resistant coatings for interior use and using thermosetting high gloss coating.
- 30.4 All specified coatings shall be applied according to the relevant specification and the manufacturers instructions shall be followed. Coatings shall not be applied in conditions which may be detrimental to the effectiveness of the coating, or the appearance of the painted surface.
- 30.5 When examined visually the finished product shall have a uniform appearance as far as gloss is concerned and shall show no sign of damage. Damaged areas shall be repaired coat for coat to obtain the desired finish.

31.0 TESTS

- 31.1 Insulation, continuity and earthing tests in accordance with SANS 10142-1 shall be carried out to the satisfaction and in the presence of the Engineer or authorised deputy on completion of the work.
- 31.2 An installation Certificate of Compliance for the electrical installation issued by an accredited person as required by the Occupational Health and Safety Act, 1993 (Act 85 of 1993) shall be provided.
- 31.3 The Contractor shall provide the necessary approved instruments.



Technical Specification
Specification No. TPD: 001-EL&P SPEC

- 31.4 Transnet Projects reserves the right to use its own instruments should it be considered necessary.

WITNESSES

1.

.....
TENDERER

2.

.....
DATE

**Transnet Projects
Design Services**

SPECIFICATION FOR LOW VOLTAGE DISTRIBUTION BOARDS

This specification covers Transnet's requirements for low voltage distribution boards

REVISIONS		
REV	DATE	APPROVED
0	September 2022	

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1. SCOPE

1.1. This specification covers Transnet's requirements regarding the design, supply, manufacture, population, works testing, delivery to site, site erection, site testing and commissioning of low voltage Distribution Switchboards consisting of fuse switches incorporating high rupturing capacity cartridge fuse links, air circuit breakers, moulded case circuit breakers and auxiliary equipment. The tenderer is required to familiarise themselves with all applicable Standards and Codes of Practice listed herein, and to ensure compliance in the execution of any work in terms of this document.

2. REFERENCES

2.1. The following publications (latest edition) are referred to herein:-

2.1.1. SOUTH AFRICAN BUREAU OF STANDARDS

Codes of Practice

SANS064	The preparation of steel surfaces for coating
SANS10111	Engineering Drawings.
SANS10142	Wiring of premises Part 1: Low voltage installations
SANS10313	Protection against lightning - Physical damage to structures and life hazard

Specifications

SANS60947	Low-voltage switchgear and control gear
SANS156	Moulded-case circuit breakers
SANS60269	Low-voltage fuses
SANS1091	National colour standards for paint
SANS1195	Busbars
SANS1274	Coating applied by the powder coating process
SANS1973-1	Low-voltage switchgear and control gear assemblies Part 1: Type-tested assemblies with stated deviations and a rated short-circuit withstand strength above 10 kA
SANS1973-3	Low-voltage switchgear and control gear assemblies Part 3: Safety of assemblies with a rated prospective short-circuit current of up to and including 10 kA
SANS60529	Degrees of protection provided by enclosures (IP Code)
SANS1507	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V)
SABS ISO 9000	Quality management systems -- Fundamentals and vocabulary
SANS1019	Standard voltages, currents and insulation levels for electricity supply
SANS170	Fasteners

International Electrotechnical Commission

BS 3938	Current Transformers
IEC 61508	Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems.
IEC 60051	Direct acting indicating analogue electrical measuring instruments and their accessories

3. SERVICE CONDITIONS

3.1 The equipment shall be designed and rated for continuous operation under the following conditions:-

3.1.1 Ambient/Environment Conditions:

- 3.1.1.1 Ambient temperature- 5°C to +40°C (daily average +35 °C).
- 3.1.1.2 Relative humidity- As high as 95%
- 3.1.1.3 Lightning conditions- Severe, with a maximum lightning ground flash density of eleven (11) flashes per km² per annum.
- 3.1.1.4 Atmosphere- Salt laden and corrosive industrial atmosphere

3.1.2 Electrical Conditions:

- 3.1.2.1 The system of supply shall be three phase, 4 wire, 50 Hz alternating current with solidly earthed neutral at a nominal voltage of 400 / 231 Volts.
- 3.1.2.2 The voltage may vary within the range of 95% to 105% of the nominal and all equipment installed shall be suitably rated.
- 3.1.2.3 All equipment shall be adequately rated for prospective fault level ratings.

4 DRAWINGS AND INSTRUCTION MANUALS

- 4.1 All drawings shall be in accordance with SANS 10111 – Engineering Drawings.
- 4.2 The successful tenderer shall supply the following instruction manuals, all of which shall be included in the tender price and be to the satisfaction of Transnet.
 - 4.2.1 THREE (3) sets of detailed drawings and instruction manuals, with illustrations where necessary and 2 sets of prints of the "As Built" General Arrangement drawings and the schematic and wiring diagrams to facilitate erection and adjustment of the switchgear.
 - 4.2.2 A full set of electronic media including all information requested above.
 - 4.2.3 These instruction manuals and drawings shall be supplied as soon as possible after placing of the order, but before delivery of the equipment.

5. STANDARD OF WORK, EQUIPMENT & MATERIALS

- 5.1. The distribution board shall conform to the requirements of the latest edition and amendments of SANS 10142-1 Code of Practice for the Wiring of Premises Part 1: Low voltage installations and any additional requirements thereto, described in this specification.
- 5.2. All equipment and material used shall be of high quality and the work shall be of a high standard of workmanship carried out by qualified staff under proper supervision by experienced and competent officers.
- 5.3. If any special tools are required for the maintenance of the switchboard, the tenderer shall supply three (3) sets at delivery of the switchboard to site.

6. DISTRIBUTION BOARDS

6.1. The distribution board shall comply with SANS 60439-1

6.1.1. The form of separation will be specified in the project specific documentation.

6.2. The degree of protection shall be to IEC Publication 144/EN60529 and shall conform to the following:

- Inside Substations and MCC Rooms: IP42
- Other Locations: IP65

6.3. The distribution board shall consist of either a framework of substantial steel sections covered with heavy gauge steel plates or of folded sheet steel sections, forming a robust construction.

6.4. Particular attention shall be given to the ventilation of panels, to eliminate build-up of excessive heat caused by the sun or internal heat generation. All necessary precautions shall be taken to ensure that the temperature of the air in any portion of the assembly does not rise more than 15°C above ambient air temperature

6.5. Every board shall be fitted with a suitable gasket incorporated into the frame to ensure that the arrangement is in accordance with the required degree of protection. Sealing strips and gaskets shall be made of durable, non-hardening rubber, neoprene or other synthetic material, suitably fixed to the door or frame to ensure that the seal does not become dislodged during normal operation.

6.6. Where possible the lock and door catch shall comprise of a combination unit. Door latching and delatching operations shall be smooth and quick, whilst ensuring proper compression of the sealing gaskets. Repeated opening and closing of the hinged doors and operations of the door locks and catches shall not cause chipping or scratching of the painted surfaces or any other blemishes to the finished boards

6.7. Lifting lugs shall be provided for floor standing enclosures and as needed for wall mounted enclosures.

6.8. The board shall have a separate latches hinged or removable front cover secured to the board by means of suitable captive type screws or bolts. When the cover is removed/ opened, easy access to that compartments components and wiring shall be possible.

6.8.1. The control units shall be mounted flush with the front cover so that only the operating handles protrude.

6.8.2. Large removable panels shall be supplied with handles for easy handling.

6.8.3. No possibility should exist for panels to come into contact with live parts.

6.9. Due care shall be taken to ensure that the live side of the MAIN SWITCH is suitably protected so that no live conductors are exposed when the panel door is opened or the panel cover is removed.

6.10. The board shall be equipped with a set of 3 phase and neutral copper busbars. The 3 phase busbars shall be continuously rated for the full load of the incoming supply switch. The neutral shall be 100% of the phase busbars. Earth bar shall be rated to fault current and touch voltage.

- 6.11. All busbars shall be designed, manufactured, marked and tested in accordance with SANS1195.
- 6.12. Busbar rating shall be 2A/mm^2 up to 630A and 1.6A/mm^2 thereafter.
- 6.13. Busbar temperature shall not exceed a 40°C temperature rise.
- 6.14. The busbars shall be adequately braced and supported. The busbars shall be covered with a sufficient number of layers of high quality insulating tape or heat shrinkable sleeving and finished in standard colours.
- 6.15. Where busbar joints and terminations have not been covered, a kit shall be provided for covering during installation.
- 6.16. Alternatively, busbars shall be suitable enclosed in a busbar chamber or behind a protective barrier for protection against inadvertent contact with "live" busbars with access panels removed.
- 6.17. Inter-connectors between the busbars and control units shall be by means of fully insulated, adequately rated conductors firmly bolted to the busbar and secured to the appropriate terminals of the control units using crimped-on terminal lugs. Solid flat conductors shall be used if the rating exceeds 400 A or if the fault current exceeds 25kA rating. No conductor of less than 16mm^2 shall be used between busbars and control units. All conductors shall be suitably rated for the fault level.
- 6.18. The other terminals of the incoming and outgoing panel units shall be connected by means of conductors conforming to clause 6.17, i.e. they shall be robust, insulated, easily accessible terminals, of adequate size, conveniently located in the distribution board near the incoming and outgoing cable entries but with sufficient clearance and space to enable the incoming and outgoing cables to be connected to their corresponding terminals without difficulty or strain.
- 6.19. All the outgoing connections of MCCB'S greater than 400A 3 phase shall be done by means of copper bus bars, securely clamped using approved busbar clamping insulators, fixed to a robust metal section of adequate size, conveniently located in the rear of the distribution board to enable the incoming cables to be terminated in the back of the distribution board cubical behind each respective MCCB. This is to allow for the easy termination of the larger incoming cables, with sufficient clearance and space to enable the outgoing cables to be connected to their corresponding busbar terminals without difficulty or strain to the MCCB's. Each MCCB up to 250A shall be fitted with extended terminal complete with phase barriers as supplied by circuit breaker supplier.
- 6.20. Outgoing cable tails that connect to the busbars in clause 6.19 shall have securing places to enable the cable to be secured with nylon type cable fasteners in an approved manner.
- 6.21. The busbars that protrude into the back compartment of the distribution board shall be covered with a perspex type barrier and shall have danger signs on each section.
- 6.22. Removable gland plates shall be provided. These gland plates shall be of adequate thickness or construction for the cables to be terminated without distortion of the gland plate, and shall not be less than 2mm mild steel (zinc passivated). Gland Plates shall not be mounted less than 300mm above ground floor level, alternatively a base frame of suitable depth may be provided.
- 6.23. Distribution board cases shall be of such dimensions that adequate space is available for manoeuvring and connecting the incoming and outgoing cables.

- 6.24. All cable entries shall be from the bottom of the distribution board unless stated otherwise.
- 6.25. Glands shall not be less than 300mm above floor level. Unless otherwise stated.
- 6.26. The terminals of all incoming and outgoing cables shall be firmly connected to the terminals on the lugs or ferrules, unless they are of a type that will grip the cable without splaying the strands of the conductor.
- 6.27. A substantial earthing terminal shall be firmly attached to the metal work of the distribution board and connected to an earth bar of cross sectional area not less than 50% of the phase bars, running the full length of the distribution board to which all earthing conductors of the incoming and outgoing circuits shall be firmly connected.
- 6.28. A removable link shall be provided in the Neutral busbar to ensure that the neutral busbar can be split in two sections for testing purposes. The link shall be secured in position with a bolt and nut arrangement.
- 6.29. The distribution board manufacturer shall allow for at least 30% capacity for the installation of additional switchgear in the distribution boards.
- 6.30. Each distribution board shall be fitted with the following labels as needed in suitable positions:
 - Live busbars
 - Flash signs
 - Main label (always required)
 - Voltage rating
 - Current rating
 - Fault level and time
 - IP rating
 - Job number
 - Reference number
 - Date of manufacture
 - Form of separation
 - Fed from
 - Each feeder/starter to be labelled
- 6.31. Each distribution board shall be supplied with a test certificate. This certificate shall include all items as indicated in annexure 1 of SANS 1973–1 and annexure E of SANS 1973–3.

7. ARC DETECTION SYSTEM

- 7.1. All switchgears shall be equipped with an efficient and reliable arc detection system designed according to IEC 61508 with a safety level meeting at least SIL 2.
- 7.2. The system shall consist of one or more arc monitoring units and light detectors.

7.2.1. Arc detection system:

Arc detection system shall not be activated by interfering influences such as portable lamps, electro-magnetic fields, vibration or touching. In case of an arc occurring in the switchgear it shall be possible to identify where and when the arc has occurred. This information should be accessible without opening the switchgear door and stored even if power is lost to the system. The HMI shall not affect the IP degree of the cabinet.

7.2.2. Arc monitoring unit and light detector:

The arc detection system shall use light as the main condition for tripping. Detectors shall cover each bus-bar section, respective circuit breaker and in any other areas where the designer of the switch gear considers or finds it as a potential risk for an arc. The detectors shall be made of optical fibre in order to avoid EMC disturbances. Without any extra calibration from the user the system shall not react for a light intensity lower than 3000 lux in order to avoid nuisance tripping. The light intensity shall also be constant regardless the length of the detector.

7.3. The trip signal shall be sent within less than 2 ms to the circuit breaker in an event of an arc

7.4. The arc monitoring unit shall provide at least three high speed solid state tripping outputs to the circuit breaker.

7.5. It shall be possible to configure the detectors to trip different breakers depending on which detector detects the arc.

7.6. The system shall have the possibility to mount up to 30 detectors in the space of the main unit in order to avoid space issues if the system would be extended.

8. FUSE SWITCHES

8.1. Fuse switches shall comply with SANS 152 and SANS 60947 – 3.

8.2. Fuse switches shall be enclosed, triple pole, quick break and dustproof.

8.3. Fuse switch handle shall have an IP rating of IP65 and the handle shall be defeatable to override the door interlock.

8.4. Fuse switches shall be of the double break type and the fuses shall be completely isolated when the switches are in the "OFF" position.

8.5. Fuse switch and handle shall have a test position. It will be possible to have an auxiliary for only indication test position.

8.6. The switches shall be interlocked to prevent the opening of the front covers unless the switches are in the "OFF" position and the closing of the switches with the covers open. The switches shall be lockable in the "OFF" position.

8.7. Fuse Switches shall have a lever or rotary action with a positive spring controlled opening and closing action for making or breaking the circuit under load conditions. Fuse carrier and base contacts shall be designed to give permanent high contact pressure and shall be designed to facilitate location of blown fuses without removal of the carrier. Fuse carriers and bases shall be of the highest grade phenolic mouldings to BS 771 and shall be non-flammable and nonhygroscopic, with a hard gloss black finish.

8.8. It shall be possible to install the fuse switch in any position without derating.

9. FUSE LINKS

9.1. HRC Fuse Links shall be of the high rupturing capacity type, compliant with SANS IEC 60269 –

1:2006. Fuse links shall incorporate a visual indication device to facilitate location of blown fuses and shall be designed to clip into the fuse carrier contacts without the use of fixing screws.

9.2. Breaking capacity of all fuse links shall be not less than Category of duty AC.50 at 415 Volts (SANS IEC 60269 - 1:2006). The Fusing factor of the fuses shall not exceed 1.5 (SANS IEC 60269 Class Q1).

9.3. Fuse current ratings shall be indicated on engraved 20 x 12mm white-black-white trifoliate labels in 4mm letters. The labels are to be fitted at the fuse bases and shall not be obscured by wiring.

9.4. Fifty- percent spare fuses of each size shall be provided in suitable cubicle on the switchboard. The door of this cubicle shall be suitably identified.

10. AIR CIRCUIT BREAKERS (ACB) SHALL CONFORM TO THE FOLLOWING CHARACTERISTICS.

10.1. Functional characteristics:

10.1.1. Air circuit breakers for use on the incoming supply side of the distribution board shall comply with SANS 60947.

10.1.2. The circuit breakers shall have a continuous enclosed current rating as indicated on the relevant drawings with a minimum Icu (ultimate breaking capacity) of 42kA at 415 volts. The circuit breakers shall be tested for category P.2, unless specified otherwise.

10.1.3. The circuit breakers shall have an Ics (service capacity) rating equal to the Icu (ultimate breaking capacity) rating.

10.1.4. The circuit breakers shall have an Icw (withstand current) of 1 sec and 3 sec. The 1 sec Icw rating shall be equal to the Icu rating.

10.1.5. The air circuit breakers shall be of the enclosed, ventilated, independent manual spring, draw-out type with a rated service voltage of 690 volts and a rated insulation voltage of 1000 volts and be equipped for shunt tripping from a 115 V DC battery supply. The shunt tripping facility shall be wired so that the ACB shall trip when it's associated high voltage transformer circuit breaker trips.

10.1.6. The circuit-breakers shall have a rated impulse withstand voltage of 12 kV.

10.1.7. The rated uninterrupted current shall be between 100 and 6300 A with the possibility of set trip threshold of L protection from 40A.

10.1.8. Different versions of circuit-breakers shall be available, divided into their category of use: A (current-limiting) and B (selective).

10.1.9. Different versions shall be available with rated ultimate breaking capacity from 42 to 150 kA at 440 V AC and from 42 to 100 kA at 690 V AC for circuit-breakers in category B and with 130 kA at 415 V AC, 85 kA at 690 V AC for circuit-breakers in category A.

10.1.10. The mechanical life shall be at least 12000 operations with a frequency of 60 operations/hour without the need for maintenance of the contacts and arcing chambers

- 10.1.11. The electrical life at a voltage of 440 V AC shall be (with a frequency of at least 10 operations/hour and without the need for maintenance of the contacts and arcing chambers):
- at least 9000 operations up to 2000 A
 - at least 5000 operations up to 3200 A
- These values are intended to be valid only for category B circuit-breakers.

10.2. Environmental characteristics

- 10.2.1. Operating temperature: -25 °C...+70 °C (-13 °F...158 °F) and storage temperature: -40
- 10.2.2. Altitude: operation without derating shall be up to 2000 metres above sea level. (6600 ft), and with derating up to 5000 metres above sea level. (16500 ft).
- 10.2.3. Suitability for use in a hot-humid environment. With regard to this, the circuit-breakers shall undergo a tropicalisation process which makes them suitable for use in a hot-humid environment, as established by the prescriptions of the main shipping registers and in accordance with the international IEC 60068-2-30 Standards.

10.3. Construction characteristics

- 10.3.1. All the models shall be available in the 3 and 4 pole versions both in the fixed (with rear horizontal, rear vertical and front terminals) and withdrawable (with rear horizontal, rear vertical, front and front terminals) versions.
- 10.3.2. There shall be total segregation between power and front shield, using double insulation where suitable so as to guarantee maximum operator safety.
- 10.3.3. Total segregation between the phases shall be guaranteed for safety reasons without need of phase barriers up to 1000V.
- 10.3.4. It shall be possible to inspect easily the arcing chambers easily and to check main contact wear with the circuit-breaker racked-out, by removing the arcing chambers.
- 10.3.5. All the circuit-breakers in the range shall have the same height and depth with the aim of standardising the supporting structures of the switchgear and the switchgear itself as far as possible.
- 10.3.6. IP30 degree of protection shall be guaranteed on the front part and IP20 on the rest of the circuit-breaker (excluding the terminals), with the possibility of having IP54 degree of protection (NEMA 3/3s/13) on the front, using the transparent cover which completely protects the front, but still leaves the panel underneath and the protection unit fully visible with the relative indications.
- 10.3.7. The whole range of air circuit-breakers shall be fitted with electronic protection releases. It shall be allowed the inter-changeability of protection releases from skilled personnel.

10.4. Special points for withdrawable versions:

- 10.4.1. The circuit-breakers in the withdrawable version shall be fitted with anti-racking-in locks to prevent racking a moving part into a fixed part with a different rated current.
- 10.4.2. In the case of the withdrawable version, the presence of a device shall prevent racking-out and racking-in with the apparatus closed.



10.5. Accessories

The following accessories shall be common to the whole range standard:

10.5.1. Electrical accessories:

- 10.5.1.1. Shunt opening/closing release.
- 10.5.1.2. Control and monitoring Test Unit - allows continuity of the different versions of the shunt opening releases to be checked;
- 10.5.1.3. Undervoltage release;
- 10.5.1.4. Time delay device for undervoltage release - allows release trip delay with established and adjustable times;
- 10.5.1.5. Geared motor for the automatic charging of the closing springs;
- 10.5.1.6. Mechanical and electrical signalling of overcurrent release trip;
- 10.5.1.7. Trip reset release;
- 10.5.1.8. Auxiliary contacts which allow signalling of the circuit-breaker state;
- 10.5.1.9. Current transformer for the neutral conductor outside the circuit-breaker;
- 10.5.1.10. Homopolar toroid for the main power supply earth conductor (star centre of the transformer).

10.5.2. Mechanical accessories:

- 10.5.2.1. Interlocks between 2 circuit-breakers or among three circuit-breakers can be used horizontally, vertically or in "L" position using different types of flexible cables:
- 10.5.2.2. Standard version (with maximum distance between two circuit breakers: up to 1200 mm if horizontally interlocked while up to 750mm if vertically interlocked).
- 10.5.2.3. Extended version (with distance between two circuit breakers: from 1200mm up to 1600 mm if horizontally interlocked while from 750 up to 1000 if vertically interlocked).
- 10.5.2.4. Mechanical locks to control enabling racking-in/out operations available also with interlocks. IP54 transparent front protection (NEMA 3/3S/13).

10.6. Protection Release

10.6.1. Basic Protection Functions

- 10.6.1.1. The release shall not require auxiliary power supplies since the power is taken from the current transformers.
- 10.6.1.2. The signals supplied by the release shall not operate with power supply supplied by internal batteries.

- 10.6.1.3. The protection against overload (L) with characteristic $t=k/I^2$ shall always have setting ranges with timing adjustable up to 144s with $I=3I_n$.
- 10.6.1.4. The protection of neutral shall be set at 50%, 100%, 200% and OFF of the phase currents without changing any component.
- 10.6.1.5. All the protection functions except protection against overload shall be excludable.

10.6.2. Measurement Functions

- 10.6.2.1. The release shall always be able to provide measurement of the currents and voltages in the three phases, in the neutral and of earth fault (ammeter function), both in self-supply and with an auxiliary power supply. Measurement function shall be active, even without external supply, starting from 140 A of single-phase current, independently from the circuit-breaker size. Accuracy of the ammeter measurement chain (current sensor plus ammeter) shall equal or better than 1.5% in the 30% - 120% current interval of I_n .
- 10.6.2.2. The release shall not normally require auxiliary power supplies since the power is taken from the current transformers. For measurements and programming at very low currents, a power supply at 24 V DC shall be available. As alternative the release shall be able to receive power supply directly from busbars or terminals, up to line voltage equal to 690 V AC.
- 10.6.2.3. The release shall be able to acquire the waveforms of electrical values with a sampling frequency selectable from 600 to 4.800 Hz and sampling interval from 3 s to 27 s. Acquisition shall be frozen after a trip or a configurable event. Acquisition data shall be retrieved from an external device (personal computer or similar) for fault analysis purposes. The release shall show voltage measurements on display, with a precision equal or higher than 1%.
- 10.6.2.4. Measurement functions that shall be available:
 - Current measurements
 - Voltage measurements
 - Power measurements
 - Power factor measurements.
 - Measurements of frequency and peak factor
 - Energy measurements
 - Historical measurements
 - The last 10 trips information
 - Complete trip information on display without batteries
 - Data logger included as standard

10.7. Advanced Protections Functions

- 10.7.1. Thermal memory for functions L (overload protection) and S (short circuit protection).
- 10.7.2. Protection against over-temperature. It shall be possible to signal the presence of anomalous temperatures on the release by means of two LEDs (Warning and Alarm) and, if decided during the unit configuration phase, when the temperature is over 85 °C, to simultaneously control circuit-breaker opening.

- 10.7.3. Protection against missing and unbalanced phase (U) with characteristic $t=k$ shall be possible.
- 10.7.4. Load control protection (K).
- 10.7.5. Undervoltage protection (UV)
- 10.7.6. Overvoltage protection (OV)
- 10.7.7. Residual voltage protection (RV)
- 10.7.8. Underfrequency protection (UF)
- 10.7.9. Overfrequency protection (OF)
- 10.7.10. Protection against reversal of active power (RP)

10.8. User Interface and Signalling LEDs

- 10.8.1. An alarm shall indicate by means of LEDs located on the release the disconnection of opening solenoid and current transformers. A trip shall also occur, after a short time delay, when the disconnection is detected.
- 10.8.2. The release shall allow parameterisation by means of keys and a LCD graphic display.
- 10.8.3. Access to control and configuration of the unit by means of a password (edit MODE).
- 10.8.4. The signals given by the permanent indicators shall guarantee maximum reliability.
- 10.8.5. Indication shall be available directly on display on request of the user for not less than 48 hours even without an auxiliary voltage and batteries and also be given in the case of re-losing on a fault. After 48 hours of inactivity the information shall be retrievable by external devices. Indication shall contain at least the protection tripped.
- 10.8.6. It shall be possible to read the current values and information on the last 10 measures (current values, protection tripped) at any time through external devices, some of which can transmit data via bluetooth;
- 10.8.7. In the event of CB tripped, shall be indicated the type of protective function that intervened.
- 10.8.8. Each alarm or warning alarm shall be clearly shown on the display, when it is active.
- 10.8.9. On the protection release two (2) led's shall be present.
- 10.8.10. Warning LED shall be in place indicating at least the following:
 - Presence of one or more phases with current values in the $0.9 \cdot I_n < I < 1.05 \cdot I_n$ range
 - Presence, between two or three phases, of unbalance higher than the value programmed during configuration
 - The first temperature threshold of $T=70^\circ\text{C}$ has been exceeded
 - Contact wear $> 80\%$
 - Harmonic distortion
 - Out of range frequency
 - Breaker status error
 - Warning threshold override

- 10.8.11. Alarm LED shall be in place indicating at least following:
- Presence of one or more phases under overload with current values $I > 1,3 \cdot I_n$ (Overload Protection - L under timing)
 - Timing in progress for protection function S (Selective short circuit protection)
 - Timing in progress for protection function G (Earth fault protection)
 - The second temperature threshold of $T=85^\circ\text{C}$ has been exceeded
 - Contact wear 100%.
 - Timing in progress for protection function D;
 - Timing in progress for protection function UV(Under Voltage), OV(Over Voltage), RV (Residual Voltage);
 - Timing in progress for protection function RP(Reversal of Active Power);
 - Timing in progress for protection function
 - Timing in case of unbalance between the phases higher than the value set during configuration with trip set to ON;
 - Current Sensors disconnected;
 - Opening solenoid (Trip Coil) disconnected
- 10.8.12. The communication function shall be implemented on the release by means of:
- An internal bus, with interface RS485;
 - An external bus, with Modbus RS485 protocol 2-Wire Twisted Pair, 19.2 kbit/s max.
- 10.8.13. There shall be the possibility of setting the release in remote and in local operating mode, and with the latter it shall not be possible to carry out data transmission from the system to the release. It shall be possible to automatically set the local mode by means of an external contact. An 24VDC auxiliary supply shall be used.
- 10.8.14. The protection release shall be able to send to the system these data:
Protection parameters set, phase and neutral currents, state of the circuit-breaker (open closed), position of the circuit-breaker (connected-isolated), state of the springs (charged discharged), number of circuit-breaker mechanical operations, total and for each protection number of trips, last interrupted current, contact wear, state of the protection functions (pre alarm function. L, timing function. L, S,G...), overtemperature protection function, state of internal communication bus.
- 10.8.15. The system shall transmit to the protection release the following data: protection parameters, circuit-breaker opening and closing commands, reset for tripping of some protection functions.
- 10.8.16. Adjustable inverse definite minimum time (IDMT) overcurrent release facilities are required in addition to the instantaneous fault trip for the air circuit breakers.

11. MOULDED CASE CIRCUIT BREAKERS (MCCB) SHALL CONFORM TO THE FOLLOWING CHARACTERISTICS.

11.1. Functional Characteristics

11.1.1. AC rated service voltage for currents over 160 A: 690 V AC (50-60 Hz).

11.1.2. DC rated service voltage: 500 V DC for currents of 160 A and 750 V DC for currents over 160A.

- 11.1.3. Rated uninterrupted current for 1000 V AC or DC applications: 800 A (three and four poles).
- 11.1.4. Minimum rated insulation voltage for currents equal or over 160 A: 8 kV.
- 11.1.5. Rated insulation voltage for currents equal or over 160 A: 800 V AC.
- 11.1.6. Rated uninterrupted current between 160 and 3200 A with trip units settings starting from 1A.
- 11.1.7. According to IEC 60947-2 (§ 4.4) starting from 400 A the circuit breakers shall be category B
- 11.1.8. MCCBs shall be available with different ultimate short breaking capacities between 16kA and 200kA @ 380/415 V AC.
- 11.1.9. Both line up and line down supplying shall be possible without decreasing MCCBs performances or functionality
- 11.1.10. For rated uninterrupted currents up to 160 A, the MCCB limiting features shall be enough to assure its conformity to IEC 60439-1 (§ 8.2.3.1) once installed into a type AS or ANS switchboard as general breakers. This shall be valid up to the MCCB's rated uninterrupted current (limiting versions are excluded).
- 11.1.11. A test bottom for the correct functionality checking (moving contacts opening) shall be place in front of the breaker.

11.2. Ambient Characteristics

- 11.2.1. Operating temperature: -25 °C. +70 °C (ambient temperature)
- 11.2.2. Storage temperature: -40 °C .. +70 °C (ambient temperature)
- 11.2.3. Reference temperature for setting the thermal element of the thermomagnetic trip unit: +40 °C
- 11.2.4. Maximum relative humidity: 98%
- 11.2.5. Maximum altitude: 2000 m above sea level, 5000 m above sea level with derating suitability for being used in hot-humid places. With regard to this, the circuit-breakers shall undergo a tropicalization process to make them suitable for use in hot-humid places, as established in the prescriptions of the major naval registers and in compliance with the International IEC 60068-2-30 Standards.
- 11.2.6. Circuit-breakers fitted with electronic trip units shall comply with the prescriptions of the International Standards on electromagnetic compatibility.

11.3. Construction Characteristics

- 11.3.1. The range of moulded case circuit-breakers shall cover a range of rated uninterrupted currents from 160 to 3200 A
- 11.3.2. By means of the double insulation technique, moulded case circuit-breakers shall guarantee complete separation between the power circuits and the auxiliary circuits.
- 11.3.3. Moulded case circuit-breakers shall have an operating lever which always indicates the exact position of the circuit-breaker contacts (positive operation), by means of safe and reliable signals (I= closed, O= open, yellow-green line= open due to trip unit).

- 11.3.4. The operating mechanism shall be designed to operate all poles of the circuit breaker simultaneously for making, breaking and tripping.
- 11.3.5. Moulded case circuit-breakers shall be suitable for isolation in compliance with § 7.2.7 of the IEC 60947-2 Standard. This indication shall be clearly and indelibly marked on the circuit-breaker (in accordance with § 5.2 of IEC 60947-2) and in a position where it is visible with the circuit-breaker installed.
- 11.3.6. Moulded case circuit-breakers shall be available in the three-pole and four-pole version both in the fixed, and in any possible plug-in or withdrawable versions.
- 11.3.7. Circuit-breakers in the plug-in version starting from 250 A shall be available. In the case of a plug-in or withdrawable version, the presence of a device shall prevent racking-in or racking-out with the apparatus closed.
- 11.3.8. In the withdrawable version, racking-out with the door closed shall be possible.
- 11.3.9. The same depth and installation on a DIN EN 50022 rail shall be guaranteed up to the rated setting of 250 A inclusive. The same depth shall be guaranteed. This characteristic shall allow the switchboard and their support structures to be standardized.
- 11.3.10. Moulded case circuit-breakers with rated uninterrupted current up to 250 A shall have a 45 mm high face which makes them suitable for installation on modular panels.
- 11.3.11. All the installation positions shall be possible without jeopardizing the function of the apparatus. Starting from 630 A up to 1600 A the withdrawable version shall be mounted and operated horizontally.
- 11.3.12. For the front parts of the circuit-breakers the degree of protection of at least IP20 (excluding the terminals) shall be guaranteed, IP30 when they are installed in switchboards, and up to IP54 for circuit-breakers installed in a switchboard fitted with transmitted rotary handle and special accessory.

11.4. Protection Trip Units

- 11.4.1. Moulded case circuit-breakers shall be equipped with interchangeable trip units. From 160 A up to 800 A it shall be possible to choose between a thermomagnetic and an electronic protection. For the sizes higher than 800 A, the trip unit shall only be electronic. The trip unit shall be integrated in the volume of the apparatus.
- 11.4.2. From the 250 A size circuit-breakers, the trip unit shall be interchangeable. Trip units shall be adjustable and it shall be possible to fit lead seals to prevent unauthorised access to the settings

11.5. Thermomagnetic Overcurrent Trip Units

- 11.5.1. Thermomagnetic trip units shall be fitted with protection threshold against overload (whose thermal element shall consist of a bimetal) and with protection threshold against short circuit.
- 11.5.2. The protection threshold against overload shall be continuously adjustable starting from 0.7 times the rated current of the trip unit and up to its rated value.
- 11.5.3. The reference temperature for setting the thermal element of the protection trip unit is 40°C.

11.5.4. The temperature performance of the trip unit shall be indicated as the temperature varies.

11.5.5. The protection threshold against short-circuit shall be either the fixed or adjustable type with continuity from 5 and up to 10 times the rated current of the trip unit. In the four-pole version, the neutral pole shall always be protected. For current values equal to or higher than 125 A, protection of the neutral pole shall, at choice, be at 100% or at 50% of the rated current of the trip unit. Vice versa, for current values of less than 125 A, protection of the neutral pole shall always be 100%.

