

HYDERABAD ELECTRIC SUPPLY COMPANY

BIDDING DOCUMENT

AGAINST TENDER NO. PMU-205/25-26

PROCUREMENT OF

PMU- 205/25-26	I	1	In Door Termination Kits for Single Core 500MCM XLPE Cable
		2	Out Door Termination Kits for Single Core 500MCM XLPE Cable
		3	In Door Termination Kits for Single Core 1000MCM XLPE Cable
		4	Out Door Termination Kits for Single Core 1000MCM XLPE Cable
	II	1	11KV Differential C.Ts 1600A/800A/5A
		2	11KV Overcurrent C.Ts 2400A/1200A/5A/5A
		3	11KV Differential C.Ts 2400A/1200A/5A

UNDER HESCO'S OWN RESOURCES

SINGLE STAGE SINGLE ENVELOPE PROCEDURE

(THROUGH NATIONAL COMPETITIVE BIDDING)

DIRECTOR GENERAL (PROCUREMENT) PMU
HESCO, HYDERABAD

May 2026

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- Section-IX: Contract Form
- Revised NTDC type Test Policy
- NTDC/WAPDA Specification

CHECK LIST

Sr. No.	Description	Attached	
		Yes	No
1	Form of Bid		
2	Bid Security		
3	Price Schedule		
4	Schedule of Requirement		
5	Form of Qualification Information		
6	Manufacturer's Authorization		
7	Manufacturer's Experience of Supply Record		
8	Bidder's Experience of Supply Record		
9	Performance Certificate/End user certificate		
10	Manufacturing Capacity		
11	Order in Hand and its implementation schedule		
12	Power of Attorney		
13	Financial Data		
14	Annual Turnover Data		
15	Financial Resources (Audit reports for last three years)		
16	Pending Litigation		
17	Integrity Pact (If applicable)		
18	Current Contract Commitment		
19	No Blacklisting certificate		
20	Technical Data and Drawings along with literature, broucher etc		
21	Type Test Reports (If applicable)		

SECTION - I

“INVITATION TO BIDS”

Hyderabad Electric Supply Company (HESCO), a Power Distribution Company, its core function is to supply, distribute and sell power (Electricity) in area of 13-districts of Sindh Province, invites sealed Tenders on NCB basis under Single Stage Single Envelope Procedure, from eligible bidders (manufacturers / authorized distributors/suppliers having valid manufacturer’s authorization), duly prequalified/registered in required categories and non-registered/non prequalified/ manufacturers/suppliers, complying qualification & experience criteria as laid down in bidding document, for the supply of Grid Station Material conforming to WAPDA/PEPCO/NTDC Specifications (amended to date), on the rates in local currency without involving foreign exchange element, inclusive of all taxes & duties and exclusive of General Sales Tax on FCS basis at Regional Store HESCO Hyderabad. This procurement is financed under HESCO’s own resources. Detail is given as under: -

Tender No.	Lot No.	Item No.	Description of Material	Unit	Required Qty	Date & Time of bid submission	Date & Time of bid opening
PMU-205/25-26	I	1	In Door Termination Kits for Single Core 500MCM XLPE Cable	No.	321	20.05.2026 10:00 A.M	20.05.2026 10:30 A.M
		2	Out Door Termination Kits for Single Core 500MCM XLPE Cable	No.	333		
		3	In Door Termination Kits for Single Core 1000MCM XLPE Cable	No.	80		
		4	Out Door Termination Kits for Single Core 1000MCM XLPE Cable	No.	80		
	II	1	11KV Differential C.Ts 1600A/800A/5A	No.	11		
		2	11KV Overcurrent C.Ts 2400A/1200A/5A/5A	No.	24		
		3	11KV Differential C.Ts 2400A/1200A/5A	No.	24		

1. E-bidding documents as per regulations, containing detailed terms and conditions, specifications and requirements etc. are available for the registered bidders on EPADS at (www.eprocure.gov.pk).
2. The electronic bids, must be submitted by using EPADS on scheduled date & time. Manual bids, shall not be accepted. Electronic Bids will be opened on the same day.
3. All e-Bids must be accompanied by Bid Security amount mentioned in Bidding document in the favour of Director General (Procurement)/Chief Engineer (Development) PMU, HESCO, Hyderabad in the shape of “Bank Guarantee” / CDR/ Banker Cheque from any Scheduled Bank of Pakistan, valid for 28 days beyond bid validity date. The bidders shall upload scanned copy of Bid Security on EPADS. Original Bid Security must be submitted to the Procuring Agency on or before the closing date & time of e-bids submission, failing which the e-bid shall be rejected.
4. The bidders must quote firm and final prices and no request for escalation in cost after the bid opening shall be entertained.
5. HESCO reserves all its rights regarding rejection of tenders as defined in Clause-33(1) of PPRA Rules 2004.
6. This advertisement is also available on PPRA website www.ppra.org.pk and HESCO website www.hesco.gov.pk.

Note:

- i. Notification of the GRC constituted in terms of Rule-48 of PPRA rules, 2004 is provided on EPADS at www.eprocure.gov.pk
- ii. **In Future, all the tenders in HESCO will be floated through E-PADs, therefore potential bidders/ Supplier/Manufactures are requested to get registered on EPADS(www.eprocure.gov.pk)**

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Director General (Procurement)
Project Management Unit
HESCO, Hyderabad

SECTION - II INSTRUCTION TO BIDDERS (ITB)

A. INTRODUCTION

1. Scope of Bid	1.1	Hyderabad Electric Supply Company (The Procuring Agency) invites Bids for the provision of Goods as specified in the BDS and Section V - Technical Specifications & Schedule of Requirements. The successful Bidder(s) will be expected to deliver the goods within the specified period and timeline(s) as stated in the BDS.
2. Source of Funds	2.1	Source of funds is referred to in Clause-2 of Invitation for Bids.
3. Eligible Bidders	3.1	<p>A Bidder may be a natural person, company or firm or public or semi-public agency of Pakistan or any foreign country, or any combination of them with a formal existing agreement (on Judicial Papers) in the form of a joint venture, consortium, or association. In the case of a joint venture, consortium, or association, all members shall be jointly and severally liable for the Contract's execution under the Contract's terms and conditions. The joint venture, consortium, or association shall nominate a Lead Member as nominated in the BDS, who shall have the authority to conduct all business for and on behalf of all the members of the joint venture, consortium, or association during the Bidding process, and in case of award of contract, during the execution of the contract.</p> <p>(The limit on the number of members of JV or Consortium or Association may be prescribed in BDS, per the guidelines issued by the PPRA).</p>
	3.2	The appointment of the Lead Member in the joint venture, consortium, or association shall be confirmed by submission of a valid Power of Attorney to The Procuring Agency.
	3.3	A verifiable copy of the agreement that forms a joint venture, consortium or association shall be required to be submitted as part of the Bid.
	3.4	Any bid submitted by the joint venture, consortium or association shall indicate the part of the proposed contract to be performed by each party and each party shall be evaluated (or post-qualified if required) concerning only, and the responsibilities of each party shall not be substantially altered without the prior written approval of The Procuring Agency and in line with any instructions issued by the Authority.
	3.5	The invitation for Bids is open to all prospective suppliers, manufacturers or authorized agents/dealers subject to any provisions of incorporation or licensing by the respective national incorporating agency or statutory body established for that particular trade or business.
	3.6	Foreign Bidders must be locally registered with the appropriate national incorporating body or the statutory body, before participating in the national/international competitive tendering except for such procurement made by the foreign missions of

		<p>Pakistan. For such purpose, the bidder must have to initiate the registration process before the bid submission and the necessary evidence shall be submitted to The Procuring Agency along with their bid, however, the final award will be subject to the complete registration process.</p>
	3.7	<p>A Bidder shall not have a conflict of interest. All Bidders found to have a conflict of interest shall be disqualified. A Bidders may be considered to have a conflict of interest with one or more parties in this Bidding process if they:</p> <ul style="list-style-type: none"> a) are associated or have been associated in the past, directly or indirectly with a firm or any of its affiliates which have been engaged by The Procuring Agency to provide consulting services for the preparation of the design, specifications and other documents to be used for the procurement of the goods to be purchased under this Invitation for Bids. b) have controlling shareholders in common; or c) receive or have received any direct or indirect subsidy from any of them; or d) have the same legal representative for purposes of this Bid; or e) have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence the Bid of another Bidder, or influence the decisions of The Procuring Agency regarding this Bidding process; or f) Submit more than one Bid in this Bidding process.
	3.8	<p>A Bidder may be ineligible if:</p> <ul style="list-style-type: none"> (a) he is declared bankrupt or, in the case of a company or firm, insolvent; (b) payments in favour of the Bidder are suspended per the judgment of a court of law other than a judgment declaring bankruptcy and resulting (by the national laws) in the total or partial loss of the right to administer and dispose of its property; (c) legal proceedings are instituted against such Bidder involving an order suspending payments and which may result, under the national laws, in a declaration of bankruptcy or in any other situation entailing the total or partial loss of the right to administer and dispose of the property; (d) the Bidder is convicted, by a final judgment, of any offence involving professional conduct; (e) the Bidder is blacklisted and hence debarred due to involvement in corrupt and fraudulent practices, performance failure or breach of bid securing declaration. (f) the firm, supplier and contractor are blacklisted or debarred by a foreign country, international organization, or other foreign institutions for the period defined by them.

	3.9	Bidders shall provide to The Procuring Agency evidence of their eligibility, and proof of compliance with the necessary legal requirements to carry out the contract effectively.
	3.10	Bidders shall provide such evidence of their continued eligibility to the satisfaction of The Procuring Agency, as The Procuring Agency shall reasonably request.
	3.11	Bidders shall submit proposals relating to the nature, conditions and modalities of sub-contracting wherever the sub-contracting of any elements of the contract amounting to more than ten (10) per cent of the Bid price is envisaged.
4. Eligible Goods and Related Services	4.1	All goods and related services to be supplied under the contract shall have their origin in eligible source countries, and all expenditures made under the contract will be limited to such goods and services. For purpose of this Bid, ineligible countries are stated in section-4 titled “Eligible Countries”.
	4.2	For purposes of this Clause, “origin” means the place where the goods are mined, grown, cultivated, produced, manufactured, or processed, or through manufacture, procession, or assembly, another commercially recognized article results that differ substantially in its basic characteristics from its imported components or the place from where the related services are/to be supplied.
	4.3	The nationality of the supplier that supplies, assembles, distributes, or sells the goods and services shall not determine the origin of the goods.
	4.4	To establish the eligibility of the Goods and the related services, Bidders shall fill the country of origin declarations included in the Form of Bid.
	4.5	If so required in the BDS, the Bidder shall demonstrate that it has been duly authorized by the manufacturer of the goods to deliver in Pakistan (or in the respective country in case of procurement by the Pakistani Missions abroad), the goods indicated in its Bid.
5. One Bid per Bidder	5.1	A bidder shall submit only one Bid, in the same bidding process, either individually as a Bidder or as a member in a joint venture or any similar arrangement.
	5.2	No bidder can be a sub-contractor while submitting a Bid individually or as a joint venture member in the same Bidding process.
	5.3	A person or a firm cannot be a sub-contractor with more than one bidder in the same bidding process.
6. Cost of Bidding	6.1	The Bidder shall bear all costs associated with the preparation and submission of its Bid, and The Procuring Agency shall in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

B. BIDDING DOCUMENTS

7. Contents of Bidding Documents	7.1	The goods required, bidding procedures, and contract terms and conditions are prescribed in the Bidding Documents. In addition to the Invitation to Bids, the Bidding Documents which should be read in conjunction with any addenda issued in accordance with ITB 9.2 include:
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		<p>Section I Invitation to Bids Section II Instructions to Bidders (ITBs) Section III Bid Data Sheet (BDS) Section IV Eligible Countries Section V Technical Specifications, Schedule of Requirements Section VI Forms – Bid Section VII General Conditions of Contract (GCC) Section VIII Special Conditions of Contract (SCC) Section IX Contract Forms</p>
	7.2	The number of copies to be completed and returned with the Bid is specified in the BDS.
	7.3	The Procuring Agency is not responsible for the completeness of the Bidding Documents and their addenda if they were not obtained directly from The Procuring Agency or the signed pdf version downloaded from the website.
	7.4	The Bidder is expected to examine all instructions, forms, terms and specifications in the Bidding Documents. Failure to furnish all the information required in the Bidding Documents will be at the Bidder's risk and may result in the rejection of his Bid.
8. Clarification of Bidding Documents	8.1	A prospective Bidder requiring any clarification of the Bidding Documents may notify The Procuring Agency in writing or in electronic form that provides a record of the content of communication at The Procuring Agency's address indicated in the BDS.
	8.2	The Procuring Agency will within three (3) working days after receiving the request for clarification, respond in writing or electronic form to any request for clarification provided that such request is received not later than three (03) days before the deadline for the submission of Bids as prescribed in ITB 23.1. However, this clause shall not apply in the case of alternate methods of Procurement.
	8.3	Copies of The Procuring Agency's response will be forwarded to all identified Prospective Bidders through an identified source of communication, including a description of the inquiry, but without identifying its source. In the case of downloading the Bidding Documents from the website of The Procuring Agency, the response of all such queries will also be available on the same link available on the website.
	8.4	Should The Procuring Agency deem it necessary to amend the Bidding Documents as a result of a clarification, it shall do so following the procedure under ITB 9.
	8.5	If indicated in the BDS , the Bidder's designated representative is invited at the Bidder's cost to attend a pre-Bid meeting at the place, date and time mentioned in the BDS . During this pre-Bid meeting, prospective Bidders may request clarification of the schedule of requirement, the Evaluation Criteria or any other aspects of the Bidding Documents.
	8.6	Minutes of the pre-Bid meeting, if applicable, including the text of the questions asked by Bidders, including those during the meeting (without identifying the source) and the responses

		given, together with any responses prepared after the meeting will be transmitted promptly to all prospective Bidders who have obtained the Bidding Documents. Any modification to the Bidding Documents that may become necessary as a result of the pre-Bid meeting shall be made by The Procuring Agency exclusively through the use of an Addendum according to ITB 9. Non-attendance at the pre-Bid meeting will not be a cause for disqualification of a Bidder.
9. Amendment of Bidding Documents	9.1	Before the deadline for submission of Bids, The Procuring Agency for any reason, whether at its initiative or in response to a clarification requested by a prospective Bidder or pre-Bid meeting may modify the Bidding Documents by issuing addenda.
	9.2	Any addendum issued including the notice of any extension of the deadline shall be part of the Bidding Documents according to ITB 7.1 and shall be communicated in writing or in any identified electronic form that provides a record of the content of communication to all the bidders who have obtained the Bidding Documents from The Procuring Agency. The Procuring Agency shall promptly publish the Addendum at The Procuring Agency's web page identified in the BDS: Provided that the bidder who had either already submitted their bid or handed over the bid to the courier before the issuance of any such addendum shall have the right to withdraw his already filed bid and submit the revised bid before the original or extended bid submission deadline.
	9.3	To give prospective Bidders reasonable time in which to take an addendum/corrigendum into account in preparing their Bids, The Procuring Agency may, at its discretion, extend the deadline for the submission of Bids: Provided that The Procuring Agency shall extend the deadline for submission of Bid if such an addendum is issued within the last three (03) days of the Bid submission deadline.

C. PREPARATION OF BIDS

10. Language	10.1	The Bid prepared by the Bidder, as well as all correspondence and documents relating to the Bid exchanged by the Bidder and The Procuring Agency shall be written in the English language unless specified in the BDS. Supporting documents and printed literature furnished by the Bidder may be in another language provided they are accompanied by an accurate translation of the relevant pages in the English language unless specified in the BDS, in which case, for purposes of interpretation of the Bidder, the translation shall govern.
11. Documents and Sample(s) Constituting the Bid	11.1	The Bid prepared by the Bidder shall constitute the following components: a) Form of Bid and Bid Prices completed in accordance with 14 and 15; b) Details of the Sample(s) where applicable and requested in the BDS.

		<ul style="list-style-type: none"> c) Documentary evidence established per ITB 13 that the Bidder is eligible and/or qualified for the subject bidding process. d) Documentary evidence established in accordance with ITB 13.3(a) that the Bidder has been authorized by the manufacturer to deliver the goods into Pakistan, where required and where the supplier is not the manufacturer of those goods; e) Documentary evidence established in accordance with ITB 12 that the goods and related services to be supplied by the Bidder are eligible goods and services, and conform to the Bidding Documents; f) Bid security or Bid Securing Declaration furnished in accordance with ITB 18; g) Duly Notarized Power of Attorney authorizing the signatory of the Bidder to submit the bid; and h) Any other document required in the BDS.
	11.2	<p>Where a sample(s) is required by a The Procuring Agency, the sample shall be:</p> <ul style="list-style-type: none"> a) submitted as part of the bid, in the quantities, dimensions and other details requested in the BDS; b) carriage paid; c) received on, or before, the closing time and date for the submission of bids; and d) evaluated to determine compliance with all characteristics listed in the BDS.
	11.3	<p>The Procuring Agency shall retain the sample(s) of the successful Bidder. A The Procuring Agency shall reject the Bid if the sample(s)-</p> <ul style="list-style-type: none"> a) do(es) not conform to all characteristics prescribed in the bidding documents; and b) is/are not submitted within the specified time clearly mentioned in the Bid Data Sheet.
	11.4	<p>Where it is not possible to avoid using a propriety article as a sample, a Bidder shall make it clear that the propriety article is displayed only as an example of the type or quality of the goods being Bided for, and that competition shall not thereby be limited to the extent of that article only.</p>
	11.5	<p>Samples made up from materials supplied by a The Procuring Agency shall not be returned to a Bidder nor shall a The Procuring Agency be liable for the cost of making them.</p>
	11.6	<p>All samples produced from materials belonging to an unsuccessful Bidder shall be kept by The Procuring Agency till thirty (30) days from the date of award of contract or exhaust of all the grievance forums (including those pending at Authority's Level or in some Court of Law).</p>
12. Documents Establishing Eligibility of Goods and Related Services and	12.1	<p>Pursuant to ITB 11, the Bidder shall furnish, as part of its Bid, all those documents establishing the eligibility in conformity to the terms and conditions specified in the Bidding Documents for all goods and related services which the Bidder proposes to deliver.</p>

Conformity to Bidding Documents	12.2	The documentary evidence of the eligibility of the goods and related services shall consist of a statement in the Price Schedule of the country of origin of the goods and related services offered which shall be confirmed by a certificate of origin issued at the time of shipment.
	12.3	The documentary evidence of conformity of the goods and related services to the Bidding Documents may be in the form of literature, drawings, and data, and shall consist of: <ul style="list-style-type: none"> a) A detailed description of the essential technical specifications and performance characteristics of the Goods; b) An item-by-item commentary on The Procuring Agency’s Technical Specifications demonstrating substantial responsiveness of the Goods and Services to those specifications, or a statement of deviations and exceptions to the provisions of the Technical Specifications; c) Any other procurement-specific documentation requirement as stated in the BDS.
	12.4	The Bidder shall also furnish a list giving full particulars, including available sources and current prices of goods, spare parts, special tools, etc., necessary for the proper and continuing functioning of the Goods during the period specified in the BDS following commencement of the use of the goods by the Procuring Agency.
	12.5	For purposes of the commentary to be furnished pursuant to ITB 12.3(c) above, the Bidder shall note that standards for workmanship, material, and equipment, as well as references to brand names or catalogue numbers designated by the Procuring Agency in its Technical Specifications, are intended to be descriptive only and not restrictive. The Bidder may substitute alternative standards, brand names, and/or catalogue numbers in its Bid, provided that it demonstrates to the Procuring Agency’s satisfaction that the substitutions ensure substantial equivalence to those designated in the Technical Specifications.
	12.6	The required documents and other accompanying documents must be in English. In case any other language than English is used the pertinent translation into English shall be attached to the original version.
13. Documents Establishing Eligibility and Qualification of the Bidder	13.1	Pursuant to ITB 11, the Bidder shall furnish, as part of its Bid, all those documents establishing the Bidder’s eligibility to participate in the bidding process and/or its qualification to perform the contract if its Bid is accepted.
	13.2	The documentary evidence of the Bidder’s eligibility to Bid shall establish to the satisfaction of The Procuring Agency that the Bidder, at the time of submission of its bid, is from an eligible country as defined in Section-4 titled “Eligible Countries”.
	13.3	The documentary evidence of the Bidder’s qualifications to perform the contract if its Bid is accepted shall establish to the satisfaction of The Procuring Agency that:

		<p>a) in the case of a Bidder offering to deliver goods under the contract which the Bidder did not manufacture or otherwise produce, the Bidder has been duly authorized by the goods' Manufacturer or producer to deliver the goods in Pakistan;</p> <p>b) the Bidder has the financial, technical, and supply/production capability necessary to perform the Contract, and meets the qualification criteria specified in BDS.</p> <p>c) in the case of a Bidder not doing business within Pakistan, the Bidder is or will be (if awarded the contract) represented by an Agent in Pakistan equipped, and able to carry out the Supplier's maintenance, repair, and spare parts-stocking obligations prescribed in the Conditions of Contract and/or Technical Specifications.</p> <p>d) that the Bidder meets the qualification criteria listed in the BDS.</p>
14. Form of Bid	14.1	The Bidder shall fill the Form of Bid furnished in the Bidding Documents. The Bid Form must be completed without any alterations to its format and no substitute shall be accepted.
15. Bid Prices	15.1	The Bid Prices and discounts quoted by the Bidder in the Form of Bid and the Price Schedules shall conform to the requirements specified below in ITB Clause 15 or exclusively mentioned hereafter in the bidding documents.
	15.2	All items in the Statement of Work must be listed and priced separately in the Price Schedule(s). If a Price Schedule shows items listed but not priced, their prices shall be construed to be included in the prices of other items.
	15.3	<p>Items not listed in the Price Schedule shall be assumed not to be included in the Bid, and provided that the Bid is still substantially responsive in their absence or due to their nominal nature, the corresponding average price of the respective item(s) of the remaining substantially responsive bidder(s) shall be construed to be the price of those missing item(s):</p> <p>Provided that:</p> <p>a) where there is only one (substantially) responsive bidder, or</p> <p>b) where there is provision for alternate proposals and the respective items are not listed in the other bids,</p> <p>c) The Procuring Agency may fix the price of missing items in accordance with the market survey, and the same shall be considered as a final price.</p>
	15.4	The Bid price to be quoted in the Form of Bid in accordance with ITB 15.1 shall be the total price of the Bid, excluding any discounts offered.
	15.5	The Bidder shall indicate on the appropriate Price Schedule, the unit prices (where applicable) and the total Bid price of the goods it proposes to deliver under the contract.
	15.6	Prices indicated on the Price Schedule shall be entered separately in the following manner:

		<p>a) For goods manufactured from within Pakistan (or within the country where procurement is being done in case of foreign missions abroad):</p> <p>i) the price of the goods quoted EXW (ex-works, ex-factory, ex-warehouse, ex-showroom, or off-the-shelf, as applicable), including all customs duties and sales and other taxes already paid or payable:</p> <p>A. on the components and raw material used in the manufacturing or assembly of goods quoted ex- works or ex-factory; or</p> <p>B. on the previously imported goods of foreign origin quoted ex-warehouse, ex-showroom, or off-the-shelf.</p> <p>ii) all applicable taxes which will be payable on the goods if the contract is awarded.</p> <p>iii) the price for inland transportation, insurance, and other local costs incidental to the delivery of the goods to their final destination, if specified in the BDS.</p> <p>iv) the price of other (incidental or allied) services, if any, listed in the BDS.</p>
	15.7	<p>For goods offered from abroad:</p> <p>i) the price of the goods shall be quoted CIF named port of destination, or CIP border point or CIP named place of destination, in the The Procuring Agency’s country, as specified in the BDS. In quoting the price, the Bidder shall be free to use transportation through carriers registered in any eligible country. Similarly, the Bidder may obtain insurance services from any eligible source country. Or</p> <p>ii) the price of the goods quoted FOB port of shipment (or FCA, as the case may be) if specified in the BDS. Or</p> <p>iii) the price of goods quoted CFR port of destination (or CPT as the case may be) if specified in the BDS.</p> <p>iv) the price for inland transportation, insurance, and other local costs incidental to the delivery of the goods from the port of entry to their final destination, if specified in the BDS.</p> <p>v) the price of (incidental) services, if any, listed in the BDS.</p>
	15.7	<p>Prices proposed on the Price Schedule for goods and related services shall be dis aggregated, where appropriate as indicated in this Clause. This desegregation shall be solely to facilitate the comparison of Bids by The Procuring Agency. This, shall not in any way limit The Procuring Agency’s right to contract on any of the terms and conditions offered:</p>

		<p>a) For Goods:</p> <p>i) the price of the Goods, quoted as per applicable INCOTERMS as specified in the BDS</p> <p>ii) all customs duties, sales tax, and other taxes applicable on goods or on the components and raw materials used in their manufacture or assembly, if the contract is awarded to the Bidder, and</p> <p>b) For Related Services</p> <p>i) The price of the related services, and</p> <p>ii) All customs duties, sales tax and other taxes applicable in Pakistan, paid or payable, on the related services, if the contract is awarded to the Bidder.</p>
	15.8	Prices quoted by the Bidder shall be fixed during the Bidder's performance of the contract and not subject to variation on any account. A Bid submitted with an adjustable price will be treated as non-responsive and shall be rejected, pursuant to ITB 28.
	15.9	If so indicated in the Invitation to Bids and Instructions to Bidders, that Bids are being invited for individual contracts (Lots) or any combination of contracts (packages), Bidders wishing to offer any price reduction for the award of more than one contract shall specify in their Bid the price reductions applicable to each package, or individual contracts (Los) within a package.
16. Bid Currencies	16.1	Prices shall be quoted in the following currencies: <p>a) For goods and services that the Bidder will deliver from within Pakistan, the prices shall be quoted in Pakistani Rupees, unless otherwise specified in the BDS.</p> <p>b) For goods and related services that the Bidder will deliver from outside Pakistan, or for imported parts or components of goods and related services originating outside Pakistan, the Bid prices shall be quoted in any freely convertible currency of another country. If the Bidder wishes to be paid in a combination of amounts in different currencies, it may quote its price accordingly but use no more than three foreign currencies.</p>
	16.2	For comparison of bids quoted in different currencies, the price shall be converted into a single currency specified in the bidding documents. The rate of exchange shall be the selling rate, prevailing on the date of opening of (financial part of) bids specified in the bidding documents, as notified by the State Bank of Pakistan on that day.
	16.3	Bidders shall indicate details of their expected foreign currency requirements in the Bid.
	16.4	Bidders may be required by The Procuring Agency to clarify their foreign currency requirements and to substantiate that the amounts included in Lump Sum and the SCC are reasonable and responsive to ITB 16.1.

17. Bid Validity Period	17.1	Bids shall remain valid for the period specified in the BDS after the Bid submission deadline prescribed by The Procuring Agency. A Bid valid for a shorter period shall be rejected by The Procuring Agency as non-responsive. The period of Bid validity will be determined from the complementary bid securing instrument i.e. the expiry period of bid security or bid securing declaration as the case may be.
	17.2	Under exceptional circumstances, prior to the expiration of the initial Bid validity period, The Procuring Agency may request the Bidders' consent to an extension of the period of validity of their Bids only once, for the period not more than the period of initial bid validity. The request and the Bidder's responses shall be made in writing or in electronic forms that provide a record of the content of the communication. The Bid Security provided under ITB 18 shall also be suitably extended. A Bidder may refuse the request without forfeiting its Bid security or causing to be executed its Bid Securing Declaration. A Bidder agreeing to the request will not be required nor permitted to modify its Bid but will be required to extend the validity of its Bid Security or Bid Securing Declaration for the period of the extension, and in compliance with ITB 18 in all respects.
	17.3	If the award is delayed by a period exceeding sixty (60) days beyond the expiry of the initial Bid validity period, the contract price may be adjusted by a factor specified in the request for extension. However, the Bid evaluation shall be based on the already quoted Bid Price without taking into consideration the above correction.
18. Bid Security or Bid Securing Declaration	18.1	Pursuant to ITB 11, unless otherwise specified in the BDS, the Bidder shall furnish as part of its Bid, a Bid Security in form of the fixed amount not exceeding five per cent of the estimated value of procurement determined by The Procuring Agency and in the amount and currency specified in the BDS or Bid Securing Declaration as specified in the BDS in the format provided in Section VI (Standard Forms).
	18.2	The Bid Security or Bid Securing Declaration is required to protect The Procuring Agency against the risk of Bidder's conduct which would warrant the security's forfeiture, pursuant to ITB 18.9.
	18.3	<p>The Bid Security shall be denominated in the local currency or another freely convertible currency, and it shall be in the form specified in the BDS which shall be in any of the following:</p> <ul style="list-style-type: none"> a) a bank guarantee, an irrevocable letter of credit issued by a Scheduled bank in the form provided in the Bidding Documents or another form acceptable to The Procuring Agency and valid for twenty-eight (28) days beyond the end of the validity of the Bid. This shall also apply if the period for Bid Validity is extended. In either case, the form must include the complete name of the Bidder; b) a cashier's or certified cheque; or c) another security if indicated in the BDS

	18.4	The Bid Security or Bid Securing Declaration shall be in accordance with the Form of the Bid Security or Bid Securing Declaration included in Section VI (Standard Forms) or another form approved by The Procuring Agency prior to the Bid submission.
	18.5	The Bid Security shall be paid promptly upon written demand by The Procuring Agency in case any of the conditions listed in ITB 18.9 are invoked.
	18.6	Any Bid not accompanied by a Bid Security or Bid Securing Declaration in accordance with ITB 18.1 or 18.3 shall be rejected by The Procuring Agency non-responsive, pursuant to ITB 28.
	18.7	Unsuccessful Bid Security will be discharged or returned as promptly as possible, however in no case later than thirty (30) days after the expiration of the period of Bid Validity prescribed by The Procuring Agency pursuant to ITB 17 . The Procuring Agency shall not claim to the amount of the Bid Security, and shall promptly return the Bid Security document after whichever of the following occurs earliest: <ul style="list-style-type: none"> a) the expiry of the Bid Security; b) the entry into force of a procurement contract and the provision of performance security (or guarantee), for the performance of the contract if such security (or guarantee), is required by the Bidding documents; c) the rejection by The Procuring Agency of all Bids; d) the withdrawal of the Bid prior to the deadline for the submission of Bids, unless the Bidding documents stipulate that no such withdrawal is permitted.
	18.8	The successful Bidder's Bid Security will be discharged upon the Bidder signing the contract pursuant to ITB 41, or furnishing the performance security (or guarantee), pursuant to ITB 42.
	18.9	The Bid Security may be forfeited or the Bid Securing Declaration executed: <ul style="list-style-type: none"> a) if a Bidder: <ul style="list-style-type: none"> i. withdraws its Bid during the period of Bid Validity as specified by The Procuring Agency, and referred by the bidder on the Form of Bid except as provided for in ITB 17.2; or ii. does not accept the correction of errors pursuant to ITB 30.3; or b) or in the case of a successful Bidder, if the Bidder fails: <ul style="list-style-type: none"> i. to sign the contract in accordance with ITB 41; or ii. to furnish performance security (or guarantee) in accordance with ITB 42.
19. Alternative Bids by Bidders	19.1	Bidders shall submit offers that comply with the requirements of the Bidding Documents, including the basic Bidder's technical design as indicated in the specifications and Schedule of Requirements. Alternatives will not be considered unless specifically allowed for in the BDS . If so allowed, ITB 19.2 shall prevail.

	19.2	When an alternative schedule for delivery of goods is explicitly invited, a statement of that effect will be included in the BDS as will the method for evaluating the different schedules for the delivery of goods.
	19.3	If so allowed in the BDS, Bidders wishing to offer technical alternatives to the requirements of the Bidding Documents must also submit a Bid that complies with the requirements of the Bidding Documents, including the basic technical design as indicated in the specifications. In addition to submitting the basic Bid, the Bidder shall provide all information necessary for a complete evaluation of the alternative by The Procuring Agency, including technical specifications, breakdown of prices, and other relevant details. Only the technical alternatives, if any, of the Most Advantageous Bidder conforming to the basic technical requirements (without altering the bid price) shall be considered by The Procuring Agency.
20. Withdrawal, Substitution, and Modification of Bids	20.1	Before the bid submission deadline, any bidder may withdraw, substitute, or modify its Bid after it has been submitted by sending a written notice, duly signed by an authorized representative, and the corresponding substitution or modification must accompany the respective written notice.
	20.2	Bids requested to be withdrawn in accordance with ITB shall be returned unopened to the Bidders.
21. Format and Signing of Bid	21.1	The Bidder shall prepare an original and the number of copies of the Bid as indicated in the BDS, clearly marking each "ORIGINAL" and "COPY," as appropriate. In the event of any discrepancy between them, the original shall prevail: Provided that except in Single Stage One Envelope Procedure, the Bid shall include only the copies of the technical proposal.
	21.2	The original and the copy or copies of the Bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorized to sign on behalf of the Bidder. This authorization shall consist of a written confirmation as specified in the BDS and shall be attached to the Bid. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the Bid, except for un-amended printed literature, shall be initialed by the person or persons signing the Bid.
	21.3	Any interlineations, erasures, or overwriting shall be valid only if they are signed by the person or persons signing the Bidder.

D. SUBMISSION OF BIDS

22. Sealing and Marking of Bids	22.1	In the case of Single Stage One Envelope Procedure, the Bidder shall seal the original and each copy of the Bid in separate envelopes, duly marking the envelopes as "ORIGINAL" and "COPY." The envelopes shall then be sealed in an outer envelope securely sealed in such a manner that opening and resealing cannot be achieved undetected. <i>Note: The envelopes shall be sealed and marked in accordance with the bidding procedure adopted as referred to in Rule-36 of PPR-2004.</i>
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	22.2	The inner and outer envelopes shall: <ul style="list-style-type: none"> a) be addressed to The Procuring Agency at the address given in the BDS; and b) bear the title of the subject procurement or Project name, as the case may be as indicated in the BDS, the Invitation to Bids (ITB) title and number indicated in the BDS, and a statement: “DO NOT OPEN BEFORE,” to be completed with the time and the date specified in the BDS, pursuant to ITB 23.1.
	22.3	In the case of Single Stage Two Envelope Procedure, The Bid shall comprise two envelopes submitted simultaneously, one called the Technical Proposal and the other Financial Proposal. Both envelopes are to be enclosed together in an outer single envelope called the Bid. Each Bidder shall submit his bid as under: <ul style="list-style-type: none"> a) Bidder shall submit his TECHNICAL PROPOSAL and FINANCIAL PROPOSAL in separate inner envelopes and enclosed in a single outer envelope. b) ORIGINAL and each copy of the Bid shall be separately sealed and put in separate envelopes and marked as such. c) The envelopes containing the ORIGINAL and copies will be put in one sealed envelope and addressed/identified as given in Sub-Clause 21.2.
	22.4	The inner and outer envelopes shall: <ul style="list-style-type: none"> a) be addressed to The Procuring Agency at the address provided in the Bidding Data; b) bear the name and identification number of the contract as defined in the Bidding Data; and provide a warning not to open before the time and date for bid opening, as specified in the Bidding Data pursuant to ITB 23.1. c) In addition to the identification required in Sub-Clause 21.2 hereof, the inner envelope shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared “late” pursuant to Clause ITB.24
	22.5	If all envelopes are not sealed and marked as required by ITB 22.2, ITB 22.3 and ITB 22.4 or incorrectly marked, The Procuring Agency will assume no responsibility for the misplacement or premature opening the of Bid.
23. Deadline for Submission of Bids	23.1	Bids shall be received by The Procuring Agency no later than the date and time specified in the BDS .
	23.2	The Procuring Agency may, in exceptional circumstances and at its discretion, extend the deadline for the submission of Bids by amending the Bidding Documents in accordance with ITB 9 , in which case all rights and obligations of The Procuring Agency and Bidders previously subject to the deadline will thereafter be subject to the new deadline.
24. Late Bids	24.1	The Procuring Agency shall not consider any Bid for evaluation that arrives after the deadline for submission of Bids, in accordance with ITB 23

	24.2	Any Bid received by The Procuring Agency after the deadline for submission of Bids shall be declared late, recorded, rejected and returned unopened to the Bidder.
25. Withdrawal of Bids	25.1	A Bidder may withdraw its Bid after it has been submitted, provided that written notice of the withdrawal of the Bid, is received by The Procuring Agency prior to the deadline for submission of Bids.
	25.2	The revised bid may be submitted after the withdrawal of the original bid in accordance with the provisions referred to in ITB 22.

E. OPENING AND EVALUATION OF BIDS

26. Opening of Bids	26.1	The Procuring Agency will open all Bids, in public, in the presence of Bidders or their representatives who choose to attend, and other parties with a legitimate interest in the Bid proceedings at the place, on the date and at the time, specified in the BDS . The Bidders' representatives present shall sign a register as proof of their attendance.
	26.2	First, envelopes marked "WITHDRAWAL" shall be opened and read out and the envelope with the corresponding bid shall not be opened but returned to the Bidder. No bid withdrawal shall be permitted unless the corresponding Withdrawal Notice contains a valid authorization to request the withdrawal and is read out at bid opening.
	26.3	Second, outer envelopes marked "SUBSTITUTION" shall be opened. The inner envelopes containing the Substitution Bid shall be exchanged for the corresponding Original Bid being substituted, which is to be returned to the Bidder unopened. No envelope shall be substituted unless the corresponding Substitution Notice contains a valid authorization to request the substitution and is read out and recorded at bid opening.
	26.4	Next, outer envelopes marked "MODIFICATION" shall be opened. No Technical Proposal and/or Financial Proposal shall be modified unless the corresponding Modification Notice contains a valid authorization to request the modification and is read out and recorded at the opening of the Bids. Any Modification shall be read out along with the Original Bid except in the case of Single Stage Two Envelope Procedure where only the Technical Proposal, both Original as well as Modification, are to be opened, read out, and recorded at the opening. Financial Proposal, both Original and Modification, will remain unopened till the prescribed financial bid opening date.
	26.5	Other envelopes holding the Bids shall be opened one at a time, in case of Single Stage One Envelope Procedure, the Bidder's names, the Bid prices, the total amount of each Bid and any alternative Bid (if alternatives have been requested or permitted), any discounts, the presence or absence of Bid Security, Bid Securing Declaration and such other details as The Procuring Agency may consider

		appropriate, will be announced by the Procurement Evaluation Committee.
	26.6	In the case of Single Stage Two Envelope Procedure, The Procuring Agency will open the Technical Proposals in public at the address, date and time specified in the BDS in the presence of Bidders` designated representatives who choose to attend and other parties with a legitimate interest in the Bid proceedings. The Financial Proposals will remain unopened and will be held in the custody of The Procuring Agency until the specified time of their opening.
	26.7	The envelopes holding the Technical Proposals shall be opened one at a time, and the following read out and recorded: <ul style="list-style-type: none"> a) the name of the Bidder; b) whether there is a modification or substitution; c) the presence of a Bid Security, if required; and d) Any other details as The Procuring Agency may consider appropriate.
	26.8	Bids not opened and not read out at the Bid opening shall not be considered further for evaluation, irrespective of the circumstances. In particular, any discount offered by a Bidder which is not read out at Bid opening shall not be considered further.
	26.9	Bidders are advised to send in a representative with the knowledge of the content of the Bid who shall verify the information read out from the submitted documents. Failure to send a representative or to point out any un-read information by the sent Bidder`s representative shall indemnify The Procuring Agency against any claim or failure to read out the correct information contained in the Bidder`s Bid.
	26.10	No Bid will be rejected at the time of Bid opening except for late Bids which will be returned unopened to the Bidder, pursuant to ITB 24 .
	26.11	The Procuring Agency shall prepare minutes of the Bid opening. The record of the Bid opening shall include, as a minimum: the name of the Bidder and whether or not there is a withdrawal, substitution or modification, the Bid price if applicable, including any discounts and alternative offers and the presence or absence of a Bid Security or Bid Securing Declaration.
	26.12	The Bidders` representatives who are present shall be requested to sign on the attendance sheet. The omission of a Bidder`s signature on the record shall not invalidate the contents and affect the record. A copy of the record shall be distributed to all the Bidders.
	26.13	A copy of the minutes of the Bid opening shall be furnished to individual Bidders upon request

	26.14	In the case of Single Stage Two Envelop Bidding Procedure, after the evaluation and approval of the technical proposal The Procuring Agency, shall at a time within the bid validity period, publically open the financial proposals of the technically accepted bids only. The financial proposal of bids found technically non-responsive shall be returned un-opened to the respective bidders subject to redress of the grievances from all tiers of grievances.
27. Confidentiality	27.1	Information relating to the examination, clarification, evaluation and comparison of Bids and recommendation of contract award shall not be disclosed to Bidders or any other persons not officially concerned with such process until the time of the announcement of the respective evaluation report.
	27.2	Any effort by a Bidder to influence The Procuring Agency processing of Bids or award decisions may result in the rejection of its Bid.
	27.3	Notwithstanding ITB 27.2 from the time of Bid opening to the time of contract award, if any Bidder wishes to contact The Procuring Agency on any matter related to the Bidding process, it should do so in writing or in electronic forms that provides a record of the content of the communication.
28. Clarification of Bids	28.1	To assist in the examination, evaluation and comparison of Bids (and post-qualification if applicable) of the Bidders, The Procuring Agency may ask any Bidder for a clarification of its Bid including a breakdown of prices. Any clarification submitted by a Bidder that is not in response to a request by The Procuring Agency shall not be considered.
	28.2	The request for clarification and the response shall be in writing or in electronic forms that provide a record of the content of the communication. In the case of Single Stage Two Envelope Procedure, no change in the prices or substance of the Bid shall be sought, offered, or permitted, whereas in the case of Single Stage One Envelope Procedure, only the correction of arithmetic errors discovered by The Procuring Agency in the evaluation of Bids should be sought in accordance with ITB 31 .
	28.3	The alteration or modification in THE BID that in any way affects the following parameters will be considered as a change in the substance of a bid: <ul style="list-style-type: none"> a) evaluation & qualification criteria; b) required scope of work or specifications; c) all securities requirements; d) tax requirements; e) terms and conditions of bidding documents. f) change in the ranking of the bidder
	28.4	From the time of Bid opening to the time of Contract award if any Bidder wishes to contact the Procuring Agency on any matter related to the Bid it should do so in

		writing or in electronic forms that provide a record of the content of the communication.
29. Preliminary Examination of Bids	29.1	<p>Prior to the detailed evaluation of Bids, The Procuring Agency will determine whether each Bid:</p> <ol style="list-style-type: none"> a) meets the eligibility criteria defined in ITB 3 and ITB 4; b) has been prepared as per the format and contents defined by the Procuring Agency in the Bidding Documents; c) has been properly signed; d) is accompanied by the required securities; and e) is substantially responsive to the requirements of the Bidding Documents. <p>The Procuring Agency's determination of a Bid's responsiveness will be based on the contents of the Bid itself.</p>
	29.2	<p>A substantially responsive Bid is one which conforms to all the terms, conditions, and specifications of the Bidding Documents, without material deviation or reservation. A material deviation or reservation is one that: -</p> <ol style="list-style-type: none"> a) affects in any substantial way the scope, quality, or performance of the Services; b) limits in any substantial way, inconsistent with the Bidding Documents, The Procuring Agency's rights or the Bidder's obligations under the Contract; or c) if rectified, would affect unfairly the competitive position of the bidders presenting substantially responsive Bids.
	29.3	<p>The Procuring Agency will confirm that the documents and information specified under ITB 11, 12 and 13 have been provided in the Bid. If any of these documents or information is missing or is not provided in accordance with the Instructions to Bidders, the Bid shall be rejected.</p>
	29.4	<p>The Procuring Agency may waive off any minor informality, nonconformity, or irregularity in a Bid which does not constitute a material deviation, provided such waiver does not prejudice or affect the relative ranking of any Bidder.</p> <p><i>Explanation: A minor informality, non-conformity or irregularity is one that is merely a matter of form and not of substance. It also pertains to some immaterial defect in a Bid or variation of a bid from the exact requirements of the invitation that can be corrected or waived without being prejudicial to other bidders. The defect or variation is immaterial when the effect on quantity, quality, or delivery is negligible when contrasted with the total cost or scope of the supplies or services being acquired. The Procuring Agency either shall give the bidder an opportunity to cure any deficiency</i></p>

		<p><i>resulting from a minor informality or irregularity in a bid or waive the deficiency, whichever is advantageous to The Procuring Agency. Examples of minor informalities or irregularities include the failure of a bidder to –</i></p> <p>(a) <i>Submit the number of copies of signed bids required by the invitation;</i></p> <p>(b) <i>Furnish required information concerning the number of its employees;</i></p> <p>(c) <i>the firm submitting a bid has formally adopted or authorized, before the date set for opening of bids, the execution of documents by typewritten, printed, or stamped signature and submits evidence of such authorization and the bid carries such a signature.</i></p>
	29.5	<p>Provided that a Technical Bid is substantially responsive, The Procuring Agency may request the Bidder to submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities or omissions in the Technical Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any such aspect of the technical Proposal linked with the ranking of the bidders. Failure of the Bidder to comply with the request may result in the rejection of its Bids.</p>
	29.6	<p>Provided that a Technical Bid is substantially responsive, The Procuring Agency shall rectify quantifiable nonmaterial nonconformities or omissions related to the Financial Proposal. To this effect, the Bid Price shall be adjusted, for comparison purposes only, to reflect the price of the missing or nonconforming item or component.</p>
	29.7	<p>If a Bid is not substantially responsive, it will be rejected by The Procuring Agency and may not subsequently be evaluated for complete technical responsiveness.</p>
30. Examination of Terms and Conditions; Technical Evaluation	30.1	<p>The Procuring Agency shall examine the Bid to confirm that all terms and conditions specified in the GCC and the SCC have been accepted by the Bidder without any material deviation or reservation.</p>
	30.2	<p>The Procuring Agency shall evaluate the technical aspects of the Bid submitted in accordance with ITB 22, to confirm that all requirements specified in Section V – Schedule of Requirements, Technical Specifications of the Bidding Documents have been met without material deviation or reservation.</p>
	30.3	<p>If after the examination of the terms and conditions and the technical evaluation, The Procuring Agency determines that the Bid is not substantially responsive in accordance with ITB 29, it shall reject the Bid.</p>

<p>31. Correction of Errors</p>	<p>31.1</p>	<p>Bids determined to be substantially responsive will be checked for any arithmetic errors. Errors will be corrected as follows:</p> <ul style="list-style-type: none"> a) if there is a discrepancy between unit prices and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail, and the total price shall be corrected, unless in the opinion of The Procuring Agency there is an obvious misplacement of the decimal point in the unit price, in which the total price as quoted shall govern and the unit price shall be corrected; b) if there is an error in a total corresponding to the addition or subtraction of sub-totals, the sub-totals shall prevail and the total shall be corrected; and c) where there is a discrepancy between the amounts in figures and in words, the amount in words will govern. d) Where there is any discrepancy between the grand total of the price schedule and the amount mentioned on the Form of the Bid, the amount referred to in the Price Schedule shall be treated as correct subject to the elimination of other errors.
	<p>31.2</p>	<p>The amount stated in the Bid will, be adjusted by The Procuring Agency in accordance with the above procedure for the correction of errors and, with, the concurrence of the Bidder, shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount, its Bid will then be rejected, and the Bid Security may be forfeited or the Bid Securing Declaration may be executed in accordance with ITB 18.9.</p>
<p>32. Conversion to Single Currency</p>	<p>32.1</p>	<p>To facilitate evaluation and comparison, The Procuring Agency will convert all Bid prices expressed in the amounts in various currencies in which the Bid prices are payable. For the purposes of comparison of bids quoted in different currencies, the price shall be converted into a single currency specified in the bidding documents. The rate of exchange shall be the selling rate, prevailing on the date of opening of (financial part of) bids specified in the bidding documents, as notified by the State Bank of Pakistan on that day.</p>
	<p>32.2</p>	<p>The currency selected for converting Bid prices to a common base for the purpose of evaluation, along with the source and date of the exchange rate, are specified in the BDS.</p>
<p>33. Evaluation of Bids</p>	<p>33.1</p>	<p>The Procuring Agency shall evaluate and compare only the Bids determined to be substantially responsive, pursuant to ITB 29.</p>
	<p>33.2</p>	<p>In evaluating the Technical Proposal of each Bid, The Procuring Agency shall use the criteria and methodologies listed in the BDS and in terms of the Statement of Requirements and Technical Specifications. No other evaluation criteria or methodologies shall be permitted.</p>

	33.2	<p>The Procuring Agency’s evaluation of a Bid will take into account:</p> <ul style="list-style-type: none"> a) in the case of goods manufactured in Pakistan or goods of foreign origin already imported in Pakistan, Income Tax, General Sales Tax and other similar/applicable taxes, which will be payable on the goods if a contract is awarded to the Bidder; b) in the case of goods of foreign origin offered from abroad, customs duties and other similar import taxes which will be payable on the goods if the contract is awarded to the Bidder;
	33.3	<p>The comparison shall be between the EXW price of the goods offered from within Pakistan, such price to include all costs, as well as duties and taxes paid or payable on components and raw material incorporated or to be incorporated in the goods, and named port of destination, border point, or named place of destination) in accordance with applicable INCOTERM in the price of the goods offered from outside Pakistan.</p>
		<p>In evaluating the Bidders, the evaluation committee will, in addition to the Bid price quoted in accordance with ITB 15.1, take account of one or more of the following factors as specified in the BDS, and quantified in ITB 32.5:</p> <ul style="list-style-type: none"> a) Cost of inland transportation, insurance, and other costs within Pakistan are incidental to the delivery of the goods to their final destination. b) delivery schedule offered in the Bid; c) deviations in payment schedule from that specified in the Special Conditions of Contract; d) the cost of components, mandatory spare parts, and service; e) the availability (in Pakistan) of spare parts and after-sales services for the equipment offered in the Bid; f) the projected operating and maintenance costs during the life of the equipment; g) the performance and productivity of the equipment offered; and/or h) other specific criteria indicated in the TBS and/or in the Technical Specifications.
	33.5	<p>For factors retained in BDS, pursuant to ITB 33.4 one or more of the following quantification methods will be applied, as detailed in the BDS:</p> <ul style="list-style-type: none"> a) <i>Inland transportation from EXW/port of entry/border point, Insurance and incidentals.</i> <p>Inland transportation, insurance, and other incidental costs for delivery of the goods from EXW/port of entry/border point to Project Site named in the BDS will be computed for each Bid by The Procuring</p>

Agency on the basis of published tariffs by the rail or road transport agencies, insurance companies, and/or other appropriate sources. To facilitate such computation, Bidder shall furnish in its Bid the estimated dimensions and shipping weight and the approximate EXW or as per applicable INCOTERM value of each package. The above cost will be added by The Procuring Agency to EXW or as per applicable INCOTERM price.

