



ZIMBABWE ELECTRICITY TRANSMISSION & DISTRIBUTION COMPANY

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OUR REF:..... FN/ec

YOUR REF

WHEN CALLING WITH REFERENCE
TO THIS LETTER PLEASE ASK FOR

..... F. Nyamakambo.....

12 February 2024

To All Bidders

Dear Sir/Madam

ADDENDUM NO. 7 TO TENDER NO. ZETDC/INTER/06/2023 FOR THE SUPPLY, DELIVERY, INSTALLATION AND COMMISSIONING OF 20MVA, 132/88/11KV POWER TRANSFORMER AT GLENVILLE 88/11KV SUBSTATION

The above subject matter refers.

Attached herewith is **ADDENDUM NO. 7** for Tender No. ZETDC/INTER/06/2023 for the Supply, Delivery, Installation and Commissioning of 20MVA, 132/88/11kV Power Transformer at Glenville 88/11kV Substation in response to queries raised by participating Bidders.

N.B. This addendum is as read together with **Clarification No. 5**, which was uploaded on the ZETDC website as "Replacement". Hence, the clarification uploaded as "**Replacement Clarification No. 5 for Tender No. ZETDC/INTER/06/2023 for the Supply, Delivery, Installation and Commissioning of 20MVA, 132/88/11kV Power Transformer at Glenville 88/11kV Substation**" is the one that is in use.

Yours faithfully

F. NYAMAKAMBO
SUPPLY CHAIN MANAGER

ZIMBABWE ELECTRICITY TRANSMISSION & DISTRIBUTION COMPANY



ADDENDUM NO. 7

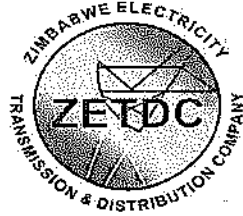
**TO STANDARD BIDDING DOCUMENT (SBD) FOR
TENDER NO. ZETDC/INTER/06/2023**

**FOR THE SUPPLY, DELIVERY, INSTALLATION AND
COMMISSIONING OF 20MVA, 132/88/11KV POWER
TRANSFORMER AT GLENVILLE 88/11KV
SUBSTATION**

ATTACHED:

- **Technical Specification for Jointing and Termination Kits up to 132kV.**
- **Technical Specification for Battery Charger and Battery Bank.**
- **Technical Specification for PVCFR/PVCFR/SWA/PVCFR Cables (600/1000V)**
- **Technical Specification for Distribution Transformers (100KVA, 11/0.4kV Earthing Transformer)**
- **Technical Specification for Protection and Control Panels**

ZETDC

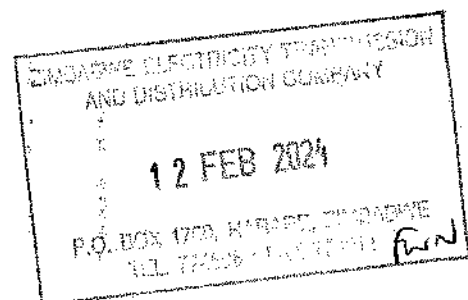


DISTRIBUTION SERVICES DEPARTMENT

ZESA SPECIFICATION NO. DS2710202021JK

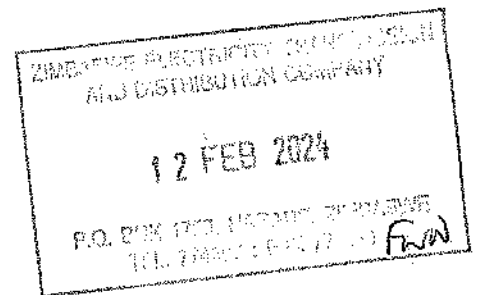
SPECIFICATION FOR

JOINTING AND TERMINATION KITS UP TO 132 kV



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1. SCOPE

This specification calls for supply and delivery of cable jointing kits and termination kits suitable for copper and aluminium XLPE and PILC cables up to 132 kV.

The Specification also covers transition joints for jointing PILC Cables to XLPE Cables.

Tenderers shall include a complete statement of compliance with this Specification. For every clause in this Specification the Tenderers shall state compliance or non-compliance and shall elaborate where appropriate.

Tenderers shall use the words "comply", "do not comply" with this Specification or in the clauses of an informative nature, "noted".

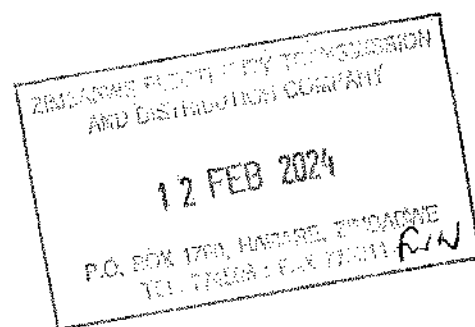
2. STANDARDS, LANGUAGE AND UNITS

Jointing kits, termination kits and transition jointing kits to be supplied under this specification shall conform to the following standards:

- (i) VDE 0278:
- (ii) IEC Standards
- (iii) BS where they amplify IEC Standards

All tenders, correspondence, description upon drawings, illustrations or instructions shall be in unambiguous English Language. SI Units of measurements shall be used throughout. The termination and jointing kits shall be manufactured to high quality standards.

The kits shall be sourced from manufacturers who have ISO 9001 or 9002 Certification. Evidence of the ISO certification shall be provided with the bid. The kits shall have a shelf life of at least 3 years.



3. PARTICULARS OF ENVIRONMENT

The kits will either be subjected to Atmospheric or Underground Environment or both.

3.1 Particulars Of Atmospheric Environment

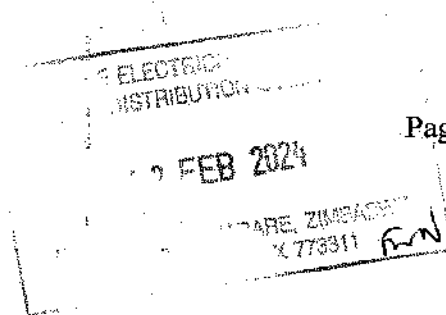
The joints and terminations shall be capable of operation under the following atmospheric conditions:

- a) At an average altitude of 1 500m above sea level.
- b) Ambient air temperatures not exceeding +45 degrees centigrade or below -10 degrees centigrade with a maximum daily average of 35°C.
- c) Humidity of 13 mg per cubic meter absolute and 65% Relative Humidity before storms with vapour pressure of 17 mm hg.
- d) Equipment will operate within the tropics and is subject to sudden ambient air temperature changes of the order of 10 degrees centigrade per hour occurring at the onset of rain, but the barometric pressure at any given place does not vary by more than ($\pm 7\%$)
- e) Frequent and severe lightning storms occur during summer months, with isokeraunic levels varying between 50 and 100 thunderstorm days per annum.
- f) Particular attention should be paid in the design of the equipment to prevent damage due to ingress of dust, insect and vermin which are prevalent for long periods in the year.

3.2 Particulars of the Underground Environment

In addition to being exposed to the conditions under 5.1 the joints shall be capable of operation in the following ground conditions:-

- a) In soil with thermal resistivity of 1.2 K.m/W.
- b) The depth of burial from ground surface to centre of joint shall be 850mm for the 11kV joints, 1050mm for the 33kV joints and 1300mm for cables greater than 33kV.
- c) The mean ground temperature at this depth being 25 degrees centigrade with maximum value of 30 degrees centigrade.
- d) A foundation or bed of washed pit sand 150mm deep is laid in the trench first followed by a second 150mm pit sand above the cable. It is then backfilled by 450mm of earth before the yellow cable marker ribbon is laid and the trench completely closed.



4. ELECTRICAL EQUIPMENT MATERIALS

All materials incorporated in the equipment shall be new and of first class commercial quality free from defects and imperfections.

The kits shall have characteristics equal to or better than the cable they are applicable for. They shall withstand the local environmental conditions stated above. The kits shall have electrical and mechanical strengths equal to or better than the cable. The kits shall consist of light and ultraviolet resistant materials which shall be non-tracking and self-cleansing.

The equipment shall withstand the impulse insulation levels and short circuit currents equal to or higher than the cable.

5. CONSTRUCTION

5.1 General

The kits shall have electrical and mechanical properties that are better than those of the cable to be joined or terminated. The joints and terminations shall be any of the following types:

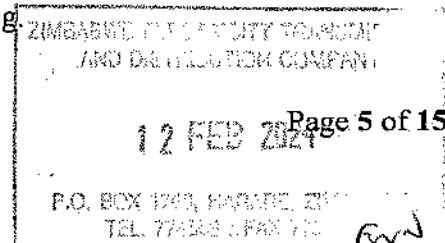
- (i) Heat shrink
- (ii) Resin filled
- (iii) Heat shrink/Resin filled
- (iv) Cold Shrink
- (v) Any other proven design, as long as adequate test reports and supply records are supplied.

All components of a kit shall have a shelf life of at least 3 years. All jointing kits shall be supplied complete with ferules. Ferules requiring use of crimping tools are not acceptable and will be rejected.

Joints and termination kits that require use of heated compounds such as Bitumen are not acceptable and will be rejected. All resin or filling compound shall be suitable for use at ambient temperatures ranging from 15 degrees Celsius to 40 degrees Celsius.

All parts and materials shall be subjected to a programme of tests to be agreed with the manufacturer.

- a) The kits shall be suitable for both aluminium and copper cables.
- b) The terminations and jointing kits shall require minimum manual preparation of the insulation e.g tapering.



- c) The method of jointing or termination shall not require special skills beyond those normally acquired by an experienced workman.
- d) Jointing kits employing tapes are not acceptable and will be rejected.
- e) Jointing kits requiring extreme hygienic conditions for preparation are not preferred.

5.2 Cable Joints

The joints shall be watertight, free from sharp points or ridges, thoroughly clean internally and externally and designed to retain the filling medium at all times without leakage. The sleeves shall be of sufficient diameter and length to permit colour-to-colour jointing without undue bending, handling or deformation of the cores. The joints shall be water proof. Joints using tapes are not acceptable and will be rejected.

5.3 Instructions

Detailed instructions for jointing and terminating cables shall be included in the bid. Also each kit shall be delivered with detailed instructions for jointing or terminating the cables. ZETDC has the right to reject any bid with jointing and termination instructions which does not comply with its standard practice.

5.4 Materials

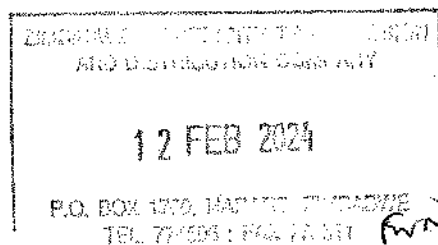
A kit shall be complete with all materials contained in a box complete with Ferules or Connectors supplied. Ferules are to be specified to accommodate both copper and aluminium cables.

Ferules that require use of a crimping tool are not acceptable and will be rejected. Each set of jointing materials shall be packed as one complete self-contained unit package for direct issue to a joiner at a work site.

Heat shrink tubing and moulded parts shall be flexible, flame retardant, material of electrical insulating quality, and shall be obtained from an approved manufacturer. They shall be suitable for use indoors and outdoors in the conditions prevailing on site.

Each part shall bear the manufacturer's mark, part number and any other necessary markings to ensure correct identification for use on the correct size and type of cable. Each set of parts shall be packed as one unit with full and complete installation instructions and clearly marked to show the application.

The materials shall reduce to the predetermined size and shape when heated above 120°C. The components shall also be provided with an internal coating of



hot melt adhesive compound which shall not flow or exude at temperatures below 85°C.