11.5.6. For circuit-breakers with rated uninterrupted current of 160 A, 250 A, 400 A and 500A, a thermomagnetic trip unit shall be available for generator protection with adjustable thermal threshold, starting from $0.7 \times I_n$, and fixed magnetic threshold at $3 \times I_n$ or adjustable magnetic threshold from 2.5 to $5 \times I_n$. Suitability for use in direct current.

11.6. Magnetic only overcurrent trip units

11.6.1. The overcurrent trip units with magnetic only threshold shall be suitable for protection against short-circuit.

11.6.2. The adjustable magnetic only trip units (suitable for motor protection) shall only be available in the three-pole version, whereas those with fixed threshold shall also be available in the four-pole version.

11.6.3. The adjustable magnetic only trip units shall be available for circuit-breakers up to 320 A. Suitability for use in direct current.

11.7. Electronic Overcurrent Release Trip Units

11.7.1. The electronic overcurrent trip units shall be self-supplied and shall be able to guarantee correct operation of the protection functions even in the presence of a single phase supplied with a current value equal to 20% of the phase current. They shall be unaffected by electromagnetic interference in compliance with the EMC directive on the matter.

11.7.2. The basic version shall be fitted with protection functions against overload (function L) and against short-circuit. The latter function can either be of the instantaneous type (function I) or, alternatively, with intentional delay selective short circuit protection (function S). The function of protection against short circuit shall be excludable.

11.7.3. A basic version shall also be provided with only the protection threshold against instantaneous short-circuit which cannot be excluded.

11.7.4. The complete version shall be fitted with protection threshold against overload (function L), against instantaneous short-circuit (function I) and with intentional delay (function S) and also with protection threshold against earth fault (function G). All the protection functions except for protection against overload shall be excludable.

11.7.5. The advanced version shall be suited for zone selectivity protection for the S and G protection functions. An integrated ammeter and many other additional features are provided over and above the protection functions. All the protection functions except for protection against overload shall be excludable.

11.7.6. The advanced version shall be suited for zone selectivity protection for the S and G protection

functions. An integrated ammeter and many other additional features are provided over and above the protection functions. All the protection functions except for protection against overload shall be excludable.

- 11.7.7. A version dedicated to ultra rapid short-circuit protection (with a detection time less than 5 ms) combined with zone selectivity shall be available.
- 11.7.8. An advanced version dedicated to motor protection shall be available with protection functions against overload (function L), against instantaneous short circuit (function I), against unbalanced or missing phase (function U) and against rotor block (function R).
- 11.7.9. A version dedicated to generator protection shall be available (up to 160A), with protection functions against overload (function L), against instantaneous short circuit (function I) and with intentional delay (function S). The S and I protection functions are not an alternative to each other. All these functions are imposed by the major naval registers.
- 11.7.10. All the advanced trip units shall be available with thermal memory.
- 11.7.11. All the protection functions shall be characterized by threshold and time tolerances according to the International Standards.
- 11.7.12. The trip unit shall allow parameterization of the trip thresholds and timing locally or remotely; in the case of any anomalies in remote parameterization, the protection shall automatically use the series of parameters set manually on the front of the circuit breaker.
- 11.7.13. On the advanced version, access to information and programming shall be allowed by a keyboard and graphic liquid crystal display.
- 11.7.14. Alarm signals for the protection functions will be available by means of LEDs located on the trip unit (complete version) and/or on the display (advanced version).
- 11.7.15. The size of the current sensors shall be a minimum of 10 A to a maximum of 3200 A so as to cover the widest possible current range.
- 11.7.16. Interchangeable rating-plugs shall be available starting from 400 A.
- 11.7.17. The four-pole circuit-breaker shall always be supplied with the neutral protected at 100% up to 125A excluded, and for higher values with protection selected between 50% and 100% of the rated current of the trip unit. Starting from 630A setting of the neutral at 150% and 200% shall be possible.
- 11.7.18. The current sensors for external neutral shall be optional.
- 11.7.19. Moulded Case Circuit breakers equipped with electronic releases shall be available a dedicated function to verify the correct connection between the trip unit, current sensor and trip coil. Eventual anomalies shall be signalled by a red led flashing.
- 11.8. Accessories for electronic trip units shall be available, such as the test unit for checking functioning of the tripping coil of the electronic trip unit, a trip signalling unit of the protections, a test and configuration unit which allows the electronic trip unit protections to be tested and configured, an actuation unit which allows circuit-breaker opening and closing by means of a motor operator

mounted on it, a battery unit which allows trip unit testing when the circuit-breaker and an external unit for wireless communication.

- 11.8.1. For both the complete and the advanced version a measurement module shall be available, in order to gauge the plant functioning parameters, such as phase and phase to phase voltages, powers and energies. On the advanced version all the available measurements can be displayed on the LCD. Furthermore, for the electronic trip units for motor protection, there shall also be a contactor control unit available.
- 11.8.2. The advanced version will be provided with a data logger function that automatically records and stores the instantaneous values of all the currents and voltages. Data shall be easily downloaded to any personal computer for elaboration. The data logger function freezes the recording whenever a trip occurs, so that a detailed analysis of faults can be easily performed. The sampling rate shall be adjustable up to 4800Hz, with total sampling time up to 27 s (@ 600Hz sampling rate). Tracking of up to 64 events shall be possible.

11.9. Protections

The minimum performances of the protection functions of the electronic protection trip unit for distribution, where present, shall be:

- 11.9.1. Function L: adjustable trip threshold $I1 = (0.4-1) \times I_n$, trip curves for the basic version with time settings from 3 to 12 seconds – 2 different trip curves - (at 6 times the set threshold), whereas for the advanced version with time settings from 3 to 18 seconds – 4 different trip curves - (at 6 times the set threshold). For the advanced version, L function according to IEC 60255-3 shall be available. *Cannot be excluded.*
- 11.9.2. Function S: adjustable trip threshold $I2 = (1-10) \times I_n$, trip curves for the basic version with time settings from 0.1 to 0.25 seconds – 2 different trip curves – (at 8 times the rated current of the trip unit), whereas for the advanced version with time settings from 0.05 to 0.5 seconds – 4 different trip curves with inverse short time with definite time characteristic or curves with definite time – (at 6 times the rated current of the trip unit). For circuit breakers from 250 A to 630 A, in the advanced version, $I2 = (0.6-10) \times I_n$. *Can be excluded.*
- 11.9.3. Function I: adjustable trip threshold $I3 = (1-10) \times I_n$ for the basic version (instantaneous trip), whereas for the advanced version $I3 = (1.5-15) \times I_n$ (instantaneous trip). *Can be excluded.*
- 11.9.4. Function G: adjustable trip threshold $I4 = (0.2-1) \times I_n$ with trip time settings from 0.1 to 0.8 s with curve with inverse short time and definite time characteristic. *Can be excluded.*
- 11.9.5. Function U: adjustable trip threshold $I6 = (2\%...90\%) \times I1$ with trip time settings from 0.5 to 60 s with curve with inverse short time and definite time characteristic. *Can be excluded.*
- 11.9.6. Function OT: fixed at 85 °C (with instantaneous trip). *Can be excluded.*

- 11.9.7. Function UV: adjustable trip threshold $U8 = (0.5-0.95) \times U_n$ with trip time settings from 0.1 to 5 s with curve with inverse short time and definite time characteristic. *Can be excluded.*
- 11.9.8. Function OV: adjustable trip threshold $U9 = (1.05-1.2) \times U_n$ with trip time settings from 0.1 to 5 s with curve with inverse short time and definite time characteristic. *Can be excluded.*
- 11.9.9. Function RV: adjustable trip threshold $U10 = (0.1-0.4) \times U_n$ with trip time settings from 0.5 to 30 s with curve with inverse short time and definite time characteristic. *Can be excluded.*
- 11.9.10. Function RP: adjustable trip threshold $P11 = (-0.3...-0.1) \times P_n$ with trip time settings from 0.5 to 25 s with curve with inverse short time and definite time characteristic. *Can be excluded.*
- 11.9.11. Function UF: adjustable trip threshold $f12 = (0.9-0.99) \times f_n$ with trip time settings from 0.5 to 3 sec with curve with inverse short time and definite time characteristic. *Can be excluded.*
- 11.9.12. Function OF: adjustable trip threshold $f13 = (1.01-1.10) \times f_n$ with trip time settings from 0.5 to 3 s with curve with inverse short time and definite time characteristic. *Can be excluded.*
- 11.9.13. The minimum performances of the protection functions of the electronic protection trip unit for motor protection shall be:
- Function L: adjustable trip threshold $I1 = (0.4-1) \times I_n$, trip curves in class 10A, 10, 20 and 30 or 3E, 5E, 10E e 20E in compliance with the IEC 60947-4-1 Standard, with temperature compensation and sensitivity to missing/unbalanced phase. *Cannot be excluded.*
 - Function R: adjustable trip threshold $I5 = (3-10) \times I1 + \text{OFF}$, with 4 different trip curves with definite time with time settings $t5 = 1...10$ s. Automatic exclusion of the function during the motor starting phase, and automatically reactivated after this. *Can be excluded.*
 - Function I: adjustable trip threshold $I3 = (6-13) \times I_n$ (instantaneous trip) with recognition of the motor starting phase.
 - Function U: adjustable trip threshold $I6 = (0.4-0.9) \times I1$ e $t6 = 4$ s. *Can be excluded.*
 - Possibility of contactor control for trip of functions L and R.
 - Possibility of connection to a PTC (temperature probe) inserted in the motor.

11.10. Dialogue

For circuit-breakers from 250 A to 1600 A dialogue shall be available, making the following functions possible:

- 11.10.1. Remote setting of the protection function parameters, unit configuration and communication.

- 11.10.2. Transmission of measurements, states and alarms from circuit-breaker to system transmission of events to the system.
- 11.10.3. Dialogue units able to support different standard market protocols shall be available:
 - 11.10.3.1. Modbus RTU protocol, EIA RS485 physical transmission means, speed 9.6...19,2 Kbit/s, bus architecture.
 - 11.10.3.2. Profibus DP protocol, RS485 physical transmission, speed 9.6...19,2 Kbit/s, bus architecture.
 - 11.10.3.3. Device Net protocol, RS485 physical transmission, speed 9.6...19,2 Kbit/s, bus architecture. Wireless bluetooth protocol.
 - 11.10.3.4. The dialogue unit shall make all the parameterization and measurement information of the protection unit available on the field bus, as well as the state of the circuit-breaker (open/closed, racked-in/racked-out) and of the related trip units. Shall be providing a tool able to analyse all these data by PC.

11.11. Accessories

11.11.1. Electrical Accessories

- 11.11.1.1. Internal Accessories has to be the same up to 250A as well from 250A to 1000A.
- 11.11.1.2. Auxiliary contacts: these shall allow the state of the circuit-breaker (open or closed; contact on change-over) and trip unit to be known. Auxiliary contacts for use at 250 V AC/DC, 400V AC and 24 V DC (digital contacts) shall be available.
- 11.11.1.3. Releases: the shunt opening and under-voltage releases shall be available with different power supply voltages both in AC and DC.
- 11.11.1.4. With circuit-breakers up to 250 A the electrical accessories shall be available both in the pre- cabled version and with 1m long un-cabled cables.
- 11.11.1.5. The addition of the electrical accessories shall not increase the volume of the circuit breakers.

11.11.2. Mechanical Accessories

- 11.11.2.1. Terminals: different types of terminals (both front and rear) shall be available for all the sizes, suitable for connection with copper, copper-aluminium cable and bus bar connections.
- 11.11.2.2. Up to the 160 A size, the circuit-breakers can be fitted with different types of terminals combined in different ways (higher of one type, lower of a different type). Terminal covers and phase separators shall also be available.
- 11.11.2.3. Multi-cable terminals shall be available for circuit-breakers for the 250-320-400-630 A size. Support for fixing onto DIN rail: supports for fixing onto DIN EN 50022 rail shall be available up to the rated current of 250 A inclusive.
- 11.11.2.4. Mechanical interlocks: mechanical interlocks shall be available for the whole series of circuit-breakers; the interlock can be of the front type for circuit-breakers with rated

current up to 250 A. It shall be possible to interlock circuit-breakers of different sizes at least up to 250 A and between 250A and 630 A.

11.11.2.5. Rotary handle: a rotary handle operating mechanism both in the direct and transmitted version shall be available for the whole range of circuit-breakers, both padlockable in the open position and fitted, on request, with the following accessories: early contact for under-voltage release, compartment door lock and key lock in open position.

11.11.2.6. The whole range of moulded case circuit-breakers shall be fitted with motor operator (according to the rated current of the circuit-breaker, this can either be of the solenoid type, or with stored energy) for remote operation of the circuit-breaker.

11.12. Residual Current Release

11.12.1. General Aspects

11.12.1.1. The residual current releases used in low voltage installations shall be designed, constructed and tested in compliance with the International Standards and in particular with:

11.12.1.1.1. IEC 60947-2 appendix B and ANNEX M

11.12.1.1.2. IEC 60255-4 and IEC 61000: for protection against unwarranted trips

11.12.1.1.3. IEC 60755 for insensitivity to the continuous current components

11.12.1.2. It shall be possible to install the residual current releases in installations with line-to-line voltage up to 690 V.

11.12.1.3. They shall be able to be used in close connection with circuit-breakers and/or switch disconnectors.

11.12.1.4. Shall be guaranteed the normal operating up to -25°C

11.13. Construction Characteristics

11.13.1. It shall be possible to combine the range of residual current releases with all the circuit breakers making up the range of moulded case circuit-breakers so as to cover the whole current range of MCCBs.

11.13.2. It shall be possible to combine the residual current releases with circuit-breakers in fixed, plug-in and withdrawable version.

11.13.3. Their installation on a DIN rail shall be possible.

11.13.4. Control of correct operation shall be possible according to the prescriptions of the reference Standards, by means of a test pushbutton on the front of the apparatus.

11.13.5. Residual current releases shall be available both in the three-pole up to 250A and in the four-pole version.

11.13.6. Dedicated residual current releases shall be available up to 1600 A

11.13.7. Type B residual current protection shall be available

- 11.13.8. It shall be possible to select the maximum threshold of sensitivity to the residual current fault frequency (3 steps: 400 700 1000 Hz).

11.14. Electrical Characteristics and Performances

- 11.14.1. Up to the rated current of 250 A, the service voltage shall be between 85 and 500 V AC line-to-line (operation up to 50 V phase-neutral). Trip thresholds I_{dn} starting from 0.03A and up to 10 A shall also be available for the advanced version which shall also allow selection of the trip times (for the basic version, the trip shall be of the instantaneous type).
- 11.14.2. A contact signalling pre-alarm shall be available in the advanced version and the availability of an input for remote opening.
- 11.14.3. There shall be type A versions for alternating pulsed current, S selective and E for emergency stop of the residual current release.
- 11.14.4. The release shall be self-supplied and the power supply can come either from above or below.
- 11.14.5. Compliance with the International Standards on the matter of electromagnetic compatibility.
- 11.14.6. There shall be a switchboard residual current unit with voltage varying between 80 and 500 V AC and between 48 and 125 V DC. There shall be availability of several adjustment ranges from 0.03 to 30 A, with trip times from instantaneous to 5 s and pre-alarm threshold adjustment.
- 11.14.7. The toroidal transformers can either be closed (from 60 to 180 mm in diameter) or open (from 110 to 230 mm in diameter).

12. MINIATURE CIRCUIT BREAKERS SHALL CONFORM TO THE FOLLOWING CHARACTERISTICS.

12.1. Functional Characteristics (1 to 63 Amps)

- 12.1.1. Miniature Circuit Breaker for cable protection according to:
DIN VDE 0641 Teil 11,
EN 60898, IEC 60947-2, EN 60947-2,
UL1077/C22.2 No.235, UL489/C22.2 No.5
- 12.1.2. Rated short-circuit capacity I_{cn} shall be: 6/10/25 kA unless otherwise indicated.

12.2. Tripping Characteristics/curves shall be as follows

B: In 6/10/13/16/20/25/32/40/50/63 A
C: In 0,5/1/1,6/2/3/4/6/8/10/13/16/20/25/32/40/50/63 A
K: In 0,2/0,5/1/1,6/2/3/4/6/8/10/13/16/20/25/32/40/50/63 A
Z: In 0,5/1/1,6/2/3/4/6/8/10/16/20/25/32/40/50/63 A
Number of poles: 1/2/3/4/1+NA/3+NA
Energy Limiting Class: 3
Rated Voltage U_n :
Single-pole: 230/400 VAC
Multi-pole: 400VAC
Max. Operating Voltage U_{Bmax} DC:
Single Pole: 72 VDC

Double Pole: 125 VDC
Suitable for isolation acc. IEC 60898-1

12.3. Environmental Characteristics

- 12.3.1. Operating temperature: -25 °C...+70 °C and storage temperature: -40 °C...+70 °C.
- 12.3.2. Altitude: operation without derating up to 2000 m (6600 ft), and with derating up to 4000 m.
- 12.3.3. Suitability for use in a hot-humid environment. With regard to this, the circuit-breakers shall undergo a tropicalisation process which makes them suitable for use in a hot humid environment, as established by the prescriptions of the main shipping registers and in accordance with the international IEC 60068-2-30 Standards.

12.4. Construction Characteristics

- 12.4.1. Guide edge for labels
- 12.4.2. Prepared for locking devices
- 12.4.3. Quick and easy removal of installed device

12.5. Wiring

- 12.5.1. Busbars: Terminals for in and out coming feeder on top of busbars. The MCB shall have a "safe terminal". Each pole shall have 2 connection points. Combining busbar and wire in same terminal shall not be permitted. Combining wire of un-equal sizes in the same terminal shall not be permitted.

12.6. Accessories

- 12.6.1. Retrofit accessories (extract):
 - Universal signal contact/auxiliary contact (right): 1SO
 - Auxiliary contact (right): 1SO
 - Auxiliary contact (left): 1NO/1NC, 2NO or 2NC
 - Bottom-fitting auxiliary contact: 1NO or 1NC
 - (bottom fitted without increasing width of MCB)
 - Undervoltage- or Shunt trip release
 - Hand operated neutral
 - Motor operating device (remote control)
 - DDA-Block
 - Labelling system (marked or blank)
 - Locking devices

12.7. Functional Characteristics (80 to 100 Amps)

- 12.7.1. Miniature Circuit Breaker for cable protection according to:
DIN VDE 0641 Teil 11, DIN VDE 0660 Teil 101, IEC 60898, EN 60898, IEC 60947-2, EN 60947-2
- 12.7.2. Rated short-circuit capacity shall be minimum: 6 kA unless otherwise stated.

12.8. Tripping Characteristics

- 12.8.1. B mit In 80/100 A

C mit In 80/100 A
Number of poles: 1/2/3/4
Energy Limiting Class: 3
Rated Voltage:
Single-pole: 230 VAC and 60 VDC
Single-pole: 400 VAC and 125 VDC
Suitable for isolation acc.: IEC 60947-1/-3

12.9. General Features

- 12.9.1. Label holder
- 12.9.2. Prepared to get equipped with toggle-locking device

12.10. Wiring

- 12.10.1. Busbars: Terminals for in and out coming feeder on top of busbars. The MCB shall have a "safe terminal". Each pole shall have 2 connection points. Combining busbar and wire in same terminal shall not be permitted. Combining wire of un-equal sizes in the same terminal shall not be permitted.

12.11. Accessories

- 12.11.1. Auxiliary contact: 2 or 3 contacts (screw-able or push-in-able)
- 12.11.2. Auxiliary contact (low power): 1 or 3 contacts
- 12.11.3. Signal contact or signal contact/auxiliary contact: 3 contacts
- 12.11.4. Undervoltage release or shunt trip
- 12.11.5. Neutral conductor
- 12.11.6. Printed labels
- 12.11.7. Labels for individual printing
- 12.11.8. Locking devices

12.12. Functional Characteristics (DC Protection)

- 12.12.1. Miniature Circuit Breaker for cable protection according to: DIN VDE 0641 Teil 12, DIN VDE 0660 Teil 101, IEC 60898, EN 60898, IEC 60947-2, EN 60947-2, UL1077
- 12.12.2. Rated short-circuit capacity: 4,5/6 kA

12.13. Tripping characteristics shall conform to the following

B: In 6/10/16/20/25 A
K: In 0,2/0,3/0,5/0,75/1/1,6/2/3/4/6/8/10/16/20/25/32/40/50/63 A
In 0,5/1/1,6/2/3/4/6/8/10/16/20/25/32/40/50/63A
Number of poles: 1/2/3/4 (K,Z); 1/2 (B)

Rated Voltage:

Single-pole: 230/400 VAC and 220 VDC

Multi-pole: 400 VAC and 440 VDC

Suitable for isolation acc: IEC 60947-1/-3

12.14. General Features

12.14.1. Label holder

12.14.2. Prepared to get equipped with toggle-locking device

12.15. Wiring

12.15.1. Busbars: Terminals for in and out coming feeder on top of busbars. The MCB shall have a "safe terminal". Each pole shall have 2 connection points. Combining busbar and wire in same terminal shall not be permitted. Combining wire of un-equal sizes in the same terminal shall not be permitted.

12.16. Accessories

12.16.1. Auxiliary contact: 2 or 3 contacts shall be (screw-able or push-in-able)

12.16.2. Auxiliary contact (low power): 1 or 3 contacts

12.16.3. Signal contact or signal contact/auxiliary contact: 3 contacts

12.16.4. Undervoltage release or shunt trip

12.16.5. Neutral conductor

12.16.6. Printed labels

12.16.7. Labels for individual printing

12.16.8. Locking devices

13. CONTACTORS

13.1. Contactors shall comply with SANS 60947. Duty cycle shall be AC3. Contactor coil voltage may be either 230V or 400V unless otherwise stated.

13.2. Lighting contactors for 24 to 63 Amps (AC1) shall be DIN mounted on the same rail as the MCBs and feature a DC solenoid actuator and are thus hum-free. They shall have a switching position indicator, integrated coil protection circuits and overvoltage protection for the solenoid coil up to 5kV.

13.3. Contactors from 9 to 38 Amps shall be electronic coils.

13.4. For contactors from 50 to 300 Amps, standard coils will be accepted.

13.5. Contactors from 400 to 2050 Amps shall be electronic coils.

13.6. Mixture of contactors shall not be permitted.

13.7. Ambient characteristics

13.7.1. Climatic withstand according to IEC60068-2-0 AND 60068-2-11

13.8. Construction characteristics

13.8.1. Contactors with electronic coils 9 to 38 Amps AC3 shall have:

- 13.8.1.1. Maximum of two frame sizes from 9 to 16 amps AC3
- 13.8.1.2. Width not to exceed 45mm for contactors 9 to 38 amps AC3 rating
- 13.8.1.3. Contactor up to 16 amps to include built in auxiliary contact
- 13.8.1.4. Common auxiliaries for contactors 9 to 38 amps AC3

13.8.2. Contactors 9 to 110 Amps with standard coil shall have:

- 13.8.2.1. Mounting positions: only position 6 not permitted (see appendix 1)
- 13.8.2.2. Maximum of 4 frame sizes from 9 to 110 amps
- 13.8.2.3. Quick fixing on mounting rail according to IEC 60715 standards as:-
 - 35 x 7.5 mm for 9 to 40 amps contactors
 - 35 x 15 mm for 9 to 75 amps contactors
 - 75 x 25 mm for 50 to 110 amps contactors
 - Terminal with captive screws
 - Terminal screws to be of Pozidriv type up to 75 amps AC3
 - Terminal screws to be M8 Hexagon socket for main terminals and Pozidriv for coil terminals

13.8.3. Contactors 145 to 750 Amps AC3 with Standard or Electronic Coil shall have:

- 13.8.3.1. Maximum of 4 frame sizes from 145 amp to 750 amp
- 13.8.3.2. Mechanical design to incorporate power terminal at base of contactor, operating coil to be mounted on top of contactor. Coil removal to side of contactor shall not be permitted.
- 13.8.3.3. Shall have front access to coil , with no need to remove the power cables when changing coils
- 13.8.3.4. Shall have front access to main fixed and moving contacts , without the need to remove the power cables
- 13.8.3.5. Removal and replacement of the fixed and moving contacts shall be able to be accomplished without the need to remove the power cables
- 13.8.3.6. Contactor shall have quick release quarter turn screws for easy access to main contact inspection
- 13.8.3.7. Clear marking of contactor electrical information, marking to be clearly visible on front of contactor

13.8.3.8. Electrical characteristics and performances

- 13.8.3.8.1. All Contactors shall be electrically coordinated with upstream protection device, whether device or the fuse type, MCCB, or manual motor starter. All coordination to be backed up by Manufacturers coordination tables, available on request.

13.8.4. Contactors with electronic coils 9 to 38 Amps AC3

- 13.8.4.1. Same coil to cover both the AC or DC control supplies
- 13.8.4.2. Coil to be of torroidal design
- 13.8.4.3. Coil to have extended voltage operating limits.
- 13.8.4.4. 4 coil types only covering: 24..500 V 50/60Hz and 20..500 V DC
- 13.8.4.5. Coil Consumption not to exceed the following limits
- 13.8.4.6. On pull in 50VA
- 13.8.4.7. On holding 2.2VA
- 13.8.4.8. Built-in surge protection to be incorporated
- 13.8.4.9. Flexible position of Coil terminals i.e. can be transferred from the top to the bottom of contactor
- 13.8.4.10. With additional coil terminal block, it shall be possible to connect the coil both at the top and at the bottom.

13.8.5. Contactors with standard AC coil 50 to 30 Amps AC3 shall have:

- 13.8.5.1. Rated operational voltage 690V for contactors up to 40 amp AC3
- 13.8.5.2. Rated operational voltage 1000V for contactors 50 to 750 amps AC3.
- 13.8.5.3. Rated making capacity to be equal to 10 x AC3 rated operational current, or greater.
- 13.8.5.4. Rated breaking capacity to be equal to 8 x AC3 rated operational current, or greater.
- 13.8.5.5. Coil operating limits (according to IEC60947-4-1) 0.851.1 x rated Control circuit voltage, at temperature less or equal to 55degrees Celsius
- 13.8.5.6. Drop out voltage in %age of rated Control Voltage approximately 40 to 65%
- 13.8.5.7. Contactors 400 amp AC3 upward to incorporate electronic coil technology

13.8.6. Contactors with electronic coils 400 to 750 Amps AC3 shall have:

- 13.8.6.1. As above but to include the following
- 13.8.6.2. Same coil to cover both the AC or DC control supplies
- 13.8.6.3. Coil to have extended voltage operating limits.

- 13.8.6.4. Can withstand voltage interruptions or voltage dips in control supply up to 20ms.
- 13.8.6.5. Distinct opening and closing voltages as follows
- 13.8.6.6. Opening 0.55 x min operating voltage
- 13.8.6.7. Closing 0.85 x min operating voltage
- 13.8.6.8. Coil types only covering: 24..500 V 50/60Hz and 20..500 V DC

13.9. Accessories

- 13.9.1. All auxiliary contacts shall employ the “wipe action” mechanism for the self cleaning of the contact tips.
- 13.9.2. Front mounted auxiliary contact blocks rated insulation voltage equal to 690V a.c or greater
- 13.9.3. Rated operation voltage 24...690VAC
- 13.9.4. Rated making capacity 10 x AC-15 rated operational current
- 13.9.5. Rated breaking capacity 10 x AC-15 rated operational current
- 13.9.6. Rated short time withstand current 100amps for 1sec:, 140 amps for 0.1 sec
- 13.9.7. Electrical durability, max electrical switching frequency 1200 cycles per hour or greater

13.10. Side Mount Auxiliary Contact Blocks shall have:

- 13.10.1. Rated insulation voltage equal to 690V a.c or greater
- 13.10.2. Rated operation voltage 24...690V a.c
- 13.10.3. Rated making capacity 10 x AC-15 rated operational current
- 13.10.4. Rated breaking capacity 10 x AC-15 rated operational current
- 13.10.5. Rated short time withstand current 100amps for 1sec:, 140 amps for 0.1 sec
- 13.10.6. Electrical durability, max electrical switching 1200 cycles per hour or greater.

14. LIGHTNING AND SURGE PROTECTION

14.1. Main Distribution Board

- 14.1.1. According to the IEC 62305 recommendations, electrical installations shall be protected against direct lightning and surge impulses with din rail Class 1/Type 1 (10/350µs) lightning current arresters.
- 14.1.2. SPD shall use a triggered spark gap technology to allow high lightning discharge current, unpluggable type to avoid ejection of the cartridge during the discharge of the current and non-blow out technology to avoid fire risks.
- 14.1.3. The SPD shall provide either common protection in TNC network or common and differential mode protection in TT and TNS network according to the IEC60364 recommendations.

14.1.4. Lightning arresters shall have the following technical specifications:

- 14.1.4.1. Class of test (IEC 61643-1) I
- 14.1.4.2. Lightning impulse current: $I_{imp}/pole (10/350\mu s) \geq 25kA$
- 14.1.4.3. Nominal voltage U_n 230 / 400V
- 14.1.4.4. Maximum continuous AC voltage U_c 255V
- 14.1.4.5. Follow current extinguishing capability $I_{fi} \geq 50kA$
- 14.1.4.6. Protection level U_p : 2.5kV
- 14.1.4.7. Max. back up fuse gG/gL: 125A
- 14.1.4.8. Visual state indicator: Yes

14.2. Sub-Main Distribution Board

- 14.2.1. According to the IEC 62305 recommendations to avoid oscillations and magnetic coupling phenomenon, sensible equipments shall be protected against indirect surges with din rail Class 2 / Type 2 (8/20 μs) surge arresters.
- 14.2.2. The SPD shall have a safety reserve system and shall be pluggable for preventive and easy maintenance. The SPD shall provide either common protection in TNC network or common and differential mode protection in TNS and TT network according to the IEC 60 364 recommendations.
- 14.2.3. In case of common and differential mode protection the SPD shall use an association of MOV and GDT to provide isolation to the ground and low protection level in all protection modes. The associated switching element
- 14.2.4. (MCB/Fuse) (to insure a safe end of life) shall be the same brand as the SPD to insure a good coordination.
- 14.2.5. Surge arresters technical specifications:
 - 14.2.5.1. Class of test (IEC 61643-1) II
 - 14.2.5.2. Max. discharge current: $I_{max}/pole (8/20\mu s) \geq 40kA$
 - 14.2.5.3. Nominal current I_n / pole $\geq 20kA$
 - 14.2.5.4. Nominal voltage U_n 230 / 400V
 - 14.2.5.5. Maximum continuous AC voltage U_c 275 / 255V
 - 14.2.5.6. Protection level U_p at 20kA $\leq 1.5 kV$

14.2.5.7. Protection level Up at 3kA (Class 3 test)

14.2.5.8. Pluggable :Yes

14.2.5.9. Visual status indicator: Yes

14.2.5.10. Safety reserve: Yes

14.2.5.11. Remote indicator :Yes

14.3. Data line / Telecom line

14.3.1. The selection of the surge protection device shall be according the IEC 62305 recommendations and therefore shall be a type C2 SPD.

14.3.2. The SPD shall be pluggable type for easy maintenance and shall provide the dialling tone returns when the cartridge is withdrawn in case of end of life.

14.3.3. The cartridges, whatever the nominal voltage, shall be adaptable onto different base. The base shall be chosen according to the connection of the wire: it can be RJ11, RJ45 or screw connection. The connections to the earth shall be either by a DIN rail contact or by a screw terminal.

14.3.4. The SPD dimension shall not exceed 12.5 mm wide to save space. The SPD shall use two level of protection: the first one by GDT, the second one by zener diode. These two levels shall be coordinated and shall provide common and differential mode protection.

14.3.5. Low current surge arresters technical specifications:

14.3.5.1. Class of test (IEC 61643-21): C2

14.3.5.2. Nominal voltage U_n According to the Max.voltage of signal

14.3.5.3. Maximum continuous AC voltage U_c (L-N / N-G): According to the Max. voltage of signal

14.3.5.4. Loading current: 140mA

14.3.5.5. Max. discharge current: $I_{max} / \text{line } (8/20\mu s) \geq 10kA$

14.3.5.6. C2 Nominal discharge current $I_n / \text{line } (8/20\mu s) \geq 5kA$

14.3.5.7. Protection level Up (L-L / L-G): According to the Max. voltage of signal

14.3.5.8. Pluggable: Yes

15. ANTI-CONDENSATION HEATERS

15.1. Anti-condensation 220 Volt heaters shall be provided for all compartments. A switch with thermostat shall be provided to control the heaters.

15.2. The wiring from the heater elements to terminals shall be high temperature insulation covered, a suitable compression type gland shall be fitted for the incoming 231V supply.

16. INDICATING INSTRUMENTS

- 16.1. A flush mounted, industrial grade, 96 mm square voltmeters and ammeter conforming to SABS 1299 shall be mounted near the centre top of the front panel and connected to measure the busbar voltage and current.
- 16.2. The calibrated scale length shall be a minimum of 70 mm. Means shall be provided for zero adjustment from the front without any dismantling of the indicating instrument.
- 16.3. A voltmeters selector switch with phase to phase, phase to neutral, and "off" position shall be provided.
- 16.4. An ammeter selector switch shall be provided with an "OFF" position.
- 16.5. Meters shall indicate by means of colours the relevant phase that it is metering.

17. CURRENT TRANSFORMERS

- 17.1. Current transformers shall comply with BS 3938.

18. MECHANICAL CABLE GLANDS

- 18.1. Cable glands shall be of the compression type, manufactured in brass and/or bronze, and suitable for termination of earth-continuity conductor type cables where applicable.
- 18.2. The gland body shall incorporate a knurled cone for clamping the armouring and an integrally cast earth lug, complete with earthing screw.
- 18.3. All metal portions of the gland shall be electroplated for corrosion resistance.
- 18.4. The glands shall be supplied complete with weatherproof neoprene shrouds.
- 18.5. Entries for multi-core PVC, PVC, wire armoured, PVC sheathed cables shall comprise cone grip mechanical type glands mounted on robust gland plates.
- 18.6. The board shall be supplied complete with all glands for all outgoing and incoming circuits as indicated on the drawing.