b) *Delivery schedule.*

i) The Procuring Agency requires that the goods under the Invitation for Bids shall be delivered (shipped) at the time specified in the Schedule of Requirements. The estimated time of arrival of the goods at the Project Site will be calculated for each Bid after allowing for reasonable international and inland transportation time. Treating the Bid resulting in such time of arrival as the base, a delivery “adjustment” will be calculated for other Bids by applying a percentage, specified in the **BDS**, of the EXW or as per applicable INCOTERM price for each week of delay beyond the base, and this will be added to the Bid price for evaluation. No credit shall be given to early delivery. Or

ii) The goods covered under this invitation are required to be delivered (shipped) within an acceptable range of weeks specified in the Schedule of Requirement. **No credit will be given to earlier deliveries, and Bids offering delivery beyond this range will be treated as non-responsive.** Within this acceptable range, an adjustment per week, as specified in the **BDS**, will be added for evaluation to the Bid price of Bids offering deliveries later than the earliest delivery period specified in the Schedule of Requirements. Or

iii) The goods covered under this invitation are required to be delivered (shipped) in partial shipments, as specified in the Schedule of Requirements. Bids offering deliveries earlier or later than the specified deliveries will be adjusted in the evaluation by adding to the Bid price a factor equal to a percentage, specified in the **BDS**, of EXW or as per applicable INCOTERM price per week of variation from the specified delivery schedule.

c) *Deviation in payment schedule.*

i) Bidders shall state their Bid price for the payment schedule outlined in the **SCC**. Bids will be evaluated on the basis of this base price. Bidders are, however, permitted to state an

	<p>alternative payment schedule and indicate the reduction in Bid price they wish to offer for such alternative payment schedule. The Procuring Agency may consider the alternative payment schedule offered by the selected Bidder. Or</p> <p>ii) The SCC stipulates the payment schedule offered by The Procuring Agency. If a Bid deviates from the schedule and if such deviation is considered acceptable to The Procuring Agency, the Bid will be evaluated by calculating interest earned for any earlier payments involved in the terms outlined in the Bid as compared with those stipulated in this invitation, at the rate per annum specified in the BDS.</p> <p>d) <i>Cost of spare parts</i></p> <p>i) The list of items and quantities of major assemblies, components, and selected spare parts, likely to be required during the initial period of operation specified in the BDS, is annexed to the Technical Specifications. The total cost of these items at the unit prices quoted in each Bid, will be added to the Bid price. Or</p> <p>ii) The Procuring Agency will draw up a list of high-usage and high-value items of components and spare parts, along with estimated quantities of usage in the initial period of operation specified in the BDS. The total cost of these items and quantities will be computed from spare parts unit prices submitted by the Bidder and added to the Bid price. Or</p> <p>iii) The Procuring Agency will estimate the cost of spare parts usage in the initial period of operation specified in the BDS, based on information furnished by each Bidder, as well as on past experience of The Procuring Agency or other Procuring Agencies in similar situations. Such costs shall be added to the Bid price for evaluation.</p> <p>e) <i>Spare parts and after sales service facilities in Pakistan</i></p> <p>The cost to The Procuring Agency of establishing the minimum service facilities and parts inventories, as outlined in the BDS or elsewhere in the Bidding Documents, if quoted separately, shall be added to the Bid price.</p> <p>f) <i>Operating and maintenance costs</i></p> <p>Since the operating and maintenance costs of the goods under procurement form a major part of the life cycle cost of the equipment, these costs will be evaluated in accordance with the criteria</p>
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		<p>specified in the BDS or in the Technical Specifications.</p> <p>g) <i>Performance and productivity of the equipment.</i></p> <p>i. Bidders shall state the guaranteed performance or efficiency in response to the Technical Specification. For each drop in the performance or efficiency below the norm of 100, an adjustment for an amount specified in the BDS will be added to the Bid Price, representing the capitalized cost of additional operating costs over the life of the plant, using the methodology specified in the BDS or in the Technical Specifications. Or</p> <p>ii. Goods offered shall have minimum productivity specified the under the relevant provision in the Technical Specifications to be considered responsive. Evaluation shall be based on the cost per unit of the actual productivity of goods offered in the Bid, and adjustment will be added to the Bid price using the methodology specified in the BDS or in the Technical Specification.</p> <p>h) <i>Specific additional criteria</i> Other specific additional criteria to be considered in the evaluation and the evaluation method shall be detailed in the BDS and/or the Technical Specifications.</p>
	33.6	If these Bidding Documents allow Bidders to quote separate prices for different Lots, and the award to a single Bidder of multiple Lots, the methodology of evaluation to determine the lowest evaluated Lot combinations, including any discounts offered in the Form of Bid, is specified in the BDS .
34. Domestic Preference	34.1	If the BDS so specifies, The Procuring Agency will grant a margin of preference to certain goods in line with the rules, regulations, regulatory guides or instructions issued by the Authority from time to time.
35. Determination of Most Advantageous Bid	35.1	In the case where The Procuring Agency adopts the Cost Based Evaluation Technique. The Bid with the lowest evaluated price—from amongst those which are eligible, compliant and substantially responsive shall be the Most Advantageous Bid.
	35.2	<p>The Procuring Agency may adopt the Quality & Cost Based Selection Technique due to the following two reasons:</p> <p>a) Where The Procuring Agency knows about the main features, usage and output of the products; however not clear about the complete features, technical specifications and functionalities of the goods to be procured and requires the bidders to submit their proposals defining those features, specifications and functionalities; or</p> <p>b) Where The Procuring Agency, in addition to the mandatory requirements and mandatory</p>

		<p>technical specifications, requires parameters specified in Evaluation Criteria to be evaluated while determining the quality of the goods:</p> <p>In such cases, The Procuring Agency may allocate certain weightage to these factors as a part of the Evaluation Criteria and may determine the ranking of the bidders on the basis of combined evaluation in accordance with provisions of Rule 2(1)(h) of PPR-2004.</p>
36. Post Qualification of Bidder and/or Abnormally Low Financial Proposal	36.1	<p>After determining the Most Advantageous Bid, if neither the pre-qualification was undertaken separately nor any qualification parameters were undertaken as part of determining the Most Advantageous Bid, The Procuring Agency shall carry out the post-qualification of the Bidder using only the requirements specified in the BDS.</p> <p>In the case of International Tendering, the parameters for incorporation or licensing within Pakistan may be fulfilled as part of post qualification.</p>
	36.2	<p>Where the Bid price is considered to be abnormally low, The Procuring Agency shall perform price analysis either during the determination of the Most Advantageous Bid or as a part of the post-qualification process. The following process shall apply:</p> <ol style="list-style-type: none"> a) The Procuring Agency may reject a Bid if The Procuring Agency has determined that the price in combination with other constituent elements of the Bid is abnormally low in relation to the subject matter of the procurement (i.e. scope of the procurement or ancillary services) and raises concerns as to the capability and capacity of the respective Bidder to perform that contract; b) Before rejecting an abnormally low Bid The Procuring Agency shall request the Bidder for the explanation of the Bid or of those parts which it considers contribute to the Bid being abnormally low; take account of the evidence provided in response to a request in writing, and subsequently verify the Bid or parts of the Bid being abnormally low; c) The decision of The Procuring Agency to reject a Bid and reasons for the decision shall be recorded in the procurement proceedings and promptly communicated to the Bidder concerned; d) The Procuring Agency shall not incur any liability solely by rejecting the abnormally Low Bid; and e) An abnormally low Bid means, in the light of The Procuring Agency's estimate and of all the Bids submitted, the Bid appears to be abnormally low by not providing a margin for normal levels of profit. <p>Guidance for The Procuring Agency: In order to identify the Abnormally Low Bid (ALB)</p>

		<p>following approaches can be considered to minimize the scope of subjectivity:</p> <ul style="list-style-type: none"> (i) Comparing the bid price with the cost estimate; (ii) Comparing the bid price with the bids offered by other bidders submitting substantially responsive bids; and (iii) Comparing the bid price with prices paid in similar contracts in the recent past either government- or development partner-funded.
	36.3	The Procuring Agency will determine to its satisfaction whether the Bidder that is selected as having submitted the most advantageous Bid is qualified to perform the contract satisfactorily, in accordance with the criteria listed in ITB 13.3.
	36.4	The determination will take into account the Bidder's financial, technical, and production capabilities. It will be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB 13.3, as well as such other information as The Procuring Agency deems necessary and appropriate. Factors not included in these Bidding Documents shall not be used in the evaluation of the Bidders' qualifications.
	36.5	<p>The Procuring Agency may seek "Certificate for Independent Price Determination" from the Bidder and the results of reference checks may be used in determining the award of the contract.</p> <p>Explanation: The Certificate shall be furnished by the bidder. The bidder shall certify that the price is determined keeping in view all the essential aspects such as raw material, it's processing, value addition, optimization of resources due to economy of scale, transportation, insurance and margin of profit etc.</p>
	36.6	An affirmative determination will be a prerequisite for the award of the contract to the Bidder. A negative determination will result in rejection of the Bidder's Bid, in which event The Procuring Agency will proceed to the next ranked bidder to make a similar determination of that Bidder's capabilities to perform satisfactorily.

F. Award of Contract

37. Criteria of Award	37.1	<p>Subject to ITB 36 and 38, The Procuring Agency will award the Contract to the Bidder whose Bid has been determined to be substantially responsive to the Bidding Documents and who has been declared as Most Advantageous Bidder, provided that such Bidder has been determined to be:</p> <ul style="list-style-type: none"> a) eligible in accordance with the provisions of ITB 3; b) is determined to be qualified to perform the Contract satisfactorily; and c) Successful negotiations have been concluded if any.
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38. Negotiations	38.1	<p>Negotiations may be undertaken with the Most Advantageous Bid relating to the following areas:</p> <ul style="list-style-type: none"> (a) a minor alteration to the technical details of the statement of requirements; (b) reduction of quantities for budgetary reasons, where the reduction is in excess of any provided for in the Bidding documents; (c) a minor amendment to the special conditions of the Contract; (d) finalizing payment arrangements; (e) delivery arrangements; (f) the methodology for the provision of related services; or (g) clarifying details that were not apparent or could not be finalized at the time of Bidding;
	38.2	<p>Where negotiation fails to result in an agreement, The Procuring Agency may invite the next ranked Bidder for negotiations. Where negotiations are commenced with the next ranked Bidder, The Procuring Agency shall not reopen earlier negotiations.</p>
39. The Procuring Agency's Right to Reject all Bids	39.1	<p>Notwithstanding ITB 37, The Procuring Agency reserves the right to reject all the bids and to annul the Bidding process at any time prior to the award of the contract, without thereby incurring any liability to the affected Bidder or Bidders. However, the Authority (i.e. PPRA) may call from The Procuring Agency the justification of those grounds.</p>
	39.2	<p>Notice of the rejection of all Bids shall be given promptly to all Bidders that have submitted Bids.</p>
	39.3	<p>The Procuring Agency shall upon request communicate to any Bidder the grounds for its rejection of its Bids, but is not required to justify those grounds.</p>
40. The Procuring Agency's Right to Vary Quantities at the Time of Award	40.1	<p>The Procuring Agency reserves the right at the time of contract award to increase or decrease the quantity of goods or related services originally specified in these Bidding Documents (schedule of requirements) provided this does not exceed by the percentage indicated in the BDS, without any change in unit price or other terms and conditions of the Bid and Bidding Documents.</p>
41. Notification of Award	41.1	<p>Prior to the award of contract, The Procuring Agency shall issue a Final Evaluation Report giving justification for acceptance or rejection of the bids.</p>
	41.2	<p>Where no complaints have been lodged, the Bidder whose Bid has been accepted will be notified of the award by The Procuring Agency prior to expiration of the Bid Validity period in writing or electronic forms that provide record of the content of communication. The Letter of Acceptance will state the sum that The Procuring Agency will pay the successful Bidder in consideration for the execution of the scope of works as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price).</p>

	41.3	The notification of award will constitute the formation of the Contract, subject to the Bidder furnishing the Performance Security (or guarantee) in accordance with ITB 43 and signing of the contract in accordance with ITB 42.2 .
	41.4	Upon the successful Bidder's furnishing of the performance security (or guarantee) pursuant to ITB 43 , the The Procuring Agency will promptly notify each unsuccessful Bidder, the name of the successful Bidder and the Contract amount and will discharge the Bid Security or Bid Securing Declaration of the Bidders pursuant to ITB 18.7 .
42. Signing of Contract	42.1	Promptly after notification of award, The Procuring Agency shall send the successful Bidder the draft agreement, incorporating all terms and conditions as agreed by the parties to the contract.
	42.2	Immediately after the Redressal of grievance by the GRC, and after fulfillment of all conditions precedent of the Contract Form, the successful Bidder and The Procuring Agency shall sign the contract.
	42.3	Where no formal signing of a contract is required, the purchase order issued to the bidder shall be construed to be the contract.
43. Performance Security (or Guarantee)	43.1	After the receipt of the Letter of Acceptance, the successful Bidder, within the specified time, shall deliver to The Procuring Agency a Performance Security (or Guarantee) in the amount and in the form stipulated in the BDS and SCC , denominated in the type and proportions of currencies in the Letter of Acceptance and in accordance with the Conditions of Contract.
	43.2	If the Performance Security (or Guarantee) is provided by the successful Bidder and it shall be in the form specified in the BDS which shall be in any of the following: <ul style="list-style-type: none"> (a) certified cheque, cashier's or manager's cheque, or bank draft; (b) irrevocable letter of credit issued by a Scheduled bank or in the case of an irrevocable letter of credit issued by a foreign bank, the letter shall be confirmed or authenticated by a Scheduled bank; (c) bank guarantee confirmed by a reputable local bank or, in the case of a successful foreign Bidder, bonded by a foreign bank; or (d) surety bond callable upon demand issued by any reputable surety or insurance company. Any Performance Security (or guarantee) submitted shall be enforceable in Pakistan.
	43.3	Failure of the successful Bidder to comply with the requirement of ITB 43.1 shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security, in which event The Procuring Agency may make the award to the next ranked Bidder or call for new Bids.
44. Advance Payment	44.1	The advance payment will not be provided in normal circumstances. However, in case where international

		incoterms are involved, the same will be dealt with standard international practices and in the manner as prescribed in ITB 44.2.
	44.2	The Procuring Agency will provide an Advance Payment as stipulated in the Conditions of Contract, subject to a maximum amount, as stated in the BDS . The Advance Payment request shall be accompanied by an Advance Payment Security (Guarantee) in the form provided in Section IX. For the purpose of receiving the Advance Payment, the Bidder shall make an estimate of, and include in its Bid, the expenses that will be incurred in order to commence Delivery of Goods. These expenses will relate to the purchase of equipment, machinery, materials, and the engagement of labour during the first month beginning with the date of The Procuring Agency's "Notice to Commence" as specified in the SCC .
45. Arbitrator	45.1	The Arbitrator shall be appointed by mutual consent of both parties as per the provisions specified in the SCC .
46. Corrupt & Fraudulent Practices	46.1	Procuring Agencies (including beneficiaries of Government funded projects and procurement) as well as Bidders/Suppliers/Contractors under Government financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts, and will avoid engaging in any corrupt and fraudulent practices.

G. GRIEVANCE REDRESSAL & COMPLAINT REVIEW MECHANISM

47. GRC	47.1	The Procuring Agency shall constitute a Grievance Redressal Committee (GRC) comprising of odd number of person with proper power and authorization to address the complaint. The GRC shall not have any of the members of Procurement Evaluation Committee. The committee must have one subject specialist depending the nature of the procurement.
48. GRC Procedure	48.1	Any party can file its written complaint against the eligibility parameters or any other terms and conditions prescribed in the prequalification or bidding documents found contrary to provision of Procurement Regulatory Framework, and the same shall be addressed by the GRC well before the bid submission deadline.
	48.2	Any Bidder feeling aggrieved by any act of The Procuring Agency after the submission of his bid may lodge a written complaint concerning his grievances not later than seven days of the announcement of technical evaluation report and five days after issuance of final evaluation report.
	48.3	In case, the complaint is filed against the technical evaluation report, the GRC shall suspend the procurement proceedings.
	48.4	In case, the complaint is filed after the issuance of the final evaluation report, the complainant cannot raise any objection on technical evaluation of the report: Provided that the complainant may raise the objection on

		any part of the final evaluation report in case where single stage one envelop bidding procedure is adopted.
	48.5	The GRC, in both the cases shall investigate and decide upon the complaint within ten days of its receipt.
	48.6	Any bidder or The Procuring Agency not satisfied with the decision of the GRC may file Appeal before the Appellate Committee of the Authority on prescribed format after depositing the prescribed fee.
	48.7	The Committee, upon receipt of the Appeal against the decision of the GRC complete in all respect shall serve notices in writing upon all the parties to Appeal.
	48.8	The committee shall call the record from the concerned The Procuring Agency or the GRC as the case may be, and the same shall be provided within prescribed time.
	48.9	The committee may after examination of the relevant record and hearing all the concerned parties, shall decide the complaint within fifteen (15) days of receipt of the Appeal.
	48.10	The decision of the Committee shall be in writing and shall be signed by the Head and each Member of the Committee. The decision of the committee shall be final.

H. MECHANISM OF BLACK LISTING

49. Mechanism of Black Listing	49.1	The Procuring Agency shall bar for not more than the time prescribed in Rule-19 of the Public Procurement Rules, 2004, from participating in their respective procurement proceedings, bidder or contractor who either: <ul style="list-style-type: none"> i. Involved in corrupt and fraudulent practices as defined in Rule-2 of Public Procurement Rules; ii. Fails to perform his contractual obligations; and iii. Fails to abide by the id securing declaration;
	49.2	The show cause notice shall contain: <ul style="list-style-type: none"> (a) precise allegation, against the bidder or contractor; (b) the maximum period for which the Procuring Agency proposes to debar the bidder or contractor from participating in any public procurement of The Procuring Agency; and (c) the statement, if needed, about the intention of The Procuring Agency to make a request to the Authority for debarring the bidder or contractor from participating in public procurement of all the procuring agencies.
	49.3	The Procuring Agency shall give minimum of seven days to the bidder or contractor for submission of written reply of the show cause notice.
	49.4	In case, the bidder or contractor fails to submit written reply within the requisite time, The Procuring Agency may issue notice for personal hearing to the bidder or contractor/ authorize representative of the bidder or contractor and The Procuring Agency shall decide the matter on the basis of available record and personal hearing, if availed.
	49.5	In case the bidder or contractor submits written reply of the

		show cause notice, The Procuring Agency may decide to file the matter or direct issuance of a notice to the bidder or contractor for personal hearing.
	49.6	The Procuring Agency shall give minimum of seven days to the bidder or contractor for appearance before the specified officer of The Procuring Agency for personal hearing. The specified officer shall decide the matter on the basis of the available record and personal hearing of the bidder or contractor, if availed
	49.7	The Procuring Agency shall decide the matter within fifteen days from the date of personal hearing unless the personal hearing is adjourned to a next date and in such an eventuality, the period of personal hearing shall be reckoned from the last date of personal hearing.
	49.8	The Procuring Agency shall communicate to the bidder or contractor the order of debaring the bidder or contractor from participating in any public procurement with a statement that the bidder or contractor may, within thirty days, prefer a representation against the order before the Authority.
	49.9	Such blacklisting or barring action shall be communicated by The Procuring Agency to the Authority and respective bidder or bidders in the form of a decision containing the grounds for such action. The same shall be publicized by the Authority after examining the record whether the procedure defined in the blacklisting and debarment mechanism has been adhered to by The Procuring Agency.
	49.10	The bidder may file the review petition before the Review Petition Committee Authority within thirty days of communication of such blacklisting or barring action after depositing the prescribed fee and in accordance with “Procedure of filing and disposal of the review petition under Rule-19(3) Regulations, 2021”. The Committee shall evaluate the case and decide within ninety days of the filing of the review petition.
	49.11	The committee shall serve a notice in writing upon all respondents of the review petition. The notices shall be accompanied by the copies of review petition and all attached documents of the review petition including the decision of The Procuring Agency. The parties may file written statements along with essential documents in support of their contentions. The Committee may pass such order on the representation may deem fit.
	49.12	The Authority on the basis of the decision made by the committee either may debar a bidder or contractor from participating in any public procurement process of all or some of the procuring agencies for such period as deemed appropriate or acquit the bidder from the allegations. The decision of the Authority shall be final.

SECTION - III Bid Data Sheet (BDS)

The following specific data for the goods to be procured shall complement, supplement, or amend the provisions in the Instructions to Bidders (ITBs). Whenever there is a conflict, the provisions herein shall prevail over those in ITBs.

BDS Clause Number	ITB Number	Amendments of, and Supplements to, Clauses in the Instruction to Bidders
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A. Introduction

1.	1.1	<p>Name and address of the Purchaser & Summary of Goods to be procured: Hyderabad Electric Supply Company (HESCO) Address: Director General (Procurement), PMU, HESCO Address: Bungalow #A-1, HESCO Colony Hussainabad Hyderabad. Phone No : 0092-9260070 Fax No : 0092-9260525</p> <p>The subject of procurement is: Procurement of Goods to be supplied on FCS (Free Consignee Stores)/DDP(Delivered Duties Paid) at Regional Store MCPL Workshop Jamshoro. The unloading of the goods shall be the responsibility of the Supplier.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Tender No.</th> <th style="text-align: center;">Lot No.</th> <th style="text-align: center;">Item No.</th> <th style="text-align: center;">Description of Material</th> <th style="text-align: center;">Qty (Nos.)</th> </tr> </thead> <tbody> <tr> <td rowspan="7" style="text-align: center; vertical-align: middle;">PMU-205/ 25-26</td> <td rowspan="4" style="text-align: center; vertical-align: middle;">I</td> <td style="text-align: center;">1</td> <td>In Door Termination Kits for Single Core 500MCM XLPE Cable</td> <td style="text-align: center;">321</td> </tr> <tr> <td style="text-align: center;">2</td> <td>Out Door Termination Kits for Single Core 500MCM XLPE Cable</td> <td style="text-align: center;">333</td> </tr> <tr> <td style="text-align: center;">3</td> <td>In Door Termination Kits for Single Core 1000MCM XLPE Cable</td> <td style="text-align: center;">80</td> </tr> <tr> <td style="text-align: center;">4</td> <td>Out Door Termination Kits for Single Core 1000MCM XLPE Cable</td> <td style="text-align: center;">80</td> </tr> <tr> <td rowspan="3" style="text-align: center; vertical-align: middle;">II</td> <td style="text-align: center;">1</td> <td>11KV Differential C.Ts 1600A/800A/5A</td> <td style="text-align: center;">11</td> </tr> <tr> <td style="text-align: center;">2</td> <td>11KV Overcurrent C.Ts 2400A/1200A/5A/5A</td> <td style="text-align: center;">24</td> </tr> <tr> <td style="text-align: center;">3</td> <td>11KV Differential C.Ts 2400A/1200A/5A</td> <td style="text-align: center;">24</td> </tr> </tbody> </table> <p>Period for delivery of goods: 120 days from the date of the signing of Purchase Order (PO).</p>	Tender No.	Lot No.	Item No.	Description of Material	Qty (Nos.)	PMU-205/ 25-26	I	1	In Door Termination Kits for Single Core 500MCM XLPE Cable	321	2	Out Door Termination Kits for Single Core 500MCM XLPE Cable	333	3	In Door Termination Kits for Single Core 1000MCM XLPE Cable	80	4	Out Door Termination Kits for Single Core 1000MCM XLPE Cable	80	II	1	11KV Differential C.Ts 1600A/800A/5A	11	2	11KV Overcurrent C.Ts 2400A/1200A/5A/5A	24	3	11KV Differential C.Ts 2400A/1200A/5A	24
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2.	2.1	<p>Financial year for the operations of the Procuring Agency: 2025-26 Name of financing institution: HESCO (Own Sources) Name and identification number of the Contract: No. PMU-205/25-26</p>																													
3.	3.1	Maximum number of members in the joint venture, consortium or association shall be: Three																													
4.	3.6	Not Applicable																													
5.	4.1	Ineligible countries are stated in the Section IV of this Bidding Documents.																													
6.	4.5	This clause is not applicable																													

B. Bidding Documents

7.	7.2	The Bids will be submitted through E-Procurement/EPADS(https://eprocure.gov.pk).
8.	7.3	The existing Clause may be replaced with: The Procuring Agency is not responsible for the completeness of the Bidding Documents. Bidder has to ensure to fulfill all requirements/ necessary arrangements to submit the bid, complete in all respect through EPADS.
9.	8.1	The existing Clause may be replaced with: A prospective Bidder requiring any clarification of the Bidding Documents may notify the Procuring Agency through EPADS as per the given time frame.
10.	8.2	The existing Clause may be replaced with: The Procuring Agency will within three (3) working days after receiving the request for clarification, respond in writing through EPADS to any request for clarification provided that such request is received not later than three (03) working days before the deadline for the submission of Bids as prescribed in ITB 23.1. However, this clause shall not apply in the case of alternate methods of Procurement.
11.	8.3	Not Applicable, as the Clarification and their response will be available on EPADS.
12.	8.5	Not Applicable

C. Preparation of Bids

13	9.2	The existing Clause may be replaced with: Any addendum issued including the notice of any extension of the deadline shall be part of the Bidding Documents according to ITB 7.1 and shall be communicated through EPADS. Provided that the bidder who had either already submitted their bid before the issuance of any such addendum shall have the right to withdraw his already filed bid and submit the revised bid before the original or extended bid submission deadline.
14.	10.1	The Language of all correspondences and documents related to the Bid is: English
15.	11.1 (b)	Samples are not required.
16.	11.1 (g)	Power of Attorney Authorizing the signatory of the bidder to submit the bid on the Company's Letter Head.
17.	11.1 (h)	Documents Comprising the Bid The Bid submitted by the Bidder shall be prepared,) comprising the following documents on Standard Form. <ul style="list-style-type: none"> • Form of Bid • Price Schedule • Completion Schedule • Form of Qualification Information <ul style="list-style-type: none"> ➤ Manufacturer Authorization ➤ Manufacturer's Experience of

		<ul style="list-style-type: none"> ➤ Supply Record ➤ Bidder's Experience of Supply Record ➤ Performance Certificate ➤ Current Contract Commitment ➤ Pending Litigation ➤ Financial Data ➤ Annual Turnover Data ➤ Financial Resources <ul style="list-style-type: none"> • Letter of Acceptance • Bid Security Form • Integrity Pact • Beneficial ownership disclosure form • JV agreement (if applicable)
18.	11.2,11.3 11.4,11.5 & 11.6	Not Applicable
19.	12.3 (c)	<p>A. All equipment being supplied shall conform to type test (if applicable) as per technical specification and shall be subject to routine tests in accordance with requirements stipulated under respective sections.</p> <p>B. The reports for all type tests (if applicable) as per technical specification shall be furnished by the Supplier along with equipment/material drawings provided with the bid. The reports must be complied with revised NTDC Type Test policy</p> <p>C. The bidder shall submit an unconditional undertaking duly signed and stamped by bidder duly supported by manufacturer(s) in bid that in case of award of contract if submitted type test reports are not according to NTDC type test policy, he will carry out type tests under witness of NTDC/HESCO as per NTDC type test policy within the quoted Bid price and without affecting the delivery / completion period as mentioned in the Bidding Documents.</p> <p>D. The equipment which are not mentioned in latest NTDC type test policy shall be tested as per relevant NTDC specifications.</p> <p>E. In the event of any discrepancy in the type test reports i.e. any test report not acceptable due to any design/manufacturing changes (including substitution of components) or due to non-compliance with the requirement stipulated in the Technical Specification or any/all additional type tests not carried out, same shall be carried out without additional cost without effecting delivery period implication to the Purchaser as per National Transmission and Dispatch Company Pakistan latest type test policy attached herewith.</p>
20.	12.4	Not Applicable

21.	13.3 (b)	<p>(A) Eligible Bidders</p> <ol style="list-style-type: none"> i. A Bidder having the nationality of Pakistan. ii. The Bidder shall be registered with Income Tax and Sales Tax Departments and shall be on Active Taxpayers List of the Federal Board of Revenue. iii. The Bidder/manufacturer shall not be, blacklisted by DISCOs/NTDC/PPMC/PPRA or any other Government department. <p>(B) Qualification of the Bidder</p> <p>To be qualified for award, the Bidder shall meet the experience, capability and adequacy of resources as per criteria delineated herein below:</p> <p>1. <u>Contractual Experience</u></p> <p>a) Bidder/JV shall have successfully completed at least two (02) number of contracts of same nature/type. “Same nature/type” means material/equipment having comparable characteristics/ features same rating or higher rating not lower rating within last 07 years. In this context, complete set of copies of the contract agreements/Purchase Orders along-with copy of GRN/ completion certificate (must be issued by the end user client) for the equipment indicated in the supply record pertaining to the specified and comparable equipment during the bid evaluation. In this context the bidder is required to fill only in the relevant forms given in tender document and submit the same with the bid. Schedule of qualifications duly filled in should be submitted with the bid and extra sheets may be used to furnish qualifications, experience and supply record (year wise) of the addresses/contract numbers of the purchasers/clients.</p> <p>b) The bidders/JV, who are not manufacturers themselves, shall furnish a valid and fresh authorization from the concerned manufacturer to submit a bid from supply of their goods to Pakistan against the tender.</p> <p>2. <u>Manufacturing Experience.</u></p> <p>The manufacturer shall demonstrate designing and manufacturing experience of similar or higher rated equipment /material for at least five year and Two-year satisfactory operation performance of offered equipment.</p> <p>3. <u>Performance Criteria</u></p> <p>The material manufactured/supplied by the bidder must have satisfactory operational experience. The bidder shall submit at least two (2) operational certificate with the bid from the end user from Pakistan or from outside the country of origin of Page 46 of 98 offered equipment /goods to establish satisfactory operation for a continuous period of at least two years prior to deadline for submission of bids within the period of last 10 years. If the bidder has already supplied the offered equipment/goods to NTDC/DISCOs/K-Electric/GENCOS/Azad Jammu Kashmir (AJK) and the</p>
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		<p>same is in satisfactory operation for a continuous period of at least two years prior to deadline for submission of bids, the same shall be considered equivalent to criteria mentioned above. The bidder shall submit purchase order(s)/ /Contract Agreement(s) in such case along with Completion Certificates(s)/Goods Receipt Notes (GRNs)/ Inspection Certificates.</p> <p>4. <u>Supply Capacity</u></p> <p>The manufacturer shall provide the following information with the Bid to establish its capacity/capability to execute the order.</p> <p>i. Manufacturing Capacity ii. Orders in hand iii. The manufacturing capacity of the Bidder should be at least equal to orders in hand and this order (if placed on it).</p> <p>5. <u>Financial Criteria</u></p> <p>i. The bidder should have sound financial health. In order to determine the same the bidder shall provide its up to date audited financial statements/ other financial statements acceptable to employer i.e. balance sheet, income statement, and cash flow statements for the last 3 years (three years). The bidder's Net worth for each last 3 years should be positive. In this context the bidder is required to fill in the relevant forms of this bidding document and submit the same with the bid.</p> <p>ii. The bidder shall have an average annual turnover in the last 3 years equal to or more than that of the quoted bid price. The annual turnover of partners in a JV shall be calculated by summing their individual turnovers. In case of JV, all JV partners shall combinely meet the said requirement.</p> <p>iii. A bidder/or all partners combined in case of JV has to have sufficient financing sources, liquid assets, unencumbered real assets, lines of credit, available to meet the total cash flow demands of the contract. The cash flow availability be at least 25% of the total quoted amount.</p> <p>6. <u>Litigation History</u></p> <p>Bidders are requested to submit details of all litigation, arbitration and other claims whether pending, threatened or resolved in the last five years.</p> <p>The above stated information should be completed as per prescribed format and submitted along with required attachments. The missing or in complete information / documents may render the bid substantially non-responsive. In this regard, the Purchaser does not have an obligation to request any document / certificates.</p>
22.	15.6	<p>The existing Clause may be replaced with:</p> <p>The offered Bid prices shall be on FCS (Free Consignee Stores)/DDP (Delivered Duty Paid) inclusive of all taxes, duties and other levies on the finished Goods excluding of GST at Regional Store MCPL Workshop Jamshoro, Sindh. The unloading of the goods shall be the responsibility of the Supplier.</p>

23.	16.1	The quoted Prices shall be in PKR.
24.	16.2,16.3 & 16.4	Not applicable.
25.	17.1	The Bid Validity period shall be 90 days .
26.	18.1	The amount of Bid Security shall be PKR 400,000/- for Lot-I & PKR: 100,000/- for Lot-II The currency of the Bid Security shall be in PK
27.	18.2	Bid Securing Declaration is not allowed.
28.	18.3	All e-Bids must be accompanied by Bid Security in the favour of Director General (Procurement)/Chief Engineer (Development) PMU, HESCO, Hyderabad in the shape of "Bank Guarantee" / CDR/ Banker Cheque from any Scheduled Bank of Pakistan, valid for 28 days beyond bid validity date/extended bid validity date. The bidders shall upload scanned copy of Bid Security on EPADS. Original Bid Security must be submitted to the Procuring Agency on or before the closing date & time of e-bids submission, failing which the e-bid shall be rejected. Note: i. The bid security from any insurance company will not be acceptable in any case and the bid shall be liable for rejection. ii. In case the bid security is not valid as per the given requirement, the bid shall be rejected.
29.	19.1	Alternative Bid is not allowed.
30.	19.2 & 19.3	Not Applicable
31.	21.1	The existing Clause may be replaced with: The original bid completed in all respects and duly signed will be submitted electronically through EPADS(https://eprocure.gov.pk)
32.	21.2	The existing Clause may be replaced with: The original Bid submitted through EPADS shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorized to sign on behalf of the Bidder. This authorization shall consist of a written confirmation as specified in the BDS and shall be attached to the Bid. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the Bid, except for un-amended printed literature, shall be initialed by the person or persons signing the Bid.

D. Submission of Bids

33.	22.1, 22.2 & 22.3	The existing clause may be replaced as following: The Bids will be submitted through E-Procurement/EPADS(https://eprocure.gov.pk). The bids submitted through EPADS will only be acceptable. All the PPRA rules regarding e-procurement will be followed. Bids not submitted through EPADS, not signed and / or not stamped, will be rejected.
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34..	23.1	The deadline for Bid submission through EPADS is Day: Wednesday Date: 20.05.2026 Time: 10:00A.M
35.	24.1 & 24.2	Not Applicable.
36.	25.1 & 25.2	The bidder may withdraw and may resubmit on EPADS before its opening.

E. Opening and Evaluation of Bids

37.	26	<p>The existing clause will be replaced as following:</p> <p>1. The Bids will be opened electronically on;</p> <p>Day: Wednesday Date: 20.05.2026 Time: 10:30A.M</p> <p>2. The Procuring Agency shall prepare minutes of the Bid opening. The record of the Bid opening shall include, as a minimum: the name of the Bidder, the Bid price if applicable, including any discounts and the presence or absence of a Bid Security or Bid Securing Declaration.</p> <p>3. The Bidders' representatives who chose to attend physically shall be requested to sign on the attendance sheet. The omission of a Bidder's signature on the record shall not invalidate the contents and affect the record. A copy of the record shall be distributed to all the Bidders.</p>
38.	32.1,32.2	Only PKR currency is acceptable.
39.	33.2	<p>The existing Clause may be replaced with:</p> <p>Technical and Financial Evaluation/Comparison of bids shall be carried out on FCS (Free Consignee Stores)/DDP (Delivered Duty Paid) basis (at Regional Store MCPL Workshop Jamshoro, Sindh). The unloading of the goods shall be the responsibility of the Supplier). The material shall be supplied as per stipulated delivery schedule strictly according to NTDC/PPMC approved Standard specifications (amended-to-date). Any deviations in the tender specification shall be liable for the rejection of the tender. Arithmetical errors will be rectified on the following basis:</p> <p>If there is a discrepancy between the unit price and total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected. If there is a discrepancy between the words and figures the amount in words shall prevail.</p> <p>If there is a discrepancy between the total Tender price entered in Form of Tender and the total shown in the Schedule of Prices. The amount stated in the Form of Tender will be corrected by the Purchaser/Engineer in accordance with the Corrected Schedule of Prices.</p> <p>If the Tenderer does not accept the corrected amount of Tender, his Tender shall be rejected and his Tender Security forfeited.</p> <p>Tenders indicating the delivery beyond the date specified in Tender Schedule shall be declared non-responsive.</p> <p>The bidder must be registered with Income Tax and Sales Tax Department.</p>

40.	33.3	The existing Clause may be replaced with: The comparison shall be made on the basis of FCS (Free Consignee Stores)/DDP (Delivered Duty Paid) without GST at Regional Store MCPL Workshop Jamshoro, Sindh. The unloading of the goods shall be the responsibility of the Supplier.
41.	33.5	The existing Clause may be replaced with: The offered bid in addition to the relevant specification shall be evaluated by the procuring agency's evaluation committee as per <i>PP Rule-4 Principles of Procurement</i> especially in terms of quality of material used, material finishing workmanship, efficiency, economy, reliability and value for money etc.
42.	33.6	Not Applicable
43.	34.1	As per Govt. Policy S.R.O. 827(1)/2001 or updated.
44.	35.1	The existing Clause may be replaced with: The evaluation shall be carried out as per ITB Clause 30 and Clause-36, 37 & 38 of BDS on the basis of the eligibility of the supplier/manufacturer and the eligibility of goods. If eligible, the bidder will be selected on the least cost basis.
45.	35.2	Not Applicable
46.	38.1	The existing Clause may be replaced with: Negotiations will be undertaken as per Public Procurement Rule 40.

F. Award of Contract

47.	40.1	The existing Clause may be replaced with: The Procuring Agency reserves the right at the time of contract award and during the currency of contract to increase or decrease the quantity of goods or related services originally specified in these Bidding Documents (schedule of requirements) provided this does not increase or decrease by 15%, without any change in unit price or other terms and conditions of the Bid and Bidding Documents.
48.	43.1	The Performance Security (or guarantee) shall be 10% of the total Contract Price including GST
49.	43.2	The Performance Security (or guarantee) shall be in the form of: <ul style="list-style-type: none"> - A bank guarantee issued by a scheduled bank of Pakistan in the form provided in the Bidding Documents. - Call Deposit Receipt (CDR) Note: The performance security from any insurance company will not be acceptable.
50.	44.1	Advance Payment is not allowed.
51.	44.2	Not Applicable
52.	48.1	The existing Clause may be replaced with: Any party can file its written complaint through EPADS against the eligibility parameters or any other terms and conditions prescribed in the prequalification or bidding documents found contrary to provision of Procurement Regulatory Framework, and the same shall be addressed by the GRC well before the bid submission deadline in the light of PPRA rules amended to date.

SECTION – IV

Eligible Countries

All the bidders are allowed to participate in the subject procurement without regard to nationality, except bidders of some nationality, prohibited in accordance with policy of the Federal Government.

Following countries are ineligible to participate in the procurement process:

1. India
2. Israel

Ministry of Interior, Government of Pakistan has notified List of Business Friendly Countries (BVL), information can be accessed through following link:

<http://www.dgip.gov.pk/Files/Visa%20Categories.aspx#>

SECTION -V
Schedule of Requirements

The delivery schedule expressed as days stipulates hereafter a delivery date which is the date of delivery at Regional Store HESCO MCPL Workshop Jamshoro on FCS (Free Consignee Stores)/DDP (Delivered Duty Paid) basis. The unloading at HESCO stores shall be the responsibility of the contractor.

Tender No.	Lot No.	Item No.	Description of Material	Unit	Required Qty	Technical Specifications	Delivery Period Required FCS/DDP Hyderabad
PMU - 205/ 25-26	I	1	Indoor Termination Kits for Single Core 500MCM XLPE Cable	No.	321	P-184:86 (amended to date)	120 Days from the date of signing the Purchase Order
		2	Outdoor Termination Kits for Single Core 500MCM XLPE Cable	No.	333		
		3	Indoor Termination Kits for Single Core 1000MCM XLPE Cable	No.	80		
		4	Outdoor Termination Kits for Single Core 1000MCM XLPE Cable	No.	80		
	II	1	11KV Differential C.Ts 1600A/800A/5A	No.	11	P-44:2018 (amended to date)	
		2	11KV Overcurrent C.Ts 2400A/1200A/5A/5A	No.	24		
		3	11KV Differential C.Ts 2400A/1200A/5A	No.	24		

Note:

If any standard, specification, or drawing is not available or in case of any ambiguity the material shall be supplied in accordance with the already approved data and drawings of NTDC (now NGC), HESCO, or any other DISCO, or as per an approved prototype and these will supersede.

Technical Specifications

1. GENERAL

- 1.1 All design, equipment, materials and workmanship shall comply with and be tested in accordance with requirements of the specifications. Equipment or parts which are not covered by the specifications shall comply with rules, codes and regulations of the international electro-technical commission or approved National Standards bodies.
- 1.2 The general intent of these specifications is to require the supply of equipment and materials equal or superior to those actually described herein. Unless otherwise stated, reference to the brand or manufacture, if made is only for the sake of comparison as to type, design, character or quality of the equipment and material desired and shall not be interpreted as eliminating other equipment and material of equal performance, quality and durability.

2. SPECIFICATIONS AND DRAWINGS

- 2.1. The contract shall be executed in strict conformity with the specifications and / or drawings given or mentioned in this section and the supplier shall do not `start production` without proper specifications, instructions and / or drawings.
- 2.2 Specifications and/or drawings are intended to complement each other so that if anything is shown on the drawings as required but not mentioned in the specifications or vice versa, it shall be of like effect as if shown or mentioned in both. If any errors, omissions or discrepancies are found in the figures, specifications and/or drawings or, if any feature shall appear to the supplier to be indefinite or unclear, the same shall be referred to the Engineer whose written explanation and/or clarification shall be obtained before proceeding with the work.
- 2.3 The supplier shall submit to the Director General (Procurement) PMU HESCO, Hyderabad within 10 days of the issuance of the Purchase Order, for approval of the Engineer, four (4) copies of all drawings, technical literature, data, operation and maintenance instruction books and/or manuals required under the specifications and such other documents as are required in the Technical Specifications or other provisions of the bidding documents or, if he deems necessary, require changes or modifications to be made therein, he shall return two copies to the Supplier marked "Approved", "Approved as Noted" or "Returned for Correction". Each drawing which is noted "Returned for Correction" shall be resubmitted to the Engineer after corrections.
- 2.4 The Supplier shall allow 30 days for the Engineer`s approval of drawings in his schedule of work and in the time allowed for completion of the Contract. Extra time required for approval of drawings due to deficiencies in design or errors in submitted drawings shall be the responsibility of the Supplier and no extension in time will be allowed on this account. Delays in obtaining approval caused by the Engineer beyond 30 days will entitle the Supplier to an extension of time.
- 2.5 Approval by the Engineer does not relieve the Supplier of his responsibility to do the work in accordance with the Contract.
- 2.6 The Supplier shall be responsible for any discrepancies, errors or omissions in any drawings or other particulars supplied by him whether such drawings or particulars have been approved by the Engineer or not.
- 2.7 All drawings and documents furnished by the Supplier in accordance with the

Contract shall become the property of the Purchaser.

- 2.8 Wherever reference is made in the Technical Specifications to specific standards and codes to be met by the goods and materials to be furnished or tested, the provisions of the latest current edition or revision of the relevant standards or codes in effect shall apply, unless otherwise expressly stated in the Contract. Where such standards and codes are national or relates to a particular country or region, other authoritative standards that ensure substantial equivalence to the standards and codes specified will be acceptable.

3. **LANGUAGE**

- 3.1 All correspondence, literature, drawings, name plates, diagrams, applicable data, equipment details, instructions and maintenance books and manuals, spare parts books and descriptive data shall be in the English language.

4. **UNITS OF MEASUREMENT**

- 4.1 All dimensions and units given by the Supplier in the Bid with its associated drawings and the approval Drawings as submitted by the Supplier shall be in metric system and all reference to weights, measurements and quantities shall be in metric units.

5. **TEST CERTIFICATE**

The firm will enclose with each consignment, manufacturer's test certificate in triplicate conforming that the goods offered conform to requirements of the tender and literature / brochure provided with the equipment.

6. **TECHNICAL SPECIFICATIONS**

The offered Material shall comply with all the specified requirements as laid down in NTDC specification (Amended to date) attached with the bidding document.

SECTION – VI
STANDARD FORMS

FOR

Single Stage One Envelope Procedure

Form of Bid

Bid/Tender No. _____

Date: _____

To

Director General (Procurement)
Project Management Unit
HESCO, Hyderabad.

We, the undersigned, declare that:

Having examined the Bidding Documents including Addenda, the receipt of which is hereby duly acknowledged, we, the undersigned, offer to deliver in conformity with the said Bidding Documents for the sum of _____ or such other sums as may be ascertained in accordance with the Schedule of Prices attached herewith and made part of this Bid.

We declare that our Bidding price did not involve agreements with other Bidders for the purpose of Bid suppression.

We are hereby confirming, Mr. _____ to be the Appointing Authority, to appoint the adjudicator in case of any arisen disputes in accordance with **ITB Clause 45.1**

We undertake, if our Bid is accepted, to deliver the goods in accordance with the delivery schedule specified in the Schedule of Requirements.

If our Bid is accepted, we undertake to provide a Performance Security (or Guarantee) in the form, in the amounts, and within the times specified in the Bidding Documents.

We declare that as Bidder(s) we do not have a conflict of interest with reference to **ITB Clause 3.7**.

We agree to abide by this Bid for the Bid Validity Period specified in BDS 22, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

We are not participating, as Bidders, in more than one Bid in this Bidding process, other than alternative offers in accordance with the Bidding Documents

Our firm, its affiliates or subsidiaries – including any subcontractors or suppliers for any part of the contract – has not been declared ineligible by the Government of Pakistan under Pakistan's laws or official regulations.

Until a formal Contract is prepared and executed, this Bid, together with your written acceptance thereof and your notification of award, shall constitute a binding Contract between us.

We understand that you are not bound to accept the lowest or any Bid you may receive.

We certify/confirm that we comply with the eligibility requirements as per **ITB Clause 3** of the Bidding Documents

Dated this _____ day of _____ 20_____.

(Name)

[signature]

[in the capacity of]

Duly authorized to sign Bid for and on behalf of _____

PRICE SCHEDULE TENDER NO. PMU-205/25-26

Lot #	Item #	Description of Stores	Specification (Amended to-date)	Quantity required (No.)	FCS/DDP unit rate (as per SCC clause 11) in PKR without GST	Total Amount in PKR (3 x 4)
		1	2	3	4	5
I	1	In Door Termination Kits for Single Core 500MCM XLPE Cable	NTDC Specification P-184:86	321		
	2	Out Door Termination Kits for Single Core 500MCM XLPE Cable		333		
	3	In Door Termination Kits for Single Core 1000MCM XLPE Cable		80		
	4	Out Door Termination Kits for Single Core 1000MCM XLPE Cable		80		
II	1	11KV Differential C.Ts 1600A/800A/5A	NTDC Specification P-44:2018	11		
	2	11KV Overcurrent C.Ts 2400A/1200A/5A/5A		24		
	3	11KV Differential C.Ts 2400A/1200A/5A		24		
		Applicable GST				
		Grand Total				

(IN WORDS: _____)

Stamp & Sign: _____ Date: _____

Form of Qualification Information

1. Individual Bidders or Individual Members of Joint Ventures

1.1 Constitution or legal status of Bidder: *[attach copy]*

Place of registration: *[insert]*

Principal place of business: *[insert]*

Power of attorney of the signatory of Bid: *[attach]*

1.2 Qualification and experience of Manufacturer/supplier provide as required in bidding document on attached Performa.

1.3 Financial reports for the last 3 years: balance sheets, profit and loss statements, auditors' reports, and other data as per attached Performa.

1.4 Evidence of access to financial resources to meet the qualification requirements: cash in hand, lines of credit, etc as per attached Performa.

1.5 Major items of Supplier's Equipment proposed for carrying out the Services. List all information requested below. Refer also to ITB 13.3(c).

Item of equipment	Description, make, and age (years)	Condition (new, good, poor) and number available	Owned, leased (from whom?), or to be purchased (from whom?)
(a)			
(b)			
(c)			
(d)			

1.6 We certify/confirm that we comply with eligibility requirements as per ITB 3 of the bidding documents.

1.7 Name, address, telephone, telex, e-mail, and facsimile numbers of banks that may provide references if contacted by HESCO.

1.8 Information regarding Occupation Health and Safety Policy and Safety Records of the Bidder. Attach valid certificates.

1.9 Statement of compliance with the requirements of ITB 3.4.

1.10 Descriptions, Data drawings, and type test reports (if applicable) as necessary, to comply with the requirements of the bidding documents.

2. Joint Ventures

2.1 The information listed in 1.11 - 1.12 above shall be provided for each member of the joint venture.

2.2 The information in 1.13 above shall be provided for the joint venture.

2.3 Attach the power of attorney of the signatory(ies) of the Bid authorizing the signature of the Bid on behalf of the joint venture.

2.4 Attach the Contract among all members of the joint venture (and which is legally binding on all members), which shows that

- a) all members shall be jointly and severally liable for the execution of the Contract in accordance with the Contract terms;
- b) one of the members will be nominated as being in-charge, authorized to incur liabilities, and receive instructions for and on behalf of any and all members of the joint venture; and
- c) the execution of the entire Contract, including payment, shall be done exclusively with the member in charge.

3. Additional Requirements

3.1 Bidders should provide any additional information required in the Bid Data Sheet and to fulfil the requirements of ITB 12.1, if applicable.

We, the undersigned declare that

- a) The information contained in and attached to this form is true and accurate as of the date of bid submission *Or [delete statement which does not apply]*
- b) The originally submitted pre-qualification information remains essentially correct as of date of submission

Authorized Signature: _____

Name and Title of Signatory: _____

Name of Bidder: _____

Address: _____

Bid Security Form

To:

[Insert name of procuring agency]

Whereas *[name of the Bidder]* (hereinafter called "the Bidder") has submitted its Bid dated *[date of submission of Bid]* for the delivery of *[name and/or description of the goods]* (hereinafter called "the Bid").

KNOW ALL PEOPLE by these presents that WE *[name of Financial Institution]* of *[name of country]*, having our registered office at *[address of Financial Institution]* (hereinafter called "the Bank"), are bound unto *[name of HESCO]* (hereinafter called "HESCO") in the sum of *[amount]* for which payment well and truly to be made to the said HESCO, the Bank binds itself, its successors, and assigns by these presents.

Sealed with the Common Seal of the said Bank this _____ day of _____ 20____.