5.5 Voltage Rating

The Cable terminations kits, jointing kits and transition joints will be used on networks with nominal voltages that is given in the schedule of requirements. The maximum continuous voltage will be 110% of the nominal voltage of the particular network. The rated one minute power frequency withstands shall be 28, 70 and 275kV for 11, 33 and 132kV kits. The basic Insulation level shall be 75, 170 and 650kV for the 11, 33 and 132kV kits.

The Specific wet flashover voltage shall be at least 3kV/cm

5.6 Tests Certificates

Test certificates from internationally recognised and unbiased Test Institute (eg. KEEMA) shall be submitted with the bid. Proof that the Test Institute is recognised by IEC shall be provided with the bid. A minimum requirement is that the Test Institute is used by international clients in testing their products. The tests shall be in accordance with the relevant IEC Standards or other relevant standards of equal standing.

5.7 Supply and Delivery

Each kit shall be delivered with enclosed manuals in unambiguous English language giving detailed and illustrated step by step instructions for use as well as detailed explanation of each component's task and purpose.

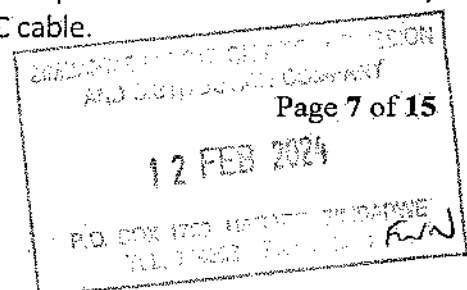
All technical literature relating to the terminations and jointing system shall be provided with the Tender.

5.8 XLPE to XLPE Joints

The kit can be any of the types mentioned in clause 6. The kits shall be suitable for both aluminium and copper cables, armoured and unarmoured cables. The kits shall not contain components that are likely to adversely affect the XLPE cables, and shall be fully compatible with all components of an XLPE cable.

5.9 PILC Cable joints

These will be required mostly for maintenance, as the procurement of PILC cables has been stopped in favour of XLPE cables. All components in a kit shall be fully compatible with components making up the PILC cable.



5.10 Transition Joints: XLPE to PILC Cable

Transition Joints will be used for jointing XLPE to PILC Cables as ZESA is phasing out use of PILC cables. The kits shall ensure that the oil contained in the PILC cable does not interfere with the XLPE insulation. All components in the kit shall be fully compatible with both XLPE and PILC cables. The kits shall be supplied complete with solid centre ferrules, compound, jointing tube. The transition joints shall be resin filled, and shall be supplied with connectors.

5.11 Joints for Low Voltage Cables (Cables rated up to 1000 volts)

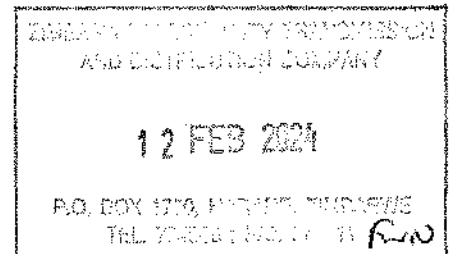
The joints shall comply with SAZS 555 Part 1 of 1997. This standard is available from Standards Association of Zimbabwe. The joints shall be supplied complete with ferrules suitable for both aluminium and copper conductor. Soldered connectors are not acceptable.

The certificate shall be submitted as per requirements of SAZ 5555.

Joints using heat shrink tubing are not acceptable.

The following type of kits are required:

- (a) PVC SWA to PVC SWA: cable
- (b) PVC SWA to PILC: cable-Transition
- (c) PVC SWA to XLPE: cable-Transition
- (d) PILC to XLPE: cable-Transition
- (e) PILC to PILC: cable
- (f) XLPE to XLPE: cable



All other requirements are as per clause 6.1 to 6.5

5.12 Terminations

The terminations shall be suitable for terminating XLPE and PILC cables. Kits that incorporate Porcelain insulators or require filling with oil are not acceptable and will be rejected. The terminations shall be of any design stated under clause 6. They shall be suitable for either indoor or outdoor terminating, as indicated in the schedule of requirements. They shall incorporate suitable stress control and ram sheds (where applicable) for outdoor use.

Stress cones or other approved means shall be provided for grading the voltage stress on the core insulation of screened cables.

Provision shall be made for earthing all sealing end base plates, cable boxes, glands and armour clamps.

5.13 Termination Kits for Low voltage cables

The cable Termination kits shall consist of a bushing and an impact resistant polyethylene hood. There shall be slots inside the bushing, to enable the cores of the cable to be bent over and be pushed into these slots, before the hood is pushed over them.

5.14 Information to be supplied by the Supplier

The following information shall be supplied with the bid and included in each kit on delivery.

- a) the maximum voltage;
- b) the diameter of cable entries and conductor types and the sizes that are accommodated.
- c) Installation instructions that are specific to the joint;
- d) the contents;
- e) the name of the manufacturer and the reference number;
- f) Instructions on how to use the resin compound in the manner necessary to develop the properties and to reach the level of performance specified in this standard.
- g) Instructions on how to keep the resin compound before use in conditions that will comply with any relevant regulations and that will ensure that the resin compound retains its properties for one year.

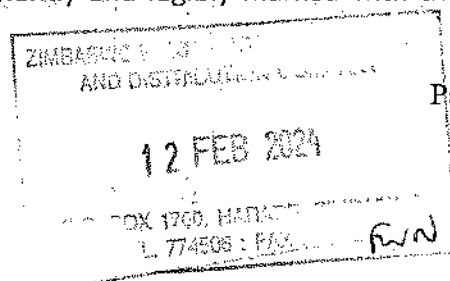
5.15 MARKING AND LABELLING, PACKAGING AND INFORMATION TO BE GIVEN BY THE MANUFACTURER

5.15.1 Marking and Labelling

All joint shells or outer coverings shall be permanently and legibly marked with a reference that will enable the range of cables for which the joint is suitable to be identified from the manufacturer's literature.

All conductor connectors shall be permanently and legibly marked with the conductor type and size or a reference number that will enable this information to be obtained from the manufacturer's literature.

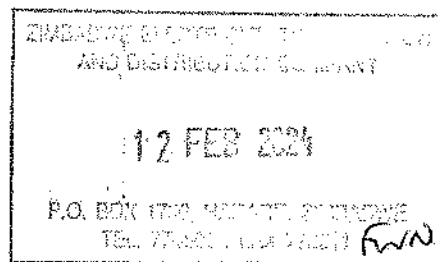
Individual resin kits shall be permanently and legibly marked with the following information:



- a) the manufacturer's name;
- b) the type of cold pour resin compound (when specified);
- c) The contents;
- d) The batch number(s);
- e) The reference number;
- f) The defined storage conditions and expiry date (for resin kits)
- g) The health and safety marking and handling instructions (for resin kits)
- h) The mixing instructions (for resin kits)
- i) This SAZ standard number;

5.15.2 Packaging

Packaging shall be sufficient to ensure that deterioration of the components will not happen under cover, dry storage within the stated ambient air temperatures such that the performance of these kits will not be affected.



6. TECHNICAL GUARANTEE SCHEDULES

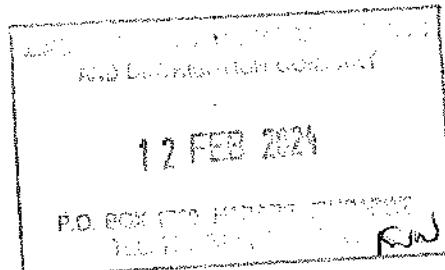
Please complete this schedule by stating the actual tendered kits specification in the column labeled Guaranteed Value.

6.1 TECHNICAL GUARANTEE SCHEDULE FOR XLPE-XLPE JOINTING KITS

JOINTING KITS: XLPE-XLPE				
Item	Description	Unit	Requirement	Guaranteed Value
1	Number of Cores		3	
2	Cable Type		XLPE-XLPE	
3	Voltage Rating	kV	11	
4	Conductor Size Range	mm sq.	50 -95	
5	Specific wet flashover	kV/cm	at least 3kV/cm	
6	Basic Insulation Level	kV	75	
7	Short circuit current rating	kA	At least 25kA for 3 seconds	
8	Specific creepage distance	mm/kV	25	
9	Rated one minute power frequency withstand Voltage	kV	28	
10	Ferules that require use of a crimping tool	Yes/No	No	
11	kits shall be suitable for both aluminium and copper cables	Yes/No	Yes	
12	Kit shall be complete with all materials contained in a box complete with Ferules or Connectors supplied	Yes/No	Yes	
13	Shelf life of all components Supplied		At least 3 years	
14	Depth of laying	mm (min)	850	

Tenderer's Signature.....

Date.....

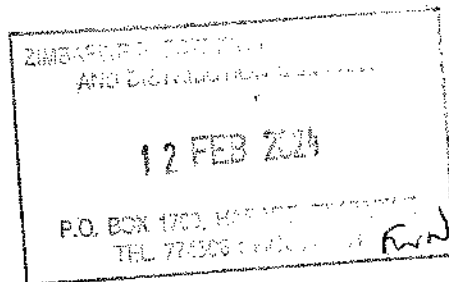


6.2 TECHNICAL GUARANTEE SCHEDULE FOR XLPE-XLPE JOINTING KITS

JOINTING KITS: XLPE-XLPE				
Item	Description	Unit	Requirement	Guaranteed Value
1	Number of Cores		3	
2	Cable Type		XLPE-XLPE	
3	Voltage Rating	kV	11	
4	Conductor Size Range	mm sq.	120-185	
5	Specific wet flashover	kV/cm	at least 3kV/cm	
6	Basic Insulation Level	kV	75	
7	Short circuit current rating	kA	At least 25kA for 3 seconds	
8	Specific creepage distance	mm/kV	25	
9	Rated one minute power frequency withstand Voltage	kV	28	
10	Ferules that require use of a crimping tool	Yes/No	No	
11	kits shall be suitable for both aluminium and copper cables	Yes/No	Yes	
12	Kit shall be complete with all materials contained in a box complete with Ferules or Connectors supplied	Yes/No	Yes	
13	Shelf life of all components Supplied		At least 3 years	
14	Depth of laying	mm (min)	8500	
15	Ground Temperature	°C	25	

Tenderer's Signature.....

Date.....

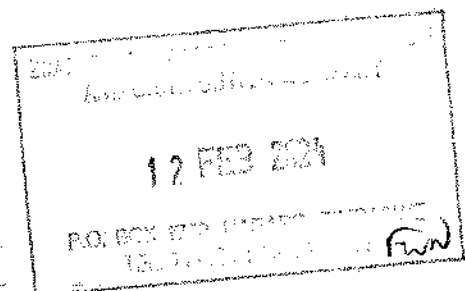


6.3 TECHNICAL GUARANTEE SCHEDULE FOR XLPE-XLPE JOINTING KITS

JOINTING KITS: XLPE-XLPE				
Item	Description	Unit	Requirement	Guaranteed Value
1	Number of Cores		3	
2	Cable Type		XLPE-XLPE	
3	Voltage Rating	kV	11	
4	Conductor Size Range	mm sq.	240-300	
5	Specific wet flashover	kV/cm	at least 3kV/cm	
6	Basic Insulation Level	kV	75	
7	Short circuit current rating	kA	At least 25kA for 3 seconds	
8	Specific creepage distance	mm/kV	25	
9	Rated one minute power frequency withstand Voltage	kV	28	
10	Ferules that require use of a crimping tool	Yes/No	No	
11	kits shall be suitable for both aluminium and copper cables	Yes/No	Yes	
12	Kit shall be complete with all materials contained in a box complete with Ferules or Connectors supplied	Yes/No	Yes	
13	Shelf life of all components Supplied		At least 3 years	
14	Depth of laying	mm (min)	850	
15	Ground Temperature	°C	25	

Tenderer's Signature.....