19. LIGHT SENSITIVE CONTROL UNIT

- 19.1. Light sensitive control units shall be supplied by others.
- 19.2. A suitably rated single pole over-riding switch, for over-riding the unit in 19.1, and moulded case circuit breaker shall be provided, when called for in the drawings or appendices hereto.
- 19.3. The switch and circuit breaker shall be wired to a suitable terminal strip, mounted within the distribution board, to facilitate connection of the light sensitive control unit when installed.

20. EARTHING

- 20.1. The components shall be effectively bonded to the main frame of the distribution board, which shall also be bonded to the main earth bar. Earthing shall comply with SANS-10142 code of practice for the wiring of premises.

21. CABLING AND WIRING

- 21.1. All cables and wires used shall be stranded, 600/1000 V grade and comply with SABS 150, except where special cables have been otherwise specified.

22. LABELS

- 22.1. Labels shall be provided comprising conspicuous engraved black lettering on white background secured with rivets or screws on or adjacent to the items concerned, and worded in English.
- 22.2. Labels of embossed tape or labels secured with adhesive are not acceptable.
- 22.3. All fuse-switches, circuit breakers, isolators, contactors, relays, etc., shall be clearly designated.
- 22.4. The terminals of all outgoing circuits shall be provided with labels to correspond with the labelling of the units on the panel of the distribution board.
- 22.5. All terminal connections shall be provided with durable tags or clips, on which shall be clearly and indelibly marked, the identifying code letters of each wire. Such code letters shall correspond to those used on the wiring diagram.

23. PAINTING

- 23.1. All surfaces of the distribution board shall be light orange to SABS 1091 colour No. B26. (Transnet orange; Pantone 165C / 021U; Coats 50/50; Vermilion MW52; RAL 2004 rein orange; Trichromatic 70% magenta, 90% yellow), unless otherwise specified.
- 23.2. All surfaces shall be cleaned according to the appropriate method described in SABS 064 for the particular surface to be cleaned, the contamination to be removed and the primer to be applied.
- 23.3. Blast cleaning of components shall be in accordance with clause 4.3 of SABS 064 to a degree of cleanliness of at least Sa2 for inland exposure components and Sa 1/2 for coastal exposure components. See Table 1 of SABS 064 for the appropriate profile.
- 23.4. Sheet metal that cannot be blast cleaned shall be cleaned by pickling according to clause 4.6 of SABS 064.
- 23.5. Components that shall be powder coated shall be cleaned and prepared by the surface conversion process according to clause 5 of SABS 064 to a medium-weight classification of table 2 of that specification.
- 23.6. Oil and accumulated dirt on steel components where no rusting is present shall be removed according to clause 3 of SABS 064.
- 23.7. The powder-coating process shall be in accordance with SANS 1242 - type 4 : Corrosion-resistant coatings for interior use and using the thermosetting type high gloss coating.
- 23.8. All specified coatings shall be applied according to the relevant specification and the manufacturer's instructions shall be followed.

- 23.9. Coatings shall not be applied under conditions that may be detrimental to the effectiveness of the coating or the appearance of the painted surface.
- 23.10. When examined visually the finished products shall have a uniform appearance as far as gloss is concerned and shall show no sign of damage. Damaged areas shall be repaired coat for coat to obtain the desired finish.

24. ADDITIONS AND MODIFICATIONS TO EXISTING DISTRIBUTION BOARDS

- 24.1. Where the contractor needs to make modifications or additions to existing distribution boards, the following minimum criteria shall be adhered to :
 - 24.1.1. Re-labelling and proving of existing circuits in accordance with security of existing terminations to be confirmed
 - 24.1.2. Isolation barriers, cover blanks to be in place where required
 - 24.1.3. Panel modification in terms of architraves, DB covers, and the closing of redundant openings to be undertaken by an accredited switchboard manufacturer.
 - 24.1.4. Wiring to be examined for integrity correct sizing and tidied and/or replaced and neaten as required.
 - 24.1.5. A certificate of compliance shall be issued for the full distribution board and not the additions only.

25. INSPECTION

- 25.1. Transnet reserves the right to carry out inspection of any items of equipment and work at any time during the manufacture at manufacturer's works and to be present at any tests.
- 25.2. A final inspection by Transnet before delivery to site is required.

26. TESTS

- 26.1. All prescribed tests as referred to in the standard specifications may be called for at the discretion of Transnet.
- 26.2. Transnet also reserves the right to carry out any check tests on the equipment.
- 26.3. Notwithstanding the successful completion of tests, the tenderer shall still be responsible for the efficient operation of the equipment.
- 26.4. The tenderer shall bear all costs for any tests, which shall be required.

27. GUARANTEE

- 27.1. The Contractor shall undertake to repair all faults due to bad workmanship and / or faulty materials and to replace all defective apparatus or materials during a period of twelve (12) calendar months, calculated from the date of delivery.
- 27.2. Any defects that may become apparent during the guarantee period shall be rectified to the

satisfaction of, and free of cost.

- 27.3. The Contractor shall undertake work on the rectification of any defects that may arise during the guarantee period within 7 days of his being notified by Transnet of such defects.
- 27.4. Should the Contractor fail to comply with the requirements stipulated above, Transnet will be entitled to undertake the necessary repair work or effect replacement of defective apparatus or materials, and the Contractor shall reimburse Transnet the total cost of such repair or replacements, including the labour costs incurred in replacing defective material.

28. SPARES

- 28.1. The tenderer shall state whether a complete range of spares is held in stock by their local representatives for subsequent purchase by Transnet as and when required.



WITNESSES

1.

.....
TENDERER

2.

.....
DATE

**Transnet Port Terminals
Design Services**

**SPECIFICATION FOR THE SUPPLY AND INSTALLATION OF MEDIUM VOLTAGE
AND LOW VOLTAGE ELECTRICAL CABLES**

REVISIONS		
REV	DATE	APPROVED
0	September 2022	

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APPENDICES

Appendix 1 - "Statement of Compliance"

1.1 SCOPE OF WORK

The scope of this specification covers the minimum requirements for the supply installation, testing and commissioning of medium and low voltage cables, instrumentation cables, cable racking, trenching, sleeves and earthing reticulation on Transnet sites on behalf of Transnet.

Contractors are required to familiarise themselves with all applicable Standards and Codes of Practice listed herein, and to ensure compliance in the execution of any work in terms of this document. Failure to comply may render the contractor liable for corrections at his own cost.

These Standards and Codes of Practice should be read in conjunction with all other Specifications and drawings as issued for a particular contract. Where discrepancies occur, these must be brought to the attention of Transnet in writing before commencement of work. In the event of any conflict between the contents of any documents forming part of a contract (as listed in the Master Index) and this document, the former shall prevail.

1.2 APPLICATION TO WORK ACTIVITIES

The Standards and Codes of Practice contained herein apply to all installations requiring Medium and Low voltage Electrical and Instrument Cabling, Racking, Trenching Sleeves and Earthing Reticulation and include amongst others the following standards:

- Supply of electrical and instrument cable trenches
- Supply, installation of electrical and instrument ladder racking reticulation
- Supply, installation of electrical and instrument dropper reticulation
- Supply, installation and termination of electrical and instrument cabling
- Cable Tagging and Core Identifying standards for electrical and instrument cabling
- Supply, installation of instrument and electrical earthing

2. STANDARDS AND REFERENCES

2.1 The requirements of the materials, design, layout, fabrication, assembly, erection, examination, inspection and testing of equipment and facilities on site shall be in accordance with the relevant sections of codes: -

- | | | | |
|----|-----------------------|---|---|
| a) | SANS 10142-1 | - | Code of Practice for the Wiring of Premises |
| b) | SABS 763 | - | Hot dip (galvanising) Zinc Coating. |
| c) | SABS 1507 | - | Electric cables with extruded solid dielectric Insulation for fixed installation. |
| d) | SANS 1574 | | |
| e) | ASME/ANSI.B31.3 | - | Chemical Plant and Petroleum Refinery piping |
| f) | ASME/ANSI.B31.4 | - | Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia and Alcohols. |
| g) | SABS 089:Part II-1965 | - | The Petroleum Industry Part II: Electrical Code |

- h) SABS 089 - Part II - The Handling, Storage and Distribution of Petroleum Products (Electrical Code)
- i) SABS 0198 - "The Selection, Handling and Installation of Electric Power Cables of rating not exceeding 33KV"
- j) API 2003 - Protection against ignitions arising out of static, Lighting and stray currents.
- k) SABS 03 - The Protection of structures against lightning.
- l) SABS 086 - The Installation and Maintenance of Electrical Equipment used in explosive atmospheres. Refer to Section 2 for Hazardous area classification.
- m) IEC 79-14 - Electrical Installations in Hazardous Areas
- n) Government, local authorities or other statutory bodies' regulations, laws, requirements or customs which are more stringent than those specified in this project specification.

2.2 The following standard specifications are to be used for reference purposes and need to be noted by Contractors in order to signify familiarity and compliance with the requirements. It is expected of Contractors that they be familiar with the applicable clauses and that these will be adhered to in the execution of any work in terms of this specification. Contractors will be required to confirm that they are able to meet these requirements.

- a) SABS 0108 : 1995 The Classification of hazardous locations and the selection of electrical apparatus for use in such locations
- b) The Occupational Health & Safety (OHS) Act No. 85 of 1993.
- c) SABS 0314 Flameproof Enclosures for Electrical Apparatus
- d) SABS 0549 Intrinsically Safe Electrical Apparatus
- e) API Manual of Petroleum Measurement Standards Chapters 4 to 12
IP Chapter 10 and Papers 2 and 3
- f) SABS 969 Enclosures for electrical apparatus
- g) BS 5490 Classification of degrees of protection provided by enclosures
- h) Safety Regulations for Contractors
- i) Technical Instruction No. 16 - Contractors Work Permit Procedures.
- j) VDE Standards

2.3 Where no specific rules, regulations, codes or requirements are contained in this specification nor covered by the above mentioned codes, the contractor shall, in consultation with Transnet, adhere to internationally accepted modern design and engineering practices in the Electrical and Petrochemical Industry.

3.0 SERVICE CONDITIONS

3.1 The cable shall be designed and rated for continuous operation under the following conditions :-

3.1.1 Ambient/Environment Conditions :

- 3.1.1.1 Altitude : Sea level.
- 3.1.1.2 Ambient temperature : -5° C to +45° C (daily average +35° C).
- 3.1.1.3 Relative humidity : As high as 96%
- 3.1.1.4 Lightning conditions : Severe, with a maximum lightning ground flash density 11 flashes per km² per annum.
- 3.1.1.5 Exposure conditions : Salt laden, industrial atmosphere as well as hazardous gases and dust atmosphere.
- 3.1.1.6 Electrolytic corrosion conditions prevail in all the areas owing to the proximity of direct current traction system and cathodic protection schemes.

3.1.2 Electrical Conditions:

- 3.1.2.1 The system of supply will be three phase, 3 wire, 50 Hertz, 11KV alternating current for medium voltage and three-phase, 4 wire, 50 Hz 400 Volts alternating current for low voltage.
- 3.1.2.2 The voltage may vary within the range of 95% to 105% of the nominal and all cable shall be suitably rated.

4.0 RESPONSIBILITY FOR WORK, SAFETY

- 4.1 The Contractor shall be responsible for all aspects associated with the provision of the cables. This includes items such as supply of testing cable to test the cables prior to commissioning, provision of site office and storage facilities.
- 4.2 Occupational Health and Safety Act (Act No 85 of 1993) must be complied with in all respects during the execution of this contract. The onus shall be on the contractor to ensure that staff under his control adheres to the provisions of the act at all times.

5.0 ELECTRICAL CABLE SPECIFICATION

This part of the specification covers the general specification of electrical cables to be used on Transnet sites on behalf of Transnet Port Terminals.

5.1 TYPES OF CABLE

5.1.1 CROSS-LINKED POLYETHYLENE (XLPE)

5.1.1.1 Cross-linked Polyethylene (XPPE)-insulated cables shall be individually screened, 3 core, stranded copper conductor, type A, cable manufactured in accordance with SABS.1339. The cable is to be supplied with an overall graphite coating to the outer PVC sheath.

5.1.1.2 The cable shall have embossed on the outer P.V.C. sheath next to the **S.A.B.S.** mark the following letters:

T/G/B

where T = TRANSNET STANDARD G = GRAPHITE COATED B = BEDDING TEST

Only the above mentioned cable shall be accepted.

5.1.1.3 The cable shall be capable of withstanding continuous operational temperatures up to 90° C.

5.1.1.4 Completed cable runs are subjected to the following tests :-

- a. As laid down in S.A.B.S. 1339 (Appendix "E" paragraph E-1.4)
- b. Anti-electrolysis insulation, applied between armouring and earth, tested at 10kV D.C. for one minute. Bedding shall be tested at 4kV D. C. for one minute.

All the above tests shall be carried out in the presence of the Engineer

5.1.2 PAPER INSULATED

5.1.2.1 Fully impregnated hygroscopic paper insulated, Helically lapped, insulated, Three core, Stranded copper conductors, Outer layer numbered for core identification, Seamless pure lead sheath, Covered with bitumen impregnated paper, Single steel wire armoured, extruded plastic sheathed, Operational voltage 6.35 to 11kV.

5.1.2.2 The cable shall have embossed on the outer P.V.C. sheath next to the **S.A.B.S.** mark the following letters:

T/G/B

Where: T = TRANSNET STANDARD
G = GRAPHITE COATED
B = BEDDING TEST

Only the above mentioned cable shall be accepted.

5.1.2.3 The cable is to be supplied with the P.V.C. outer sheath impregnated with a high quality graphite powder coating.

- 5.1.2.4 Type general purpose copper woven taped screened (Table 19) cable manufactured in accordance with S.A.B.S. 97 is required.
- 5.1.2.5 The cable shall be capable of withstanding continuous operational temperatures up to 70 / 80° C.
- 5.1.2.6 Completed cable runs are subjected to the following tests
- As laid down in S.A.B.S. 97
 - Anti-electrolysis insulation, applied between armouring and earth, tested at 10Kv D. C. for one minute. Bedding shall be tested at 4Kv D.C. for one minute.
All the above tests shall be carried out in the presence of the Engineer

5.1.3 LOW VOLTAGE PVC CABLE

- 5.1.3.1 Low voltage cables shall be PVC insulated cables with ECC, and shall comply with SABS.1507.
- 5.1.3.2 Earth continuity conductors shall be single core PVC insulated copper cables, and shall comply with SABS. 1507.
- 5.1.3.3 The cable shall be capable of withstanding continuous operational temperatures up to 70° C.
- 5.1.3.4 Electrical LV Power cabling installed in hazardous locations (flammable environment) running between Equipment located in the field, LV Panels or Motor Control Centre Panels, Valve Panels and Distribution Boards shall comprise of steel wire armoured, earth continuity conductor (ECC), PVC Insulated, four core cable, as follows:

Conductors.

Core Size : 4 core - Rated as per application (SABS 10142-1)
Stranded untinned copper, 7 strands minimum

PVC Insulated, Insulation Breakdown Voltage to withstand 2 kV 50Hz RMS for a 1 min period.

Insulation Colours: Colored RD-BL-YE/WT-BK (not numbered)

Lay Twist to be 40 – 60 mm (i.e. 16-25 twist per metre)

Inner Jacket

Extruded fire retardant black PVC with rip cord for jacket removal.
Minimum thickness 1.2mm

Outer Jacket

Overall weatherproof thermoplastic PVC jacket – fire retardant and UV resistant (Carbon black added).

Jacket thickness 1.5mm

Jacket to be totally bonded to a steel wire armoured sleeve.

Fire retardant, low halogen (20% Halogen, Blue Stripe) plastics to be used in non-ventilated areas. Fire retardant, high halogen (100% Halogen, Red Stripe) plastics may be used in ventilated areas. Fire retardant, no halogen (0% Halogen, White Stripe) plastics not required to be used.

- 5.1.3.5 Electrical Control cabling running between the Equipment located in the field, Control System Marshalling Cabinets, LV Panels and Incomer Breaker panels will comprise of steel wire armoured, PVC Insulated, multi-core cable, as follows :

Conductors.

Core Size : 7 core – 1.5 mm² (Valve Actuators)
12 core – 1.5 mm², 19 core – 1.5 mm² (Switchgear)

Stranded untinned copper, 7 strands minimum

PVC Insulated, Insulation Breakdown Voltage to withstand 2 kV 50Hz RMS for a 1 min
Insulation Colours: 7 core and less – colored BL-YE/WT-RD-GR-BK-BR-PR/OR
(Not numbered)

12 core and more – black, conductors to be numbered

Lay Twist to be 40 – 60 mm (i.e. 16-25 twist per metre)

Inner Jacket

Extruded fire retardant black PVC with ripcord for jacket removal.
Minimum thickness 1.2mm up to 7 core, 1.5mm for 12 and 19 core

Outer Jacket

Overall weatherproof thermoplastic PVC jacket – fire retardant and UV resistant.

Jacket thickness 1.5mm up to 7 core, 2.0mm for 12 and 19 core

Jacket to be totally bonded to a steel wire armoured sleeve.

Fire retardant, low halogen (20% Halogen, Blue Stripe) plastics to be used in non-ventilated areas. Fire retardant, high halogen (100% Halogen, Red Stripe) plastics may be used in ventilated areas. Fire retardant, no halogen (0% Halogen, White Stripe) plastics not required to be used.

- 5.1.3.6 Completed cable runs are subjected to the following tests as laid down in SANS 10142-1. Insulation resistance test between Phases, Phases and Neutral, Phases and ECC, Neutral and ECC.

5.1.4 INSTRUMENTATION CABLING

- 5.1.4.1 Instrument Cabling as defined within this and other Transnet Specifications includes the following types of cabling:
1. PVC SWA Multicore instrument cables running between Instrument Junction Boxes in the field and PLC Cabinets (IS and non-IS rated)
 2. PVC SWA Multicore instrument cables running between instruments in the field and PLC Cabinets (IS and non-IS rated)
 3. Dekabon armoured instrument cables running between Junction Boxes in the field and the instruments themselves (IS and non-IS rated)
- 5.1.4.2 All Instrumentation Cabling will comply in all respects to the specifications as contained in the Scope of Work attached to an Order. In the absence of cable specifications being detailed in the Scope of Work attached to an Order, the following cable specifications will apply.
- 5.1.4.3 Instrument cabling will be marshalled on Instrument racking and trenching as defined elsewhere within this specification.
- 5.1.4.4 Instrument multi-core cabling running between the Field Junction Boxes and the Control System Marshalling Cabinets will comprise of steel wire armoured, PVC Insulated, individual and overall screened multi-core cable. Note that Petronet has standardised on 1 pair, 2 pair, 8 pair and 16 pair cable – prior approval from Petronet will be required to deviate from these specifications.

Conductors

Core Size : 1.0 mm²

Stranded untinned copper, 7 strands minimum

PVC Insulated, Insulation Breakdown Voltage to withstand 2 kV 50Hz RMS for a 1 min.

Insulation Colours : Black and White

Multipair cores to be numbered (numeric on both conductors of the pairs)
Lay Twist to be 40 – 60 mm (i.e. 16-25 twist per metre)

Shield/Screen

Individual & overall screened – plasticised aluminium foil (100%) coverage
Stranded tinned copper drain wire 0.5 mm²

Inner Jacket

Extruded fire retardant black PVC with rip cord for jacket removal.
Minimum thickness 1.2mm up to 8 pair, 1.5 mm for 16 to 36 pair

Outer Jacket

Overall weatherproof thermoplastic PVC jacket – fire retardant and UV resistant (Carbon Black added).

Jacket thickness 1.5mm up to 8 pair, 2.0 mm for 16 to 36 pair.

Jacket to be totally bonded to a steel wire armoured sleeve.

Fire retardant, low halogen (20% Halogen, Blue Stripe) plastics to be used in non-ventilated areas. Fire retardant, high halogen (100% Halogen, Red Stripe) plastics may be used in ventilated areas. Fire retardant, no halogen (0% Halogen, White Stripe) plastics not required to be used.

IS Circuits: Jacket color light blue Non IS Circuits: Jacket color black.

- 5.1.4.5 Individual Instrument cabling running between the Field Junction Boxes and the individual field mounted Instruments will comprise of Dekabon armoured, PVC Insulated, individual and overall screened multi-core cable. Note that Petronet has standardised on 1, 2, 4 and Triad cable – prior approval from Petronet will be required to deviate from these specifications.

(Note that this specification only applies to cabling running on racks above the ground, all Instrument cables running in trenches will need to comply with the Instrument Multi-core Cable Specifications detailed above).

Conductors.

Core Size : 1.5 mm²

Stranded untinned copper, 7 strands minimum

PVC Insulated, Insulation Breakdown Voltage to withstand 2 kV 50Hz RMS for a 1 min

Insulation Colours : Black and White

Multipair cores to be numbered (alphanumeric on both conductors of the pairs)

Lay Twist to be 40 – 60 mm (i.e. 16-25 twist per metre)

Shield/Screen

Individual & overall screened – plasticised aluminium foil (100%) coverage

Stranded tinned copper drain wire 0.5 mm²

Inner Jacket

Extruded fire retardant black PVC with ripcord for jacket removal.

Minimum thickness 1.2mm

Outer Jacket

Overall weatherproof thermoplastic PVC jacket – fire retardant and UV resistant (Carbon black added).

Jacket thickness 1.5mm.

Jacket to be totally bonded to an inner waterproof aluminium sleeve, with a ripcord under the sleeve for jacket removal.

Fire retardant, low halogen (20% Halogen, Blue Stripe) plastics to be used in non-ventilated areas. Fire retardant, high halogen (100% Halogen, Red Stripe) plastics may be

used in ventilated areas. Fire retardant, no halogen (0% Halogen, White Stripe) plastics are not required to be used.

IS Circuits: Jacket color light blue Non IS Circuits: Jacket color black.

6.0 CABLE TERMINATIONS

6.1 Medium and Low Voltage cables shall be terminated to busbars and switchgear in the panels, distribution boards and kiosks using suitable cable lugs. Cable earth wires shall be brought into glands on gland plates. The insulation between cable armouring and cable earth wires shall be maintained at terminations. The separate earth conductor cable shall terminate to the main earth bar.

6.2 All materials necessary for installing all cable terminations shall be provided by the Contractor and the cost thereof shall be included in the tender price.

6.3 Glanding

6.3.1 All instrument and electrical cables will be glanded at both ends using the appropriate sized gland and will include associated adaptors, washers, ferrules, bands, etc. Provision for all glands, adaptors, washers, ferrules, bands etc. shall be included in the Tenderer's offers. All cable glands shall comply with the following specification, unless otherwise specified in the Scope of Work attached to an Order:

6.3.2 Dekabon Armoured Cabling (Instrumentation)
Increased Safety Ex"e" rated compression gland, IP68 rated, complete with UV resistant black shroud where required, in accordance with SABS 1031.

6.3.3 PVC SWA Cabling (Instrument & Electrical motors)
Increased Safety Ex"e" rated non-compression gland, IP68 rated, complete with SWA protection (CCG Corrosion Guard or similar), in accordance with SABS 1031.

6.3.4 PVC SWA Cabling (Ex"d" rated Valve Actuators)
Flameproof Ex"d" rated non-compression gland, IP68 rated, complete with SWA protection (CCG Corrosion Guard or similar), in accordance with SABS 808.

6.3.5 PVC SWA Cabling (Electrical and PLC Panels located within buildings rated as Safe Areas in terms of Hazardous Area Classifications SABS 0108)
Non-Flameproof rated, non-compression gland, IP68 rated, complete with UV resistant (black) shroud where required.

All glands will be waterproof and in the case of Hazardous Areas, correctly rated in terms of the Explosion Proof Classification of the equipment housings to which they are installed.

6.4 Termination

6.4.1 All cables will be terminated at field instrumentation, electrical equipment, field junction boxes, switchgear panels and control room marshalling cabinets according to

manufacturers specifications, instrument hook-up diagrams and control system specifications as provided/approved by Petronet.

6.4.1.1 Instrument Dekabon Cabling

- Outer Dekabon armouring shall be stripped back to the entry point into the associated termination/junction box. Protrusion of cable sheath/armouring into the termination/junction box (through the compression gland) shall be a minimum of 15mm and a maximum of 50mm.
- Cable pair inner aluminium foil shall be stripped back to the point at which the individual cores leave the PVC Trunking to be terminated onto the respective terminal rails. Ends of the inner foil shall be neatly taped/heat shrunk so as to prevent unravelling.
- Individual cable ends shall be sealed with the use of heat shrink tubing applied over the cable sheath/armouring at the point of entry into the termination/junction box/panel, in order to protect the cable and prevent the ingress of moisture.
- Both cable overall (drain wire) and individual screens shall be insulated with the use of appropriately sized green coloured sleeving, to prevent inadvertent contact with metallic surfaces.
- All individual cable cores (including spares) will be left long enough to accommodate 200mm slack, i.e. taking into account the routing via the trunking.
- Excess lengths of individual cable cores will be neatly folded and tied within the trunking provided. All spare cores shall be terminated into terminals so provided.
- Termination of individual cable cores in the termination strips will be such that all Control System related cabling will be terminated to one side of termination strips, whilst all field instrumentation/equipment cabling will be connected to the other side of termination strips.

In the case of Field Junction Boxes with dual terminal strips, multi-core cabling will be glanded in the centre of the gland plate and terminated into terminal rails provided, running from the centre PVC Trunking outwards. Individual Instrument cables will then be terminated into the terminal rails provided, running from the outermost PVC Trunking inwards.

In the case of Field Junction Boxes with single terminal strips, multi-core cabling will be glanded on the right side of the gland plate and terminated into terminal rails provided, running from the right hand side of the panel inwards. Individual Instrument cables will then be terminated into the terminal rails provided, running from the left hand side of the panel inwards.

- All cables connected to individual instruments/equipment will be provided with a single loop of minimum diameter of 150mm. All loops will be neatly strapped.

- All cores (including spares) will be terminated into allocated termination strips/rails in the respective Instrumentation, Termination and Field Junction Boxes

6.4.1.2 Instrument PVC SWA Multi-core Cabling

- Cable SWA armouring shall be stripped back to the entry point into the associated marshalling cabinet/junction box and shall be glanded in such a manner so as to ensure electrical continuity with the gland. When terminated in hazardous areas, cable armouring shall be bonded to the panel equi-potential bonding system via means of earthing rings provided as an integral part of the gland. Contact between the gland and the gland plate shall not be considered as sufficient for bonding purposes.
- Protrusion of cable inner PVC sheaths into the marshalling cabinet will be a minimum of 25mm and a maximum of 50mm.
- Cable inner aluminium foil shall be stripped back to the point at which the individual cores leave the PVC Trunking to be terminated onto the respective terminal rails. Ends of the inner foil shall be neatly taped/heat shrunk so as to prevent unravelling.
- Cable ends shall be sealed with the use of heat shrink tubing applied over the cable inner sheath at the point of entry into the termination/junction box/panel, in order to protect the cable and prevent the ingress of moisture.
- Both cable overall and individual screens shall be insulated with the use of appropriately sized green coloured sleeving, to prevent inadvertent contact.
- All individual cable cores (including spares) will be left long enough to accommodate 200mm slack, i.e. taking into account the routing via the trunking.
- Excess lengths of individual cable cores will be neatly folded and tied within the trunking provided. All spare cores shall be terminated into terminals so provided.
- Termination of individual cable cores in the termination strips will be such that all Control System related cabling will be terminated to one side of termination strips, whilst all field instrumentation/equipment cabling will be connected to the other side of termination strips.

In the case of Field Junction Boxes with dual terminal strips, multi-core cabling will be glanded in the centre of the gland plate and terminated into terminal rails provided, running from the centre PVC Trunking outwards. Individual Instrument cables will then be terminated into the terminal rails provided, running from the outermost PVC Trunking inwards.

In the case of Field Junction Boxes with single terminal strips, multi-core cabling will be glanded on the right side of the gland plate and terminated into terminal rails provided, running from the right hand side of the panel inwards. Individual Instrument cables will then be terminated into the terminal rails provided, running from the left hand side of the panel inwards.

- All cores (including spares) will be terminated into allocated termination strips/rails in the respective Instrumentation, Termination and Field Junction Boxes

6.4.1.3 **Electrical Power and Control Cabling (Low Voltage)**

- Cable SWA armouring shall be stripped back to the entry point into the associated equipment housing/termination box/panel and shall be glanded in such a manner so as to ensure electrical continuity with the gland. When terminated in hazardous areas, cable armouring shall be bonded to the panel equip-potential bonding system via means of earthing rings provided as an integral part of the gland. Contact between the gland and the gland plate shall not be considered as sufficient for bonding purposes.
- (Option 1) Cable inner PVC sheath shall be cut back at the point of entry into the equipment housing/termination box/panel, protrusion of the inner sheath into the associated switchgear cabinet/equipment housings shall be a minimum of 25mm and a maximum of 50mm. Heat shrink tubing shall be applied at the point of entry into the equipment housing/termination box/panel, in order to protect the cable and prevent the ingress of moisture.

(Option 2) Where cables are glanded into panels, cable inner PVC sheaths may be taken directly into trunking/marshalling arrangements, with the inner PVC sheaths cut back at point of termination. Note that in this instance, heat shrink need not be applied at the point of entry into the cabinet.
- All individual cable cores (including spares) will be left long enough to accommodate 200mm slack, i.e. taking into account the routing via the trunking.
- Excess lengths of individual cable cores will be neatly folded and tied within the trunking provided.
- Termination of individual cable cores in the termination strips will be such that all Starter related cabling will be terminated to one side of termination strips, whilst all field cabling will be connected to the other side of termination strips.
- All cables connected to individual instruments/equipment will be provided with a single loop of minimum diameter of 150mm. All loops will be neatly strapped.

6.5 **Cable Core Lugging**

All individual cable cores will be neatly terminated. Appropriately sized lugs will be attached to all core ends, using the appropriate crimping tool (not side cutters or ordinary pliers). The colouring of crimps will match the size of the associated cable core. All cable lugs utilised shall comply with the following specification, unless otherwise specified in the Scope of Work attached to an Order:

- Instrument Cables - bootlace ferrules

- Electrical Power Cables - spade lugs for compression terminals, ring lugs for screw terminals (pin lugs are not acceptable)
- Electrical Control Cables - spade lugs for compression terminals, ring lugs for screw terminals (pin lugs are not acceptable)

6.6 Cable Screening – Instrument Cabling

6.6.1 Individual Screens

6.6.1.1 All Individual Instrument Cable Pair Screens shall be terminated into terminals provided within the Instrument Termination Boxes as well as the Field Junction Boxes, and shall be grounded to a common insulated earth rail to be provided in each of the Control System Marshalling Cabinets, alongside the Termination Rails provided. Individual Screens shall be terminated in such a manner so as to be continuous from the Instrument/Instrument Termination Box to the Control System Marshalling Cabinets i.e. individual instrument cables as well as multi-pair cables.

6.6.1.2 Individual screen terminals shall be insulated in the Termination Boxes and Field Junction Boxes provided, thus ensuring that the individual cable pair screens are not grounded at instrument/equipment ends, i.e. to prevent common mode noise. Where Instrument Cables terminate directly into Instrument housings, individual screens shall be cut back and insulated within the Instrument housing using heat shrink sleeving, to prevent inadvertent contact with any conducting surfaces.

9.6.1.3 All individual screen earth rails in the Control System Marshalling Cabinets will be connected to the existing panel Instrument Earth bar via means of a 25mm insulated earth cable, which shall in turn be connected at two points via means of PVC Cu 70mm² insulated earth cables (Yellow/Green in colour), to the Instrument Earth bar located within the control room.

6.6.2 Overall Screens

6.6.2.1 All Instrument Cable Overall Screens/Drain wires shall be terminated to insulated earth bars provided within the Field Junction Boxes, and shall be earthed to a common electrical earth bar to be provided in each of the Control System Marshalling Cabinets. Overall Screens /Drain Wires shall be cut back and insulated within the Instrument Termination Boxes and Instrument housings (where applicable) to prevent inadvertent contact with the Termination Box housing, utilising heat shrink sleeving. Overall Screens shall be terminated in such a manner so as to be continuous from the Instrument Junction Box to the Control System Marshalling Cabinets.

6.6.2.2 The electrical earth bar shall be earthed to the Cabinet Frame, and connected at two points via means of PVC Cu 70mm² insulated earth cables (Yellow/Green in colour), to the Electrical Earth bar located within the control room.

6.7 Cable Screening – Electrical Cabling (Power & Control)

6.7.1 All electrical cable screens/drain wires (where applicable) will be grounded to a common electrical earth bar to be provided in each of the Control System Marshalling Cabinets/Switchgear Cubicles. The electrical earth bar shall be earthed to the Cabinet Frame,

and connected at two points via means of PVC Cu 70mm² insulated earth cables (Yellow/Green in colour), to the Electrical Earth bar located within the control and switchgear rooms.

7 ADDITIONAL REQUIREMENTS FOR EX IA/IB INSTALLATIONS

7.1 All I.S. (Ex ia/ib Intrinsically Safe) Installations shall be in strict compliance with IEC 79-14 Electrical Installations in Hazardous Areas, and in particular Chp 12 "Additional Requirements for type protection Intrinsic Safety", inclusive of the under mentioned items.

7.2 Clause 12.2.

In installations with Zone 1 and 2 classifications, IS apparatus and the intrinsically safe parts of associated apparatus shall comply to at least category "ib". Note that Petronet has standardised on category "ia" protection, and permission will need to be sought in writing for relaxation to "ib".

7.3 Cables – General

Where multi stranded cables are used in a hazardous area, the ends of the conductor shall be protected against separation of individual strands, by means of cable lugs.