THE CONDITIONS of this obligation are:

1. If the Bid
 - (a) have withdrawn or modified our Bid during the period of Bid Validity specified in the Form of Bid;
 - (b) Disagreement to arithmetical correction made to the Bid price; or
 - (c) having been notified of the acceptance of our Bid by HESCO during the period of Bid Validity, (i) failure to sign the contract if required by HESCO to do so or (ii) fail or refuse to furnish the Performance Security or to comply with any other condition precedent to signing the contract specified in the Bidding Documents.
2. We undertake to pay to HESCO up to the above amount upon receipt of its first written demand, without HESCO having to substantiate its demand, provided that in its demand HESCO states the amount claimed by it is due to it, owing to the occurrence of one or both of the conditions, specifying the occurred condition or conditions.

This guarantee shall remain in force up to and including twenty-eight (28) days after the period of Bid Validity, and any demand in respect thereof should reach the Bank not later than the above date.

Name: _____ in the capacity of _____ signed
[Signature of the Bank]

Dated on _____

Performance Security (or guarantee) Form

To:

[Insert name of procuring agency]

WHEREAS *[name of Supplier]* (hereinafter called “the Supplier”) has undertaken, in pursuance of Contract No. *[reference number of the contract]* dated *[insert date]* to delivery *[description of goods and services]* (hereinafter called “the Contract”).

AND WHEREAS it has been stipulated by you in the said Contract that the Supplier shall furnish you with a Bank Guarantee by a reputable bank for the sum specified therein as security for compliance with the Supplier’s performance obligations in accordance with the Contract.

AND WHEREAS we have agreed to give the Supplier a guarantee:

THEREFORE, WE hereby affirm that we are Guarantors and responsible to you, on behalf of the Supplier, up to a total of *[amount of the guarantee in words and figures]*, and we undertake to pay you, upon your first written demand declaring the Supplier to be in default under the Contract and without cavil or argument, any sum or sums within the limits of *[amount of guarantee]* as aforesaid, without your needing to prove or to show grounds or reasons for your demand or the sum specified therein.

This guarantee is valid until the: *[insert date]*

Signature and seal of the Guarantors

[name of bank or financial institution]

[address]

[date]

Integrity Pact

DECLARATION OF FEES, COMMISSION AND BROKERAGE ETC. PAYABLE BY THE SUPPLIERS OF GOODS, SERVICES & WORKS IN CONTRACTS WORTH RS.10.00 MILLION OR MORE

Contract Number: _____

Date: _____

Contract Title: _____

Contract Value: _____

[Name of Supplier] hereby declares that it has not obtained or induced the procurement of any contract, right, interest, privilege or other obligation or benefit from Government of Pakistan or any administrative subdivision or agency thereof or any other entity owned or controlled by it (GoP) through any corrupt business practice.

Without limiting the generality of the foregoing [Name of Supplier] represents and warrants that it has fully declared the brokerage, commission, fee etc. paid or payable to anyone and not given or agreed to give and shall not give or agree to give to anyone within or outside Pakistan either directly or indirectly through any natural or juridical person, including its affiliate, agent, associate, broker, consultant, director, promoter, shareholder, sponsor or subsidiary, any commission, gratification, bribe, finder's fee or kickback, whether described as consultations fee or otherwise, with the object of obtaining or inducing the procurement of a contract, right, interest, privilege or other obligation or benefit in whatsoever form from GoP, except that which has been expressly declared pursuant hereto.

[Name of Supplier] certifies that it has made and will make full disclosure of all agreements and arrangements with all persons in respect of or related to the transaction with GoP and has not taken any action or will not take any action to circumvent the above declaration, representative or warranty.

[Name of Supplier] accepts full responsibility and strict liability for making and false declaration, not making full disclosure, misrepresenting fact or taking any action likely to defeat the purpose of this declaration, representation and warranty. It agrees that any contract, right interest, privilege or other obligation or benefit obtained or procured as aforesaid shall, without prejudice to any other right and remedies available to GoP under any law, contract or other instrument, be voidable at the option of GoP.

Notwithstanding any rights and remedies exercised by GoP in this regard, [Name of Supplier] agrees to indemnify GoP for any loss or damage incurred by it on account of its corrupt business practices and further pay compensation to GoP in an amount equivalent to ten times the sum of any commission, gratification, bribe, finder's fee or kickback given by [Name of Supplier] as aforesaid for the purpose of obtaining or inducing the procurement of any contract, right, interest, privilege or other obligation or benefit in whatsoever form from GoP.

Buyer

Seller

MANUFACTURER'S AUTHORIZATION

Date: _____ Bid Reference No.: _____

To: _____
(Name of Bidder)

WHEREAS we _____ who are official
Manufacturer of _____ (name & description of Goods offered) having factories
at
(address of factory) _____ do hereby authorize M/s

(Name and address of Bidder) to submit a
Bid in relation to the Invitation for Bids indicated above, the purpose of which is to
provide the following Goods manufactured by us and to subsequently negotiate and sign
the Contract:

Description of Goods: _____

No company or firm or individual other than M/s _____ are
authorized to bid, and conclude the contract for the above goods manufactured by us
against this specific IFB.

We hereby extend our full guarantee and warranty in accordance with Clause 28 of the
General Conditions of Contract, with respect to the Goods offered by the above firm in
reply to this Invitation for Bids

Name: _____

In the capacity of: _____

Signed: _____

Duly authorized to sign the Authorization for and on behalf of _____
(Name of Manufacturer)

Date: _____

Note: This letter of authority should be on the letter head of the Manufacturer and should
be signed by a person competent and having the Power of Attorney to legally bind the
Manufacturer.

**MANUFACTURER'S EXPERIENCE OF SUPPLY
RECORD**

(For a period of Last 05 Years) Name of the Equipment/Goods:

Sr. No.	Client Name, Address Phone, Number & E-mail	Item	Quantity	Year	End-user Certificate

Signed & Stamped

BIDDER'S EXPERIENCE OF SUPPLY RECORD

Name of the Equipment/Goods:

Sr. No.	Client Name, Address Phone, Number & E-mail	Item	Quantity	Amount (PKR)	Year	Copies of agreement / P.O.

Signed & Stamped

CURRENT CONTRACT COMMITMENTS

Bidder and each partner of JV (in case of JV) should provide information on their current commitments on all contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for contracts approaching completion.

Sr. No.	Name of Contract / Order	Employer's Contract Address, Tel, Fax	Value of Outstanding orders (Pak Rupee Equivalent)	Estimated Delivery Date	Average Monthly Invoicing Over Last Six Months (Pak Rupees Equivalent / month)
1	2	3	4	5	6
2					
3					
4					
5					
6					
7					

Signed & Stamped

Manufacturer's Orders in Hand and its Implementation Schedule

Manufacturer should provide following information on their all contracts/orders in hand, that have been awarded or for which a letter of intent or acceptance has been received, or for contracts approaching completion and Implementation Schedule thereof:

Sr. No.	Particulars of Contracts/ Orders in hand	Order No. & Date	Name of Order Placing Authority	Order Completion Date	Remaining Contract Period (in months)	Ordered Quantity	Balance Quantity yet to be supplied
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.							
2.							
3.							
4.							
5.							
6.							
7.							
Total							

Signature and Seal of the Manufacturer / Bidder:

FINANCIAL RESOURCES

Specify proposed sources of financing, such as liquid assets, lines of credit, and other financial means less current commitments to meet the total cash flow demands of this contract.

Financial Resources			
Sr. No.	Source of Financing	Amount (currency)	Equivalent Amount* (US\$/PKR)
1	Liquid Assets		
2	Credit Lines		
3	Total (1+2)		
4	Current Commitments		
5	Net Available Financial Resources (4-5)		

* Converted to US\$/PKR at exchange rate (selling) prevailing twenty-eight (28) days prior to deadline for submission of Bids.

Signature and Seal of the Bidder:

ANNUAL TURNOVER DATA

Name of the Bidder / JV Partner:

Bidder and each Joint Venture Partner (in case of JV) are requested to complete the information in this form separately.

Annual turnover data for the last three years			
Year	Amount (Currency)	Exchange Rate*	Equivalent Amount (US\$/PKR)
Average Annual Turnover (for last three years)			

* The Exchange Rate (Selling) prevailing 28 days prior to Bid Opening

Signature and Seal of the Bidder:

FINANCIAL DATA

The Bidder and each JV partner (in case of JV) shall complete the information in this Form. Name of the Bidder / JV Partner: _____

Financial Data for Last (03) Years			
Fiscal Year			
Information for Balance Sheet			
Total Assets			
Total Liabilities			
Net Worth			
Current Assets			
Cash and Cash equivalents			
Current Liabilities			
Information from Income Statement			
Total Revenues			
Profits Before Taxes			
Profits After Taxes			
<p>Attach copies of audited financial statements along with notes for the last three years, as indicated above, complying with the following conditions:</p> <ul style="list-style-type: none"> • All such documents must reflect the financial situation of the Bidder and not sister, affiliate or parent companies. • Historic financial statements must be audited by a chartered accountant whose certificate of incorporation with its concerned accreditation body for example Association of Chartered Accountants of X-Country shall be submitted with the Bid. • Historic financial statements must correspond to accounting periods already completed and audited (no financial statements for partial periods shall be accepted). 			

Signature and Seal of Bidder:

PENDING LITIGATION

Each Bidder or member of a JV must fill in this form.

Pending Litigation					
Year	Name of Other Party (ies)	Matter in Dispute	Litigation whether in Courts or Arbitration	Amount involved	
				Pending or Threatened	Resolved
Total					
% age of Net Worth					

Signature and Seal of Bidder:

PERFORMANCE CERTIFICATE
Summary of operational Experience

It is certified that M/s. _____ has supplied the following materials for the quantities indicated against each. The performance of the delivered material is satisfactory

Sr. No.	Order No. & Date	Designation & address of order placing authority/User	Description of Material	Quantity	Date of Supply	Performance of Material	Description of Material

Signature & seal of the Manufacturer / Bidder

Note:

Bidder shall attach the operational certificate with this Performa.

SECTION – VII
GENERAL CONDITIONS OF THE CONTRACT (GCC)

<p>1. Definitions</p>	<p>1.1</p>	<p>The following words and expressions shall have the meanings hereby assigned to them:</p> <ul style="list-style-type: none"> a) “Authority” means Public Procurement Regulatory Authority. b) The “Arbitrator” is the person appointed with mutual consent of both the parties, to resolve contractual disputes as provided for in the General Conditions of the Contract GCC Clause 31 hereunder. c) The “Contract” means the agreement entered into between HESCO and the Supplier, as recorded in the Contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein. d) The “Commencement Date” is the date when the Supplier shall commence execution of the contract as specified in the SCC. e) “Completion” means the fulfillment of the related services by the Supplier in accordance with the terms and conditions set forth in the contract. f) “Country of Origin” means the countries and territories eligible under the PPRA Rules 2004 and its corresponding Regulations as further elaborated in the SCC. g) The “Contract Price” is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract. h) “Defective Goods” are those goods which are below standards, requirements or specifications stated by the Contract. i) “Delivery” means the transfer of the goods from the supplier equipment, machinery, and /or other materials which the Supplier is required to supply to HESCO under Contract. j) “Effective Contract date” is the date shown in the Certificate of Contract Commencement issued by HESCO upon fulfilment of the conditions precedent stipulated in GCC Clause 3. k) “HESCO” means the person named as HESCO in the SCC and the legal successors in title to this person, procuring the Goods and related service, as named in SCC. l) “Related Services” means those services ancillary to the delivery of the Goods, such as transportation and insurance, and any other incidental services, such as installation, commissioning, provision of technical assistance, training, initial maintenance and other such obligations of the Supplier covered under the Contract. m) “GCC” means the General Conditions of Contract
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		<p>contained in this section.</p> <p>n) “Intended Delivery Date” is the date on which it is intended that the Supplier shall effect delivery as specified in the SCC.</p> <p>o) “SCC” means the Special Conditions of Contract.</p> <p>p) “Supplier” means the individual private or government entity or a combination of the above whose Bid to perform the contract has been accepted by HESCO and is named as such in the Contract Agreement, and includes the legal successors or permitted assigns of the supplier and shall be named in the SCC.</p> <p>q) “Project Name” means the name of the project stated in SCC.</p> <p>r) “Day” means calendar day.</p> <p>s) “Eligible Country” means the countries and territories eligible for participation in accordance with the policies of the Federal Government.</p> <p>t) “End User” means the organization(s) where the goods will be used, as named in the SCC.</p> <p>u) “Origin” means the place where the Goods were mined, grown, or produced or from which the Services are supplied. Goods are produced when, through manufacturing, processing, or substantial and major assembly of components, a commercially recognized new produce results that is substantially different in basic characteristics or in purpose or utility from its components.</p> <p>v) “Force Majeure” means an unforeseeable event which is beyond reasonable control of either Party and which makes a Party’s performance of its obligations under the Contract impossible or so impractical as to be considered impossible under the circumstances.</p> <p>For the purposes of this Contract, “Force Majeure” means an event which is beyond the reasonable control of a Party, is not foreseeable, is unavoidable, and its origin is not due to negligence or lack of care on the part of a Party, and which makes a Party’s performance of its obligations hereunder impossible or so impractical as reasonably to be considered impossible in the circumstances. and includes, but is not limited to, war, riots, civil disorder, earthquake, fire, explosion, storm, flood, epidemics, or other adverse weather conditions, strikes, lockouts or other industrial action (except where such strikes, lockouts or other industrial action are within the power of the Party invoking Force Majeure to prevent), confiscation or any other action by Government agencies.</p> <p>w) “Specification” means the Specification of the Goods and performance of incidental services in</p>
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		<p>accordance with the relevant standards included in the Contract and any modification or addition made or approved by HESCO.</p> <p>x) The Supplier's Bid is the completed Bid document submitted by the Supplier to HESCO.</p>
2. Application and Interpretation	2.1	These General Conditions shall apply to the extent that they are not superseded by provisions of other parts of the Contract.
	2.2	In interpreting these Conditions of Contract headings and marginal notes are used for convenience only and shall not affect their interpretations unless specifically stated; references to the singular include the plural and vice versa and masculine include the feminine. Words have their ordinary meaning under the language of the Contract unless specifically defined.
	2.3	<p>The documents forming the Contract shall be interpreted in the following order of priority:</p> <ol style="list-style-type: none"> i. Form of Contract, ii. Special Conditions of Contract, iii. General Conditions of Contract, iv. Letter of Acceptance, v. Certificate of Contract Commencement vi. Specifications vii. Contractor's Bid, and viii. Any other document listed in the Special Conditions of Contract as forming part of the Contract.
3. Conditions Precedent	3.1	<p>Having signed the Contract, it shall come into effect on the date on which the following conditions have been satisfied:</p> <ol style="list-style-type: none"> a) Submission of performance Security (or guarantee) in the form specified in the SCC; b) Furnishing of Advance Payment Unconditional Guarantee.
	3.2	If the Condition precedent stipulated on GCC Clause 3.1 is not met by the date specified in the SCC this contract shall not come into effect;
	3.3	If HESCO is satisfied that each of the conditions precedent in this contract has been satisfied (except to the extent waived by him, but subject to such conditions as he shall impose in respect of such waiver) he shall promptly issue to the supplier a certificate of Contract commencement, which shall confirm the start date.
4. Governing Language	4.1	The Contract as all correspondence and documents relating to the contract exchanged by the Supplier and HESCO shall be written in the language specified in SCC. Subject to GCC Clause 3.1, the version of the Contract written in the specified language shall govern its interpretation.
5. Applicable Law	5.1	The contract shall be governed and interpreted in accordance with the laws of Pakistan, unless otherwise specified in SCC.
6. Country of Origin	6.1	The origin of Goods and Services may be distinct from the nationality of the Supplier.
7. Standards	7.1	The Goods supplied under this Contract shall conform to

		the standards mentioned in the Technical Specifications, and, when no applicable standard is mentioned, the American Standards (such as ACI, IEEE, ASME, etc.) or the Pakistani standards such as PSQCA such standards shall be the latest issued by the concerned institution.
8. Use of Contract Documents and Information; Inspection and Audit by the Government of Pakistan	8.1	The Supplier shall not, without HESCO's prior written consent, disclose the Contract, or any provision thereof, or any specification, plan, drawing, pattern, sample, or information furnished by or on behalf of HESCO in connection therewith, to any person other than a person employed by the Supplier in the performance of the Contract. Disclosure to any such employed person shall be made in confidence and shall extend only as far as may be necessary for purposes of such performance.
	8.2	The Supplier shall not, without HESCO's prior written consent, make use of any document or information enumerated in GCC Clause 7.1 except for purposes of performing the Contract.
	8.3	Any document, other than the Contract itself, enumerated in GCC Clause 7.1 shall remain the property of HESCO and shall be returned (all copies) to HESCO on completion of the Supplier's performance under the Contract if so required by HESCO.
	8.4	The Supplier shall permit the Government of Pakistan or / and donor agencies involved in financing the project to inspect the Supplier's accounts and records relating to the performance of the Supplier and to have them audited by auditors appointed by the Government of Pakistan or / and the appropriate donor agencies if so required by the Government of Pakistan or / and the appropriate donor agencies.
9. Patent and Copy Rights	9.1	The Supplier shall indemnify HESCO against all third-party claims of infringement of patent, trademark, or industrial design rights arising from use of the Goods or any part thereof in Pakistan.
	9.2	The patent right in all drawings, documents, and other materials containing data and information furnished to HESCO by the Supplier herein shall remain vested in the supplier, or, if they are furnished to HESCO directly, or through the Supplier by any third party, including suppliers of materials, the patent right in such materials shall remain vested in such third party.
10. Performance Security (or Guarantee)	10.1	The Performance Security (or Guarantee) shall be provided to HESCO no later than the date specified in the Letter of Acceptance and shall be issued in an amount and form and by a bank or surety acceptable to HESCO, and denominated in the types and proportions of the currencies in which the Contract Price is payable as specified in the SCC.
	10.2	The proceeds of the Performance Security (or Guarantee) shall be payable to HESCO as compensation for any loss resulting from the Supplier's failure to complete its obligations under the Contract.

	10.3	The Performance Security (or Guarantee) shall be in one of the following forms: a) A bank guarantee, an irrevocable letter of credit issued by a reputable bank, or in the form provided in the Bidding Documents or another form acceptable to HESCO; or b) A cashier's or certified check.
	10.4	The performance security (or guarantee) will be discharged by HESCO and returned to the Supplier not later than thirty (30) days following the date of completion of the Supplier's performance obligations under the Contract, including any warranty obligations unless otherwise specified in SCC.
11. Inspections and Test	11.1	HESCO or its representative shall have the right to inspect and /or to test the Goods to confirm their conformity to the Contract specifications at no extra cost to HESCO. SCC and the Technical Specifications shall specify what inspections and tests HESCO shall notify the Supplier in writing or in electronic forms that provide record of the content of communication, in a timely manner, of the identity of any representatives retained for these purposes.
	11.2	The inspections and tests may be conducted on the premises of the Supplier or its subcontractor(s), at point of delivery, and/or at the Goods' final destination. If conducted on the premises of the Supplier or its subcontractor(s), all reasonable facilities and assistance, including access to drawings and production data, shall be furnished to the inspectors at no charge to HESCO.
	11.3	Should any inspected or tested Goods fail to conform to the Specifications, HESCO may reject the Goods, and the Supplier shall replace the rejected Goods to meet specification requirements free of cost to HESCO.
	11.4	HESCO's right to inspect, test and, where necessary, reject Goods after the Goods' arrival in HESCO's country shall in no way be limited or eared by reason of the Goods having previously been inspected, tested, and passed by HESCO or its representative prior to the Goods' shipment from the country of origin.
	11.5	Nothing in GCC Clause 10 shall in any way release the supplier from any warranty or other obligations under this Contract.
12. Packing	12.1	The supplier shall provide such packing of the Goods as is required to prevent their damage or deterioration during transit to their final destination, as indicated in the Contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit, and open storage. Packing case size and weights shall take into consideration, where appropriate, the remoteness of the Goods final destination and the absence of heavy handling facilities at all points in transit.
	12.2	The packing, marking, and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the

		Contract, including additional requirements, if any, specified in SCC, and in any subsequent instructions ordered by HESCO.
13. Delivery and Documents	13.1	Delivery of the Goods shall be made by the Supplier in accordance with the terms specified in the Schedule of Requirements. The details of shipping and or other documents to be furnished by the Supplier as specified in SCC.
	13.2	For purposes of the Contract, “EXW”, “FOB”, “FCA”, “CIF”, “CIP,” and other trade terms used to describe the obligations of the parties shall have the meanings assigned to them by the current edition of INCOTERMS published by the International Chamber of Commerce, Paris.
	13.3	Documents to be submitted by the Supplier are specified in SCC.
14. Insurance	14.1	The Goods supplied under the Contract shall be fully insured in a freely convertible currency against loss or damage incidental to manufacture or acquisition, transportation, storage, and delivery in the manner specified in the SCC.
15. Transportation	15.1	Where the Supplier is required under Contract to deliver the Goods FOB, transport of the Goods, up to and including the point of putting the Goods on board the vessel at the specified port of loading, shall be arranged and paid for by the Supplier, and the cost thereof shall be included in the Contract Price. Where the Supplier is required under the Contract to deliver the Goods FCA, transport of the Goods and delivery into the custody of the carrier at the place named by the Procuring Agency or other agreed point shall be arranged and paid for by the Supplier, and the cost thereof shall be included in the Contract Price.
	15.2	Where the Supplier is required under Contract to deliver the Goods CIF or CIP, transport of the Goods to the port of destination or such other named place of destination in Pakistan, as shall be specified in the Contract, shall be arranged and paid for by the Supplier, and the cost thereof shall be included in the Contract Price.
	15.3	Where the Supplier is required under the Contract to transport the Goods to a specified place of destination within Pakistan, defined as the Project Site, transport to such place of destination in Pakistan, including insurance and storage, as shall be specified in the Contract, shall be arranged by the Supplier, and related costs shall be included in the Contract Price.
16. Related Services	16.1	The Supplier may be required to provide any or all of the following services, including additional services, if any, specified in SCC: <ul style="list-style-type: none"> a) Performance or supervision of on-site assembly, Installation Commissioning and/or start-up of the supplied Goods; b) Furnishing of tools required for assembly and/or maintenance of the supplied Goods; c) Furnishing of detailed operations and maintenance

		<p>manual for each appropriate unit of the supplied Goods;</p> <p>d) Performance or supervision or maintenance and/or repair of the supplied Goods, for a period of time agreed by the parties, provided that this service shall not relieve the Supplier of any warranty obligations under this Contract; and</p> <p>e) Training of HESCO's personnel, at the Supplier's plant and/or on-site, in assembly, start-up, operation, maintenance, and/or repair of the supplied Goods.</p>
	16.2	Prices charged by the Supplier for related services, if not included in the Contract Price for the Goods, shall be agreed upon in advance by the parties and shall not exceed the prevailing rates charged to other parties by the Supplier for similar services.
17. Spare Parts	17.1	<p>As specified in SCC, the Supplier may be required to provide any or all of the following materials, notifications, and information pertaining to spare parts manufactured or distributed by the Supplier:</p> <p>a) Such spare parts as HESCO may elect to purchase from the Supplier, provided that this election shall not relieve the Supplier of any warranty obligations under the Contract; and</p> <p>b) In the event of termination of production of the spare parts:</p> <p>i. Advance notification to HESCO of the pending termination, in sufficient time to permit HESCO to procure needed requirements; and</p> <p>ii. Following such termination, furnishing at no cost to HESCO, the blueprints, drawings, and specifications of the spare parts, if requested.</p>
18. Warranty/ Defect Liability Period	18.1	The Supplier warrants that the Goods supplied under the Contract are new, unused, of the most recent or current models and that they have incorporated all recent improvements in design and materials unless provided otherwise in the Contract. The Supplier further warrants that all Goods supplied under this Contract shall have no defect, arising from design, materials, or workmanship (except when the design and/or material is required by the HESCO, specifications) or from any act or omission of the Supplier, that may develop under normal use of the supplied Goods in the conditions prevailing in Pakistan.
	18.2	This warranty shall remain valid for a period specified in the SCC after the Goods, or any portion thereof as the case may be, have been delivered to and accepted at the final destination indicated in the Contract.
	18.3	HESCO shall promptly notify the Supplier in writing or in electronic forms that provide a record of the content of communication of any claims arising under this warranty.
	18.4	Upon receipt of such notice, the manufacturer/supplier shall, within the period specified in SCC and with all reasonable speed, repair or replace the defective Goods or

		parts thereof. The cost of lifting the defective materials its subsequent repair or replacement and returning back to HESCO stores shall be borne by the supplier.
	18.5	If the Supplier, having been notified, fails to remedy the defect(s) within the period specified, HESCO may proceed to take such remedial action as may be necessary, at the Supplier's risk and expense and without prejudice to any other rights which HESCO may have against the Supplier under the Contract.
19. Payment	19.1	The method and conditions of payment to be made to the Supplier under this Contract shall be specified in SCC.
	19.2	The Supplier's request(s) for payment shall be made to HESCO in writing or in electronic forms that provide a record of the content of communication, accompanied by an invoice describing, as appropriate, the Goods delivered and Services performed, and by documents submitted pursuant to GCC Clause 13, and upon fulfilment of other obligations stipulated in the Contract.
	19.3	Payments shall be made promptly by HESCO, within sixty (60) days after submission of an invoice or claim by the Supplier. If HESCO makes a late payment, the Supplier shall be paid interest on the late payment. Interest shall be calculated from the date by which the payment should have been made up to the date when the late payment is made at the rate as specified in the SCC.
	19.4	The currency or currencies in which payment is made to the Supplier under this Contract shall be specified in SCC subject to the following general principle: payment will be made in the currency or currencies in which the payment has been requested in the Supplier's Bid.
	19.5	All payments shall be made in the currency or currencies specified in the SCC pursuant to GCC Clause 19.4
20. Prices	20.1	The contract price shall be specified in the Contract Agreement Subject to any additions and adjustments thereto or deductions therefrom, as may be made pursuant to the Contract.
	20.2	Prices charged by the Supplier for Goods delivered and Services performed under the Contract shall not vary from the prices quoted by the Supplier in its Bid, with the exception of any price adjustments authorized in SCC or in HESCO's request for Bid Validity extension, as the case may be.
21. Change Orders	21.1	HESCO may at any time, by a written order given to the Supplier pursuant to GCC Clause 22, make changes within the general scope of the Contract in any one or more of the following: <ul style="list-style-type: none"> a) Drawings, designs, or specifications, where Goods to be furnished under the Contract are to be specifically manufactured for HESCO; b) The method of shipment or packing; c) The place of delivery; and/or d) The Services to be provided by the Supplier.

	21.2	If any such change causes an increase or decrease in the cost of, or the time required for, the Supplier's performance of any provisions under the Contract an equitable adjustment shall be made in the Contract Price or delivery schedule, or both, and the Contract shall accordingly be amended. Any claims by the Supplier for adjustment under this clause must be asserted within thirty (30) days from the date of the Supplier's receipt of HESCO change order.
	21.3	Prices to be charged by the supplier for any related services that might be needed but which were not included in the Contract shall be agreed upon in advance by the Parties and shall not exceed the prevailing rates charged to other parties by the Supplier for similar services.
22. Contract Amendments	22.1	Subject to GCC Clause 20, no variation in or modification of the terms of the Contract shall be made except by a written amendment signed by the parties.
23. Assignment	23.1	Neither HESCO nor the Supplier shall assign, in whole or in part, obligations under this Contract, except with the prior written consent of the other party.
24. Sub- contracts	24.1	The Supplier shall consult HESCO in the event of subcontracting under this contract if not already specified in the Bid. Subcontracting shall not alter the Supplier's obligations.
	24.2	Subcontracts must comply with the provision of GCC Clause 5.
25. Delays in the Supplier's Performance	25.1	Delivery of the Goods and performance of Services shall be made by the Supplier in accordance with the time schedule prescribed by HESCO in the Schedule of Requirements.
	25.2	If at any time during the performance of the Contract, the Supplier or its subcontractor(s) should encounter conditions impeding timely delivery of the Goods and performance of Services, the Supplier shall promptly notify HESCO in writing or in electronic forms that provide record of the content of communication of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the Supplier's notice, HESCO shall evaluate the situation and may at its discretion extend the Supplier's time for performance, with or without liquidated damages, in which case the extension shall be ratified by the parties by amendment of Contract.
	25.3	Except as provided under GCC Clause 28, a delay by the Supplier in the performance of its delivery obligations shall render the Supplier liable to the imposition of liquidated damages pursuant to GCC Clause 26, unless an extension of time is agreed upon pursuant to GCC Clause 25.2 without the application of liquidated damages.
26. Liquidated Damages	26.1	Subject to GCC Clause 28, if the Supplier fails to deliver any or all of the Goods or to perform the Services within the period(s) specified in the Contract, HESCO shall, without prejudice to its other remedies under the Contract, deduct from the Contract Price, as liquidated damages, a sum equivalent to the percentage specified in SCC of the delivered price of the delayed Goods or unperformed

		Services for each week or part thereof of delay until actual delivery or performance, up to a maximum deduction of the performance security (or guarantee) specified in SCC. Once the said maximum is reached, HESCO may consider termination of the Contract pursuant to GCC Clause 26.
27. Termination for Default	27.1	HESCO or the Supplier, without prejudice to any other remedy for breach of Contract, by written notice of default sent to the concerned party may terminate the Contract if the other party causes a fundamental breach of the Contract.
	27.2	<p>Fundamental breaches of Contract shall include, but shall not be limited to the following:</p> <ul style="list-style-type: none"> a) the Supplier fails to deliver any or all of the Goods within the period(s) specified in the Contract, or within any extension thereof granted by HESCO pursuant to GCC Clause 24; or b) the Supplier fails to perform any other obligation(s) under the Contract; c) Supplier's failure to submit performance security (or guarantee) within the time stipulated in the SCC; d) the supplier has abandoned or repudiated the contract. e) HESCO or the Supplier is declared bankrupt or goes into liquidation other than for reconstruction or amalgamation; f) a payment is not paid by HESCO to the Supplier after 84 days from the due date for payment; g) the HESCO gives Notice that goods delivered with a defect is a fundamental breach of Contract and the Supplier fails to correct it within a reasonable period of time determined by HESCO; and h) if HESCO determines, based on reasonable evidence, that the Supplier has engaged in corrupt, coercive, collusive, obstructive or fraudulent practices, in competing for or in executing the Contract. <p>For the purpose of this clause: "Corrupt and Fraudulent Practice" means the practices as described in Rule-2 (1) (f) of Public Procurement Rules-2004.</p>
	27.3	In the event HESCO terminates the Contract in whole or in part, pursuant to GCC Clause 26.1 HESCO may procure, upon such terms and in such manner as it deems appropriate, Goods or Services similar to those undelivered, and the Supplier shall be liable to HESCO for any excess costs for such similar Goods or Services. However, the Supplier shall continue the performance of the Contract to the extent not terminated.

<p>28. Termination for Force Majeure</p>	<p>28.1</p>	<p>Notwithstanding the provisions of GCC Clauses 25, 26, and 27, neither Party shall have any liability or be deemed to be in breach of the Contract for any delay nor is other failure in performance of its obligations under the Contract, if such delay or failure is a result of an event of Force Majeure.</p> <p>For purpose of this clause, “Force Majeure” means an event which is beyond the reasonable control of a Party, is not foreseeable, is unavoidable, and its origin is not due to negligence or lack of care on the part of a Party, and which makes a Party’s performance of its obligations hereunder impossible or so impractical as reasonably to be considered impossible in the circumstances, and includes, but is not limited to, war, riots, civil disorder, earthquake, fire, explosion, storm, flood, epidemics, or other adverse weather conditions, strikes, lockouts or other industrial action (except where such strikes, lockouts or other industrial action are within the power of the Party invoking Force Majeure to prevent.</p>
	<p>28.2</p>	<p>If a Party (hereinafter referred to as “the Affected Party”) is or will be prevented from performing its substantial obligation under the contract by Force Majeure, it shall give a Notice to the other Party giving full particulars of the event and circumstance of Force Majeure in writing or in electronic forms that provide a record of the content of communication of such condition and the cause thereof. Unless otherwise directed by HESCO in writing or in electronic forms that provide a record of the content of communication, the Supplier shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.</p>
<p>29. Termination for Insolvency</p>	<p>29.1</p>	<p>HESCO may at any time terminate the Contract by giving written notice to the Supplier if the Supplier becomes bankrupt or otherwise insolvent. In this event, termination will be without compensation to the Supplier, provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to HESCO.</p>
<p>30. Termination for Convenience</p>	<p>30.1</p>	<p>HESCO, by written notice sent to the Supplier, may terminate the contract, in whole or in part, at any time for its convenience. The notice of termination shall specify that termination is for HESCO’s convenience, the Contract is terminated, and the date upon which such termination becomes effective.</p>
	<p>30.2</p>	<p>The Goods that are complete and ready for shipment within thirty (30) days after the Supplier’s receipt of notice of termination shall be accepted by HESCO at the Contract terms and price. For the remaining Goods, HESCO may elect:</p> <ul style="list-style-type: none"> a) To have any portion completed and delivered at the Contract terms and prices; and / or b) To cancel the remainder and pay to the Supplier

		an agreed amount for partially completed Goods and Services and for materials and parts previously procured by the Supplier.
31. Dispute Resolution	31.1	In the event of any dispute arising out of this contract, either party shall issue a notice of the dispute to settle the dispute amicably. The parties hereto shall, within twenty-eight (28) days from the notice date, use their best efforts to settle the dispute amicably through mutual consultations and negotiation. Any unsolved dispute may be referred to by either party to an arbitrator that shall be appointed by mutual consent of both parties.
	31.2	After the dispute has been referred to the arbitrator, within 30 days, or within such other period, as may be proposed by the Parties, the Arbitrator shall give its decision. The rendered decision shall be binding to the Parties.
32. Procedure for Disputes Resolution	32.1	The arbitration shall be conducted in accordance with the arbitration procedure published by the Institution named and in the place shown in the SCC.
	32.2	The rate of the Arbitrator's fee and administrative costs of arbitration shall be borne equally by the Parties. The rates and costs shall be in accordance with the rules of the Appointing Authority. In conducting arbitration to its finality each party shall bear its incurred costs and expenses.
	32.3	The arbitration shall be conducted in accordance with the arbitration procedure published by the institution named and in the place shown in the SCC.
33. Replacement of Arbitrator	33.1	Should the Arbitrator resign or die, or should HESCO and the Supplier agree that the Arbitrator is not functioning in accordance with the provisions of the contract, a new Arbitrator shall be appointed by mutual consent of both parties.
34. Limitation of Liability	34.1	Except in cases of criminal negligence or willful conduct, and in the case of infringement pursuant to GCC Clause 8, <ul style="list-style-type: none"> a) The supplier shall not be liable to the HESCO, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the Supplier to pay liquidated damages to HESCO; and b) The aggregate liability of the Supplier to HESCO, whether under the Contract, in tort or otherwise, shall not exceed the total Contract Price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment or to any obligation of the Supplier to indemnify HESCO with respect to patent infringement.
35. Notices	35.1	Any notice given by one party to the other pursuant to this Contract shall be sent to the other party in writing or in

		electronic forms that provide a record of the content of communication and confirmed in writing or in electronic forms that provide a record of the content of communication to the other party's address specified in SCC.
	35.2	A notice shall be effective when delivered or on the notice's effective date, whichever is later.
36. Taxes and Duties	36.1	A foreign Supplier shall be entirely responsible for all taxes, stamp duties, license fees, and other such levies imposed outside Pakistan.
	36.2	If any tax exemptions, reductions, allowances or privileges may be available to the Supplier in Pakistan HESCO shall use its best efforts to enable the Supplier to benefit from any such tax savings to the maximum allowable extent.
	36.3	A local Supplier shall be entirely responsible for all taxes, duties, license fees, etc., incurred until delivery of the contracted Goods to HESCO.

SECTION - VIII
Special Conditions of Contract (SCC)

The following Special Conditions of Contract (SCC) shall supplement the GCC. Whenever there is a conflict, the provisions herein shall prevail over those in the GCC. The corresponding clause number of the GCC is indicated in parentheses.

SCC Clause Number	GCC Clause Number	Amendments of, and Supplements to, Clauses in the GCC
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Definitions (GCC 1)

1.	1.1	The Procuring Agency is: Hyderabad Electric Supply Electric Company (HESCO)
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Documents forming the Contract (GCC)

2.	2.3	<ul style="list-style-type: none"> (1) Purchase Order (PO) (2) Performance Guarantee submitted by the successful Firm and its verification from the concerned Bank (3) Letter of Intent (LOI) issued by HESCO and its acceptance by the successful bidder (4) Special Conditions of Contract (5) General Conditions of Contract (6) Specifications (7) Contractor's Bid & Bidding Document (8) Addendum (if any)
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Conditions Precedent (GCC 3)

3.	3.1	Having signed the contract, it shall come into effect on the date of its issuance.
4.	3.1 (b)	Not applicable

Governing Language (GCC 4)

5.	4.1	The Governing Language shall be English
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Performance Security (or Guarantee) (GCC 10)

7.	10.1	<p>The amount of performance security (or guarantee), as a percentage of the Contract Price, shall be: 10% of the total Contract price (including GST)</p> <p>Time period of validity: shall be valid for 18 months from the date of installation/commissioning or 24 months from the date of delivery of last consignment whichever is earlier.</p>
8.	10.3 (a) & (b)	<p>The Performance Security/Guarantee shall be in PKR issued in favour of Director General (Procurement)/Chief Engineer (Dev) PMU HESCO and it shall be in the form as the per following:</p> <ul style="list-style-type: none"> a. A bank guarantee issued by a scheduled bank of Pakistan in the form provided in the Bidding Documents. b. Call Deposit Receipt (CDR) <p>Note: The performance security from any insurance company will not be acceptable in any case.</p>

Inspections and Tests (GCC 11)

9.	11.6	<p>The following sub clause may be added 11.6</p> <ol style="list-style-type: none"> a. To ensure the manufacture of Goods to be in conformity with Contract requirements, the Supplier shall institute and follow regular procedures for quality assurance during manufacturing process. The manufacturer shall maintain an independent quality control department, which shall be responsible for enforcing the quality assurance programme. Upon Award of the Contract, the Supplier and the Engineer (s) shall establish mutually acceptable quality control and inspection procedure. b. The Goods shall be subjected to the type, sample and routine tests as described in the specifications. The supplier shall provide free of charge all such assistance, instruments, machines, labour and materials as are normally required for carrying out such tests. c. Two authorized representatives of Director General (Procurement) will carry out pre delivery inspection at manufacturer works at supplier expenses including 1st class travelling (return air tickets for places of inspection located out of Hyderabad), local transportation, boarding & lodging in any A class accommodation and daily allowance (including travel time), as per Govt. of Pakistan Policy. The said payment will be made to the inspectors before issuance of Inspection Certificate. d. All reasonable facilities as provided in the specifications or followed by Trade & Industry in general shall have to be offered to the Inspecting officers by manufacturer/supplier at their expense for carrying out Testing and Inspection. e. As soon as goods are ready for inspection, the manufacturer/supplier shall give a notice of at least 15-days for locally manufactured material and two months (60-days) for material manufactured out of Pakistan, for witnessing such tests with date time and place. The nomination of Inspectors will be made by purchaser within 15 days from the receipt of inspection call. The nominated inspectors will immediately proceed for inspection after necessary arrangements by the supplier. Within 7 days from the completion of inspection the inspector shall issue the inspection certificate. f. In case the Goods fail to withstand any test, the cost of repeating such tests and the cost of witnessing such test by the Director General (Procurement) PMU HESCO or 02-No. of its authorized representatives / Inspectors shall be borne by the Supplier and the equipment released or modified to the satisfaction of
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		<p>the Purchaser without any additional cost to the Purchaser.</p> <p>g. Any inspection and / or witnessing of tests or the waiving of such tests and / or surveillance by the Director General (Procurement) PMU HESCO, Hyderabad or 02-Nos. representatives / Inspectors shall not relieve the Supplier of its obligations and responsibilities under the Contract.</p>
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Packaging (GCC 12)

10.	12.2	<p>The Goods shall be packed properly in accordance with standard export packing specified by the Procuring Agency in the Technical Specification.</p> <p>The word “Hyderabad Electric Supply Company” or HESCO with PO No. & year of manufacturing together with other essential markings as per the Specification shall be provided.</p>
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Delivery and Documents (GCC 13)

	13.1	<p>For Goods supplied from abroad:</p> <p>Upon shipment, the Supplier shall notify the Procuring Agency and the Insurance Company by cable the full details of the shipment, including Contract number, description of Goods, quantity, the vessel, the bill of lading number and date, port of loading, date of shipment, port of discharge, etc. The Supplier shall mail the following documents to the Procuring Agency, with a copy to the Insurance Company:</p> <ol style="list-style-type: none"> i. One original plus two copies of the Supplier’s invoice showing Goods’ description, quantity, unit price, and total amount; ii. original and four copies of the negotiable, clean, on-board bill of lading marked “freight prepaid” and four copies of nonnegotiable bill of lading; iii. One original plus four copies of the packing list identifying contents of each package; iv. inspection certificate issued by the nominated inspection agency, and the Supplier’s factory inspection report; and v. Insurance Certificate; vi. Manufacturer’s or Supplier’s warranty certificate; <p>For Goods from within Pakistan:</p> <p>Upon delivery of the Goods to the transporter, the Supplier shall notify the Procuring Agency and mail the following documents to the Procuring Agency:</p> <ol style="list-style-type: none"> i. one original plus two copies of the Supplier’s
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		<p>invoice showing Goods' description, quantity, unit price, and total amount;</p> <p>ii. delivery note, railway receipt, or truck receipt;</p> <p>iii. One original plus four copies of the packing list identifying contents of each package;</p> <p>iv. Manufacturer's or Supplier's warranty certificate;</p> <p>v. Inspection certificate issued by the nominated inspection agency, and the Supplier's factory inspection report; and</p> <p>vi. Certificate of country of origin issued by Pakistan Chamber of Commerce and Industry or equivalent authority in the country of origin in duplicate.</p> <p>The above documents shall be received by the Procuring Agency before arrival of the Goods and, if not received, the Supplier will be responsible for any consequent expenses.</p>
11.	13.2	The Goods shall be supplied on FCS (Free Consignee Stores)/DDP (Delivered Duty Paid) at Regional Store MCPL Workshop Jamshoro, Sindh. The unloading of the goods shall be the responsibility of the Supplier.

Insurance (GCC 14)

13.	14.1	The Insurance shall be in an amount equal to 110 percent of the FCS value of the Goods from "warehouse" to "warehouse" on "All Risks" basis, including War Risks and Strikes.
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Warranty (GCC 18)

14.	18.2	A warranty to the effect that the goods offered conform exactly to the specifications laid down in this Contract and that the goods in question have also been tested and checked prior to delivery & that the goods in question are new and free from all defects, and that in the event of goods being found old or defective or not conforming to the specifications, or not in conformity with the test certificate, the supplier/manufacturer will be held responsible for all losses and that the supplier agree to substitute the unacceptable goods with the acceptable goods at your risk and cost provided the above mentioned defects/deficiencies are noticed within 18 months from the date of installation/commissioning or 24 months from the date of delivery of last consignment whichever is earlier.
15.	18.4 & 18.5	Upon receipt of notice for correction of defects under warranty period the manufacturer/supplier shall, within 45 days (or the period specified in Specification) and with all reasonable speed, repair or replace the defective Goods or parts thereof. The cost of lifting the defective Goods, its subsequent repair or replacement and returning back to HESCO stores shall be borne by the supplier. If the supplied Goods or its part(s) is/are damaged during the warranty and need repair, its warranty period will be protected. The warranty period shall effectively remain active from the

		<p>date of intimation of defective goods to the manufacturer/supplier and shall resume again once the defect has been removed and goods supplied back to HESCO stores.</p> <p>For Example: An item has a warranty period of 12 months. Its warranty starts on 1st January and it gets defective after its successful use/commissioning after 6 months on 5th July. The manufacturer/supplier is intimated about the defect on 7th July. The remaining warranty is 5 months and 23days. This remaining warranty period shall remain reserved. The item is lifted for repair on 15th July and returned to HESCO stores on 7th August. The remaining warranty of 5 months and 23 days will resume from 7th August.</p> <p>The warranty period of the entirely replaced item shall be as per the initial warranty period of new goods.</p> <p>If the Goods under warranty period already repaired are damaged again (second time) the procedure mentioned for the first time damage shall be followed. Accordingly, the same procedure shall be followed for damage/defect for the third time. However, if the goods under warranty period are damaged for the third time the manufacturer/supplier shall be issued a Performance Certificate that will have an impact on its participation in future bids/tenders in HESCO.</p> <p><i>NOTE: Liquidated Damages shall be applicable where there is a delay in delivery of material under the warranty claim. Liquidated Damages shall be applicable as per SCC clause 20.</i></p>
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Payment (GCC 18)

16.	19.1	<p>The payment will be made on the production of the following documents: -</p> <ol style="list-style-type: none"> i. Invoice of the supplied material in triplicate. ii. Delivery Challan duly acknowledged and signed by the consignee. iii. GRN issued by concerned Deputy Manager, Regional Store HESCO MCPL Workshop Jamshoro. iv. Warranty Certificate as per warranty clause. v. Inspection Certificate as per inspection clause. vi. Confirmation letter of acceptance of performance Bond/Security by the Manager (Procurement) PMU HESCO. vii. Certificate to the effect that the billed amount has not been claimed or received earlier (Non-payment certificate). viii. Professional Tax paid certificate by the firm (if applicable). ix. All Federal & Provincial Taxes will be applied as per prevailing laws. x. Copy of General Sales Tax/Excise Duty Invoice. xi. The manufacturer/supplier in its invoices shall also give an undertaking, in case of omission of any deductible amount; HESCO's claim at any later stage (through pre-audit / post audit) shall be acceptable to
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		<p>them.</p> <p>xii. As per directions of FBR dated. 3.9.2015 conveyed vide C.E (Operation) PEPCO vide letter No. 1918-28 dated. 17.09.2015, the payment to the registered persons may be linked with the active taxpayer status of the suppliers as per FBR database.</p> <p>xiii. Integrity pact (if applicable) on prescribed Performa duly signed and stamp.</p> <p>xiv. Visual inspection certificate issued by inspector at the time of delivery in store.</p> <p>xv. Visual inspection certificate confirming the quantity, accessories (if any), packaging etc are consistent with relevant contract Clauses issued by Deputy Manager Regional Store at the time of delivery in store.</p> <p><i>PARTIAL DELIVERIES AND PARTIAL PAYMENTS ARE ALLOWED.</i></p> <p>The amount of 18% sales tax will be reimbursed as under:</p> <p>i. Sales Tax return cum payment Challan for the month of delivery of material.</p> <p>ii. Copy of GRN duly stamped and signed by the respective consignees.</p> <p>iii. Sales Tax Invoice as per GRN above.</p> <p>iv. Any increase/decrease in the existing tariff of custom duty/Sales tax or any other tax is imposed or charged by the Government of Pakistan/Provincial Government, the same will be adjusted by the Manager Project Financing PMU on production of documentary evidence.</p> <p>In case the manufactures who pay lump-sum Sales Tax, they shall also submit an affidavit on non-judicial paper separately that “Challan includes the amount of Rs. _____ of Sales Tax for supply of material to HESCO against P.O. No. _____ dated. _____”</p>
18.	19.5	All payments shall be made in PKR

Prices (GCC 20)

19.	20.1 & 20.2	Prices shall not be adjusted. The offered price shall be firm and final.
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Liquidated Damages (GCC 26)

20.	26.1	<p>If the supplier fails to deliver the Goods or any consignment thereof within the specified delivery period, the purchaser shall be entitled at his option, either:</p> <p>a) To recover from the supplier liquidated damages levied at the rate of two percent (2%) per month or a fraction thereof subject to a maximum of ten percent (10%) of the PO/contract price, except:</p> <ul style="list-style-type: none"> • Where un-delivered stores hold up the use of other stores, liquidated damages shall be levied on the total value of the contract/PO. • The recovery of liquidated damages mentioned above can be effected from any payment due to the
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		<p>supplier from any unit of HESCO.</p> <p>b) To purchase from elsewhere, without notice to the supplier, at the supplier's risk and cost, the stores not delivered, without canceling the contract/PO in respect of the consignment not yet due for delivery Or</p> <p>c) To cancel the contract/PO at the supplier's risk and cost.</p> <p>In the event of action being taken under (b) or (c) above, the supplier shall be liable for any loss which the purchaser may suffer on the account, but the supplier shall not be entitled to any gain on repurchase made against the supply order.</p>
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Procedure for Dispute Resolution (GCC 32)

21.	32.1	As per the Laws of Government of Pakistan.
22.	32.3	<ol style="list-style-type: none"> 1. If any dispute of any kind whatsoever shall arise between HESCO and the Supplier in connection with or arising out of the Contract, including without prejudice to the generality of foregoing, any question regarding its existence, validity, termination and the execution of the Contract– whether during developing phase or after their completion and whether before or after the termination, abandonment or breach of the Contract – the parties shall seek to resolve any such dispute or difference by mutual diligent negotiations in good faith within 7 (seven) days following a notice sent by one Party to the other Party in this regard. 2. At future of negotiation the dispute shall be resolved through mediation. 3. At the event of failure of mediation to resolve the dispute relating to this contract such dispute shall finally be resolved through binding Arbitration by sole arbitrator in accordance with Arbitration Act 1940. The Arbitration shall take place in Hyderabad and proceedings will be conducted in English language. 4. The cost of the mediation and arbitration shall be shared by the parties in equal proportion however the both parties shall bear their own costs and lawyer's fees regarding their own participation in the mediation and arbitration. However, the Arbitrator may make an award of costs upon the conclusion of the arbitration making any party to the dispute liable to pay the costs of another party to the dispute. 5. Arbitration proceedings as mentioned in the above clause regarding resolution of disputes may be commenced prior to, during or after delivery of goods. <p>Notwithstanding any reference to the arbitration herein, the parties shall continue to perform their respective obligations under the Contract unless they otherwise agree that HESCO shall pay the Supplier any monies due to the Supplier.</p> <p>Furthermore, the bidder agrees that the territorial jurisdiction of the litigation shall be Hyderabad District.</p>

		No court other than Hyderabad District will entertain any judicial matter in respect thereto.
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Notices (GCC 35)

23.	35.1	<p>Procuring Agency's address for notice purposes: Director General (Procurement), PMU, HESCO Address: Bungalow #A-1, HESCO Colony Hussainabad Hyderabad. Phone No : 0092-9260070 Fax No : 0092-9260525</p>
24.	36.4	<p>Add the following sub clause after GCC 36.3; The taxes as per Sindh Stamp duty act would be applicable. The applicable rates (updated) shall be borne by the supplier.</p>

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SPECIFICATION P-184: 86

TERMINATIONS FOR XLPE 11 KV POWER CABLES



PAKISTAN
WATER AND POWER DEVELOPMENT AUTHORITY
DESIGN DEPARTMENT (T&G) WAPDA

C O N T E N T S

0. Foreword.
1. Scope.
2. Service Conditions.
3. Constructional Requirements.
4. Ratings and Characteristics.
5. Test Samples, Acceptance and Rejection.
6. Tests.
7. Test Methods.
8. Tool Kit.
9. Technical Data and Drawings.
10. Packing.