Date.....

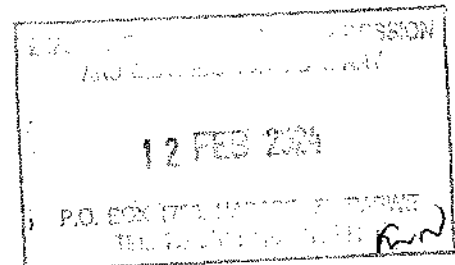


6.4 TECHNICAL GUARANTEE SCHEDULE FOR PILC-PILC JOINTING KITS

JOINTING KITS: PILC-PILC				
Item	Description	Unit	Requirement	Guaranteed Value
1	Number of Cores		3	
2	Cable Type		PILC-PILC	
3	Voltage Rating	kV	11	
4	Conductor Size Range	mm sq.	50-95	
5	Specific wet flashover	kV/cm	at least 3kV/cm	
6	Basic Insulation Level	kV	75	
7	Short circuit current rating	kA	At least 25kA for 3 seconds	
8	Specific creepage distance	mm/kV	25	
9	Rated one minute power frequency withstand Voltage	kV	28	
10	Ferules that require use of a crimping tool	Yes/No	No	
11	kits shall be suitable for both aluminium and copper cables	Yes/No	Yes	
12	Kit shall be complete with all materials contained in a box complete with Ferules or Connectors supplied	Yes/No	Yes	
13	Shelf life of all components Supplied		At least 3 years	
14	Depth of laying	mm (min)	850	

Tenderer's Signature.....

Date.....

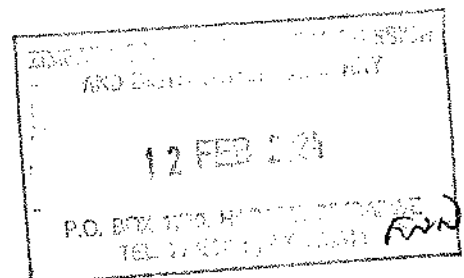


6.5 TECHNICAL GUARANTEE SCHEDULE FOR PILC-PILC JOINTING KITS

JOINTING KITS: PILC-PILC				
Item	Description	Unit	Requirement	Guaranteed Value
1	Number of Cores		3	
2	Cable Type		PILC-PILC	
3	Voltage Rating	kV	33	
4	Conductor Size Range	mm sq.	120-185	
5	Specific wet flashover	kV/cm	at least 3kV/cm	
6	Basic Insulation Level	kV	170	
7	Short circuit current rating	kA	At least 25kA for 3 seconds	
8	Specific creepage distance	mm/kV	25	
9	Rated one minute power frequency withstand Voltage	kV	70	
10	Ferules that require use of a crimping tool	Yes/No	No	
11	kits shall be suitable for both aluminium and copper cables	Yes/No	Yes	
12	Kit shall be complete with all materials contained in a box complete with Ferules or Connectors supplied	Yes/No	Yes	
13	Shelf life of all components Supplied		At least 3 years	
14	Depth of laying	mm (min)	1050	

Tenderer's Signature.....

Date.....



ZETDC



DISTRIBUTION DEPARTMENT

ZETDC SPECIFICATION NO. 10052017

SPECIFICATION FOR

Battery Charger and Battery Bank

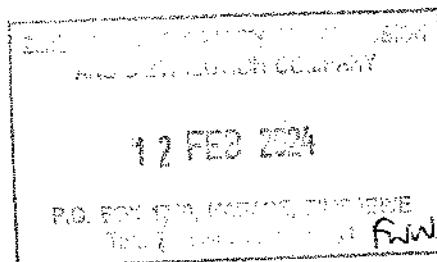
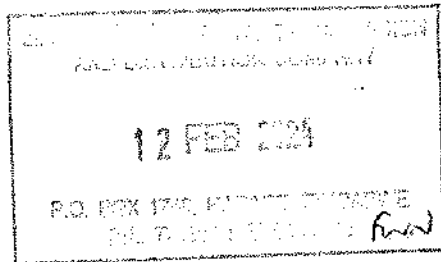


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ZETDC SPECIFICATION NO. 10052017

Battery Bank and Battery Charger

1 SCOPE

This specification calls for the supply and delivery of a complete DC backup system with batteries, charger, battery monitoring and alarm unit, main fuses, battery test socket and DC distribution board.

The Supplier shall state name, place and country of manufacture. The Supplier shall state whether or not the equipment are produced under license, in which case the licence holders' name shall be stated.

Tenderers shall include a complete statement of compliance with this Specification. For every clause in this Specification the Tenderers shall state compliance or non-compliance and shall elaborate where appropriate.

Tenderers shall use the words "comply", "do not comply" with this Specification or in the clauses of an informative nature, "noted".

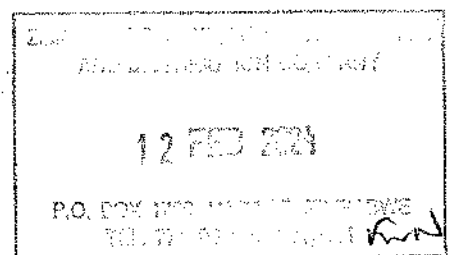
2. DETERMINATION OF RESPONSIVENESS

Prior to the detailed evaluation of Tenders, ZETDC will determine whether each Tender is substantially responsive to the requirements of the Tender Document.

For the purpose of this clause, a substantially responsive Tender is one which will conform to all the terms, conditions and specifications of the Tender Document without material deviations or reservations. A material deviation or reservation is one which affects in a substantial way the price, scope, quality, completion, timing or administration of the works undertaken by the Tenderer under the Contract, or which limits in a substantial way, inconsistent with the Tender Document, the Zimbabwe Electricity Transmission and Distribution Company's rights or the Tenderer's obligations under the Contract and the rectification of which would affect unfairly the competitive position of other Tenders who have presented substantially responsive Tenders at reasonable price.

A Tender determined to be substantially non-responsive will be rejected by the Authority and may not subsequently be made responsive by the Tenderer by correction of the non-conformity.

The Zimbabwe Electricity Transmission & Distribution Company may accept any non-material deviation or reservation provided that the acceptance thereof does not prejudice or affect the relative ranking order of any tender in the evaluation of tenders.



3. PARTICULARS OF THE ELECTRICAL SYSTEM

Unless otherwise specified in the Schedule of Requirements, it must be assumed that the electrical system in which the equipment will be used in is;

- a) Three phase overhead-line construction and underground system. The maximum earth fault factor on the network is 1.5.
- b) Operated at 50 Hz, with approximately sinusoidal wave form.
- c) The highest system voltage does not normally exceed the nominal system voltage by more than 10%. The nominal system voltages are 33 kV, 11 kV and 0.4kV.
- d) The system frequency variation does not exceed plus or minus 2.5% from 50 Hz.
- e) Maximum Short circuit current of 15kA for both 33 and 11kV networks.

Designs should allow for these variations.

4. PARTICULARS OF THE ENVIRONMENT

The equipment will operate within the tropics and will be subjected to sudden ambient air temperature changes of the order of 10 °C per hour, occurring at the onset of rain, but the barometric pressure at any given place does not vary by more than approximately 10mm Mercury. Frequent and severe lightning storms occur during summer months, with isoceraunic levels varying between 50 and 100 thunderstorm days per annum.

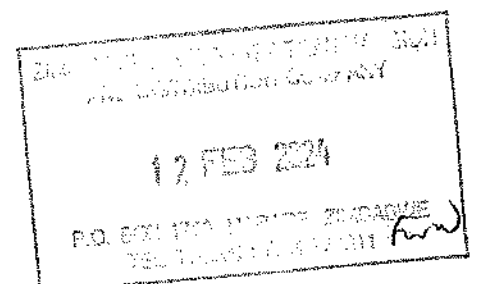
The equipment shall be capable of operating under the following environmental conditions.

- a) **Ambient temperatures:**
 - (i) Maximum: 45 °C
 - (ii) Minimum: minus 10 °C
 - (iii) Maximum daily average: 35 °C
- b) **Altitude:**

Maximum altitude of 1 500 metres above sea level. The design shall allow for reduced cooling effect due to high altitude.
- c) **Humidity:**

Humidity of 13mg per cubic metre absolute and 65% relative before storms with vapour pressure of 17mmHg.
- d) **Lightning:**

Frequent and severe lightning storms occur during summer months, with isoceraunic levels varying between 50 and 100 thunderstorm days per annum.



e) **Dust:**

Particular attention should be paid in the design of all equipment to ensure that there is no damage to working parts or insulation through the ingress of dust, insects, vermin which are prevalent for long periods in the year.

It is the supplier's responsibility to make himself familiar with any other climatic and physical conditions pertaining in Zimbabwe and to supply equipment which meet all such conditions.

5. LANGUAGE, UNITS AND STANDARDS

All tenders, correspondence, description upon drawings, illustrations or instructions shall be in unambiguous English Language. SI units of measurements shall be used throughout.

Except where modified by ZETDC's specifications, IEC recommendations (IEC 529, IEC 896-2 and IEC 297) shall apply throughout. In the case of conflict between the above stated standards and this specification, the ruling of this specification shall prevail.

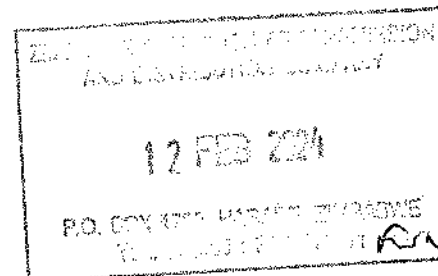
6. TECHNICAL SCHEDULES

The Technical Schedules shall be filled in, signed, dated and completed by the Bidder, and submitted with the Bid. All data entered in the Schedules of Technical Guarantees are guaranteed values by the Bidder and cannot be departed from whatsoever. All data entered in the Schedules of Informative Data are also guaranteed values by the Bidder. These data may only be altered following the Engineer's written consent.

7.0 DESIGN & CONSTRUCTION

7.1 Battery

- The supplier shall state the type and designation of the battery.
- The battery shall be maintenance free Nickel cadmium.
- The battery shall comply with IEC 896-2 requirements for safe ventilation.
- The battery connections shall be fully insulated.
- The battery shall have a life expectancy, not less than 10 years when operated at 25 °C and under float conditions.
- The batteries shall be tested to IEC 68-2-29, test certificate to be included with the bid.
- Each cell shall comply with vibration test as per IEC 77 for 2 hrs at 1gram.
- Each cell shall accept a ripple voltage of up to +-10 % without loss of electrolyte.
- The battery shall not accumulate salts on the terminals during its operation.
- The battery shall be hermetically sealed to avoid the ingress of moisture and insects.
- A recombination level of at least 85 % should be met at normal recommended float conditions.
- Nominal voltage per battery should be any voltage within the range from 1.5V to 2.2V.



- The batteries should come with battery racks.
- The capacity per battery should not be less than 95Ah.
- The manufacturer of the batteries shall have ISO 9001 or 9002 Certification, which shall be included in the bid. Test Reports shall also be submitted with the bid.
 - o Rated voltage: As per schedule of requirements
 - o Capacity minimum: Capacity per battery should not be less than 96Ah.
- The batteries shall be provided from manufacturer who has manufactured similar batteries for at least a period of 10 years. The Bidder shall indicate the supply record for the past 5 years and a reference letter from a utility indicating reliability of batteries.