Where cable screens are required, these shall be connected to earth at one point only, normally in the non-hazardous area. (Refer to Section 9.6 and 9.7 of this specification).

Cable armouring shall normally be bonded to the equi-potential bonding system via the cable entry devices (glands), at the end of each cable run. Where interposing Junction Boxes exist or other apparatus, the armouring shall be similarly bonded to the equi-potential bonding system at these points. In this regard and where earthing rings are provided as an integral part of the gland, use of these is recommended in serving this function. Contact between the gland and the gland plate shall not be considered as sufficient for bonding purposes.

Conductors of intrinsically safe circuits and non-intrinsically safe circuits shall not be carried in the same cable.

Conductors of intrinsically safe circuits and non-intrinsically safe circuits in the same bundle or duct shall be separated by an intermediate layer of insulated material or by an earthed metal partition. No segregation is required if metal sheaths or screens are used for intrinsically safe or non-intrinsically safe circuits. Note that Petronet has standardised on physical separation regardless of whether the cabling is screened or not, and permission will need to be sought in writing for relaxation.

7.4 Cables – Marking

Un-armoured Cables containing intrinsically safe circuits shall be marked. If outer sheaths are marked by color, the color used shall be light blue. Note that whilst armoured cabling

is not required to be marked in terms of IEC79-14, Petronet has standardised on the principle of marking all cable outer sheaths carrying intrinsically safe circuits by color (light blue), whether armoured or not, and that this will need to be complied with in all instances.

7.5 Cable Insulation Tests

All cables carrying intrinsically safe circuits shall be proven to be capable of withstanding an RMS AC test voltage of twice the normal voltage of the intrinsically safe circuit with a minimum of 500 V between the armouring and screens joined together and the individual conductors. Tests shall be conducted in accordance with manufacturers specifications. Where no such method is available, tests shall be carried out as follows:

- Voltage shall be an ac voltage of sinusoidal waveform at a frequency of between 48 and 62 Hertz
- Voltage shall be derived from a transformer of at least 500 VA output
- Voltage shall be increased steadily to the specified value in a period of not less than 10 seconds and maintained for a period of not less than 60 seconds.

7.6 Cable Termination

All terminals shall be reliably separated from non-intrinsically safe circuits (for example by a separating panel or gap of at least 50mm). Terminals of intrinsically safe circuits shall be marked as such. Petronet has standardised on marking by color - the specified color being light blue. All terminals, plugs and sockets shall satisfy the requirements of IEC79-11 Sections 6.3.1 and 6.3.2 respectively (6mm creepage and clearance rules 4mm to earth).

7.7 Zone 1 Installations - Surge Protection

All equipment installed in Zone 0 areas and exposed to hazardous potential differences (e.g. lightning surges), shall have a surge protection device installed between each non-earth bonded conductor/core and the local earthed structure as near as is practically possible. The surge protection device shall be capable of diverting a minimum peak discharge current of 10kA (8/20 microsecond impulse according to IEC60-1, 10 operations). The bonding connection between the protection device and the structure shall have a minimum cross sectional area equivalent to 4 mm² copper.

Note that Petronet has extended these requirements to include all analogue transmitters installed in the field, whether in hazardous areas or not, and will need to be complied with in all instances.

8. CABLE JOINTS

8.1 MEDIUM VOLTAGE CABLE JOINTS

- 8.1.1 The contractor shall give the Engineer advance notice of his intention to do jointing of medium voltage cables to enable arrangements to be made for measuring and inspection.

- 8.1.2 The complete cable installation, including all joints shall be fully insulated from earth throughout.

8.2 LOW VOLTAGE CABLE JOINTS

- 8.2.1 The low voltage cable through joints shall be of the epoxy resin filled type. The low voltage joints shall be constructed according to manufacturer's instructions.

9. CABLE ROUTES

- 9.1 All low voltage cables and associated earth continuity conductors shall be installed as shown in drawings PPD: BDD059C-E-01, sheet 1 of 3.

10. SURVEY OF ROUTE

- 10.1 The drawings showing the proposed cable route listed in the "Schedule of Drawings" shall not be taken to show the precise final cable route. The Contractor shall within 30 days after being awarded the Contract carry out a final route survey, which shall include digging test holes, and using the routes shown on the drawings as a general guide, to determine a suitable route.
- 10.2 The Contractor shall submit details of the cable routes selected in final survey to the Engineer for approval. No excavation of any section of the cable route shall commence until the Engineer has authorised the commencement of work on the section concerned.
- 10.2.1 After completion of all cable laying and jointing and before commissioning of any cable the Contractor shall carry out a final "as laid" survey of the cable routes and hand to the Engineer cable route plans. The cable route plans shall include the following information:
- (i) Overall length of each cable.
 - (ii) Centre to centre distances between all joints and between final joints and terminations of each cable including auxiliary cables.
 - (iii) Accurate indications of the position of each cable joint and cable marker preferably by triangulation, i.e. indicating two distances to each joint or marker from structures not likely to be moved such as permanent buildings, bridge piers, etc.
 - (iv) Tables showing all information regarding each high-voltage cable necessary for cable fault location by the reflected pulse method.
 - (v) Soil thermal resistivity and temperature values as determined on final survey shown on the plans at the positions where they were determined.

11. EXCAVATIONS

- 11.1 Excavations shall be carried out in strict compliance with the specification for works on, over, under or adjacent to a railway line No. E.7 (July 1998) (Part 1) that forms part of the tender documents.
- 11.2 The procedure and the order of doing the work shall be subject to the approval of the Engineer.
- 11.3 The Contractor shall, before trenching commences, familiarise himself with the route and conditions on site. The Contractor shall be advised of any known buried services such as cables, pipes, etc., in the vicinity of the cable route. However, the Contractor shall at all times exercise care to ensure that any uncharted services are not damaged.
- 11.4 Power driven mechanical excavators may be used for trenching operations provided that they are not used in close proximity to other cables, water mains, or any other plant liable to be damaged by the use of such plant. Their use along sections of the route shall in each case be subject to approval of the Engineer.
- 11.5 Trenches shall be as straight as possible and each trench shall be excavated to the dimensions indicated in this specification. The Contractor shall provide shuttering for use in places where danger exists should the sides of the trench collapse. The strength of such shuttering must be adequate especially where railway tracks in proximity are concerned and the shuttering must be braced across the trench. Provision of shuttering will be paid for per metre length of shuttered trench.
- 11.6 The bottom of each cable trench shall be as firm as conditions permit and be of smooth contour.
- 11.7 In sections where the soil or water level conditions indicate that the cable trench will endanger rail tracks or any nearby structures, the Contractor must restrict the length of continuous open trench to a distance to be indicated by the Engineer.
- 11.8 The Contractor shall take all reasonable steps to ascertain if the cables will be liable to be subjected to chemical or other damage or electrolysis action and shall submit his recommendations for approval, of any precautionary measures to be taken, in such instances.
- 11.9 The material excavated from each trench shall be placed adjacent to the trench in such a manner as to prevent nuisance or damage to adjacent ditches, railway lines, drains, gateways and other properties and shall be stacked so as to avoid undue interference with traffic. Where, owing to certain considerations, this is not permissible, the excavated materials shall be removed from the site and be returned for refilling the trench on completion of laying.
- 11.10 Surplus material shall be disposed of by the Contractor at his cost. Where the possibility exists that railway line ballast may be fouled by excavated material or material brought on site, the Contractor shall take precautions as directed by the Engineer.
- 11.11 The Contractor shall not trench beneath any railway line without departmental supervision. Should the contractor wish to carry out such work the Engineer must be

advised not less than 14 working days before hand to arrange for the necessary supervision. The cost of such supervision shall not be charged to the Contractor.

- 11.12 Prior to laying the cable, the trench shall be inspected thoroughly by the Engineer or his authorised representative to ensure that it is free from all objects likely to damage the cable either during or after cable laying operations. Cable laying shall not proceed unless the Engineer or his authorised representative is satisfied with the condition of the trench.
- 11.13 When trenching, the Contractor shall take all precautions necessary to prevent damage to any other cables, water mains, roads, pavements, drainage systems, building or any structure etc. Should any of the above be damaged by the Contractor's staff, it shall be reported immediately to the Engineer, who shall arrange for the necessary repairs. The Contractor is responsible for the cost of repairs.
- 11.14 Should it be necessary for any reason to remove accumulated water or other liquid from the trench, this shall be done by the Contractor at his expense and should be taken into account at the time of tendering. The Contractor is to provide all pumps and appliances required to carry out this operation. Water or any other liquid removed shall be disposed of without creating any nuisance or hazard.
- 14.15 Trenching procedure shall be programmed in advance with the Engineer and the programme approved by the Engineer shall not be departed from save with his consent.
- 11.16 Programming of trenching shall be on the basis of the Contractor giving the Engineer an assurance that any length of trench opened on a particular day will be back-filled and compacted to an adequately firm surface on the same day where possible. If it is anticipated that trenching will remain open for longer periods, the Contractor shall first obtain the approval of the Engineer. No new sections of trenching shall commence if previously uncompleted sections still exist. Under no circumstances may sections greater than 300 metres be opened.

Where such approval is given, the onus shall be on the Contractor to safeguard the works to the satisfaction of the Engineer during the extended period such trenches remain open. Where cables have already been laid, but not covered, steps shall be taken by the Contractor to protect cables and the personnel around.
- 11.17 The near side of any cable trench shall preferably not be less than 2500mm from any adjacent railway line. Approval from the Engineer will be required if the above clearances cannot be achieved. The conditions of clause 13.1 shall apply.
- 11.18 The removal of obstructions along the cable routes shall be subject to the approval of the Engineer and shall be paid for at pre-agreed rates.
- 11.19 The area traversed by the cable routes has been used for many years. It is inevitable that there will be uncharted services. On encountering any such service the Contractor shall promptly advise the Engineer who shall direct what action shall be taken.
- 11.20 Transnet reserves the right to alter any cable route or portion thereof in advance of cable laying. Payment in respect of any additional or wasted work involved shall be at scheduled rates.

11.21 Any existing electrical cables obstructing the cable routes shall be removed or deviated as appropriate by the Contractor. The work shall be paid for at scheduled rates.

11.22 The bottom of the trench shall be filled with 200mm of suitable soil sifted through a 6mm mesh and levelled off. Only soil with a satisfactory thermal resistivity may be used for this purpose and ash which occurs on the route shall not be used. Where no suitable soil is available in proximity, imported fill shall be arranged. The manufacturer's assurance is required that the current rating of cables is not reduced by the ground conditions.

12.0 TRENCH/EXCAVATION SPECIFICATION

Separate Trenches shall be supplied to cater for the following cable types:

12.1 ELECTRICAL HV/MV TRENCHES

Trench Dimensions	:	1200 mm deep by 500 mm wide (two cables), add 300mm width for additional cables
River Sand Bedding	:	PVC Piping – 75 mm above pipe, 50mm under pipe
	:	Direct Burial – 100 mm
Identification	:	PVC or Concrete Interlocking Tiles at a depth of 350mm
Cable Markers	:	Concrete with engraved anodised aluminium ID plates cable Marker Colour – Brilliant Green
Cabling	:	Medium and High Voltage Power Cabling > 400 VAC
Separation	:	400 mm (LV cabling), 800mm (Instrument cabling)

12.2 ELECTRICAL LV TRENCHES

Trench Dimensions	:	800 mm deep by 300 mm wide
River Sand Bedding	:	PVC Piping – 75 mm above pipe, 50mm under pipe
	:	Direct Burial – 100 mm
Identification	:	Polythene Marker Tape (150mm wide, yellow and marked with the words "Electric Cable" at a depth of 350mm
Cable Markers	:	Concrete with engraved anodised aluminium ID plates. cable Marker Colour – Black
Cabling	:	Low Voltage Power Cabling 400 VAC/230 VAC (e.g. Actuators, Aux Motors, DB circuits)
	:	Control Cabling (e.g. MV Breaker Inter-tripping cables, Actuator control signals, Aux Motor local stop/start panels etc.)

Separation : 400 mm (HV/MV cabling), 800mm (Instrument cabling)

12.3 INSTRUMENT TRENCHES

Trench Dimensions : 500 mm deep by 300 mm wide

River Sand Bedding : PVC Piping – 75 mm above pipe, 50mm under pipe

: Direct Burial – 100 mm

Identification : PVC Tiles / Polythene Marker Tape (150mm wide, yellow and marked with the words “Electric Cable/Elektriese Kabel”) at a depth of 350mm

Cable Markers : Concrete with engraved anodised aluminium ID plates
cable Marker Colour – Light Blue

Cabling : Instrument Multi-core & Single Pair Cabling (IS and non IS)

Separation : 800mm (HV/MV/LV Electrical cabling)

13. CABLE LAYING

13.1 CABLES BURIED UNDERGROUND.

13.1.1 HV, MV, LV AND Instrument cables shall be spaced as indicated in Table 1 below. Pilot cables shall be laid beside the associated power cable. Cables crossing beneath railway tracks, roads, etc., shall be enclosed in 150mm diameter uPVC pipes. Where more than one length of pipe is required for a crossing, uPVC couplings with PVC glue, shall be used to prevent water from penetrating the joint. Cable pipes must maintain or exceed the specified cable spacing.

Table 1

CABLE	MINIMUM SPACING BETWEEN CABLES
MV To MV	300mm
MV To LV	400mm
LV TO LV	300mm
MV To instrumentation	800mm
LV To instrumentation	800mm

13.1.2 All pipes laid beneath the railway lines, roads, pavements shall be laid with their tops not less than 900mm below the formation level, and shall where possible extend at least 2000mm on either side of the centre of the outer most line. Where there is more than one

line crossed and in the case of roads and pavements at least 900mm on either side of the road and 1 or pavement. All pipes shall be graded for water drainage ; the required grade is 75mm in 30m.

- 13.1.3 All Low voltage cables shall be laid at a depth of 750mm. All cable depth measurements shall be made to the top of the cable when laid direct in the ground, otherwise to the top of the duct concerned.
- 13.1.4 Except where ducts, tunnels or pipes are provided and unless instructed to the contrary by the Engineer, the Contractor shall lay the cables direct in the ground.
- 13.15 Rollers may be used during the laying of cables, but they shall have no sharp projecting parts liable to damage the cables. They shall be carefully placed in the trench or duct in such a manner that they will not readily capsize during cable laying operations.
- 13.1.6 The Contractor shall ensure that all cable is laid in the same direction. No crossing of conductors inside through joints or end boxes will be permitted.
- 13.1.7 Where cables have to be drawn around corners, skid plates shall be used for this purpose and these plates shall be well lubricated. The skid plates shall be securely fixed between rollers and shall be constantly examined during the cable laying operations.
- 13.1.8 Cable shall be visually inspected for damage during and after laying.
- 13.1.9 Cable pulling and laying shall preferably be done manually whenever possible. Mechanical means such as winches and the like may only be used subject to the approval of the Engineer. No cable shall be subjected to a tension exceeding that stipulated by the cable manufacturer.
- 13.1.10 In the event of mechanical means of cable pulling being approved, the Contractor shall establish means of communication between the operator of the winch or other pulling device and the persons tending the drum from which the cable is being run off, to the satisfaction of the Engineer.
- 13.1.11 The contractor shall be wholly responsible for making his own arrangements for transporting all materials to and from and on the working sites.
- 13.1.12 At locations where cables run under concrete bridges, the cables shall be supported on suitable brackets secured on the side of concrete wall. These brackets shall be spaced a maximum of 500mm apart. Brackets and fixing material shall be of robust design and shall meet with Engineer's approval. Drawing of proposed ' bracket shall accompany tender. Brackets shall be galvanised in accordance with SABS 763, and thereafter painted to the satisfaction of the Engineer.

14.0 CABLES LAID IN DUCTS, CABLE TRAYS AND LADDERS

- 14.1.1 Cables in stalled in ducts shall be supported by cable ladder installed along the walls of the ducts or installed on the duct floor. If the cable ladder is installed on the duct floor, it shall be supported at +/- 50mm from the duct floor.

14.1.2 Cables installed in perforated cable trays and cable ladder shall be secured by means of heavy duty cable ties, cable clamps, etc.

14.1.3 Where medium and low voltage cables share the same wire-ways a reasonable space shall be left between the medium voltage and low voltage cables.

15.0 CABLE SLEEVING

15.1 All areas subject to vehicle traffic, rail crossings and paved areas shall be sleeved.

15.2 Sleeves shall be designed and installed so as to ensure 25 % spare capacity.

15.3 Sleeve Specifications

Material : PVC or PHD Polyethylene

Dimensions : 100 mm OD min

Standards : DIN EN50086-2, BS EN50086-2-4:1994

16.0 DRAW BOXES

16.1 Where cable sleeves are utilised and to facilitate the hauling of cables, brick draw boxes shall be provided at all trench junctions, complete with concrete slab, as detailed below:

Draw Box Dimensions (min) : Internal 450 mm square, 3 courses of stock brick deep.

Base & Top : Concrete 50mm thick

17. COVERING, BACKFILLING AND REINSTATEMENT

17.1 Filling in of trenches shall not be commenced until the Engineer or his authorised representative has inspected and approved the cables in situ in the section of trench concerned. Such inspection shall not be unreasonably delayed.

17.2 Where, in the opinion of the Engineer, the soil on site is unsuitable for riddling or backfilling, the Contractor shall arrange for the importation of approved material. A 75mm thick layer of soil sifted through a 6mm mesh shall be laid above the high-tension cables and consolidated by hand ramming only. The conditions of clause 13.20 apply in this case also.

17.3 All excavations made (whether for the purpose of cable laying, joint bays or trial holes) shall be back-filled in 150mm layers, the earth in each layer being well rammed and consolidated and sufficient allowance being made for settlement. The back-filling shall be completed to the satisfaction of the Engineer.

15.4 The refilled trench shall be maintained by the Contractor at his expense in a thoroughly safe condition for the duration of the contract. In the case of tarmac surfaces, until such time as this surface has been restored.

- 17.5 All backfilling of road crossings shall be mechanically rammed by means of approved type of mechanical power driven rammer.
- 17.6 The replacement of made up surfaces, such as roads, pavements, tarred aprons, verandas, floors, etc., necessitated by trenching or other works shall be arranged by the contractor at his cost. The price thereof shall be included in the tender price.
- 17.7 Concrete cable protection slabs to Drawing No. PPD-PA-10 shall be laid on top of the 75mm layer of soil referred to in clause 15.2 before the trenches are backfilled. Cable protection slabs shall be laid close butted, convex end to concave end, directly above each cable throughout the underground portion except where otherwise protected such as by. pipes, etc. Three coloured slabs to drawing PPD-PA-9 shall be provided to give the indication of the route in the case of a change of direction. Only unbroken cable protection slabs, and those actually laid will be paid for.
- 17.8 When back filling of cable trench has reached a level, after consolidation, approximately 150mm below the normal level of the surface of the surrounding area the Contractor shall lay a continuous plastic cable warning tape directly above each cable for the full length of the cable trench before completing the backfilling.
- 17.9 Concrete cable markers to Drawing No. PPD-PA-12 shall be provided and installed by the Contractor at his cost. The price thereof shall be included in the tender price. Initial cable markers shall be installed as close as possible to cable terminations, thereafter at approximately 60m intervals and at cable joints, also on either side of crossings of oil pipelines and at ends of underground cable pipes.
- 17.10 Changes of direction and joints in cable runs shall be indicated by installing two markers at such positions in the manner shown on Drawing No. PPD-PA-12. The markers shall be coloured orange with oxide mixed into the concrete. Cable markers shall project approximately 25mm above normal ground level except where projecting cable markers could be a hazard to pedestrians such as in shunting yards, walkways, pavements, etc. In such cases the cable markers shall be flush with the surface.
- 17.11 If more than one cable is laid in one trench, only one row of cable markers shall be placed on the centre line of the trench to define the general route of the cables.

18. CABLE TESTING AND TEST DATA

- 18.1 All tests on completed cables shall be carried out in the presence of a representative of Transnet Projects. Not less than 14 working days notice of the Contractor's intention to carry out such tests shall be given to the Engineer.
- 18.2 On completion of the jointing and termination of cables, the 11kV cables are to be subjected to the test laid down in paragraph E-1.4 of Appendix E of S.A.B.S.1339 and the low voltage type cables to be tested for insulation and loop resistance.
- 18.3 The anti-electrolysis insulation of each 11kV cable run complete, shall withstand for 1 minute, a test voltage of 10kV D.C., applied from the cable armouring to earth. The bedding shall withstand a test voltage of 4kV D.C. between screen and armouring for 1 minute.

- 18.4 As a graphite coating is required to be applied to the PVC oversheath (in accordance with British Standard), a D.C. voltage test will be carried out on all cables after installation. The D.C. voltage test can only be carried out on the installed system if the joints are suitably insulated from earth, otherwise the D.C. voltage test should be carried out prior to jointing.
- 18.5 The contractor shall obtain written confirmation from the manufacture of all cables, joints and terminations -etc. that the test that Transnet Projects requires the contractor to carry out in terms of this specification meets with the manufacturers approval. Such confirmation must be obtained prior to any, tests commencing.
- 18.6 The electrical Contractor shall on completion of the tests submit three copies of all test results. The costs of all the tests mentioned above shall be borne by the Contractor.
- 18.7 In addition the cable manufacturer shall provide test sheets of each manufactured cable drum length together with the cable drum numbers which shows all the test results.
- 18.8 Transnet Projects reserves the right to carry out any further tests deemed necessary itself, using either the Contractor's instruments and cable, or its own, or both. The costs of such tests shall not be charged to the Contract.

18.9 Cable Testing – Low Voltage Cables (< 1 kV)

Each individual core of all cables (including spares) will be checked for continuity and insulation breakdown, in accordance with SABS 150 (PVC):

- Insulation Resistance shall be measured with a 1000V Megger and the readings tabulated and certified.
- Similarly, earth continuity resistance shall be measured and recorded.
- All cables will be checked for correct termination.

18.10 Cable Testing – Medium Voltage Cables (< 22 kV)

Each section of laid and jointed cable shall be tested, in accordance with SABS 97 (PILC/SWA):

- Insulation Resistance shall be measured with a 1000V Megger, followed by the relevant pressure test. Readings shall be tabulated and certified.
- AC test voltage must be applied to each phase in turn for one minute, or alternatively the DC test voltage for fifteen minutes. Leakage current shall be measured and recorded for each test.
- All cables will be checked for correct termination.

19. MEASUREMENTS OF CABLES

- 19.1 All measurements for payment purposes shall be made jointly by representatives of the Contractor and Transnet Projects and shall be agreed and approved by both parties.

- 19.2 Measurements of cable length shall be made from centre to centre of cable joints and to the cable ends and will exclude any wastage due to jointing and terminating.
- 19.3 Measurements of trench width and depth shall be made to the nearest 50mm and shall not take into account subsidence or unnecessarily large excavations. No allowance shall be made where trenches have to be widened at the bottom to accommodate cables, cable joints and protection slabs

APPENDIX 1

STATEMENT OF COMPLIANCE (TO BE COMPLETED BY TENDERER)

This tender complies with specification TPD: 003-CABLESPEC in all respects.

SIGNATURE : _____ DATE : _____

This tender complies generally with specification TPD: 003-CABLESPEC but differs from it on the following points.

SIGNATURE : _____ DATE : _____

Transnet Port Terminals

**SPECIFICATION FOR EARTHING AND THE PROTECTION OF BUILDINGS AND
STRUCTURES AGAINST LIGHTNING.**

REVISIONS		
REV	DATE	APPROVED
0	September 2022	

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1.0 SCOPE

- 1.1 This specification covers Transnet Projects requirements with respect to the protection of buildings and structures against lightning and the requirements for air terminal systems, down conductors and earthing of installation of this specification
- 1.2 This specification applies to assessing, testing and upgrading of existing lightning protection systems and earthing on existing buildings and structures.

2.0 STANDARDS, SPECIFICATIONS AND DRAWINGS

- 2.1 The following publications (latest editions and amendments) are referred to herein.

South Africa Bureau of Standards (South African National Standards)

SANS 10313	-	The protection of structures against lightning.
SABS IEC 61643	-	Surge protective devices connected to low voltage power distribution systems.
SANS IEC 60950	-	Information technology equipment – safety.
SANS 10142	-	Code of practice for the wiring of premises
BS 6651	-	Code of practice for protection of structures against lightning.
BS 7430	-	Code of Practice for Earthing.
SABS 064	-	Code of Practice for the Preparation of Steel Surfaces for Coating.
SABS 086	-	Installation and Maintenance of Electrical Equipment used in Explosive Atmospheres.
SANS 10108	-	The Classification of Hazardous Locations and the Selection of Electrical Apparatus for use in such Locations.
SABS 0199	-	The design and Installation of Earth Electrodes SPECIFICATIONS
SABS 763	-	Hot Dip Zinc (galvanised) Coatings
SABS 1091	-	National Colour Standards for Paints.
SABS 1507	-	Electric Cables with Extruded Solid Dielectric Installation for Fixed Installations
SABS IEC 742	-	Isolating Transformers and Safety Isolating Transformers.

OCCUPATIONAL HEALTH AND SAFETY ACT OF 1993 (ACT 85 OF 1993).

3.0 SERVICE CONDITIONS

- 3.1 The earthing shall be designed, rated and installed for continuous operation under the following conditions :-

3.1.1 Ambient/Environment Conditions :

- 3.1.1.1 Altitude : Sea level.
- 3.1.1.2 Ambient temperature : -5° C to +45° C (daily average +35° C).
- 3.1.1.3 Relative humidity : As high as 96%
- 3.1.1.4 Lightning conditions : Severe, with a maximum lightning ground flash density 11 flashes per km² per annum.
- 3.1.1.5 Exposure conditions : Salt laden, industrial atmosphere as well as hazardous gases and dust atmosphere.
- 3.1.1.6 Electrolytic corrosion conditions prevail in all the areas owing to the proximity of direct current traction system and cathodic protection schemes.

4.0 EQUIPMENT AND MATERIALS

- 4.1 Equipment and materials to be used, shall be of high quality, and shall comply with all relevant specifications, codes as mentioned in this specification as well as the Occupational Health and Safety Act of 1993(Act 85 of 1993).
- 4.2 Where equipment and material does not comply with the relevant specifications it shall be submitted to Transnet Project's Engineer for approval.
- 4.3 All materials used for the lightning protection system shall withstand the electric and electromagnetic effects of lightning current and predictable stresses without being damaged.
- 4.4 Materials and sizes shall be chosen bearing in mind the possibility of corrosion of either the lightning protection system or the structure to be protected.
- 4.5 Components of the lightning protection system may be manufactured from the materials listed in Table 8 of SANS 10313, provided they have sufficient electrical conductivity and corrosion resistance.

5.0 LIGHTNING PROTECTION REQUIREMENTS

- 5.1 The contractor shall carry out the installation in accordance with SANS 10313: Code of Practice for the protection of structures against lightning and the requirements of this specification.
- 5.2 Where the local supply authority requirements differ from those specified herein Transnet Projects's Electrical Engineer shall be approached for a decision.
- 5.3 All equipment and material shall comply with the relevant National or International standard specification. Where equipment does not comply it shall be submitted to the Transnet Projects Electrical Engineer for approval.

- 5.4 The system of protection will be finials/air terminals, down conductors and earth spike or roof conductors, down conductors and earth spike.
- 5.5 The earth resistance for separate earth electrodes if down conductors are not connected to a ring earth shall be not exceed the following;
- Rt = 10 Ohm for category A structures
Rt = 15 Ohm for category B and C structures.

6.0 DESIGN OF LIGHTNING PROTECTION

The designer of lightning protection shall take into consideration the following principles and requirements during the design of the system.

6.1 GENERAL PRINCIPLES

- 6.1.1 Basic Principles of Lightning Protection:** the requirements of the basic principles of lightning protection as detailed in SABS 0313 shall be taken into consideration to ensure proper protection of structures against lightning.
- 6.1.2 Evaluation of Risk:** The risk of lightning stroke shall be evaluated as described in SANS 10313.
- 6.1.3 Effective height of a structure (He):** The effective height of the highest point shall be determined by considering the average height of building, trees and structures and land profile of the surrounding area.
- 6.1.4 Ground flash density (Ng):** The ground flash density (Ng) for general buildings, structures and installations shall be estimated from the average ground flash density given in table 1 of SANS 10313 as a general guide. For important structures and installations the value of the ground flash density shall be determined on the basis of at least 5 lightning years, or from existing records
- 6.1.5 Number of flashes to structure per 100 year (Nt):** The number of flashes to structures per 100 year shall be determined taking into consideration type and the height of the structure as described in SANS 10313.

6.2 HAZARD CATEGORY

- 6.2.1 Buildings and structures where lightning protection system will be installed shall be categorised prior to the installation. Hazard categories are based on the nature of the building, its content and occupancy.
- 6.2.2 The Hazard categories are classified as follows in SABS 03 -1985 Code of practice for the protection of buildings structures against lightning.

Category A: High Hazard

Category A1: Structures and areas containing explosives of Category Z.

Category A2: Structures and areas classified as

- a) Division 0 areas in accordance with SABS089: Part II, or
- b) Class I, Division 0 locations in accordance with SABS 0108.

Category A3: Strategic control and communications installations such as airport towers

Category A4: Thatched-roof structures of historic values or that contain irreplaceable works of art or like values.

Category B: Medium Hazard

Category B1: Structures and areas containing explosives of Category X or Y.

Category B2: Structures and areas classified as

- a) Division 1 or 2 areas in accordance with SABS089, Part II, or
- b) Class I, Division 1 or 2 locations, or Class II, Division 1 location in accordance with SABS 0108.

Category B3: All structures not included in Category A and to which the public normally has access or which are of historic value.

Category B4: Large temporary structures used for exhibitions and entertainment.

Category B5: Thatched roof dwelling houses.

Category B6: Communications towers, water towers and reservoirs.

Category B7: Caravans and Yachts.

Category B8: Buildings and areas used for livestock, fuel or flammable material.

Category C: Low Hazard

Category C1: Small buildings that are infrequently occupied.

Category C2: Dwelling houses other than thatched-roof houses.

Category C3: Farm buildings, other than those included in category B8.

6.3 ZONES PROTECTION AND SHIELDING ANGLES

6.3.1 The zone of protection shall be the area covered by either one of the following types of protection:

- a) Single Vertical air terminal
- b) Single horizontal air terminals
- c) Area between two or more air terminals
- d) Area between roof conductors.

6.3.2 The shielding angles α and β are given in table 3 of SABS03-1985, Code of practice for the protection of buildings and structures against lightning.

6.3.3 The zone protection for Shielding Angles on Steep Slopes and High Ridges is not considered effective beyond a horizontal distance from the nearest air terminal of greater than $2H_e$, where H_e is the effective height of the part of the air terminal above its immediate surroundings.

6.3.4 In roof areas away from the edges of tall structures (generally of $H_e > 50\text{m}$), shielding angles given in table 3, SABS 0313 can be used appropriate to hazard category of the roof area so protected and the effective height H_e of the air terminal above the roof area.

6.4 SELECTION OF AIR TERMINAL

- 6.4.1 Mast Protection:** An air terminal consisting of one or more masts that cover the structure or area to be protected with the appropriate shielding angle will, with the possible exception of a few weak lightning strokes, successfully intercept lightning strokes.
- 6.4.2 Air Terminals as Part of the Structure:** An air terminal as part of the structure may be one or more of the following:
- A continuous metal roof.
 - A metal roof structure supporting a metal roof
 - The metal reinforcement in the roof of a reinforced concrete structure with peripheral conductors and finials where necessary.
 - Roof conductors and finials, where necessary, on a non-conducting roof.
 - Finials in chimney, gable ends, parapet walls, etc.
- 6.4.3 Air Terminal Systems For Category A Hazards:** The protection is based on the principle that a primary air terminal system must be provided for the interception of major lightning strokes with, if necessary a secondary air terminal system for the interception of those weak lightning strokes that might penetrate the protection of the primary air terminal system. The secondary air terminal system shall not be intended to carry currents of major lightning strokes.

One of the following lightning protection systems shall be used as detailed in SANS 10313.

- Mast protection used as a primary air terminal
- Metal roof used as primary air terminal system
- Reinforced concrete structure used as primary air terminal system.

6.5 MASTS AND CATENARY CONDUCTORS OVER THE STRUCTURE TO BE PROTECTED

6.5.1 GENERAL

- 6.5.1.1** A lighting protection system consisting of free standing masts separate from the structure provides the highest degree of protection, subject to the correct positioning of the mast and to the correct choice of shielding angle.
- 6.5.1.2** The number and height of masts (and, where necessary, the provision of the catenary conductors between the masts) shall be based on cost, aesthetics, shielding angles and mechanical consideration

6.5.2 CLEARANCE FROM STRUCTURES

- 6.5.2.1** A safe clearance distance shall be kept between the mast and the catenary conductor strung between the masts and the structure to be protected by the mast or the catenary conductor. The clearance distance depends to various factors detailed in SANS 10313.
- 6.5.2.2** Where a common earth electrode is provided for mast and structures in close proximity, the following clearance distance “d” shall be maintained with a minimum of 100 m.
- Between the mast and any point of structure: $d \geq 0,06.h$ m.

- b) Between the catenary conductor and any part of the upper surface of the structure: $d \geq 0,1 \cdot (L/2)$ m for Category A hazard, and $d \geq 0,06 \cdot (L/2)$ m for Category B and C hazards.
- c) Between a network of conductors and any part of the upper surface of the structure: $d \geq 0,1 \cdot (D + (L - D)/N)$ m for Category A hazard, and $d \geq 0,06 \cdot (D + (L - D) / n)$ m for Category B and C hazards.

Where $L =$ length of path measured from the base of one mast along the catenary conductor to the base of the other mast between which the catenary conductor is suspended, m.
 $D =$ spacing between the mesh of the network measured along the catenary conductor, m
 $h =$ height of structure, m
 $n =$ number of cross bonds between two catenary conductors.