PRINTING HISTORY

First approved in January 1986.

SPECIFICATION P-184: 86

TERMINATIONS FOR 11 KV POWER CABLES

0 FOREWORD

- 0.1 This specification has been prepared by the Standards and Research Directorate of the Design Department (T&G) WAPDA, Lahore.
- 0.2 This specification is intended only for the purpose of procurement of material and does not include the provisions of contract.
- 0.3 This specification supersedes 11 kv Cable Terminations already covered in WAPDA Specification P-86:80.
- 0.4 This specification is subject to revision as and when required.

1 SCOPE

- 1.1 This specification briefly describes the salient characteristics of the indoor and outdoor terminations required for 11 kv crosslinked polyethylene power cables standardized in WAPDA Specification P-29:81 and for dimensions specified in Table-1.
- 1.2 The terminations covered are of premoulded cold, heat shrinkable and slip on type for indoor and outdoor use, suitable for rapid and easy installation and for maintaining safety of the persons and the equipment. The terminations offered shall be of well proven design suitable for the service conditions to match or exceed the life of the cable they protect.
- 1.3 Ageing and tracking of polymers and other plastic products occur very slowly over a time period of years and therefore often do not appear in the normal tests specified in the national or international standards. The manufacturer is therefore required to supply sufficient information and data including material testing and field trial reports in support of life expectancy of their products, particularly the environmental effects of ultra violet light, and aggressive gasses under hot and humid conditions. The manufacturer may also supply accelerated product tests to prove the claimed life expectancy of their products such as non tracking, low erosion rate, environmental ageing, and thermal effects etc.

2 SERVICE CONDITIONS

- 2.1 Climatic Conditions

2.1.1 Ambient Temperature

Maximum .	50°C
Maximum mean over any 24 hours.	45°C
Mean in any year.	30°C
Minimum .	-10°C

2.1.2 Relative humidity may range upto 100%. The maximum value of the ambient temperature and humidity however do not occur simultaneously. During the monsoons high humidity may persist for many days at a time.

2.2 Supply System

2.2.1. The termination kits shall be suitable for a three phase 11 kV distribution system of the following characteristics:-

Nominal system voltage.	11 kV
System highest voltage	12 kV
Frequency.	50 Hz
Maximum short circuit rating.	25 KA

2.3 Indoor terminations shall be made in padmounted steel enclosures and switchgear panels where dust and severe condensation is liable to occur.

3. CONSTRUCTIONAL REQUIREMENTS

3.1 General

3.1.1 All components of the termination shall be suitable for cable specified in WAPDA Specifications P-29:81 "11 kV Power Cables". The terminations shall have sufficient flexibility so as to accommodate cables of sizes as indicated in Table-I.

3.1.2 The manufacturers should use suitable adhesives at the inner surface of the components to effect sealing on joints where required.

3.2 Protective Covering

A protective covering of suitable materials having anti-track and erosion-resistant properties for use as an external covering of insulated cores for indoor and outdoor use shall be provided. Where required, sealants may be used to effect seals on joints.

3.3 Stress Relief Cone or Tube.

A tube or pre-moulded cone of suitable material having properties to provide electrical stress control over

insulated cores of the terminations for indoor and outdoor use shall be provided.

3.4 Boot or Terminator Cap

A suitable tubing for enclosing and sealing prepared lug for indoor and outdoor terminations shall be provided. The tube shall anti-track and erosion resistant properties.

3.5 Trifurcated Tube

The trifurcated tube of suitable material for sealing a prepared crotch (for three core cables) for indoor and outdoor terminations shall be provided. It shall have excellent Water Proof and erosion resistant properties.

3.6 Rain Sheds

Rain sheds of suitable material shall be provided for application over prepared outdoor terminations. The material shall have excellent anti-tracking and erosion resistant properties.

The internal surface of the tubular part shall be coated with suitable adhesive compound or provided with adhesive tape for proper fixing of the shed.

3.7 Sleeves, Connectors and Lugs

3.7.1 Indoor termination shall be provided with Lugs as per Table-II "Lug Dimensions" and Table-III "Quantities of Cable Lugs Connectors and Sleeves" for cable sizes mentioned therein.

3.7.2 Outdoor termination shall be provided with Sleeves and Connectors as per Table-III "Quantities of Cable Lugs, Connectors and Sleeves" and attached Drawings No. PDW/DF-424, 425 and 426.

3.7.3 All bolts, Nuts and Spring Washers used in connectors shall be of steel and electrolytically galvanised. The thickness of coating shall be such as to withstand two one minutes dips in a copper sulphate solution.

3.8 Earthing

A suitable copper flexible earthing strap of one meter in length shall be provided for soldering with the metallic shield of the cable. Alternate earthing devices can also be offered for which technical details will be provided:

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4 RATINGS AND CHARACTERISTICS

4.1 The terminations shall have the following minimum ratings and characteristics when tested in accordance with IEEE 48:1975 and for other conditions relating to Thermal emergency and short circuit ratings of the cable as specified in P-29:81,

a)	Creepage distances for indoor terminations min.	250 mm
b)	Creepage distance for outdoor terminations min.	350 mm
c)	Basic insulation level-impulse voltage withstand 1.2/50 micro-second wave.	110 kV
d)	DC Test 15 min dry withstand.	75 kV
e)	1 min Dry withstand.	50 kV
f)	6 Hours Dry withstand.	35 kV
g)	10 Sec. Wet withstand.	45 kV
h)	Radio Influence Voltage dry.	50 μ V
i)	Partial discharge (Crona) Extinction voltage.	13 kV
j)	Minimum Detector Sensitivity(PC).	3.0

4.2 It is preferred that the indoor terminations and the outdoor terminations should be identical except that outdoor termination shall have longer creepage distance and sealing against rain and moisture penetration under the outdoor service condition specified in Clause 2.

5 TEST SAMPLES, ACCEPTANCE AND REJECTION.

5.1 The manufacturer shall provide all necessary facilities including testing equipment for carrying out tests free of cost to WAPDA. The cost of termination kits destroyed during testing shall be borne by the manufacturer.

5.2 Type tests shall be carried out once only for the entire order. Two termination kits of each type and size shall be selected at random from the consignment. The termination kits thus selected shall be assembled completely on a power cable of a suitable size, and shall be subjected to type tests as specified in Clause 6.3. If any specimen fails in any of the above referred tests, the entire lot shall be rejected.

5.3 For routine tests specified in Clause 6.4, each consignment shall be grouped into lots containing total offered termination kits of a identical type and size.

5%

5.4 A sample of five percent of the termination kits subject to minimum of five shall be drawn at random from each lot and subjected to tests as specified in Clause 6.4.

5.5 For quantity check, if one or more than one item is found short from the kit, the entire lot shall be subjected to this test. Kits found short of items shall be rejected. For the other tests listed in Clause 6.4, if one specimen fails to meet the requirements of any individual test, a second sample of the same number of termination kits shall be selected at random from the lot. Failure of any specimen from the second sample mean rejection of the entire lot.

6 TESTS

6.1 The following type, routine and material tests shall be carried out in accordance with the standards mentioned against each.

6.2 Certified type test report of cyclic ageing test and material tests on the identical units may be accepted in lieu of the actual tests. The type test reports shall incorporate sufficient information to identify the materials and its components of which the termination kit is constituted and which form its integral part.

6.3 Type Tests

I. Dielectric Tests

- ✓ a. Power frequency voltage one min. dry withstand test in accordance with Clause 7.4.1.1 of IEEE Std. 48:1975.
- ✓ b. Power frequency voltage 10 Sec. Wet Test in accordance with Clause 7.4.1.2 of IEEE Std. 48:1975.
- ✓ c. Power frequency voltage 6 hour dry withstand Test in accordance with Clause 7.4.1.3 of IEEE Std. 48:1975.
- ✓ d. Power frequency partial discharge Test in accordance with Clause 7.4.1.5 of IEEE Std. 48:1975.
- ✓ e. Lightning impulse voltage withstand Test in accordance with Clause 7.4.1.6 of IEEE Std. 48:1975.
- ✓ f. Switching impulse voltage Wet withstand Test as per Clause 7.4.1.7 of IEEE Std. 48:1975.
- ✓ g. Direct voltage 15 min. Dry withstand Test as per Clause 7.4.1.8 of IEEE Std. 48:1975.
- ✓ h. Radio influence voltage Test in accordance with Clause 7.4.1.4 of IEEE Std. 48:1975.

2. Cyclic Ageing Test in accordance with Clause 7.4- and AEIC CS5-1979.
3. Thermal short circuit test in accordance with Clause 7.5 and VDF-273.
4. Humidity test in accordance with Clause 7.6 and IEC 466.
5. Track resistance test in accordance with Clause 7.7 and IEC 507.
6. Salt Fog test in accordance with Clause 7.8.

6.4 Routine Tests

1. Visual Inspection
2. Measurement of Dimensions
3. Quantity Check

6.5 Material Tests

Material tests on components and sealants may be carried out to ensure quality as agreed upon by the manufacturer and the WAPDA. The manufacturer alongwith their bids shall supply details of all such tests giving test methods, results and name of standard to which these tests were carried out.

7 TEST METHODS

7.1 Visual Examination

Each termination kit offered for acceptance shall be visually inspected for the defects given below:

<u>Examination</u>	<u>Defects</u>
1. Material	i) Not of specified type or style ii) Components not made of specified material iii) Any components missing or damaged
2. Finish	i) Pinholes, cracks or inclusions of foreign materials ii) Tubings not of even and uniform shape iii) Sealant coating if not even and continuous iv) Connector not of smooth uniform finish or with flaws such as bubbles, surface cracks or other inclusions

- v) Clamping bolts, nuts and spring washers not properly galvanised.
- 3. Construction Design not in accordance with the drawings.
- 4. Marking Missing, not legible, incomplete or not permanent.
- 5. Punching Code and Trade Mark not punched.
- 6. Packing Not in accordance with approved methods.

7.2 Verification of Dimensions

The dimensions shall be checked as per approved drawings.

7.3 Quantity Check

Quantity shall be checked with the approved list of components.

7.4 Cyclic Ageing Test

The test shall be performed in accordance with the following procedure:-

- i) Supply to cable terminations a continuous 50 Hz voltage of 13 kV for 21 days, then increase the voltage to 20 kV for an additional 21 days.
- ii) Apply a load current to the conductor for approximately eight continuous hours each working day.
- iii) During the period of first 21 days the load current shall produce a nominal conductor temperature of 90°C for a period of not less than six hours each working day.
- iv) During the period of last 21 days when the applied voltage is 20 KV, the load current shall produce a conductor temperature of 130°C for a period of not less than six hours per working day.
- v) At the end of each 7 days test period, measure the partial discharge in picocoulombs at room temperature of 20°C to 30°C at voltage of 13 KV. The value of partial discharge at room temperature shall not exceed 3 picocoulombs

7.5 Thermal Short Circuit Test

A 50 Hz alternating current given in Table below shall be passed through the termination for two seconds.

The termination shall not have any sign of damage.

TABLE - SHORT CIRCUIT CURRENT

Insulation	Cable Size	Current	Time
XLPE	4/0 AWG	7×10^3	2 Second
XLPE	500 MCM	1.3×10^4	2 Second
XLPE	1000 MCM	3.25×10^4	2 Second

7.6 Humidity Test

A 50 Hz alternating voltage of 10.1 kV shall be applied for 100 hours between the terminal and the ground wire in a humid test chamber. Water having a conductivity of 800 $\mu\text{s}/\text{cm}$ shall be sprayed at a rate of 0.4 m^3/hr .

There shall be no break-down, flashover, visible tracking and erosion.

7.7 Tracking Resistance Test

The termination shall be perpendicularly suspended in a test chamber. A voltage of 11.3 kV shall be applied between the terminal and the ground wire. A test solution specified below shall be sprayed for 10 seconds and stopped for 20 seconds. The same process shall be repeated 101 times. A leakage current through the surface of the termination shall not exceed 500 mA during the 101 repetitions.

The termination shall not burn during the test.

Test Solution:

- Conductivity of the test solution : 3000 $\mu\text{s}/\text{cm}$
- Rate of horizontal precipitation : 0.5 mm/min
- Spraying speed : 5 m/s
- Distance between termination and nozzle : 500 mm

7.8 Salt Fog Test

The termination shall be subjected to the specified salinity rate at the test voltage of 10.1 kV for 20 min or until the termination does not flashover, the voltage is raised in steps of 10% of the specified voltage every 5 min until flashover.

-: 9 :-

After flashover, the voltage is reapplied and raised as quickly as possible to 90% of the flashover voltage, and thereafter increased in steps of 5% of the initial voltage every 5 min until flashover. The test process is repeated two further times, that is the voltage is raised rapidly to 90% of the initial flashover voltage then in steps of 5% until flashover.

After the flashover, the fog is cleared, the termination washed down with tap water and subjected to the test voltage of 10.1 kV for 1 hour.

There shall not be any visible tracking or damaged in the termination.

Saline:

Salt	1	224 Kg/m ³
Conductivity	1	20600 Us/cm
Density	1	1140 Kg/m ³
Rate of Spray	1	0.5 cm ³ /min
Angle of Spray	1	45°

8 **TOOL KIT**

Test kit shall consist of the following components:

1. Hydraulic compressor 20 Ton capacity with dies suitable for sleeves/lugs sizes as specified in attached tables.
2. Heating torch, (in case of heat shrinkable terminations) propane torch for shrinking high voltage non-tracking materials. It should allow rapid installation of heat shrinkable material with maximum burning efficiency. The handle should be designed to permit easy access to workpiece from all angles. It should be provided with a gas regulator.
3. Blow Lamp.
4. Hacksaw with extra 5 blades.
5. Cable knife with extra 5 blades.
6. File.
7. Plier.
8. Steel measuring tape 2M (length)
9. Soldering iron.

9 **TECHNICAL DATA AND DRAWINGS**

9.1 The contractor shall furnish drawings, descriptive data

and other information listed below with the bid and failure to supply the same may subject the bid to disqualification. The drawings and details of components shall be got approved from WAPDA prior to manufacture.

- i) Ratings and characteristics of the termination kits.
- ii) Catalogue/literature of Indoor/Outdoor terminations. Design and development data on which life of the components used in the termination is based.
- iii) List of components stating quantity and material per termination.
- iv) Drawings details and quantity of components of indoor/outdoor terminations.
- v) Overall assembly drawings of indoor/outdoor termination kits showing its dimensions.
- vi) Detailed instruction of making joints/terminations.
- vii) Since how long the firm is in the business of manufacturing terminations.
- viii) Since how long the specific type offered is being manufactured.
- ix) Consumers to whom indoor/outdoor type kits have been supplied indicating quantity and period against each.

9.2 The manufacturer shall supply the type test reports required in Clause 6.3 and may also furnish the test reports or the minimum test values and the standards to which under mentioned material tests have been performed to check suitability of the offer.

9.2.1 Material Tests

- i) Brittleness temperature
- ii) Flame retardency
- iii) Flamibility
- iv) Heat resistant
- v) Low temperature properties
- vi) Heat shock
- vii) Restricted shrinkage
- viii) Stress modulus
- ix) Tensile strength and ultimate elongation
- x) Thermal endurance test/Thermal ageing

- xi) Stability to weather conditions.
- xii) Ageing of electrical properties.
- xiii) Fungus resistance.
- xiv) Water absorption.
- xv) Water vapour permeability.
- xvi) Tracking resistance.

9.2.2 Tests for Sealants

- i) Corrosion resistance
- ii) Flow at elevated temperature
- iii) Internal pressure sealing ability.
- iv) Low temperature flexibility
- v) Peel strength
- vi) Solvent resistance

9.2.3 Other information and field trial reports in support of life expectancy of their products as detailed in Clause 1.3.

10 PACKING

10.1 Each termination kit shall be packed in a suitable cardboard carton, and marked as follows:-

- i) Type of termination kit
- ii) Size of cable.
- iii) Voltage rating
- iv) Designation.
- v) Year of manufacture ✓
- vi) Serial No. ✓
- vii) Net weight ✓
- viii) Gross weight. ✓
- ix) Manufacturer's name.

10.2 A suitable number of kits shall then be packed in wooden boxes, such that it can withstand rigours of transportation by sea, rail and road.

10.3 Each kit shall be supplied with detailed installation instructions regarding marking of terminations. All important precautions to be observed during installation of the termination kit such as handling of cleaning fluid shall be printed in bold letters.

Encls: Table-I, II & III

Dwg. No. PDW/DF-424
PDW/DF-425
PDW/DF-426

YK

TABLE-I CABLE DIMENSIONS

Sr. No.	Description	2 AWG		4/0 AWG		500 MCM		1000 MCM	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1.	Dia over insulation	15.73	20.00	21.72	26.00	28.96	33.24	37.57	41.85
2.	Dia over metallic shielding tape	17.24	22.58	23.23	28.51	30.47	35.75	39.08	44.36
3.	Dia over PVC sheath (for single core cable)	20.49	24.82	26.48	30.75	33.72	37.99	43.55	47.43
4.	Dia of overall PVC sheath (for 3 Core Cable)	49.86	64.24	62.74	76.98	79.53	94.23	-	-

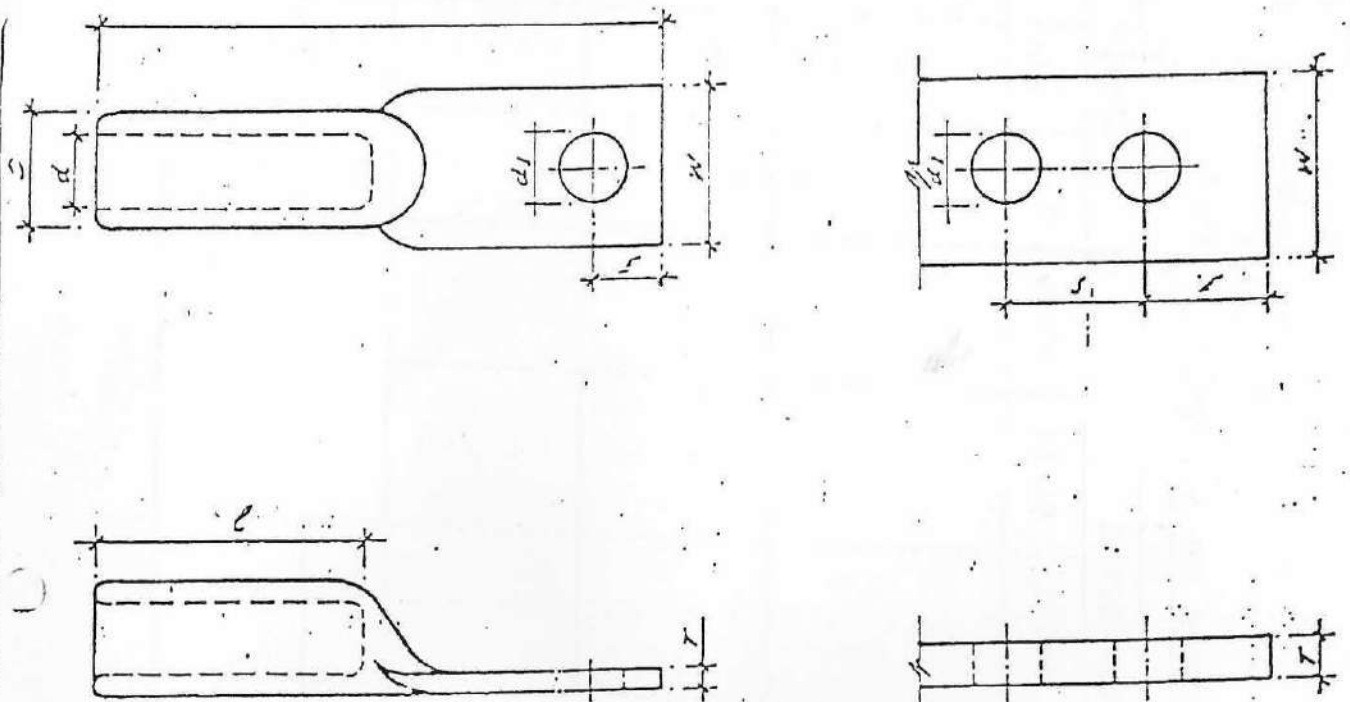


TABLE NO. II

MAIN CABLE/ CONDUCTOR SIZE	DESIGNATION	DIMENSIONS IN MILLIMETRES								
		L	P	D	d	W	d ₁	E	S	T
2 AWG	L-2	80	42	13.5	7.8	23	14	15	-	5
4/0 AWG	L-4/0	105	55	21.5	14.0	30	14	15	-	8
500 MCM	L-500	150	90	33.4	21.7	45	14	15	-	12
1000 MCM	L-1000	220	100	46	30.3	64	14	15	46	18

120

240

TOLERANCE ON DIAMETERS ± 0.25
 " " LENGTH ± 2

FIG. NO. I ALUMINIUM LUGS FOR
CABLE TERMINATIONS
 SKETCH NO. PD-285

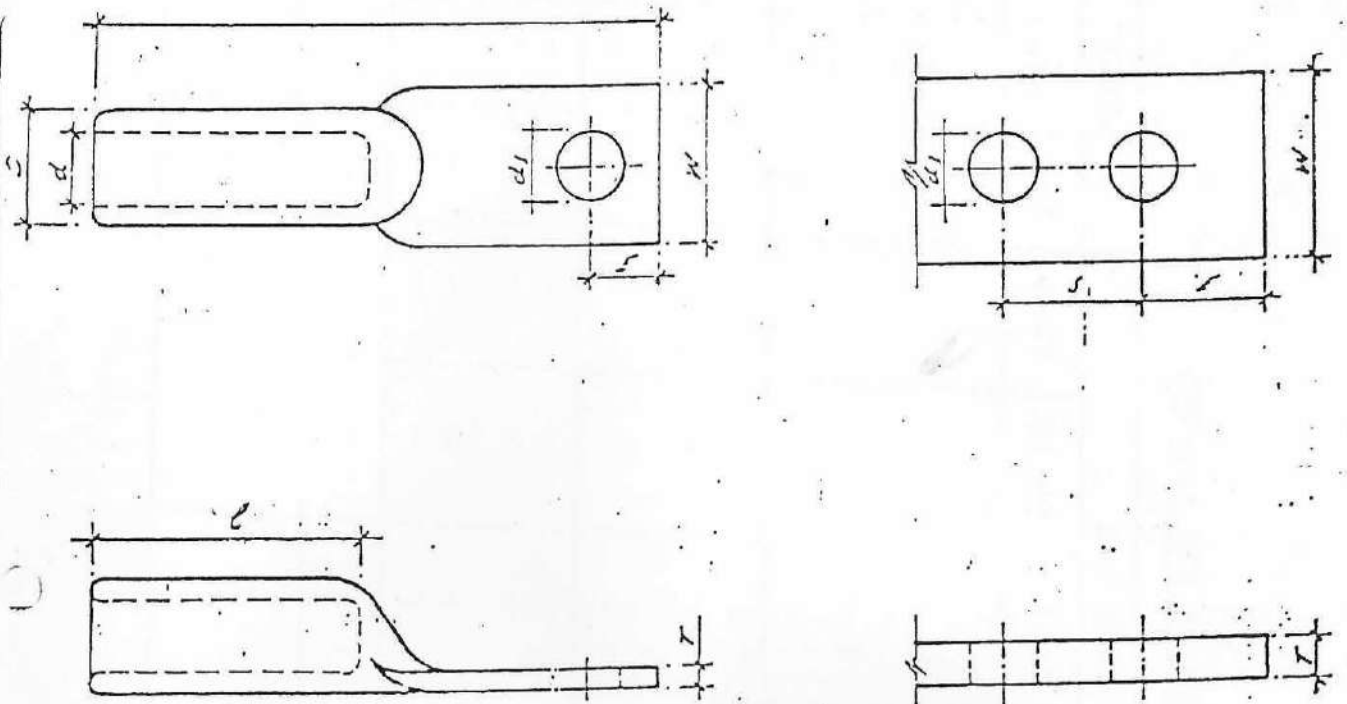


TABLE NO. II

MAIN CABLE/ CONDUCTOR SIZE	DESIGNATION	DIMENSIONS IN MILLIMETRES									
		L	ℓ	D	d	W	d ₁	E	S	T	
120 2 AWG	L-2	80	42	13.5	7.8	23	14	15	-	5	
240 4/0 AWG	L-4/0	105	55	21.5	14.0	30	14	15	-	8	
500 MCM	L-500	150	90	33.4	21.7	45	14	15	-	12	
1000 MCM	L-1000	220	100	46	30.3	61	14	15	46	18	

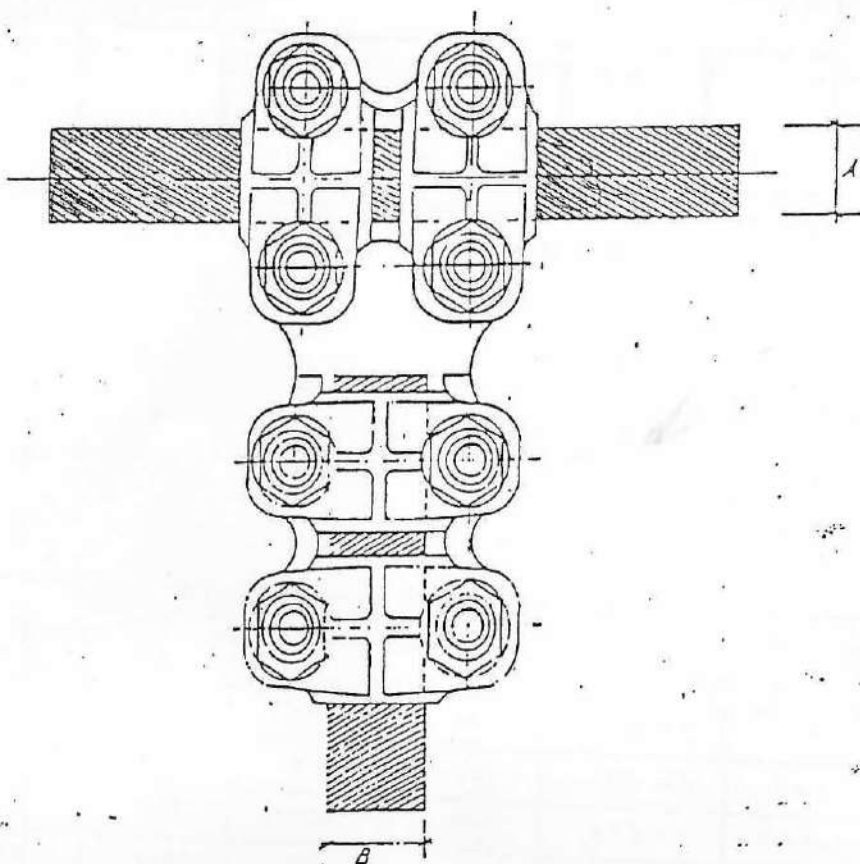
TOLERANCE ON DIAMETERS ± 0.25
 " " LENGTH ± 2

FIG. NO. 1 ALUMINIUM LUGS FOR
CABLE TERMINATIONS
 SKETCH NO. PD-285

TABLE-III

QUANTITIES OF CABLE LUGS, CONNECTORS AND SLEEVES

SIZE OF TERMINATION	TYPE OF TERMINATION	LUGS				TEE CONNECTOR				SLEEVE				
		L-2	L-4/0	L-500	L-1000	TM63R	TM63L	DL-15	RD-8	S-2	S-4/0	S-500	S-10	
		2 AWG												
4/0 AWG	Indoor 3/C Outdoor 3/C	3	-	-	-	-	-	-	-	-	-	-	-	-
	Indoor S/C Outdoor S/C	1	-	-	-	-	-	-	1	-	-	-	-	-
500 MCM	Indoor 3/C Outdoor 3/C	-	3	-	-	-	-	-	3	-	-	-	-	-
	Indoor S/C Outdoor S/C	-	1	-	-	-	-	-	1	-	-	-	-	-
1000 MCM	Indoor 3/C Outdoor 3/C	-	-	3	-	-	-	-	3	-	-	-	-	3
	Indoor S/C Outdoor S/C	-	-	-	1	-	-	-	1	-	-	-	-	1
1000 MCM	Indoor 5/C Outdoor 3/C	-	-	-	3	-	-	-	3	-	-	-	-	-
	Indoor S/C Outdoor S/C	-	-	-	1	-	-	-	1	-	-	-	-	-

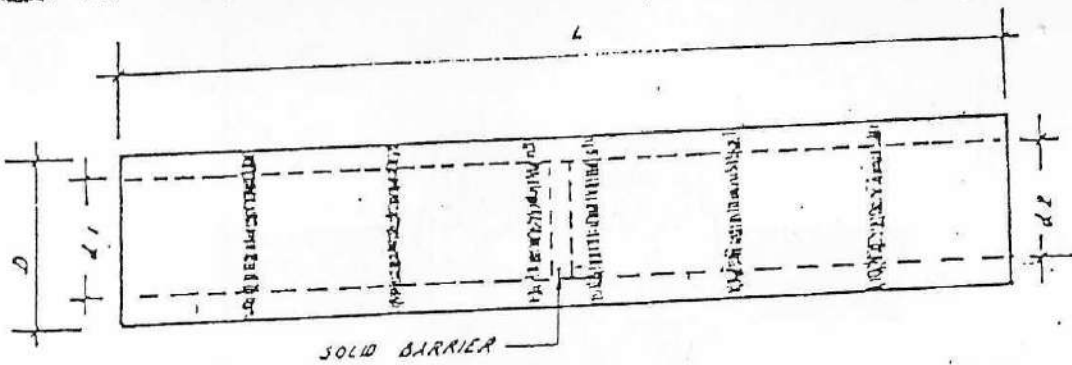


TYPE & DESIGNATION	A	B
RD - 8	13 - 15	8
DL - 15	15 - 19	15

NOTE.

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. BODY MANUFACTURED IN AL-ALLOY.
3. THIS DRAWING IS FOR GUIDANCE ONLY.






PAKISTAN WATER AND POWER DEVELOPMENT AUTHORITY		DESIGN DEPARTMENT PORT 116
DRAWN	NOOR-UL-HADOOD	TEE CONNECTOR FOR CABLE TERMINATION
CHECKED	A. LATIF	
JUNIOR ENGINEER	N. A. OURESHI	
SENIOR ENGINEER	SARDAR NISSAIN	
DIRECTOR	R. A. BAIG	
SCALE: N.T.S.		DATE: 26-1-1986
NO. DATE REVISION BY		DRWG. NO: PDW/DF 424



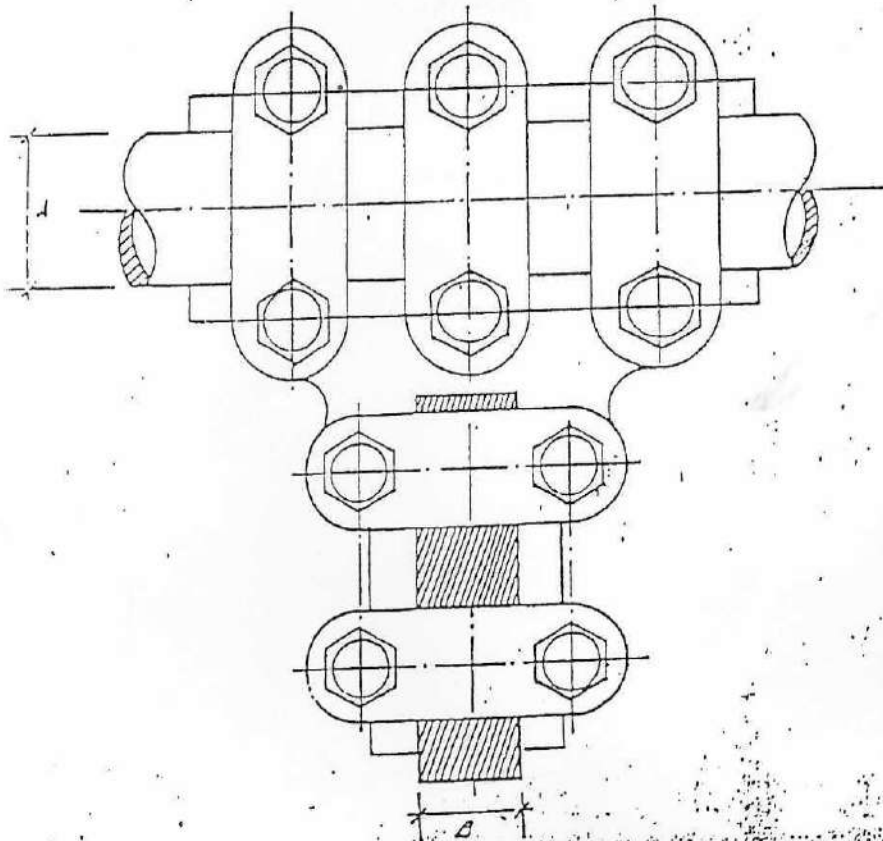
CABLE SIZE DESIGNATION		DIMENSIONS IN MILLIMETRES			
		L	d1	d2	d2
2 AWG	S-2	75	13.5	7.0	8
4/0 AWG	S-4/0	95	21.5	14.0	15
500 MCM	S-500	140	33.4	21.7	21
1000 MCM	S-1000	180	45	30.3	31

TOLERANCE ON DIAMETERS ± 0.25
 " " LENGTH ± 2

d1 = DIA OF CABLE CONDUCTOR
 d2 = DIA OF CONDUCTOR

PAKISTAN WATER AND POWER DEVELOPMENT AUTHORITY			DESIGN DEPARTMENT POWER (T & G)
DRAWN	SUNAIL ANJUMAR		COMPRESSION SLEEVE FOR CABLE TERMINATION
CHECKED	A. LATIF		
JUNIOR ENGINEER	N.A. QURESHI		
SENIOR ENGINEER	SARDAR HUSSAIN		
DIRECTOR	R.A. BAIG		
		SCALE:- N.T.S	DATE:- 26.1.1965
		DWG: NO:- PDW/DF. 425	

NO.	DATE	REVISION	BY



TYPE & DESIGNATION	A	B
TM 63 L	63	20
TM 63 R	63	30

NOTE.

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. BODY MANUFACTURED IN AL-ALLOY.
3. THIS DRAWING IS FOR GUIDANCE ONLY.

PAKISTAN WATER AND POWER DEVELOPMENT AUTHORITY		DESIGN DEPARTMENT POWER (T&G)
DRAWN	MOON-UL-HADOOD	<p>TEE CONNECTOR: FOR ALUMINIUM PIPE</p> <p>SCALE:- N.T.S DATE:-26-1-88</p> <p>DWG. NO. PDW/DF.4.26</p>
CHECKED	A. LATIF	
JUNIOR ENGINEER	N.A. QURESHI	
SENIOR ENGINEER	SARDAR HUSSAIN	
DIRECTOR	R. A. BAIG	

6. Mention contents and quantity of each item of Outdoor Termination kit of each quoted type.
If necessary use separate page.

7. Mention manufacturer part no. material and other detail of each quoted item.

i). Protective Covering

ii). Stress relief cone or tube

iii). Boot or termination cap

iv). Trifurcated tube

v). Rain sheds

vi). Lug

a). Manufacturer name:

b). Part No:

c). Material:

d). Finish:

vii). Tee-Connector

a). Manufacturer name:

b). Part No:

c). Material:

d). Finish:

viii). Dead end bolt.
(of suitable size)

a). Manufacturer name:

b). Part No:

c). Material:

d). Finish:

8. Supply system:

i). Nominal system voltage

Don

2

0

Schedule of Technical Data

15 kV Termination Kits (P-184)

1.
 - i). Name of Bidder: _____
 - ii). Address: _____
 - iii). Telephone No: _____
 - iv). Telex No: _____
 - v). Fax No: _____

2.
 - i). Name of Manufacturer: _____
 - ii). Address: _____
 - iii). City and Country of works, from where material shall be supplied
 - a). City: _____
 - b). Country: _____
 - iv). Telephone No. with area code: _____
 - v). Telex No: _____
 - vi). Fax No: _____

3. Mention type of Termination Kit i.e., ~~pre-mould, cold~~ or heat shrinkable or slip on type

4.
 - i). Sizes of each part of Indoor Termination Kits quoted for: (These sizes must be earmarked on the printed literature) supplied with the bid. _____

 - ii). Sizes of each part of Outdoor Termination Kits quoted for: (These sizes must be earmarked on the printed literature) supplied with the bid. _____

5. Mention contents and quantity of each item of Indoor Termination kit of each quoted type. If necessary use separate page. _____

x). Whether Tee-connector for Aluminum conductor is as per DWG No. *PDW/DF-426* Yes/No

xi. Whether all nuts, bolts and spring washers used in connectors shall be of steel and electrolytically galvanized. Yes/No

xii) Thickness of coating _____

xiii). Material and length of earthing Copper strape. _____

a). for 1-Core _____

b). for 3-Core _____

10. Rating and Characteristics

a). Creepage distances for indoor termination. _____

b). Creepage distances for outdoor termination. _____

c). Basic insulation level - impulse voltage withstand 1.2/50 micro second wave. _____

d). DC test 15 min. dry withstand. _____

e). One minute dry withstand _____

f). Six hours dry withstand _____

g). 10 second wet withstand _____

h). Radio influence voltage _____

i). Partial discharge (crons) Extinction voltage _____

j). Min. Detector sensitivity (-3PC) _____

k). Cyclic Ageing Test _____

l). Thermal short circuit test _____

m). Humidity test _____

n). Track resistance test (ASTM D2303) _____

o). Salt fog test _____

- ii). System highest voltage
- iii). Frequency
- iv). Max. short circuit rating

9. Constructional Requirements

- i). Whether the terminations have sufficient flexibility to accommodate cables as indicated in table -I of P-184:86 Yes/No
- ii). Whether suitable adhesive at the inner surface of the components to effect sealing of terminations are used. Yes/No
- iii). Whether a protective covering of suitable materials having anti-track and erosion - resistant properties for use as an external covering has been provided Yes/No
- iv). Whether sealants are used to effect seals on terminations. Yes/No
- v). Whether a stress control tube of suitable material having properties to provide electrical stress control over insulated cores of the terminations for indoor and outdoor use. has been provided Yes/No
- vi). Whether a suitable tubing for enclosing or sealing prepared lugs for indoor and outdoor termination has been provided. Yes/No
- vii). Properties of tube. Yes/No
- viii). Whether the trifurcated tube of suitable material for sealing a prepared crotch (for three core cables) for indoor and outdoor terminations has been provided. Yes/No
- ix). Whether internal surface of the tubular part has been coated with suitable adhesive compound or provided with adhesive tape for proper fixing of the shed. Yes/No

The following information shall be supplied with each bid and failure to supply the same will subject the bid to dis-qualification.

- i). Detailed dimensional drawings of terminations kits.
- ii). Specification giving electrical/mechanical characteristics and material composition of all the items contained in each type of termination kit.
- iii). Detailed instructions of making each type of termination kits.
- iv). Two complete sample kits for each type of termination kit.

12. Name, & Signature & Seal of Manufacturer:

6. Mention manufacturer part no. material and other detail of each quoted item.

- i). Co-extruded Insulating/conductive tube _____
- ii). Insulating tube _____
- iii). Stress relief tube _____
- iv). Outer protective covering tube _____
- v). Armour Case (for armoured cable) _____
- vi). Ferrule
 - a). Manufacturer name: _____
 - b). Part No: _____
 - c). Material: _____
 - d). Finish: _____

7. Supply system:

- i). Nominal system voltage _____
- ii). System highest voltage _____
- iii). Frequency _____
- iv). Max. short circuit rating _____

8. Constructional Requirements

- i). Whether suitable adhesive at the inner surface of the components to effect sealing on joints are used. Yes/No
- ii). Whether a protective covering of suitable materials having adhesive coating inside of joint has been provided. Yes/No
- iii). Whether sealants are used to effect seals on joints. Yes/No
- iv). Whether a stress relief tube of suitable material having properties under various electrical stress control and temp cycle has been provided. Yes/No

Schedule of Technical Data

15 kV Splice Kits (P-104)

1.
 - i). Name of Bidder: _____
 - ii). Address: _____
 - iii). Telephone No: _____
 - iv). Telex No: _____
 - v). Fax No: _____

2.
 - i). Name of Manufacturer: _____
 - ii). Address: _____
 - iii). City and country of works, from where material shall be supplied
 - a). City: _____
 - b). Country: _____
 - iv). Telephone No. with area code: _____
 - v). Telex No: _____
 - vi). Fax No: _____

3. Mention type of Splice Kit i.e., premould, cold or heat shrinkable or slip-on type _____

4. Sizes of each part of Splice Kits Kit quoted for: _____
 - i). (These sizes must be earmarked on the printed literature) supplied with the bid _____

5. Mention contents and quantity of each item of splice kits of each quoted type. If necessary use separate page. _____

v). Whether a suitable discharge free, insulation tube to be used over the stress relief tube has been provided. Yes/No

vi). Properties of tube. Yes/No

a). Co-extruded Insulating/conductive tube

b). Insulating tube

c). Stress relief tube

d). Outer protective covering tube

vii). Whether a suitable co-extruded insulating/semi conductive tube to provide insulation and screening has been provided. Yes/No

viii). Whether ferrule is as per drawing No: POW/DF-40. Yes/No

ix). Thickness of coating

x). Material and length of earthing Copper strap/mesh.

9. Rating and Characteristics

a). Basic insulation level - impulse voltage withstand 1.2/50 micro second wave.

b). DC test 15 min. dry withstand.

c). One minute dry withstand

d). Six hours dry withstand

e). Radio influence voltage

f). Partial discharge (corna) Extinction voltage

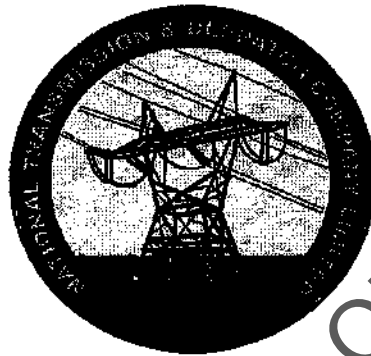
g). Min. Detector sensitivity (-3PC)

h). Cyclic Ageing Test

i). Thermal short circuit test

NATIONAL TRANSMISSION & DESPATCH COMPANY LIMITED

NTDC SPECIFICATION P-44:2018



11kV METAL CLAD SWITCHGEAR

SUBSTATION DESIGN NTDC

FOR ADB 300C ONLY

C O N T E N T S

CLAUSE	DESCRIPTION
0.0	FOREWORD
1.0	SCOPE
2.0	REFERENCE STANDARDS
3.0	DEFINITIONS
4.0	SERVICE CONDITIONS
5.0	CONSTRUCTIONAL REQUIREMENTS
6.0	COMPONENTS OF SWITCHGEAR PANELS
7.0	CIRCUIT BREAKER
8.0	LOAD BREAK SWITCH
9.0	EARTHING SWITCH
10.0	ENCLOSURE
11.0	BUS-BARS
12.0	RELAYS
13.0	CURRENT TRANSFORMERS
14.0	VOLTAGE TRANSFORMERS
15.0	CONTROL WIRING AND TERMINATION
16.0	INSTRUMENTS
17.0	ENERGY METERS
18.0	MINIATURE CIRCUIT BREAKERS
19.0	RATING PLATES
20.0	TESTS ON PANELS
21.0	SPARE PARTS
22.0	DRAWINGS AND DESCRIPTIVE DATA
23.0	PACKING AND TRANSPORTATION
24.0	ATTACHMENTS a.Schedule of Technical Data b.Drawings

PRINTING HISTORY

- First edition in August, 1968
- Second edition in December, 1979
- Third edition in 1985
- Fourth edition in 1987
- Fifth edition in April, 1996
- Sixth edition in Mar, 2018

NTDC SPECIFICATION P-44:2018
11kV METAL-CLAD SWITCHGEAR

0.0 FOREWORD

- 0.1 This specification has been prepared by Substation Design Department NTDC. This sixth edition cancels and replaces all the five editions published in 1968, 1979, 1985, 1987, 1996 and its amendments. This specification also supersedes P-115:77(11kV CT specification) & the technical requirement for capacitor control panel as given in specification P-165:89 & its amendments (if any).
- 0.2 This specification is intended for the procurement of material and does not include all the necessary provisions of a contract.
- 0.3 This specification is subject to revision as and when required by Substation Design Department NTDC. No other department is authorized to issue any change/amendment in it.

1.0 SCOPE

- 1.1 This specification is applicable for 11kV Metal-Clad Switchgear for indoor installation to be mounted on floor and opening in the bus-bar section so that bus bar compartment lies along all the units of a group of switchgear with bottom entry of power cables.

2.0 REFERENCE STANDARDS

- 2.1 The metal-clad switchgear and all auxiliary equipment which form an integral part of the switchgear shall be designed, manufactured and tested in accordance with the following International Electro-Technical Commission (IEC) Publications as amended to date:

IEC Publication 62271-1	Common specification
IEC Publication 62271-100	High voltage alternating current circuit breakers
IEC Publication 62271-102	High voltage AC disconnectors with earthing switches
IEC Publication 62271-103	High voltage switches for rated voltages above 1 kV and less than 52 kV
IEC Publication 62271-200	AC metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV
IEC Publication 60255	Measuring relays and protection equipment
IEC Publication 61869-2	Current transformers
IEC Publication 61869-3	Voltage transformers
IEC Publication 60051	Direct acting indicating analogue electrical measuring instruments and their accessories
IEC Publication 60468	Method of measurement of resistivity of metallic materials
IEC Publication 60529	Degree of protection (IP Code)
NTDC Specification P-151:2008	Requirements for protection relays

2.2 In case the requirements laid down herein differ from those given in the above IEC Publications in any particular, the switchgear shall comply with the requirements indicated herein in regard to that item.

3.0 **DEFINITIONS**

For this purpose, the definitions of relevant IEC Standards shall apply. Some of them are recalled here for ease of reference.

3.1 **Switchgear and Control-gear**

General term covering switching devices and their combination with associated control, measuring, protective and regulating equipment.

3.2 **Enclosure**

Part of switchgear and controlgear providing a specified degree of protection of equipment against external influences and specified degree of protection against approach to or contact with live parts and contact with moving parts.

3.3 **Compartment**

Part of switchgear and controlgear enclosed except for openings necessary for interconnection, control or ventilation.

3.4 **Partition**

Part of switchgear and controlgear separating one compartment from other compartments.

3.5 **Shutter**

Part of switchgear and controlgear that can be moved from a position where it permits contacts of a removable part or moving contact of a disconnector, to engage fixed contacts, to a position where it becomes a part of the enclosure or partition shielding the fixed contacts.

3.6 **Main Circuit**

All the conductive parts of metal-enclosed switchgear and controlgear included in a circuit which is intended to transmit electrical energy.

3.7 **Auxiliary Circuit**

All the conductive parts of metal-enclosed switchgear and controlgear included in a circuit (other than the main circuit) intended to control, measure, signal and regulate.

3.8 **Circuit-Breaker Class E2**

Circuit-breaker designed so as not to require maintenance of the interrupting parts of the main circuit during its expected operating life, and only minimal maintenance of its other parts (circuit-breaker with extended electrical endurance).

3.9 Circuit-Breaker Class C2

Circuit-breaker with very low probability of restrike during capacitive current breaking as demonstrated by specific type tests.

3.10 Circuit-Breaker Class M2

Frequently operated circuit-breaker for special service requirements and designed so as to require only limited maintenance as demonstrated by specific type tests (circuit-breaker with extended mechanical endurance, mechanically type tested for 10,000 operations).

3.11 Circuit-Breaker Class S1

Circuit breaker intended to be used in a cable system.

3.12 No-Load Line-Charging Breaking Capacity

Breaking capacity for which the specified conditions of use and behavior include the opening of an overhead line operating at no-load.

3.13 No-Load Cable-Charging Breaking Capacity

Breaking capacity for which the specified conditions of use and behavior include the opening of an insulated cable operating at no-load.

3.14 Capacitor Bank Breaking Capacity

Breaking capacity for which the specified conditions of use and behavior include the opening of a capacitor bank.

3.15 Capacitor Bank Inrush Making Capacity

Making capacity for which the specified conditions of use and behavior include the closing onto a capacitor bank.

3.16 Out-of-Phase (making or breaking) Capacity

Making or breaking capacity for which the specified conditions of use and behavior include the loss or the lack of synchronism between the parts of an electrical system on either side of the circuit-breaker.

3.17 Opening Time

- a) For a circuit-breaker tripped by any form of auxiliary power, the opening time is the interval of time between the instant of energizing the opening release, the circuit-breaker being in the closed position, and the instant when the arcing contacts have separated in all poles;
- b) For a self-tripping circuit-breaker, the opening time is the interval of time between the instant at which, the circuit-breaker being in the closed position, the current in the main

circuit reaches the operating value of the over-current release and the instant when the arcing contacts have separated in all poles.

3.18 **Arcing Time (multi pole switching device)**

Interval of time between the instant of the first initiation of an arc and the instant of final arc extinction in all poles.

3.19 **Break Time**

Interval of time between the beginning of the opening time of a mechanical switching device and the end of the arcing time.

3.20 **Closing Time**

Interval of time between energizing the closing circuit, the circuit-breaker being in the open position, and the instant when the contacts touch in all poles.

3.21 **Make Time**

Interval of time between energizing the closing circuit, the circuit-breaker being in the open position, and the instant when the current begins to flow in the first pole.

3.22 **Pre-Arcing Time**

Interval of time between the initiation of current flow in the first pole during a closing operation and the instant when the contacts touch in all poles for three-phase conditions and the instant when the contacts touch in the arcing pole for single-phase conditions.

3.23 **Open-Close Time (during auto-reclosing)**

Interval of time between the instant when the arcing contacts have separated in all poles and the instant when the contacts touch in the first pole during a reclosing cycle.

3.24 **Dead Time (during auto-reclosing)**

Interval of time between final arc extinction in all poles in the opening operation and the first re-establishment of current in any pole in the subsequent closing operation.

3.25 **Re-closing Time**

Interval of time between the beginning of the opening time and the instant when the contacts touch in all poles during a reclosing cycle.

3.26 **Re-Make Time (during reclosing)**

Interval of time between the beginning of the opening time and the first re-establishment of current in any pole in the subsequent closing operation.

3.27 Close-Open Time

Interval of time between the instant when the contacts touch in the first pole during a closing operation and the instant when the arcing contacts have separated in all poles during the subsequent opening operation.