7.1.1 Accessories

The following accessories shall be provided for each battery bank supplied

1. Thermometer
2. Hygrometer

7.2 Battery Charger

- The supplier shall state the type and designation of the charger.
- Nominal output voltage: As per schedule of requirements
- Current: As per schedule of requirements
- AC supply: 230 V 1-ph. 50 Hz.
- AC fuse: 16 A
- Current ripple with 50 Ah battery less than: 0.09 A, eff.
- Voltage ripple less than: 0.5 % peak-peak.
- Load stability full range less than: 1 %

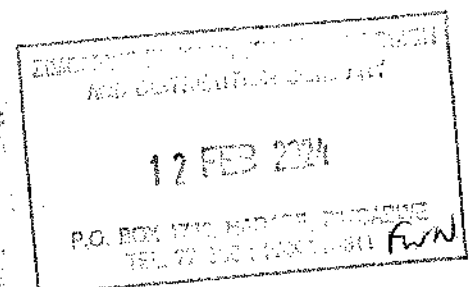
7.3 Distribution panel

- The panels shall be supplied with signals for tripped fuses.
- No. of fuses: 6 off 2 * 63 A and 6 off 2 * 25 A
- Nominal Voltage: As per schedule of requirements.

7.4 Monitoring unit

Following functions shall be provided and the annunciator module placed in the door.

- Charger failure.
- Mains failure.
- Voltage high.
- Voltage low.
- Float charge High/Low.



- Battery circuit failure.
- High voltage shut down.
- A-meter charging.
- V-meter charging
- Earth fault + and -.

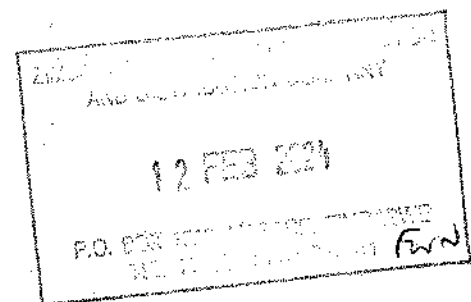
8. Protection.

IP 42 Tropical protection.

9. Supply and Delivery.

The Bidder shall provide one complete manual in unambiguous English with tender and two more manuals with the equipment, for the successful tenderer.

The manuals shall contain assembly instruction, wiring diagrams and schematics together with all equipment operation and maintenance instruction.



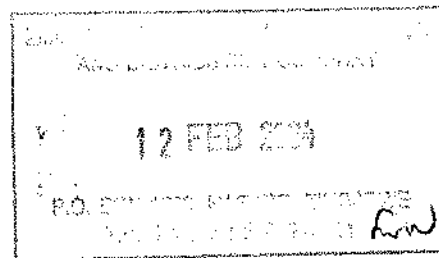
10. TECHNICAL GUARANTEE SCHEDULE FOR BATTERY BANK AND CHARGER

Please complete this schedule by stating the actual tendered equipment specification in the column labelled Guaranteed Value and sign and insert date as indicated.

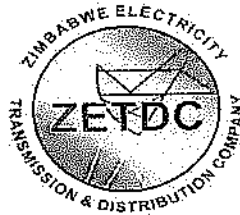
Item	Description	Required	Guaranteed Value (Offered)
1	DC Voltage	See Schedule of requirements	
2	AC Voltage	230v, 1ph	
3	AC Fuse	16A	
4	Voltage Ripple	<0.5% Peak-Peak	
5	Full range load stability	<1%	
6	Applicable standards	IEC529, IEC 896-2 and IEC 297.	
7	Protection	IP 42 Tropical Protection	
8	Ventilation	Refer to IEC 896-2	
9	Battery Tests	To IEC 68-2-29	
10	Vibration Tests	as per IEC 77	
11	Battery Racks	The batteries should come with battery racks	
12	Capacity of the batteries	The capacity per battery should not be less than 96Ah	
13	Accessories for each battery bank. Yes/No: 1. Thermometer 2. Hygrometer	Yes Yes	

Tenderer's Signature.....

Date.....



ZETDC

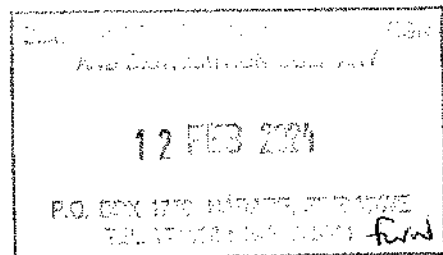


DISTRIBUTION DEPARTMENT

ZETDC SPECIFICATION NO. DS20052022MVPVC

SPECIFICATION FOR

PVCFR/PVCFR/SWA/PVCFR CABLES (600/1000V)



SPECIFICATION FOR: MV (PVC) POWER CABLES

1. Introduction

This Specification calls for supply and delivery of **MV PVCFR/PVCFR/SWA/PVCFR power cables with voltage rating 600/1000V.**

The supplier shall state name, place and country of manufacture. The supplier shall state whether or not the cables are produced under license, in which case license holder's name shall be stated.

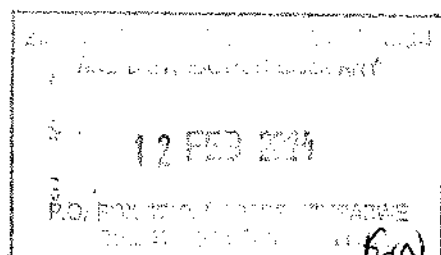
Bidders/Tenderers shall include a complete list of suitable jointing and termination kits available on the market for the cables being tendered. They should also list the recommended types of terminating and jointing kits.

The manufacture shall have a proven track record of manufacture and delivery of such goods for at least 5 years, and must indicate production for the past 2 years.

The Bidder/Tenderer has to complete the Technical Guarantee Schedules at the end of the specification.

Tenderers shall include a complete statement of compliance with this Specification. For every clause in this Specification the Tenderers shall state compliance or non-compliance and shall elaborate where appropriate.

Tenderers shall use the words "comply", "do not comply" with this Specification or in the clauses of an informative nature, "noted".



2. Standards, Units and Language

All cables supplied under this specification shall conform to relevant IEC/BS Standard. Any other standard provided the Bidder can provide documentary evidence that the standard is equal to or better than the above standards.

Cables not complying with the above standards will be rejected. All tenders, correspondence, and all description upon drawings, illustrations or instructions shall be in the **English language**.

SI units of measurements shall be used throughout. The Cables shall be manufactured to high quality standards. The companies manufacturing the cables shall have ISO Certification. Documentary proof of **ISO certification** shall be provided with the bid.

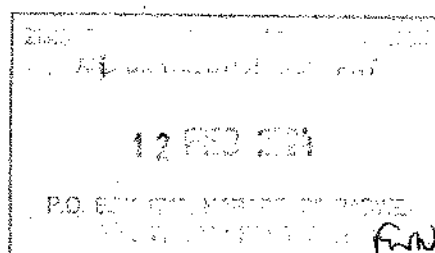
3. Particulars of Electrical System

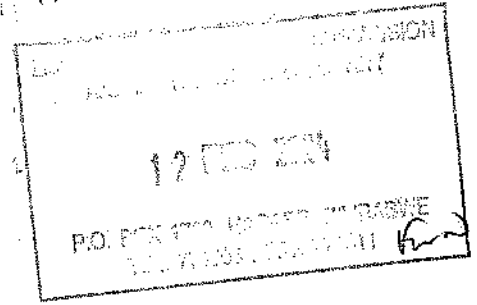
The cables shall be capable of operation in the following system: -

- (a) 3 phase, underground, resistance earthed system (where applicable).
- (b) Operated at 50Hz variable between plus or minus 2.5%
- (c) A highest system voltage not exceeding the normal by more than 10%.
- (d) Earthed so that the earth fault factor will be less than 1.5 at any location.
- (e) Maximum duration of earth fault not exceeding 20s.

4. Particulars of Environment

The cables will either be subjected to Atmospheric, or Underground Environment or both.





4.1 Particulars of Atmospheric Environment

The cables shall be capable of operation under the following atmospheric conditions.

- (a) At an average altitude of 1.500m above sea level.
- (b) Ambient air temperatures not exceeding +45 degrees centigrade or below - 10 degrees centigrade.
- (c) Humidity 13mg/cubic metre absolute and 65% relative before storms with vapour pressure 17mm hg.
- (d) Equipment will operate within the tropics and is subject to sudden ambient air temperature changes of the order of **10 degrees centigrade per hour** occurring at the onset of rain, but the barometric pressure at any given place does not vary by more than approximately 10mm mercury.
- (e) Frequent and severe lightning storms occur during summer months, with **isoraunic** levels varying between 50 and 100 thunderstorm days per annum.
- (f) Particular attention should be paid in the design of all equipment to ensure that there is no damage to working parts or insulation through the ingress of dust, insects, vermin which are prevalent for long periods in the year.

4.2 Particulars of Underground Environment

In addition to being exposed to the conditions stated in 4.1 the cables shall be capable of operation in the following underground conditions: -

- (a) Mean ground temperature at this depth being 25 degrees centigrade with a maximum value of 30 degrees.
- (b) In soil with a maximum resistivity of 1.2 K Ω m
- (c) With a foundation or bed of washed pit sand 150mm deep laid in the trench first, followed by a second 150mm pit sand above the cable. It is then backfilled by

450mm of earth before the yellow cable marker ribbon is laid and the trench completely closed.

5. Electrical Equipment Materials

All materials incorporated in the equipment supplied shall be new and of first class commercial quality, free from defects and imperfections.

6. Drumming Cables

Cables are to be supplied on suitably reinforced (where applicable) cable drums which shall be weatherproofed for extended external outdoor unprotected storage. Each drum shall be firmly, clearly and indelibly labelled to include information on actual cable length in meters, size, type, and voltage rating of the cable, as well as rolling arrow and direction of lay of the cores where appropriate.

The drum capacities shall be utilised fully, and the drum sizes selected for minimum drum transport cost. The drum weight shall not exceed 1000kg.

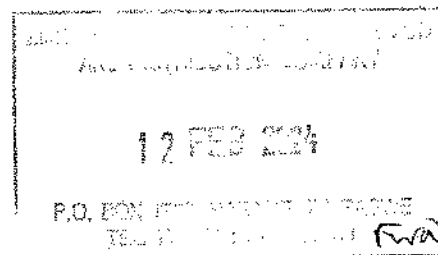
7. Ratings

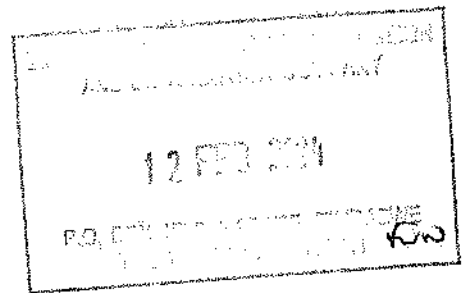
7.1 Voltage rating

The maximum continuous voltage rating shall be 10% more than the continuous voltage rating. Cables that do not meet this requirement will be rejected.

7.2 Current Rating

Unless otherwise approved by the Authority, the current ratings depending on the method and environment in which the cable is laid according to the attached schedule of requirements shall conform to IEC 502 for cable rated below 30kV and IEC 840 for cables rated above 30kV. These shall correspond to conductor temperature of 90 degrees during normal operation and 250 degrees during faults. The short circuit ratings shall be according to IEC 949.





8. TECHNICAL GUARANTEE SCHEDULES

Please complete this schedule by stating the actual tendered cable specification in the column labeled Guaranteed Value. The schedule must be signed and dated as indicated.