6.5.2.3 Where the earth electrode of a mast is separate from the metal water main, other services or the earth electrode of a structure, the following clearance distance “d” shall be maintained with a minimum of 1.00 m:

- a) Between the mast and any point of the structure: $d \geq 0,06 \cdot h + 0,1 \cdot R_s$ m.
- b) Between a horizontal catenary conductor and any part of the roof of the structure: $d \geq 0,06 \cdot (L/2) + 0,1 \cdot R_s$ m.

Where $R_s =$ numerical value of the earth electrode resistance of the mast or, where masts are connected together by a catenary conductor, of the mast thus connected together, measured in ohms.

6.5.2.4 The minimum clearance distance “d” where the structure has no earth electrode and has limited water or electricity supply, shall be maintained within the following minimum clearance distances:

- a) $d \geq 1,00$ m between the mast or catenary conductor and any part of the structure.
- b) $D \geq 0,1 R_s$ m between the mast and any water pipe or electric cable, whether buried or above ground unless the mast electrode is bonded to the metal pipe of the underground water main. If R_s is not known, the clearance distance D must be at least 3m.

6.5.3 MAST PROTECTION IN THATCHED ROOFS

6.5.3.1 Thatched roofs shall be protected by one or more free-standing masts only. The zone of protection of the masts must include gable ends, chimneys, antennas, vent pipes and any other metal objects.

6.5.3.2 Telephone wires, overhead services connections to the electricity supply, or other overhead metal wires or pipes, shall not enter the structure through or close to the thatch.

6.5.3.3 On remote chimneys or gable ends close to imaginary surface of the protection zone, install a finial and down conductor well away from the thatch.

6.5.3.4 Metal wires and metal-coated insulating sheets used in the construction of the thatched roof shall be bonded together and to the earthed metal water main or electrode of the structure.

6.5.3.4 Where metals used in the construction of the roof are not bonded and earthed, a minimum clearance distance c of 1m between metals of the roof and water pipes, vent pipes, tanks, gas pipes, antennas, telephone and bell wires, bugler alarms and electrical wiring and conduits shall be maintained.

7.0 INSTALLATION

7.1 AIR TERMINALS ON THE STRUCTURE TO BE PROTECTED.

- 7.1.1 The purpose of an air terminal on a structure to be protected shall be to intercept lightning strokes at preferential points of an air terminal, thereby:
- a) Minimizing penetration of a lightning discharge current which could have followed a random path in the roof structure with possibility of a resultant fire.
 - b) Preventing the loosening of masonry or the cracking of precast panels or reinforced concrete.
- 7.1.2 The selection of the air terminal system and the the position of down conductors shall be so selected such that at any likely point of incidence of lightning stroke, there are at least two parallel paths for the current to floe to earth.
- 7.1.3 Parallel routes shall not be necessary in the following cases.
- a) An air terminal on a small structure having only one prominent point of incident.
 - b) Dead-ended conductors, i.e those conductors of the air terminal for which it is not feasible to provide a connection to a down conductor.
- 7.1.4 Where a peripheral roof conductor is required for the protection of the outer side edge of a structure, the conductor shall be installed as close to the edge as is practicable (preferable not more than 100mm from the outer edge)
- 7.1.5 Where buttresses or parapet walls are not already equipped with an air terminal in the form of continuous metal cladding or similar metalwork and peripheral conductors are to be provided at an effective height H_e of 15 m or more, finials shall be added on all exposed outer corners and at intervals not exceeding 30 m between outer corners. The finials shall be placed as close as possible to the outer edge, and so position the down conductors such that their connection to the peripheral conductor is close to the finial.
- 7.1.6 Concrete masonry chimneys or gables ends that are not protected with the appropriate shielding angle of another structure shall be protected by means of a finial or metal cap. Where the chimney or gable end is of masonry, a peripheral conductor along the gable or around the chimney shall be used instead.
- 7.1.7 Where it is not feasible to provide a down conductor at one end of an air terminal or a connection to another part of the lightning protection system, a dead ended conductor shall be used provided it is not longer than 10 m an generally flows a horizontal or downward course from the free end to end connected to the remaining part of the lightning protection system.
- 7.1.8 Where a dead-ended conductor partly flows an upwards course, the dead-ended conductor shall be not longer than 7.5 m. If the top of the protected part is considerably lower than the ridge conductor to which the dead-ended conductor is connected, a finial shall not be used at the free end, unless it is required for the enhancement of the protection of the surrounding area, in which case an additional down conductor at the free end is recommended.
- 7.1.9 Metal gutters shall be bonded along the outside perimeter of the roof to the nearest down conductor, or to the metal of the roof, where applicable.

7.2 METAL ROOFS AND NON-METAL ROOFS SUPPORTED BY METAL ROOF STRUCTURES

- 7.2.1 Structures having roofs covered with electrically continuous metal sheets do not require air terminals, but shall be earthed by down conductors.
- 7.2.2 Sheet metal separated from each other by insulating strips or by epoxy or plastic coating s, may be regarded as providing continuous metal roof. However where sparking between such roofing is considered undesirable because of magnetic interference, all sheets adjacent to the ridge conductor or peripheral conductor shall be bonded.
- 7.2.3 A non-metal roof consisting of non-combustible roofing material held by metal fasteners to a roof supporting structure of metal construction may be considered to be a metal if the metal structure is earthed by down conductors, or supported by earthed metal columns, and spacing between roof beams does not exceed 15m for Category B and C hazards.

7.3 REINFORCED CONCRETE STRUCTURES

- 7.3.1 Reinforced steel shall not be used as parallel paths to enable lightning discharge current to flow safely to general mass of the earth.
- 7.3.2 Air terminals or finials and where necessary peripheral conductors shall be installed, taking into consideration the likely points of incidence of lightning and the path of the current through internal down conductors.
- 7.3.3 Where the outer support columns of the structure may be regarded as continuous from roof to basement, the peripheral and air terminal conductors shall be bonded to the internal or external down conductors.
- 7.3.4 Peripheral conductors and finials shall be used for medium height structures with reinforced concrete. Where the peripheral conductor is on a parapet wall that surrounds a metal roof or the air terminals of other structures, the other air terminal shall be connected to the peripheral conductor, preferably close to a down conductor. The peripheral conductor and other air terminal shall be connected to internal or external down conductor.
- 7.3.5 If the upper edge of the structure with chimneys and cooling towers and of medium height is not metal clad, horizontal conductors around the upper circumference of the structure, equipped with finials at intervals of not more than 15 m, with a minimum of two shall be installed.
- 7.3.6 On tall reinforced concrete structures, one of the following shall be installed in order to increase the protective efficiency, depending on the risk and the degree of protection required, height and slenderness of the structure:
 - a) At intervals of not more than 10 m, install oblique finials along the upper perimeter, pointing upwards and outwards such that the tip of each finial points outwards at an angle of 30° to the vertical through the outer edge of the structure, and is at least 400mm above the structure, each finial being connected to a peripheral conductor.
 - b) A horizontal conductor that follows the contour of the structure and that is so raised on oblique struts of length at least 500 mm that the conductor is displaced outwards at an angle of 30° to the vertical through the outer edge of the structure.
 - c) Oblique finials spaced as in (a) above, positioned on a horizontal conductor arranged as in (b) above and in line with the oblique struts, each finial pointing upwards and outwards at an angle of 30 to the vertical through the outer edge of the structure, and of length such that the tip of the finial is at least 800 mm above the outer edge of the structure.

Where the structure is slender, an air terminal as in (b) or (c) above is to be preferred to that in (a)

The air terminal shall be bonded to the internal down conductor at intervals not exceeding 10 m, or where the circumference exceeds 60 m, at appropriate intervals not exceeding 30m with a minimum of six bonds.

7.4 FINIALS AND ROOF CONDUCTORS

- 7.4.1 Roof conductors and finials shall be installed along the ridges of the roof and on other projections, in accordance to SANS10313 – code of practice for the protection of structures against lightning.
- 7.4.2 Protruding metal objects shall be bonded in a horizontal or in a downwards direction to the nearest roof or down conductor where the distance between the metal object and the conductor is less than 7.5m otherwise provide a separate down conductor. In all cases where the pitch of the roof is less than 30°, metal gutters and roof conductors shall be bonded or eaves conductors shall be provided.
- 7.4.3 In the case of large roofs of non-conducting material, additional conductors shall be installed across the surface of the roof, perpendicular to the long side of the roof and at extremely equal spaces not exceeding 15m. If the width of the roof exceeds 15m install conductors to form a grid at approximately equal spacing not exceeding 15m in either direction.
- 7.4.4 Roof conductors, finials and roof conductor grids shall be connected to the closest down conductor.
- 7.5.5 All roof conductors shall be manufactured from SABS approved single-core bare aluminium conductor with a minimum cross sectional area of 25mm².

7.5 DOWN CONDUCTORS

- 7.5.1 Down conductors shall be installed close to the point of the air terminal that are most likely to be struck by lightning and preferably run them vertically along the most direct route to the earth electrode.
- 7.5.2 At least two down conductors shall be provided in a building, such that in plan view no point of a structure is more than 15m from the nearest down conductor, except for masts and small structures having only one prominent point of incident, such as rondavels, these need only one down conductor.
- 7.5.3 Each down conductor shall be supplied with a separate earth electrode. This will reduce the current flow per down conductor, resulting in a lower voltage drop across the down conductor caused by the surge impedance of the conductor.
- 7.5.4 Down conductors shall not be placed close to doorways or entrances to buildings. Maintain a minimum clearance distance of the order of 1 m from the door and window frames, balustrades and other large metal objects.
- 7.5.5 Where down conductors deviate from a vertical route due to sharp bends and loops required to carry a conductor over eaves and parapet walls, shall be permitted, provided that all requirements stated in SANS 10313, clause 6.1.4 are met.
- 7.5.6 Steel columns and internal metal storm water drain-pipes shall be used as down conductors only if they are joined by screwing, bolting or welding.
- 7.5.7 External metal stair cases, fire escapes or other large frames shall be used as down conductors if they

are electrically continuous over their full height. If not electrically continuous they shall be bonded to the lightning protection system at the top or at the bottom of the framework.

- 7.5.8 In the case of structures of Hazard Category A, Test joints shall be installed in down conductors at convenient heights above finished ground level.
- 7.5.9 Internal reinforcing steel of vertical concrete column, particularly those on the outer corners can be used as down conductors, provided that the reinforcement is electrically continuous.
- 7.5.10 Vertically discontinuous reinforcement shall be bonded between the reinforcement of each section to provide a continuous path to ground or an external down conductor shall be installed.
- 7.5.11 Large external metal frames, balconies and metal cladding on the top floors of tail structures (typically 30 floors or more) that may be exposed to direct lightning strokes must be bonded to the reinforcement of the structure or to a down conductor that is connected to the reinforcement of the roof.

8.0 STATUTORY REQUIREMENTS

- 8.1 The Contractor shall ensure that the installation satisfies the requirements of all relevant South African Statutory Regulations
- 8.2 Where applicable, equipment items shall carry the SABS mark to demonstrate compliance with the regulations.

9.0 RESPONSIBILITY FOR WORK

- 9.1 The tenderer shall be responsible for the complete installation of the lightning protection system including testing, earthing conductors, surge protection devices, spikes etc. as required for various buildings and structures. These installations shall include the review and the upgrading of the existing lightning protection systems. Due considerations shall be taken of the effects of lightning covered herein below in clause 8, in providing the lightning protection system.
- 9.2 The tenderer shall undertake to repair all faults due to bad workmanship and/or the use of faulty materials and to replace all defective materials within six months after the installation date.
- 9.3 The tenderer shall rectify all the defects to the satisfaction of Transnet Projects, that may become apparent during the guarantee period.
- 9.4 The tenderer may be required to carry out builders work such as cutting of concrete columns and coring of holes for testing of the continuity of the existing steelwork or cabling. Good contact between reinforcing bars should be ensured.

9.0 APPLICABLE INFORMATION

- 10.1 **Electrical effect** – The current discharged through the earth electrode resistance produces a resistive volt drop which may raise the potential of the system to a high value relative to true earth.
- 10.2 **Side-flashing** – The point of strike may be raised to a high potential, and there is a risk of flashover from the protection system to any metal or in the structure.
- 10.3 **Thermal effect** – The thermal effect of a lightning discharge is confined to the temperature rise of the conductor through which the current passes.

- 10.4 **Mechanical effect** – When a high current is discharged along parallel conductors in close proximity or along a single conductor with sharp bends, a different mechanical effect is exerted by a lightning flash. This is due to a sudden rise of 30 000K in air temperature and the resulting explosive expansion of the adjacent air in the channel along which the charge is propagated.

11.0 PROTECTION AGAINST CORROSION

- 11.1 The tenderer shall ensure that atmospheric, chemical and or electrolytic corrosion of copper and other metals is prevented from occurring when used for the lightning protection system.
- 11.2 The contact surfaces of dissimilar metals shall be kept completely dry and protected against ingress of moisture to prevent the acceleration of electrolytic corrosion.
- 11.3 Although copper is highly resistant to many types of chemical attack, lead coating shall be recommended wherever subjected to severe corrosion due to presence of sulphur compounds.
- 11.4 Stainless steel material of similar grading shall not be used unless prior approval is obtained.

12.0 EARTHING CODES OF PRACTICE

This part of specification details standards and codes of practice to be adhered to in the supply, installation and termination of earthing systems on all Transnet Sites.

12.1 National Standards

- 12.1.1 The requirements of the materials, design, layout, fabrication, assembly, erection, examination, inspection and testing of an earthing system on site shall be in accordance with the relevant sections of codes: -

- SABS 089 Part 2 1965 Electrical Code for Petroleum Industry
- SABS 0121 1977 Cathodic Protection of Buried and Submerged Structures
- SABS 0123 1976 The Control of Undesirable Static Electricity
- SABS 0198 Part 12 1988 Installation of Earthing System
- SABS 0199 1985 The Design and Installation of and Earth Electrode
- SABS 0200 1985 Neutral Earthing in Medium Voltage Industrial Power Systems
- SABS 0292 1999 Earthing of Low Voltage (LV) distribution systems
- SANS 10313 Latest amended Protection of Structures against Lightning
- SABS 1063 1998 Earth Rods and Couplers
- SABS IEC 61000-5-2 1997 Electromagnetic Compatibility (EMC)
Part 5: Installation and mitigation guidelines

Section 2: Earthing and Cabling

- SABS IEC TS 61312-2 1999 Protection against Lightning Electromagnetic Impulse (LEMP) Part 2: Shielding of structures, bonding inside structures and earthing
- SABS IEC 61024-1 1990 Protection of Structures against Lightning Part 1: General principles
- SABS IEC 61024-1-1 1993 Protection of Structures against Lightning Part 1: General principles
Section 1: Guide A – Selection of protection levels for lightning protection systems
- SABS IEC 61024-1-2 1998 Protection of Structures against Lightning Part 1-2: General Principles
Guide B – Design, Installation, maintenance and inspection of lightning protection systems
- SABS IEC 61312-1 1995 Protection against Lightning Electromagnetic Impulse Part 1: General principles
- SABS IEC 61312-4 1998 Protection against Lightning Electromagnetic Impulse Part 4: Protection of Equipment in existing structures
- SABS IEC 61643-1 1998 Surge Protective Devices Connected to Low Voltage Power Distribution Systems
Part 1: Performance requirements and testing methods
- SABS IEC TS 61312-2 1999 Protection against Lightning Electromagnetic Impulse (LEMP) Part 2: Shielding of structures, bonding inside structures and earthing

12.1.2 Statutory Requirements

- a) The Contractor shall ensure that the installation satisfies the requirements of all relevant South African Statutory Regulations
- b) Where applicable, equipment items shall carry the SABS mark to demonstrate compliance with the regulations.

12.2 Technical Requirements

12.2.1 General

- a) A common integrated station earthing system shall be provided for electronic and electrical systems equipment, static and lightning protection in accordance with the requirements of this document.
- b) A soil resistivity survey shall be carried out by a specialist earthing consultant/contractor. The consultant/contractor shall prepare a detailed report on the conditions identified and provide the survey data recordings together with proposals, for a basis of the earthing system design.
- c) Major electrical equipment such as switchgear, transformers, lighting boards, floodlight towers on poles, control panels etc. and associated metallic support frameworks, shall be connected to the station safety earth via Electrical Earth bars located nearby.

Use of embedded conductors within a power cable (spare core earth) may be utilised as the primary equipotential bonding system provided the following conditions are met: (SABS 086-1:2001)

- The embedded conductor has a cross-sectional area equal to those of the live and neutral conductors or equal to the values in Table 1 of SABS 0142)

In addition, a second visual earth connection shall be provided to each item of electrical equipment, to prevent the potential to earth of such equipment rising above spark potential. (SABS 089-2:2000)

- d) The neutrals of generators and transformers shall be connected to the main earth grid either directly or via an earthing resistor, as required. Where neutrals of transformers are connected directly to earth, this shall be done via means of connections to both an individual earth rod located nearby as well as to the station earth mat by means of Electrical Earth bar located within the Switchgear Room.
- e) Frames of motors shall be connected to the earthing system in accordance with the following table:

Motors kW Rating	Minimum Earth Conductor Size
Up to 30	16 mm ²
37 – 132	50 mm ²
150 – 175	70mm ²

Note:

In order to minimize the number of different sizes of earth conductor, the above three sizes only shall be used throughout, unless specifically stated otherwise.

- f) Cables supplying lighting fixtures shall be 3 core for single-phase supplies and 5 core for 3 phase supplies, of which one core shall be used as the earth conductor.
- g) Plant Infrastructure such as manifold piping, tanks and metallic support frameworks, shall be connected to the station safety earth, either directly or by means of Electrical earth bars located nearby.

- h) Flanged joints in metallic pipelines shall be considered inherently continuous provided the surfaces of one of the bolts are cleaned and identified for earthing. Flanges of metallic pipelines that have insulated linings for purposes other than cathodic protection shall be bonded to ensure electrical continuity.

Pipelines shall only be connected to the earthing system where they enter and leave the battery limits.

- i) Storage tanks that are not cathodically protected shall be earthed through at least two separate connections to the tank. Tanks shall be earthed in accordance with the relevant SABS code.

Electrically continuous structural steel columns may be used as down conductors by means of which elevated tanks, vessels, etc. shall be deemed to be connected to the earthing system.

All tank covers, gauge floats and stirrers etc. as well as all pipes entering the tanks shall be earthed.

The steel roof shall be in a direct electrical contact with, or bonded to the tank shell.

Earthed grids, gauges, gratings and the like placed in or across the inlets of tanks are not to be used as a means of static discharge. Individual bonding shall be made to the earthing system.

- j) Cable trays and cable racks shall have continuous earth continuity. This shall be ensured by installing 10mm² earth straps across the racking fishplates (joints). Cable Trays shall be connected to the earthing system in two places - where they enter and leave the battery limits.
- k) Earthing connections to all equipment and process plant shall comprise of welded earth bosses in compliance with SABS 089 Part II:1965 regulation 5.1.4K with properly provided terminations i.e. 10mm diameter earth studs. Anchor bolts shall not be used.

Earth connections to all equipment shall be effectively bolted, using crimped lugs. All cable connections shall be fitted with a "star" or serrated washer in addition to the backnut, to ensure good earth contact.

- l) All earthing connections between the station earth system and respective earth bars/lightning protection systems shall where possible be made above ground, by means of bolts, crimped lugs and PVC taped.

All cable connections shall be fitted with a "star" or serrated washer in addition to the backnut, to ensure good earth contact.

Earth connection points shall be clearly labelled.

In cases where earth connection points are required to be made underground (e.g. to earth rods), inspection wells shall be provided comprising of pre-cast concrete/PVC surrounds complete with covers, to facilitate periodic inspection.

- m) Earthing conductors rising through paving or other concrete work shall be run in suitable protective sleeves which shall project above finished level.

- n) Earthing and bonding conductors shall be sized and installed in compliance with regulations detailed in the current SAIEE Standard Regulations for the Wiring of Premises and in SABS 03 as applicable.
- o) Extendable earthing rods shall be manufactured from stainless / copper clad / galvanized steel (dependant on soil acidity and chlorides and existence of cathodic protection systems) 16mm diameter, 1200 mm long sections, and shall have molecular bond between the two metals to prevent moisture ingress. Where it is necessary to join earth rods together, a non-ferrous corrosion resistant coupling device shall be used which shall prevent the ingress of moisture into the joint.
- p) Lightning and static earthing protection shall be provided for all tall steel, masonry and concrete structures, towers, vessels, tanks etc, as well as all buildings used to house sensitive electrical/electronic equipment. Lightning protection systems shall be connected both to individual earth rods as well as bonded to the station earth mat. Where possible, the mesh method (as defined in SANS 10313) should be utilised in the protection of buildings against lightning strikes i.e. the use of masts and catenary conductors are to be avoided.

Tall steel structures such as towers or structure columns, provided they are electrical continuous, shall be considered inherently protected against lightning by their connection to the earth.
- q) **The resistance of the common earthing system to the general mass of earth shall not exceed 1 Ohm.**
- r) Where a separate system is installed for other than electrical equipment in remote locations, e.g. storage tanks; its resistance to the general mass of earth shall not exceed 7 Ohms. (Note: This applies only for Lightning Protection and remote valve chambers that are not connected to the Station Earth).

12.2.2 Station Safety Earth

In cases where a new Station Safety Earth Mat is required to be provided, the following specifications shall apply:

The **Earth Mat** shall consist of a completely buried, lattice network of 40x3mm, bare copper tape. All the crossover points of the lattice shall be braised or cadwelded and protected with PVC insulation tape. Buried joints or splices shall not be clamped or bolted. The earth mat shall be buried, 1000mm minimum, below finished grade.

The interconnecting conductors shall be radially interconnected to form a common earthing system, for all electrical equipment, lightning protection and static earthing in accordance with relevant SABS requirements.

If required, additional earth electrodes may be installed to achieve the specified resistance, of the common earthing system to the general mass of earth. Where earth rods are paralleled in a group to reduce the earth resistance to the permissible value, they shall be spaced apart for a distance at least equal to their buried depth length.

12.3 Switchgear Room Building and Equipment

12.3.1 A Main Safety/Electrical Earth Bar comprising of a copper bar, 50mm x 5mm min shall be installed in the basement/false floor of the Switchgear Room. Where possible, this Earth Bar shall be designated as the Primary Test Point for the station earthing system with the following equipment directly connected:

- **Station Earth Mat.** Where possible, a minimum of four separate connections shall be taken into the Switchgear Room via separate routes from the Earth Mat, by means of 40mm x 3mm Cu Earth tape. Connection to the Main Safety Earth bar shall be made in two places by means of 70mm², 600-volt class, green colored, PVC insulated, stranded copper conductor, to facilitate testing of the Earth System.
- **Transformers.** By means of 70mm², 600-volt class, green colored, PVC insulated, stranded copper conductor
- **MV/LV Panels.** By means of dual 70mm², 600-volt class, green colored, PVC insulated, stranded copper conductors
- **Generator.** By means of 70mm², 600-volt class, green colored, PVC insulated, stranded copper conductor
- **Instrument Earth.** By means of dual 70mm², 600-volt class, green colored, PVC insulated, stranded copper conductors
- **Manifold Earth.** By means of dual 70mm², 600-volt class, green colored, PVC insulated, stranded copper conductors

Note that on existing sites, the earth mat has been connected to the station earthing system in multiple places (namely; the Switchgear Room, Control Room and Manifold), and thus designation of a single Primary Test point is not possible. Multiple test points have thus been defined as follows: Switchgear Room, Control Room and Manifold Mainline Pumps 1 & 4 (where possible).

12.3.2 All secondary earthing within the substation shall be attached to this station earth bar at appropriate demarcated points.

12.4 Control Room Building and Equipment

12.4.1 A secondary Safety/Electrical Earth Bar comprising of a copper bar, 50mm x 5mm min shall be installed in the basement/false floor of the Equipment/Control Room in an easily accessible position. Where possible, this Earth Bar shall be directly connected to the Main Safety/Electrical Earth bar located in the Switchgear Room, by means of dual 70mm², 600-volt class, green colored, PVC insulated, stranded copper conductors.

Note that all marshalling and equipment panels shall have an electrical earth bar, separate from an insulated instrument earth bar, installed and to which all electrical equipment earths shall be connected.

12.4.2 An Instrument Earth Bar comprising of a copper bar, 50mm x 5mm min shall be installed in the basement/false floor of the Equipment/Control Room in an easily accessible position. Where possible, this Earth Bar shall be directly connected to the Main Safety Earth bar located in the Switchgear Room, by means of dual 70mm², 600-volt class, green colored, PVC insulated, stranded copper conductors.

Note that all marshalling and equipment panels shall have an insulated instrument earth bar, separate from the electrical earth bar, installed and to which all clean/instrument earths shall be connected.

12.4.3 Instrument and Electrical Earth systems shall be clearly labelled.

12.5 Manifold Area and Equipment

12.5.1 All manifolds shall have an insulated manifold earthing system installed, comprising of the following specifications:

- 40mm x 3mm min flat copper tape, to run the entire length of the main electrical racking reticulation and supported off of insulators at distances of no more than 2m apart. Use of existing electrical racking reticulation supports shall be permitted. All joints will require to be braised. Earthing reticulation shall be installed in such a manner so as to be unobtrusive and yet accessible and shall be positioned so as to avoid obstruction to walkways and access routes.
- The Manifold Earth bar shall be connected to the main safety/electrical earth located in the Switchgear Room, by means of dual 70mm², 600-volt class, green colored, PVC insulated, stranded copper conductors.

Note that on existing sites, the earth mat has been connected to the earthing system in multiple places (namely; the Switchgear Room, Control Room and Manifold), and thus designation of a single Primary Test point is not possible. Secondary test points have thus been defined where possible as follows: Switchgear Room, Control Room and Manifold Mainline Pumps 1 & 4.

12.4.2 All process plant and equipment located within the manifold area shall be attached to this manifold earth bar at appropriate demarcated points, via appropriately sized insulated PVC copper cable (green/yellow colored insulation), as follows:

- All electrical equipment shall be earthed via two separate earths, namely via the power cable earth core back to the respective Starter Panel electrical earth bar, and secondly via a separate visual earth from the motor frame to the manifold earth bar. Use of cable armouring as an earth conductor is not acceptable.
- All instrument stands and field junction boxes shall be separately earthed via means of an insulated 16mm² min PVC copper cabling.
- All process vessels (tanks, vessels and piping) and racking reticulation shall be earthed via insulated 70mm² min PVC copper cabling in two separate places.

All earth conductors utilized shall comprise of stranded, PVC insulated copper conductors with crimped cable lugs. All connections shall be fitted with a "star" or serrated washer in addition to the backnut, to ensure good earth contact.

12.6 Earth System Identification Standards

12.6.1 Earth Bar Labels

Earth bars shall be clearly labelled according to their functionality (e.g. "EB xx" to denote an electrical earth bar, "IB xx" to denote an instrument earth bar, where xx denotes a unique consecutive number). The Functional Identifier "EB 00" shall always denote the Station Earth Mat.

In addition, earth bars designated as Test Points shall be labelled accordingly.

Labels shall comprise of the Traffolyte engraved type, and fixed by means of stainless steel screws. Finish shall comprise of black letters against a white background, with text 40mm height.

Labels shall be readable/visible after the wiring has been done.

12.6.2 Earth cable Identification

Earth cables may be divided into two types, namely primary earth cabling running from subsystem earth bars directly or indirectly to the main station earth (and used for testing purposes), and secondary earth cabling running between the subsystem earth bars and equipment or infrastructure.

Only Primary earth cabling (i.e. those used for testing purposes) is required to be identified, by means of a Functional Identifier denoting both source and destination earth bars.

Identification numbers will comprise of the following specification:

- Grafoplast Targa Metal TGT System (Carrier Rail 58mm in length) 316 Stainless Steel Markers, with punched text 6 mm height minimum, fastened onto the cable at both ends via means of Stainless Steel cable ties

Examples:

EB01 – EB00 Cable Identifier for Earth cable running between Electrical Earth bar EB01 and the Station Earth Mat

IB01 – EB00 Cable Identifier for Earth cable running between Instrument Earth bar IB01 and the Station Earth Mat

12.7 Testing

12.7.1 Earth Resistivity and Electrode Testing

It will be the Contractors responsibility to carry out all necessary earth resistivity tests on site, where applicable. Tests will be in accordance with the requirements of BS 1013 as amended.

After all earth electrodes/trench earth's have been installed, an earth megger shall be used to test the earth resistance at the earth bar or connection point to the main station earth and the results recorded. Note that all ECC connections, and any other bonding material shall be disconnected from the earth connection point whilst the earth is being tested.

Earth Continuity Testing.

Earth continuity readings shall be measured and recorded from the earth bar to each item of equipment and process plant, and shall include all piping, vessels, transformers, motors, actuators, switchgear cabinets, marshalling enclosures and instrumentation.

12.7.2 The following are the maximum acceptable earth electrode resistances:

Electrical Earth

- Main substation - 1 ohm
- Miniature substations and kiosks - 2 ohms
- Highmasts - 5 ohms.

Instrument Earth

a) Instrument Earth - < 1 ohm

13.0 INSPECTION AND GUARANTEE

- 13.1 Transnet Projects reserves the right to inspect the installation and the equipment to be used.
- 13.2 All lightning protection systems shall be inspected and certified by an accredited person after completion of the installation, to verify conformance as required by Code of Practice, SANS 10313.
- 13.3 All components of the lightning protection system shall be inspected to ensure that they are in good condition and are capable of performing their designed functions.
- 13.4 The tenderer shall ensure that all elements of the electrical installation have been incorporated into the protected space by bonding or extensions to the lightning protection system.
- 13.5 The mechanical condition of all conductors, bonds, joints and earth electrodes shall be checked and the observations noted. .
- 13.6 The tenderer shall undertake to repair and replace all faults and faulty materials due to bad workmanship during a period of six months.
- 13.8 The tenderer shall be required to guarantee the installation for a period of twelve (12) months.

END

SIGNATURE OF TENDERER: -----

DATE: -----

**TRANSNET PROJECTS
DESIGN SERVICES**



Specification No: TPD-009-
STANDBYPLANTSPEC

Engineering

Title: **SPECIFICATION FOR DIESEL GENERATOR
SYSTEMS**

Unique Identifier:

Area of Applicability: **Engineering**

Documentation Type: **Standard**

Revision: **1**

Total Pages: **63**

Next Review Date:

Prepared by:

Samukelo Magcaba (Electrical)

03/02/2025

Date



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1. Introduction

The document is required to provide the baseline requirements for new Diesel Generator systems to be used within the Transnet Port Terminals. It also provides a standardised approach when defining the user or site- specific requirements for Diesel Generator systems.

2. Supporting Clauses

2.1 Scope

This standard covers the design, testing, supply, delivery to site, erection, and commissioning requirements for Diesel Generator (DG) Systems.

2.1.1 Purpose

To provide the minimum technical requirements for DG systems used in Transnet Port Terminals.

2.1.2 Applicability

This document shall apply throughout Transnet Port Terminals.

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

- [1] ISO 9001 Quality Management Systems.
- [2] BS 5514-5, Reciprocating internal combustion engines: performance -Part 5: Torsional vibrations.
- [3] ISO 3046, Reciprocating internal combustion engines.
- [4] NFPA 850, Recommended practice for fire protection for electric generating plants and high voltage direct current converter stations
- [5] Act No. 85 of 1993, Occupational Health and Safety Act
- [6] SANS 342, Automotive diesel fuel
- [7] SANS 1186, Symbolic safety signs
- [8] SANS 1507, Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V)
- [9] SANS 1632, Batteries
- [10] SANS 1652, Battery chargers – industrial type
- [11] SANS 8528, Reciprocating internal combustion engine driven alternating current generating sets (all parts)
- [12] SANS 10089, The Petroleum Industry: Storage and distribution of petroleum products in above- ground bulk installation



- [13] SANS 10140, Identification colour marking.
- [14] SANS 60034, Rotating electrical machines.
- [15] SANS 60529, Degrees of protection provided by enclosures.
- [16] SANS 60947, Low-voltage switchgear and control gear – Part 7-1: Ancillary equipment – Terminal blocks for copper conductors
- [17] SANS 10142, Wiring of Premises
- [18] 240-56227516, Specification for LV switchgear and control assemblies and associate's equipment for voltages up to and Including 1 000 V AC and 1 500 V DC
- [19] 36-1126, Specification for corrosion protection of plant and equipment with coatings
- [20] 32-333, Standard for Electronic Protection and Fault Monitoring Equipment for Power Stations

2.3 Definitions

2.3.1 General

Refer to [11] SANS 8528-1 and [14] SANS 60034-1 for definitions relevant to this document.

2.3.2 Disclosure classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 Abbreviations

Table 1: Abbreviations

Abbreviation	Description
AC	Alternating Current
AVR	Automatic Voltage Regulator
BIL	Basic Insulation Level
CAP	Committee for Accepted Products
CCA	Cold Cranking Amps
COP	Continuous Power
DC	Direct Current
DCS	Distributed Control System
DG	Diesel Generator
ESP	Emergency Standby Power
FAT	Factory Acceptance Test
HMI	Human–Machine Interface
HV	High Voltage
IP	International (Ingress) Protection
ISO	International Organization for Standardization

LAP	List of Accepted Products
LCD	Liquid Crystal Display
LED	Light-emitting Diode
LTP	Limited-time running power
MCCB	Moulded Case Circuit-breaker
n/a	not applicable
NFPA	National Fire Protection Association
OEM	Original Equipment Manufacturer
OHSA	Occupational Health and Safety Act
P	Proportional
PI	Proportional Integral
PID	Proportional Integral Differential
PRP	Prime Power
rpm	revolutions per minute
SAE	Society of Automotive Engineers
SANS	South African National Standards
SAT	Site Acceptance Test
SC	Steering Committee
THD	Total Harmonic Distortion
VAR	Volt-Ampere Reactive

2.5 Roles and responsibilities

This document shall be used whenever diesel generators are procured for Transnet Port Terminals purposes.