3.28 Make-Break Time

Interval of time between the initiation of current flow in the first pole during a closing operation and the end of the arcing time during the subsequent opening operation.

3.29 First-Pole-to-Clear Factor (in a three-phase system)

When interrupting any symmetrical three-phase current the first-pole-to-clear factor is the ratio of the power frequency voltage across the interrupting pole before current interruption in the other poles, to the power frequency voltage occurring across the pole or the poles after interruption in all three poles.

3.30 Out-of-Phase Conditions

Abnormal circuit conditions of loss or lack of synchronism between the parts of an electrical system on either side of a circuit-breaker in which, at the instant of operation of the circuit breaker, the phase angle between rotating vectors, representing the generated voltages on either side, exceeds the normal value and may be as much as 180° (phase opposition).

3.31 Normal Current

Current which the main circuit of a circuit-breaker is capable of carrying continuously under specified conditions of use and behavior.

3.32 Rated Short-time Withstand Current (I_k)

The r.m.s value of the current which the switchgear and controlgear can carry in the closed position during a specified short time under prescribed conditions of use and behavior. ($I_k = I_{sc}$)

3.33 Rated Duration of Short Circuit

The interval of time for which switchgear and controlgear can carry, in the closed position, a current equal to its rated short-time withstand current.

3.34 Rated Peak Withstand Current (I_p)

The peak current associated with the first major loop of the rated short-time withstand current which switchgear and controlgear can carry in the closed position under prescribed conditions of use and behavior.

3.35 Rated Short-Circuit Breaking Current (I_{sc})

The rated short circuit breaking current is the highest circuit current which the circuit breaker shall be capable of breaking under prescribed conditions of use and behavior.

3.36 **Rated Cable Charging Breaking Current**

The rated cable charging breaking current is the maximum cable charging current which the circuit breaker shall be capable of breaking at its rated voltage under prescribed conditions of use and behavior.

4.0 **SERVICE CONDITIONS**

4.1 **Atmospheric Conditions**

It may be assumed that the air is not normally heavily polluted by dust, smoke, aggressive gases, vapors or salt spray. However, at certain times of the year, severe dust storms may be experienced and certain areas are subjected to heavily polluted atmosphere. For this purpose, special lacquer coating on bus bar support insulators shall be applied to protect against the effects of humidity and other pollutions.

4.2 **Ambient Temperature**

Maximum	+ 50 °C
Maximum mean over any 24 hours	+ 45 °C
Mean in any year	+ 30 °C
Minimum	- 10 °C

4.3 **Relative Humidity**

The relative humidity may range up to 100 %. The maximum values of the ambient temperature and humidity, however, do not occur simultaneously. During the monsoons, high humidity may persist for many days at a time, with temperature ranging from 30 °C to 40 °C.

4.4 **Altitude**

Installations will be up to 1000 meter above sea level.

4.5 **Supply System**

The switchgear shall be suitable for installation in 11kV 3-phase AC supply system with the following characteristics:

Nominal system voltage	11 kV
Rated voltage	12 kV
Frequency	50 Hz

5.0 **CONSTRUCTIONAL REQUIREMENTS**

5.1 **General**

5.1.1 The switchgear panel shall be equipped with a draw-out type circuit breaker and all associated equipment mentioned in this specification for indoor use to be mounted on the floor and shall be

supplied in the form of a single switchgear panel for straight forward extension of existing installations on either side. The frame and supporting parts are designed as a compound construction of welded/bolted/riveting sections.

- 5.1.2 The metal-clad panel shall consist of cable compartment situated at rear bottom, CB compartment situated at front, bus-bar compartment situated at rear top, and relay & meter compartment situated at front top of the panel. All live parts such as circuit breakers, busbars, current and voltage transformers etc. shall be enclosed within grounded metal compartments separated by grounded metal barriers. The bus-bar and cable compartments shall be separated from the CB compartment through automatic shutters to prevent exposure of live parts when the CB is in disconnected/test position. Necessary means shall be provided to separate CB & cable compartments when CB is in connected positions.
- 5.1.3 All secondary wiring and instruments, meters, relays etc. shall be isolated from ground metal barriers and from all primary circuit elements with the exception of short lengths of wires at instrument transformer terminals.
- 5.1.4 Switchgear shall be designed and manufactured to secure safety during operation, inspection, cleaning and maintenance and shall be so arranged as to minimize the risk of fire arising or spreading. Each switchgear panel shall be completely covered on both sides to ensure against spreading of fire to the adjacent panels. Fire retardant pipe/shrouds shall be provided for covering the bus bar joints & connections to the adjacent panels on both sides. Fiber glass sheet having minimum thickness of 3mm for covering of bus bar chamber on both sides of each panel shall also be installed.
- 5.2 **Standardization of switchgear Panels**
- 5.2.1 To accomplish the interchangeability requirement of switchgear panels manufactured by different manufactures, certain dimensions of the switchgear panel, bus-bars & their joints, CT's and PT's etc. have been standardized as per drawing Nos. PDW/DF-423, PDW/DF-447, PDW/TS-1630, PDW/DF-297, PDW/TS-2010 and PDW/TS-4932.
- 5.2.2 The mounting arrangement of energy meter shall be provided in such a way that various types of energy meters can be fixed on the same arrangement.
- 5.2.3 At every switchgear panel, the incoming AC/DC circuits shall be connected to the terminal block of the panel from where the supply shall further be distributed through miniature circuit breakers of appropriate rating and characteristics.
- 5.3 **Standard Types of Panels**

The switchgear Panels shall be of the following types:

- a) Incoming panel for connecting the 11kV switchgear to the power transformer.
- b) Outgoing panel for connecting supply to 11kV feeder.
- c) Bus-coupler panel for connecting two Incoming panels where two power transformers are installed and for grid station auxiliary supply.

- d) Industrial panel for giving 11kV supply to individual consumer.
- e) Ring main panel for giving 11kV supply to individual consumers fed from two different feeders.
- f) Consumer panel for giving connection to an individual consumer from the grid stations through an express or dedicated 11kV feeder.
- g) Capacitor bank control panel for the automatic switching of the capacitor banks

5.4 Interchangeability

All removable components of the same type and rating in a given assembly shall be physically and electrically interchangeable.

5.5 Short-circuit Strength

Each switchgear panel shall be designed to carry and withstand following thermal and mechanical stresses:

- a) Rated short-time withstand current for main and earthing circuit (1s): 25kA
- b) Rated peak withstand current for main and earthing circuits: 63kA

5.6 Protection and Metering

5.6.1 Over-current Protection

All switchgear panels shall have over-current & earth fault protection. For incoming, outgoing & consumer panels, the over-current relays shall operate on 110 VDC. For industrial & ring main panels, the relay shall be arranged to operate on AC or any alternate arrangement in case of operation of relay on DC. Arrangement will be approved by the office of Chief Engineer (SS) NTDC.

5.6.2 Differential Protection

Incoming panels shall be provided with three additional current transformers for differential protection. The differential protection zone of power transformers is required to trip the 11kV incoming circuit breakers.

5.6.3 DC Supply and Trip Indications

Supervision relay(s) shall be provided for continuously monitoring the healthy conditions of breaker trip circuit and presence of DC supply on all applicable panels. The presence of healthy trip circuits shall be indicated by the continuous glow of a lamp.

5.6.4 Hooter

- 5.6.4.1 One hooter with its acknowledge and canceling arrangement shall be installed in the incoming panel to indicate failure of DC mains supply, DC supply failure to any panel, failure of P.T. MCB supply and failure of healthy trip circuit and tripping of any breaker. In all switchgear panels NC contact of each MCB shall be used for alarm purpose, completely wired. Tripping of any one MCB shall initiate an alarm signal.
- 5.6.4.2 One hooter and its acknowledgement and canceling arrangement shall also be installed in the capacitor bank control panel.

5.6.5 Metering

- 5.6.5.1 Arrangements for metering shall be provided as shown in drawing No. PDW/TE-580 & 581. The voltage coils of all energy meters, instruments & relays of the outgoing & capacitor panels shall be connected to the voltage transformer of the corresponding bus section installed in incoming panels.
- 5.6.5.2 For switchboards with bus coupler, the voltage transformer of each bus section shall be operated independently. However, when the corresponding incoming feeder is out of service and the bus coupler is closed, the voltage transformer in service shall feed all the panels. Therefore, P.T. selection scheme shall be developed in each relevant panel to fulfill the requirement.
- 5.6.5.3 In case of industrial, consumer and ring main panels, independent voltage transformers shall be provided for metering of energy. Moreover, the metering equipment in these panels shall be housed in separate, lockable and sealable compartment.

5.7 Signaling Lamps

- 5.7.1 The indicating lamps shall be of 22 mm panel mount LED type with life of minimum 35,000 Hours and shall not be greater than 4 W at 150 V. Signaling lamps shall be provided with name plate.
- 5.7.2 For each panel, two signaling lamps "RED" and "GREEN" shall be provided to indicate "ON" and "OFF" positions of the circuit breaker respectively.
- 5.7.3 Yellow signaling lamp indicating DC trip circuit healthiness shall be provided.
- 5.7.4 Blue signaling lamp indicating "OFF" position of P.T. supply shall be provided.
- 5.7.5 Purple signaling lamp indicating AC alarm supply failure shall be provided.
- 5.7.6 White signaling lamp/signaling relay indicating fault indication shall be provided.

5.8 Surge Arrestors

Surge arrestors having rated voltage 12 kV and nominal discharge current of 10 kA shall be installed in the outgoing, capacitor control & consumer panels near to the cable termination. The surge arrestors shall conform to NTDC Specification P-181:2012 amended to date.

5.9 Insulation and Clearances

5.9.1 Switchgear panels shall be designed for the following insulation level:

- a) Lightning impulse withstand voltage: 95 kV
- b) Power frequency withstand voltage for one minute.: 36 kV

5.9.2 The minimum phase to phase and phase to ground clearance in air shall be 160 mm. In case of clearances less than the above specified value, insulation barrier plates of fire retardant fiber glass having thickness 3.0 mm (min.) shall be provided. The insulation barrier between the poles of breaker shall be of manufacturer's recommended material.

5.9.3 The insulation sheets, covers and sleeves shall be made of material having good fire-resistant properties. Materials liable to catch fire shall not be used in construction of the panels. The insulating materials for barriers, covers and sleeves etc. shall essentially have non-hygroscopic, non-corrosive, non-tracking and non-inflammable properties such as reinforced fiber glass, epoxy resin etc., specially made to suit the intended applications with respect to mechanical, electrical and thermal requirements. Complete details regarding mechanical, electrical and thermal characteristics of the insulating material along with proposed locations for installation shall be supplied for approval.

5.9.4 At locations such as breaker terminals or interconnections where it is not possible to meet above clearances, smaller clearances with insulation will be permitted subject to approval and withstanding insulation tests.

5.10 Earthing


5.10.1 All metal parts of a switchgear panel shall be effectively bonded together to form a continuous earthing. Hinged doors shall be connected to the panel body by means of flexible copper earthing straps having minimum 36 mm² cross-section.

5.10.2 Each panel shall be provided with a copper earth strip of cross section 25×5 mm and all earthed parts shall be firmly bonded to it. The earth strip shall be so arranged that the strips of adjacent panels can be brought out at both ends of the panel and connected together on either side as required to form a common earth bus as shown in drawing No. PDW/TS-2010. Earthing terminals for taking 7 to 15 mm dia. copper wire for connection to the substation earthing system shall also be provided.

5.10.3 The earthing connections of the auxiliary equipment e.g. CTs & PTs etc. to the main earth busbar shall be made by means of 16 mm² solid copper strip or flexible insulated copper cable. All cable glands/brackets shall be connected to the main earth busbar by means of 25×5 mm solid copper strip.

5.10.4 The withdrawable metallic parts of the switchgear shall be provided with a separate earthing conductor within the switchgear unit frame fixed along the switchgear in such a manner that permanent direct earth connections are established which shall be capable of carrying short circuit currents. The circuit breaker frame shall also remain earth connected in the test and disconnected position and also in any intermediate position whilst the auxiliary circuits are not totally disconnected. On insertion, the normally earthed metallic parts of CB shall be connected to earth prior to the making of the male/fixed and female/movable contacts.

- 5.10.5 The bus coupler panels shall also be provided with an external earthing point.
- 5.10.6 Two independent earthing points with earthing lugs shall be provided in industrial and ring main panels.
- 5.11 **Circuit Connections**
- 5.11.1 **Incoming Panel**
- Each incoming panel shall have provision of incoming circuit by means of underground cables. Space shall be provided for the cable connections with dry termination of 5 Nos. per phase single core 500 mm² (1000 MCM) cross-linked polyethylene (XLPE) aluminium/copper cables having outer diameter of 50 mm approx.
- 5.11.2 **Outgoing and Consumer Panels**
- Each outgoing and consumer panel shall have sufficient space and provisions for the dry termination of three (one per phase) single core 500mm² (1000 MCM) cross-linked polyethylene (XLPE) aluminium/ copper cables having outer diameter of 50mm approx.
- 5.11.3 **Capacitor Bank Control Panel**
- Each capacitor bank control panel shall have sufficient space and provisions for the dry termination of three single core 240mm² (500 MCM) cross-linked polyethylene (XLPE) aluminium/copper cables per phase having outer diameter of 35mm approx.
- 5.11.4 **Others**
- Each bus coupler, industrial and ring main panel shall have sufficient space for provision of dry termination for the following cables:
- One 3-core, 120mm² cross-linked polyethylene (XLPE) aluminium/copper cable for bus coupler panel having outer diameter of 60 mm approx.
 - One 3-core, 35mm² to 120mm² cross-linked polyethylene (XLPE) aluminium/copper cable for ring main and industrial panels having outer diameter 60 to 75 mm approx.
- 5.11.5 The cable termination pads shall be supported on 12kV post insulators. The manufacturer shall provide terminals with high tensile steel bolts, nuts and washers for cable connections in accordance with drawing No. PDW/DF-444.
- 5.12 **Special Tools and Accessories**
- 5.12.1 A set of special tools and accessories shall be supplied which always include, but not be limited to the following:
- Operating attachment/handle for the withdrawal and insertion of the circuit breaker trolley (one per two panels).
 - Spring charging handle for manual charging of the spring (one per two panels).



- c) Instrument compartment door locking key (one per panel).
- d) Bus bar coupling pieces made of copper as per drawing No. PDW/TS-2010 with nuts, bolts and washers for each switchgear panels for interconnection throughout the length of adjacent panels forming a common bus duct except for industrial/ring main unit (Nine per panel).
- e) Two interconnection pieces for connecting earth bus bars of adjacent panels as per drawing No. PDW/TS-2010 for each switchgear panels except industrial/ring main unit.
- f) Four grouting bolts for mounting the switchgear panel on the floor.
- g) Operation and maintenance catalogues for circuit breaker, relays, energy meter and complete set of schematic diagrams (one set per five panels).
- h) End box complete with fixing arrangement (Two per five panels).
- i) One earthing kit for each incoming, industrial and ring main panels for safety while carrying out maintenance.
- j) Guide/Extension plate of 600mm×900×2.5mm with guide rails to facilitate the truck movement on the floor in case of truck type circuit breaker (one per panel).
- k) Trolley to facilitate insertion or removal in case of cassette type circuit breaker (Two per five panels/ as per requirement of purchaser)
- l) Nine fire retardant pipes/shrouds for covering busbar joints & interconnections as per clause 11.3 of this specification.
- m) Laminated wiring diagram of VCB & Panel with each panel.

5.12.2 The tools/accessories listed from a) to f) shall be housed in a tool box for the safe storage.

5.12.3 The earthing kit is equipped with three flexible insulated short-circuiting copper cables for each phase having length of at-least one meter joined together in a junction box and one insulated earth cable having length of at-least 1.5m for connection to system earthing. Threaded copper ball head cap clamps suitable for tightening the ball pin having diameter above 20 mm by means of insulating operating stick from a distance of at least one meter shall be crimped on each short-circuiting cable while earth clamp shall be crimped with the earth cable. The size of flexible insulated copper cables shall be 95 mm². The earthing kit shall be designed to carry and withstand rated short-time withstand current of 25 kA for 1 sec. The insulated stick shall withstand the power frequency voltage of 300kV per meter for 5 minutes. The complete earthing kit shall be packed in a carrying bag for storage and transportation.

6.0 COMPONENTS OF SWITCHGEAR PANELS

The components of all types of switchgear panels are listed in Table-I. Each switchgear panel shall be supplied with Cable termination pads, signaling lamps and Push buttons for electrical ON & OFF as per their requirement.

TABLE – I: Components of Metal-Clad Switchgear Panels

Sr. No.	Item Description	Incoming Panel	Outgoing Panel	Bus-Coupler Panel	Capacitor Control Panel	Consumer Panel	Industrial Panel	Ring Main Panel
1	Circuit breaker	1	1	1	1	1	1	1
2	Load break switch	-	-	2	-	-	-	2
3	Earthing switch	-	1 ⁽ⁱ⁾	-	1 ⁽ⁱ⁾	1 ⁽ⁱ⁾	-	-
4	Single phase, 2-core CT for over-current protection and metering	3	3	-	3	-	-	-
5	Single phase, 1-core CT for over-current protection	-	-	-	-	3	3	3
6	Single phase, 1-core CT for metering	-	-	-	-	3	3	3
7	Single phase, 1-core CT for differential protection	3	-	-	-	-	-	-
8	Single phase voltage transformer	3	-	-	-	3	3	3
9	Surge arrestors	-	3	-	3	3	-	-
10	Over-current and Earth-fault relay	1 ⁽ⁱⁱ⁾	1 ⁽ⁱⁱ⁾	-	1 ⁽ⁱⁱⁱ⁾	1 ⁽ⁱⁱ⁾	1 ^(iv)	1 ^(iv)
11	Two step capacitor unbalance detection Relay	-	-	-	1 ⁽ⁱⁱⁱ⁾	-	-	-
12	Under voltage/over voltage relay	-	-	-	1	-	-	-
13	DC trip circuit supervision relay (TCS)	2	2	-	2	2	1 ^(v)	1 ^(v)
14	Trip & lockout relay	-	-	-	1	-	-	-
15	Energy meter	1	1	-	-	1	1	1
16	Ammeter	3	3	-	1	1	3	3
17	Voltmeter 0 -15kV with 7 position selector switch	1	-	-	1	1	1	1
18	Power factor meter	1	1	-	1	1	1	1
19	Hooter and its acknowledgement	1	-	-	1	-	-	-
20	Power quality analyzer	1 ⁽ⁱ⁾	-	-	-	1 ⁽ⁱ⁾	-	-

i) If required by purchaser/end user.

ii) Three Phase four element Over Current & Earth Fault Relay shall be used as per clause 12.5.

- iii) Three Phase five elements Over Current & Earth Fault Relay shall be used with built-in two step capacitor unbalance detection protection in Capacitor Control Panel as per clause 12.5.
- iv) For industrial and ring main panels, the relays shall be arranged to operate on AC or any alternate arrangement in case of operation on DC with the approval of o/o Chief Engineer (SS) NTDC.
- v) For industrial and ring main panels, DC Supervision relay shall be provided in case of operation on DC.

7.0 CIRCUIT BREAKER

7.1 General Requirements

- 7.1.1 The circuit breaker shall be draw-out vacuum type suitable for indoor installation with unique traceable tracking identification. The circuit breaker shall be triple pole, fixed with cast resin post insulators, and coupled electrically as well as mechanically on a common base frame so as to operate simultaneously. All drive parts, auxiliary & control switches, charging motor, over-current & under voltage releases, anti-pumping system, anti-slam system, lockout relay for interlocking, closing & trip coils, spring charged indicator, counter, etc. shall be placed in a closed cabinet. The complete CB shall be mounted on the withdrawable truck or on trolley with carriage arrangement to facilitate its insertion/removal.
- 7.1.2 The CB shall be provided with an energy storing device which shall be charged both manually by hand crank as well as electrically by an electric motor. In a closed position, the circuit breaker can be brought for mechanical "ON" & "OFF" from front of CB and electrically "ON" & "OFF" by means of push buttons in the instrument compartment while showing position indication.
- 7.1.3 The circuit breaker shall be vertically/horizontally isolated, suitable for automatic tripping, re-closing, shall have interlocking devices, arc control devices, disconnecting devices, automatic safety shutters with locking facility, and all necessary accessories to make a complete operating unit. The circuit breaker shall be suitable for single shot, 3-pole rapid auto re-closing.
- 7.1.4 The circuit breaker shall be capable of making and breaking all short circuit currents, symmetrical & asymmetrical, up to and including the rated short circuit breaking currents. The circuit breaker shall also be capable of switching covered by transients over & under voltage and over-currents in the system i.e. switching the no load currents of transformers, switching of shunt capacitor banks, switching under condition of single/double earth faults, switching under condition of phase opposition (out of phase condition) and the switching the charging current of cables. To achieve these requirements, necessary devices shall be equipped in the operating mechanism.
- 7.1.5 In case the CB is mounted on truck, the wheels of truck on the operator side shall have rotating facilities with locking arrangement in ON position to prevent moving of circuit breaker and shall have provision of earth to withstand the short circuit stresses. In case of carriage/cassette arrangement, trolley shall be used only for removal of CB outside the switchgear panel or vice versa.
- 7.1.6 The circuit breaker shall incorporate anti-pumping & anti-slam feature which shall be the integral part of circuit breaker to avoid continuously energizing the circuit breaker closing coil, once the circuit breaker has already closed. Moreover, circuit breaker shall be trip free.

- 7.1.7 The mechanical strength and physical characteristics of the insulation structure shall be such that it can withstand the shocks of circuit breaker operations within the rated capacities as well as reasonable strains of connecting conductors under the specified service conditions.
- 7.1.8 Circuit breaker shall be so constructed that the interval between instants the contacts of the individual poles touch or separate shall not exceed 10ms during closing or opening operation.
- 7.1.9 It shall be possible to make independent adjustments to each unit of circuit breaker where circuit breaker comprises three independent units.
- 7.1.10 Where single rods & tubes are used for raising or lowering the moving contacts of the circuit breaker they shall be securely pinned at each end to prevent rotation or displacement of the contacts. Tubes shall be plugged securely where contacts or other parts are fixed to the tube.

7.2 Vacuum Interrupter of VCB

- 7.2.1 The vacuum interrupter which is a core component of VCB requires reliable operation such that even after repeated fault interruptions, the contact resistance is not impaired and remains constant due to contact pressure throughout its service life without maintenance. The arc interrupting mechanism shall be designed with ample mechanical and electrical factors of safety in all its parts. The X-radiation level during operation shall be kept within permissible safety limits according to international standards.
- 7.2.2 The vacuum interrupter tube shall have excellent vacuum tightness and mechanical characteristics. A permanent mark shall be provided on the lower interrupter support to check the contact wear/end of service life of vacuum interrupter (sticker is not acceptable).

7.3 Interlocks

- 7.3.1 At least the following interlocks shall be provided in the operating mechanism of circuit breaker to ensure safe operation in the correct sequence under all service conditions:
- The withdrawal or engagement of a circuit breaker shall be prevented unless it is in the open position.
 - It shall be impossible to move the circuit breaker in service position unless the low voltage plug is inserted to the auxiliary circuit.
 - It shall be impossible to move the circuit breaker from service while it is in closed position.
 - The closing operation of the circuit breaker shall be prevented when the circuit breaker is already in closed position or under opening operation phase.
 - The closing of VCB of incoming circuit breaker shall be blocked in case of PT MCB Trip or PT supply failure.
 - VCB of incoming circuit breaker shall be tripped in case of PT MCB trip or PT supply failure in order to block Energy Metering. Alarm & annunciation signal shall also be generated in case of PT MCB Trip or PT supply failure.
 - Complete withdrawal of circuit breaker shall not be possible unless auxiliary circuit is disconnected

- h) The operation of a circuit breaker shall not be possible unless it is in a service, disconnected, removed, test or earthing position.

7.3.2 For bus-coupler panel, electrical interlocking shall be such as that the CB shall not close if the circuit breakers of incoming panels on both sides of bus-coupler panel are in the closed position.

7.3.3 In addition, the manufacturer shall provide sufficient number of interlocks to provide full safety for the operator when parts of the circuit breaker or its mechanism become malfunctioning during the operation of the switchgear.

7.4 **Operating Device Movement**

The direction of motion of operating devices and handles wherever possible, shall be in accordance with the following.

- a) Rotary handles shall be moved clockwise for switching ON and counter clockwise for switching OFF.
- b) Handles and levers with an essentially straight-line movement shall move upwards or to the right (in case of handles moving vertically or horizontally respectively) for a closing operation and shall move in the opposite direction for an opening operation. Handles shall move horizontally and away from the operator for a closing operation and towards the operator for an opening operation.
- c) For push or pull buttons which are located one above the other, the upper button shall be the ON button and the lower button shall be the OFF button. For push buttons placed side by side, the right-hand button shall be the ON button and the left-hand button shall be the OFF button. The ON button shall be colored red and the OFF button shall be colored green.

7.5 **Characteristics and Ratings**

The circuit breakers shall have the following characteristics and ratings:

a)	Nominal voltage	11kV
b)	Rated voltage	12kV
c)	Normal current at reference ambient temp. of 50 °C	
	i) Incoming & Bus-coupler panels	2500 A
	ii) Other switchgear panels	630 A
d)	Rated Frequency	50 Hz
e)	Rated auxiliary circuit DC voltage	110 V
f)	Rated Short circuit breaking current	25 kA
g)	Rated Peak withstand current	63 kA
h)	Rated Short circuit making current	63 kA
i)	Duration of short circuit	1 sec
j)	First pole to clear factor	1.5

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k)	Rated TRV (Peak) for terminal faults	20.6 kV
l)	Rated TRV (Peak) for Out of Phase	30.6 kV
m)	One-minute AC withstand voltage	36 kV
n)	Lightning Impulse withstand voltage	95 kV
o)	Single capacitor bank breaking current	As per IEC
p)	Rate of rise of recovery voltage (RRRV)	As per IEC
q)	Operating sequence	
	i) Outgoing, consumer and capacitor bank control panels (with fast auto-reclosing)	O-0.3sec-CO-3min-CO
	ii) Others (without fast auto-reclosing)	O-3min-CO-3min-CO
r)	Break time	As per IEC
s)	Dead time	As per IEC
t)	Opening time	As per IEC
u)	Closing time	As per IEC
v)	Spring charging time	≤15sec
w)	Close-Open time	As per IEC
x)	Circuit Breaker Class	
	i) w.r.t Mechanical Endurance	M2
	ii) w.r.t Electrical Endurance	E2
	iii) w.r.t. Capacitive Current Breaking	C2
	iv) w.r.t Connection to Cables	S1

7.6 Isolation of Breaker

7.6.1 A set of six female silver-plated copper clip/flat/tulip (preferably on higher rating) type contacts for 2500A & 630A CBs shall be provided for separating the CB from silver plated male contacts to be fixed in cast resin spouts to eliminate possibility of misalignment and to ensure separation of compartments. Further for cassette type VCB complete VCB including cradle of high grade shall be provided from original manufacturer as a part of circuit breaker (no alternate will be acceptable). In the isolation/ withdrawal position of CB from live part, the shutter shall be closed automatically.

7.6.2 Silver plated plug contacts shall be provided between separable units to complete the secondary circuits. They shall be of the pressure loaded self-aligning type. In case the connection of auxiliary circuit wiring plug with circuit breaker socket is to be made manually the plug shall be held tightly in the socket with spring loaded clips. Wiring of auxiliary circuit to circuit breaker shall be routed through flexible steel pipe or high quality flexible plastic pipe.

7.7 Operating Mechanism

7.7.1 The operating mechanism shall be spring charged electrically as well as manually with push buttons for closing and opening of the circuit breaker. The closing springs shall be charged with 240 V AC

variation range of +10% and -15%. The closing springs, if charged, should not be capable of release while the circuit breaker is closed.

- 7.7.2 The energy stored in motor compressed spring shall be sufficient for an open-close-open operation at rated short circuit current. The motor shall not require more than 15s to recharge the closing springs after a C-O or O-C operation. If the closing mechanism is not fully recharged, the mechanism shall be locked out and an alarm initiated.
- 7.7.3 The mechanism of circuit breaker shall be so arranged that emergency manual spring charging by using hand crank and release of the springs is possible without electrical operation. The circuit breaker shall be provided with the indicator to show the charged/discharged state of spring.
- 7.7.4 The rated control and auxiliary supply voltages shall be 110 VDC. Operating mechanism of the breaker and all other associated accessories/components shall operate satisfactorily within the range of voltage given below:

11kV Panels	Closing Circuits (Volts)		Tripping Circuits (Volts)	
Incoming, outgoing, consumer & capacitor protection panels	110VDC (93V-121V)		110VDC (77V-121V)	
Industrial & Ring main Panels	110VDC (93V-121V)	230VAC (150V-250V)	110VDC (77V-121V)	230VAC (150V-250V)

- 7.7.5 Trip coils to be provided in each type of panel shall be as under:

Incoming Panel	Two DC trip coils.
Outgoing, Consumer, Bus-Coupler and capacitor bank control panels	Two DC trip coils.
Industrial & ring main panels	Three (03) AC trip coils or alternatively DC shunt trip coil with capacitor trip unit arrangement and will be approved by O/o C.E (S&S) NTDC.

- 7.7.6 The VA capacity of trip coils shall be such that they are capable to perform mechanical endurance test without being over heated or change in characteristics.
- 1
- 7.7.7 A 5-digit operation counter without resetting shall be provided to record the number of opening operations of the circuit breaker. It shall be visible and readable from outside the switchgear.

7.8 Circuit Breaker Auxiliary Switch and Control Contacts

- 7.8.1 The connection to the circuit breaker is established by means of multiple pin plug and flexible cable. The auxiliary switch shall have adequate number of contacts so that, in addition to contacts actually used in circuit connections, at least four NO and four NC spare contacts shall be provided for future use. The PT supply of incoming panel shall be routed through auxiliary contacts of circuit breaker.

7.8.2 Auxiliary contacts shall be suitable for the number of electrical and mechanical operating cycles specified for the switching device. The operating characteristics of auxiliary contacts shall comply with the requirements of relevant IEC standard.

7.9 Rating Plate

Each circuit breaker and its operating devices shall be provided with a rating plate marked with the following data/information in an indelible manner.

- a) CB Manufacturer's name with country of origin.
- b) Circuit breaker type/designation.
- c) Serial No. of circuit breaker along with date of manufacturing of Breaker.
- d) Interrupter manufacturer's name with country of origin.
- e) Type designation of interrupter.
- f) Rated voltage, kV
- g) Rated frequency, Hz
- h) Rated normal current, A
- i) Rated insulation level
- j) Lightning impulse withstand voltage, kV
- k) One-minute power frequency withstand voltage, kV
- l) Rated short-circuit breaking current, kA
- m) Rated duration of short-circuit
- n) Rated short-circuit making current, kA
- o) Single capacitor bank breaking current, A
- p) Rated operating sequence
- q) Rated supply voltage and frequency of closing and opening devices
- r) Rated supply voltage and frequency of control & auxiliary circuits
- s) Weight

7.10 Tests on Circuit Breaker

7.10.1 The tests shall be made in accordance with the procedure mentioned in IEC Publication 62271-100 and as specified herein.

7.10.2 Routine Tests

The following routine tests shall be made on circuit breaker.

- a) Measurement of the resistance of interrupter & main circuit.
- b) Verification of components used in operating mechanism, their conformance to that of type tested sample.
- c) Checking of interlocking arrangement and other requirements as per clause 7.4.
- d) One Minute AC Voltage Withstand test (36 kV)
- e) Mechanical operation tests.
- f) Tests on auxiliary & control devices (2kV for 1 min)

7.10.3 **Type Tests**

7.10.3.1.1 Duly certified and complete type test reports for tests as specified herein carried out at an STL approved lab on circuit breaker having same design, voltage ratings shall be acceptable in lieu of actual tests. The validity of the type tests reports shall be as per type test policy of NTDC.

7.10.3.1.2 In case of non-production of the requisite type test reports or if the type test reports are otherwise not acceptable to the Design NTDC following type tests shall be performed on circuit breaker at STL approved lab or any independent lab approved by Design NTDC in the presence of two representative of Design NTDC at the cost & arrangement of the manufacturer including travel expenses, boarding, lodging and daily allowance for the inspector to prove compliance with the requirement as listed in this specification.

Table-II

No.	Description of Tests	Current Rating
a)	Dielectric tests	630A & 2500A
b)	Measurement of resistance of main circuit and interrupter	630A & 2500A
c)	Temperature rise test	630A & 2500A
d)	Short time withstand and peak withstand current tests	630A & 2500A
e)	Extended mechanical endurance test at ambient air Temperature	630A & 2500A
f)	Short circuit current making and breaking tests	630A & 2500A
g)	Capacitor bank breaking & Capacitive current switching test	630A & 2500A
h)	Short circuit life test	630A
i)	Electrical endurance test	2500A
j)	Small inductive current breaking test	630A & 2500A
k)	Measurement of contact wear	630A & 2500A

7.10.3.2 **Short Circuit Life Test**

The circuit breaker shall be subjected to short circuit life test. The tests shall be carried out according to the test duties as indicated in Table-III based on IEC 62271-100 except as modified herein.

- a) The short circuit breaking currents and the respective number of operations for each test duty as mentioned in Table-III shall be applied in one stretch. The time interval between operations shall not exceed 3 minutes. In case, the time interval between any operations is more than 3 minutes, the complete respective short circuit breaking current test series/operations shall be repeated except if allowed in IEC standard.
- b) Single phase short circuit breaking test has been included to show that operation of the circuit breaker is not adversely affected by unbalance forces produced. This test duty will consist of close-open operations at rated pole i.e. Red, Yellow or Blue phase and applied in one stretch in each pole.

- c) The transient recovery voltage shall meet the requirement with the specified values as for three phase tests by dividing voltages by first pole to clear factor 1.5, time co-ordinate remaining unchanged. The applied voltage shall not be less than phase to neutral value i.e. $12/\sqrt{3}$ kV.
- d) Small inductive current breaking test shall be carried out during electrical life test to determine significant variation in chopping level of VCB if any. These shall be done at beginning and at the end of life cycle test.
- e) The vacuum interrupter may be replaced with new ones after conducting small inductive current breaking test at beginning and before start of life cycle test series, if so desired by manufacturer/supplier. Small inductive current breaking test shall not be carried out separately if already carried out as part of short circuit life test.
- f) The short circuit life test shall be preceded and followed by a temperature rise test and no-load operation test.

Conditions after Life Test Series

The circuit breaker shall be deemed to have passed the life test provided:

- a) The characteristics of no load closing and opening test made before and after completion of the test series shall show no significant change.
- b) The circuit breaker shall be capable of closing and opening at its rated normal current at the rated voltage although its short circuit making and breaking performance may be impaired. The main contacts shall be capable of carrying out rated normal current of the circuit breaker continuously without exceeding temperature rise limits specified in IEC62271-100 and withstanding the voltage specified under dielectric tests.
- c) There shall be no mechanical or electrical insulation failure during the test series so as to impair the performance of the circuit breaker.
- d) There shall be no indication of significant leakage current to the circuit breaker earth structure.
- e) Re-strike during interruption is permissible so long as CB interrupt the short circuit current successfully. Over voltages produced during the life test shall be measured and shall not exceed the value specified in IEC 62271-100.
- f) The change in average chopping current values measured at beginning and end of the life test shall not exceed more than 30%.

Table – III

Test duty	Short circuit breaking current	No. of operations
1	0.8 kA	CO: 30
	1.25 kA	CO: 40
	2.0 kA	CO: 50
2	3.1 kA	CO: 100
	5.0 kA	CO: 100
	8.0 kA	CO: 60
3	12.5 kA	CO: 60
	16.0 kA	CO: 55
4	25 kA (Symmetrical)	CO: 25
5	25 kA (Asymmetrical)	O: 5
Single Phase	25 kA	CO operations per each phase: 20

7.10.3.3 **Small Inductive Current Breaking Test**

These tests shall be carried out to ascertain:

- 1) the true chopping level of the vacuum circuit breaker
- 2) the over voltage levels for the two types of chopping (i.e. true and virtual)

The maximum switching over-voltage resulting in each condition shall be recorded and, in case this value exceeds 27 kV peak, suitable surge arresters as per clause 5.8 complying with NTDC Specification P-181:2012 (amended to date) shall be installed at appropriate place inside the relevant switchgear panels.

- a) Switching of magnetizing current of an unloaded oil immersed three phase power transformer rated 11/33 kV, 4MVA connected to the circuit breaker via 30m long single core 500MCM, XLPE insulated aluminum cable.
- b) Switching of 2 Nos. oil immersed, three phase distribution transformers rated 11/0.4kV, 1000KVA at (a) no load and (b) while supplying inductive loads of 10A (P.F=0.3), and 100A (P.F=0.5), the transformers being connected to the circuit breaker via 250m long three phase overhead distribution line consisting of ACSR dog conductor in horizontal formation and 50 m long single core 500 MCM, XLPE insulated aluminum cable.

Since the type of chopping whether true or virtual that might be expected in a given condition and the resulting over voltages in a particular type of chopping depend largely on the parameters of the supply and load circuits, the test circuit shall be so arranged as to present the actual service conditions as closely as practicable. For this purpose, actual transformers may be used which should have approximately the same relevant characteristics as would be expected from the above transformer or, alternatively, the transformers may be replaced by an equivalent circuit to obtain the desired load condition. The cable and overhead line may, if necessary for practical reason, be simulated by adding in parallel equivalent lumped capacitance of the values given below between the circuit breaker under test and the transformers.

Equipment		Equivalent Capacitance (nF)	
		Case (i)	Case (ii)
i)	Cable	12	20
ii)	Overhead line	-	5.5

In addition, 170 nF capacitance to earth shall be connected in each phase on the source side of the test circuit to account for the capacitances of cable associated with and connected to other circuit breakers in the switchboard. The transformers to be used for these tests are assumed to have the following typical values for the magnetizing current, iron losses and stray capacitance. In case the characteristics values in the actual transformers are different from the pertinent values given below (slight variations, which are not likely to influence the test results, may be ignored), suitable resistance and or inductance may be connected in the load circuit in a manner to compensate for the difference.

Sr. No.	Transformer Data	No-Load Current	Iron Losses	Stray Capacitances
i)	11/33 kV 4MVA	1 % (2.1 A)	0.1 % (4 kW)	16 nF
ii)	11/0.415kV 1MVA	2 % (1.05 A)	0.15 % (1.5 kW)	6 nF

Any change or simplification of the specified circuit shall however, not be considered except with regard to its effects on test result in either type of chopping. In order to take into account, the effect of moment of contact separation on the test result, 10 to 15 opening operations shall be performed in each test condition varying the instant of switching on the voltage wave successively by about 20 electrical degrees.

7.10.3.4 Temperature Rise

The temperature rise test of the main circuit, auxiliary circuits & devices of the breaker when carrying rated current shall be according to IEC-62271-100. However, the limits of temperature rise specified in the relevant IEC standard shall be reduced by 10°C to account for higher ambient condition required in this specification.

Note: The quality of the coated contacts shall be such that a continuous layer of coating material remains in the contact area after type tests, otherwise the contacts shall be regarded as "Bare". Manufacturer shall specify the thickness of coating during type tests.

7.10.3.5 Capacitor Bank Breaking Test

The capacitor Bank Breaking test shall be carried out as per relevant IEC standard. The rated capacitor bank breaking current for circuit breakers of different current ratings are given here.

Sr. No.	Rated Current of Circuit Breaker (A)	Capacitor bank breaking Current (A)
i)	630	500
ii)	2500	1600

8.0 LOAD BREAK SWITCH

8.1 General

8.1.1 The load break switch shall generally conform to relevant IEC standard and the general requirements listed herein.

8.1.2 The load break switches shall be air break type equipped with HRC fuses suitable for installation in 12kV switchgear system for switching the load currents. The HRC fuses shall be installed on the connecting blades of the load break switch or alternatively separate HRC fuses shall be provided with load break switch for the protection of outgoing feeders. The fuse shall be refill type having continuous current rating of 200A. It shall be triple pole fixed with cast resin post insulators and manually make and break operated. The poles shall be coupled mechanically on a common base frame so as to operate simultaneously. The isolator gap shall be visible under all circumstances for safety reasons.

- 8.1.3 The load break switch including its operating switch drive shaft shall be so constructed that these cannot come out of their open or closed positions by gravity, vibrations, reasonable shocks or accidental touching of the connecting rods or handle.
- 8.1.4 The load break switch shall be so designed that no dangerous leakage current can pass from the terminal of one side to any of the terminal of the other side of the switch. It shall permit locking in both the open and closed position. Mechanical indicators to show the positions shall be provided.
- 8.1.5 The frame of each load break switch shall be provided with a reliable earth terminal and earth connection to the earth conductor. The diameter of the clamping screw shall be at least 12mm and the connecting point shall be marked with the "Earth" symbol.
- 8.1.6 The load break switch shall be able to bear on the terminals the total electrodynamic forces to which these may be subjected during short circuit operation without impairing its reliability or current carrying capacity.
- 8.1.7 The load break switch shall have 3 positions as indicated in single line diagram No. PWD/TC-580. It shall be capable of being closed for connection to either bus section and the middle position shall be the "OFF" position.
As an alternative to the triple pole 3 position switch two 3 phase switches with interlocking arrangement may be provided as shown in drawing No. PDW/TE-580 and PDW/TE-581 as applicable. The interlocks shall be such that when one switch is closed, it shall not be possible to close the other.
- 8.1.8 Mechanical interlocks shall be provided as under to prevent any malfunction:
- a) Both the switches shall not be "ON" at the same time.
 - b) Locking arrangement shall be provided for the switch in "ON" and "OFF" position for safety purposes.

8.2 Ratings

8.2.1 The load break switch shall have the following ratings:

a)	Rated voltage	12kV	
b)	Nominal voltage	11kV	
c)	Rated current	400A	
d)	Rated short time and peak withstand current (1sec)	25kA & 63kA	
e)	Rated short circuit making current, peak	63kA	
f)	Electrical Endurance	E1	
g)	Mechanical Endurance	M1	
h)	Lightning impulse withstand voltage	across isolating distance	110kV
		to earth	95kV
i)	Power frequency withstand voltage	across isolating distance	40kV
		to earth	36kV

8.3 Tests on Load Break Switch

8.3.1 The load break switch shall be tested in accordance with the requirements laid down herein and in accordance with IEC.

8.3.2 Type Tests

Duly certified and complete type test reports for tests carried out at an Independent lab acceptable to Substation Design NTDC on the Load Break switch having same design, voltage ratings shall be acceptable in lieu of actual tests. The validity of the type test reports shall be as per type test policy of NTDC. In case of non-production of the requisite type test reports or if the type test reports are otherwise not acceptable to the Design NTDC, the following tests shall be performed on the Load Break Switch having same voltage & current ratings as ordered in presence of two (02) representatives one from Design, NTDC and other from purchaser at any independent lab approved by Design NTDC at the cost and arrangement of the manufacturer including travel expenses, boarding, lodging and daily allowance for the representatives.

- a) Dielectric tests
- b) Temperature-rise tests
- c) Measurement of resistance of main circuit
- d) Short time withstand current and peak withstand current tests
- e) Tests to prove the ability of the switch to make and break the specified currents
- f) Tests to prove satisfactory mechanical operation and endurance

8.3.3 Routine Tests

The following routine tests shall be carried out on each load break switch by the manufacturer.

- a) Dielectric tests
- b) Contact resistance measurement
- c) Operation tests

8.4 Rating plate

8.4.1 The load break switch shall be provided with a rating plate containing the following information:

- a) Manufacturer's name with country of origin
- b) Type and designation
- c) Serial number
- d) Rated voltage, kV
- e) Lightning impulse withstand voltage, kV
- f) Normal current, A
- g) Short time withstand current
- h) Weight, kg
- i) Date of Manufacturing

9.0 **EARTHING SWITCH**

9.1 **General**

Earthing switch shall generally conform to relevant IEC and the general requirements listed herein. Earthing switch shall be high speed type, spring operated and independent manual operation type with rated peak withstand current of 63kA. Earthing switch shall be operated from front of the panel with suitable indication on front. Following interlocks shall at least be provided.

- a) Earthing switch must be mechanically interlocked with the circuit breaker so that it cannot be operated unless the circuit breaker is in removed/test position.
- b) The circuit breaker truck / carriage cannot be inserted when the earthing switch is in closed position.

9.2 **Ratings**

Earthing switch shall have the following ratings:

a)	Rated voltage	12kV
b)	Nominal voltage	11kV
c)	Rated Short time withstand and peak withstand current (1sec) (rms, peak)	25kA, 63kA
d)	Rated short circuit making current (rms, peak)	25kA, 63kA
e)	Rated lightning impulse withstand voltage 1) To earth and between poles 2) Across the isolating distance	95 kV (peak) 110 kV (peak)
f)	Rated one-minute Power Frequency withstand voltage 1) To earth and between poles 2) Across the isolating distance	36kV 40 kV
g)	Electrical Endurance	E1
h)	Mechanical Endurance	M1

9.3 **Tests on Earthing Switch**

Earthing switch shall be tested in accordance with the requirements laid down herein and the relevant IEC Publications.

9.3.1 **Type Tests**

Duly certified and complete type test reports for tests carried out at an independent lab acceptable to Design NTDC on the earthing switch having same design, ratings shall be acceptable in lieu of actual tests. The validity of the type tests reports shall be as per type test policy of NTDC. In case of non-production of the requisite type test reports or if the type test reports are otherwise not acceptable to the Design NTDC, the following tests shall be performed on the earthing switch having same voltage & current ratings as ordered in presence of two representatives one from Design, NTDC and other from purchaser at an independent lab approved by Design NTDC at the cost and arrangement of the manufacturer including travel expenses, boarding, lodging and daily allowance for the representatives.

- a) Short time and peak withstand current tests.
- b) Mechanical endurance test.
- c) Test to prove short-circuit making performance of earthing switches.
- d) Measurement of resistance.

9.3.2 Routine Tests

The following routine tests shall be carried out on each earthing switch.

- a) Contact resistance measurement
- b) Operation tests

9.4 Rating plate

The earthing switch shall be provided with a rating plate containing the following information:

- a) Manufacturer's name with country of origin
- b) Type and designation
- c) Serial number
- d) Rated voltage, kV
- e) Short time withstand current
- f) Weight, kg
- g) Date of Manufacturing

10.0 ENCLOSURE

10.1 General

- 10.1.1 The enclosure shall conform in general to clause 5.102 of IEC-62271-200. All live parts including bus-bars, connections, circuit breaker, load break switches, voltage transformers, current transformers etc. shall be suitably enclosed. The degree of protection shall be IP3X and service continuity category LSC2L in accordance with relevant IEC standard. Enclosure shall be capable to meet internal arc fault criteria as per IEC 62271-200 classification IACAFLR 25kA for 0.5 sec.
- 10.1.2 Access to parts such as bus bars, main connections, current & voltage transformers and all other components for normal maintenance operation shall be through bolted plates or hinged doors with locking facilities.
- 10.1.3 The enclosure shall have a hinged door in the front and bolted plates at the rear. The instrument compartment door and rear bolted plates shall have proper sealing arrangement. All doors shall be provided with rubber gasket to minimize dust entrance.
- 10.1.4 Four grouting holes of diameter 14 mm shall be provided in the base plate of the switchgear panel.
- 10.1.5 Guide rails shall be provided at the base to ensure smooth entry of breaker truck into the panel.
- 10.1.6 An extension plate 600mm x 900mm x 2.3mm shall be provided with guide rails for each row of wheels of trolley. This shall have suitable arrangements for bolting on front of panel so that extension plate can be mounted flush with the floor on which the panel is installed.

- 10.1.7 For industrial, consumer and ring main panels, separate metering compartments shall be provided in which all the metering equipment, energy meters and all secondary wiring shall be housed. The over-current relay and the indicating instruments shall be mounted separately.
- 10.1.8 The depth for enclosure of incoming panels shall be 2400 mm maximum. The enclosure for bus coupler panel shall be fabricated in two parts i.e. load break switch compartment and breaker compartment. The two compartments shall be held together by suitable welding/bolting arrangement.
- 10.1.9 The cable entry bottom plates shall be made of aluminium sheet of at least 3.0 mm thickness in two parts, one fixed and other movable for adjustment of cable entry with brass cable glands.
- 10.1.10 Inspection windows (dully sealed) covered by a transparent polycarbonate sheet with metallic shutters shall be provided on front and back of panel at a suitable place.
- 10.1.11 Temperature indicators with sensors will be provided in all compartments (i.e. busbar, cable & CB) with display on front panels along with alarm function with selectable temperature range from 20 °C to 100 °C.
- 10.2 **Construction**
- 10.2.1 The enclosure shall be made of high grade wrinkle free steel sheet of minimum thickness of 2.3mm. The supporting structure and frame shall be formed from angles, channels, folded sections of sheet metal fastened together with suitable stiffeners so that the enclosure shall be rigid and self-supporting and internally sectionalized through partitions for circuit breaker, main busbar, CTs/PTs and LV instrument compartments.
- 10.2.2 The circuit breaker compartment includes the complete assembly of circuit breaker, interrupter and operating mechanism mounted on truck or carriage/cassette.
- 10.2.3 Current and voltage transformer mountings and cable termination shall be located in a separate compartment having the provision for sealing independently. The condition of cables and CTs/VTs shall be visible through inspection window.
- 10.2.4 Four (04) lifting eyes shall be provided for lifting the complete individual panel from corners by means of slings. The holes of the lifting eyes shall have a minimum diameter of 45mm.
- 10.3 **Shutter**
- 10.3.1 The shutter having partitioned design class PM as per IEC 62271-200 shall be provided to prevent incidental contact with live parts when the circuit breaker is in test position, in disconnected position or has been removed. They shall be earthed and if they become part of the enclosure they shall provide the degree of protection specified for the enclosure.
- 10.3.2 The isolating contacts shall be adequately interlocked and protected by automatic shutters with locking facility. The shutter consists of moving & fixed plates. The shutters shall be marked "BUSBARS" and "CABLE". For bus-coupler panel, shutters shall be marked "BUSBAR-1" and "BUSBAR-2".

10.4 Vermin Proofing

The enclosure shall be completely vermin proof with special regard to the danger of flashover both in service and isolated positions. Provision shall be made to ensure complete vermin proofing of the cable entry holes.

10.5 Painting

10.5.1 All interior and exterior surfaces of steel sheet enclosure shall be thoroughly cleaned, rust proofed to prepare the metal surface for painting through process of degreasing and phosphating. The paint shall have a hard-durable surface and excellent weathering and fire-resistant properties.

10.5.2 Powder coating paint with weather resistance quality shall be used.

10.5.3 The paint thickness shall be at least 0.08mm on flat surface and 0.06mm on curved surfaces. The panels shall be finished in light grey color equivalent to RAL 7022.