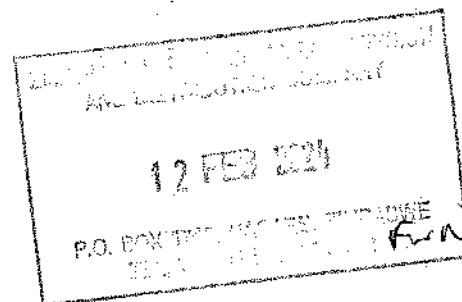
8.1 TECHNICAL GUARANTEE SCHEDULE FOR PVC SINGLE AND MULTI CORE CABLES

Item	Description	UOM	Required	Guaranteed Value/ Actual offered	Remarks	Reference document page (e.g. Found on page 3, section 3.1 of brochure/data sheet/manual/drawing etc.)
1	Conductor material	-	copper			
2	Conductor Construction	Min no of wires	6			
3	Conductor size	mm ²	2.5/16			
4	Conductor resistance at 20°C	Ohm/km	1.15			
5	Insulation material		PVC/FR			
6	Number of Cores/ Colour		Singular or multi-colour			
7	Single Layer Steel Armour		Where applicable			
8	Armouring material		GSW where applicable			
9	Armouring construction		Min of 43 of 1.25mm Diameter where applicable			
10	Sheathing material		LHPVC/FR where applicable			
11	Method of installation		Air and direct burial			

12	Bedding material		LHPVC/FR			
13	Depth of laying	mm (min)	500 where applicable			
14	Ground temperature	°C	25			
15	Ground thermal resistivity	Km/W	1.2			
16	Rated voltage ac (U ₀ /U)	V	600/1000			
17	Highest system voltage	V	1100			
18	Operating Ambient temperature	°C	-1 to 40			
19	Conductor maximum operating temperature	°C	70			
20	Current ratings Ground/Ducts/Air	A	88/75/82/ as applicable			
21	Altitude	m	1400			
22	Relative humidity	%	85			
23	Sample Test Certificate		Yes			
24	Cable length per despatch drum	m	As per tender quantity			
25	Type of despatch		Treated wooden drum where applicable			

Tenderer's Signature.....

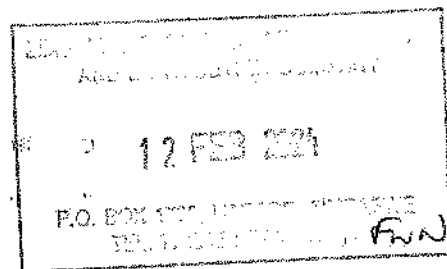
Date.....



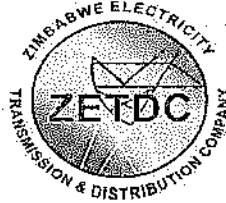
IMPORTANT INFORMATION

1. Factory Acceptance Tests, as detailed in this tender shall be carried according to the IEC 502 standard. Tests to be carried out are as specified in this specification.
2. Results of Type tests carried out by an independent Technical Institute on previously manufactured items to be included in the bid. The tests should have been carried out by a recognised institute (e.g KEEMA). The institute should be recognised by IEC. Documentary proof that the Test Institute is recognised by IEC shall be provided with the bid.
3. The drum weight shall not exceed 1000kgs.
4. A marking bearing voltage designation, maker's name, year of manufacture shall be marked on the PVC outer sheath at suitable intervals throughout the cable. The cable shall be marked at 1.0 m intervals to indicate the length of cable remaining on the cable drum as the cable is used.
5. Each drum shall be firmly, clearly and indelibly labelled to include information on actual cable length in meters, size, type, and voltage rating of the cable, as well as rolling arrow and direction of lay of the cores where appropriate.

Failure to meet any of the technical requirements will result in rejection of the bid.



ZETDC



DISTRIBUTION SERVICES DEPARTMENT

SPECIFICATION FOR

DISTRIBUTION TRANSFORMERS

ZETDC SPECIFICATION NO. DS17102019DSTFRS

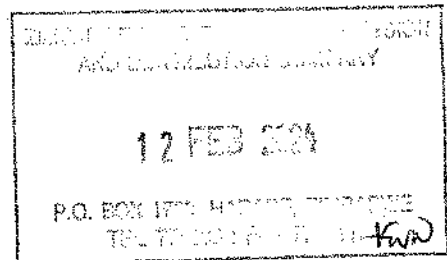
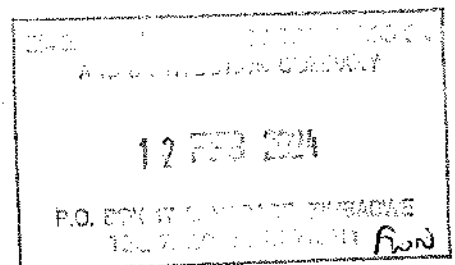


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1.0 SCOPE

This specification calls for supply and delivery of distribution transformers. The details of each transformer are as specified in Schedule of Requirements.

Spares as recommended by the supplier should be included in the scope of supply.

Tenderers shall include a complete statement of compliance with this Specification. For every clause in this Specification the Tenderers shall state compliance or non-compliance and shall elaborate where appropriate.

Tenderers shall use the words "comply", "do not comply" with this Specification or in the clauses of an informative nature, "noted".

2.0 PARTICULARS OF ELECTRICAL SYSTEM

Unless otherwise specified in Schedule of Requirements, it must be assumed that the system on which the equipment will operate is:

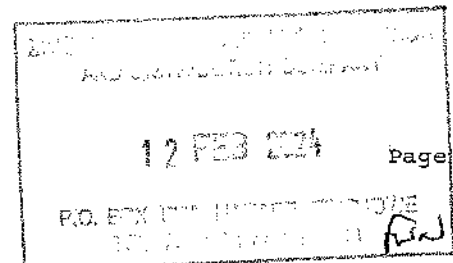
- a) Three phase overhead-line construction and underground system. The maximum earth fault factor on the network is 1.5.
- b) Operated at 50 Hz, with approximately sinusoidal wave form.
- c) The highest system voltage does not normally exceed the nominal system voltage by more than 10%. The nominal system voltages are 33 kV and 11 kV.
- d) The system frequency variation does not exceed plus or minus 2.5% from 50 Hz.

Designs should allow for these variations.

3.0 PARTICULARS OF ENVIRONMENT

The transformers shall be capable of operating under the following environmental conditions.

- (a) At an average altitude of 1,500 m above sea level.
- (b) Ambient air temperatures not exceeding a maximum of +45°C or below -10°C with a daily maximum average of 35°C.
- (c) Exposed to direct tropical sun.
- (d) Humidity 13 mg per cubic metre absolute and 65% relative before storms with vapour pressure 17 mm.hg.
- (e) Equipment will operate within the tropics and is subject to sudden ambient air temperature changes of the order of 10 degrees centigrade occurring at the onset of rain, but the barometric pressure at any given place does not vary by more than approximately 10 mm mercury.
- (f) Frequent and severe lightning storms occur during summer months, with isoceraunic levels varying between 50 and 100 thunderstorm days per annum.
- (g) Particular attention should be paid in the design of all equipment to ensure that there is no damage to working parts or insulation through the ingress of dust, insects, vermin which are prevalent for long periods in the year.



4.0 STANDARDS, UNITS AND LANGUAGE

Except where modified by the Authority's Specifications, IEC 60076 standards shall apply throughout or British Standards (BS) where they amplify the IEC 60076.

In the case of conflict between the above stated Standards and this Specification, the ruling of this Specification will prevail.

All tenders, correspondence, description upon drawings, illustrations or instructions shall be in unambiguous English Language. SI Units of measurements shall be used throughout.

All materials used in the manufacture of the transformers shall be new and of high commercial quality.

The transformers shall be manufactured to high quality standards.

Tenders should advise to which standard the transformers are manufactured and tested, and shall supply relevant test certificates or test results.

The transformers shall be sourced from manufacturers who have ISO 9001 Certification. Evidence of the ISO 9001 Certification shall be provided with the bid. Manufacturers who cannot submit such certification are liable to be rejected.

5.0 DESIGN

5.1 General

(a) The transformer shall be of the oil-immersed type suitable for outdoor use. They shall be dried out at the manufacturer's workshop and it should be possible to commission them without further drying out

(b) Designs shall be such that water does not collect on any part of the equipment. Particular attention shall be paid in the design of all equipment to ensure that there is no damage to working parts or insulation through the ingress of dust, insects or vermin which are prevalent for long periods in the year.

Live metal of auxiliary connections in air shall be screened to prevent accidental contact and shall be enclosed in compartments which are fitted with approved means to provide reasonable dry conditions within the compartments. In addition, where there are auxiliary connections at 380 volts or more, "Danger" notices shall be affixed to the outside of the compartments.

(c) Transformers shall be connected in accordance with BS 171; three phase transformers to Vector Group reference Dyn11.

(d) The L.V neutrals shall be brought out of the tank to a readily accessible terminal and shall not be earthed inside the tank, unless otherwise specified in the enquiry.

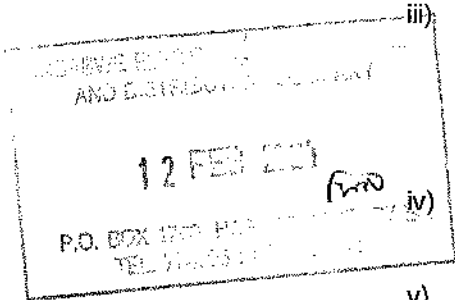
(e) Transformers on a particular contract with similar kVA rating, voltage ratios and connections shall be suitable for parallel operation on all relevant taps under which conditions they should share the load in proportion to their ratings subject to the tolerances on impedance laid down in IEC 60076 or BS 171.

(f) If it is required to parallel any transformer with existing transformers then full details of the existing transformers will be provided when tenders are placed.

- (g) Low impedance transformers are preferred, a maximum of 5% being envisaged on any size with no plus tolerance.
- (h) An oil gauge shall be provided for non-sealed transformers.

The following details shall apply to sealed designs:

- i) Hermetically sealed transformers are acceptable by the Authority.
- ii) Any holes or plugs used to facilitate vacuum/pressure testing, leak testing or oil filling of the transformer shall finally be sealed.
- iii) The expansion space for the oil shall not be less than 25 percent of the volume of the oil at 20 degrees Celsius, for transformers with conservators and transformers using the tank for expansion, and shall be nitrogen filled. The transformer shall be sealed at atmospheric pressure.
- iv) Transformers using the expandable ribs for expansion shall be totally filled with oil and sealed at atmospheric pressure.
- v) Drain plugs shall NOT be fitted to transformer tanks. In case they are fitted, they have to be blanked off or sealed before delivery to ZETDC.
- vi) Earth studs are required at both the H.V and L.V ends of transformer.



5.2 Windings

- (a) Tappings shall be provided in the H.V windings, preferably in the electrical centre of the windings, to permit variation of the number of H.V turns without any variation in the kVA rating. The variations shall be effected by means of a manually operated tapping switch to be provided.
- (b) All windings and terminations shall be fully insulated and those for service above 1 000 volts shall be designed for impulse voltage tests.

Designs shall be such that electrical stresses are as uniform as possible throughout the windings under impulse conditions.
- (c) Windings shall be vacuum impregnated and insulating materials shall not be liable to soften, shrink, become brittle, carbonise, deteriorate, or collapse in any way during service.
- (d) HV and LV windings shall be of copper or aluminium wire. L.V windings of aluminium sheet are not acceptable. Transformers with such windings will be rejected.