2.6 Process for Monitoring

The engineering Department shall ensure that this document is maintained.

2.7 Related/Supporting Documents

This document is to be used in conjunction with the following:

- Application-specific Design Guide (where available)
- Employer's Specification for Works which will contain the plant-specific Operating and Control philosophy.
- Supporting AB Schedules

3. Requirements



3.1 General

- a) The DG shall be built in accordance with the latest revisions of [11] SANS 8528, except where deviations are specified in this document and its accompanying Schedule A and Schedule B.
- b) Where deviations exist between this document; its accompanying Schedule A, Schedule B and [11] SANS 8528, the order of precedence is as follows: accompanying Schedule A and Schedule B; followed by this document; and then [11] SANS 8528.
- c) The system shall be designed to run free of excessive vibration and noise under all conditions of load and speed, and shall comply with the requirements of [14] SANS 60034 and [2] BS 5514-5.
- d) All moving and rotating parts shall comply with the requirements of the Occupational Health and Safety Act (OHSA) [5] Act No. 85 of 1993.
- e) The Genset shall be of the integrated self-contained, super silent sound attenuated canopy type with self bunding base tank. The canopy should be a minimum 3CR12 grade of steel.

3.2 Application and operating philosophy

- a) DGs will be generally used at the following sites:
 - Transnet Port Terminals sites
 - Substations
 - Office buildings
 - Cranes
- b) The generator configuration will be generally used for mobile applications unless specified differently in Schedule A.
- c) The DG will generally be used for extended backup unless specified differently in Schedule A.
- d) The Specification is only applicable to AC generating sets.

3.3 Site conditions

- a) The DG shall be designed for use inland or coastal as specified in Schedule A.
- b) The DG System shall be designed for a maximum ambient temperature of 50 °C.
- c) The following conditions shall be specified in Schedule A:
 - 1) Minimum ambient temperature
 - 2) Altitude
 - 3) Humidity
 - 4) Air quality (dust or sand)
 - 5) Marine environment
 - 6) Shock and imposed vibration



- 7) Chemical pollution
- 8) Radiation
- 9) Cooling water/liquid

3.4 Reliability

- a) The DG System shall be designed for an operating life of 20 years under the specified operating conditions in Schedule A.
- b) Any deviation from this shall be clearly indicated.

3.5 Maintainability

- a) The DG System shall be designed to minimize the need for maintenance.
- b) Whether preventative or predictive, where maintenance is required, the design shall provide for good ergonomics to make it as easy as possible, with due consideration given to personnel safety.
- c) The design shall allow for modular replacement of assemblies and components to a level as low as possible.
- d) The time to isolate a faulty component shall be reduced by making extensive use of built-in test facilities.
- e) Component conditions that may lead to a failure shall be monitored, and an alarm condition generated.
- f) Spares and parts availability shall be guaranteed for the designed life of the DG.
- g) Warranty on any part of the system shall be at least two years unless specified differently in Schedule A.
- h) All safety requirements to enable fueling whilst running (refuel on the fly) shall be included in the design of the genset.



3.6 System definition

The overview of a typical DG system is defined in in more detail in the clauses following the table.

Table 2: System definition – overview

Diesel Engine (prime mover)	Alternator	Control and switchgear	Auxiliaries	Mechanical build
- Engine rating - Speed - Governor - Emissions - Deutz/Cummins/Volvo Penta	- Type - Excitation - Power Output - Voltage and Frequency - Marelli	- Equipment for the control, switching, operation, monitoring, and alarming of the generating set shall be part of the associated control gear and switchgear systems - Comap Intelligen 1000 autosynchronising paralleling controller	- Starting system - Air intake and exhaust gas systems - Cooling systems - Lubricating oil system - Fuel system (including fuel treatment where applicable) - Auxiliary electrical power supply - Earthing	- Base frame - Coupling - Enclosure - Fire detection - Canopy-Type - Integrated Self bunding base tank

3.6.1 Diesel Engine

3.6.1.1 General

- The diesel engine shall be of the diesel fueled, cold starting, water-cooled , speed-governed type.
- Engine Preheater and Pre-start Lubricating Oil Pump (Prelube Pump) are required..
- The supplier shall state in Schedule A, the guaranteed specific fuel consumption of the complete set with all auxiliary equipment at full load, three-quarter load, and half load to accuracy within 5%.
- The fuel consumption shall be determined in accordance with [3] ISO 3046-1, and given in litres per kilowatt hour (l/kWh). The supplier shall also make reference to lubricating oil consumption.

3.6.1.2 Rating

- The engine shall be suitably rated to provide the required power output from the generator, even under impact loading when all pre-impact loads are connected.



- b) The generator start-up time (as specified in [11] SANS 8528-1) shall be specified in Schedule A.
- c) The engine shall deliver full load in accordance with [3] ISO 3046-1, within the starting period, and under the specified environmental conditions.
- d) De-rating shall be in accordance with [3] ISO 3046-1.
- e) The engine performance classification shall be Continuous Power (COP), Prime Power (PRP), Limited time running power (LTP) or Emergency Standby Power (ESP) as defined in [11] SANS 8528-1 and as specified in Schedule A.
- f) The required mounting type and Generating set configuration shall be in accordance with [11] SANS 8528-1 and specified in Schedule A.
- g) The required Performance Class as defined in [11] SANS 8528-1 and load type are also given in Schedule A. If no performance class is specified, a G3 class shall be assumed.
- h) Where the employer does not declare a duty type, the supplier shall assume that duty type S1 (continuous running duty) applies.
- i) The power rating shall be expressed in kilowatts at rated frequency and a power factor of 0,8 lagging unless otherwise stated in Schedule A.
- j) The output of the engine under the specified site conditions shall be the net available output power after allowance has been made for all auxiliary equipment (i.e. parasitic losses) including air filter, radiator fan, oil pump, water pump, battery charger alternator, governor, etc.
- k) It shall be possible to operate the DG with a lagging Power Factor from 0,8 up until Unity, depending on the active power demand, unless otherwise stated in Schedule A.
- l) The DG shall be capable of performing a single load step equal $\geq 50\%$ of the continuous kilowatt (kW) rating of the machine while remaining within operating limits.
- m) The DG shall be capable of performing a single load step equal to 110% of the most severe single step load in the plant design profile.
- n) The DG shall accept the load without voltage collapse or engine stalling and recover to normal operating speed.
- o) The supplier shall document the voltage and frequency deviation observed.
- p) The supplier shall supply with the tender all technical data with de-rating graphs on altitude of all engines. This shall form part of the engine sizing.

3.6.1.3 Governor

- a) The engine shall be fitted with an electronic governor to provide speed control in accordance with the requirements of [3] ISO 3046-4 and [11] SANS 8528-1.
- b) The governor shall be of the Proportional Integral (PI) or Proportional Integral Differential (PID) type as specified in Schedule A.

3.6.1.4 Speed



An engine operating nominal speed of 1 500 rpm is preferred, except where it is otherwise stated in Schedule A.

3.6.1.5 Emissions

Any emission (noise, vibration, heat, gas, and electromagnetic disturbance) limits as specified by applicable legislation relating to the protection of the environment and to the health and safety of personnel operating or maintaining the generating set shall be specified in Schedule A.

3.6.2 Alternator (Generator)

3.6.2.1 Type

- a) The alternator shall be of the brushless type and comply with the relevant requirements of [14] SANS 60034-1, [14] SANS 60034-8, [14] SANS 60034-9 and [11] SANS 8528-3, and with the additional requirements specified.
- b) Where the Employer's Engineer does not declare a duty type, the supplier shall assume that duty type S1 (continuous running duty) applies.

3.6.2.2 Excitation

- a) Whether a permanent magnet is required for excitation shall be specified in Schedule A.
- b) The method of excitation, the excitation voltage range and the maximum field control current shall be provided.
- c) Series current boost (consisting of controls and current transformers) shall be provided, if required, to meet transient voltage response performance.

3.6.2.3 Heaters

- a) The alternator shall be fitted with one or more anti-condensation heater elements to protect those components that can be adversely affected by moisture.
- b) The heater shall be approved by the alternator supplier.
- c) The heater's power requirement shall be stated.

3.6.2.4 Power Output

- a) The Employer's Engineer shall specify the required output power requirements in kilovolt-ampere (kVA) and the power factor.
- b) The rated output is the apparent power at the terminals and shall be expressed in kilovolt-ampere (kVA) together with the power factor.
- c) The supplier shall specify the short-circuit rating of the alternator. The alternator shall comply with the requirements of section 5.2 of [11] SANS 8528-3 in respect of short-circuits.
- d) The alternator's efficiency at full load, 3/4 load, 1/2 load and 1/4 load at unity and at 0.8 lag power factors shall be stated in Schedule A.
- e) The continuous current capabilities and the regulation percentages shall be stated in Schedule



A.

3.6.2.5 Loading

- a) Linear and non-linear loads shall be started as per the Starting Sequence detailed in Schedule A and the load schedules.
- b) The alternator shall be suitable for supplying the following types of loads:
 - 1) Linear loads, such as lighting circuits and motors.
 - 2) Non-linear loads, such as saturable-reactor controlled rectifiers, six-pulse or 12-pulse controlled thyristors, Variable speed drives or stop/start control systems.

3.6.2.6 Voltage and Frequency

- a) The nominal voltage and frequency, including tolerances, shall be as stated in Schedule A. The terminal voltage shall be adjustable over the specified range.
- b) The generator voltage shall remain within the limits specified from no-load to full-load at unity, and at 0,8 lag power factors, inclusive of diesel engine speed drop of 4% and temperature drift.
- c) The maximum permissible voltage drop and frequency variation for the maximum load step should be maintained within the specified limits as stated in Schedule A.

3.6.2.7 Type of Construction

- a) Details shall be provided of the bearings offered.
- b) The alternator shall be air-cooled.
- c) The alternator insulation class for its different parts shall be as specified in Schedule A.

3.6.3 Control, Monitoring, Alarms, Indications and Switchgear

3.6.3.1 General

The Employer's Engineer shall provide the Employer's Specification for Works which will contain the Operating and Control philosophy for the electrical plant system. This will include operating scenarios (test functionality, test load, shut down, breaker status, etc) in a Matrix table.

- a) The control system shall comply with the requirements of [11] SANS 8528-4, and shall be electrically fail-safe.
- b) The control system shall be powered from Direct Current (DC) available from the engine cranking batteries.
- c) The control system shall be capable of operating on an alarm-only basis or alarm and shut down, if so required.
- d) All data shall be date and time stamped.

3.6.3.2 Control Panel Controls

- a) The DG control panel shall provide local control of most of DG functions.



- b) As a minimum, the local control panel shall include the following. Any or all the functions can be available from a local Human–Machine Interface (HMI).
- 1) Local Start
 - 2) Local Stop
 - 3) Emergency Stop
 - 4) Raise/Lower Load (when synchronized)
 - 5) Raise/Lower Volt-Ampere Reactive (VAR)
 - 6) Breaker Selection (Generator or Paralleling)
 - 7) Initiate Sync Command
 - 8) Remote/Local
 - 9) DG Breaker Trip and Close Functions
 - 10) Raise/Lower Voltage
 - 11) Raise/Lower Speed
 - 12) Alarm Accept/Test/Reset
 - 13) Lamp Test
 - 14) Local/Remote Control
 - 15) Mains Circuit-breaker operation
 - 16) Generator Bus Breaker (if parallel units)
- c) The sync function shall utilize the The Comap intelligen 1000 autosynchronising paralleling controller
- d) Manual sync capability (including sync scope and sync lights) shall not be provided unless specifically requested in Schedule A.

3.6.3.3 Control Panel Features

- a) The following features shall be included in the control panel. Any or all of the functions can be available from a local HMI:
- 1) Analogue Alternating Current (AC) Metering panel: Provides a colour-coded display of generator set output, voltage, current, frequency, power factor and kilowatt (kW).
 - 2) Graphical Data Display: Allows the operator to view all engine and alternator data; to perform operator adjustments for speed, voltage, and time delays; and to view fault history.
 - 3) Light-emitting Diode (LED) Status Lamps: Indicate remote start command, not in auto, warning and shutdown.
 - 4) Exercise switch: Automated exercise function in the DG controller allows the operator to initiate an exercise period and have it automatically completed by the controller. The controller shall start the engine; perform the testing method as specified in the AB Schedules (synch with main supply, dummy resistor load or



unloaded); run for a pre-set period; then run down, open the generator breaker, and shut down.

- 5) Fault Reset switch: Allows the operator to reset the control after a warning or shutdown condition.
 - 6) LED lamp, which indicates that a fault is present on the system.
- b) The following features shall be included in the control panel and not from a local HMI:
- 1) Emergency stop push-button: Provides positive and immediate shutdown of the generator set.
 - 2) Key-type mode selector switch (local/remote/maintenance).

3.6.3.4 Remote Control System Interface (If required in the AB Schedules)

- a) The control system shall cater for all the input/output signals required for a complete system. Remote inputs/outputs may include, but are not limited to the following, **from the Remote Control System (inputs)**:
- 1) Remote Start Command
 - 2) Remote Stop Command
 - 3) Initiate Sync Command
 - 4) Select Generator Breaker for Sync
 - 5) Select Paralleling Breaker for Sync
 - 6) Load Demand (kW)
 - 7) VAR Demand (kVAR)
 - 8) Emergency Mode (disabled engine trips)
- b) The control system shall cater for all the input/output signals required for a complete system. Remote inputs/outputs may include, but are not limited to the following, **to the Remote Control System (outputs)**:
- 1) Control Mode (local/remote/maintenance)
 - 2) Engine Running
 - 3) Load kW (analogue)
 - 4) VARs (analogue)
 - 5) Ready to Load
 - 6) Ready to Start
 - 7) Common Alarm
 - 8) Shutdown Alarm
 - 9) Breaker Interface
 - 10) Generator Breaker Open
 - 11) Generator Breaker in Operate Position



- 12) Generator Breaker Protective Relay Reset
 - 13) Generator Breaker Close Command
 - 14) Generator Breaker Trip Command
 - 15) Generator Breaker Trip Status
 - 16) Paralleling Breaker Open
 - 17) Paralleling Breaker in Operate Position
 - 18) Paralleling Breaker Protective Relay Reset
 - 19) Paralleling Breaker Close Command
 - 20) Generator Voltage
 - 21) Bus Voltage (reference for testing)
 - 22) Paralleling Source Voltage (reference for return after power outage)
- c) If the required input/output signals are not specified by the Employer's Engineer, the control system shall cater for the following:
- 1) 8 × Digital inputs.
 - 2) 2 × Analogue inputs.
 - 3) 16 × Digital outputs.
 - 4) 4 × Analogue outputs.

3.6.3.5 Diesel Generator Control Panel Indications

- a) As a minimum, the following indications are available locally on the DG control panel HMI:
- 1) Control system in remote mode.
 - 2) Control system in local.
 - 3) DG control system healthy.
 - 4) Diesel engine ready to accept load.
 - 5) Main DC supply healthy.
 - 6) Backup DC supply healthy (if required).
 - 7) Generating kVAr (kilovolts-ampere reactive), kW (kilowatt), Volts, Frequency and Amps are displayed on digital instruments.
 - 8) Starter battery charger voltage and current.
 - 9) Engine running hours.
 - 10) Fuel level.
 - 11) Engine temperature.
 - 12) Oil pressure.

3.6.3.6 Diesel Generator Annunciator Alarms (if required in the AB Schedules)



a) The following alarms are available on the local DG annunciator:

- 1) Diesel engine start failure.
- 2) Low engine oil pressure.
- 3) Low radiator water level.
- 4) Engine over speed.
- 5) Engine air flaps closed.
- 6) Emergency stop activated.
- 7) Generator field breaker tripped.
- 8) Fuel tank < 5%.
- 9) Fuel tank < 15%.
- 10) Fuel tank > 105%.
- 11) Fuel tank rupture alarm.
- 12) Fire alarm.
- 13) Protection trip.
- 14) High engine temperature.
- 15) Low engine temperature.
- 16) High bearing temperature.
- 17) Stator temperature.
- 18) Under frequency.
- 19) Abnormal voltage.
- 20) Low starter battery voltage.
- 21) Charger fail.
- 22) Auxiliary supply fail.
- 23) Fuel transfer scheme failure.
- 24) Synch Failure.
- 25) DC failure.
- 26) Moulded Case Circuit-breaker (MCCB) tripped.

b) The following alarms will be repeated for input into the Remote-Control System (i.e DCS):

- 1) Engine protection tripped alarm.
- 2) Engine protection delayed time before trip will occur alarm.
- 3) Engine protection alarm.

3.6.3.7 Safety features

a) The following safety features shall be available:



- 1) A continuously rated, fail-safe engine stop solenoid used to control the fuel injection system.
- 2) An emergency stop push button on the diesel engine.
- 3) An emergency stop push button on the control panel.
- 4) Remote emergency shutdown capability.
- 5) Over speed protection.
- 6) Fully automatic mode with very little human interaction during power restoration after a blackout.
- 7) The DG controller will ensure that an engine will only shut down after running at no load for the engine manufacturer's recommended time period. This no load run is necessary to cool down the turbo chargers properly. However, using the emergency shutdown function will stop the machine immediately. Using the manual key switch function will also override the no load run function.

3.6.3.8 Control System Functionality

- a) Emergency stop: An emergency stop push-button shall be provided both on the engine and on the control panel. These push buttons shall be of the self-latching, twist-to-release type, red in colour, and at least 25 mm in diameter. Directly above each push-button, there shall be a red label indicating the function of the push-button. The button shall open the DG main breaker and shut the diesel engine down by cutting the fuel.
- b) Automatic Voltage Regulator (AVR): The AVR shall control the generator output voltage by three- phase sensing. When operating in either the asynchronous or in the synchronous mode, the AVR' shall operate accordingly.
- c) Control functions: Refer to the Employer's Specification for Works for the required control philosophy.

3.6.3.9 Alarms and Indications

- a) Each alarm shall register and maintain the alarm indication until manually cancelled, even if the signal that initiated the alarm has ceased.
- b) Each alarm shall be displayed in the front of the alarm panel by an indicating lamp, LED, or Liquid Crystal Display (LCD).
- c) A common 'Alarm Reset' push-button shall be provided to restore the control circuit to its original state once the alarm conditions have been noted and rectified.
- d) All alarm lamps or LEDs shall have a Lamp Test facility to test whether they are operational; this facility shall be operated by a single push-button.
- e) Each alarm shall be duplicated at a potential-free changeover contact. Both positions (three wires) shall be wired to outgoing terminals. Archiving/logging of alarms shall be kept.

3.6.3.10 Assemblies, Terminals, Wiring and Cabling

- a) LV Switchgear and control gear assemblies and associated equipment shall be in accordance



with

[18] 240-56227516 and [20] 32-333.

- b) [17] SANS 10142 shall be used as a minimum for Distribution boards.
- c) External wiring for low voltage control, interlocking, alarm, measuring, and DC circuits shall terminate on numbered wiring terminals that comply with the requirements of [16] SANS 60947-7- 1.
- d) Unless otherwise agreed upon, all terminals shall be marked in accordance with [14] SANS 60034-8. The position of the supplier terminal boxes, if of importance, shall be as specified.
- e) Where heat-generating equipment is present and the internal temperature is likely to exceed 50 °C, heat-resistant insulation (silicon wire) shall be used on stranded conductors. The supplier shall state where such insulation is used.

3.6.4 Auxiliaries

3.6.4.1 Cooling

- a) The engine shall be cooled by a pressurized radiator and shall be entirely self-contained. The radiator shall be filled with anti-freeze.
- b) Unless otherwise specified, fans of engines that are installed in an engine room shall draw air through the room and exhaust it externally. The method of driving the radiator fan (i.e. whether it is driven by electric motor or mechanical coupling to the engine) is listed in Schedule A. Electric motors will only be used for remote radiators and should be avoided where possible.
- c) A heating element operating at either U_{AC} 230 V single-phase, or U_{AC} 400 V three-phase shall be fitted in the engine water jacket to maintain the engine at a temperature suitable for cold starting. It is a requirement that these jacket water heaters can be isolated individually for heating element change out without draining the complete engine coolant capacity.
- d) The element terminals shall be brought out separately, such that both terminals of each heater element are available externally. The element wiring shall be terminated on a separate external terminal strip. The circuit shall be wired independently to ensure that a heater element failure will not affect the DG control system. The power to the heater element shall be thermostatically controlled to adequately regulate the engine temperature. An alarm shall be issued if the engine temperature drops below the minimum temperature specified by the supplier.

3.6.4.2 Starting

- a) The starting method shall be specified in Schedule A.
- b) For electric motor starter, on initiation of the start command, the engine starter shall make five consecutive start attempts. Depending on the application, the required start philosophy will be as follows and indicated by the Employer's Engineer in Schedule A:
 - 1) Start Initiation 1: maximum duration of 10 s each, with rest periods of not more than



10 s between attempts (Generation Division only).

- 2) Start Initiation 2: maximum duration of 8 s each, with rest periods of not less than 10 s between attempts.
- c) If the fifth start attempt is unsuccessful, the indication 'Start Failure' (red) shall be activated on the control panel.

3.6.4.3 Batteries

- a) The type of batteries to be used shall be specified in Schedule A.
- b) Batteries shall be rated for the voltage and currents of the starting motors and the control equipment, and for the time requirements of the alarm system specified. Details of the batteries offered shall be provided.
- c) The starting battery discharge capacity at 25 °C shall be such that the full cranking current can be drawn for 30 s, and that the final discharge voltage does not fall below the value as specified in [9] SANS 1632.
- d) During engine operation, the starter battery shall be charged from a charging generator. The battery charger shall take over battery charging when the charging generator fails or if the engine is shutdown.
- e) The battery shall be mounted separately from the vibrating part of the set, preferably in a clean and cool environment.
- f) The battery mounting shall be protected against corrosion, and shall include a spill tray and a transparent cover over the battery.
- g) A removable link system between battery and starters, whereby it is safe to isolate the engine for maintenance, yet have the charger and controller still energized shall be installed. The starter battery mounting shall be as close as possible to the starter motor and shall be arranged in a position permitting easy access for maintenance.

3.6.5 Battery Charger

- a) Equipment shall be provided in the control panel for charging the starter battery from the Employer's Engineer's U_{AC} 230 V or U_{AC} 400 V system.
- b) Battery chargers shall comply with the requirements of [10] SANS 1652, and shall be of the constant voltage, current limited type.
- c) The performance characteristics of battery chargers shall comply with the recommendations of the battery manufacturer.
- d) There shall be a separate charger for each battery/starter system if specified in Schedule A.

3.6.5.1 Fuel System

- a) Each Generator Set shall be equipped with a day tank or base tank as specified in Schedule A and the required accessories such as pumps, valves, and piping to supply the DG Set with



fuel, when running at full load for duration as specified in Schedule A.

- b) The fuel system design and installation shall comply with the requirements of the local authority, e.g. fire department, and of the latest OHSA standards.
- c) Galvanized materials or materials that contain zinc, copper, brass shall not be used in the fuel system for piping, valves, etc.
- d) To filter the input fuel to the DG, a water and fuel separator shall be fitted before the engine supply pump.
- e) The fuel/water separator device shall be installed between the fire shut-off valve and the engine fuel pump.
- f) The water fuel water filter drain shall be connected to an external outlet.
- g) A water level alarm system shall be provided to monitor the water level in the water fuel separator.
- h) The alarm system shall have a 'water in fuel' alarm.

3.6.5.2 Fuel Injection

- a) The engine shall be equipped with a means of priming the fuel system to the injectors following long engine shutdown times.
- b) If the fuel serves as 'injector cooling', the supplier shall provide adequate cooling to the fuel supply system to avoid increases in day tank temperature.
- c) A continuously rated fail-safe engine-stop solenoid shall be provided on the fuel pump supply line.
- d) The main fuel line shall be equipped with a fire-resistant shutdown valve, operated by a fusible link or similar type fire detector that closes off the main fuel supply line and 'spill' return line between the tank and diesel in the event of a fire.

3.6.5.3 Day Fuel Tank (if applicable)

- a) Each engine shall be equipped with its own day fuel tank installed next to the generator.
- b) The supplier shall construct and install the day tank in accordance with [12] SANS 10089 parts 1 to 3.
- c) The capacity of the day fuel tank shall be a minimum of 2 h continuous operation at full load unless specified differently in Schedule A.
- d) The day tank shall be of double wall construction unless specified differently in Schedule A and shall have a leak detection sensor in the interstitial space.
- e) Alarm sensors shall be furnished for high fuel, low fuel, and critical low fuel.
- f) Alarm contacts from these fuel sensors shall be connected to the engine control system for local alarm indication. In addition, single-pole double-throw contacts from each alarm sensor shall be connected to terminal blocks in the engine control panel for the Employer's Engineer's use.



- g) The top of the day tank shall be such as to allow for gravity feed from the bulk storage tank.
- h) The day fuel tank shall have a sloping bottom with a drain valve at the lowest point of the tank. The slope shall be 1:20 towards the drain valve.
- i) The intake to the fuel delivery pipe to the engine shall be located at a level that is equal to a position representing at least 2% of the total tank capacity. A manual shut-off valve (no copper or brass) shall be fitted in this pipe.
- j) The overflow pipe shall be twice the diameter of the filler pipe and shall be so positioned that the overflow can occur only when the tank is 98% full. The overflow pipe shall be connected to the bulk storage tank.
- k) A filler pipe shall be provided and shall preferably pass through the tank top.
- l) A removable hand hole with an inspection cover shall be provided in the top of the day tank, for maintenance purposes. The cover shall have a gasket and be provided with a locking facility.
- m) The capacity of the fuel tank shall be limited to 1 000 l. No farm tank shall be used for fuel storage.
- n) The fuel supply line shall be fitted with a fire valve. For this purpose, a suitably designed fused-link system shall be provided to cut off the fuel to the engine in the event of fire.

3.6.5.4 Diesel Fuel

The fuel injection equipment offered shall use diesel fuel that complies with the requirements of [6] SANS 342.

3.6.5.5 Lubrication

- a) The engine shall be supplied with a force-feed lubrication system rated to supply the circulating lubrication oil to all the bearings, gear trains and other moving parts.
- b) An oil pressure gauge (if required) and an oil pressure sensor and switch shall be so mounted downstream of the oil filter that the engine lubricating oil pressure is readily indicated on the engine or on the control panel (or on both), as specified. The safety range and the danger zones shall be indicated on the gauge.
- c) The oil pressure sensor shall be connected to the control system, to give an alarm and to stop the engine if low oil pressure occurs.
- d) The oil filter shall have adequate capacity of at least 250 h continuous operation.
- e) Where duplex oil filters are installed, it shall be possible to switch from one filter to the other while the engine is running.
- f) Oil filters shall be readily accessible.
- g) All bearings and continuously rotating moving parts that are not pressure lubricated shall be fitted with sealed ball, roller, or needle bearings.
- h) If so, specified in Schedule A, a lubrication oil make-up tank shall be supplied. The make-up oil shall be gravity fed into the engine sump.



- i) If so, specified in Schedule A, a semi-rotary hand-operated sump drain pump shall be fitted, and so positioned as to facilitate oil drainage during oil change servicing.
- j) If a motor-driven lubricating oil priming pump is provided, this shall be stated in Schedule A. The supplier shall also indicate if this is a prerequisite for engine pre-lubing, and should no oil gallery pressure be successfully achieved, any engines starting shall be aborted.
- k) A label indicating the grade of oil to use the frequency of oil changes and the volume of oil shall be affixed to the engine. The use of multigrade oils is preferred against monograde oils.
- l) Any need for separate oil cooler or auxiliary oil heater or both for cold starting shall be stated in Schedule A together with the power requirements for any auxiliary oil heater.
- m) The crank case breather shall be extended/ routed beyond the radiator system where vapours can be discharged within the hot airflow.

3.6.5.6 Aspiration and Cooling Air Intake

- a) The engine air filter shall be dry type as appropriate for the site conditions.
- b) The air intake shall be so mounted that the intake of dust or other particles is minimized.
- c) The air intake shall be screened to prevent vermin or birds from entering the intake.
- d) If water has entered the intake, it shall be possible to drain the water from a low-lying collection point.
- e) The air filter construction shall be such that the filter element can be readily cleaned or replaced.
- f) If so, specified in Schedule A, a 'differential pressure high' switch shall be provided to indicate a dirty filter element condition.
- g) The air intake shall be positioned such that the intake of exhaust gasses or radiated heat is avoided.

3.6.6 Earthing

3.6.6.1 General

- a) Earthing shall be provided to meet the system protection and safety requirements for the DG Set power circuits. The minimum earth fault current dictates the generator protection settings for correct operation.
- b) The maximum earth fault current and its duration determine the cross-sectional area of the earth conductors to be used.
- c) Independent earthing is required to eliminate electromagnetic disturbances in control circuitry, and to prevent mechanical damage to the shaft and bearings in the set, caused by induced and stray currents.
- d) Provision shall be made by the supplier to enable the earthing of the plant.
- e) The supplier shall provide details of its specific earthing system requirements, philosophy,



etc. The system shall be suitable for the a movable unit.

3.6.6.2 Generator Neutral Earthing

- a) Neutral earthing implies interconnection of the generator's neutral and the Employer's Engineer's power system's neutral, which is generally earthed.
- b) Multiple earth connections can cause neutral circulating currents between parallel systems. Care shall be taken to avoid this phenomenon and the consequent unnecessary operation of the protection.
- c) The neutral earthing method employed shall be in accordance with [11] SANS 8528 and will depend on the existing site earthing philosophy, DG mode of operation and level of protection required. The Employer's Engineer shall specify the neutral earthing method in Schedule A.
- d) The neutral connector shall be able to carry the full earth-fault current of the generator.
- e) The supplier shall provide protection of the generator against internal earth faults, and details of such protection shall also be supplied.

3.6.6.3 Earth and Bonding of Components

- a) Each main component of equipment shall be earthed direct to a solid copper earth bar, which shall be connected to the Employer's earth system at a point as specified.
- b) As a rule, the earth continuity conductor shall be of a nominal cross-sectional area at least half that of the largest phase conductor, but not more than 70 mm².
- c) Earth conductors may be bare copper, insulated copper, aluminium or an anti-theft copper/steel compound unless specifically stated in Schedule A. Where aluminium is used as an earth conductor, bimetal connections shall be used between different materials, and these cannot be installed underground.
- d) On batteries and battery chargers, the negative pole shall be earthed to the frame of the set unless specified differently.
- e) The frame of the DG Set shall be flexibly earthed to the earth continuity conductor with due regard to the magnitude and duration of possible local earth faults.
- f) Electrolytic corrosion shall be avoided. A suitable earthing facility shall be provided on the frame. If so recommended, bypass earthing of insulated bearings shall be carried out by means of an earthed brush, to prevent damage caused by induced shaft currents.
- g) Tanks shall have an earthing facility provided on the tank, for connection of an earth conductor between the tank and the frame of the set.
- h) Junction boxes shall be fitted with an earth terminal. The earthing conductor shall be of suitable cross-sectional area to withstand any earth fault currents.
- i) Junction boxes enclosures shall be rated IP54 as per [15] SANS 60529, unless specified otherwise in Schedule A.

3.6.6.4 Enclosures



- a) Enclosures shall be rated IP65 as per [15] SANS 60529, unless specified otherwise in [15] SANS 60529. Colour shall be as specified in [15] SANS 60529.
- b) Enclosures shall be constructed of minimum 3CR12 material and powder coated to colour as per the Employer's Engineer's requirements.
- c) Enclosure doors shall be positively drawn and closed onto seals by means of pad-lockable lever-operated catches. Cable entry shall be from the bottom using removable gland plates.
- d) Enclosures containing a rectifier and/or inverter shall be fitted with removable filters that prevent the ingress of dust. The airflow to air-cooled components shall be arranged to promote cross ventilation, and such that it cannot be impeded accidentally in any way.
- e) A stud shall be provided for earth connections from inside and outside the enclosure. Where studs are not welded to the plate, flat washers shall be used as the final mating surface in the case of a conductive gland plate. A bolt and nut arrangement may also be used.
- f) Where the plate is coated with non-conductive covering, studs shall be welded to the plate after the coating is removed.
- g) An earth bar shall be provided. The earth bar shall be connected to the earth stud inside the enclosure by the shortest possible path. All earth connections shall follow the shortest path, and no 'pigtailes' (wire coils for neatening purposes) are permissible.
- h) The connection between the earth stud and the earth bar shall be made using a suitability sized conductor and shall be appropriately lugged for the purpose.
- i) Gland plates shall be fabricated from a conductive material and shall be protectively coated against corrosion using a conductive coating, such as cadmium.
- j) The gland plate shall be bolted to the enclosure in at least four places, in such a manner as to ensure galvanic continuity between the plate and the enclosure is ensued.
- k) Doors shall be bonded to the enclosure using earth studs.
- l) Doors > 0,5 m in length shall be bonded in at least two different locations, with 0,5 m spacing between each bond.
- m) Bonds shall be made using braided copper strapping ≥ 10 mm wide and having a width to thickness ratio > 5:1. (larger machines).

Commented [SN1]: Consider increasing this to IP65 since it is externally located with sensitive equipment. As a minimum least for the controls and switching compartments.

3.6.7 Mechanical Build

3.6.7.1 Coupling

- a) The generator and engine may be coupled directly with a flange adapter ring or a bell housing within which a shock absorbing flexible coupling is fitted. The method shall be fully described by the supplier.
- b) In the case of large DG Sets, the generator and engine may be coupled directly.
- c) If the generator is offered with double bearings, it shall be coupled to the engine with a flexible coupling designed to take up any angular misalignment, and to transmit the drive



torque smoothly.