10.6 Circuit Labeling

A plain plastic sheet of black color background with white letters in English shall be provided on each panel. The size of sheet shall be 200mm × 60mm × 3mm and it shall be fixed on the front of the enclosure.

10.7 Metering Compartment for Industrial, Consumer and Ring Main Panels

The metering compartment which shall house the metering equipment shall be separately lockable and sealable from the outside. This compartment will have an internal partition separating the HT side from the LT side but access to the equipment shall be possible only by breaking the main seals of the metering compartment. No access to the metering circuits shall be possible (even with the panel de-energized and the breaker trolley removed) without breaking the seals and opening the locks.

10.8 Ventilating openings, vent outlets

10.8.1 Ventilating opening and vent outlets shall be so arranged or shielded that a wire of 2 mm diameter cannot be brought into a position which should reduce the insulation level of the main circuit below the specified level. Such opening may make use of wire mesh or the like provided that it shall have a suitable mechanical strength.

10.8.2 Three (03) pressure relief flaps/explosion vents having at least 200 x 600 mm shall be provided each on the roof of bus bar compartment and CTs & PTs compartment of switchgear panel and with circuit breaker compartment to quickly release of hot gases pressure within the switchgear assembly and dissipate the exhaust from an explosion due to electrical arcing within a switchgear assembly without spreading the explosive detritus, smoke, or airborne chemicals to adjacent panels. The vent outlets shall be covered by perforated aluminum sheet of 1.5 mm to 2 mm thickness. The diameter of perforations shall be 2.0 mm maximum and the center to center distance shall be 4.0 mm. The steel cover of thickness 1.25mm to 1.5mm for explosion vents shall be provided. All the four corners of explosion vents shall be spring loaded. The design of vents shall prevent entry of dust.

11.0 **BUS-BARS**

11.1 Copper bus bars (one set for each phase) made of 99.9% IACS electrical conductivity shall be provided. Test reports as per relevant standard shall be submitted with the bid.

11.1.1 The size of main bus-bars for connections to adjacent panels shall be as under:

Incoming, Outgoing, Bus-coupler, Consumer and Capacitor bank control panels	2×100mm×10mm
Industrial and ring main panels	1×60mm×5mm/300mm ² (area)

11.1.2 The size of dropper bus-bars for connections from main bus-bars to circuit breaker shall be as under:

Incoming and Bus-coupler panels	3×80mm×10mm
Outgoing, Consumer, Capacitor bank Control, Industrial and ring main panels	1×60×5mm

11.1.3 All bus bars shall be tin plated and firmly jointed according to drawing no. PDW/DF/297. The bus bars shall be capable of being extended without difficulty on either side.

11.2 **Insulators/Bus-bar Supports**

The bus bars shall be supported on cast resin insulators. The insulators shall conform to relevant international standard and shall be free from imperfection of all sorts. The standard color of the glaze shall be brown. The characteristics of the insulators shall be as under:

Sr. No.	Characteristics	Ratings
a)	Minimum creepage distance	300 mm
b)	Dry arcing distance (min.)	175 mm
c)	Dry one-minute power frequency withstand voltage	50 kV
d)	Lightning impulse withstand voltage	95 kV
e)	Failing load bending	10 kN

Duly certified complete test reports carried out as per relevant IEC from an independent lab on offered insulators by the manufacturer having same design characteristics, shall be provided. Name of manufacturer should be embossed on the insulator.

11.3 **Bus-bar Insulation**

The bus bars including droppers, connections to CT/PTs and surge arrestors shall be completely covered with insulation of red color capable of withstanding Power Frequency voltage for one (01) minute. The insulation shall be of non-corrosive, non-tracking, flame-retardant and heat shrinkable type to ensure that it fully adheres to bus-bars. The manufacturer's name or trade mark shall be printed on the insulation sleeves. Sleeve used should be subject to prior approval by Design NTDC. The material of insulating sleeves and bus bar joint covers shall not melt, crack, split, drip, flow or

ignite when busbar temperature is raised to 280 deg. C. by an induced current nor shall burn when subjected to effects of power arc of 15 kA for one second. The supplier shall provide test reports of the above-mentioned properties in accordance with IEC/ ASTM or equivalent standard.

12.0 RELAYS

All protection relays used in 11KV switchgear panels shall be numeric type except Trip & Auxiliary relays and all relays shall be subjected to approval by NTDC. For this purpose, NTDC Specification P-151:2008 (amended to date) will be followed.

12.1 General

12.1.1 The relay shall be designed, manufactured and tested according to relevant IEC standards. The switchgear panel manufactures shall furnish at least three years warranty for the relays from the date of supply of switchgear.

12.1.2 The relays shall be of the back connected, dust proof, flush mounting on the front of the switchgear with connections at the rear.

12.1.3 Relays for incoming, outgoing, consumer and capacitor bank control panels shall operate on 110V DC with a tolerance of +20% and -15%. DC-1 & DC-2 auxiliary supplies automatic changeover circuit be designed for redundant power supplies to solid relays. However, for industrial and ring main panels, the relays shall be arranged to operate on AC or any alternate arrangement in case of operation of relay on DC with the approval of Chief Engineer (S&S) NTDC.

12.1.4 Separate and independent relays shall be provided for each protection function except where it is specified that built-in function of relay shall be used.

12.1.5 All protection, control and measurement devices and components shall be approved by NTDC.

12.1.6 All protection relays shall be provided with at least six (06) output contacts and one (01) live status contact for healthiness of relay. Binary inputs shall be provided as per requirement of the scheme.

12.1.7 The independent test blocks shall be provided with each protection relay to facilitate testing by secondary injection test set via test plugs without disconnecting any wire or permanent connection and without affecting the other devices and protection functions. Moreover, test blocks shall be wired in such a manner that trip and alarm from the device and DC supplies to the devices are interrupted upon insertion of the test plug. The test block shall permit to supply test currents and voltages into the individual relays during testing. The CT circuit, PT circuit, DC power supplies and trip outputs to each protective device shall be routed through the test blocks.

12.1.8 Test blocks shall isolate the trip contacts of main protection relays on both sides. Injection sockets shall be arranged so that it shall not be possible to open circuit the current transformer secondary circuits when inserting test plugs. The trip functions shall be blocked when inserting the test plugs.

12.2 Ratings

12.2.1 System frequency is 50 Hz and continuous operating temperature shall be in range from -40°C to 75°C (min.)

- 12.2.2 Unless otherwise specified, the current circuit for the relays shall be suitable for 5A, 50Hz and voltage circuit shall be rated for 63.5V, 50Hz (Ph-N) or 110V, 50Hz (Ph-Ph).
- 12.2.3 The performance of the relay contacts shall be in accordance with IEC 60255-1.
- 12.2.4 Relays shall be capable of withstanding for one minute:
- a) When a voltage of 2kV AC, 50Hz is applied on control wiring, MCB, relay, measuring equipment, tripping & closing coil of circuit breaker etc. to test Insulation from ground.
 - b) When 500VDC is applied on control wiring to test insulation from ground (Insulation resistance).
- 12.2.5 The accuracy class of all relays shall conform to the applicable requirements of approved international standards.
- 12.3 **Numerical Relays**
- 12.3.1 Relays shall be of NTDC approved types complying with IEC 60255 (British Standard 142), shall have approved characteristics, flush mounted, in dust and moisture proof cases and shall comply with BS 2011 test classification 20/40/04. The components of each relay shall be suitable for operation under the local climatic conditions.
- 12.3.2 The relays shall be type tested from KEMA or equivalent independent laboratory in accordance with the latest IEC standards, with particular attention to the EMI immunity.
- 12.3.3 **a. For NTDC Grid Stations & I/P/SCADA Application**
- All protection relays shall be of numerical type and shall have serial interface (at relay front & back) and single Fiber Optic Interface (Dual FO channel if specified) compliant with IEC-61850 standard protocol to facilitate data communication with station control system. The protection schemes shall include an hardware and software to permit both local & remote setting/interrogation/real time monitoring/fault & event evaluation from the engineering/operator work station of the control room.
- b. For DISCOS (Incoming, Outgoing, Consumer, Industrial & Ring Main Panels)**
- All protection relays shall be provided with serial RS232/RJ45 or USB Ports interface (as the case may be) for uploading/downloading relay setting files & retrieve of fault/event records from protection relays. (Note: clause 12.3.3(a) shall be applicable only, if Discos particularly specify in tender document or the case may be the requirement of IEC-61850 compliant Fiber optic port for SAS system).
- 12.3.4 In case 11kV switchgear panels are installed for turnkey projects (or as specified), where Substation Automation System (SAS) are available all necessary optical distribution frames/optical splicing cassette, fiber optic cables and connectors shall be installed in panel for communication with SAS.
- 12.3.5 The numerical relays provided shall have following features:

- a) Shall be based on digital signal processing and algorithmic based functions using multiple CPUs.
- b) Programmable scheme logic.
- c) Remote setting/interrogation.
- d) Measured quantities displayed and real-time monitoring on laptop computer.
- e) Shall be of compact design and modular software.
- f) Shall have continuous self-monitoring and diagnostic features or shall have automatic relay and circuitry testing features.
- g) Shall have selection functions from protection software library and shall be complete with Menu-driven user interface program.
- h) Shall have serial interfaces (redundant ports at front & back) and IEC 61850 compliant single Fiber Optic port (for NTDC & IPPs) for on-line and off-line transmission of relay operation data, feeder load data, sequential event and fault recording, remote setting etc.
- i) Shall have time-tagged events/disturbance record. Relay shall have facility of historic fault information of at least five system faults and on demand shall display relay operations, fault recording, protection operating times and feeder load data prior to fault etc. from each system disturbance.
- j) Shall have both front and rear serial-ports for further data exploitation, equipment parameterization, retrieval of fault records etc.
- k) Shall be suitable for operation based on 110 VDC and 230 VAC auxiliary power sources as specified.
- l) Shall have built-in AC/AC and DC/DC converters for any of its modules required auxiliary supply other than 110V DC and 230V AC.
- m) All overcurrent & earth fault protection relays shall have built-in cold load pick up & switch on to fault features.

12.3.6 The design of offered Modern numeric relays should be hardened against transient surge and over voltages caused by the CT/VT and DC circuits and associated field devices. The routing of cables shall be such as to limit interference to a minimum. Any auxiliary supplies necessary to power solid state circuits shall be derived from the main station battery and not from batteries built into the relay. Continuously energized relays including those with economy resistors will not be accepted for any application.

12.3.7 Numerical relays shall have built-in RS232/USB serial communication port at the front to communicate directly with the personal computer/laptop without converter/adaptor to facilitate local interrogation, setting-up and recorded data extraction and Ethernet communication port at the rear equipped with communication software for local/remote access of data and parameter download. The relay shall have also built-in HMI (Human Machine Interface) Keypad facility for local access to relay settings, monitoring and retrieving the fault/event data recorded. Individual protection units shall be provided with an integral user interface to facilitate changes in setting and observation of indications without the use of remote communications.

12.3.8 Numeric relays shall also remain stable under conditions of Radio Interference. Radio Interference tests acceptable to the Engineer shall have been carried out by the Manufacturer and in this case RFI test reports shall be submitted for the Engineers approval. If such tests have not been carried out, the contractor shall carry out RFI tests to the satisfaction of the Engineer and submit test report for approval.

12.3.9 Hardware and Software shall be checked by software sub-routine continuously. Important components supervised shall include:

- a) CPU's and associated Memory (ROM, RAM, EEPROM etc.)
- b) Input signal validity (A/D converter)
- c) O.S. Software
- d) Protection function software
- e) Watchdog and self-monitoring software
- f) Output signal integrity
- g) Algorithm execution / logic performance
- h) Digital input conversion system
- i) I/O logic points
- j) Power Supply Noise/Failure
- k) Internal Clock

12.3.10 Functional elements in numeric relays shall have LED indicators on the front panels to enable identification of their operation, faulted phases, zones, hardware and software status etc.

12.3.11 All numerical data communication shall comply with standard protocols.

12.3.12 The numeric relay must have user friendly software which shall also support all the previous versions.

12.3.13 **Operator Interface**

- a) All numerical protection systems shall be provided with an integral local user interface, to enable communication with the relay without the use of external equipment. Any facilities provided for connection to an external computer shall be an additional feature to the local user interface. No exceptions to this requirement shall be permitted.
- b) Relay serial communication facilities should allow all information which is available locally at the relay front panel to be accessed remotely. It should also be possible to carry out bulk transfer of settings and fault record information using appropriate licensed PC based software. The necessary software for communication with each relay type shall be provided as part of the contract.

12.3.14 **Identification**

Each protection relay shall have a unique identifier that is clearly visible. The software reference and issue level shall be identified. The marking of all relays shall comply with Clause 12 of IEC 60255-6.

12.3.15 Each protection relay shall be provided with LCD display facilities on which shows:

- a) The current transformer ratio.
- b) Voltage transformer ratio (if applicable)

12.3.16 **Settings**

Each Protection shall provide a means by which the user can easily apply the required settings, which is also secure from inadvertent operation. A display of the selected settings shall be provided on the protection relay.

12.4 Testing Facilities

12.4.1 Separate testing facilities shall be provided for each current and voltage transformer secondary circuit so that as to give access for testing of protection relays, metering system and associated circuits. These shall consist of test block mounted adjacent to relays, or any other testing arrangement approved by Engineer of NTDC.

12.4.2 Test facilities shall be provided for testing of the protection/signaling schemes. These facilities shall include all features necessary to permit testing with line in service with minimum risk of unwanted tripping.

12.4.3 Test facilities for testing of protection relays, metering system and associated circuits are as follows:

- a) The outputs of current transformers can be short circuited to neutral and disconnection from relay circuits.
- b) The output of voltage transformers can be disconnected from relay circuits.
- c) Currents and voltages can be applied to relays free from any connections to the current or voltage transformers.
- d) Current and voltage earth connections shall not be disturbed by use of testing devices.
- e) Whilst in service, the currents and voltages can be measured without interrupting relay inputs.

12.5 Operating Characteristics

12.5.1 Over Current and Earth Fault Protection Relay

12.5.1.1 Over Current & Earth Fault Protection shall be numerical type only.

12.5.1.2 The relay shall have at least two (2) stages, each stage can be independently selectable as definite time or inverse time characteristics. The relay shall have non-directional three phase over current elements, one earth fault element along with independent instantaneous settings for phase & earth fault currents.

12.5.1.3 For capacitor protection, the relay shall also have built-in independent 2-stages high sensitive earth fault protection element which shall be used for two step capacitor unbalance detection protection. Each stage can be independently selectable as definite time or inverse time characteristics.

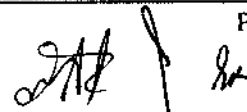
12.5.1.4 The relay shall have the facility of selection of following characteristics according to IEC 60255 and BS-142.

- a) Standard inverse
- b) Very reverse
- c) Long time inverse
- d) Extremely inverse
- e) Definite time

- 12.5.1.5
- a) Relay shall have adjustable settings for both operating current and time. The design of the relay being such that the setting can be carried out without taking relay out of service.
 - b) The range of current settings for phase fault shall cover at least 5-500 percent of rated CT current with tapings of minimum 5-percent intervals.
 - c) Earth fault element shall have a minimum range of setting from 5% to 120% of rated CT current with tapping of 5% interval.
 - d) The high set over current & earth fault element shall have a setting range of 100 % to 2500 % of rated CT current with tapings a minimum of 5-percent intervals. The tripping time of high set elements shall not be more than 20ms at current greater than two times the setting.
 - e) Time setting (definite time characteristic) for over current, earth fault & instantaneous elements shall be adjustable over a range of 0 to 60 sec with step size of 0.01 sec. Instantaneous elements shall have also an infinity setting.
 - f) Time Dial setting (Inverse Time characteristic) for both over current and earth fault elements shall be adjustable over a range of at least 0.05 to minimum 1.0 in steps not exceeding 0.01.
 - g) Over current & earth fault relays with built-in sensitive earth fault protection (Note: Sensitive Earth Fault Protection feature shall only be provided in case system is grounded via. Resistor or transformer or as per application required) shall have a minimum range of setting from 0.1% to 120% of rated CT current with tapping of 0.1% interval.
 - h) The high set Sensitive Earth fault protection shall have a setting range of 0.1% to 150 % of rated CT current with tapings of minimum 0.1% interval.
 - i) Time setting (definite time characteristic) for sensitive earth fault protection & its instantaneous elements shall be adjustable over a range of 0 to 60 sec with step size of 0.01 sec. Instantaneous elements shall have also an infinity setting.
 - j) Time Dial setting (Inverse Time characteristic) for sensitive earth fault protection shall be adjustable over a range of at least 0.05 to minimum 1.0 in steps not exceeding 0.01.
- 12.5.1.6 Each protection element shall have separate trip and alarm contacts and separate trip indicators. The relay shall have at least Six output configurable contacts and eight programmable LEDs.
- 12.5.1.7 The relays shall be thermally rated such the operating time of the relay at the highest practical current levels on combination of current and time multiplier settings shall not exceed the thermal with stand time of the relay.
- 12.5.1.8 The actual relay pick-up current shall not exceed 105% of relay setting and reset value shall not be less than 95% of pick-up current.
- 12.5.1.9 The relay shall meet with a situation of sudden change in load on switching the feeder.
- 12.5.1.10 The relay shall have built-in cold load pickup and SOTF features.



- 12.5.2 **Capacitor Unbalance Detection Relay (Built-in function of Over Current & Earth Fault Protection Relay)**
- 12.5.2.1 The built-in function of over current & earth fault protection relay shall be used as Capacitor Unbalance Detection protection. Capacitor unbalance detection relay is used in capacitor control panels and operates from 5A secondary of the bank neutral current transformer of Y section. The relay shall have 2-stages and each stage can be independently selectable as definite time or inverse time characteristics. The first stage of the relay shall initiate an audible alarm on the failure of one capacitor unit and the second stage shall cause tripping the circuit breaker on the failure of the second capacitor unit with audible/visible indications and lock-out action of over/under voltage relay in auto control mode. The neutral unbalance protection scheme for the capacitor bank shall consist of double star with neutral connected to the current transformer. The relay must have C.T arrangement for both capacitor unbalance & neutral unbalance protection.
- 12.5.2.2 The relay shall have all standard characteristics according to IEC standards.
- 12.5.2.3 Over Current and Earth Fault Protection shall be of Five elements, the fifth element shall be used for two step capacitor unbalance detection protection setting and shall be connected to neutral unbalance C.T. of 50/5A. For detail specification, the clause 12.6.1 above shall be followed.
- 12.5.2.4 This capacitor unbalance detection function can be attained by utilizing the built-in sensitive earth fault protection function of over current & earth fault relay.
- 12.5.3 **Over/Under Voltage Relay**
- 12.5.3.1 Over/Under Voltage protection shall be of numeric type. Over/Under voltage relay is used in capacitor control panels. The over voltage component of the relay shall be capable to provide capacitor protection against over voltage and facilitate auto switch OFF the capacitor bank when bus voltage exceeds a predetermined value for a preset time interval. Similarly, under voltage component of the relay switch ON the capacitor bank when bus voltage falls below a predetermined value for a preset time interval. The operation of relay shall be independent of harmonics and transients in the supply system.
- 12.5.3.2 The voltage and time sensitive automatic capacitor switching control shall be of single pole type flush mounted and suitable for installation in the switchgear instrument compartment on the front door. The scale and range of operation shall be suitable for switching a 7200kVAR capacitor bank. The accuracy shall be 2% of the full scale. Selector switches shall be provided for manual or automatic operation through "Automatic-Manual" and "Open-Neutral-Close" switches.
- 12.5.3.3 The voltage sensitive control shall measure line voltage and as function of that quantity control the relay which in turn shall operate the switchgear. The relay shall be electronically controlled with an adjustable time delay. The instrument shall also be provided adjustable bandwidth range for setting switching IN and OUT voltages so that little variation in voltage shall not cause hunting.
- 12.5.3.4 The relay shall have V.T. fuse failure feature and binary input for detecting P.T. MCB trip status and on operation of P.T. fuse failure Alarm shall be generated and lockout relay be operated for tripping of circuit breaker and close block.



12.5.4 **Trip & Lockout Relay**

12.5.4.1 Trip & lockout relay, shall be required for over current & earth fault protection and capacitor unbalance detection protection for safety reason, in order to close block operation of circuit breaker due to operation of protection relays in capacitor protection panel. It shall be electromechanical, draw out, high burden, hand and electrically reset, hand reset mechanical indication or flag, high speed and of multi-contact construction complying with E.A (ESI) standard 48-4, Class EB2. The relay coil shall be designed for continuous operation of 110 V DC with tolerance of +20% and -15%. The high burden relays shall be immune to AC and capacitance discharge current.

12.5.4.2 Lockout relays shall have at least five (5) years field proven experience. The contact arrangement shall consist of at least 3 NO and 2 NC contacts. Number of relays shall commensurate with the requirement of the protection scheme. The contact rating shall not be less than the following:

Contract Rating	Make and Carry Continuously	Make and Carry for 3-Seconds	Break
AC	1250 VA with maximum of 5A 300 V	7500 VA with maximum of 30 A and 300 V	1250 VA with maximum of 5A and 300 V
DC	1250 W with maximum of 5A and 300 V	7500 W with maximum of 30 A and 300 V	100 W resistive 50 W inductive (L/R=0.04s) with maximum of 5A and 300 V

12.5.4.3 The relays shall be suitable for flush mounting on the front of the cubicle with connections made at the rear of the case.

12.5.4.4 Tripping relay contacts shall be suitably rated to satisfactorily perform their required duty and relay operating time shall not exceed 10 ms from initiation of trip relay operating coil to contact close.

12.5.4.5 Resetting of the indicator and the contact shall be possible without having to open the relay case.

12.5.4.6 The operation and reset coils of electrically reset table trip relays shall have internal cut-off contacts.

12.5.4.7 The contactor/supplier shall submit test evidences of mechanical durability performance of the offered relays for both loaded contacts and un-loaded contacts.

12.5.4.8 The mechanical durability shall be 10,000 operations (minimum) with loaded contact.

12.5.5 **Trip Circuit Supervision Relay**

12.5.5.1 Two (02) Nos. Separate/independent Relays shall be provided for Trip Circuit Supervision.

12.5.5.2 The relay shall be electronic/electromechanical, flush mounted, dust proof, draw out type, hand reset flag with indication target to be reset manually.

12.5.5.3 The trip circuit supervision scheme shall provide continuous supervision of the trip circuits of the circuit breaker both in the open or closed position and independent of local or remote selection at the local operating position. The supervision relay shall include D.C. supply voltage, trip coils, all interconnected cables, auxiliary contacts for trip coils, trip circuit etc.

- 12.5.5.4 The relay shall also initiate an alarm if the trip supply or auxiliary supply voltage fails. The relay shall be equipped with at least 2 normally open and two normally closed contacts or alternately four 2-way changeover contacts. All contacts for alarm functions shall be volt-free, self-reset.
- 12.5.5.5 The relay shall have time delay (200 ms) on drop off to avoid mal-operation & to prevent spurious alarms due to voltage dips caused by operation of other equipment or fault in other circuits.
- 12.5.5.6 The relay shall not only monitor the presence of DC supply but also its level. It shall have provision for initiating a visual indication and audible alarm when the DC voltage falls below 80%.

12.5.6 Auxiliary Relays

- 12.5.6.1 Auxiliary relays shall be of rugged construction and shall have a high degree of reliability even when they have been idle for long periods of time. All auxiliary relay coils and contacts shall be suitable for continuous operation at 110 V DC for 11 KV system with a tolerance of + 20% and -15 %. The relay coils shall be so designed that their consumption is kept to a minimum and yet sufficient contact pressure is ensured when the relay operates to make contacts. The continuous current carrying rating of the contacts make and make rating shall not be less than 5A at 110 V DC.
- 12.5.6.2 Auxiliary relays shall be of instantaneous type or time delayed as required. The time delay provided in the relays shall not be affected by changing temperature or humidity. Auxiliary and contact multiplier relays in the tripping circuits shall be of high speed type and equivalent or better than class-I relays as defined in IEC-60255.
- 12.5.6.3 Manual reset auxiliary relays shall be high speed, multi-contact type with operation indicator.
- 12.5.6.4 Self-reset auxiliary relays shall be for rear of panel mounting, front-connected type.
- 12.5.6.5 Auxiliary tripping relays shall be self-reset, front-connected type suitable for rear-of-panel mounting.
- 12.5.6.6 The operative speed of auxiliary relays shall be within 4 to 10 ms depending on application.

12.5.7 Coils

- 12.5.7.1 The current coils of the numerical relays shall withstand the thermal and mechanical stresses at least 35 times the continuous current rating of the coil for one half second or 20 times the continuous rating of the coil for 3 seconds without damage to coil or associated mechanical or electronic components. The continuous rating shall be twice the rated current, with the specified temperature rise.
- 12.5.7.2 Voltage coils shall withstand thermal stress due to continuous energization at voltage 25% in excess of the rated voltage at all settings of the relays.

12.5.9 Indications

Operation indicators shall be provided on all elements of relays and shall be designed for hand resetting.

12.5.10 Test Devices

Relays shall incorporate test devices which shall be mounted on front of panel so that testing can be carried out from the front of the panels using test plug. The test devices shall be so arranged that the current transformer secondary circuits cannot be open circuited at any position while test plugs or covers are being inserted or removed.

12.5.11 Testing and Inspection

12.5.11.1 General

12.5.11.1.1 Testing of relays and their components shall be performed in line with NTDC specification, and in accordance with the relevant IEC standards.

12.5.11.1.2 Protection relays and their components shall be subjected to routine tests as per the relevant international standards. Protection relays mounted in cubicles shall be completely wired, tested and inspected. Routine test certificate as per relevant IEC standards shall be submitted to NTDC/DISCOs along with relay.

12.5.11.2 Routine Tests

Routine tests shall not be limited to but should cover at least the following:

Secondary injection, scheme checks, relay logic performance of engineer interface, functional-trip tests, setting ranges and calibration accuracy, response (trip) times, functional availability and application limits, system supervision, performance of communication interfaces with PCMS, events and disturbance records etc.

12.5.12 Operation and Maintenance Manual of Protection, Control & Monitoring Equipment/Relays

12.5.12.1 The supplier shall submit operation and maintenance instruction manual to the purchaser.

12.5.12.2 The complete manuals must be provided to NTDC/DISCOs before the delivery of relays or panels. Information in the manuals and documentation for relay system shall not contain less than the following:

- a) Specification and characteristics.
- b) External connections.
- c) Description and drawing of the construction and principle of operation. Additionally, for relay systems, the module layout in interconnection diagrams, internal wiring and component descriptions. For numerical relays, details / information of all applicable software, interfaces, marshalling of BI/BO contacts, programming, optional features etc. shall be provided.
- d) All setting calculation instructions explained with examples.
- e) All setting and calibrations procedures and instructions.
- f) Receiving inspections and acceptance test on instructions.
- g) Installation requirements and instructions.
- h) Routine maintenance requirements and instructions.

- i) Repair and recalibration instructions.
- j) Parts list.
- k) Design test report.
- l) Original manufacturer's instruction manuals and documentation (detailed information of basic and optional features if any) and not brochures shall be provided to Protection & Control department NTDC/DISCOs to acceptance of relays or relays system. Photocopies of manuals shall not be acceptable (i.e. all manuals shall be original as issued by Relay Manufacturers).

12.6 Rating Data

The relays shall have a rating data marked with at-least the following:

- a) Manufacturer's name
- b) Year of manufacture
- c) Type of relay
- d) Serial number
- e) Country of origin
- f) Ordering code along with detail ordering sheet
- g) Detailed technical catalogue
- h) Voltage and frequency etc. as applicable
- i) Setting ranges

13.0 CURRENT TRANSFORMER

- 13.1 The current transformers shall be single pole epoxy resin insulated, dry type, self-contained suitable for indoor mounting and shall be tested in accordance with relevant IEC and particular requirements listed herein. The class of insulation shall be at least "E" type.
- 13.2 The current transformers shall be provided with a steel mounting base as per drawing No. PDW/DF-445 which shall be securely attached to the casting and shall have coating to withstand the weather conditions.
- 13.3 For dual ratio current transformers, ratio shall be obtained by tapings on the secondary side only. The ratio(s) of current transformer shall be printed on the CT body.
- 13.4 For Consumer, Industrial and Ring main panels, two separate sets of single-core current transformers i.e. one for over-current protection and the other for metering shall be provided. The metering current transformers shall have necessary provisions for sealing of the secondary terminal box besides being located in a separate independently sealable compartment.
- 13.5 The transformation ratios required for various types of switchgear of different ratings shall be as follows:

13.5.1 Over-current Protection & Metering

Sr. No.	Type of Switchgear Panel	Ratings (Amps)
a)	Incoming panel	2400:1200/5-5Amps or 1600:800/5-5 (as per requirement)
b)	Outgoing and capacitor bank control panels	600:300/5-5
c)	Industrial and ring main panels — Protective and metering CT (as specified by the purchaser)	100/5 or 150/5 or 200/5 or 300/5 or 600/5
d)	Consumer panel — Protective CT — Metering CT	600:300/5 600:300/5
e)	Outdoor capacitor bank neutral current transformer of protection class	50 / 5

13.5.2 Differential Protection

Incoming panel	2400:1200/5Amps or 1600:800/5 Amps (as per requirement)
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13.6 Rating and characteristics

The rating and characteristics of the current transformers shall be as under:

Sr. No.	Type designation	Metering (M)	Protection (P)	Metering and Protection (MP)
a)	Rated Voltage, U_m , kV, rms	12	12	12
b)	Nominal voltage, U_n , kV, rms	11	11	11
c)	Rated frequency, Hz	50	50	50
d)	Rated Secondary Output:			
	- Measuring winding: VA.	10		10
	- Protective winding: VA.	-	15	15
e)	Accuracy Class:			
	- Measuring winding.	0.5FS10 ^(a)	-	0.5FS10 ^(a)
	- Protective winding.	-	5P20	5P20

Sr. No.	Type designation	Metering (M)	Protection (P)	Metering and Protection (MP)
f)	Short time current rating at all ratios, kA			
	- Thermal, I _{th}	25	25	25
	- Dynamic, I _{dyn}	63	63	63
g)	Rated short-circuit duration, sec.	1	1	1
h)	Accuracy limit factor for protection core	-	20	20
i)	One-minute power frequency withstand voltage, kV			
	- Primary winding	36	36	36
	- Secondary winding	3	3	3
j)	Impulse withstand voltage, 1/50 μ sec., kV Peak	95	95	95
k)	Temperature rise, °C, Max.	40	40	40
l)	Partial Discharge, (Maximum)			
	Um, pC 1.2Um/√3	50 20	50 20	50 20

Notes:

- a) Panels provided with Power Quality Analyzer shall have Metering C.T. accuracy class of 0.2s.
- b) The VA burden of CTs mentioned in table is at secondary lowest tap position and shall be multiplied correspondingly on higher taps.

13.7 **Rated Continuous Thermal Current (I_{cth})**

The current transformer shall be capable for continuous operation at 1.2 times the rated current.

13.8 **Temperature Rise**

13.8.1 The temperature-rise of the current transformers when carrying primary current equal to the rated continuous thermal current (1.2 times the rated current) with a unity power factor & burden corresponding to the rated output under service conditions shall not be more than 40°C.

13.8.2 Test shall be carried out as per relevant IEC standard.

13.9 **Markings**

The terminals P1 & P2 shall be printed in the CT body. The marking shall carry at least the following information in an indelible manner. No sticker is allowed.

- a) Manufacturer's name & trade mark

- b) Serial number and type designation
- c) Rated primary and secondary currents
- d) Rated voltage
- e) Rated frequency
- f) Rated output and corresponding accuracy class for each core
- g) Rated insulation level (e.g., 36/95kV)
- h) Rated thermal and dynamic currents (e.g. 25/63kA)
- i) Class of insulation
- j) For CTs with dual secondary windings, the use of each winding and its corresponding terminals
- k) Rated continuous thermal current (e.g., $I_{cth} = 120\%$)

13.10 Tests on Current Transformers

13.10.1 Tests shall be performed in accordance with the procedure mentioned in relevant IEC Publication by the manufacturer and the test report shall be submitted.

13.10.2 Routine Tests

The following routine tests shall be made on each CT as per relevant IEC.

- a) Verification of terminal markings.
- b) Power frequency withstand test on primary windings.
- c) Power frequency withstand test on secondary windings.
- d) Inter-turn over voltage test.
- e) Partial discharge measurement.
- f) Measurement of the resistance of primary and secondary windings. The measured resistance should not exceed the resistance of the type tested CT and approved by Design NTDC.
- g) Accuracy tests with 20%, 100% and 120% of rated current (for metering core only).
- h) Composite error, current and phase displacement measurements (for protection core only).

The number of current transformers to be tested for accuracy tests and partial discharge test shall be the nearest higher whole number to the cube root of the number of current transformers to be supplied with panels or in loose. If one specimen fails to meet the requirements of any individual test specified above, a second sample shall be selected at random from the same lot. Failure of any specimen from the second sample shall cause rejection of the entire lot.

13.10.3 Type Tests

Duly certified complete type test reports for the following tests carried out on Current Transformers at an independent lab having same design, ratios, current & voltage ratings shall be acceptable in lieu of actual tests. In case of non-production of the requisite type test reports or if the type test reports are otherwise not acceptable to the Design NTDC, the following tests shall be performed on the Current Transformer having same ratings and design as ordered in presence of two representatives one from Design, NTDC and other from purchaser at any independent lab approved by design NTDC at the cost and arrangement of the manufacturer including travel expenses, boarding, lodging and daily allowance for the representatives. The validity of type tests shall be per type test policy of NTDC.

- a) Short-time current tests.
- b) Temperature-rise test.
- c) Lightning impulse withstand voltage test.
- d) Measurement of the resistance of primary and secondary windings.
- e) Power frequency voltage withstand test at Primary & secondary windings.
- f) Inter-turn over voltage test.
- g) Partial discharge measurement.
- h) Accuracy test (for metering core only).
- i) Test for composite error, current error and phase displacement measurement (for protection, cores only).
- j) Instrument security current tests (for metering cores only).

13.11 **Data and Drawings to be submitted for approval**

- a) Schedule of technical data.
- b) Excitation curve.
- c) Typical composite error curves for the standard burden from 0 to 20 times rated secondary current for protective current transformers.
- d) Overall assembly drawing showing front, side and plan views and sufficient cross-sectional views clearly showing the transformer.
- e) Dimensional drawings of mounting base and terminals.
- f) Side view photo of current transformer.

14.0 **VOLTAGE TRANSFORMERS**

14.1 The voltage transformers shall be single pole epoxy resin insulated, dry type, self-contained suitable for indoor mounting and shall be tested in accordance with relevant IEC and particular requirements listed herein. The class of insulation shall be at least "E" type.

14.2 The voltage transformers shall be provided with a steel mounting base which shall be securely attached to the casting and shall have coating to withstand the weather conditions.

14.3 The voltage transformer shall be so installed as to be energized prior to the closing of the breaker for incoming, industrial & ring main panels and shall be capable of convenient isolation from the bus bars. For protection against short circuit on secondary side, a triple pole AC miniature circuit breaker shall be installed in the instrument compartment.

14.4 **Rating and characteristics**

The rating and characteristics of the voltage transformer shall be as under:

Sr. No.	Type designation	Rating
a.	Rated Primary Voltage, U_m , kV rms	12
b.	Nominal Primary voltage, U_n , kV rms	11
c.	Nominal Secondary voltage, U_n , V rms	110
d.	Rated frequency Hz	50
e.	Rated Secondary Output, VA	100

Sr. No.	Type designation	Rating
f.	Accuracy Class:	0.5
g.	Rated Voltage Factor, - Continuous duty, - 30 second duty,	1.2
		1.5
h.	Rated Insulation Level, kV - Power Frequency withstand Voltage of Primary winding - Impulse withstand voltage, 1/50 μ sec., kV Peak	36
		95
i.	Power Frequency withstand Voltage of Secondary winding	3
j.	Partial Discharge: Um, pC 1.2Um/ $\sqrt{3}$, pC	50
		20
k.	Short circuit withstand duration, sec.	1

14.5 **Temperature-rise**

14.5.1 The temperature-rise of the voltage transformer at the specified voltage, at rated frequency, at rated burden and at any power factor between 0.8 lagging and unity under service conditions shall not be more than 40°C. The voltage to be applied to the voltage transformer shall be 1.2 times the rated primary voltage.

14.5.2 Test shall be carried out as per relevant IEC standard.

14.6 **Short-circuit Characteristics**

14.6.1 Voltage transformer shall be capable of withstanding the mechanical and thermal stresses for one second resulting from short-circuit on secondary terminals with full voltage maintained on the primary terminals. The Voltage Transformer shall be energized from the primary side at rated voltage and the short circuit current applied between the secondary terminals for duration of 1s. The test may be carried out by energizing the secondary winding and applying the short circuit between the primary terminals of voltage transformer.

14.7 **Markings**

The marking shall be in accordance with relevant IEC standard. The marking shall carry at least the following information in an indelible manner. No sticker is allowed.

- a) The manufacturer's name & trade mark
- b) Serial number and type designation
- c) Rated primary and secondary voltage
- d) Rated frequency
- e) Rated output and accuracy class (e.g., 100VA Class 1.0)
- f) Class of insulation
- g) Rated insulation level (e.g., 36/95kV)

- h) Rated voltage factor and corresponding rated time (e.g., 120% continuous & 150% for 30s)
- i) Connection diagram and polarity marking

14.8 Tests on Voltage Transformers

Tests shall be performed in accordance with the procedure mentioned in relevant IEC Publication and the test report shall be submitted for approval of design NTDC.

14.8.1 Routine Tests

The following routine tests shall be made as per relevant IEC standard.

- a) Verification of terminal marking
- b) Power frequency withstand voltage test on primary windings
- c) Power frequency withstand voltage test on secondary windings.
- d) Partial discharge measurement.
- e) Determination of errors according to requirement of accuracy class.
- f) Measurement of resistance of primary and secondary winding. The measured resistance should not exceed the resistance of the type tested PT and approved by Design NTDC.

The number of voltage transformers to be tested for accuracy tests and partial discharge test shall be the nearest higher whole number to the cube root of the number of voltage transformers to be supplied with panels or in loose. If one specimen fails to meet the requirements of any individual test specified above, a second sample shall be selected at random from the same lot. Failure of any specimen from the second sample shall cause rejection of the entire lot.

14.8.2 Type Tests

Duly certified complete type test reports for the following tests carried out on voltage transformer at an independent lab having same design, ratios & voltage ratings shall be acceptable in lieu of actual tests. In case of non-production of the requisite type test reports or if the type test reports are otherwise not acceptable to the Design NTDC, the following tests shall be performed on the Voltage Transformer having same ratings and design as ordered in presence of two representatives one from Design, NTDC and other from purchaser at any independent lab approved by design NTDC at the cost and arrangement of the manufacturer including travel expenses, boarding, lodging and daily allowance for the representatives. The validity of type tests shall be per type test policy of NTDC.

- a) Temperature-rise test.
- b) Lightning impulse voltage test.
- c) Power frequency withstand voltage test on primary windings.
- d) Power frequency withstand voltage test on secondary windings.
- e) Measurement of resistance of primary and secondary winding.
- f) Short circuit withstand capability test.
- g) Determination of errors.
- h) Partial discharge measurement.

14.8.3 **Data and Drawings to be submitted for approval**

- a) Schedule of technical data.
- b) Overall assembly drawing showing front, side and plan views and sufficient cross-sectional views clearly showing the transformer.
- c) Dimensional drawings of mounting base and terminals.
- d) Side view photo of voltage transformer.

15.0 **CONTROL WIRING AND TERMINATION**

15.1 Control cable used in wiring shall be of 600V grade multi stranded copper wires and shall conform to NTDC specification P-100 (Amended to date). Voltage circuit shall be made with **2.5mm²** cable and current circuit with **4mm²** cable. All control wiring shall run through steel channels with removable covers in HV compartment. In instrument compartment, the wiring shall be routed through PVC trays.

15.2 Each wire shall be identified by machine lettered permanent printed at least 50mm from the end of wire or plastic identification ferrules. Ground wire has no number and identified by cable color. Following color identification shall be applied:

3-phase AC	1-Phase AC	DC	Color
Phase 1	Phase	Positive	Red
Phase 2	-	-	Yellow
Phase 3	-	-	Blue
Neutral	Neutral	Negative	Black
Ground	-	-	Green

15.3 Each switchgear panel shall be supplied with necessary length of control wiring required for interconnection complete with adjacent panel.

15.4 **Termination**

15.4.1 The control wiring shall be terminated in a terminal block. The terminals shall be tinned copper and may be crimped or compression applied. Only one wire shall be terminated in a terminal block. Termination of more than one wires in a terminal block is not allowed.

15.4.2 Terminal blocks shall be mounted on the rails. Each row of the terminal blocks shall be covered with end plates/brackets. The rated cross section of terminal blocks used in voltage & current circuits shall be 4mm² & 6mm² respectively. Terminal blocks used in current circuit shall be supplied with movable short circuit plates/links covered with insulating material on one side along with screw type test socket quipped with sleeve. Provision shall be available in terminal block for fixation of push-on marking tag. The marking tag shall consist of white background with black printing with max. of three characters.

15.4.3 Terminal blocks shall conform to the requirements of IEC 60947-7-1. Duly certified complete test reports from an independent lab carried out by the manufacturer having same design & ratings shall be provided.

15.4.4 Terminal blocks for AC & DC circuits shall be placed separately. 10% spare terminal blocks of each type shall be provided in the panels. Terminal blocks shall be provided with a slip-on cover of transparent polycarbonate material to avoid any accidental touch.

16.0 INSTRUMENTS

16.1 The instruments installed on the panels shall conform to IEC 60051 and the requirements listed herein. AC moving iron analogue instruments shall be semi flush mounted, back connected, dust proof, having a removable transparent dust tight window cover with a dull black finish and having facility to change the scale from top with or without opening the instrument. The size of instrument shall be 96mm × 96mm unless otherwise specified. The zero adjuster will be provided outside the instrument.

16.2 Power Factor Meter

The Power factor meter shall be suitable and robust enough to withstand the momentary high disturbances without damage or loss of accuracy and comply with the following ratings, characteristics:

Sr. No.	Characteristics	Ratings
a)	Voltage input	110 V
b)	Current input	5A
c)	Accuracy class	1
d)	Rated frequency	50 Hz
e)	Scale range	Lead 0.5 - 1- 0.5 Lag

16.3 Ammeter

16.3.1 The ammeter shall be suitable and robust enough to withstand the momentary high current arising in the circuits during short-circuit conditions without damage or loss of accuracy and comply with the following ratings, characteristics:

Sr. No.	Characteristics	Ratings
a)	Current	1.2 In continuous 5.0 In for 30s 10 In for 5s 40 In for 1s
b)	Accuracy class	1
c)	Rated frequency	50 Hz
d)	Secondary current of CT	5A

16.3.2 The full-scale values of ammeters for use with the current transformers shall be 125% of full scale value.

16.4 **Voltmeter**

The Voltmeters shall be suitable and robust enough to withstand the momentary high disturbances without damage or loss of accuracy and comply with the following ratings, characteristics:

Sr. No.	Characteristics	Rating
a)	Voltage	1.2 Vn continous, 2.0 In for 5s
b)	Accuracy class	1
c)	Rated frequency	50 Hz
d)	Secondary voltage of VT	110V
e)	Scale range	0 – 15kV

16.5 **Power Quality Analyzer**

The Power Quality Analyzer shall be suitable and robust enough to withstand the momentary high disturbances without damage or loss of accuracy and comply with the following ratings and characteristics.

1. Panels provided with Power Quality Analyzer shall have Metering CT accuracy class of 0.2s.
2. Power Quality Monitoring equipment/ analyzer shall be installed in accordance with EN 50160, IEC 61000-4-30, IEC 61000-4-7, IEC 61000-4-15 & IEC 62586-1 standards.
3. It shall fulfill the highly precise energy management tasks and shall have an accuracy class of 0.2s according to IEC 62053-22 and Class A category according to IEC 61000-4-30.
4. It shall fulfill graphical display with back ground illuminated and transparent front cover and its size shall be preferably 144mm x 144mm.
5. It shall have flush mounting design.
6. It shall have four inputs for AC voltage measurements & 4 inputs for AC current measurements with in/out arrangement.
7. It shall operate on both DC & AC supply voltage:
 - a) DC supply voltage 70V to 250V with $\pm 20\%$ tolerance
 - b) AC supply voltage 110V to 240V with $\pm 20\%$ tolerance 50Hz
8. The typical life of battery shall be:
 - a) 10 years for operation with permanently applied supply voltage
 - b) At least 02 months over a 10 years' period for operation with sporadically interrupted supply voltage.
9. It shall be capable to measure the following electrical parameters:
 - a) Voltage (Phase-N, Phase-Phase)
 - b) Current per phase
 - c) Power Frequency
 - d) Active, Reactive & Apparent Power (Import/Export) in four quadrants
 - e) Power factor and active power factor

- f) Phase Angle
 - g) Unbalance voltage & current
 - h) Harmonics of AC voltage & current are stored up to the 40th order for evaluation
 - i) THD (Total Harmonic Distortion) of AC voltage & current
 - j) Flicker
10. It shall monitor the following minimum power quality parameters of Electrical Network as per IEC/EN standards.
- a) Power Frequency distortions
 - b) Power frequency dips
 - c) Magnitude of Supply voltage and currents and other electrical parameters.
 - d) Flicker instantaneous, short and long.
 - e) Supply voltage dips/sags
 - f) Supply voltage swells
 - g) Short and long supply Voltage interruptions
 - h) Transient under/over voltages and currents.
 - i) Supply voltage unbalance and variations
 - j) Supply Voltage and current harmonics and THD
 - k) Supply Voltage and current inter harmonic
 - l) Mains signaling voltage on the supply voltage/noises
 - m) Rapid voltage changes
 - n) Measurement of under deviation and over deviation parameters
11. All parameters shall be fully configurable.
12. Both measurements and events shall be recorded at different time intervals. PQM shall be capable to provide following functions according to EN/IEC standard.
- a) Measured recorder
 - b) Event recorder
 - c) Trend recorder
 - d) Waveform captures
 - e) Load profile
 - f) Transient log
13. The PQM shall have serial/RJ45/USB interfaces as the case may be for programming of PQM and configuration of electrical parameters and real time monitoring of electrical parameters on laptop computer via PQM software.
14. It shall have at least 8-GB memory for recording recorder data. The store data shall be exported automatically & transmitted to remote station computer/SAS via software and shall be shown in tabular and graphical forms and to generate different standardized power quality reports according to EN 50150 NS & MS or EN 50160 HS or generate use defined reports.
15. The PQM shall have front keypad for manual configuration of electrical parameters.
16. The PQM shall be equipped with RS485 or RJ45 or any other communication port with communication protocols. It shall also be capable to interface with different or same type of PQM devices for development of integrating network and for remote interrogation of PQM data on remote station computer for monitoring and programming of PQM meters and time synchronization in case of DISCOs network.

17. In case of IPPs/NTDC system the PQM shall have IEC 61850 complaint single Ethernet port for communication, monitoring, programming and GPS time synchronization via SAS.
18. The measured/monitoring values shall be recorded with date & time stamps.
19. It shall have at least two binary inputs & outputs.
20. Its degree of ingress protection shall be [P5].
21. The supplier/contractor shall supply all the necessary software for programming of PQM to export recorded data from PQM i.e. measured recorder, event recorder, trend recorder, waveform captures, load profile recording & transient log to station PC & remote-control center for storage & further evaluation/analysis along with connectors, programming and network communication cables and allied aux. equipment without any additional cost and shall be part of supply/contract.

16.6 Scale Marking

16.6.1 Marking and symbols of instrument shall be in accordance with IEC 60051. Scale plates shall have a permanent white finish with black graduation and numerals marked at 90 °. The marking shall carry at least the following information in an indelible manner.

- a) Accuracy Class.
- b) Transformation ratio.
- c) Manufacturer's name & country of origin.
- d) Scale range calibrated in Red if exceeds the nominal C.T. or P.T. value.

16.6.2 For the instruments which are used in conjunction with current transformers, the number of scales shall be in accordance with the number of CT ratios available on the connected current transformers, there being a separate scale plate for each ratio.

16.6.3 The required number of scale plates shall be fixed on the instruments so that after changing the CT ratio the corresponding scale plate of the instrument could also be changed. The scale plates shall clearly define the corresponding CT ratio. The CT ratio shall be prominently marked on the dial plate. The scale marking shall be evenly distributed between 10% & 100% of the scale range.

16.6.4 Instruments shall conform to the requirements of relevant IEC standard. Duly certified complete test reports from an independent lab carried out by the manufacturer having same design & ratings shall be provided.

17.0 ENERGY METERS

The energy meters shall conform to the NTDC specification P-202:2012 amended to date "Energy Meters for Grid Metering".

18.0 MINIATURE CIRCUIT BREAKERS

18.1 Miniature circuit breaker shall withstand a continuous duty and shall carry the rated current without exceeding the specified temperature-rise. The rating of MCB shall be as under:

i.	Rated voltage	250 V AC or 110V DC (as applicable)
ii.	Rated current	10 A
iii.	Rated breaking current	10 kA
iv.	Maximum operating time	< 500 m/s (at rated breaking current)

- 18.2 Each MCB shall have at least two auxiliary contacts. The power source signaling light shall be 110 VDC.
- 18.3 DC MCBs shall be used in DC circuits. AC or universal type MCBs shall not be accepted in lieu of DC MCBs.
- 18.4 MCBs shall conform to the requirements of relevant IEC standard. Duly certified complete type test reports from an independent lab carried out on MCBs by the manufacturer having same design & ratings shall be provided.

19.0 **RATING PLATE**

19.1 The rating plate for each complete panel shall be fixed on the front side of the enclosure as shown in drawing No. PDW/DF-299. The plate shall be made of stainless steel or Aluminium of at-least 1mm thickness. The plate shall be marked with the following engraved text in black color:

- i) Switchgear Panel Manufacturer's name
- ii) CB manufacturer's name & Country of origin.
- iii) Type/designation of CB
- iv) Panel serial number
- v) Year of manufacture
- vi) Rated voltage
- vii) Frequency in Hz
- viii) Rated insulation level:
 - a. Lightning impulse withstand voltage
 - b. Power frequency withstand voltage
- ix) Current rating of the Circuit Breaker:
 - a. Continuous at 40°C
 - b. Short-time
- x) Rated short-time withstand current (for main and earthing circuits)
- xi) Rated peak withstand current (for main and earthing circuits)
- xii) Rated duration of short circuit (for main and earthing circuits)
- xiii) Current transformation ratio of the CTs installed:
 - a. Metering
 - b. Protection
 - c. Differential
- xiv) Voltage ratio of voltage transformers where applicable
- xv) Diagram of connections as per drawing No. PDW/TE-850
- xvi) Weight:
 - a. Circuit breaker
 - b. Total
- xvii) Contract/Purchase Order No. and date
- xviii) Reference standard

19.2 The rating plate for circuit breaker, load break switches, relays, instrument transformers, instruments and energy meters shall be fixed on the equipment as specified in the respective clauses.