5.3 Cores

- (a) The magnetic circuit shall be earthed to the core clamping structure, at one point only, and the core assembly to the tank cover. Where transformers are not sealed, readily accessible removable bolted links shall be employed for the earthing connections.
- (b) The general construction of the cores, framework and the clamping arrangements shall be robust and such that they will be capable of withstanding completely any stresses which may occur due to handling, transport or service. All cores and yokes shall be

terminated and clamped by means of a suitable framework. Suitable means shall be provided for lifting the cores from the tanks.

- (c) It shall not be possible for the core to move relative to the tank during handling or transport. Designs which contravene this requirement will be rejected.
- (d) Particular attention shall be paid to maintaining low core loss consistent with sound design.

5.4 Tapping Switches

- (a) Transformers shall be provided with approved off-circuit type tap changing equipment. A fully insulated off circuit externally manually operated ganged tapping switch shall be separately capable of withstanding the specified impulse voltage when connected to the transformer windings.
- (b) Clearly visible tap position indication shall be provided. The tapping switch shall be operated by means of an external handle which can be positively located and locked in each operating position.

The switch shall be mechanically robust and provided with a device between the handle and the switch to permit operation without strain in the event of imperfect alignment between switch and handle. The switch operating shaft shall be fully insulated as between tank and switch and shall be provided with a suitable oil and vacuum tight gland where it passes through the tank.

- (c) The use of wood shall be avoided wherever possible and all the supports and terminal boards shall be completely unaffected by hot oil and shall be non-moisture absorbent.

- (d) High grade insulating materials shall be used in the construction of tapping switches which shall be designed with special attention to the elimination of points where tracking is likely to occur.

- (e) Tapping switches shall be mounted on supports made of suitable high strength insulating material and shall be provided with self-aligning spring loaded wiping contacts capable of maintaining good electrical contact without the need for periodic maintenance.

All clearance between tapping switch contacts and leads shall be indicated on drawings submitted at the time of tendering and such clearances shall be sufficient to prevent tracking or flashover in the event of carbon or sludge deposits forming on leakage paths.

- (f) The tapings to be provided on the H.V winding shall be as follows:- Minus 5%: Minus 2.5%: 0% (Normal): Plus 2.5%: Plus 5%

5.5 Bushings

- (a) All line terminals and neutral connections where specified, shall be brought out to porcelain outdoor type terminal bushings. The bushings shall be the outdoor type.
- (b) Arcing horns with equal double gaps shall be fitted on all transformer bushings above 660 volt. The total gap length (for two gaps) shall be set at 60 to 70mm for 11kV and 140 to 150mm for 33kV nominal voltage.
- (c) The bushings shall have minimum Creepage distances of 670mm and 250mm for nominal voltages of 33kV and 11kV respectively.

5.6 Tanks and Conservators

5.6.1 General

- i) Drain valves may be either screwed or flanged whilst conservator isolator valves shall be flanged. Drain valves shall be complete with captive plugs which shall be either of non-ferrous metal or galvanised.
- ii) All internal steel surfaces of tanks and conservators shall be shot blasted and cleaned, and a coat of protecting compound, unaffected by hot oil, should be applied.
- iii) All external surfaces and parts made of steel are to be thoroughly shot blasted and cleaned, after which two coats of priming paint, preferably of zinc chromate, one intermediate coat, and one coat of finishing paint are to be applied. The colour of the finishing coat shall be medium Sea Grey, Colour No. 637 to BS 381C.
- iv) Transformers on which the paints are found to flake off or deteriorate within the guarantee period shall be suitably cleaned and repainted free of charge by the supplier. Suppliers providing such transformers will not in the future be given the opportunity to offer transformers to ZETDC.

5.6.2 Tanks

- i) Each transformer shall be housed in a tank of welded steel plate construction suitably stiffened where necessary but with a flat base.

Transformers rated equal to or less than 500 kVA shall not be provided with wheels as rollers.

- ii) The lifting lugs shall be suitable for lifting the transformer bodily by means of a hoist or crane when it is completely assembled and ready for service.
- iii) All transformers up to and including 315 kVA rating shall be provided with four fixing lugs on the base drilled with 16mm holes for bolting to a platform.

The fixing holes shall project beyond the ends of the tank and be placed to provide the most practicable stable arrangement.

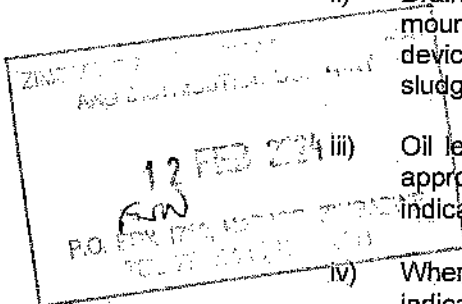
5.6.3 Conservators

- i) Conservators, shall be dimensioned such that oil expansion may occur over the working range of temperature from no load with the transformer cold and at minus 10 degrees Celsius ambient air temperature to full load at plus 40 degrees Celsius ambient air temperature while the sump pipe remains covered and the oil level is visible or indicated.

- ii) Drain plugs shall preferably incorporate approved sampling facilities, and shall be mounted at the lowest part of the conservator tank and so designed that the sampling device can be readily cleared in the event of its being blocked by an accumulation of sludge etc., without the necessity of having to dismantle the device completely.

Oil level gauges on conservator tanks shall be of the refracting plate glass or other approved type, marked with the level at 20 degrees Celsius at no-load and capable of indicating the level of oil over the specified working range.

- iv) Where dehydrating breathers are specified they shall be of the Silica gel type which give indication of moisture absorption by change in colour of the charge.

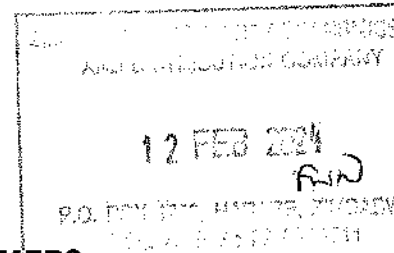


An inspection window shall be provided and mounted in a position convenient for inspection. The breather is to incorporate an oil seal to prevent contact with the external air when breathing is not taking place. The breather is to be fitted on the LV end of the transformer.

5.7 Accessories and Fittings

- (a) All transformers shall be provided with accessories and fittings in accordance with the tables below, unless otherwise specified in the enquiry:

In the following tables 'Y' means yes (To be provided)
'N' means no (Not to be provided)



ACCESSORIES AND FITTINGS FOR 11/0.4 and 33/0.4 kVA DISTRIBUTION TRANSFORMERS.

TRANSFORMER TANK FITTINGS	Transformer Nominal Ratings					
	11kV Primary Voltage			33kV Primary voltage		
	Upto but excluding 100 kVA.		100kVA and Above but excluding 500 kVA	500 kVA and above	500 kVA and above	
	Free Breathing	Sealed			upto but excluding 500 kVA	and above
1 Conservator	N	N	N	Y	Y	Y
2 Drain valve with captive sealing plug	N	N	N	N	N	N
3 Lifting lugs	Y	Y	Y	Y	Y	Y
4 Thermometer Pocket	N	N	N	Y	N	Y
5 Rating and Diagram plate	Y	Y	Y	Y	Y	Y
6 Hanger irons	Y	Y	N	N	N	N
7 Platform mounting lugs	Y	Y	Y	N	Y	N
8 Earthing Terminal	Y	Y	Y	Y	Y	Y
9 Lightning arrestor brackets	N	N	N	Y	N	Y
10 Dial type thermometer	N	N	N	Y	N	Y
11 Jacking pads	N	N	(Required only when the mass of the complete transformer is 1 000 kg or more.)			
12 Plain breather	Y	N		N	N	N
13 Oil gauge	Y	Y	On Conservator			
14 Mounting plate for Item 6 to be suitable for mounting marshalling box Item 17)	N	N	N	Y	N	Y
15 Lashing down facilities	Y	Y	Y	Y	Y	Y
16 Marshalling box for Item 10 of Tank fitting and Item 7 of Conservator fittings						
Conservator fittings						
1 Drain plugs	N/A		Y	Y	Y	Y
2 Sampler	N/A		Y	Y	Y	Y
3 Separate filling hole with caps	N/A		Y	Y	Y	Y
4 Dehydrating breather	N/A		Y	Y	Y	Y
5 Plain breather	Y	N	N	N	N	N
6 Oil gauge	N/A		Y	Y	Y	Y
7 Gas and oil actuated relay	N/A		N	Y	N	Y
8 Conservator isolating valve	N/A		N	Y	N	Y

- (b) Rating and diagram plates shall be of engraved brass or other approved non-corroding material and shall be placed on the L.V side of the transformer.

- (c) Where a thermometer pocket is provided, it shall be of a thin walled metal mounted in the tank cover. The pocket shall project 25mm outside of the tank and shall be threaded along the whole projecting portion with a 19mm B.S.P. male thread, a screwed cap shall be provided to cover the pocket when not in use. The pocket shall have internal dimensions of not less than 19mm diameter and 115mm length.
- (d) Hanger irons, where specified, shall be suitable for suspending the transformer from a 102mm x 51mm Mild Steel Channel cross-arm, bolted to the vertical legs of an 'H' pole. A suitable stop shall be provided at the base of the tank to enable the transformer to be suspended vertically, and rest against a similar 102 mm x 51mm Channel provided on the 'H' pole at a lower level for this purpose. The hanger irons shall be drilled for an M16 bolt to enable them to be bolted to the vertical web of the cross-arm and thereby prevent any lateral movement of the transformer.

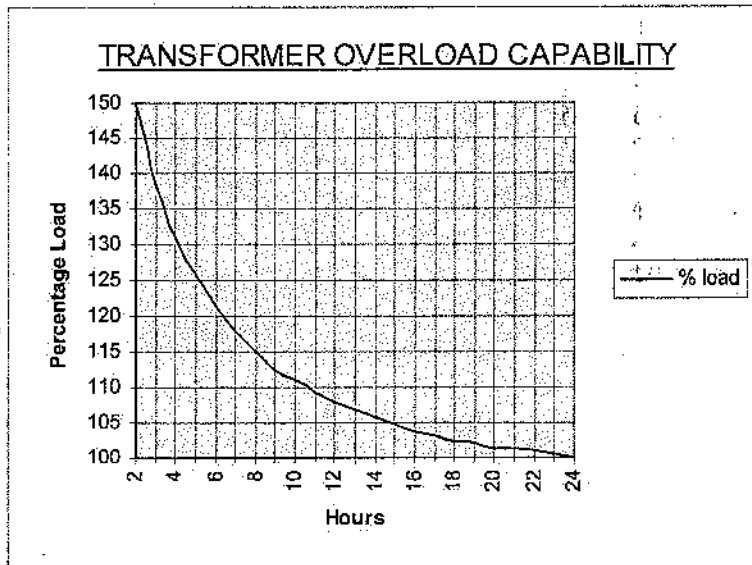
The hanger irons shall be mounted on the LV side of the transformer tank.

6.0 INSULATING OIL

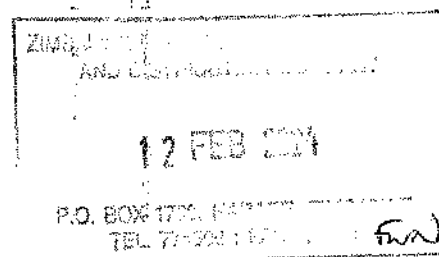
The transformers shall be fitted with low viscosity mineral insulating oil which complies in every respect with the provisions IEC 60296.