3.6.7.2 Base Frames

- a) DG Sets shall be mounted on a simplex frame.
- b) The overall dimensions of the frame shall be provided.
- c) Lifting provisions on the base shall be provided to lift the complete set, including any canopy or enclosure, if fitted. Lifting provisions are to be clearly marked. Lifting eyes not suitable for complete lifting shall be indicated as such.
- d) The maximum overall mass of the DG Set (including oil) and its frame shall be provided. This is required to ensure suitable rated equipment to lift the complete set, without decoupling.
- e) The base shall be so constructed as to allow for an integrated base tank, oil drip tray, and to allow space for draining the engine oil from the sump.

3.6.7.3 Vibration damping

- a) The system shall comply with the requirements of [11] SANS 8528.
- b) Vibration damping mounting details shall be provided.

3.6.7.4 Exhaust System

- a) The exhaust line diameter shall be adequate for the length of the exhaust line.
- b) The exhaust shall have an effective silencer that reduces the noise level to not more than that allowed by local noise regulations.
- c) The exhaust system shall have a low-lying collection point provided with a drain plug, to enable any condensation to be removed.
- d) Exhaust gases shall be released at a location that complies with the local and national regulations and shall not be drawn into the engine or ventilation intake again.
- e) The position of the exhaust shall not hinder operation and maintenance.
- f) The exhaust pipe shall be so arranged as to prevent the ingress of rain and bird nesting.
- g) Emission levels and noise levels shall be as defined in Schedule A. The maximum will be 90 dB.
- h) The exhaust system, with the exception of expansion bellows and flexible joints, shall be constructed from aluminized steel.
- i) The external (from the building) exhaust system shall be manufactured from (316) stainless steel.
- j) Expansion bellows shall be fabricated from stainless steel and shall be of the type, length and diameter recommended by the supplier.
- k) Leak-tight flexible joints shall allow for expansion and contraction without straining the system.
- l) No welding shall be done on the exhaust system.
- m) Adequate lagging, of non-asbestos material, shall be provided. The type of lagging and the



thermal capabilities of the lagging offered shall be provided in Schedule A. As a minimum, the lagging shall be rated 400 °C fiberglass material or other suitable material.

- n) Expansion bellows shall not be lagged. Flexible joints shall be lagged.
- o) The piping outside the Plant room shall not be lagged. Non-lagged piping shall be corrosion protected with a heat-resistant paint.
- p) Exhaust lagging shall be protected by means of metal cladding/cowling if specified in Schedule A.
- q) Safety guards to prevent accidental contact shall be provided over all exposed exhaust pipes and bellows.
- r) Suitable flexibility shall be built into the system to isolate the exhaust system from the structure, and to prevent any stresses on the engine flanges. Relative movement of the engine and surrounding structure shall be considered.
- s) Hangers, supports and guides shall be designed to allow for expansion and contraction, and to allow necessary access to the set.
- t) All metal and surface preparation, painting and coating processes shall comply with the requirements of [19].
- u) Before lagging, all silencers, fittings, etc. shall be painted with heat-resistant, aluminium/zinc- based, high-temperature paints.
- v) Exhaust outlets shall either be fitted with a weight-operated rain flap; or, if exiting in a horizontal direction, fitted with a 'bird screen' and appropriately cut at an angle that does not allow rain water to enter the opening.
- w) Exhaust cowling/cladding shall be manufactured from (316) stainless steel sheet as a minimum.
- x) Rubber hoses and belts shall not be painted.

3.6.7.5 Fire Protection

- a) A fire risk analysis shall be performed to determine suitability to the required solution.
- b) Fire protection and detection shall be provided by others if required.

3.6.7.6 Outdoor Canopy (if required)

- a) Refer to Schedule A for whether an outdoor canopy is required. If required, the canopy will comply with the following:
 - 1) The canopy shall be sized for the required generator.
 - 2) The canopy shall be constructed from minimum 3CR12 and epoxy powder coated for a coastal environment.

3.6.7.7 Acoustic Canopy (if required)

Under special conditions, an indoor acoustic canopy may be required to reduce the acoustic noise level. The requirement will be specified in Schedule A.



3.6.7.8 Control Panel

- a) The control panel shall:
 - 1) be vermin-proof.
 - 2) have 20% of component mounting space and wire ways available for future additions.
 - 3) include 'closed cell' neoprene seals throughout to ensure that foreign objects, such as dust and moisture, do not ingress into the enclosure.
 - 4) have an easy means of access to the underside of the gland plates from above floor level.
 - 5) have removable, cadmium-plated, hot-dip galvanized or white painted, steel equipment- mounting panels or chassis, of thickness at least 2 mm.
 - 6) include suitable rigging facilities (eyebolts, lifting brackets, etc.) if required. There shall be no protrusions beyond the bounds of the cubicles.
 - 7) have sufficiently large doors, stiffened if necessary, to permit easy and complete access to the interior.
- b) In addition, the doors shall have:
 - 1) one pad-lockable locking mechanism on doors of height < 600 mm.
 - 2) two pad-lockable locking mechanisms on doors of height in the range 600 mm to 1 200 mm.
 - 3) three lockable mechanisms in doors of height > 1 200 mm, one of which is pad lockable.
 - 4) keepers, if necessary, to keep the door open
 - 5) corrosion-resistant hinges and handles; and
 - 6) removable, undrilled, cadmium-plated or hot-dip galvanized steel gland plates of thickness at least 2 mm.
- c) Individual component labelling shall be placed on the backing plate.
- d) The engine control panel can be mounted to the base frame if additional anti-vibration bolts are used, all components are securely fixed and suitably rated for the vibrations.
- e) Alternatively, the control panel can be mounted separately using 'anti-vibration' fix on the concrete floor to ensure that engine vibrations do not cause unnecessary vibration of the components mounted within the engine.
- f) All relays shall be adequately secured to prevent the relay base from falling out during vibrations.
- g) The wiring between the control panel and the engine-mounted devices shall be resistant to temperature.
- h) Components shall be mounted in the compartments on the equipment mounting plates or chassis, using bolts screwed into tapped holes, or hank nuts that engage at least three full threads.
- i) A DIN mounting rail shall be fixed to the mounting plate or chassis in a similar manner.



- j) Self-tapping screws or bolts with loose nuts shall not be used.
- k) Components shall be spaced at least 10 mm apart when components are dissimilar or intended for flush mounting on front doors and covers.
- l) Equipment manufactured for surface mounting shall not be modified for flush mounting and shall be labelled exactly in accordance with the drawing or the wiring diagram.
- m) Fuse bases shall be labelled with the rating of the fuse link that should be fitted into them.
- n) Control transformers shall:
 - 1) Be double-wound isolating transformers with an earth screen between the primary and secondary windings; rated Class 1; and not exceed the burden.
 - 2) Have one leg of the secondary winding earthed.
 - 3) Include at least 25% spare output capacity.
- o) Wiring in the assemblies shall be:
 - 1) Run in covered wire duct that is filled to not more than 80% of its capacity.
 - 2) Protected against chafing, with grommets, where it passes through the panel work.
 - 3) Loomed with spiral wrap or alternative protection, and arranged for minimal twisting rather than a bending action where it crosses door hinges and other areas that can move relative to one another.
 - 4) Thermoplastic-insulated or thermosetting-insulated, stranded copper wire. Solid conductors shall not be used.
 - 5) Of cross-sectional area at least 1,5 mm², except for current transformer circuits, where it shall be at least 2,5 mm² and shall be 600 V/1 000 V grade in accordance with [8] SANS 1507.
 - 6) Identified at each end with an indelibly marked, interlocking, slip-on identification ferrule. The number on the ferrule shall be shown on the wiring diagram; adhesive wrap-on type ferrules shall not be used.
 - 7) Terminated at each end with pre-insulated crimp lugs. Lugs shall be crimped on with ratchet type crimping tools that do not release until the crimp is complete.
 - 8) Colour-coded in accordance with [18] 240-56227516.
 - 9) Free from joints or splices.
- p) All terminals shall, as far as possible, be at the front of the control panel, and shall be accessible without it being necessary to disturb wiring or remove components.
- q) All metalwork, including the cabinet, shall be electrically bonded to the earth connection with a conductor of suitable cross-section.

3.7 Marking, Labelling and Packaging

3.7.1 General

A metal file holder or box shall be provided and attached at a suitable location for the purpose of



3.7.2 Marking

- a) All water pipes for external cooling circuits shall be clearly and permanently marked at all connection points to indicate the direction of flow.
- b) All drain plugs shall be clearly marked with an identifying colour in accordance with [13] SANS 10140 parts 1 to 3.
- c) Fuel pipes and taps to be clearly marked and labelled.
- d) Battery and DC circuit terminals shall be clearly marked to indicate their polarity.
- e) All timers shall be marked or labelled to indicate their time control range.
- f) Earth connections shall be labelled with a standard earth symbol in black on a yellow background.

3.7.3 Labelling

3.7.3.1 Labels

- a) Labels shall be in English.
- b) Labels shall be indelibly and permanently marked and shall be securely attached to the equipment.
- c) A label indicating the grade of oil shall be attached to the diesel engine.
- d) All printed-circuit cards shall be clearly identified.
- e) All instruments shall be clearly labelled to indicate their function, and all alarm indicators shall be clearly labelled to indicate the alarm they represent.
- f) Statutory labels required to be attached to building doors, etc. shall be provided and fitted when applicable.
- g) Labels that have red letters on a white background, the lettering being of height at least 10 mm, shall be affixed to all places where danger can exist owing to automatic start-up. The text on these labels shall be in accordance with 3:

Table 3: Danger label

DANGER THIS MACHINE SHALL START WITHOUT NOTICE. BEFORE WORKING ON THE MACHINE, LOCK THE CONTROL SWITCH ON THE CONTROL PANEL IN THE OFF POSITION



- h) A label shall be attached adjacent to each terminal to indicate its function and designation in accordance with the relevant circuit diagram.
- i) A graphic diagram with an electric flash in accordance with type designation WW7 of [7] SANS 1186, and a label indicating the voltage shall be placed near all mains terminals.
- j) Labels may be engraved on sandwich plastic material that is suitable for tropical outdoor use.
- k) Warning and danger labels shall be in red on a white background.
- l) Information and instruction labels shall be in black on a white background.
- m) Devices fitted to the set shall be labelled in accordance with the relevant circuit diagram.
- n) Components shall not be labelled on the component, but on the chassis or printed circuit board adjacent to the component.
- o) Electronic modules shall be labelled to identify them, and the rear connectors shall be keyed to prevent incorrect positioning.

3.7.3.2 Rating Plates

- a) All major items of plant shall be provided with corrosion-resistant rating plates that comply with the requirements of the South African National Standards (SANS).
- b) The following details shall be clearly, legibly, and indelibly marked on the plates:
 - 1) manufacturer's name
 - 2) manufacturer's type number
 - 3) manufacturer's serial number
 - 4) year of manufacture
 - 5) rated engine speed, power, operating altitude
 - 6) voltage, power factor, frequency, etc.
 - 7) short-time withstand current, in kilo-amperes (kA), for the maximum time, in seconds
 - 8) performance class
 - 9) load acceptance
 - 10) type of fuel used
- c) Rating plates shall be permanently fixed in a prominent position on the equipment.

3.7.4 LOAD BANK (DUMMY LOAD)

- a) Load bank to be supplied to enable periodic testing, ALSO allow for built-in capability of feeding our local grid through the synchroniser controller and motorised autochangeover during routine tests if the load present on the local grid is large enough/sufficient for the test. It is pointless wasting diesel testing a 1MVA genset if we can use the electricity on our local grid.

Commented [SN2]: Include for a Load bank to be supplied to enable periodic testing, but ALSO include for built-in capability of feeding our local grid through the synchroniser controller and motorised autochangeover during routine tests if the load present on the local grid is large enough/sufficient for the test. It is pointless wasting diesel testing a 1MVA genset if we can use the electricity on our local grid.



3.7.5 Packaging and Shipping

- b) The system shall be suitable packed to prevent damage to the system or any components during transportation to site, and to allow for outdoor storage on site before installation.
- c) The DG System may be shipped as a unit or dismantled (shipped as a unit as far as practically possible).

4. Tests

4.1 Responsibility for Testing

- a) The supplier shall be responsible for all tests.
- b) Test shall be performed and certified in accordance with [11] SANS 8528-6 and this section of the standard.
- c) As a minimum, the International Organization for Standardization (ISO) standard functional tests (as specified in [11] SANS 8528-6) and the tests specified in sections 4.1.48-4.1.51 shall be performed.
- d) Additional ISO standard acceptance tests to be performed shall be specified in Schedule A.

4.2 Type Tests

- a) Type tests shall either be performed after the first unit has been completed, or the results of type tests on identical equipment shall be submitted with the tender documents.
- b) In the former case, the Engineer shall be a witness to the tests, and shall certify the plant if it passes all the tests to his/her satisfaction. The tests shall be in accordance with [11] SANS 8528.

4.3 Insulation Resistance Testing

- a) An insulation resistance test shall be applied to all circuits that do not contain components such as semiconductor devices, electronic modules and printed-circuit cards.
- b) Printed-circuit cards shall be removed from the connectors prior to testing of circuits.
- c) This test shall be performed in an atmosphere where the relative humidity is not higher than 85%, and shall consist of the following:
 - 1) a test voltage of 2 kV (rms) applied for 1 min for all AC circuits below 1 000 V, between the conductors and any earthed components.
 - 2) a DC test voltage of 500 V applied for 2 min between two separate circuits, using a 500 V resistance tester. The resistance recorded shall exceed 50 MΩ.
 - 3) a test voltage as in (b) above, but between all circuits connected together and the frame.
 - 4) a test voltage of 1 kV (rms) applied for 1 min to all DC circuits.

4.4 Factory Acceptance Tests



- a) As a minimum, the following Factory Acceptance Tests (FATs) shall be performed:
 - 1) A full functional test of all control and operating systems.
 - 2) A full load test, at the rated kilovolt-ampere (kVA) of the generator, for a period of at least 8 hours.
- b) The full load test should be followed immediately by any overload capacity test as specified. During this test, the following shall be recorded at 10 min intervals:
 - 1) engine temperature
 - 2) engine oil pressure
 - 3) generator voltage
 - 4) generator frequency
 - 5) generator current
- c) The DG shall be capable of performing a single load step equal $\geq 50\%$ of the continuous kilowatt (kW) rating of the machine while remaining within operating limits.
- d) The DG shall be capable of performing a single load step equal to 110% of the most severe single step load in the plant design profile. The DG shall accept the load without voltage collapse or engine stalling and recover to normal operating speed. The supplier shall document the voltage and frequency deviation observed.
- e) The supplier shall provide the Employer's Engineer with copies of the following:
 - 1) The engine manufacturer's test results, clearly indicating the specified performance.
 - 2) The generator manufacturer's test results, clearly indicating the specified performance.
 - 3) A pressure test of the air receiver of the compressed-air starter system.
 - 4) A pressure and functional test of the air valves included in the compressed-air starter system.
- f) The supplier shall perform a simulated function test of the control panel.
- g) Test results shall indicate that the performance at the specified site altitude meets the requirements of [3] ISO 3046.

4.5 Site Acceptance Tests

- a) On completion of the installation, the following Site Acceptance Tests (SATs) shall be performed:
 - 1) A full Functional test and Acceptance test of all control and operating conditions.
 - 2) A load test utilizing the available site load and under the load parameters given, for a period of at least 1 hour (if practically possible).
- b) During the load test, the following shall be recorded at 10 min intervals:
 - 1) engine temperature
 - 2) engine oil pressure



- 3) generator voltage
 - 4) generator frequency
 - 5) generator current
- c) The load test shall be continued until it is established that the engine temperature is stable for at least 20 min.
- d) The equipment shall perform in accordance with the requirements as specified; and the noise produced by the engine/generator set shall comply with the noise levels as specified.
- e) The following tests shall then be performed:
- 1) Battery discharge test.
 - 2) Battery charger test.

5. Authorization

This document has been seen and accepted by:

Name and surname	Designation



Annex A – A/B Technical Schedules

NOTE: Schedule A: User requirements - Indicates typical requirements for Generation applications where S >1MVA. Change User requirement as per application.

Commented [SN3]: Check if Schedule A matches the requirements described in my prior comments

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.0	Qualification				
AB.0.1	Local Agent Representation required	Yes / No	Yes (Provide Details)		
AB.0.2	Number of Years local representative exists in South Africa	Years	Yes		
AB.0.3	Supply Reference list with installations (Projects), designs and MVA size (not less than 1000KVA) duration, location, contract persons	Yes / No	Yes		
AB.0.4	Compliance with SANS (ISO) 9001:2008 required	Yes/No	Yes		
AB.0.5	The Diesel Generators are to build in accordance with SANS 8528-All Parts	Yes/No	Yes		
AB.1	The Works				
AB.1.1	Supplier				
	Generator Set Output Characteristics (No transformer Required to achieve the output Voltage)	kVA/V			
AB.1.1	Number of Diesel Generator Sets required				
AB.1.2	Name of Diesel Generator Set Manufacturer (Local/ Foreign)				
AB.1.3	Factory Test	Yes / No	Yes		
AB.1.4	Install and Erect	Yes / No	Yes		



Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.1.5	Site test and Commission	Yes / No	Yes		
AB.1.6	Install Fire Protection System	Yes / No	No		
AB.1.6.1	Perform Fire Risk Analysis	Yes / No	Yes		
AB.1.7	Type Of Fire Protection System				
AB.1.8	Fire Protection Trigger system				
AB.1.9	Diesel Generator Set Components and Services required				
AB.1.9.1	Local Control Cubicle	Yes/No	Yes (One for each Diesel Generator)		
AB1.9.1.1	Local Control Panel contains AVR	Yes/No	Yes		
AB1.9.1.2	Local Control Panel contains Governor Controller	Yes/No	Yes		
AB1.9.1.3	Local Control Panel contains Interlocking Logic, Alarming, Tripping and Annunciation	Yes/No	Yes		
AB1.9.1.4	Controller Battery Chargers and Battery	Yes/No	Yes		
AB1.9.1.5	Synchronizing Equipment	Yes/No	Yes		
AB1.9.1.6	Interfaces with Remote Control System	Yes/No	Yes		
AB.1.9.2	Control wiring between Control Cubicle and Diesel Generator	Yes/No	Yes		
AB.1.9.3	Diesel Generator Engine	Yes/No	Yes		
AB.1.9.4	Generator	Yes/No	Yes		
AB.1.9.5	Diesel Bulk Tank	Yes/No	No		



Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.1.9.6	Diesel Day Tank	Yes/No	Yes		
AB.1.9.6.1	Maximum height from the finished floor to the top of Day Tank	m			
AB.1.9.7	Interlocking and Control cabling between Diesel Generator Control Panels	Yes/No	No		
AB.1.9.8	Control cabling between Diesel Generators and relevant Switchgear	Yes/No	No		
AB.1.9.9	First Fuel fill				
AB.1.9.9.1	Supply First Fuel Fill for Commissioning and Testing Purposes	Yes / No	Yes		
AB.1.9.9.2	First Fill Amount	liters			
AB.2	Contractor Facilities				
AB.2.1	Contractor to provide own cranes for off-loading equipment	Yes / No	Yes		
AB.2.2	Contractor to provide own jacks & other tools for off-loading	Yes / No	Yes		
AB.2.3	Height of Lift required	m			
AB.2.2	Contractor to provide own lifting equipment	Yes / No	Yes		
AB.3	Site Conditions:				
AB.3.1	Site Criteria	Marine/ Land Use			



Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
		Coastal/ Land Use Inland			
AB.3.2	Altitude above sea level	m			
AB.3.3	Ambient air temperatures:				
AB.3.3.1	Average Ambient Temperature	°C	25		
AB.3.3.2	Maximum Temperature	°C	42		
AB.3.3.3	Minimum Temperature	°C	0		
AB.3.4	External Vibration source		Normal		
AB.3.5	Radiation	Yes/No			
AB.3.6	Chemical Pollution	Yes/No			
AB.3.7	Dust Pollution		Normal to Medium		
AB.3.8	External Cooling Water Average Temperature				
AB.3.9	Humidity	%	30% to 80%		
AB.4	Generator Set Generic Requirements				
AB.4.1	Designed Operating Life	Years	20		
AB.4.2	Warranty of parts	Years	2		
AB.4.3	Application	Continuous Operation at Constant Load/ Continuous Operation at Varying Load/	Limited Time Operation at Varying Load		



Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
		Limited Time Operation at Constant Load/ Limited Time Operation at Varying Load/ Canopy sound attenuation requirement of less than 65dB at 1m distance.			
AB.4.4	Operation	Parallel/Single/ Parallel with Utility supply			
AB.4.5	Generator Set Class	G1/ G2/ G3/ G4	G3		
AB.4.6	Maximum (Starting) load increment which may be applied with the voltage and frequency maintained within the limits specified (load acceptance)	kW			
AB.4.7	Cold Start Time (To rated Speed)	s			
AB.4.8	Time from Rated speed to acceptance of Full Load	s			
AB.4.9	Time that the Generator Set can run at No Load	s			
AB.4.10	Start Up Classification	Long Break/ Short Break/ No Break			



AB.4.11	Installation Requirements	Inside (Indoors) Installation/ Outside Installation with	Inside (Indoors) Installation		
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Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
		Protection/ Open Air Installation			
AB.4.12	Installation Configuration	Fixed/ Transportable/ Mobile			
AB.4.13	Generating Set Configurations	A: without base frame/ B: with base frame/ C: with base frame, integrally mounted control gear, day tank, and auxiliaries/ D: configuration as given in C with enclosure/ E: configuration as given in C having an integral set of wheels or mounted on a trailer			
AB.4.14	Mounting Type	Ridged/ Fully Resilient Semi-Resilient/Resilient Foundation			
AB.4.15	Coupling Arrangement	rigid/ torsionally			



Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
		rigid/ flexible/ torsionally flexible or clutch			
AB.4.16	Maximum acoustic noise level in the Generator Room at specified distance	dBA	65		
		m	1		
AB.4.17	Generator set, terminal box and control panel	IP Rating	65		
AB.5	Generator-Set Routine Testing (Routine Load testing to ensure reliability of the Generator Set)				
AB.5.1	Required Generator-Set Test Frequency	Times per month			
AB.5.2	Testing Method	Synch with Main Supply/ Dummy resistor/ Load Unloaded	Synchronized with Main Supply (Automated)		Specify whether the testing method must be performed automatically
AB.5.3	Minimum Loading during routine Testing (if applicable). Preferred 70-80% load with bi-annually running at 100 and 110% loading	kW			
AB.5.4	Interval between major services				
AB.5.5	Interval between minor services				



AB.5.5.1	Oil change intervals of engine sump	Monthly/ hours run time, / or oil condition monitoring bases.			
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Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.6	Generator-Set Engine Details				
AB.6.1	Manufacturer of Engine and Turbo Charger / Supercharger				
AB.6.2	Type				
AB.6.3	Rated Speed	rpm			
AB.6.4	Idle Speed	rpm			
AB.6.5	Over Speed withstand capability	%	125		
AB.6.6	Critical Speeds	rpm	Shall not be above or below 25% of rated speed		
AB.6.7	Speed at point of stalling	rpm			
AB.6.8	Prime Mover Type	Compression-Ignition Engine/ Spark-Ignition Engine	Compression Ignition		
AB.6.9	Continuous Power Output (COP)	kW			
AB.6.10	Prime Power (PRP)	kW			
AB.6.11	Limited-Time Running Power (LTP)	kW			
AB.6.12	Emergency Standby Power (ESP)	kW			



AB.6.12	Overload capability (Two hours in any 24-hour period)	%	10		
AB.6.13	Additional governing power reserve*	%	10		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.6.14	Minimum Running Load of rated without adverse effect on the Prime Mover	%	30		
AB.6.15	Engine Power Output at Sea Level				
AB.6.16	Engine Output at maximum Engine capability				
AB.6.17	Maximum (Starting) permissible frequency deviation during sudden application of Load	%	According to SANS 8528-5		
		kW			
AB.6.18	Aspiration	Super Charged/ Turbo Charged/ Naturally Aspirated			
AB.6.19	Number and Arrangement of Cylinders				
AB.6.20	Bore and Stroke	Mm			
AB.6.21	Piston Displacement	Cubic meters			
AB.6.22	Compression Ratio				
AB.6.23	Piston speed at rated rpm	m/s			
AB.6.24	Lubricating oil consumption at rated output	l/kW			
AB.6.25	Delay between application of loads	s			



AB.6.26	Diesel Generator and auxiliary systems enclosures type	IP Rating	65		
AB.6.27	Diesel Generator and auxiliary systems enclosures colour	Colour			

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
*This additional percentage governing power is not the same as the overload power.					
AB.7	Generator-Set Engine Lubrication				
AB.7.1	Engine Lube Oil Storage capacity	l			
AB.7.2	Oil Flow Required to maintain the Recommended temperature difference between the engine inlet and outlet	l/s			
AB.7.3	Maximum Lube Oil temperature at Full Load Capacity	°C			
AB.7.4	Lube Oil sump Running Capacity	l			
AB.7.5	SAE rating and Type of Lube Oil				
AB.7.6	Number of Oil Filters				
AB.7.7	Oil Filter Type				
AB.7.8	Location of Oil Pressure sensor				
AB.7.9	Oil Temperature System Required	Yes/No	Yes		
AB.7.9.1	Sump breather pipe to be vented beyond radiator/outside of building to avoid vapours fouling up radiator	Yes/No	Yes		
AB.7.10	Lube Oil Pump				
AB.7.10.1	Engine Driven Lube Oil Pump required	Yes/No	Yes		
AB.7.10.2	Lube Oil Pump manufacturer				



AB.7.10.3	Lube Oil Pump Type				
AB.7.10.4	Lube Oil Pump Capacity				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.7.10.5	Electrical Standby Lube Oil Pump required	Yes/No	No		
AB.7.10.6	Standby Lube Oil Pump manufacturer				
AB.7.10.7	Standby Lube Oil Pump Type				
AB.7.10.8	Standby Lube Oil Pump Capacity				
AB.7.10.9	Motor Size	kW, rpm, Voltage			
AB.7.11	Lube Oil Cooler				
AB.7.11.1	Manufacturer				
AB.7.11.2	Heat Exchanger Type				
AB.7.11.3	Heat Exchanger Class				
AB.7.11.4	Duty at Rated Load	J/hour			
AB.7.11.5	Effective Heat transfer area	meters square			
AB.7.11.6	Temperature Into the Heat exchanger (Normal)	°C			
AB.7.11.7	Temperature out of the Heat exchanger (Normal)	°C			
AB.7.11.8	Temperature Into the Heat exchanger (Maximum)	°C			
AB.7.11.9	Temperature out of the Heat exchanger (Maximum)	°C			
AB.7.11.10	Design Pressure Drop	Pa			
AB.7.11.11	Design Velocity	m/s			



AB.7.11.12	Design Pressure Drop	Pa			
AB.7.11.13	Design Temperature	°C			
AB.7.11.14	Fouling Factor				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.8	Closed Cooling System				
AB.8.0	Cooling system designed for an ambient temperature of	°C			
AB.8.1	Engine driven Cooling pump Required	Yes/No	Yes		
AB.8.2	Cooling Pump Manufacturer				
AB.8.3	Cooling Pump Type				
AB.8.4	Cooling Pump Capacity	l/s			
AB.8.5	Standby Electric Motor Driven Pump required	Yes/No	No		
AB.8.6	Cooling Pump Type				
AB.8.7	Cooling Pump Capacity	l/s			
AB.8.8	Cooling Pump Motor size	kW, Rpm, V			
AB.8.9	Flow	l/s			
AB.8.10	Maximum water inlet temperature at full rated load	°C			
AB.8.11	Pressure drop through engine heaters and jackets	Pa			
AB.8.11.1	Coolant Temperature sensor required	Yes/No (Position)	Yes		
AB.8.12	Radiator				
AB.8.12.1	Radiator Manufacturer (Radiator must be OEM)	Yes/No	Yes		



AB.8.12.2	Radiator Mounting	Horizontal / Vertical	Vertical		
AB.8.12.3	Size (KW heat rejection)				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.8.12.4	Capacity	l/s			
AB.8.12.5	Cooling Fan drive (Engine driven is the preferred)	Engine/ Motor Driven	Engine		
AB.8.12.6	Fan(s) Make				
AB.8.12.7	Radiator(s) / Cooling Tower Fluid Type		Anti-Freeze		
AB.8.12.8	Radiator(s) / Cooling Tower Fluid Flow Rate	l/s			
AB.8.12.9	Radiator(s) / Cooling Tower Fluid temperature In Normal	°C			
AB.8.12.10	Radiator(s) / Cooling Tower Fluid temperature Out Normal	°C			
AB.8.12.11	Radiator(s) / Cooling Tower Fluid temperature In Maximum	°C			
AB.8.12.12	Radiator(s) / Cooling Tower Fluid temperature Out Maximum	°C			
AB.8.12.13	Radiator(s) / Cooling Tower Design Pressure Drop	Pa			
AB.8.12.14	Radiator(s) / Cooling Tower Design Temperature	°C			
AB.8.12.15	Fouling Factor				
AB.8.13	Coolant Pre-Heating System				



AB.8.13.1	Supply Coolant pre-heating System	Yes/No	Yes		
AB.8.13.2	Coolant Pre-Heating Type		Thermo-Static Heater		
AB.8.13.3	Coolant Pre-Heating control temperature	°C (switch on) / °C			

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
		(switch off)			
AB.8.13.4	Pre-Heating System Power Requirements	kW			
AB.8.13.5	Pre-Heating System Voltage	V	400V 3-phase or 230V 1-phase		
AB.8.13.6	Contractor to specify ideal pre-heating temperature.	Yes/No	Yes		
AB.9	Engine Air Intake				
AB.9.1	Airflow required per engine ventilation	cubic- meters/second			
AB.9.2	Air Filter Make and Model				
AB.9.3	Air Filter Type				
AB.9.4	Air Filter Size	(LxDxW)m			
AB.9.5	Silencer Make and Model				
AB.9.6	Maximum allowable pressure drop in intake piping				
AB.9.7	"Blocked" Filter indicator to be fitted	Yes/No			
AB.10	Exhaust System				



AB.10.1	Maximum Allowable Exhaust Pressure Drop	Pa			
AB.10.2	Lagging offered				
AB.10.3	Thermal Properties of Lagging Material offered				
AB.10.4	Silencer Make and Model				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.10.5	Silencer pressure drop at Rated Flow	Pa			
AB.10.6	Silencer Manufacturer				
AB.10.7	Silencer type & model				
AB.10.8	Silencer weight				
AB.10.9	Silencer noise reduction	dBA			
AB.10.10	Silencer and Exhaust piping material				
AB.10.11	Exhaust outlet flaps/screening to be detailed				
AB.10.12	Exhaust drains to be provided				
AB.11	Fuel System				
AB.11.1	Fuel Pump Drive	Engine/ Electric Motor	Engine		
AB.11.2	Fuel Pump Manufacturer				
AB.11.3	Fuel Pump Type and Model				
AB.11.4	Fuel Pump Capacity	l/s			
AB.11.5	Fuel Pump Motor size	kW, rpm, V			
AB.11.6	Standby Electrical Fuel Pump required	Yes/No	No		
AB.11.7	Standby Electrical Fuel Pump Manufacturer				



AB.11.8	Standby Electrical Fuel Pump Type and Model				
AB.11.9	Standby Electrical Fuel Pump Capacity				
AB.11.10	Standby Fuel Pump Motor Size	kW, rpm, V			

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.11.11	Engine Fuel Injection System Manufacturer				
AB.11.12	Engine Fuel Injection System Fuel Filters	Simplex/Duplex	Duplex		
AB.11.13	Fail Safe engine fuel cut-off solenoid required	Yes/No	Yes		
AB.11.14	Diesel Fuel Consumption				
AB.11.14.1	Fuel Consumption at Rated Load	l/kWh @ temperature			
AB.11.14.2	Fuel Consumption at ¾ Load	l/kWh @ temperature			
AB.11.14.3	Fuel Consumption at ½ Load	l/kWh @ temperature			
AB.11.14.4	Fuel Consumption at ¼ Load	l/kWh @ temperature			
AB.11.15	Fuel Storage				
AB.11.15.1	Number of Day Tanks Required Per Engine	number	1		
AB.11.15.2	Day Tank capacity for continuous operation for a single generator set at full load	hours	2		
AB.11.15.3	Percentage Fuel Spare capacity required	%	10		



AB.11.15.4	Day Tank Volume	Litres			
AB.11.15.5	Day Tank Dimensions	L x W x H			
AB.11.15.6	Double Walled Day Tank Required	Yes/No	Yes		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.12	Generator				
AB.12.1	Generator Type	Asynchronous/ Synchronous	Synchronous		
AB.12.2	Generator class		S1		
AB.12.3	Manufacturer				
AB.12.4	Type and Model				
AB.12.5	Number of Phases	Single or Three			
AB.12.6	Continuous Power Rating	kW			
AB.12.7	Overload capability (Two hours in any 24 hour period)	%	10		
AB.12.8	Power Factor	PF	0.8 to 1		
AB.12.9	Generator Amperes	A			
AB.12.10	Generator Terminal Voltage phase to phase at No Load	V			
AB.12.11	Generator Terminal Voltage at Full Load	V			
AB.12.12	Steady State Voltage Droop (0-110% of Full Load)	%			
AB.12.13	Maximum (Starting) permissible voltage drop during sudden application of Load	%	According to SANS 8528-5		
AB.12.14		kW			