19.3 Operating Instruction Plate

19.3.1 An operating instruction plate indicating all necessary steps to be followed in the required sequence of operation for withdrawing and insertion operations of the circuit breaker shall be fixed right on the front of enclosure for the guidance of the operator.

19.3.2 The instruction plate shall be made of stainless steel or aluminum sheet of minimum 1.0mm thickness and so placed that it immediately catches the eyes of the operator when he intends to perform any operation of the circuit breaker.

19.3.3 The operating instructions on the plate shall be engraved in English as well as in Urdu language in black color.

20.0 TESTS ON PANELS

20.1 The components forming part of metal enclosed switchgear shall comply with and be tested according to the tests specified in the relevant clauses of this specification. The tests listed herein shall be made in accordance with the procedure mentioned in relevant IEC standards and as specified herein.

20.2 Type Tests

20.2.1 Type tests to be made on a completely assembled Metal Clad switch gear. The type tests may be carried out on a maximum four test specimens followed by grouping of tests as defined in IEC 62271-1.

20.2.2 Following type tests shall be made on representative switchgear incoming & outgoing panels including a complete three pole circuit breaker to be supplied, complete with any disconnecting features, with vent outlet forming part of unit with main connections and bus-bars in presence of two representatives from Design NTDC at an STL approved lab or at any independent lab approved by Design NTDC at the cost & arrangement of the manufacturer including travel expenses, boarding, lodging and daily allowance for the inspectors to prove compliance with the requirements as listed in this specification. The validity of the type tests reports shall be as per type test policy of NTDC.

- a) Dielectric tests.
- b) Measurement of the resistance of the main complete circuit, Breaker and interrupter in assembled condition and instrument transformers.
- c) Temperature-rise test as specified.
- d) Verification of the degree of protection of persons against approach to live parts and contact with moving parts.
- e) Mechanical operation tests.
- f) Extended mechanical endurance test.
- g) Verification of making and breaking capacities.
- h) Short time withstand and peak withstand current tests on main and earthing circuit.

- i) Short-circuit life test as specified for 630A Panel.
- j) Electrical endurance test for 2500A Panel.
- k) Capacitor bank breaking test.
- l) Measurement of contact wear both after short circuit making and breaking tests and short circuit life test.
- m) Small inductive test.

However if the circuit breaker had been previously type tested as per requirement of clause 7.10 of this specification then following tests are required to be performed on representative switchgear incoming & outgoing panels in the presence of two representatives from Design NTDC at an independent lab approved by Design NTDC at the cost & arrangement of the manufacturer including travel expenses, boarding, lodging and daily allowance for the inspectors to prove compliance with the requirements as listed in this specification.

- a) Dielectric tests.
- b) Measurement of the resistance of the main complete circuit, Breaker and interrupter in assembled condition and instrument transformers.
- c) Temperature-rise test as specified.
- d) Verification of the degree of protection of persons against approach to live parts and contact with moving parts.
- e) Short time withstand and peak withstand current tests on main and earthing circuit.

20.2.3

The results of all type tests shall be recorded in type test reports containing data to prove compliance with the specification, and sufficient information shall be included so that the essential parts of the switchgear can be identified. In particular, the following essential information shall include:

- Name of manufacture of switchgear panel.
- Type designation of switchgear panel.
- Rated voltage.
- Rated frequency.
- Rated insulation level.
- Rated normal current.
- Rated short time and peak withstand currents.
- Rated duration of short circuit.
- Rated supply voltage of closing & opening devices and of auxiliary circuit.
- Make, Type, country of origin, Serial No. of circuit breaker.
- Make, Type, country of origin, Serial No. of interrupter.
- Rated short circuit making and breaking currents of circuit breaker.
- Rated operating sequence of circuit breaker.
- Details of operating mechanism and devices employed during tests.
- Rated cable charging breaking current of circuit breaker.
- Rated out of phase making and breaking current of circuit breaker.
- Rated single capacitor bank breaking current of circuit breaker.
- Rated back to back capacitor bank breaking current of circuit breaker.
- Rated capacitor bank inrush making current of circuit breaker.

- Rated back to back capacitor bank inrush making current of circuit breaker.
- Outline drawings and data schedules of switchgear panel.
- Photographs to illustrate the condition of switchgear before and after tests
- Record of test quantities during each test or test duty, as specified in relevant IEC standard.
- Statements of behavior of the switchgear during tests, its condition after test and any parts renewed or reconditioned during the tests.
- The type test reports shall incorporate sufficient information to identify the circuit breaker and general information concerning its supporting structure or metal enclosed unit of which the circuit breaker forms an integral part. Such information shall include but is not restricted to, drawings of breaker general assembly, cross section of the breaker through the axis of arcing contacts, detail of arc control devices, contacts and the operating and coupling mechanism of the breaker, information about the materials used, the outline and other important dimensions such as the travel of moving contact etc. The details of mountings, fixing on insulators, the working details of operating mechanism such as the ampere turns, voltage, cross section of plungers and pole pieces for operating coils.

20.2.4 Type tests carried out on a representative switchgear incoming panel of a manufacturer shall be applicable for bus coupler panel provided the circuit breaker & all allied accessories/equipment to be used shall exactly be of same design, identical in their shape, in their dimensions, in their operating conditions, current & voltage ratings, breaking capacity etc. subject to performance of Short time withstand and peak withstand current test, Dielectric test and temperature rise test as specified on bus coupler panel at an independent lab approved by Design NTDC.

20.2.5 Type tests carried out on a representative switchgear outgoing panel of a manufacturer shall be applicable to industrial, consumer and capacitor bank control switchgear panel(s) provided the circuit breaker & all allied accessories/equipment to be used shall exactly be of same design, identical in their shape, in their dimensions, in their operating conditions, current & voltage ratings, breaker capacity etc. subject to performance of Short time withstand and peak withstand current test, Dielectric test and temperature rise test as specified at an independent lab approved by Design NTDC.

20.2.6 Type testing shall be followed by routine testing as per clause 20.3.1.

20.2.7 **Temperature Rise Test**

The temperature rise test of the main circuit, auxiliary circuits & devices of the panel when carrying rated current shall be according to IEC-62271-200. However, the limits of temperature rise specified in the relevant IEC standard shall be reduced by 10°C to account for higher ambient condition required in this specification.

Note: The quality of the coated contacts shall be such that a continuous layer of coating material remains in the contact area after type tests, otherwise the contacts shall be regarded as "bare". Manufacturer shall specify the thickness of coating during type tests.

20.2.8 Measurement of the resistance of Main Circuit and Interrupter

The measurement of resistance shall be carried out as per relevant IEC standard. The resistance of main circuit measured during routine testing shall not exceed 1.2 times the resistance measured before temperature rise test.

20.2.9 Tolerances on Test Quantities

Sr. No.	Designation of the Test	Test Quantity	Tolerances
i)	Power frequency voltage test	Test voltage	±1%
ii)	Impulse voltage test	Peak value Front time Time to half value	±3% ±30% ±20%
iii)	Temperature rise test	Test current Frequency Ambient temperature	+2% +2% to -5% +10 to +40°C

20.3 Routine Tests

20.3.1 The following routine tests shall be made on all switchgear panels at the manufacturer's works during pre-delivery inspection:

- a) Verification of name plate data, marking on CTs, PTs & and other instruments.
- b) Visual inspection, verification of dimensions & components used in operating mechanism and other constructional details to verify their conformance to the approved drawings as well as of type tested sample.
- c) Checking of interlocking arrangement and other requirements.
- d) Inspection of accessories and components to be supplied with the panels.
- e) Measurement of the resistance of the main circuit, Breaker and Interrupter.
- f) Mechanical operation tests to ensure the proper functioning of the shutter, mechanical interlocks, etc.
- g) Tests of auxiliary electrical devices.
- h) Verification of the interchangeability of components of the same rating and construction.
- i) Power frequency withstand voltage tests on the main circuit.
- j) Tests on control and auxiliary circuits. This includes dry short duration power frequency voltage withstand test, inspection of auxiliary & control circuits, verification of conformity to the circuit diagram and wiring, components, functional tests, verification of protection against electric shock and degree of protection (IP Code)
- k) Test on bus-bar insulation. The insulated bus-bar selected randomly shall withstand Power frequency for one (01) minute applied between the bus-bar sample and an electrode (metallic foil) effectively covering the outer surface of the insulation but sufficiently far from the ends of the sample of bus-bar.
- l) Testing of C.Ts, P.Ts, metering equipment and protection relays via. Test Set.

20.3.2 The acceptance/inspection certificate clearly indicate the performance of above tests during pre-delivery inspection/testing and test results shall be submitted to the Purchaser.

21.0 SPARE PARTS

The requirements of spare parts to be supplied against an order shall be clearly indicated by the purchaser in the schedule of prices keeping in view the available stock of spares. A list of commonly required spares is given below for guidance of purchaser for each group of twenty (20) switchgear panels of same characteristics and ratings

- a) Complete trolley 1 Nos.
- b) Current transformer 3 Nos.
- c) Voltage transformer 3 Nos.
- d) Vacuum bottles 3 Nos.
- e) Complete insulation housing
- f) Busbar spouts with contacts, 1 Set.
- g) Bus-bar support insulators 1 Set
- h) Set of trip coils (DC & AC) as applicable.
- i) Operating mechanism complete 1 No.
- j) Charging motor 1 No.
- k) Overcurrent relay each type used 1 No.
- l) Supervision relay, 1 No.
- m) Socapex 1No.
- n) Test Block 1No.
- o) Hooter 1 No.
- p) Set of signaling Lamps, 1 No.
- q) Ammeter with spare parts 1 No.
- r) Voltmeter 1 No.
- s) Power Quality Analyzer 1 No.
- t) Power factor meter 1 No.
- u) Terminal blocks 10 Nos.
- v) Auxiliary relays 02 Nos.
- w) Test Plug for Testing of Protection Relays 2 No.
- x) Set of insulating sheets 3 Sets used for insulating, covering and partitioning.

22.0 DRAWINGS AND DESCRIPTIVE DATA

22.1 Data to be provided by Purchaser/End User

Following data/requirement shall be provided by the purchaser/end-user.

- a) Type of Panel with rating.
- b) Requirement of Earthing switch and Power Quality Analyzer.
- c) Any specific requirement of tools & accessories other than clause 5.12.
- d) Requirement for relays as per clause 12.3.3.
- e) Requirement of spare parts.

f) Any other special requirement.

22.2 Drawings & Data to be submitted with the bid

22.2.1 Overall assembly drawing showing front, back side and plan views with doors closed and open of switchgear panel. Sufficient cross sections and parts views shall be indicated to clearly show all the equipment. All leading dimensions and clearances shall also be indicated.

22.2.2 Supply record of offered type, current & voltage rating of switchgear panels for last five years on the following format:

Sr. No.	Contract/Purchase Order No. & date	Quantity	Current/Voltage rating	Delivery period	Client Address/ Phone/ Fax No./ E-mail, etc.
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22.2.3 The schedule of technical data completely filled-in attached hereto. The word indicating "as per specification/standard", "equivalent" will not be acceptable.

22.2.4 Manufacturer's catalogues/drawings as required in the schedule of technical data.

22.2.5 Non-submission of completely filled - in schedule of technical data and supply record on the above format or submission of incomplete information/data as mentioned above with the bid, may render the bid non-responsive.

22.3 Drawings & Data to be submitted for approval

The supplier/manufacturer shall be required to furnish the following for approval:

- a) The schedule of technical data completely filled-in attached hereto. The word indicating "as per specification/standard", "equivalent" will not be acceptable.
- b) List of all the components/equipment, their manufacturer's name & country of origin used in the manufacture of switchgear panels.
- c) Complete wiring and schematic diagram.
- d) Overall assembly drawing showing front, side and plan views. Sufficient cross-sections and part views shall be included to clearly indicate all the equipment and insulation barrier plates. All leading dimensions and clearances shall be indicated. The sizes, and lengths of all sheets, angles, and shapes shall be provided.
- e) The drawings of support insulators, bus-bars, cable entry plates, lifting eyes, hinges, locking and sealing facilities and handles etc.
- f) The equipment used in the CB and in their operating mechanism, etc.
- g) The drawing showing detailed physical arrangements and connection of the load break switch.
- h) Detail of Earthing Arrangement.

23.0 PACKING AND TRANSPORTATION

The switchgear panels and all allied accessories shall be supplied in packing suitable for transport by rail/road and sea as per international practice. Special precaution may be essential for protection


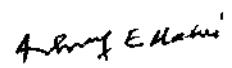
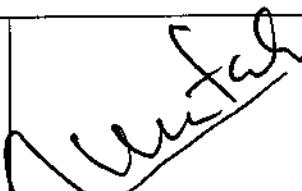

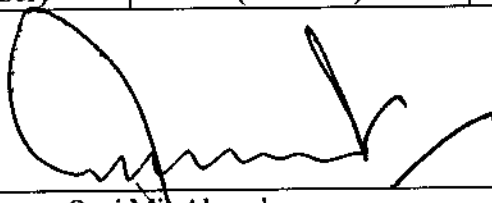
of insulation during transport to prevent moisture absorption due, for instance, to rain, snow or condensation for one year.

24.0 ATTACHMENTS

Following data sheets and drawings are attached herewith:

- a) Schedule of Technical Data
- b) Drawings
 - i) PDW/DF-297
 - ii) PDW/DF-299 A
 - iii) PDW/DF-299 B
 - iv) PDW/DF-300
 - v) PDW/DF-423
 - vi) PDW/DF-444
 - vii) PDW/DF-445
 - viii) PDW/DF-446
 - ix) PDW/DF-447
 - x) PDW/TE-580
 - xi) PDW/TE-581
 - xii) PDW/TE-582
 - xiii) PDW/TE-1331
 - xiv) PDW/TE-1630
 - xv) PDW/TS-2010
 - xvi) PDW/TS-4932

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DATE OF APPROVAL:			
APPROVED BY:			
			
Mr. Naeem Hassan	Mr. Ashraf Elahi	Mr. Raja Liaqat	Mr. Rao Afzal
CE (S.S.D) NTDC (Secretary)	GM (D&E) NTDC (Member)	GM (A.M) North NTDC (Member)	GM (P.D) North NTDC (Member)
			
Qazi Mir Ahmed			
GM(TECH) NTDC (Convener)			

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**SCHEDULE OF TECHNICAL DATA
FOR 11kV METAL-CLAD SWITCHGEAR PANELS
(NTDC SPECIFICATION P-44:2018)**

A. GENERAL		Proposed Data	Deviation from P-44:2018 (If any)
1.	Switchgear Manufacturer's name		
2.	Switchgear Manufacturer's address		
3.	Type test reports attached	YES/NO	
4.	Type/designation of switchgear panel on which following type tests performed.		
5.	Details of Type Test if performed. (Attach Type test report)	Date of Test	Name of Lab.
-	Lightning Impulse Voltage Withstand test.		
-	Power frequency withstand Voltage test.		
-	Measurement of the resistance of the main circuit.		
-	Temperature-rise test.		
-	Short time and peak withstand current tests.		
-	Verification of the degree of protection		
-	Verification of making and breaking capacities.		
-	Mechanical operation tests.		
-	Tests on non-metallic partition and shutters.		
-	Internal arcing test.		
-	Short-circuit life test as specified		
-	Capacitor bank breaking test.		
-	Measurement of contact wear both after short circuit making and breaking tests and short circuit life test.		
-	Mechanical endurance test as specified.		
B. RATINGS OF SWITCHGEAR PANEL			
1.	Nominal Voltage	kV	
2.	Rated Voltage	kV	
3.	Rated Current	A	

4.	Rated short-circuit withstand current for main and earthing circuit	kA		
5.	Rated peak withstand current for main and earthing circuit	kA		
6.	Lightning Impulse Withstand Voltage.	kV		
7.	Power frequency withstand Voltage.	kV		
8.	Phase to phase clearance	Mm		
9.	Phase to ground clearance	Mm		
10.	Thickness of insulation sheet between phases	Mm		
11.	Material of insulation sheet	Mm		
12.	Size of control cable used in voltage circuit	mm ²		
13.	Size of cable used in current circuit.	mm ²		
14.	Whether the switchgear is completely covered on both sides?	YES/NO		
15.	Whether fire retardant pipes are provided for connection to adjacent panels on both sides?	YES/NO		
16.	Whether fiberglass sheet having min. thickness of 4mm for covering the bus-bar chamber on both sides of each panel has been installed?	YES/NO		
17.	Whether control cables run through steel channels with removable cover?	YES/NO		
18.	Whether color coding of control cables as per clause 14.2 is used?	YES/NO		

B.	CIRCUIT BREAKER		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name. (Attach Manufacturer's catalogue with the bid)			
2.	Manufacturer's address.			
3.	Type/designation			
4.	Country of origin			
5.	Suitability for 3-phase operation and rapid reclosing for outgoing feeders			
6.	Current rating of circuit breaker on which type tests were performed.	A		
7.	Mass of complete circuit breaker			
8.	No. of breaks in series per pole			
9.	No. of poles			
10.	No. of close open operations possible with the stored energy			

Signature

11.	Minimum clearance in air between poles			
12.	Minimum clearance in air between poles to earth			
13.	Type Tests (Copy of type test reports attached)	YES/NO		
14.	Type/ordering code of CB installed in switchgear panel on which type tests performed.			
15.	Type/designation of interrupter installed in CB on which type tests performed.			
16.	Details of following Type Test if performed. (Attach Type test report)	Date of Test	Name of Lab.	
	- Dielectric tests			
	- Short time withstand and peak withstand current tests			
	- Extended mechanical endurance test at ambient air temperature			
	- Short circuit current making & breaking tests			
	- Capacitor Bank Breaking and Capacitive Current Switching Tests			
	- Short circuit life test			
	- Measurement of resistance of interrupter in assembled condition			
	- Electrical endurance test			
17.	Rated voltage	kV		
18.	Lightening impulse withstand voltage	kV		
19.	Power frequency withstand voltage	kV		
20.	Rated frequency	Hz		
21.	Circuit Breaker Class			
	- w.r.t Mechanical Endurance			
	- w.r.t Electrical Endurance			
	- w.r.t Capacitive Current Breaking			
	- w.r.t Connection to cables			
22.	Rated capacitor bank breaking current	kA		
23.	Rated short circuit breaking current	kA		
24.	Percentage DC component	%		
25.	Rated short time withstand current	kA		
26.	Rated duration of short circuit	Sec.		

27.	Rated short circuit making current	kA		
28.	Rated peak withstand current	kA		
29.	First pole to clear factor			
30.	Rated transient recovery voltage for terminal faults	kV		
31.	Rated operating sequence			
32.	Break time			
33.	Dead time			
34.	Opening time			
35.	Closing time			
36.	Spring charging time			
37.	Arcing time			
38.	Close-Open time			
39.	Time between two operations necessary to restore the initial conditions and/or to prevent undue heating of parts of circuit breaker, t.	Seconds		
40.	Current capability of offered circuit breaker at 20 °C (Attach Load Current Vs Ambient Temp. curve)			
41.	Temperature rise at normal rated current			
-	Contacts	°C		
-	Terminals	°C		
-	Other metal parts	°C		
42.	Resistance of main circuit of CB.	$\mu\Omega$		
43.	Guaranteed mechanical life of circuit breaker and operating mechanism and category assigned for mechanical test			
44.	No. of mechanical operating cycles the circuit breaker is capable to performing without the need for mechanical adjustments			
45.	No. of opening operations the circuit breaker is capable to perform without maintenance at:			
-	Rated normal current			
-	10 % rated breaking current			
-	30 % rated breaking current			
-	60 % rated breaking current			
-	100 % rated breaking current			

C.	INTERRUPTER		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name & address. (Attach Manufacturer's catalogue with the bid)			
2.	Type/designation			
3.	Country of origin			
4.	Type tests reports attached			
5.	Type of interrupter installed in CB on which following type tests were performed.			
6.	Rated voltage			
7.	Rated normal current			
8.	Rated short circuit breaking current			
9.	Rated duration of short circuit			
10.	Rated single capacitor bank breaking current			
11.	Lightening Impulse withstand voltage			
12.	Power frequency withstand voltage			
13.	Type of circuit breaker on which the offered interrupter was type tested			
14.	Resistance of interrupter on which type tests were performed (attach document)			
15.	Dimensions (Drawing attached)			
16.	Interrupter weight.			
17.	Contact Force			
18.	Mechanical Life			
19.	Electrical Life at rated normal current			
20.	Interrupter contact material			

D.	OPERATING MECHANISM		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name and country of origin of trip coil			
2.	Manufacturer's name and country of origin of closing/opening coil			
3.	Rated voltage of closing coil (Max./Min.)	V		
4.	Rated voltage of DC trip coil (Max./Min.)	V		
5.	Rated power consumption of Closing coil	W		
6.	Rated power consumption of Trip coil	W		

for

7.	Motor for spring charge mechanism:			
	- Manufacturer's name and country of origin			
	- Rated voltage	V		
	- Rated power consumption	W		
8.	Time required for motor to recharge the closing spring			
9.	Type of auxiliary switches			
10.	Total Nos. of Auxiliary contacts			
11.	Total number of Auxiliary contacts			
12.	Number of spare Auxiliary contacts			
13.	Whether lockout preventing closing facility is provided?			
14.	Whether anti-pumping feature has been provided?			

E.	CB ISOLATING CONTACTS		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name & country of origin. (Attach Manufacturer's catalogue with the bid)			
2.	Material			
3.	Whether isolating contacts are silver-plated?			
4.	Whether type testing of offered CB was done with the same make & type of isolating contacts?			
5.	Dimensions of isolating contact (Attach drawings)			
6.	Whether isolating contacts are tulip type for outgoing panel? (Attach drawing)	YES/NO		
7.	Whether isolating contacts are tulip type for incoming panel? (Attach drawing)	YES/NO		

F.	LOAD BREAK SWITCH		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name and country of origin (Attach Manufacturer's catalogue with the bid)			
2.	Type/designation			
3.	Type tests reports attached	YES/NO		
4.	Rated voltage	kV		
5.	Rated current	A		
6.	Electrical Endurance class			

7.	Mechanical Endurance class			
8.	Rated short time and peak withstand current	kA		
9.	Rated short circuit making current	kA		
10.	Rated lightning impulse withstand voltage:	kV		
11.	Rated power frequency withstand voltage:	kV		
12.	No. of positions of load break switch.	Nos.		
13.	Type of HRC fuse used in LBS			
14.	HRC fuse Manufacturer's name & country of origin (Attach Manufacturer's catalogue with the bid)			
15.	Type/designation of HRC fuse			
16.	Country of origin of HRC fuse			
17.	Rated voltage of HRC fuse	kV		
18.	Rated current of HRC fuse	A		

G.	EARTHING SWITCH		Proposed Data	Deviation from P-44:2018
1.	Manufacturer's name and country of origin (Attach Manufacturer's catalogue with the bid)			
2.	Type/designation			
3.	Type tests reports attached	YES/NO		
4.	Rated voltage	kV		
6.	Rated short time and peak withstand time current	kA		
7.	Rated short circuit making current	kA		
8.	Electrical Endurance class			
9.	Mechanical Endurance class			
H.	PANEL ENCLOSURE		Proposed Data	Deviation from P-44:2018
1.	Thickness of sheet			
2.	Material of sheet			
3.	Degree of protection			
4.	Dimensions of panel (Attach drawings)			
5.	Whether cable entry gland/clamp plates are removable?			
6.	Whether spring loaded type explosion vents provided on the top of panel?			
7.	Material of shutter			

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I.	BUSBARS		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name & country of origin. (Attach Manufacturer's catalogue with the bid)			
2.	Material			
3.	Size of main bus-bars			
4.	Size of dropper bus-bars			
5.	Electrical conductivity of bus bar			
6.	Resistance of complete main circuit with CTs at 20 °C before temperature rise test (R/Y/B)	$\mu\Omega$		
7.	Resistance of complete main circuit without CTs at 20 °C before temperature rise test (R/Y/B)	$\mu\Omega$		
8.	Whether bus bars are tin plated?	YES/NO		
9.	Phase to phase clearance of main bus-bars			
10.	Phase to phase clearance of dropper bus-bars			
11.	Distance of bus bar from front of the panel			

J.	BUS BAR INSULATION		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name & country of origin. (Attach Manufacturer's catalogue with the bid)			
4.	Type tests reports attached	YES/NO		
5.	Material of insulation sleeves			
6.	Does the insulation provided on bus bars have properties of non-corrosive, non-tracking and is flame retardant?	YES/NO		
7.	Whether bus bar at joints are provided with covers?			
8.	Material of insulation covers on joints			
9.	Color of insulation			
10.	Impulse withstand voltage			
12.	Continuous voltage withstand capability			

K.	BUSBAR SUPPORT INSULATOR		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name & country of origin. (Attach Manufacturer's catalogue with the bid)			
2.	Type/designation of bus-bar support insulator			
3.	Type Tests (Copy of type test reports attached)	YES/NO		
4.	Material of insulator			
5.	Creepage distance	Mm		
6.	Rated lightning impulse withstand voltage	kV		
7.	Rated one-minute power frequency withstand voltage	kV		
8.	Failing load bending	KN		
9.	Dimensions (Attach drawing)			

L.	CAST RESIN SPOUTS		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name & country of origin. (Attach Manufacturer's catalogue with the bid)			
2.	Type/designation			
3.	Type tests reports attached	YES/NO		
4.	Material of spouts			
5.	Short time withstand current			
6.	Rated lightning impulse withstand voltage			
7.	Rated power frequency withstand voltage			
8.	Dimensions (Attach drawing)			

M.	EARTHING		Proposed Data	Deviation from P-44:2018 (If any)
1.	Dimensions of common earthing strip			
2.	Size of flexible earthing parts of hinged parts			
3.	Size of earthing terminal			
4.	Short time withstand current for earthing circuits			
5.	Peak withstand current			
6.	Whether earthing strip at joints is tin plated?	YES/NO		

N.	MINIATURE CIRCUIT BREAKER		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name & country of origin. (Attach Manufacturer's catalogue with the bid)			
2.	Type/designation of MCBs			
3.	Type Tests (Copy of type test reports attached)	YES/NO		
4.	Rated voltage (AC/DC)			
5.	Rated normal current			
6.	Rated breaking current			
7.	Operating time at rated breaking current			
8.	Whether each MCB is provided with two auxiliary contacts.			

O.	INSTRUMENTS (Power Quality Analyzer Ammeter, Voltmeter & Power Factor meter)		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name & country of origin. (Attach Manufacturer's catalogue with the bid)			
2.	Type/designation/ordering code of Ammeter.			
3.	Type/designation/ordering code of Voltmeter.			
4.	Type/designation/ordering code of Power Factor meter.			
5.	Type/designation/ordering code of Power Quality Analyzer			
6.	Type Tests (Copy of type test reports attached)	YES/NO		
7.	Full scale range of Ammeter			
8.	Scale range of Voltmeter			
9.	Scale range of Power Factor Meter			
10.	Accuracy class of Ammeter			
11.	Accuracy class of Voltmeter			
12.	Accuracy class of Power Factor Meter			
13.	Accuracy class of Power Quality Analyzer			
14.	Dimensions of meters.			
15.	Whether separate scale plates for each CT ratio is provided?	YES/NO		
16.	Whether name plate data/markings & symbols is printed on the meters?	YES/NO		

P.	OVERCURRENT & EARTH FAULT RELAY (with built-in two step capacitor unbalance detection protection for Capacitor protection, wherever applicable)		Proposed Data	Deviation from P-44:2018
1.	Manufacturer's name & country of origin. (Attach Manufacturer's catalogue with the bid)			
2.	Type/designation of over current relay along with ordering code & detail ordering sheet)			
3.	Type Tests (copy of type test reports attached)	YES/NO		
4.	Type of characteristics for phase O/C & E/F element			
5.	Type of characteristics for Sensitive E/F element (<u>for applicable cases only</u>)			
6.	No. of elements			
7.	CT Inputs (1A/5A)			
8.	Setting range of over-current element			
9.	Setting range of earth Fault element			
10.	Setting range of Phase & E/F instantaneous element			
11.	Setting range of Sensitive Earth Fault Protection element (<u>for applicable cases only</u>)			
12.	Setting range of instantaneous Sensitive Earth Fault Protection element (<u>for applicable cases only</u>)			
13.	Operating voltage	V		
14.	No. of Binary input/output contacts i. Binary Inputs ii. Binary Outputs			
15.	Continuous contact rating.	VA		
16.	Make/break contact rating	VA		
17.	Front & Rear Ports			
18.	Dimensions (Attach drawings)			
19.	Whether the offered relay is approved by NTDC System protection department?	YES/NO		
20.	Detail of Fiber Optic Interface IEC61850 compliant for Remote Communication/SAS			

Q.	OVER/UNDER VOLTAGE RELAY		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name & country of origin. (Attach Manufacturer's catalogue with the bid)			
2.	Type/designation of over current relay along with ordering code & detail ordering sheet)			
3.	Type Tests (copy of type test reports attached)	YES/NO		
4.	Type of characteristics			
5.	VT input			
6.	No. of elements			
7.	Setting range of Over voltage element			
8.	Setting range of Under Voltage element			
9.	Is VT Fuse Failure element available?	YES/NO		
10.	No. of Binary input/output contacts i.Binary Inputs ii.Binary Outputs			
11.	Continuous contact rating.	VA		
12.	Make/break contact rating	VA		
13.	Front & Rear Ports			
14.	Dimensions (Attach drawings)			
15.	Whether the offered relay is approved by NTDC System protection department?	YES/NO		
R.	DC TRIP CIRCUIT SUPERVISION RELAY		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name & country of origin. (Attach Manufacturer's catalogue with the bid).			
2.	Type/designation of DC Supervision Relay			
3.	Type Tests (Copy of type test reports attached)	YES/NO		
4.	Monitors full trip circuit with CB open and close.			
5.	Rated Voltage			
6.	Operating voltage range			
7.	a) Operating time.			
	b) Resetting time.			
	c) Time delayed drop off period.			
8.	No. of contacts.			

9.	Continuous contact rating	VA		
10.	Make/break contact rating	VA		
11.	Dimensions (Attach drawings)			
12.	Whether the offered relay is approved by NTDC System protection department.	YES/NO		

S.	<u>TRIPPING RELAYS.</u>		Proposed Data	Deviation from P-44:2018 (if any)
1.	a) Manufacturer.			
	b) Country of Manufacture.			
	a)Type			
2.	Ordering code along with ordering sheet			
3.	Nominal operating voltage.			
4.	Minimum Operating voltage.			
5.	Contact Mechanism Reset (Hand / Electrical).			
6.	Operation indicator (Hand Reset).			
7.	Operating time at nominal voltage.			
8.	No. of Contacts a)NO b)NC			
9.	Contact rating:			
	a)Make and carry continuously. •AC •DC			
	b)Make and carry for 3 secs. •AC •DC			
	c)Break •resistive watts. •Inductive (L/R=0.04sec) VA			
10.	Thermal withstand capacity.			
11.	Reset mechanism.			
12.	Dimensions (Attach drawings)			
13.	Whether the offered relay is approved by NTDC System protection department.	YES/NO		

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T.	CURRENT TRANSFORMER		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name & country of origin. (Attach Manufacturer's catalogue with the bid)			
2.	Type/designation of offered current transformer			
3.	Type Tests (copy of type test reports attached).	YES/NO		
4.	Rated voltage (Um), rms.	kV		
5.	Nominal voltage, rms.	kV		
6.	Rated Frequency.	Hz		
7.	Rated normal primary current.	A		
8.	Rated Secondary current.	A		
9.	Rated continuous Thermal current, Itch,	%		
10.	Lightning Impulse voltage (Primary winding).	kV		
11.	Power frequency Voltage (Primary winding).	kV		
12.	Power frequency Voltage (secondary winding).	kV		
13.	Insulation Class			
14.	Rated duration of short circuit.	Sec.		
15.	Temperature rise.	°C		
16.	Max. Temp. withstand capability	°C		
17.	Accuracy limit factor.			
18.	Instrument Security Factor.			
19.	Inter Turn Insulation level.	kV		
20.	Resistance of primary winding at 20°C ambient temp.			
21.	Resistance of secondary winding at 20°C ambient temp.:			
	a. Measuring Core 1.	mΩ		
	b. Protective Core 2.	mΩ		
22.	Rated Secondary Output, VA:			
	a. Measuring Core 1.	VA		
	b. Protective Core 2.	VA		
23.	Accuracy Class:			
	a. Measuring Core.	A		
	b. Protective Core.	A		
24.	Short time Thermal (Ith)/dynamic(Idyn) current rating.	kA		
25.	Partial Discharge at 1.2Um/ 1.2 Um/√3.	PC		

U.	VOLTAGE TRANSFORMER		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name & country of origin. (Attach Manufacturer's catalogue with the bid)			
2.	Type/designation of offered voltage transformer.			
3.	Type Tests (Copy of type test reports attached).	YES/NO		
4.	Rated Primary Voltage, Um, kV, rms.	kV		
5.	Rated Secondary Voltage, Um, V, rms.	V		
6.	Nominal Primary Voltage, Un, kV,rms.	kV		
7.	Rated Secondary Voltage, Um, kV, rms.	V		
8.	Rated Frequency.	Hz		
9.	Rated Secondary Output:			
	- Measuring winding.			
	- Protective winding.			
10.	Accuracy Class:			
	- Measuring winding.			
	- Protective winding.			
11.	Rated Voltage Factor:			
	- Continuous duty.			
	- 30 second duty.			
12.	Temp. Rise at 1.2 times the rated primary voltage.	°C		
13.	Temperature Rise under short circuit condition.	°C		
14.	Lightning Impulse withstand voltage (Primary winding).	kV		
15.	Power freq. withstand Voltage (Primary winding).	kV		
16.	Power freq. withstand Voltage (secondary winding).	kV		
17.	Resistance of primary winding at 20°C ambient temp.			
20.	Resistance of secondary winding at 20°C ambient temp.			
21.	Partial Discharge at $U_m/1.2U_m/1.2U_m/\sqrt{3}$.	pC		
22.	Short circuit withstand capability.	Sec.		
23.	Permissible secondary short circuit current.			
24.	Details of deviations of the offered CTs from NTDC specification amended to date (attach details if any).			

V.	SURGE ARRESTOR		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name & country of origin. (Attach Manufacturer's catalogue with the bid)			
2.	Type/designation of surge arrester.			
3.	ZnO Block 's manufacturer name & address.			
4.	Type Tests (Copy of type test reports attached)	YES/NO		
5.	Highest System voltage, Um.	kV, rms		
6.	Nominal System voltage, Un.	kV, rms		
7.	Arrester min. Rated Voltage, Ur.	kV, rms		
8.	Rated Frequency	Hz		
9.	Nominal discharge current, In	kA, peak		
10.	Material of housing (Porcelain/Polymer)			
11.	Continuous operating voltage (Uc), kV.			
12.	Temporary over voltage (TOV), Is /10 s.	kVrms		
13.	Line discharge class			
14.	Short circuit withstand current, (0.2 s)	kAsym.		
15.	Pressure relief class			
16.	High Current 4/10 μ s Impulse withstand	kApeak		
17.	Switching Current Impulse Withstand (Upper value).	A		
18.	Maximum Residual Voltage at 10kA Steep Impulse current wave of 1/20 μ s.	kV		
19.	1.2/50 μ s Lightning Impulse Withstand Voltage	kVpeak		
20.	Power frequency withstand voltage for one minute	kV		
21.	Internal partial discharge at 1.05 times continuous operating voltage	pC		
22.	Maximum Residual voltage at lightning impulse current waves of 8/20 μ s.			
	- 5 kA.	kVpeak.		
	- 10 kA.	kVpeak.		
	- 20 kA.	kVpeak.		
23.	Max. Residual Voltage at Switching Impulse current wave of 30/60 μ s:			
	- 500 A.	kVpeak.		
	- 1000 A.	kVpeak.		
	- 2000 A.	kVpeak.		
24.	Energy discharge capability (2 impulses).			
	- Thermal	kJ/kV (Ur).		
	- Impulse	kJ/kV (Ur).		

W.	ENERGY METER	Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name		
2.	Manufacturer's address. (Attach Manufacturer's catalogue with the bid)		
3.	Type/designation/Model No. of offered meter.		
4.	Country of origin.		
5.	Accuracy class (Active/Reactive) of Energy Meter on which type tests were performed.		
6.	Type/designation of Energy meter on which type tests were performed.		
7.	Capability of offered energy meter to record:		
	- Active Energy Export	YES/NO	
	- Reactive Energy Export	YES/NO	
	- Active Energy Import	YES/NO	
	- Reactive Energy Import	YES/NO	
	- Apparent Energy	YES/NO	
	- Maximum Demand of Active Energy	YES/NO	
	- Maximum Demand of Reactive Energy	YES/NO	
	- Maximum Demand of Apparent Energy	YES/NO	
	- Active Energy	YES/NO	
	- Reactive Energy	YES/NO	
	- Apparent Energy	YES/NO	
8.	No. of phases/wires.	Nos.	
9.	Reference Voltage (U)	Volts	
10.	Reference Temperature.	°C	
11.	Reference frequency (f)	Hz	
12.	Rated current, In.	Amp	
13.	Maximum current, I _{max} .	Amp	
14.	Whether meter operates continuously at 1.2 In?	YES/NO	
15.	Sampling rate		
16.	Whether the arrangements as required are available on the front cover?	YES/NO	
17.	Type of display.	LCD/LEDs	
18.	No. of digits of display.	Nos.	
19.	Size of digits of display (H x W)	mm	
20.	Minimum retention period of back up non-volatile memory.	Months	
21.	Type of Memory.		
22.	Memory storage capacity of display unit.	Bytes	

Signature

Signature

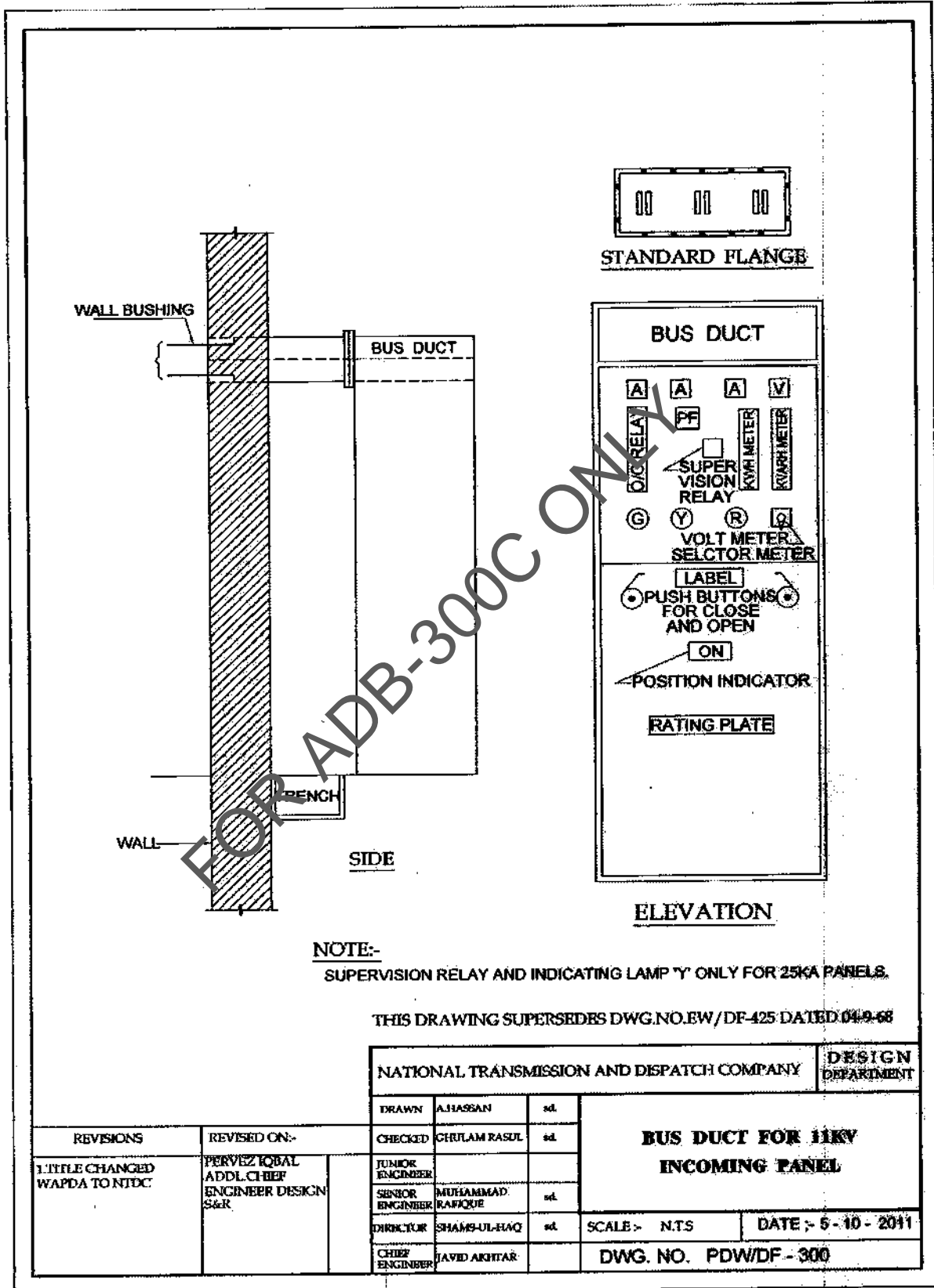
23.	Memory storage capacity of each register.	Bytes		
24.	Memory capacity for load profile.	Bytes		
25.	Total memory storage capacity of all register.	Bytes		
26.	Overall memory capacity for energy meter.	Bytes		
27.	Minimum retention period of display unit.			
28.	Minimum retention period of registers.			
29.	Battery life for display unit.			
30.	Whether facility for activating the display is provided on the front of the meter?	YES/NO		
31.	Whether display unit is reactivated in case failure of main/auxiliary supply?	YES/NO		
32.	Whether display unit is able to record & display data for a minimum period of 120 days corresponding to max. current at reference voltage and unity power factor?			
33.	Whether following data/information is displayed on with date & time stamped?			
	- Date and time	YES/NO		
	- CT & PT ratio	YES/NO		
	- Phase/Line voltages	YES/NO		
	- Phase/Line currents	YES/NO		
	- Active energies import and export (present & preceding month), KWH.	YES/NO		
	- Reactive energies import and export (present & preceding month), KVARH.	YES/NO		
	- Apparent energies import and export (present & preceding month), KVAH.	YES/NO		
	- Max. Demand of Active energies import and export (present & preceding month), KW.	YES/NO		
	- Max. Demand of Reactive energies import and export (present & preceding month), KVAR.	YES/NO		
	- Max. Demand Apparent energies import and export (present & preceding month), KVA.	YES/NO		
	- Power factor, PF.	YES/NO		
	- Frequency, Hz.	YES/NO		
	- Last Max. Demand reset	YES/NO		
	- Total No. of Max. Demands resets	YES/NO		
	- Meter serial No.	YES/NO		
	- Power Quadrant Indicator.	YES/NO		
	- Pulse Output for field testing of meter	YES/NO		
	- Error code	YES/NO		

San

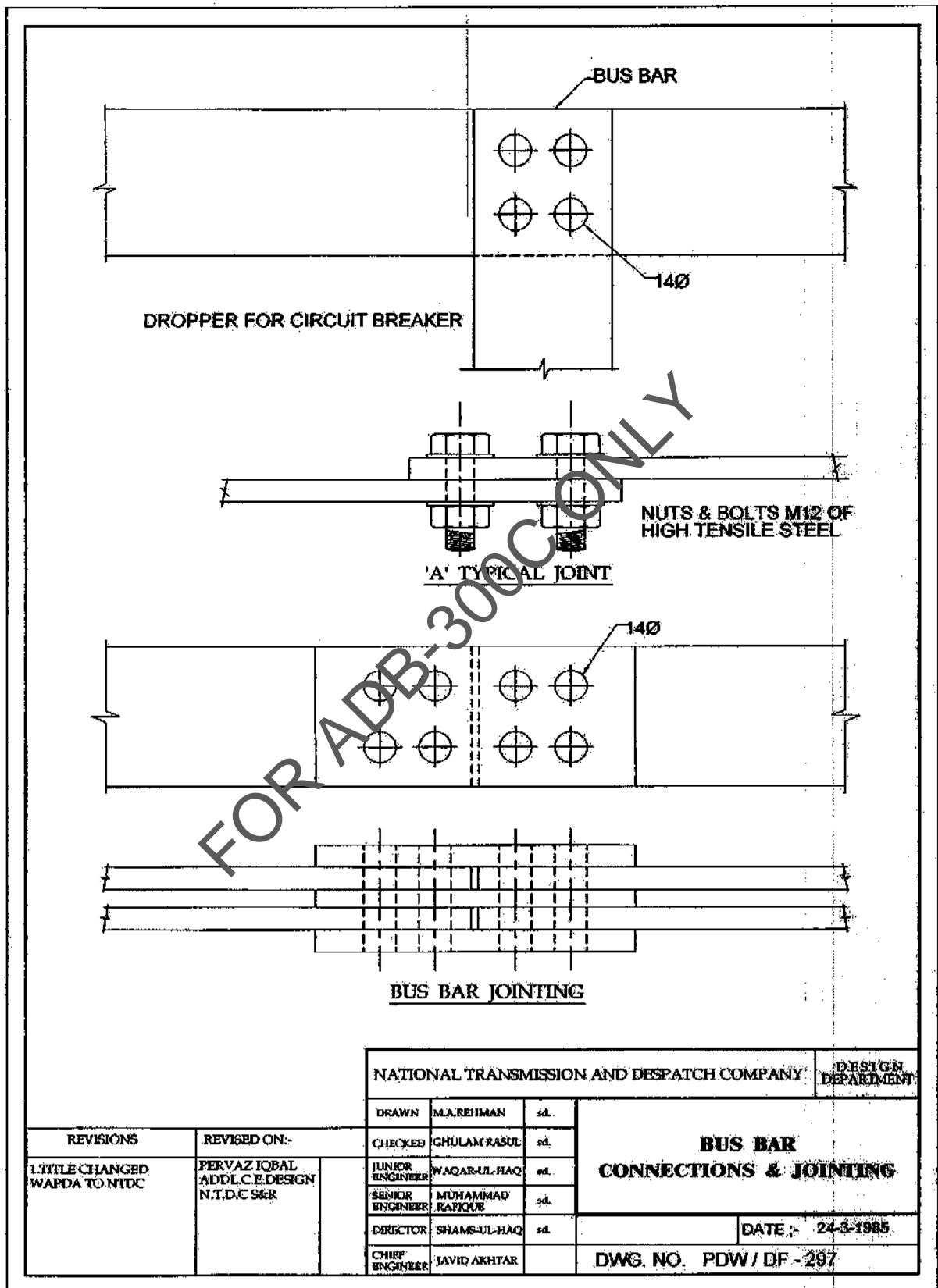
34.	Pulse outputs for remote metering:-			
	- Type of outputs.			
	- VA burden of outputs.			
	- No. of output terminals.			
	- Number of pulse outputs			
35.	Whether flashing LED indicators are provided on the meter for accuracy measurement?	YES/NO		
36.	Whether optical probes along with software on CD shall be supplied as mentioned in NTDC Spec. P- 202?	YES/NO		
37.	Normal operating voltage range	Volts		
38.	Limit range of voltage operation	Volts		
39.	Minimum starting current	mA		
40.	Initial start-up time	ms.		
41.	No. of Tariffs	Nos.		
42.	Type of Tariffs			
43.	No. of registers	Nos.		
44.	Whether meter record the all events with Date and Time Stamped as mentioned in NTDC Specification P-202:2012?	YES/NO		
45.	Type of metrology indicator (visible light/IR)			
46.	Whether energy meter have security features with Date and Time Stamped as mentioned in NTDC Specification P-202:2012?	YES/NO		
47.	EMC Electrostatic discharge.	kV		
48.	VF magnetic field withstand level	V/m		
49.	Whether meter have upgraded option.	YES/NO		
50.	Whether offered energy meter comply with DLMS/COSEM/SCADA protocols.	YES/NO		
51.	Dimensions of energy meter (attach drawing)			
52.	Weight of energy meter.	Kg.		
X.	TERMINAL BLOCKS & CABLES		Proposed Data	Deviation from P-44:2018 (If any)
1.	Manufacturer's name & address. (Attach Manufacturer's catalogue with the bid)			
2.	Type/designation of Terminal blocks			
3.	Country of origin			
4.	Type Tests (Copy of type test reports attached)	YES/NO		
5.	Current carrying capacity			
6.	Size of terminal block used in voltage circuit.			
7.	Size of terminal block used in current circuit.			
8.	No. of spare terminal blocks provided			

9.	Size of cable used in voltage circuit.			
10.	Size of cable used in current circuit.			
11.	Type of cable identification.			
12.	Color of cable used in red phase			
13.	Color of cable used in yellow phase			
14.	Color of cable used in blue phase			
15.	Color of cable used in neutral			
Y.	DIMENSIONS AND WEIGHTS		Proposed Data	Deviation from P-44:2018 (if any)
1.	Dimensions of circuit breaker (attach drawing).			
2.	Dimensions of complete panel (attach drawing).			
3.	Weight of circuit breaker.			
4.	Weight of complete panel.			