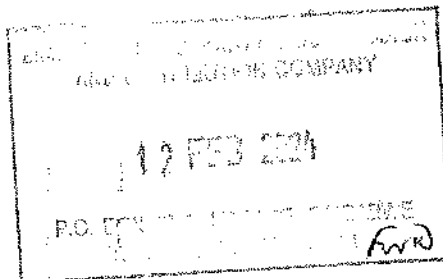
7.0 OVERLOADING CAPABILITY

The transformer shall be capable of overload at 35 °C ambient temperature without reduction in the anticipated working life of the transformer, as shown in the curve below.



The maximum load at other periods is assumed to be 70% of the transformer rating for the above transformer overload capability curve.





8.0 NOISE POLLUTION

The maximum values for the noise levels of the various distribution transformers shall be as given in the table below:

TRANSFORMER RATING kVA	MAXIMUM POLLUTION dB(A)
Less than or equal to 50kVA	48
Between 50 and 315kVA	55
Between 315 and 500kVA	56
Between 500 and 800kVA	57
Between 800 and 1000kVA	58
Between 1000 and 1600kVA	60
Above 1600 kVA	61

Transformers with Noise Pollution levels higher than that given above will be rejected by the Authority.

9.0 TESTS

Electrical tests are to be carried out according to IEC 60076. Routine covering test certificates shall be submitted immediately after completion of tests in the factory, for each and every identical group of transformers.

The following tests shall be carried out in addition to the routine tests:

- (a) As a type test, a temperature rise test on each different rating of transformer.
- (b) As a special test, an impulse voltage withstand test including chopped waves on each different rating of transformer.

NOTE: If tests to (a) and (b) above have been carried out satisfactorily on designs identical in all essential details, tests (a) and (b) may be waived on the production of acceptable certified type test certificates.

10.0 PACKING AND TRANSPORT

Transformers shall be transported to destination with their tanks full of oil up to the service level.

Bushings and any accessories or fittings likely to be damaged shall be protected adequately against damage in transit.

11.0 DRAWINGS AND DIAGRAMS

11.1 Drawings to be supplied with the Tender

The following drawings shall be supplied with any tender.

- (a) General arrangement drawing of each rating of transformer offered showing:
 - (i) All dimensions on height, width, depth, etc., minimum clearance (phase to phase and phase to earth) on H.V. and L.V. bushings including clearance H.V. to L.V.
 - (ii) Weights of oil, core/winding assembly and transformer fully erected.

(iii) Positions and identification in a separate legend of all fittings with type numbers.

(iv) Size and position of all fixing holes.

(b) Detailed dimensioned drawings of tapping switch illustrating type of material, clearances, between tapping points and to earth and method of operation.

(c) Detailed dimensioned drawings of bushings, silica gel or plain oil seal type breather, and conservator.

NOTE: Where sealed transformers are offered, a cross arrangement drawing shall be submitted with the tender showing, in particular, details of the tank construction and internal tank finish and the depth of the expansion space above the oil.

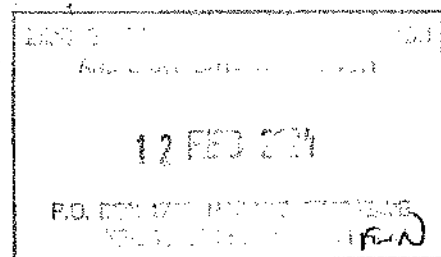
11.2 Drawings to be supplied with the Contract

(a) Latest issues of the drawing listed under Clause 12.1 shall be supplied under the contract. If no modifications are applicable to the drawings supplied with the tender, this shall be confirmed in writing under the contract and further drawings need not be supplied.

(b) Rating and diagram plate.

The transformer shall be provided with a rating plate of weatherproof material, fitted in a visible position, showing the appropriate items indicated below.

- i. Standard
- ii. Manufacturer's name
- iii. Manufacturer's serial number
- iv. Year of manufacture
- v. Number of phases
- vi. Rated power
- vii. Rated frequency (Hz)
- viii. Rated voltages (in V or kV) and tapping range
- ix. Rated currents (in A or kA)
- x. Connection symbol
- xi. Short-circuit impedance
- xii. Type of cooling
- xiii. Total mass
- xiv. Mass of insulating oil



12.0 EVALUATION OF LOSSES

The maximum load and no-load losses shall be as shown in the table below

1	2	3	4	5	6
Rated no-load secondary voltage V	Rated power kVA	Component losses			
		No load loss W			Load loss W
		Up to 12kV	24kV	36kV	
230	25	110	140	160	530
	50	180	220	250	900
400	25	120	150	170	570
	50	180	220	250	1000
	100	300	360	400	1700
	200	520	600	650	2700
	315	720	840	890	3800
	500	1100	1180	1230	5400
	800	1600	1650	1700	8000
2000	3250	3250	3300	16000	

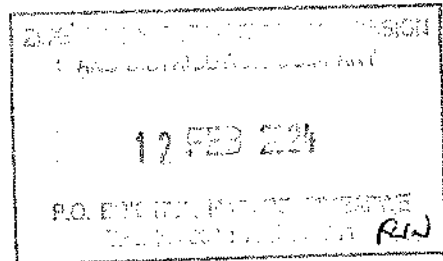
13.0 MAXIMUM DIMENSIONS REQUIRED

The bidders shall indicate the dimensions of the transformers to be provided for each transformer size.

The dimensions shall be:

- i) Maximum length shall be denoted by (l1)
- ii) Maximum width shall be denoted by (a1)
- iii) Maximum height shall be denoted by (h1)

The maximum dimensions shall be in mm.



14.0 100kVA 11/0.4KV AUXILIARY NEUTRAL GROUNDING TRANSFORMER SPECIFICATION

ITEM	DESCRIPTION		TECHNICAL PARTICULAR
1	Particulars of system		
1.1	Highest system voltage	kV	12
1.2	Nominal system frequency	Hz	50
1.3	Number of phases		3
1.4	System neutral earthing		Solidly earthed/ resistance earthed
1.5	Max. duration of short time current	Sec	1
2	Service condition		
2.1	Max. ambient temperature	°C	40/45
2.2	Min. ambient temperature	°C	5
2.3	Altitude above sea level	m	457
2.4	Pollution level		Medium to High
2.5	Max. wind velocity	m/s	30/40/45
2.6	Wind velocity at ice condition	m/s	20
2.7	Relative humidity	%	41
2.8	Average value of daily temperature	°C	25
3	AGTR characteristics	w/m ²	
3.1	Class	outdoor/indoor	outdoor
3.2	Rated voltage:		
3.2.1	HV winding	kV	12
3.2.2	LV winding	V	400
3.3	Rated frequency	Hz	50
3.4	Rated continuous power at site	kVA	100
3.5	Rated time		
3.6	Vector group		ZNynll
3.7	Method of cooling		ONAN
3.8	Impedance voltage	(%)	=/<4
3.9	Lightning impulse and power frequency		
3.9.1	Rated lightning impulse withstand voltage:		
3.9.1.1	HV terminal	kVpeak	95
3.9.1.2	LV terminal	kVpeak	5
3.9.2	Rated one minute power frequency withstand voltage:		
3.9.2.1	HV terminal	kV	28
3.9.2.2	LV terminal	kV	2.5
3.10	Short circuit strength:		
3.10.1	HV system fault level (one & three phase)	kA	31.5
3.10.2	LV system fault level (one & three phase)	kA	31.5
3.10.3	Short circuit duration	Sec	3
3.11	Tapping range	±%	±2x±2/5
3.12	Number of steps		5
3.13	Method of neutral earthing:		Resistance neutral earthing

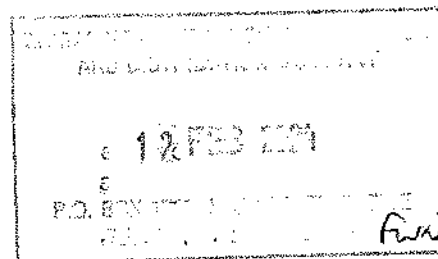
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3.13.1	HV side		Solidly earthed/ resistance earthed
3.13.2	LV side		Solidly earthed/ resistance earthed
3.14	Auxiliary power supply voltage:		
3.14.1	AC	V	400/230
3.14.2	DC	V	110
3.15	Wheels:		
3.15.1	Is required?	Yes/ No	Yes
3.15.2	Unidirectional/ bi- directional		bi- directional
3.16	Control cabinet protection degree		IP54
3.16	Type of conservator (air bag/ conventional)		conventional

15.0 TECHNICAL GUARANTEE SCHEDULES

15.1 Preamble

- 15.1.1 The Technical Guarantee Schedules shall be filled in, signed, dated as indicated, completed by the Bidder, and submitted with the Bid.
- 15.1.2 All documentation necessary to evaluate whether the equipment offered is in accordance with this Specification shall be submitted with the Bid.
- 15.1.3 All data entered in the Schedules of Technical Guarantees are guaranteed values by the Bidder and cannot be departed from whatsoever.
- 15.1.4 All data entered in the Schedules of Informative Data are also guaranteed values by the Bidder. These data may only be altered following the Engineer's written consent.

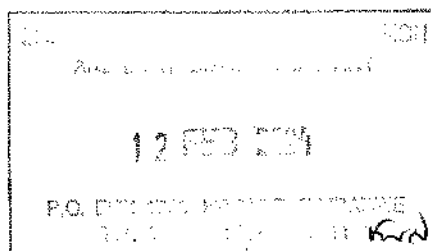


15.1.5 Technical Guarantee Schedule for 100kVA, 11/0.4kV Earthing Transformer

11/0.4kV Transformer				
Item	Description	Units	Required	Offered
1	Type/Designation		State	
2	Rating	kVA	See Schedule of requirements	
3	Type of cooling		ONAN	
4	Applicable Standards		IEC And BS	
5	HV & LV Winding wire		Cu/Al	
6	HV voltage rating	kV	11	
7	LV voltage rating	kV	0.4	
8	No. Of phases		3	
9	Power frequency	Hz	50	
10	Basic Insulation Level	kV	75	
11	Vector Group		Dyn11	
12	Accessories			
	- Bushing ct's	Yes/no	No	
	- Metering amps	Yes/no	No	
13	Dimensions			
	- Height	mm		
	- Width	mm		
	- Depth	mm		
14	Weight	kg		
	Manufacturer			
	Country of origin			

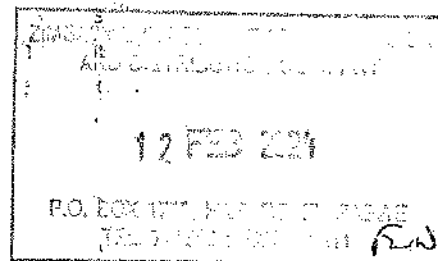
Tenderer's Signature.....

Date.....



15.1.6 IMPORTANT INFORMATION

1. Tenders should quote for delivery of the transformers complete with the ancillary equipment, fully wired, but dismantled to suitable components for delivery purposes, to ZETDC.
2. Full assembly instructions, wiring diagrams and schematics together with all equipment operation and maintenance instructions and manuals which shall be in the English language shall be provided by the successful Tenderer at least two weeks prior to delivery of the equipment and shall be to the approval of the Authority. Each transformer shall have at least (2) two sets of schematics.
3. The transformers shall be provided from manufactures, who have at least 300 units in operation and manufactured such equipment for at least three years.
4. All tenders should be fully supported with manufacturers' brochures and technical literature, illustrations, outline dimensional drawings and copies of performance and type test certificates or results done by an independent institution. Bidders shall complete the Technical guarantee schedule included with this Specification.