AB.12.15	Basic Impulse withstand (BIL)	V	95000		
AB.12.16	Power Frequency withstand Voltage	kV rms	28		
AB.12.17	Generator Insulation Class		F or H		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.12.18	Generator Rotor Rated Speed	rpm			
AB.12.19.1	Generator Stator Temperature Rise	K	Limited to class 130 (B)		
AB.12.19.2	Rotor Insulation Class		F		
AB.12.19.3	Rotor Temperature Rise above Ambient	K	105		
AB.12.20	Generator Efficiency				
AB.12.20.1	Generator Efficiency at Full Load and 0.8PF	%			
AB.12.20.2	Generator Efficiency at ¾ Load and 0.8PF	%			
AB.12.20.3	Generator Efficiency at ½ Load and 0.8PF	%			
AB.12.20.4	Generator Efficiency at Full Load and 0.9PF	%			
AB.12.20.5	Generator Efficiency at ¾ Load and 0.9PF	%			
AB.12.20.6	Generator Efficiency at ½ Load and 0.9PF	%			
AB.12.20.7	Generator Space heater (Supply Voltage 400V or 230V)	Yes/No	Yes		
AB.12.21	Reactance Values expressed on rated kVA base				
AB.12.21.1	Direct Axis, synchronous, Xd				
AB.12.21.2	Quadrature axis synchronous, Xq				
AB.12.21.3	Direct Axis transient, X'd				

AB.12.21.4	Direct Access Sub transient Axed				
AB.12.21.5	Negative sequence, X2				
AB.12.21.6	Zero Sequence, X0				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.12.21.7	Armature reactance at 75 °C				
AB.12.21.8	X/R ratio				
AB.12.21.9	Generator Zero sequence capacitance				
AB.12.21.10	Generator Short Circuit Ratio				
AB.12.21.11	Generator cooling		Air Self ventilated		
AB.12.22					
AB.12.22.1	Direct axis transient, open circuit, T'do	s			
AB.12.22.2	Direct axis transient, short circuit, T'd	s			
AB.12.22.3	Direct axis Sub transient, short circuit, T''d	s			
AB.12.22.4	Synchronization coefficient	kW/T			
AB.12.22.5	Time required for the Generator Output voltage to return to normal following a three-phase short circuit, cleared within 100ms with the Generator at rated speed and full load prior to the fault	s			
AB.12.22.6	The Generator no-load line-line voltage output waveform deviation from an ideal sine wave at rated voltage and frequency	%			
AB.12.23	Rated Short circuit withstand current (10s)				
AB.12.24	Maximum permissible asymmetric load at 0.8 p.f	%			



AB.13	Regulation and quality of supply				
AB.13.1	Base Frequency	Hz	50		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.13.2	Continuous frequency operating range	Hz	48.5 to 51.5		
AB.13.3	Frequency deviation not more than 10 minute per incident	Hz	48 to 52		
AB.13.4	Frequency deviation not more than 1 minute per incident	Hz	47.5 to 52.5		
AB.13.5	Total Harmonic Distortion (THD) of HV side Voltage and % even harmonics	% / %	5/1		
AB.13.6	HV side Voltage symmetrical three phase supply voltages (negative and zero phase sequence voltages less than)	%	2		
AB.13.7	Continuous Overflux rating	%	110% continuously		
AB.13.8	Load type		Impact Type loading		
AB.13.9	Adjustment Range on terminal voltage	%	±2.5		
AB.13.10	adjustment range of terminal frequency	%	±1.5		
AB.13.11	Voltage Output Waveform				
AB.13.11.1	Waveform deviation factor limit	%	<10		
AB.13.11.2	Total Harmonic Distortion relative to the fundamental	%	<5		
AB.13.11.3	Percentage of any one harmonic relative to the fundamental	%	<3		



AB.13.12	Alternator Bearings		Cartridge assemble type		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.14	Generator Protection				
AB.14.1	Electrical Protection				
AB.14.1.1	Supply Differential Protection	Yes/No	No		
AB.14.1.2	Supply Over current Protection	Yes/No	Yes		
AB.14.1.3	Supply 3-Phase Short Circuit Protection	Yes/No	Yes		
AB.14.1.4	Supply Phase to Ground Protection	Yes/No	Yes		
AB.14.1.5	Over-current / Over-Load and ground Fault protection,	Yes/No	Yes		
AB.14.1.6	Over-current Alarm	Yes/No	Yes		
AB.14.1.7	Reverse Power Protection	Yes/No	Yes		
AB.14.1.8	Differential Protection	Yes/No	No		
AB.14.1.9	Loss of Excitation / Field Protection	Yes/No	Yes		
AB.14.1.10	Negative Phase Sequence Protection	Yes/No	Yes		
AB.14.1.11	Winding Temperature measurement	Yes/No	Yes		
AB.14.1.12	Over flux Protection	Yes/No	Yes		
AB.14.1.13	Over Voltage Protection	Yes/No	Yes		
AB.14.1.14	Field Over-Current / Overheating protection	Yes/No	Yes		
AB.14.1.15	Over speed trip protection (Mechanical Protection)	Yes/No	Yes		



AB.14.1.16	Mains decoupling relay (Opens the Diesel Generator breaker when synchronized with the main supply for testing purposes and the main supply fails)	Yes/No	Yes		
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Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.14.1.17	Under Voltage protection,	Yes/No	Yes		
AB.14.1.18	Under/Over frequency protection	Yes/No	Yes		
AB.14.2	Mechanical				
AB.14.2.1	Crankcase mist detection,	Yes/No	Yes		
AB.14.2.2	Bearing Temperature High,	Yes/No	Yes		
AB.14.2.3	Overspeed trip,	Yes/No	Yes		
AB.14.2.4	Generator fault trip	Yes/No	Yes		
AB.14.2.5	Lubricating oil pressure very low	Yes/No	Yes		
AB.14.2.6	Oil Temperature very high	Yes/No	Yes		
AB.14.2.7	Cooling water temperature very high.	Yes/No	Yes		
AB.14.2.8	Overcrank trip alarm.	Yes/No	Yes		
AB.14.2.9	Low coolant level alarm	Yes/No	Yes		
AB.14.2.10	Low lube oil pressure pre-alarm	Yes/No	Yes		
AB.14.2.11	Low oil temperature pre-alarm	Yes/No	Yes		
AB.14.2.12	High Cooling water temperature pre-alarm	Yes/No	Yes		
AB.14.5	CT (s) 1 Neutral Star Point				
AB.14.5.1	Application				
AB.14.5.2	Location				



AB.14.5.3	Number per Set		3		
AB.14.5.4	Type				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.14.5.5	Class				
AB.14.5.6	Number of Cores				
AB.14.5.7	ratio				
AB.14.5.8	Burden				
AB.14.6	CT (s) 2 Governor And Engine Control System				
AB.14.6.1	Application				
AB.14.6.2	Location				
AB.14.6.3	Number per Set		3		
AB.14.6.4	Type				
AB.14.6.5	Class				
AB.14.6.6	Number of Cores				
AB.14.6.7	ratio				
AB.14.6.8	Burden				
AB.15	Automatic Voltage Regulator (AVR)				
AB.15.1	Manufacturer				
AB.15.2	Type and Model				



AB.15.3	Response Rate	V/s			
AB.15.4	Regulator operating time	s			
AB.15.5	Maximum excitation required to maintain rated load at steady state	A			

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.15.6	Maximum Excitation required during transient conditions	A			
AB.15.7	Transient Voltage deviation	%	20		
AB.15.8	Voltage Regulation from 0 to 100% rated Load	±%			
AB.15.9	Manual Voltage adjustment range	%	90 - 110		
AB.15.10	Maximum Voltage Droop over the Load Range 0 to 100%	%	2		
AB.15.11	Regulation Drift limit	%	0.50%		
AB.15.12	Sensitivity	%			
AB.16	Exciter				
AB.16.1	Manufacturer				
AB.16.2	Type and Model				
AB.16.3	Rating	kVA			
AB.16.4	Rated Voltage	V			
AB.16.5	Rated Current	A			

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AB.16.6	Exciter System Current when Generator is at full Load and 0.8 p.f	Ampere dc			
AB.16.7	Exciter system current when Generator is at full Load and 0.8 p.f				
AB.16.8	Exciter No Load current	Ampere dc			
AB.16.9	Exciter System resistance normalized at 75°C	Ω			

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.16.10	Permanent Magnet Generator for Voltage Regulator Power	Yes/No	Yes		
AB.16.11	Response Rate	V/s			
AB.16.12	Temperature Rise of Excitation System	K			
AB.16.13	Insulation Class of Exciter system		F or H		
AB.16.14	Time Constant of Exciter Build-up	s			
AB.16.15	Current series boost provided	Yes/No	if required		
AB.17	Governor				
AB.17.1	Manufacturer				
AB.17.2	Electronic Governor Controller	P (Proportional)/ PI (Proportional Integral)/ PID (Proportional Integral Differential)			
AB.17.3	Speed Manual Adjustment Range	%	±2.5		
AB.17.4	Drop Setting Range	%	0 to 7		



AB.18	Generator Set Outer Coating				
AB.18.1	Corrosion Protection required	Non-Corrosive/ High Corrosive/ Very High Corrosive	Very High Corrosive		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.18.2	Main tank external final colour coding	SANS 10140			
AB.19	Generator Set Starting System				
AB.19.1.1	Starting Method	Air Battery			
AB.19.1.2	Supply Air Pressure required	kPa			
AB.19.1.3	Supply Air Minimum Flow Rate	m³/s			
AB.19.1.4	Air Supply quality required				
AB.19.1.5	Air Supply Flanch details				
AB.19.1.6	Number of Starting Attempts		5		
AB.19.1.7	Crank time until over-crank lockout	s			
AB.19.1.8	Redundant Starting System (Battery Banks, Starter Motor And Charger)	Yes/No	Yes		
AB.19.5	Electrical Starter System				
AB.19.5.1	Starter System Manufacturer				
AB.19.5.2	Voltage of Starting System	V			
AB.19.5.3	Nominal Power of Starting Motor	kW			



AB.19.5.4	Maximum cranking current of Starting Motor (Cold Cranking Amps-CCA)	A			
AB.19.5.4	Battery Type	Ni-Cd/VRLA	Ni-Cd		
AB.19.5.5	Number of Battery banks per Gen Set				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.19.5.6	Number of Batteries per battery bank				
AB.19.5.7	Voltage of each battery	V			
AB.19.5.8	Final Discharge voltage	V			
AB.19.5.9	Battery Capacity	Ah			
AB.19.5.10	Battery Earthing pole		Negative		
AB.19.5.11	Earthing and Bonding Conductor		Copper		
AB.19.6	Battery Charger				
AB.19.6.1	Available input voltage	V	220V or 400V		
AB.19.6.2	Battery Charger Manufacturer				
AB.19.6.3	Battery Charger Type				
AB.19.6.4	Battery Charger model				
AB.19.6.5	Charger Rated Output	kW			
AB.19.6.6	Charger rated Output Voltage	Vdc			
AB.19.6.7	Charger rated Output Current	A			
AB.19.6.8	DC Voltage ripple amplitude when operating without batteries	%	5		



AB.19.6.9	Charger Per Battery Unit	Yes/No	Yes		
AB.19.6.10	Batteries Shall Be Manufactured According to SANS1632	Yes/No	Yes		
AB.20	Generator Set Neutral Earthing System				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.20.1	Generator Neutral Earthing method				
AB.20.2	Supply Neutral Contactor	Yes/No	No		
AB.20.3	Neutral Contactor Manufacturer				
AB.20.4	Neutral Contactor type				
AB.20.5	Neutral Contactor maximum continuous current	A			
AB.20.6	Rated Phase to Earth fault current (10s)	A			
AB.20.7	Contactor BIL (Basic Insulation Level)	kV, peak			
AB.20.8	Contactor Power Frequency withstand Voltage	kVrms			
AB.20.9	Supply Neutral Earthing Resistor	Yes/No	Yes		
AB.20.10	Neutral Earthing Resistor Manufacturer				
AB.20.11	Neutral Earthing Resistor Type				
AB.20.12	Neutral Earthing Resistor Nominal Voltage	kV			
AB.20.13	Neutral Earthing Resistor Insulation Material				
AB.20.14	Neutral Earthing Resistor Resistance at 100°C	Ω			
AB.20.15	Neutral Earthing Resistor rated phase to Earth Fault current (10s)	A			



AB.20.16	Impedance of Resistor	Ω			
AB.20.17	Neutral Earthing Resistor BIL (Basic Insulation Level)	kV, peak	75		
AB.20.18	Neutral Earthing Resistor Power Frequency Withstand Voltage	kV rms	28		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.21	Generator Set Vibrations Limits				
AB.21.1	Max engine-generator set vibration in horizontal, vertical, and axial	mm, rms	0.15		
AB.21.2	Overall velocity limit	mm, rms	24		
AB.21.3	Maximum speed relative to rated speed, for which the above limits apply	%	110		
AB.21.4	Maximum vibration peak force transmitted to the floor through Isolation system	N			
AB.21.5	Vibration damper type				
AB.21.6	Number of Vibration Dampers				
AB.21.7	Wr ² of the Engine	kgm ²			
AB.21.8	Wr ² of the Generator Rotor	kgm ²			
AB.21.9	Wr ² of the coupling	kgm ²			
AB.22	Weights and Dimensions				
AB.22.1	Dimensions				
AB.22.1.1	Overall Length				



AB.22.1.2	Overall Width				
AB.22.1.3	Overall Height from floor				
AB.22.1.4	Required end clearances				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.22.1.5	Generator Length				
AB.22.1.6	Generator Width				
AB.22.1.7	Generator Height from floor				
AB.22.1.8	Engine Length				
AB.22.1.9	Engine Width				
AB.22.1.10	Engine Height from floor				
AB.22.2	Weights				
AB.22.2.1	Engine weight	kg			
AB.22.2.2	Generator Weight total	kg			
AB.22.2.3	Generator Stator Copper Weight	kg			
AB.22.2.4	Generator Stator Machine steel weight	kg			
AB.22.2.5	Generator Rotor Copper Weight	kg			
AB.22.2.6	Generator Rotor Machine steel weight	kg			
AB.22.2.7	Shipping Weight of Engine	kg			
AB.22.2.8	Shipping Weight of Generator	kg			
AB.22.2.9	Shipping weight of the heaviest piece to be handled	kg			



AB.23	Control system				
AB.23.1	Manufacturer				
AB.23.2	Type				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.23.3	Controller Power Requirements	kW			
AB.23.4	Controller Voltage	V			
AB.23.5	Controller position		Stand Alone Control cabinet in close proximity to the Diesel Generator set		
AB.23.6	Local Alarms and Plant Status		To be displayed on a local HMI		
AB.23.7	Communication Protocol		Hardwired System		
AB.23.8	Diagnostic abilities required	Yes/No	Yes		
AB.23.9	Automatic Start	Yes/No	Yes		
AB.23.10	Remote Control System interface required	Yes/No	Yes		Employer's Engineer to provide Operating and Control Philosophy
AB.23.11	Manual Start	Yes/No	Yes		
AB.23.12	Isolate Function Inhibiting All Start Commands	Yes/No	Yes		
AB.23.13	Manual Sync function	Yes/No	No		



AB.23.14	Local DG alarm annunciator panel required	Yes/No	Yes		Employer's Engineer to provide Operating and Control Philosophy
AB.24	Air Flows				

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.24.1	Combustion Airflow Total	m³/s			
AB.24.2	Exhaust Airflow	m³/s			
AB.25	Heat Rejection to the room by:				
AB.25.1	The Engine	kW			
AB.25.2	Oil Cooler	kW			
AB.25.3	Generator	kW			
AB.25.4	Engine water Radiator	kW			
AB.25.5	Radiator required Airflow Rate	m³/s			
AB.25.6	Other Accessories	kW			
AB.26	Emissions				
AB.26.1	NOx	mg/nm³			
AB.26.2	CO	mg/nm³			
AB.26.3	HC	mg/nm³			



AB.26.4	PM	mg/nm ³			
AB.27	Tests				
AB.27.1	Perform Factory Acceptance Test in accordance with SANS 8528 - 6	Yes/No	Yes (Groups C and M)		
AB.27.2	Perform Efficiency Test to verify AB.28	Yes/No	Yes		

Item	Requirement		Schedule A: User Requirement	Schedule B: Tender Guaranteed Values	Remarks /alterations, etc.
AB.27.3	Perform 100% step load test	Yes/No	Yes		
AB.28	Efficiency Evaluation				
AB.28.1	R	Rand/Liter			
AB.28.2	P Ratio1	hours			
AB.28.3	P Ratio2	hours			
AB.28.4	P Ratio3	hours			
AB.28.5	P Ratio3	hours			
AB.28.6	Fuel Consumption at Full Load	kg / hour			
AB.28.7	Fuel Consumption at ¾ Load	kg / hour			
AB.28.8	Fuel Consumption at ½ Load	kg / hour			
AB.28.9	Fuel Consumption at ¼ Load	kg / hour			

To Whom It May Concern,

CERTIFICATE OF INSURANCE: TRANSNET (SOC) LIMITED – PRINCIPAL CONTROLLED INSURANCE

In our capacity as Insurance Brokers to the Transnet Group of Companies, we hereby certify that the undermentioned insurances are currently in place:

INSURED: Transnet (SOC) Limited

PERIOD: 1 April 2024 to 31 March 2025 (Both days inclusive)

DIVISION: Transnet Freight Rail, Transnet Engineering, Transnet Properties, Transnet Pipelines, Transnet National Ports Authority and Transnet Port Terminals

THE INSURED'S VAT NO: 4720103177

THE INSURED'S COMPANY REGISTRATION NO: 1990/000900/30

POSTAL ADDRESS (Head Office) Carlton Centre, 150 Commissioner Street, Johannesburg, 2001

CONTRACT WORKS INSURANCE

Cover Provided : Contract Works - Physical loss or damage to the Property Insured which being materials, plant and other things for incorporation into the permanent works.

Insurer : Mirabilis (Santam Limited)

Policy Number : MZAR35023-CAR

The Contract Site : Any location within the Territorial Limits upon which The Insured Contract is to be executed or carried out as more fully defined in The Insured Contract documents together with so much of the surrounding area as may be required or designated for the performance of The Insured Contract.

Territorial Limits : The Republic of South Africa.

Additional Co-Insureds:

The Contractor: All Contractors undertaking work in connection with The Insured Contract including the Employer to the extent that the Employer undertakes work in connection with The Insured Contract;

Sub-Contractors: All Sub-Contractors employed by the Contractor and all other Sub- Contractors (whether nominated or otherwise) engaged in fulfilment of The Insured Contract; and to the extent required by any contract or agreement; transporters, suppliers, manufacturers, vendors, other persons, persons providing storage facilities, plant

owners and/or operators in respect of liability loss or damage arising out of The Insured Contract; project managers, architects, land surveyors, quantity surveyors, engineers and other advisors or consultants or sub-consultants appointed in the performance of the Insured Contract activities arising at the Contract Site provided always that any such person shall not be insured hereunder in respect of liability loss or damage arising out of such person's error or omission in the performance of the professional services for which he was appointed;

Provincial & Government: any Local Provincial or Government Department with which the Insured enters into any contract or agreement for the performance of The Insured Contract; all for their respective rights and interests.

Insured Contracts : All Contracts (including any undertaking awarded or commenced prior to Inception of the Period of Insurance) involving design, construction, Performance Testing and Commissioning in respect of the Works and shall Include capital expenditure, upgrade, modification, maintenance or overhaul, refurbishment, renovation, retrofitting or alterations and additions to existing facilities undertaken by the Insured or other Insured Parties acting on their behalf but **excluding**;

- a) contracts which at award stage have a value in excess of R 1,000,000,000;
- b) contracts with an estimated construction period exceeding 48 months but increasing to 60 months in respect of rail maintenance contracts and Transnet Freight and Rail contracts for logistical support for inline inspections and identification of defects over a 5 year period in respect of Transnet's pipeline assets (excluding Defects Liability/Maintenance period);
- c) contracts involving construction or erection of petrochemical manufacturing plant(s) but this exclusion shall not apply to pipelines and other associated works undertaken by or on behalf of the Insured;
- d) contracts in or on any aircraft;
- e) Off-shore contracts;
- f) Wet Risk Contracts which at award exceeds R500,000,000;
- g) Dam Contracts
- h) Tunnel contracts which at award exceeds R50,000,000;
- i) Tunnel contracts using tunnel boring machines;
- j) Underground Mining Contracts;
- k) Horizontal Directional Drilling Contracts which at award exceeds R50,000,000;
- l) Horizontal Directional Drilling Contracts where total drilling exceeds 1 km;
- m) Horizontal Directional Drilling Contracts for pipe diameters greater than 76 cm.

Definitions

1. *"Off-shore contracts" means all works and installations in the sea or on the seabed including dredging which are accessible only by ship boat barge or helicopter and do not constitute normal wet works like harbours moles bridges wharves or sewage or cooling water intake or outlet facilities. "OffShore Contracts" shall include oilrigs and oil platforms (but not including oil platforms when connected to the land on completion). The term shall not apply to pre-fabrication works on land associated with an Off-Shore Contract.*

- 2 *"Wet Risk Contracts" shall mean any Contract and/or Works where more than thirty-five (35) percentile of its value is in a permanent body of water or is below the high water mark of any tidal body of water. The term shall include contracts for the construction of wharves, piers, marinas, causeways, breakwaters, jetties, dry docks and offshore pipelines when connected directly to on-shore facilities and canal developments. Wet Risks shall exclude Off- Shore Contracts;*
- 3 *"Dam Contracts", which term shall include weirs and hydroelectric projects involving the construction of dams or weirs;*
- 4 *"Horizontal Directional Drilling Contracts", means micro-tunnelling work for the construction of tunnels utilising surface based horizontal directional drilling equipment.*
- 5 *Tunnels" means Tunnels (Including declines) involving all of the following;*
 - (a) Works below ground level; and
 - (b) Tunnelling machinery below ground level; and
 - (c) A tunnelling crew operating the machinery below ground level;
 - (d) But shall not include Horizontal Directional Drilling Contracts
- 6 *"Horizontal Directional Drilling Contracts", means micro-tunnelling work for the construction of tunnels utilising surface based horizontal directional drilling equipment.*
- 7 *"Underground Mining Contracts", which shall mean any contract involving underground mining.*

Testing Period: 120 Days not consecutive.

Maintenance Period : 12 Months

Main Policy Extensions :

- Costs & Expenses - Limited to a maximum of R50,000,000.
- Expediting Measures – Limited to a maximum of R50,000,000.
- Professional Fees In Reinstatement Of Property Insured - Limited to a maximum of R50,000,000.
- Costs & Expenses For Removal Of Debris No Damage - Limited to a maximum of R50,000,000.
- Surrounding Property in care custody or control of the contractor – Limited to a maximum of R55,000,000.
- Fire Brigade & Public Authorities - Limited to a maximum of R10,000,000.
- Public Authority Reinstatement Costs - Limited to a maximum of R20,000,000
- Public Relationship Costs - Limited to a maximum of R1,000,000.
- Records - Limited to a maximum of R2,000,000.
- Removal to Gain Access - Limited to a maximum of R20,000,000

- Road Reserve and Servitude Extensions - Limited to a maximum of R10,000,000
- Search & Locate Costs - Limited to a maximum of R20,000,000.
- Borrowing Of Plant For Commissioning Purposes - Limited to a maximum of R10,000,000
- Escalation during Construction – 30%
- Marine Contribution Clause
- Claim Preparation Costs – Limited to a maximum of R10,000,000

Main Policy Exclusions :

- War
- Nuclear Energy Risks
- Terrorism
- Computer Loss General Exception
- DE4 (All types of Works) for defective material workmanship design plan or specification.
- LEG 3 (Mechanical or Electrical Engineering Works only) for defective material workmanship design plan or specification. Limited to maximum of 10% of the total estimated contract value in the aggregate.
- Loss or damage arising during air transit or any ocean voyage or whilst in storage thereafter.
- Occurring during any defects/maintenance period unless cause occurred prior to such defects/maintenance period
- Disappearance or by shortage revealed during routine inventory or periodic stocktaking.
- Consequential loss of whatsoever nature.
- Normal wear and tear, normal atmospheric conditions, rust, erosion, corrosion or oxidation.
- Due to its own explosion breakdown or derangement occurring after the Testing Period which has operated under load conditions.
- Second hand property due to its own electrical or mechanical breakdown or explosion.
- Cyber and Data
- Beneficial Occupation – 12 months
- Risk Mitigation – Safety Measures with Respect to Precipitation, Flood and Inundation – 10 years return period

Deductibles:

In respect of loss or damage:

Major Perils shall mean damage caused by storm, rain, tempest, wind, flood, theft, malicious damage, subsidence, collapse, earthquake, testing or commissioning and the consequences of defective design, specification, materials or workmanship (DE4).

Minor Perils shall mean damage caused by a peril not defined as Major Perils defined above.

Contracts with a contract value :

Major perils

Minor perils

0 to R100,000,000	R25,000	R15,000
R100,000,001 to R250,000,000	R50,000	R15,000
R250,000,001 to R500,000,000	R100,000	R25,000
R500,000,001 to R1,000,000,000	R150,000	R25,000

Minimum wet risk deductible of R100,000 per occurrence to apply.

Electrical Cables, Wiring and Accessories 10% of claim minimum R100,000

LEG 3 Deductible (Only in respect of Mechanical and Electrical contracts);

Contracts with a contract value	Deductible
0 to R500,000,000	R1,000,000 per occurrence
R500,000,001 to R1,000,000,000	R1,500,000 per occurrence

PUBLIC LIABILITY

Cover Provided : Contract Works Public Liability – cover the Insured's legal liability in respect of loss or damage or injury to third parties arising out of work performed in respect of the Insured Contracts.

Insurer : Stalker Hutchinson (Santam Limited)

Policy Number: 6000/132335

Territorial Limits : The Republic of South Africa.

Insured Contracts: All contracts (including any undertaking awarded or commenced prior to inception of the period of Insurance) involving design, construction, performance testing and commissioning in respect of the works and shall include capital expenditure, upgrade, modification, maintenance or overhaul, refurbishment, renovation, retrofitting or alterations and additions to existing facilities undertaken by the Insured or other Insured Parties acting on their behalf but **Excluding**:

- a) Contracts which at award stage have a value in excess of R 1,000,000,000.
- b) Contracts with an estimated construction period at award exceeding 48 months but 60 months in respect of contracts awarded prior to 1 April 2020 for rail maintenance contracts For Transnet Freight & Rail and for Transnet Pipeline's logistical support for inline inspections and identification of defects in respect of Transnet's pipeline assets (all excluding Defects Liability/Maintenance period).
- c) Contracts with a Contractual Defects Liability Maintenance Period exceeding 24 months.
- d) Contracts involving construction or erection of petrochemical manufacturing plant(s) but this exclusion shall not apply to pipelines and other associated works undertaken by or on behalf of the Insured.
- e) Contracts in or on any aircraft.
- f) Off-shore contracts - "Off-shore contracts" means all works and installations in the sea or on the seabed and do not constitute normal Wet Risk Contracts like

harbours, moles, bridges, wharves or sewage or cooling water intake or outlet facilities, piers, marinas, causeways, breakwaters, jetties, dry docks and offshore pipelines when connected directly to onshore facilities and canal developments. "Off-Shore contracts" shall include oilrigs and oil platforms.

Policy Limits:

Contractors Public Liability	R100,000,000 any one occurrence / unlimited during the Period of Insurance
Contractors Negligent Removal or weakening of Support	R100 000 000 any one occurrence and R100,000,000 per site in the aggregate during the Period of Insurance.
Statutory Legal Defence Costs	*R5 000 000 in the aggregate during the Period of Insurance.
Arrest / Assault / Defamation	*R5 000 000 in the aggregate during the Period of Insurance.
Prevention of Access	*R5 000 000 in the aggregate during the Period of Insurance.
Trespass / Nuisance	*R5 000 000 in the aggregate during the Period of Insurance.
Claims Preparation Costs	R5 000 000 any one occurrence

*Where the limits are noted as in the aggregate during the policy period of insurance, that such aggregated limit is applicable to all Transnet Insured Contracts collectively and in total and does not apply to each contract separately.

Deductible(s) : R50,000 per occurrence but increased to R5,000,000 in respect of Spread of Fire and/or Hot Works and R250,000 in respect of Sudden and Accidental Pollution and/or Goods on the Hook and/or R150,000 in respect of Developers Removal of Support.

General Policy Exclusions :

The policy does not cover:-

- deliberate, conscious and intentional disregard to take reasonable precautions.
- fines, penalties, punitive and exemplary damages.
- Pollution unless caused by a sudden, unintended and unexpected occurrence.
- cost of removing, nullifying or cleaning up the effects of pollution unless caused by a sudden, unintended and unexpected occurrence.
- the hazardous nature of asbestos.
- War And Terrorism Risks.
- Nuclear Risks.

- Actual or alleged unlawful competition, unfair practices, abuse of monopoly power, cartel activities
- Compulsory Insurance
- Loss or damage and any consequence therefrom to any Data. •
- Sanctions Exclusion
- Grid Failure

PROFESSIONAL INDEMNITY

Cover Provided :

Professional Indemnity

- a) In respect of damages which the Insured shall become legally liable to pay in consequence of neglect, error or omission by or on behalf of the Insured in the conduct or execution of their Professional Activities and Duties as defined.
- b) Prior To Handover/Rectification - against loss arising out of any defect in the works discovered prior to the issue of any practical completion or take-over certificate provided that any such defects are caused by a negligent breach of a Professional Activity or Duty by the Insured in consequence of neglect, error or omission by or on behalf of the Insured.

Insurer :

Stalker Hutchinson (Santam Limited)

Policy Number:

6000/132337

Jurisdiction :

Worldwide excluding North America

Insured Contracts:

All contracts (including any undertaking awarded or commenced prior to inception of the period of Insurance) involving design, construction, performance testing and commissioning in respect of the works and shall include capital expenditure, upgrade, modification, maintenance or overhaul, refurbishment, renovation, retrofitting or alterations and additions to existing facilities undertaken by the Insured or other Insured Parties acting on their behalf but **Excluding**:

- a) Contracts which at award stage have a value in excess of R 1,000,000,000.
- b) Contracts with an estimated construction period at award exceeding 48 months (excluding Defects Liability/Maintenance period).
- c) Contracts with a Contractual Defects Liability Maintenance Period exceeding 24 months.
- d) Contracts involving construction or erection of petrochemical manufacturing plant(s) but this exclusion shall not apply to pipelines and other associated works undertaken by or on behalf of the Insured.
- e) Contracts in or on any aircraft.
- f) Off-shore contracts - "Off-shore contracts" means all works and installations in the sea or on the seabed and do not constitute normal Wet Risk Contracts like harbours, moles, bridges, wharves or sewage or cooling water intake or outlet facilities, piers, marinas, causeways, breakwaters, jetties, dry docks and offshore pipelines when connected directly to onshore facilities and canal developments. "Off-Shore contracts" shall include oilrigs and oil platforms.

Limit Of Indemnity: Professional Indemnity - *R100,000,000 in the aggregate during the policy period of insurance.

*Where the limit is noted as in the aggregate during the policy period of insurance, that such aggregated limit is applicable to all Transnet Insured Contracts collectively and in total and does not apply to each contract separately.

Policy Extension
Limits Of Indemnity:

Claims Preparation Costs - *R7,500,000 in the aggregate during the policy period of insurance.
Loss of Documents - *R2,000,000 in the aggregate during the policy period of insurance.
Statutory Defence Costs - *R5,000,000 in the aggregate during the policy period of insurance.
Defamation - *R5,000,000 in the aggregate during the policy period of insurance.
Infringement of Copyright - *R5,000,000 in the aggregate during the policy period of insurance.

*Where the limits are noted as in the aggregate during the policy period of insurance, that such aggregated limit is applicable to all Transnet Insured Contracts collectively and in total and does not apply to each contract separately.

Deductibles: R5,000,000 each and every but R10,000 in respect of Claims Preparation Costs, Loss of Documents, Statutory Defence Costs, Defamation and Infringement Of Copyright.

Policy Special Conditions : Condition precedent to liability that the Insured is fully qualified and registered with the relevant Industry Body/Association in terms of legislation as applicable.

Prior to hand over/rectification – the insured must give prior written notice to the Insurers of the intention to take remedial action to rectify such defect and obtain the Insurers' written agreement to such action being taken and the costs and expenses expected to be expended.

Policy Main Exclusions:

- Excludes all consequential loss other than cost of re-design, rectification and replacement as a consequence of the defect.
- Excludes Supervision.
- Excludes liability arising out of environmental impairment / pollution
- Excludes the cost of removing, nullifying or cleaning-up the effects of environmental impairment/ pollution.
- Excludes war, invasion, acts of foreign enemies, hostilities or warlike operations (whether war be declared or not), civil war, rebellion, revolution, insurrection, civil commotion assuming the proportions of or amounting to an uprising, military or usurped power, any act of terrorism and nuclear risks.
- Excludes fines, penalties, punitive and exemplary damages, multiplication of compensatory damages and/or any other noncompensating damages of any kind.

- Excludes liability from the hazardous nature of asbestos.
- Excludes medical malpractice.
- Excludes failure to meet contractual requirements relating to efficiency, output or durability.
- Excludes failure to meet completion dates
- Excludes the estimation of probable costs other than cost advice and cost planning services normally provided by a Quantity Surveyor or Project manager.
- Excludes incorrect authorisation of payment.
- Excludes breach of any statutory regulation.
- Excludes liability from the insolvency, liquidation or judicial management of the Insured.
- Excludes the certification of value of work executed by any contractor where the Insured has an equity interest in such contractor;
- Excludes liability due to unlawful competition, unfair practices, abuse of monopoly power, cartel activities or breach of a competitions ac
- Sanctions Exclusion
- Grid Failure

This certificate of the insurance cover arranged is issued as a matter of information only and confers no rights upon the certificate holder. This certificate does not amend, extend or alter the coverage afforded by the policies issued by Insurers.

Dennis Govender



Chief Broking Officer