FOR ADB-300C ONLY

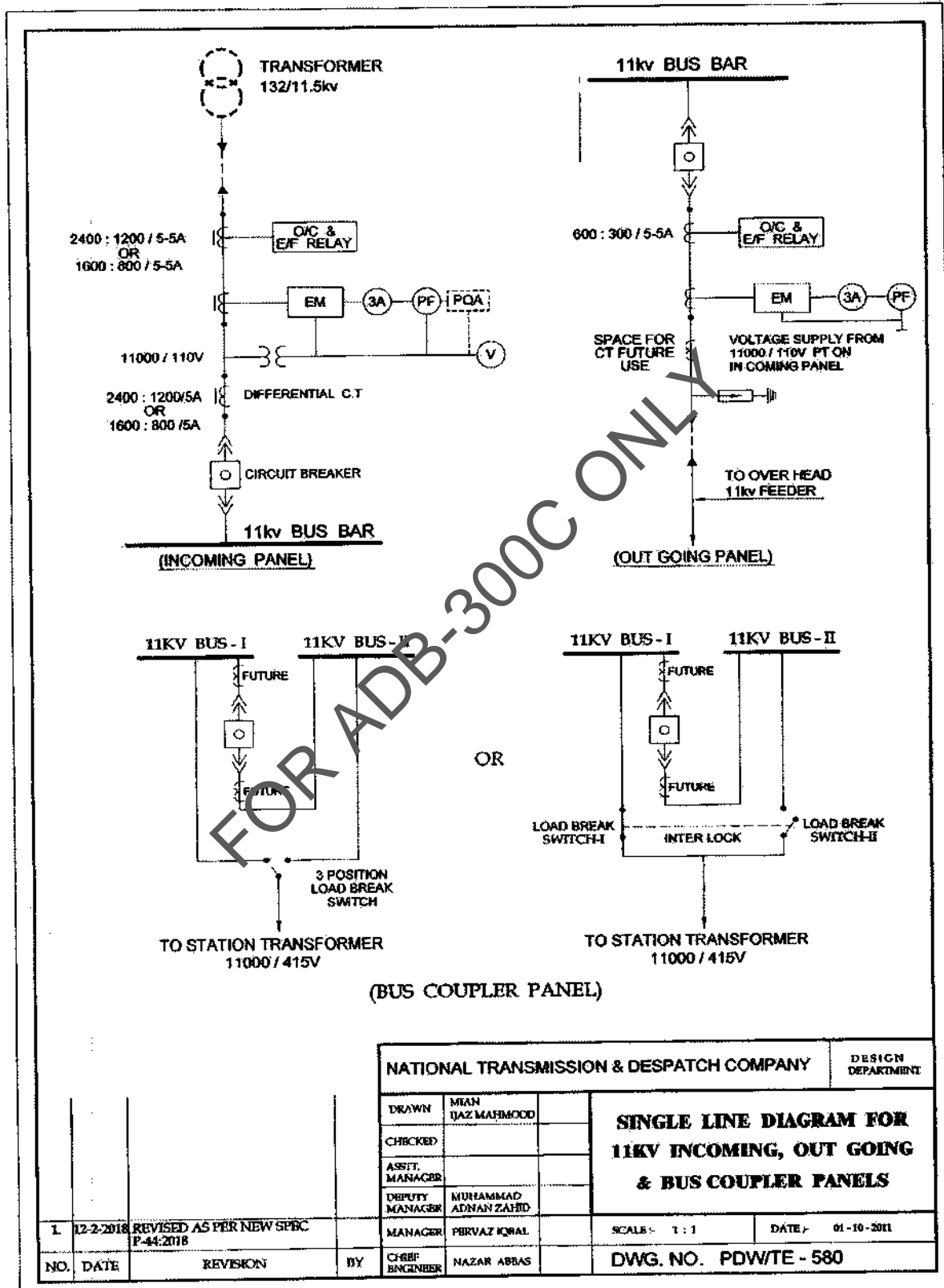


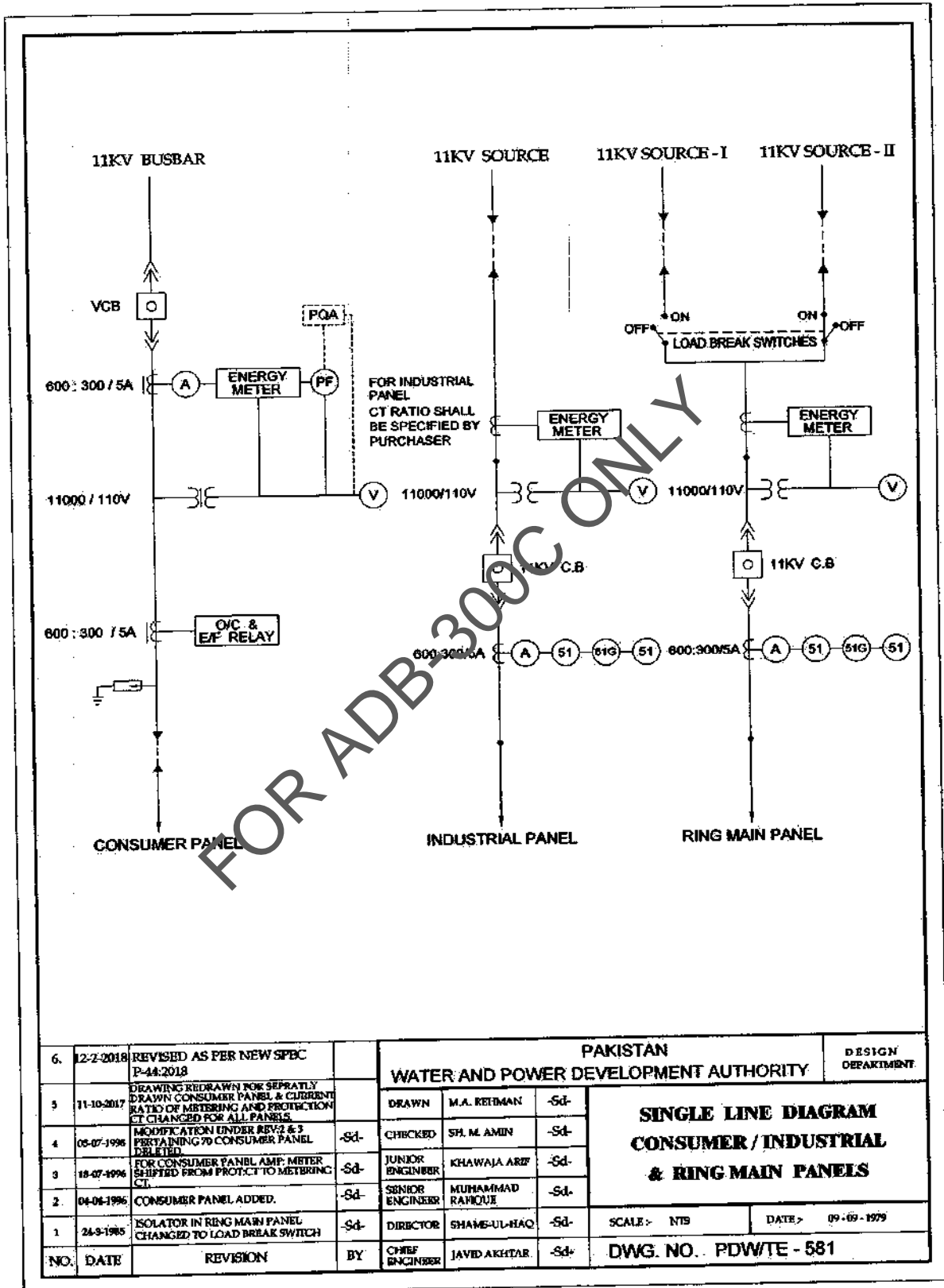
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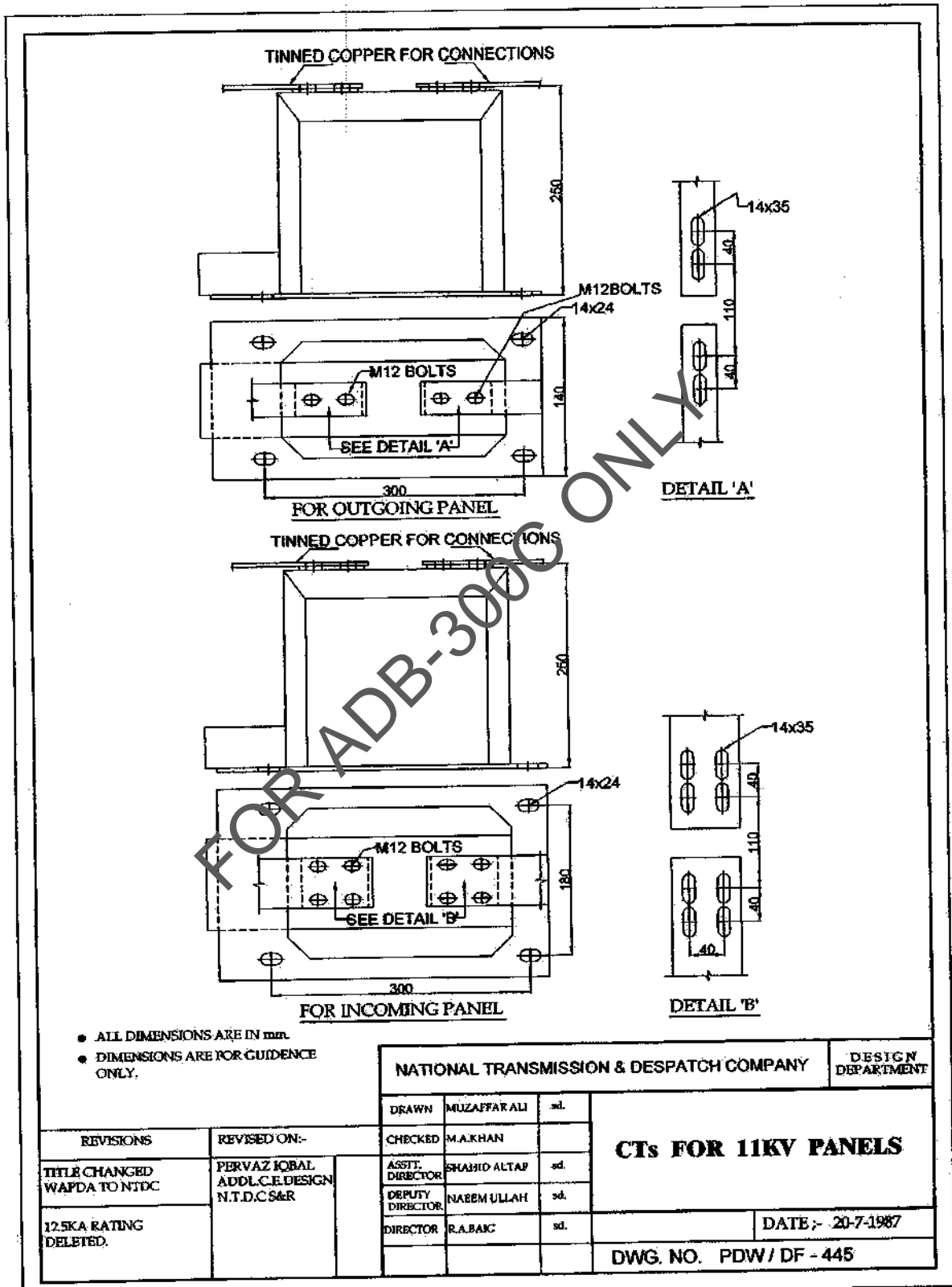
NATIONAL TRANSMISSION AND DESPATCH COMPANY			DESIGN DEPARTMENT
REVISIONS	REVISED ON:-	DRAWN	<p align="center">BUS BAR CONNECTIONS & JOINTING</p> <p>DATE: 24-3-1985</p> <p>DWG. NO. PDW / DF - 297</p>
LITTLE CHANGED WAPDA TO NTDC	PERVAZ IQBAL ADD.L.C.E.DESIGN N.T.D.C S&R	CHECKED	
		JUNIOR ENGINEER	
		SENIOR ENGINEER	
		DIRECTOR	
		CHIEF ENGINEER	

Handwritten signatures and initials.



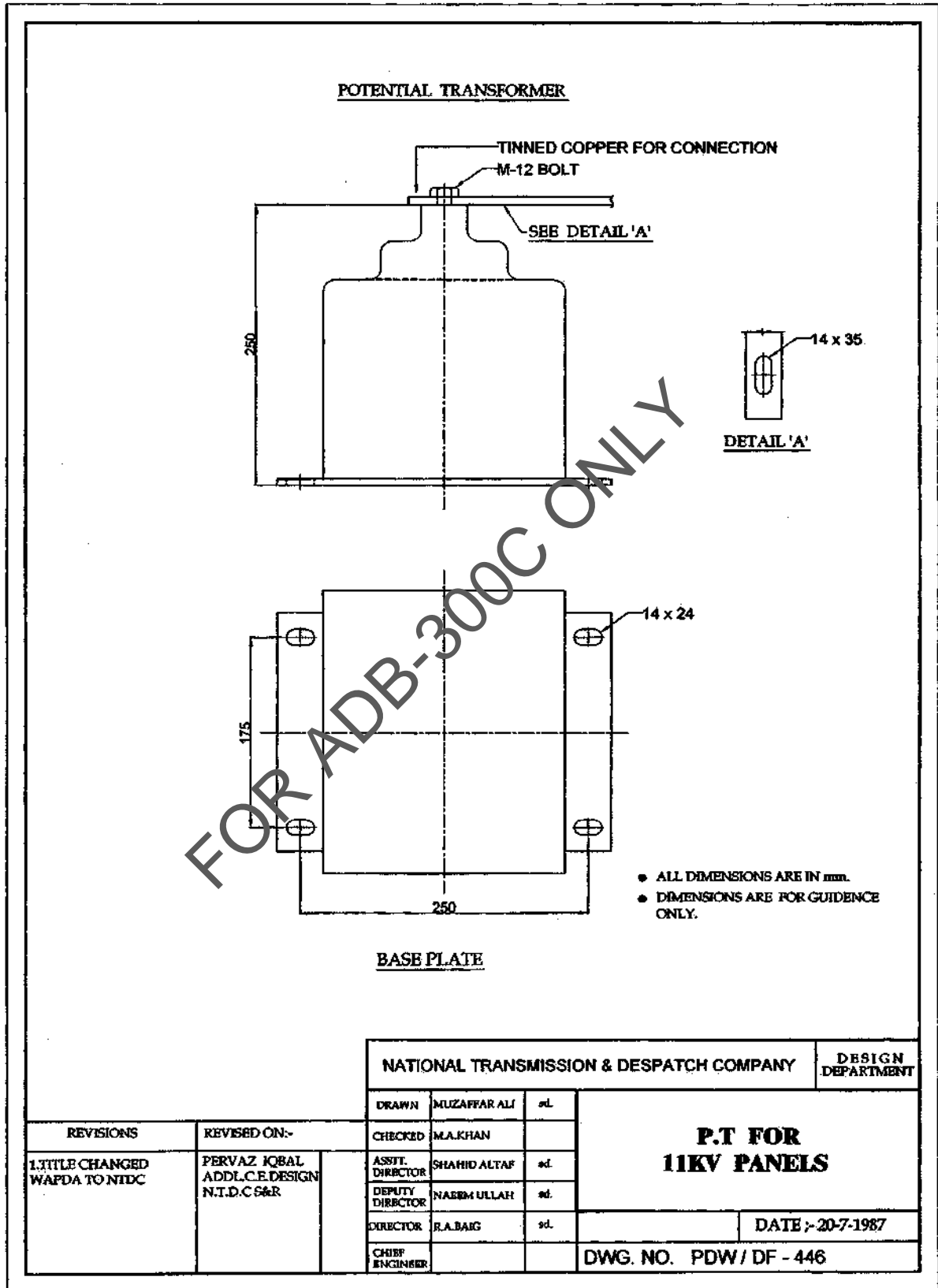


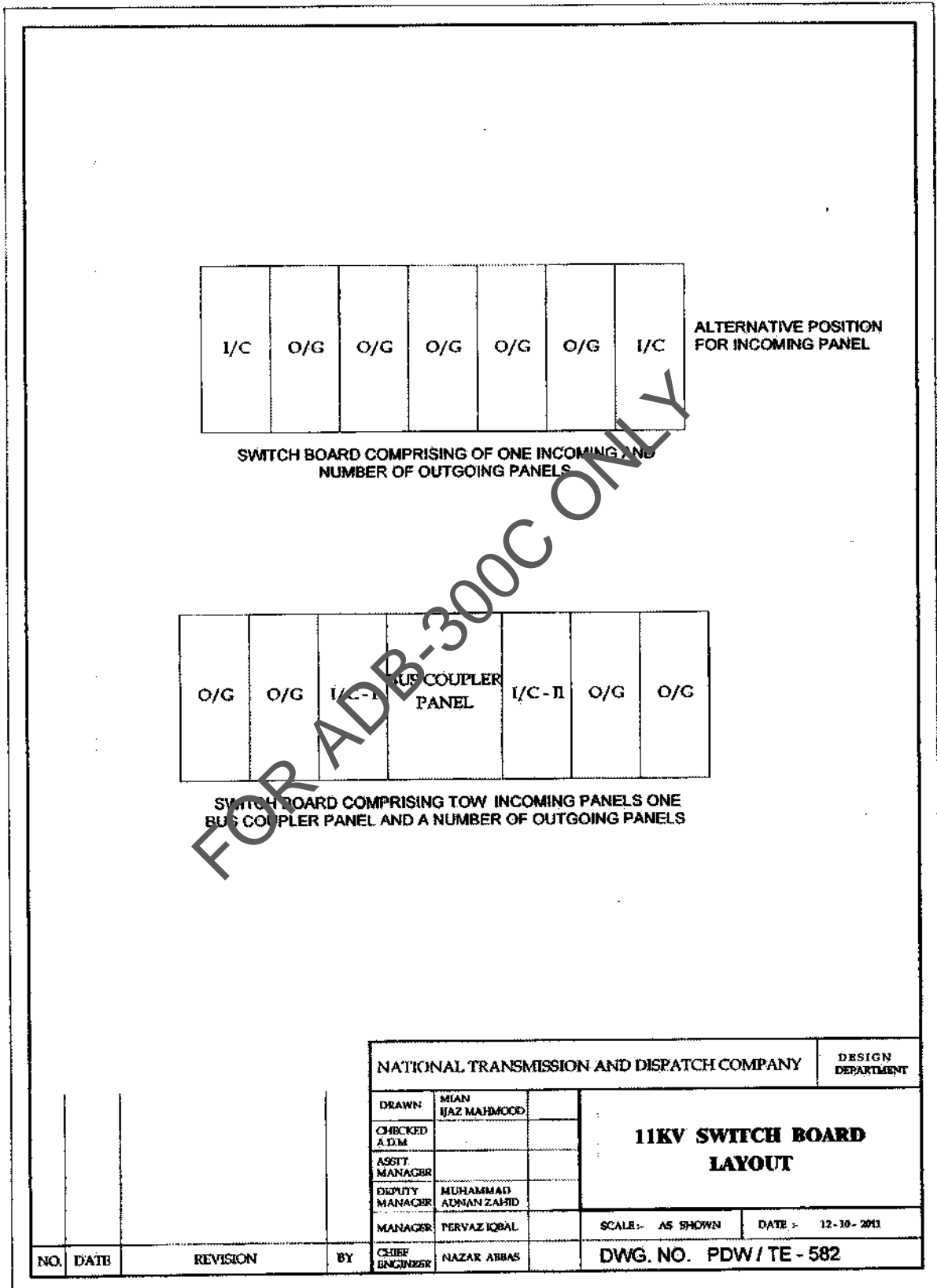
				PAKISTAN			DESIGN DEPARTMENT					
				WATER AND POWER DEVELOPMENT AUTHORITY								
6.	12-2-2018	REVISED AS PER NEW SPBC P-44:2018		SINGLE LINE DIAGRAM CONSUMER / INDUSTRIAL & RING MAIN PANELS								
5	11-10-2017	DRAWING REDRAWN FOR SEPARATELY DRAWN CONSUMER PANEL & CURRENT RATIO OF METERING AND PROTECTION CT CHANGED FOR ALL PANELS							DRAWN	M.A. REHMAN	-Sd-	
4	05-07-1996	MODIFICATION UNDER REV 2 & 3 DELETED.	-Sd-						CHECKED	SH. M. AMIN	-Sd-	
3	18-07-1996	FOR CONSUMER PANEL AMP. METER SHIFTED FROM PROTECT TO METERING CT.	-Sd-						JUNIOR ENGINEER	KHAWAJA ARIF	-Sd-	
2	04-06-1996	CONSUMER PANEL ADDED.	-Sd-						SENIOR ENGINEER	MUHAMMAD RANIQUE	-Sd-	
1	24-9-1985	ISOLATOR IN RING MAIN PANEL CHANGED TO LOAD BREAK SWITCH	-Sd-						DIRECTOR	SHAME-UL-HAQ	-Sd-	
NO.	DATE	REVISION	BY	CHIEF ENGINEER	JAVED AKHTAR	-Sd-						
							SCALE > NTS	DATE > 09-09-1979				
							DWG. NO. - PDW/TE - 581					



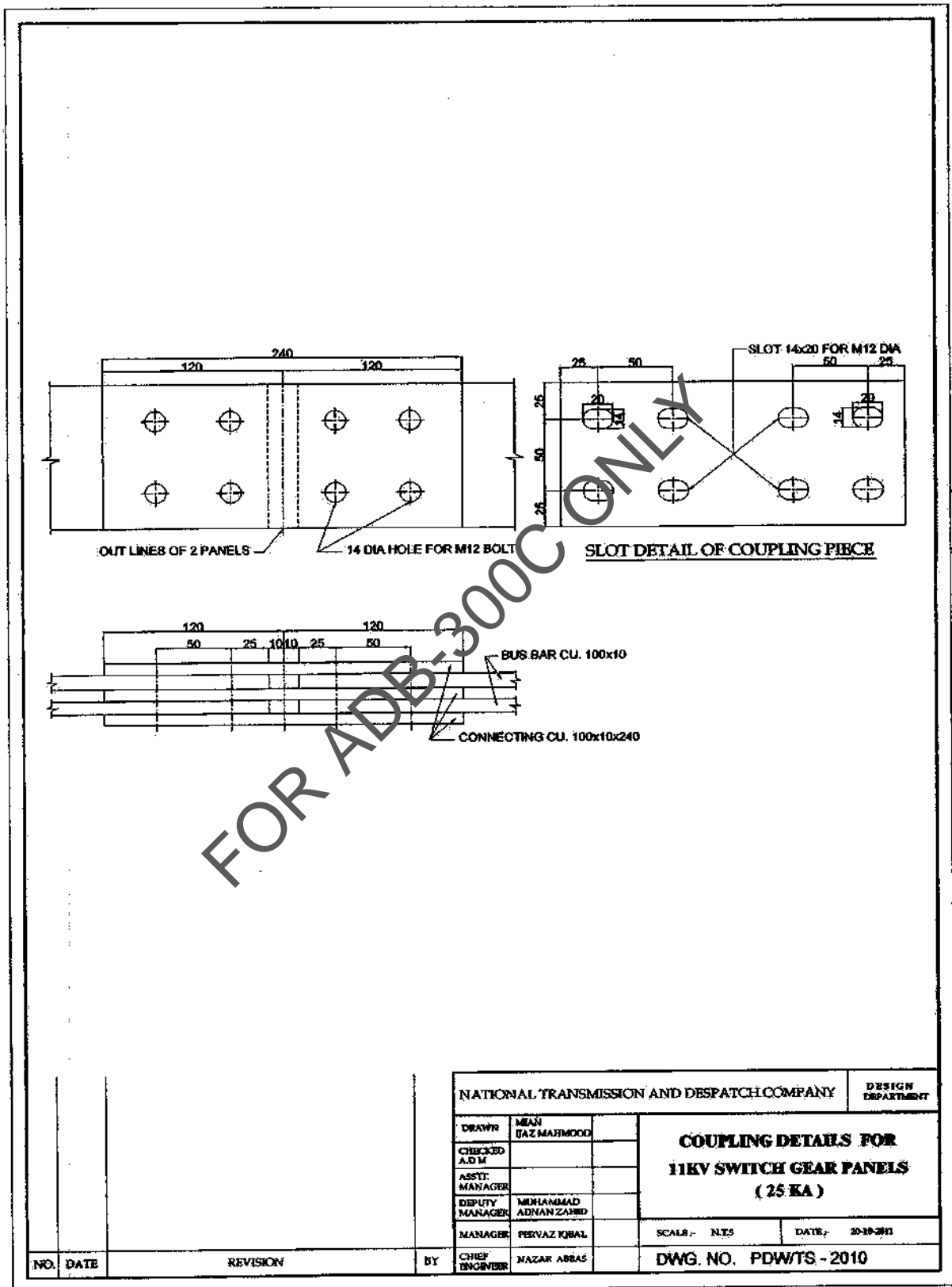
- ALL DIMENSIONS ARE IN mm.
- DIMENSIONS ARE FOR GUIDENCE ONLY.

			NATIONAL TRANSMISSION & DESPATCH COMPANY			DESIGN DEPARTMENT	
REVISIONS		REVISED ON:-	DRAWN	MUZAFFAR ALI	sd.	CTs FOR 11KV PANELS	
TITLE CHANGED WAPDA TO NTDC		PERVAZ IQBAL ADDL.C.E.DESIGN N.T.D.C S&R	CHECKED	M.A.KHAN			
12.5KA RATING DELETED.			ASSTT. DIRECTOR	SHAHID ALTAF	sd.		
			DEPUTY DIRECTOR	NAREM ULLAH	sd.		
			DIRECTOR	R.A.BAIC	sd.	DATE :- 20-7-1987	
						DWG. NO. PDW / DF - 445	



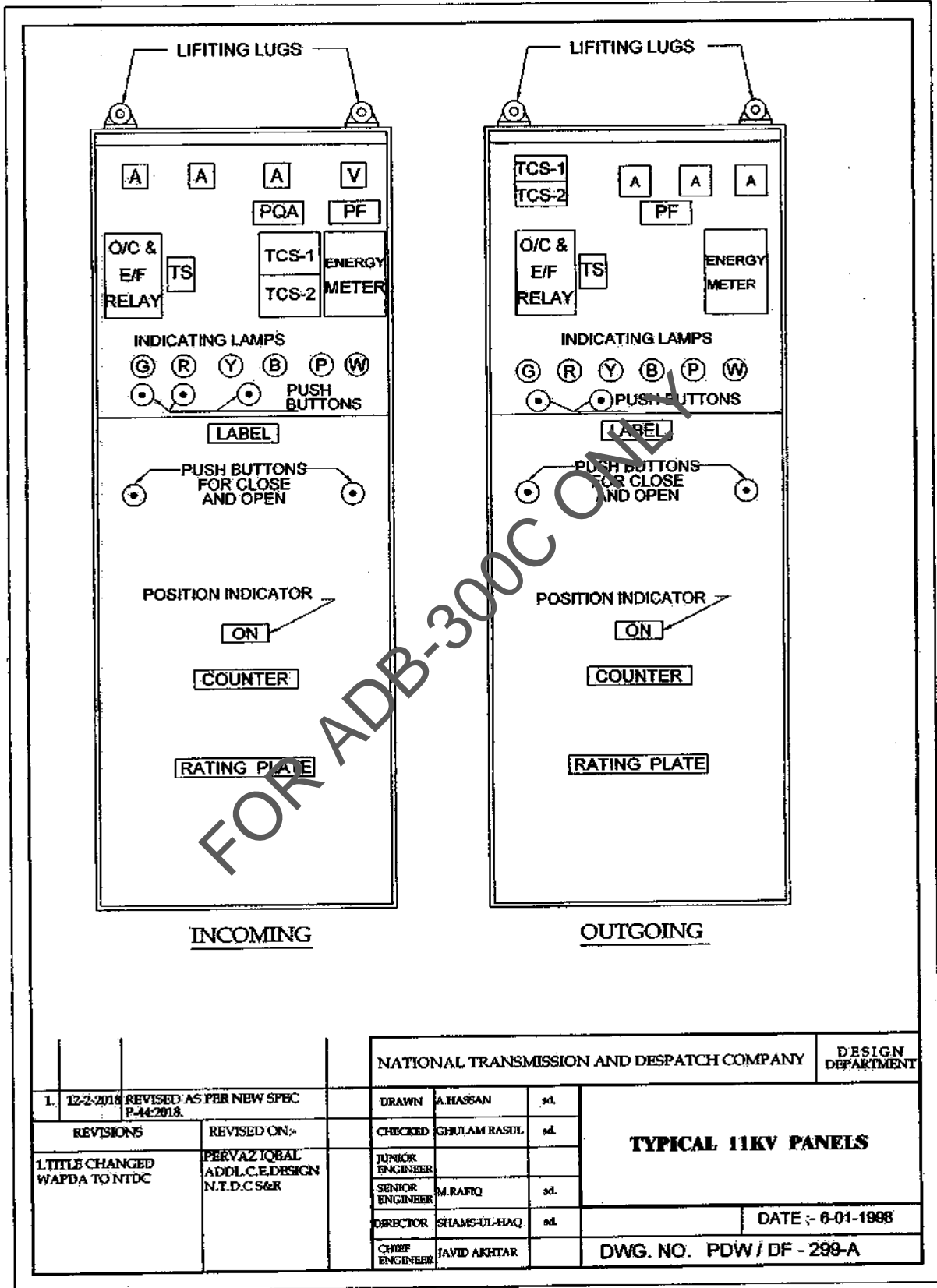


NATIONAL TRANSMISSION AND DISPATCH COMPANY				DESIGN DEPARTMENT	
DRAWN	MIAN IJAZ MAHMOOD		11KV SWITCH BOARD LAYOUT		
CHECKED A.I.D.M					
ASST. MANAGER					
DEPUTY MANAGER	MUHAMMAD ADNAN ZAHRID				
MANAGER	PERVAZ IQBAL				
		SCALE:- AS SHOWN	DATE > 12-10-2013		
NO.	DATE	REVISION	BY	CHIEF ENGINEER	NAZAR ABBAS
				DWG. NO. PDW / TE - 582	



NATIONAL TRANSMISSION AND DESPATCH COMPANY		DESIGN DEPARTMENT					
DRAWN	MEAN IJAZ MAHMOOD	COUPLING DETAILS FOR 11KV SWITCH GEAR PANELS (25 KA)					
CHECKED	A.D.M						
ASST. MANAGER							
DEPUTY MANAGER	MIRHAMMAD ADNIAN ZAHED						
MANAGER	PERVAZ IQBAL						
NO.	DATE	REVISION	BY	CHIEF ENGINEER	NAZAR ABBAS	SCALE:- N.T.S	DATE:- 20-10-2011
						DWG. NO. PDW/TS - 2010	

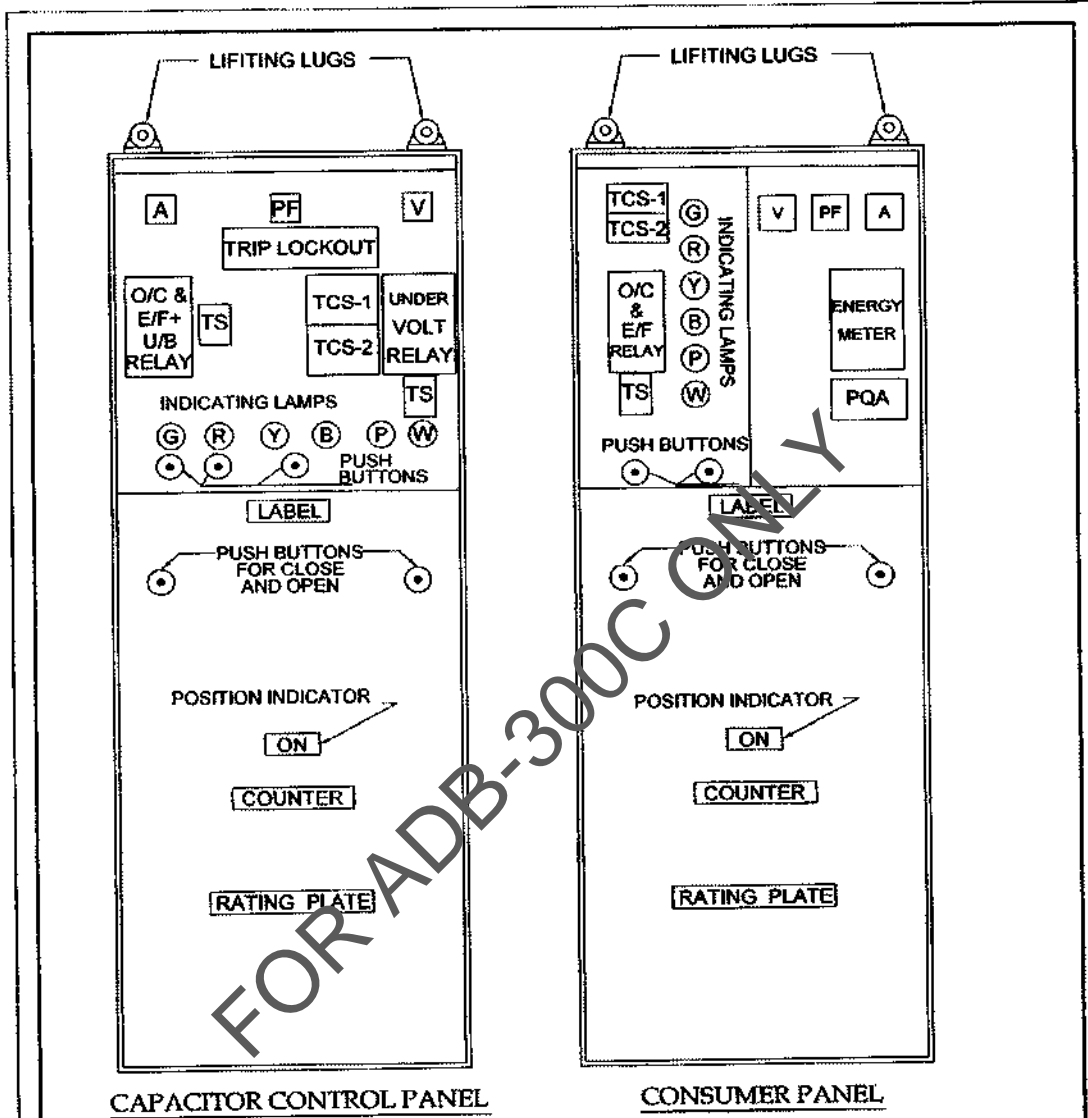
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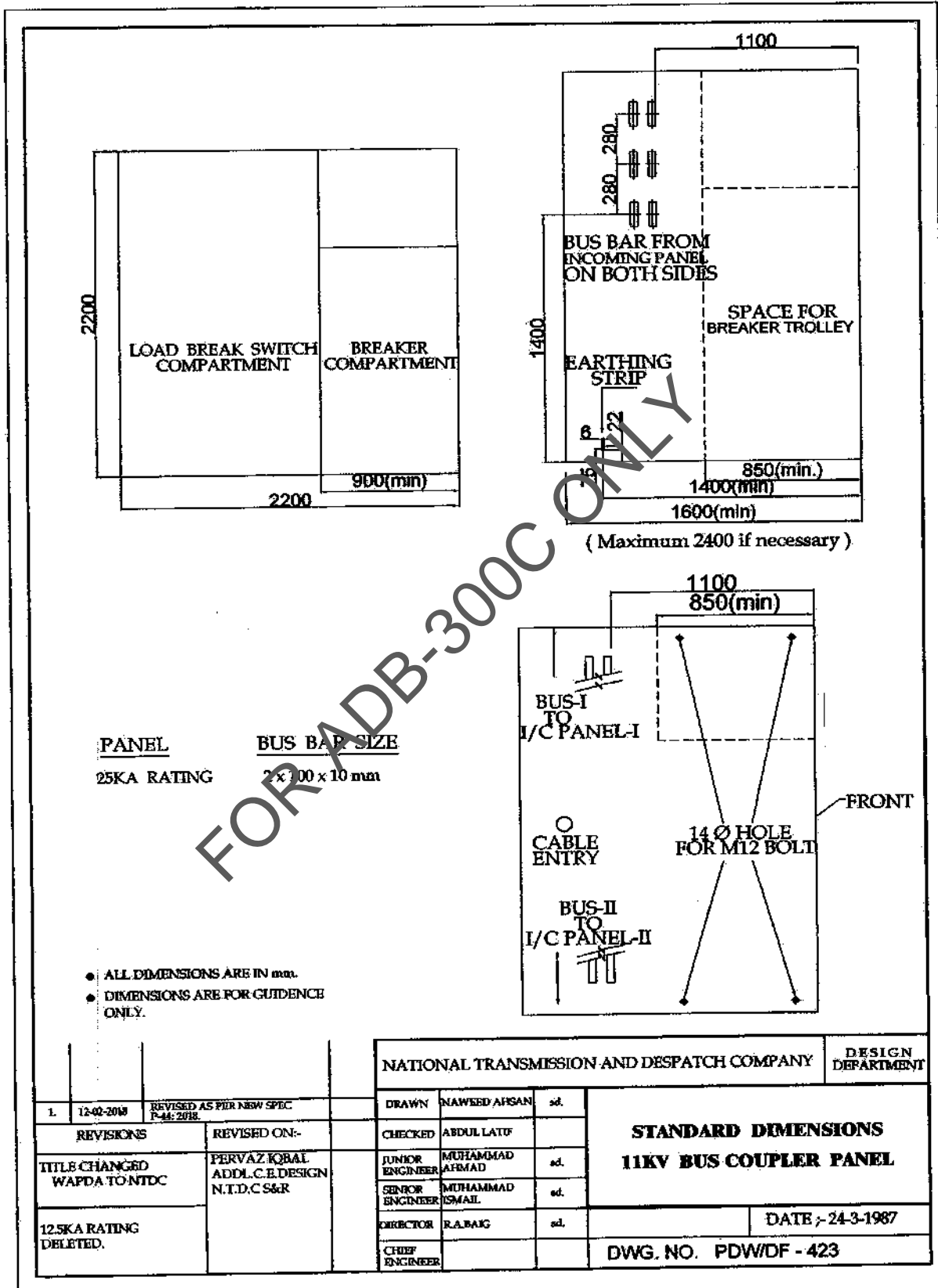
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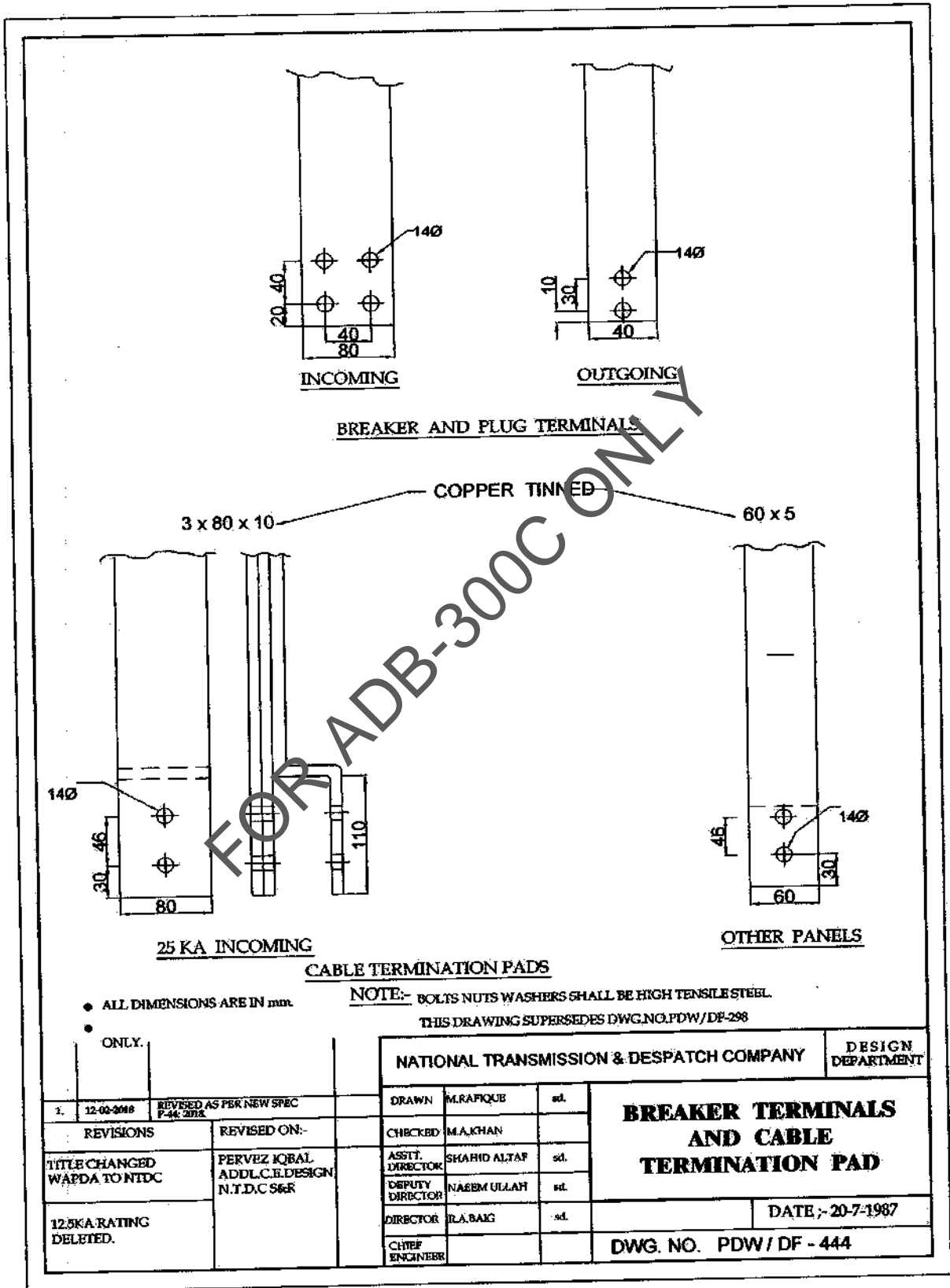
		NATIONAL TRANSMISSION AND DESPATCH COMPANY			DESIGN DEPARTMENT
1.	12-2-2018	REVISED AS PER NEW SPEC P-44:2018.	DRAWN	A.HASSAN	sd.
REVISIONS		REVISED ON:-	CHECKED	GHULAM RASUL	sd.
1. TITLE CHANGED WAPDA TO NTDC		PERVAZ IQBAL ADDL.C.E.DESIGN N.T.D.C S&R	JUNIOR ENGINEER		
			SENIOR ENGINEER	M.RAFIQ	sd.
			DIRECTOR	SHAMS-UL-HAQ.	sd.
			CHIEF ENGINEER	DAVID AKHTAR	
TYPICAL 11KV PANELS					DATE :- 6-01-1998
					DWG. NO. PDW / DF - 299-A

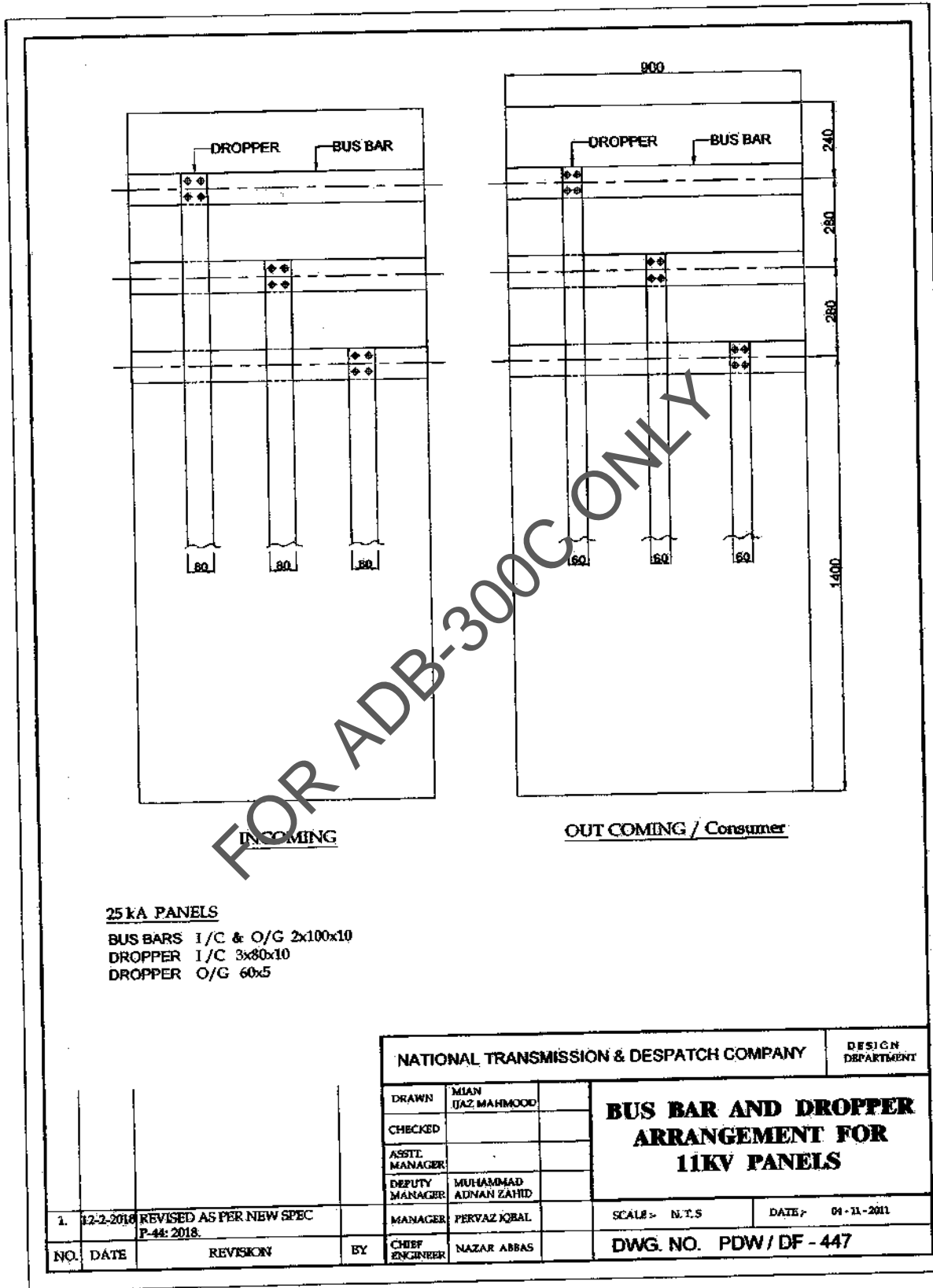
for



		NATIONAL TRANSMISSION AND DESPATCH COMPANY			DESIGN DEPARTMENT
1.	12-2-2018	REVISED AS PER NEW SPEC P-44: 2018.	DRAWN	A.HASSAN	sd.
REVISIONS		REVISED ON:-	CHECKED	GIRITAM RASUL	sd.
1. TITLE CHANGED WAPDA TO NTDC.		PHIRVAZ IQBAL, ADDL.C.E.DESIGN N.T.D.C S&R	JUNIOR ENGINEER		
			SENIOR ENGINEER	M.RAFIQ	sd.
			DIRECTOR	SHAMS-UL-HAQ	sd.
			CHIEF ENGINEER	SAVID AKHTAR	
TYPICAL 11KV PANELS					DATE :- 6-01-1996
DWG. NO. PDW / DF - 298-B					





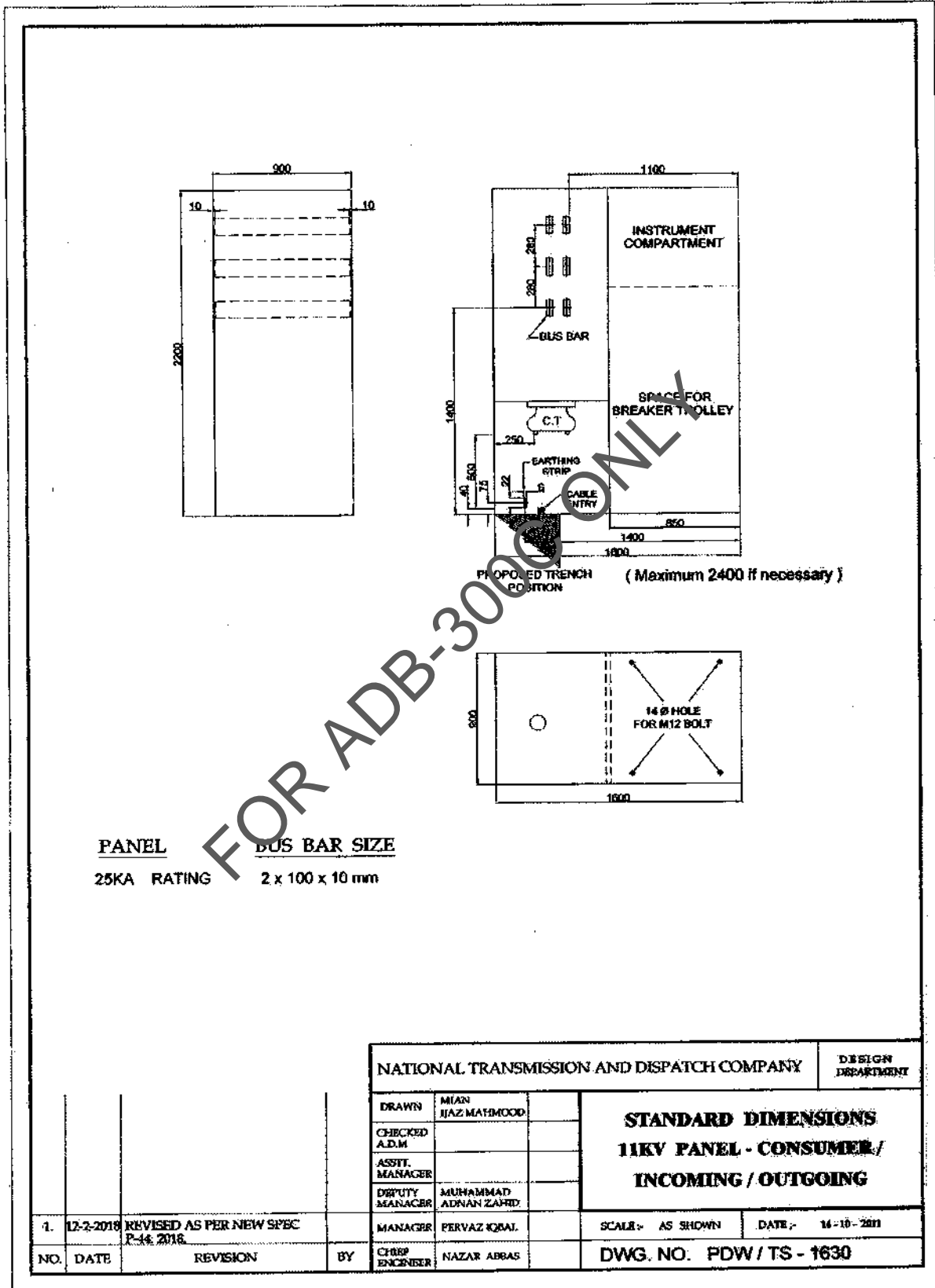


25 KA PANELS

BUS BARS I/C & O/G 2x100x10
 DROPPER I/C 3x80x10
 DROPPER O/G 60x5

NATIONAL TRANSMISSION & DESPATCH COMPANY				DESIGN DEPARTMENT		
DRAWN	MIAN IJAZ MAHMOOD	BUS BAR AND DROPPER ARRANGEMENT FOR 11KV PANELS				
CHECKED						
ASST. MANAGER						
DEPUTY MANAGER	MUHAMMAD ADNAN ZAHID					
MANAGER	PERVAZ IQBAL	SCALE -> N.T.S	DATE ->	04-11-2011		
NO.	DATE	REVISION	BY	CHIEF ENGINEER	NAZAR ABBAS	DWG. NO. PDW / DF - 447

1. 12-2-2018 REVISED AS PER NEW SPEC P-44: 2018.



Signature