**ZIMBABWE ELECTRICITY TRANSMISSION
AND DISTRIBUTION COMPANY**



ZETDC SPECIFICATION

**SPECIFICATION FOR SUPPLY AND DELIVERY OF PROTECTION
AND CONTROL PANELS**

ZIMBABWE ELECTRICITY TRANSMISSION AND DISTRIBUTION COMPANY

12 FEB 2024

P.O. BOX 1726 HARARE ZIMBABWE
TEL: 00263 92 2111111 (ext) *fw*

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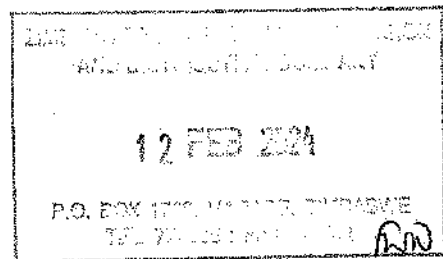
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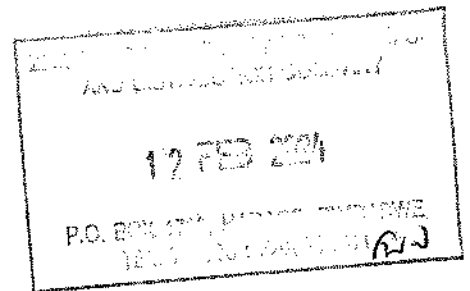


ZETDC SPECIFICATION

1. DEFINITION AND INTERPRETATION

The following terms may be encountered in this specification document and shall be interpreted as follows:

Hz	-	Hertz
kW (MW)	-	kilowatt (megawatt)
VA, (kVA, MVA)	-	volt-ampere (kilovolt-ampere, megavolt-ampere)
A (kA)	-	Ampere (kiloAmpere)
V (kV)	-	Volt (kiloVolt)
AC	-	Alternating Current
DC	-	Direct Current
I_N	-	Nominal current
U_N	-	Nominal voltage
Ah	-	Ampere-Hours
Min/(Max.)	-	Minimum (Maximum)
μ (prefix) micro	-	10^{-6}
n (prefix) nano	-	10^{-9}
rms	-	Root Mean Square
p.u.	-	per unit
p/p	-	peak to peak
F	-	Farad
$^{\circ}\text{C}$	-	degrees centigrade
K	-	kelvin
J	-	Joules
N	-	Newton
Ω (k Ω , T Ω)	-	Ohms (kilo-ohms, Tera-ohms)
Nm	-	Newton meter
Pa, Nm^{-2}	-	Pascal, Newton per square meter
Bar	-	1 bar = 10^5 Nm^{-2} = 0.1MPa
IEC	-	International Electro-technical Commission
IP	-	Ingress Protection
EMC	-	Electromagnetic Compatibility
RTU	-	Remote Terminal Unit
TCP/IP	-	Transmission Communication Protocol/ Internet Protocol
LAN	-	Local Area Network
IED	-	Intelligent Electronic Device
LED	-	Light Emitting Diode



1. SCOPE

This specification covers the supply and delivery of 1 x 88kV feeder protection panel complete with feeder differential protection relay and a Bay Controller.

The Bidder/Tenderer has to complete the Technical Guarantee Schedule, sign and insert date on the Technical Guarantee Schedule which is at the end of the specification.

Tenderers shall include a complete statement of compliance with this Specification. For every clause in this Specification the Tenderers shall state compliance or non-compliance and shall elaborate where appropriate.

Tenderers shall use the words "comply", "do not comply" with this Specification or in the clauses of an informative nature, "noted".

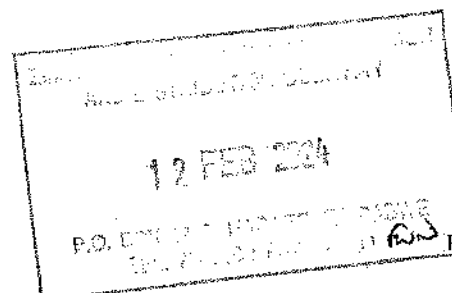
2. PARTICULARS OF THE ELECTRICAL SYSTEM

The electrical system in which the protection and control panels will be used in is:

- Three phase 3 wire AC overhead-line and underground system at 400kV, 330kV, 220kV, 132kV, 110kV, 88kV, 66kV 33kV and 11kV.
- Three phase-4 wire AC Low voltage of 390V
- Secondary system is at 110V and 1A AC nominal values.
- Control system at 50V, 110V and 220V DC.
- AC system operated at 50 Hz, with approximately sinusoidal waveform with the frequency variation not exceeding 2.5% from 50Hz. Designs should allow for these variations.
- The highest system voltage not normally exceeding the nominal system voltage by more than 10%. The nominal system voltages are 400kV, 330kV, 132kV, 110kV, 88kV, 66kV, 33kV and 11kV. Designs should allow for these variations.

3. PARTICULARS OF THE ENVIRONMENT

The altitudes of the plants shall be taken as 1500 meters above mean sea level typical air pressure 860 mbar.



- **Ambient temperatures:**
 - (i) Maximum: 45 °C
 - (ii) Minimum: -10 °C
 - (iii) Maximum daily average: 35 °C

- **Altitude:**

Average altitude of 1 500 metres above sea level.

- **Humidity:**

Relative Humidity of 80%.

- **Dust:**

Particular attention should be paid in the design of all equipment to ensure that there is no damage to insulation through the ingress of dust, insects, and vermin and relevant IP standards should be followed.

5. PARTICULARS OF THE SPECIFICATION

5.1 LANGUAGE, UNITS AND STANDARDS

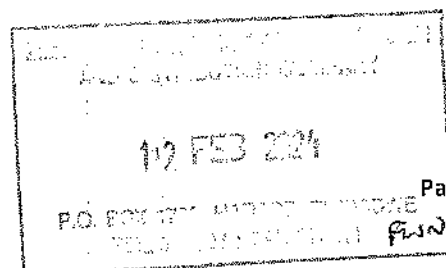
All tenders, correspondence, description on drawings, illustrations or instructions shall be in unambiguous English Language. SI units of measurements shall be used throughout.

The following standards shall apply:

IEC 60529, standards. In the case of conflict between the above stated standards and this specification, the ruling of this specification shall prevail.

5.2 DESIGN AND PROPERTIES

5.2.1 All equipment specified in this specification shall be new, free from defects, of first quality, and produced by manufacturers engaged in the manufacture of these products.



5.3 MATERIAL

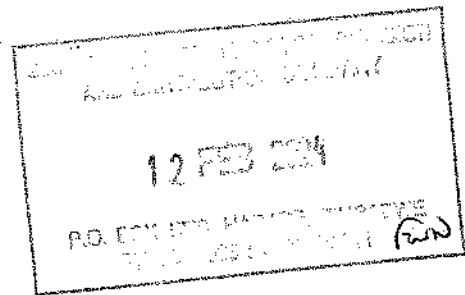
The Protection panel shall be of superior quality. The material shall be of latest design and conform to the best engineering practices adopted in the field.

5.4 PACKING

The packing should be able to withstand rough handling during transit of material at various destinations. Each Protection panel shall be packed appropriately to prevent damage.

5.7 DELIVERABLES AND ACCESSORIES

- 5.7.1 The winning bidder shall supply and deliver the Protection and Control Panel as guided by this specification.
- 5.7.2 The supplier shall provide engineering tools including but not limited to, tests plugs and accessories for installation, commissioning and maintenance of the protection scheme.
- 5.7.3 The relays housed in the panel shall be connected together through an industrial switch.
- 5.7.5 The supplier shall make provision for FAT of the protection and control system as per FAT requirements under this tender.



6. TECHNICAL GUARANTEE SCHEDULE FOR PROTECTION AND CONTROL PANELS

Item	Description	Unit	ZETDC Requirement	Tendered	Remarks	Corresponding reference page in spec sheet (e.g. Found on page 3, section 3.2 paragraph/line etc.)
	ENCLOSURE					
1.	Material	-	3mm Mild Steel Plate			
2.	Colour		Light Grey			
3.	OVERALL DIMENSIONS					
	Length	mm	800			
	Width	mm	800			
	Height	mm	2200			
4.	ACCESS		Front Access			
			Doors shall be provided with integral handles for locking			
			It shall be possible to securely fix the hinged front door in open position			
5.	CABLE ENTRY		Bottom centre entry with removable gland plates			

1.	ENVIRONMENTAL CONDITIONS					
	Operating temperature range	°C	-5 to +55			
	Degree of protection by enclosure when panel-mounted	-	At least IP 52			

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2.	<u>PANEL WIRING AND TERMINAL BLOCKS</u>					
	Connections:	-	Screw terminals for connection of wires using ring lug terminal lugs for all AC inputs. Shall be suitable for 4 mm ² compression/ ring lug			
		-	Shall be suitable for 1.5-2.5 mm ² compression/ ring lug for DC wiring.			
			No cables shall be visible from the front face.			
			Provision for CT isolating and shorting links			
	Outgoing Connections Provision	-	Provision for outgoing connections from the protection cubicles shall be made for multi-core cables			
	Ferruling Standards		All panel wiring shall be identified by ferrules at all terminations. No ferrule number shall appear on more than one circuit			
		-	Ferrule number shall change at every break in the circuit, i.e. all switches, coils, contacts, etc.			
		-	Colour coding for all AC wiring in the panel shall be red, yellow, blue and black for easier identification of ac wiring cables and black or grey for dc wiring cables.			
		-	The format of the ferrule number shall include the cable core identity and sitting position e.g. K510/ X310.28 where K510 is cable-core identity & X310 is terminal block no.			

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	Core Sleeving		Each cable core in the tripping circuit shall have a red sleeve			
	Trip Links	-	Trip links for each trip circuit shall be positioned at the bottom of the front panel.			
		-	Terminations shall be grouped according to their functions and labels shall be provided on the fixed portion of the terminal blocks showing the functions of the groups			
		-	All terminal blocks shall have a minimum of 20% spare terminals.			
	Terminations:	-	All incoming and outgoing connections shall be terminated at a terminal block. Direct termination on to auxiliary switches, links and fuses will not be accepted.			
	Panel Trunking		Panel wiring shall be adequately accommodated in panel trunking.			
		-	All panel trunking shall have covers			
	Testing Facilities	-	Panels shall be provided with test terminal blocks that will isolate plant from relay circuit in order to facilitate maintenance testing (isolate all ac and dc circuits)			
		-	The appropriate test plugs shall be provided.			
	Anti-condensation Heaters	-	Low energy heaters shall be provided in each panel to prevent condensation and the internal design shall be such as to permit free circulation of air without the ingress of dust or vermin;			
		-	Automatic heater control shall be provided inside the cubicle.			

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	Panel Lighting and socket outlet	-	Panels shall be provided with sufficient lighting of the energy saver type and a socket outlet			
		-	A door position switch to be fitted for automatically switching on panel lighting when the door is opened.			
1.	<u>VOLTAGE WITHSTAND TESTS</u>					
	Tests		All secondary and panel wiring shall withstand a test voltage of 500V to earth for one minute.			
2.	<u>PANEL LABELS</u>					
	Panel Identification		Each panel shall have a label for the protected circuit at the top			
	Protection Function		Each relay on the panel face shall have a label indicating the main function of the relay.			
	Panel dc and ac circuits protection		All ac and dc circuits shall be protected by appropriate rated MCBs			
	Relay Scheme Identity		The rear of each relay or switch in the scheme shall have a label carrying its scheme identity e.g. F10, F210, etc.			
3.	<u>ANCILLARY EQUIPMENT</u>					
	Ethernet Switch		Industrial type with at least 5-port Ethernet switch.			

Tenderer's Signature: _____ Date: _____

